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Preface

This preface explains the objectives, intended audience, and organization of Cisco Carrier Routing System 16-Slot Line Card Chassis Installation Guide and describes the conventions that convey instructions and other information.

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

Throughout the remainder of this installation guide, the Cisco CRS 16-Slot Line Card Chassis is referred to as the LCC.

Note

• Audience, on page xv
• Documentation Conventions, on page xv
• Related Documentation, on page xvii
• Changes to This Document, on page xvii
• Obtaining Documentation and Submitting a Service Request, on page xviii

Audience

This guide is intended for LCC installers and Cisco installation partners who are responsible for installing the LCC 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:

<table>
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<tr>
<th>Convention</th>
<th>Description</th>
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<tr>
<td><strong>bold</strong> font</td>
<td>Commands and keywords and user-entered text appear in <strong>bold</strong> font.</td>
</tr>
<tr>
<td><em>Italic</em> font</td>
<td>Document titles, new or emphasized terms, and arguments for which you supply values are in <em>italic</em> font.</td>
</tr>
<tr>
<td>Convention</td>
<td>Description</td>
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<tr>
<td>[ ]</td>
<td>Elements in square brackets are optional.</td>
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<tr>
<td>string</td>
<td>A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.</td>
</tr>
<tr>
<td>courier font</td>
<td>Terminal sessions and information the system displays appear in courier font.</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Nonprinting characters such as passwords are in angle brackets.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Default responses to system prompts are in square brackets.</td>
</tr>
<tr>
<td>!, #</td>
<td>An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.</td>
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</table>

**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
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 16-Slot Line Card Chassis Unpacking, Moving, and Securing Guide
- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Site Planning Guide
- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description
- Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide
- Cisco CRS Fiber-Optic Cleaning Kit Quick Start Guide
- Cisco CRS Carrier Routing System Hardware Documentation Guide
- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Hardware Operations and Troubleshooting Guide
- Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information
- Cisco CRS Carrier Routing System Ethernet Physical Layer Interface Module Installation Note
- Cisco CRS Carrier Routing System Packet-over-SONET/SDH Physical Layer Interface Module Installation Note


**Changes to This Document**

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

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<tr>
<td>March 2015</td>
<td>Added recommendation to use modular power supplies with CRS-X line cards.</td>
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<tr>
<td>December 2014</td>
<td>Added support for the CRS-MSC-X-L and CRS-FP-X-L line cards.</td>
</tr>
<tr>
<td>July 2014</td>
<td>Added support for new 2x100GE-FLEX-40 PLIM. Added updates to support the Cisco CRS-X back-to-back and multishelf systems, which include new CRS-16-FC400/M switch fabric card.</td>
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<tr>
<td>January 2014</td>
<td>Added updates to support the Cisco CRS-X, which includes new line cards, switch fabric cards, and PLIMs.</td>
</tr>
<tr>
<td>November 2011</td>
<td>Added new procedures for installing and removing modular configuration power module slot covers.</td>
</tr>
<tr>
<td>September 2011</td>
<td>Updated product IDs and technical specifications</td>
</tr>
<tr>
<td>Date</td>
<td>Change Summary</td>
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<tr>
<td>July 2011</td>
<td>Added new modular configuration AC cord clamps. Added information about new CRS-LSP Label Switch Processor (LSP). Technical updates and minor editorial changes were also made.</td>
</tr>
<tr>
<td>April 2011</td>
<td>Added information about new CRS-16-PRP-6G and CRS-16-PRP-12G Performance Route Processor (PRP) cards. Technical updates and minor editorial changes were also made.</td>
</tr>
<tr>
<td>December 2010</td>
<td>Updated document with technical corrections and updates to grounding and modular configuration power sections.</td>
</tr>
<tr>
<td>October 2010</td>
<td>Added information about the new MSC140 and FP140 line cards; FQ123-140G switch fabric card; 20-port, 14-port, 8-port, and 4-port 10-GE XFP PLIMs; and the 1-port 100-GE CFP PLIM. Minor editorial and technical changes were also made.</td>
</tr>
<tr>
<td>September 2010</td>
<td>Added new procedures on installing and removing modular configuration power components.</td>
</tr>
<tr>
<td>January 2010</td>
<td>Added new procedures for installing and removing a new trough and cut-out plate.</td>
</tr>
<tr>
<td>May 2008</td>
<td>Added new procedures on installing and removing a pillow block.</td>
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<tr>
<td>February 2008</td>
<td>Updated document with technical corrections.</td>
</tr>
<tr>
<td>July 2007</td>
<td>Made technical updates to power components chapter.</td>
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<tr>
<td>January 2007</td>
<td>Added a description of the input-power-present LEDs. Added “Installing the Inlet Grille Screen,” “Installing the Exhaust Bag and Removing Exterior Cosmetic Components.”</td>
</tr>
<tr>
<td>April 2006</td>
<td>Removed Chapter 2, “Unpacking and Securing the Line Card Chassis”, transferred the information to the Cisco CRS 16-Slot Line Card Chassis Unpacking, Moving, and Securing Guide</td>
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<tr>
<td>December 2005</td>
<td>Updated Chapter 2, “Unpacking and Securing the Line Card Chassis” to include information supporting the new dolly design.</td>
</tr>
<tr>
<td>July 2005</td>
<td>• Added multishelf information to document.</td>
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<tr>
<td></td>
<td>• Updated Chapter 2, “Unpacking and Securing the Line Card Chassis” to include the alternate mounting outrigger kit installation information.</td>
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<tr>
<td></td>
<td>• Updated Installing and Removing Exterior Cosmetic Components to include information about the new rear cosmetic kit.</td>
</tr>
<tr>
<td>July 2004</td>
<td>Initial release of the document</td>
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</table>

**Obtaining Documentation and Submitting a Service Request**

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Overview

This chapter provides a brief description of Cisco Carrier Routing System (CRS) 16-Slot Line Card Chassis (LCC) from the highest level.

This chapter includes the following topics:

• Chassis Overview
• Chassis Components
• Chassis Slot Numbers
• Chassis Footprint
• Chassis Cable Management
• Chassis Exterior Components
• Chassis Cooling System
• Chassis Power System
• Safety Guidelines
• Preventing Electrostatic Discharge

• Chassis Overview, on page 1
• Chassis Components, on page 2
• Chassis Slot Numbers, on page 7
• Chassis Footprint, on page 10
• Chassis Cable Management, on page 11
• Chassis Exterior Components, on page 11
• Chassis Cooling System, on page 11
• Chassis Power System, on page 13
• Safety Guidelines, on page 13
• Preventing Electrostatic Discharge, on page 14

Chassis Overview

The 16 slots in the LCC can contain the following:
Chassis Components

This section lists the main components of an LCC. It primarily identifies the components considered field-replaceable units (FRUs), but where additional detail is useful identifies subassemblies that are not field replaceable.

The LCC contains:

- As many as 16 MSCs, FPs, LSPs, and 16 associated PLIMs. A line card (MSC, FP, or LSP) and a PLIM are an associated pair of cards that mate through the chassis midplane. The line card provides the forwarding engine for Layer 3 routing of user data being switched through the system, and the PLIM provides the physical interface and connectors for the user data.

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

• The MSC card is available in the following versions: CRS-MSC (end-of-sale), CRS-MSC-B, CRS-MSC-140G, and CRS-MSC-X /CRS-MSC-X-L.
• The FP card is available in the following versions: CRS-FP140, CRS-FP-X/CRS-FP-X-L (200G mode).
• The LSP card is: CRS-LSP.

• Each line card can be associated with different types of PLIMs, which provide different interface speeds and technologies. Note the following:
  • The CRS-MSC-B card is compatible with both 40G CRS-1 and 140G CRS-3 fabric cards.
  • The CRS-MSC-140G card is only compatible with the 140G CRS-3 fabric card.
  • The CRS-MSC-X and CRS-MSC-X-L cards are compatible with the 400G CRS-X fabric card.

• A chassis midplane. The midplane connects an MSC, FP, or LSP to its associated PLIM. The midplane design allows the MSC, FP, or LSP to be removed from the chassis without having to disconnect the cables that are attached to the associated PLIM. The midplane, which also distributes power, connects the MSCs, FPs, and LSPs to the switch fabric cards, and provides control plane interconnections, is not field replaceable by the customer.
• Two route processor (RP) cards. The RPs supply the intelligence of the system by functioning as the LCC system controller.

A Performance Route Processor (PRP) is also available for the LCC. Two PRPs perform the same functions as two RPs, but provide enhanced performance for both route processing and system controller functionality.

**Note**
A chassis should not be populated with a mix of RP and PRP cards. Both route processor cards should be of the same type (either RP or PRP).

• Eight switch fabric cards (SFCs). These fabric cards provide switch fabric components for the system. The switch fabric receives user data from one MSC, FP, or LSP and PLIM pair and performs the switching necessary to route the data to the appropriate egress MSC, FP, or LSP and PLIM pair.
  • As a single-shelf (standalone) system, the LCC contains switch fabric cards that provide all three stages of the three-stage Benes switch fabric.
  • As part of a multishelf system, the LCC contains S13 fabric cards that provide Stage 1 and Stage 3 of the switch fabric. S2 fabric cards in the Cisco CRS Fabric Card Chassis (FCC) provide Stage 2 of the fabric, and fabric cables connect the fabric cards to each other.

**Note**
The LCC supports either 40G fabric (FC/S cards), 140G fabric (FC-140/S cards), or 400G fabric (FC-400/S cards). An LCC with a mix of 40G, 140G, and 400G fabric cards is not a supported mode of operation. Such a mode is temporarily allowed only during the upgrade process.

• Two fan controller cards. The cards vary the high-speed fans in the fan trays to adjust the airflow for ambient conditions.
• Upper and lower fan trays. The trays push and pull air through the chassis. A removable air filter is located above the lower fan tray.
• Two types of power systems are available: fixed configuration power and modular configuration power. Both power configurations use either AC or DC power and are fully redundant.

This figure shows a front view of an LCC with a fixed configuration AC power system installed. The front view of an LCC with a fixed configuration DC power system installed is similar.
This figure shows the rear view of an LCC with a fixed configuration AC and DC power system installed.
Figure 2: LCC Rear (MSC) Side View - Fixed Configuration Power

This figure shows the front view of an LCC with a modular configuration AC and DC power system installed.
This figure shows the rear view of an LCC with a modular configuration AC and DC power system installed.
Chassis Slot Numbers

This section identifies the locations and slot numbers for major cards and modules (primarily the field replaceable units) that plug into the chassis.

This figure shows the chassis slot numbers on the front (PLIM) side of the LCC.
The components on the front (PLIM) side of the chassis include:

- Upper power shelf (PS0)
- Lower power shelf (PS1)
- Upper PLIM card cage with eight PLIM slots (left to right: 0, 1, 2, 3 and 4, 5, 6, 7) spaced around two double-width fan controller card slots, FC0 and FC1. (These thicker-width slots accept only the two fan controllers.)
- Lower PLIM card cage with eight PLIM slots (left to right: 8, 9, 10, 11 and 12, 13, 14, 15) and two double-width route processor card slots, RP0 and RP1. (These thicker-width slots accept only the RPs.)

The following figure shows the chassis slot numbers on the rear (MSC) side of the LCC.
The components on the rear (MSC) side of the chassis include:

- Top fan tray (FT0)
- Upper card cage, eight MSC slots (left to right: 7, 6, 5, 4 and 3, 2, 1, 0) spaced around four switch fabric card slots (SM0, SM1, SM2, and SM3)
- Lower card cage, eight MSC slots (left to right: 15, 14, 13, 12 and 11, 10, 9, 8) spaced around four switch fabric card slots (SM4, SM5, SM6, and SM7)
- Lower fan tray (FT1)

The MSC slot numbers are reversed from the PLIM slot numbers on the other side of the chassis. Because an MSC is associated and actually mates through the midplane with a PLIM, MSC slot 0 is on the far right side of the chassis looking at it from the rear (MSC) side; PLIM slot 0 is on the far left side of the chassis looking at it from the front (PLIM) side. MSC slot 0 and PLIM slot 0 mate with each other through the midplane, and so do all other MSC and PLIM slots (2 through 15).

**Note**

Any line card (MSC, FP, or LSP) can be inserted into an MSC slot.
Chassis Footprint

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

Cisco can also provide a mylar template of the LCC 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 LCC.

This figure is a top view of the LCC footprint (with optional front and rear cosmetics installed).

*Figure 7: Top View of LCC*

<table>
<thead>
<tr>
<th>Number</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Depth of LCC with doors attached and closed, 40.2 in. (102.2 cm)</td>
</tr>
<tr>
<td>2</td>
<td>Depth of front cable management to rear cable management, excluding doors, 38.3 in. (97.2 cm)</td>
</tr>
<tr>
<td>3</td>
<td>From front surface to rear surface of chassis, excl. cable management and doors, 32.8 in. (83.2 cm)</td>
</tr>
<tr>
<td>4</td>
<td>Width of chassis, 23.5 in. (59.8 cm).</td>
</tr>
</tbody>
</table>
Because no external switch fabric interconnection cabling exists on the single LCC, the rear door is optional.

### Chassis Cable Management

The LCC has cable management features for both the front (PLIM) and rear (MSC) sides of the chassis. The PLIM side has horizontal cable management features above both card cages. The front horizontal cable management trays have a special telescoping feature that allows them to be extended when the chassis is upgraded with higher-density cards. This extension feature also helps when installing the cables in the chassis.

The front cosmetic doors need to be removed from the chassis when the telescoping feature is in use.

The MSC side of the chassis has one cable management system above the lower card cage (in the middle of the chassis). These rear cable management trays are not telescoping because there is a preset amount of fiber cabling to be managed.

### Chassis Exterior Components

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

### Chassis Cooling System

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

- Two fan trays
- Two fan controller cards
- 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 LCC is controlled by a push-pull configuration. As shown in the figure below, ambient air flows in at the bottom front (PLIM) side and up through the card cages until it exhausts at the top rear (MSC) side of the LCC. 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 8: Airflow Through LCC

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Front (PLIM) side of chassis</td>
<td>6</td>
<td>Power shelves (two installed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Air intake</td>
<td>7</td>
<td>Air exhaust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lower fan tray</td>
<td>8</td>
<td>Upper card cage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Air filter</td>
<td>9</td>
<td>Lower card cage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chassis Power System

Two types of power systems are available for the LCC: 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. Both types of power system comprise:

- Redundant AC or DC power shelves
- Alarm modules, one per power shelf
- Bus bar
- Chassis midplane

Safety Guidelines

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

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

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

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 PLIMs, MSCs, 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 follows national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 60364, part 1 through part 7.
- Connect only a DC power source that follows the safety extra-low voltage (SELV) requirements in UL/CSA/IEC/EN 60950-1 and AS/NZS 60590 to the DC-input power system.
• Make sure that you have a readily accessible two-poled disconnect device incorporated in the fixed configuration wiring of a CRS configured with the DC-input power system.
• Make sure that you provide short-circuit (overcurrent) protection as part of the building installation.

Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend 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 Cisco CRS Carrier Routing System 16-Slot line card chassis power components.

This chapter presents the following topics:

• Power Component Information Common to the Two Types of Power Systems
• Installing and Remove Fixed Configuration Power Components
• Installing and Removing Modular Configuration Power Components
• Converting a Chassis from Fixed Configuration Power to Modular Configuration Power

• Power Systems Overview, on page 15
• Power Component Information Common to the Two Types of Power Systems, on page 16
• Installing and Remove Fixed Configuration Power Components , on page 29
• Installing and Removing Modular Configuration Power Components, on page 57
• Converting a Chassis from Fixed Configuration Power to Modular Configuration Power, on page 96

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. It provides power sharing across power zones. 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
provideload-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, see the Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide.

Power Component Information Common to the Two Types of Power Systems

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

- Basic Chassis Power Details
- Bonding and Grounding Guidelines
- DC Power Systems
- AC Power Systems

Basic Chassis Power Details

The LCC 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 LCC requires that at least one power shelf and its components be installed to operate properly; however, if you install only one power shelf and its components, your system will not be 2N redundant.

Two types of power shelves exist: an AC shelf and a DC shelf. 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).
The chassis might have more than one power connection. All connections must be removed to de-energize the chassis. Statement 1028

Caution

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 threaded ground inserts are located on top of the chassis rear (MSC) side panel to the left of the lower power shelf. The following figure shows the NEBS and grounding points on the rear (MSC) side of the chassis with a modular configuration DC power shelf installed. This grounding point is also referred to as the network equipment building system (NEBS) bonding and grounding stud. The location of the grounding points on the LCC is the same for both fixed and modular configuration power systems.

Note

These bonding and grounding receptacles are provided to satisfy the Telcordia NEBS requirements for bonding and grounding connections.
The previous figure shows a 45-degree grounding. A 180-degree (straight) grounding lug can also be used.

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

The grounding points are hidden 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; use the top grounding point for NEBS grounding purposes.

Modular configuration power shelf grounding is accomplished by installing an external ground bracket between the power shelves and attached to the chassis, as shown in the next figure. 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 Installing Power Shelf Grounding Brackets for more information about installing power shelf grounding brackets.
Installing the Chassis Ground Cable

This section describes how to install the ground cable on the LCC.
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 multi strand copper wire. The grounding lug used can be either a 180 degree (straight) lug or a 45-degree lug.

*Figure 11: 180-Degree (Straight) Chassis Ground Lug*

*Figure 12: 45-Degree 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 cable diameter and length depends on the router location and site environment. This cable is not available from Cisco Systems; it is available from any commercial cable vendor. The cable should be sized according to local and national installation requirements.

**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

- 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, follow these 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 (MSC) side panel, as shown Figure 9: NEBS Bonding and Grounding Points—Modular Configuration DC Power Shown. Then 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 (MSC) side panel, as shown Figure 9: NEBS Bonding and Grounding Points—Modular Configuration DC Power Shown. Then 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 three DC PEMs. The power shelves and DC PEMs are field replaceable. Each DC PEM has its own circuit breaker.
- In the modular configuration power system, each shelf can accept up to eight DC PMs. The power shelves and DC PMs are field replaceable.
Fixed Configuration DC Power

The LCC fixed configuration DC power system provides 13,200 watts to power the chassis.

Due to its power zones, the LCC using fixed configuration power requires a total of twelve dedicated 60 Amp DC input power connections, two for each DC PEM, to provide redundant 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 LCC. Connect the six “A” 60 Amp DC inputs to the upper power shelf (PS0 in Figure 1-4) to one battery, and the six “B” 60 Amp inputs to the lower power shelf (PS1 in Figure 1-4) to the other battery.

At sites where the LCC is equipped with a DC-input power supply 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 the 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 in.) (1.60 cm) centers (for example, Panduit part number LCD2-14A-Q), as shown in the next figure.
- Maximum wire size at the DC input terminal block is 2 AWG.

Figure 13: DC Power Cable Lug

The next figure shows a typical source DC power distribution scheme. The ground cable is to the far left on the shelf. The DC terminal block cable connector screws have a 20 in.-lb (2.26 N-m) value; the power shelf ground cable connector screws 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. Ensure that the power cables are connected to the DC input power shelf terminal studs in the proper positive (+) polarity 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 for the fixed configuration power shelf.

*Figure 14: DC Power Shelf Cable Wiring for Fixed Configuration Power Shelf*

![DC Power Shelf Cable Wiring for Fixed Configuration Power Shelf](image)

The table lists the fixed configuration DC input current and voltage specifications.

*Table 2: DC Input Current and Voltage Information*

<table>
<thead>
<tr>
<th>Nominal input voltage</th>
<th>–48 VDC North America–60 VDC European Community(range: –42 VDC to –75 VDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line current</td>
<td>50 A maximum at –48 VDC40 A maximum at –60 VDC</td>
</tr>
<tr>
<td>Inrush current</td>
<td>168 A peak at –75 VDC(maximum for 1 ms)</td>
</tr>
</tbody>
</table>

Each wiring block on the fixed configuration power shelf contains two sets of terminals, one positive and one negative, and is covered by a plastic block cover that snaps onto the power shelf and is secured by a screw to a torque value of 4 to 5 in.-lb (0.46 to 0.58 N-m). You must remove the block cover or rotate it out of the way before you work with the cables. The block covers are slotted in such a way that the cables can exit only one end. For the cables to point in a different direction, remove the block cover, rotate it, and snap it back on.

**Modular Configuration DC Power**

The LCC modular configuration DC power system can provide up to 16,800 watts to power the chassis. However, by default, the power capability of a system when shipped, with six DC PMs per power shelf, is 12,600 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 eight DC PMs. The power shelves and DC PMs are field replaceable.

**Note**
Although each modular configuration DC power shelf can support up to eight DC PMs, the modular configuration DC power shelf is shipped with six DC PMs per shelf.

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

*Figure 15: DC Power Shelf Cable Wiring for Modular Configuration Power Shelf*

Each power shelf operates with up to eight DC inputs of –48/–60 VDC (nominal), 60A. 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*

<table>
<thead>
<tr>
<th>Nominal input voltage</th>
<th>–48 VDC North America–60 VDC European Community(range: –40 VDC to –72 VDC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input line current</td>
<td>50 A maximum at –48 VDC40 A maximum at –60 VDC60 A maximum at –40 VDC</td>
</tr>
</tbody>
</table>

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 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 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 16: 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).

**Input-Power-Present LEDs**

In both power configurations, the DC input-power-present LEDs provide a visual indication to service personnel that there is voltage present across the input terminal connection. The LED provides a warning to the service person that there is power present.

---

**Note**

Power should be disconnected before servicing the input power connection.

This figure shows the input-power-present LEDs on the rear of the fixed configuration DC power shelf.
This figure shows the input-power-present LEDs on the rear of the modular configuration DC power shelf.
Figure 18: Input-Power-Present LEDs—Modular Configuration DC Power Shown

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

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 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 LCC 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 LCC are made to terminal blocks on the AC power shelves that have been hard wired for a 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 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 LCC.

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: 40 A (North America) or 32 A (International). One power connection is required for 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. One power connection is required for each power shelf.

---

**Note**

The power cord for the fixed configuration AC power shelf does not arrive preattached and needs to be installed.

---

**Modular Configuration AC Power**

The LCC modular configuration AC power system can provide up to 18,000 watts to power the chassis. However, by default, the power capability of a system when shipped, with 5 AC PMs per power shelf, is 15,000 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 or 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 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 more information, see the *Cisco CRS 3-Phase AC Power Distribution Unit Installation 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.
If you have a Cisco CRS 3-Phase AC PDU installed, six AC PMs are required to be installed in each LCC AC modular configuration power shelf to maintain a balanced 3-phase power load.

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

Installing and Remove Fixed Configuration Power Components

This section contains the following procedures:

- Installing a Fixed Configuration Power Shelf
- Removing a Fixed Configuration Power Shelf
- Installing Fixed Configuration AC Power Cords
- Removing Fixed Configuration AC Power Cords
- Installing Fixed Configuration DC Power Shelf Wiring
- Removing Fixed Configuration DC Power Shelf Wiring
- Installing an AC Rectifier or DC PEM
- Removing an AC rectifier or DC PEM
- Installing a Fixed Configuration Alarm Module
- Removing a Fixed Configuration Alarm Module
- Powering Up and Down a Chassis with Fixed Configuration AC Power
- Power Up and Power Down a Chassis with Fixed Configuration DC Power
- Converting from One Fixed Configuration Power System to Another

Note
For complete information on regulatory compliance and safety, see Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information.

Installing a Fixed Configuration Power Shelf

This section describes how to install a fixed configuration power shelf in the LCC. For information on the differences between the power types, see DC Power Systems and AC Power Systems.

The power shelf encloses:

- The power modules: three AC rectifiers for an AC power shelf or three DC PEMs for a DC power shelf
Prerequisites

- An alarm module
- Power distribution connections and wiring.

The power shelf is installed in the LCC from the front (PLIM) side. 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 19: AC Wye Power Shelf with AC Rectifiers Installed

<table>
<thead>
<tr>
<th>1</th>
<th>Lever handle captive screws</th>
<th>3</th>
<th>Power shelf captive screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Lever handle (left handle shown)</td>
<td>4</td>
<td>Power shelf I/O switch</td>
</tr>
</tbody>
</table>

Prerequisites

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

Note

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

Required Tools and Equipment

You need the following tools and part 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 Delta power shelf (Cisco product number CRS-16-LCC-PS-ACD=), or
  - AC Wye power shelf (Cisco product number CRS-16-LCC-PS-ACW=), or
  - DC power shelf (Cisco product number CRS-16-LCC-PS-DC=)

Steps

To install 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

2. Make sure that the power shelf I/O switch, located on the front (PLIM) 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. Supporting the unit by the bottom and grasping one side for balance, lift the power shelf up and slide it into one of the power shelf slots on the chassis.

5. Slide the power shelf fully into the chassis and lift the lever handles up to lock the tray into position.

6. Use the screwdriver to turn the two lever screws on the front panel of the power shelf clockwise to seat the power shelf firmly in the slot.

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

Step 2  Make sure that the power shelf I/O switch, located on the front (PLIM) 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  Supporting the unit by the bottom and grasping one side for balance, lift the power shelf up and slide it into one of the power shelf slots on 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.

Step 6  Use the screwdriver to turn the two lever screws on the front panel of the power shelf clockwise to seat the power shelf firmly in the slot.

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 (Installing Fixed Configuration AC Power Cords and Installing Fixed Configuration DC Power Shelf Wiring), install the power modules (Installing an AC Rectifier or DC PEM) and install the alarm module (Installing a Fixed Configuration Alarm Module).

Removing a Fixed Configuration Power Shelf

This section describes how to remove a power shelf from the 16-slot LCC. For information on the differences between the power types, see DC Power Systems and AC Power Systems.
The power shelf is installed and removed from the front (PLIM) side and plugs into the chassis power interface connector panel. 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 19: AC Wye Power Shelf with AC Rectifiers Installed shows a fixed configuration AC power shelf.

**Prerequisites**

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis (if installed), and power down and remove AC rectifiers (or DC PEMs) and the alarm module in the shelf you want to remove. Remove the AC or DC power shelf wiring. See Removing an AC rectifier or DC PEM, Removing a Fixed Configuration Alarm Module, Removing Fixed Configuration AC Power Cords and Removing Fixed Configuration DC Power Shelf Wiring.

**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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Turn the shelf power switch, located on the front (PLIM) 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 cords from the associated power shelves and remove. See Removing Fixed Configuration AC Power Cords for more information.
4. Remove all power modules (three AC power rectifiers in an AC power shelf or three DC PEMs in a DC power shelf) from the shelf you are removing.
5. Remove the alarm module.
6. 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 slowly from the slot in the chassis. After partially removing the power shelf from the chassis using the handles, grab both side of the power shelf and slide the shelf completely from the chassis.
9. 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

**Step 2**

Turn the shelf power switch, located on the front (PLIM) 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 cords from the associated power shelves and remove. See **Removing Fixed Configuration AC Power Cords** for more information.

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. See **Removing Fixed Configuration DC Power Shelf Wiring** for more information.

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

**Step 5** Remove the alarm module.

**Step 6** 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 slowly from the slot in the chassis. After partially removing the power shelf from the chassis using the handles, grab both side of the power shelf and slide the shelf completely from 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 to your back, keep your back straight while lifting the shelf and lift the equipment as you stand up. Avoid sudden twists or lateral moves. It is safer to have two people use a ladder to install or remove the power shelf rather than do it yourself.

**Step 9** Set the power shelf carefully aside.

---

### What to do next

After performing this task, you can install a replacement power shelf (**Installing a Fixed Configuration Power Shelf**).

### Installing Fixed Configuration AC Power Cords

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

### Prerequisites

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

---

**Note** Before installing the AC power cord on the power shelf, make sure that the AC 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
- 10-mm socket wrench
- 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

The AC Wye power shelf arrives with a 5-wire Wye cord and 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 with the rear cover removed is shown in this figure.

Figure 20: AC Wye Power Shelf Rear

<table>
<thead>
<tr>
<th>Lead (L1)</th>
<th>Lead (L2)</th>
<th>Lead (L3)</th>
<th>Lead (L4, neutral)</th>
<th>Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

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 (L5).
AC Delta Power Shelf

The AC Delta power shelf arrives with a 4-wire Delta cord and 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 with the rear cover removed is shown in this figure.

Figure 21: AC Delta Power Shelf Rear

<table>
<thead>
<tr>
<th>1</th>
<th>Lead 1 (L1)</th>
<th>3</th>
<th>Lead 3 (L3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Lead 2 (L2)</td>
<td>4</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

We recommend that you rotate the L1, L2, and L3 cable conductor connection for the two power shelves to improve system availability due to common phase outage.
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 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. For AC Wye only, choose the 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 N on the plug) is connected to the neutral cable conductor.
3. Perform a continuity check with a volt meter to verify that the pins on the plug (L1, L2 and L3) are correctly connected to the corresponding cable conductor (L1, L2 and L3). Perform a continuity check with a volt meter to verify that the ground pin is connected to the ground cable conductor.
4. Remove the rear cover from the power shelf.
5. The shelf arrives with two wiring holes for the power cord. Choose the wiring hole for the cord and remove the knock-out plug, if needed.
6. Ensure that the insulating layer has been removed from the cable conductor ends.
7. Insert the AC power cord and tighten the cable bushing lock nut.
8. Remove the M6 nut from the 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).
9. 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.
10. For AC Delta and AC Wye, connect the three active cable conductors 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.

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

**Step 2**
For AC Wye only, choose the 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 N on the plug) is connected to the neutral cable conductor.

**Step 3**
Perform a continuity check with a volt meter to verify that the pins on the plug (L1, L2 and L3) are correctly connected to the corresponding cable conductor (L1, L2 and L3). Perform a continuity check with a volt meter to verify that the ground pin is connected to the ground cable conductor.

**Step 4**
Remove the rear cover from the power shelf.

**Step 5**
The shelf arrives with two wiring holes for the power cord. Choose the wiring hole for the cord and remove the knock-out plug, if needed.

**Step 6**
Ensure that the insulating layer has been removed from the cable conductor ends.
Step 7: Insert the AC power cord and tighten the cable bushing lock nut.

Step 8: Remove the M6 nut from the 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 9: 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 10: For AC Delta and AC Wye, connect the three active cable conductors 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.

What to do next
After performing this task, the AC rectifiers can be installed. For more information, see Installing an AC Rectifier or DC PEM.

Removing Fixed Configuration AC Power Cords
This section describes how to remove the AC Wye and AC Delta power cords from the fixed configuration power shelf.

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

Note: Before removing AC power cord from the power shelf, make sure that the AC power cord is not plugged into the facility power.

Required Tools and Equipment
- 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
The rear of the AC Wye power shelf with the rear cover removed is shown in Figure 20: AC Wye Power Shelf Rear, on page 34. For more information on AC Wye power shelf, see AC Wye Power Shelf, on page 34 section.

Note: When removing AC wiring from the fixed configuration power shelf, be sure to remove the ground cable conductor last.
AC Delta Power Shelf

The rear of the AC Delta power shelf with the rear cover removed is shown in Figure 21: AC Delta Power Shelf Rear, on page 35. For more information on AC Wye power shelf, see AC Delta Power Shelf, on page 35 section.

Note

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

Steps

To disconnect the AC power cord from the fixed configuration AC power shelf, perform the following:

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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. For AC Delta and AC Wye, 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2  For AC Delta and AC Wye, 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.

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.

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

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 Removing a Fixed Configuration Power Shelf.

Installing Fixed Configuration DC Power Shelf Wiring

This section describes how to install the DC power shelf wiring on the fixed configuration power shelf.
The figure shows the cable wiring for the fixed configuration power shelf.

*Figure 22: DC Power Shelf Cable Wiring for Fixed Configuration Power Shelf*

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**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 air grille on the rear [MSC] 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 cables are wrapped with black electrical tape, be sure to remove tape from cables before installing wiring 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 (3.39 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 (PLIM) 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 ground cable. For details on lugs, see DC Power Systems.
5. Using a 10-mm socket wrench, attach the ground cable to the ground cable terminal on the power shelf. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).
6. Using a 10-mm socket 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 (PLIM) 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 ground cable. For details on lugs, see 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 on the power shelf. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

**Step 6**

Using a 10-mm socket 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 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.

**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 DC PEMs and the alarm module in the shelf you want to disconnect. Remove the upper air grille from the rear (MSC) 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

- 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 (PLIM) 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 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 (PLIM) 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 cover.

**What to do next**

After the power shelf wiring has been disconnected, the power shelf can be removed. For more information, see [Removing a Fixed Configuration Power Shelf](#).

### Installing an AC Rectifier or DC PEM

This section describes how to install an AC rectifier or DC PEM in the LCC. For information on the differences between the power types, see [DC Power Systems](#) and [AC Power Systems](#).

The power module is installed into the power shelf on the front (PLIM) side of the chassis. Although differences exist among the DC PEMs and AC rectifiers (AC Wye, AC Delta, and DC), they are installed in the same manner.

The figure shows an AC rectifier for reference. The fixed configuration DC PEM is similar.

*Figure 23: AC Rectifier*
Prerequisites

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

Required Tools and Equipment

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

- ESD-preventive wrist strap
- Fixed configuration DC PEM or AC power rectifier
  - DC PEM (Cisco product number CRS-16-DC-PEM=), or
  - AC rectifier (Cisco product number CRS-16-AC-RECT=)

Steps

To install a DC PEM or AC rectifier 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Turn the AC rectifier or DC PEM power switch to the OFF position.
3. While facing the front (PLIM) 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 DC PEM or AC rectifier, slide it into the power supply 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 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 module faceplate. You hear a click when the ejector lever locks into place.
7. Push the power tab at the bottom front of the AC rectifier or DC PEM 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

**Step 2**
Turn the AC rectifier or DC PEM power switch to the OFF position.

**Step 3**
While facing the front (PLIM) 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 DC PEM or AC rectifier, slide it into the power supply 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 module into its power shelf bay.
Caution Each 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 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 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 AC rectifier or DC PEM to the ON position.

What to do next

After performing this task, re-install the upper grille on the front (PLIM) side of the chassis.

Removing an AC rectifier or DC PEM

This section describes how to remove a DC PEM or AC rectifier from the Cisco CRS 16-slot LCC. Although differences exist among the DC PEMs and AC rectifiers (AC Wye, AC Delta, and DC), they are removed in the same manner. Figure 23: AC Rectifier shows an AC rectifier for reference.

Prerequisites

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

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 PEM, 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. While facing the front (PLIM) side of the chassis, pull the power tab on the bottom front of the module out to the OFF position.
3. Press the ejector lever release button at the top of the module to release the ejector lever.
4. Pivot the ejector lever away from the module faceplate to eject the module from the power shelf backplane connector.
5. Grasp the 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, then set the 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

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

Step 4 Pivot the ejector lever away from the 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 module.

Step 5 Grasp the 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 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 Be sure to support the module while you slide the module completely from the bay, then set the module carefully aside.

What to do next

After performing this task, install a replacement AC rectifier or DC PEM if necessary (see Installing an AC Rectifier or DC PEM, page 2-29) and replace the upper grille on the front (PLIM) side of the chassis.

Installing a Fixed Configuration Alarm Module

This section describes how to install an alarm module in a fixed configuration power supply in the LCC. An alarm module can be installed only in the far right slot of the power shelf (as you are facing the front [PLIM] side of the chassis).

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 every power shelf. The same alarm module is used in all power shelves.

This figure shows a fixed configuration alarm module.
**Prerequisites**

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

**Required Tools and Equipment**

- 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 (PLIM) 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 supply shelf until the connector on the back of the alarm module makes contact with the connector on the backplane of the 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 into the chassis backplane connector.
4. Use the 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

**Caution** To prevent damage to the backplane connector on the alarm module, do not use excessive force when inserting the 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 supply shelf until the connector on the back of the alarm module makes contact with the connector on the backplane of the 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** The alarm module weighs approximately 4.2 lb (2 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the alarm module. 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 into the chassis backplane connector.

**Step 4**
Use the 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 (PLIM) side of the chassis.

**Removing a Fixed Configuration Alarm Module**

This section describes how to remove the alarm module from a fixed configuration power supply in the LCC. The alarm module is installed only in the far right slot of the power shelf (as you are facing the front [PLIM] side of the chassis). This Figure 24: Fixed Configuration Alarm Module shows a fixed configuration alarm module.

**Prerequisites**
Before performing this task, remove any the upper air grille on the front (PLIM) side of the chassis.

**Required Tools and Equipment:**
- 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 (PLIM) 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 (PLIM) 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, then set it 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 (PLIM) side of the chassis.

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

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

Caution
The 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, then set it 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 (PLIM) 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 LCC with fixed configuration AC power shelves installed. For details on the fixed configuration chassis AC power system, see AC Power Systems.

Each power shelf in the LCC 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, such as the power shelves, PEMs, 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 power shelf I/O switch (if all individual power rectifier I/O 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 (PLIM) side of the LCC with fixed configuration power installed.
**Prerequisites**

Before performing this task, you must install and wire the power shelves, and install the power modules (AC rectifiers or DC PEMs), and alarm modules. See Installing a Fixed Configuration Power Shelf, Installing an AC Rectifier or DC PEM, and Installing a Fixed Configuration Alarm Module.

**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 (PLIM) 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 an OFF position. That is, make sure all I/O levers are pulled out. There are total of six power levers for the six AC power rectifiers and two power levers for the two AC power shelves.
5. Make sure all boards (RPs, PLIMs, SFCs, and FP s) are pulled-out and disconnected from the backplane.
6. Remove the cover plate from the rear of each fixed configuration AC power shelf.
7. Plug in AC power cords for the upper (PS0) and lower (PS1) power shelf.
8. For AC Delta and AC Wye, verify the following resistance values, as shown in Figure 20: AC Wye Power Shelf Rear, on page 34 and Figure 21: AC Delta Power Shelf Rear, for the upper (PS0) and lower (PS1) power shelf.
9. Make sure that each input power cable one is connected, and energize the facility breaker to each input.
10. Measure the voltage between the following, for the upper (PS0) and lower (PS1) power shelf:
11. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the OFF position.
12. Turn the facility breaker for the upper (PS0) and lower power shelf (PS1) to the ON position.
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) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2).
15. Turn the first power rectifier (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “Power OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2).
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 rectifiers are active.
17. Insert all boards (RPs, PLIMs, SFCs, and FP s) into the chassis (See Installing and Removing Line Cards, PLIMs, and Associated Components chapter for more information).
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 10. Verify that the voltage is between 200 and 240 VAC, ensure that the voltage drop is in 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 (PS0) and lower (PS1) power shelf to the OFF position.
22. Replace the cover plate on the rear of both AC power shelves.
23. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the ON position.
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 (PLIM) 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 an OFF position. That is, make sure all I/O levers are pulled out. There are total of six power levers for the six AC power rectifiers and two power levers for the two AC power shelves.

**Step 5**  
Make sure all boards (RPs, PLIMs, SFCs, and FP s) are pulled-out and disconnected from the backplane.

**Step 6**  
Remove the cover plate from the rear of each fixed configuration AC power shelf.

**Step 7**  
Plug in AC power cords for the upper (PS0) and lower (PS1) power shelf.

**Step 8**  
For AC Delta and AC Wye, verify the following resistance values, as shown in Figure 20: AC Wye Power Shelf Rear, on page 34 and Figure 21: AC Delta Power Shelf Rear, for the upper (PS0) and lower (PS1) power shelf:

- 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 one is connected, and energize the facility breaker to each input.

**Step 10**  
Measure the voltage between the following, for the upper (PS0) and lower (PS1) power shelf:

- 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 and 240 VAC. Make a note of this voltage measurement.

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

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

**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) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2).

**Step 15**  
Turn the first power rectifier (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “Power OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2).
See Figure 25: LCC Front (PLIM) Side Slot Numbers, on page 49 figure for reference.

**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 rectifiers are active.

**Step 17**
Insert all boards (RPs, PLIMs, SFCs, and FPs) into the chassis (See *Installing and Removing Line Cards, PLIMs, and Associated Components* chapter for more information).

**Step 18**
Turn the power shelf I/O switches (PSO 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 10. Verify that the voltage is between 200 and 240 VAC, ensure that the voltage drop is in 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 (PS0) and lower (PS1) power shelf to the OFF position.

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

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

**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**

For appropriate MSC, RP, or PLIM LED information, see the appropriate section in *Installing and Removing Line Cards, PLIMs, and Associated Components* or the specific documentation for the card.

To power down the chassis entirely, you must power down both 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.

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

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

<table>
<thead>
<tr>
<th>LED Name</th>
<th>Color</th>
<th>Function or Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR OK</td>
<td>Green</td>
<td>Rectifier module is operating normally in a powered-up condition.</td>
</tr>
<tr>
<td>FAULT</td>
<td>Yellow</td>
<td>Fault has been detected in the rectifier.</td>
</tr>
<tr>
<td>AC FAIL</td>
<td>Yellow</td>
<td>AC is out of range or the rectifier is not receiving AC power input.</td>
</tr>
<tr>
<td>BREAKER TRIP</td>
<td>Yellow</td>
<td>Rectifier power switch is in the OFF position.</td>
</tr>
<tr>
<td>OT</td>
<td>Yellow</td>
<td>Rectifier is in an over-temperature condition and a shutdown has occurred.</td>
</tr>
<tr>
<td>ILIM</td>
<td>Yellow</td>
<td>Rectifier is operating in a current limit condition.</td>
</tr>
</tbody>
</table>
Power Up and Power Down a Chassis with Fixed Configuration DC Power

This section describes how to power up and power down an LCC with fixed configuration DC power shelves installed. For details on the chassis power systems, see Basic Chassis Power Details and DC Power Systems.

Each power shelf in the LCC has its own I/O switch for shelf power cutoff. The LCC 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, such as 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 power rectifier I/O 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, install the DC PEMs and alarm modules. See Installing a Fixed Configuration Power Shelf, Installing an AC Rectifier or DC PEM, and Installing a Fixed Configuration Alarm Module. Wiring at the BDFB or at the power plant should be complete.

Note

Make sure all PEM, power shelf, and power source circuit breakers and switches are turned off (or open) before you wire the power shelves.

Required Tools and Equipment

• 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Verify that the safety ground wiring is connected to the upper (PS0) and lower (PS1) 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 all the I/O switches are in an OFF position. That is, make sure all power levers are pulled out. There are total of six power levers for the DC PEMs (one for each of the six DC PEMs) and two power levers for the DC power shelves (one for each power shelf).
5. Make sure all boards (RPs, PLIMs, Line Cards, and FCs) 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 42 VDC and 72 VDC. Make a note of this voltage measurement.

8. Turn the facility breaker to the OFF position.

9. Repeat Step 7 and 8 for each of the remaining five DC inputs on the upper power shelf (PS0).

10. Repeat Step 7 and 8 for each of the six DC inputs on the lower power shelf (PS1).

11. Turn the facility power breakers for the upper (PS0) and lower (PS1) power shelf to the ON position.

12. Turn the upper power shelf (PS0) 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) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).

14. Turn the lower power shelf (PS1) circuit breaker 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.

15. Turn the first PEM (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).

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

17. Insert all boards into the chassis (For more information, Installing and Removing Line Cards, PLIMs, and Associated Components chapter).

18. Turn the power shelf I/O switches (PS0 and PS1) 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 (PLIM) 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 (PS0) and lower (PS1) 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 all the I/O switches are in an OFF position. That is, make sure all power levers are pulled out. There are total of six power levers for the DC PEMs (one for each of the six DC PEMs) and two power levers for the DC power shelves (one for each power shelf).

**Step 5**
Make sure all boards (RPs, PLIMs, Line Cards, and FCs) 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 42 VDC and 72 VDC. Make a note of this voltage measurement.
Step 8  Turn the facility breaker to the OFF position.
Step 9  Repeat Step 7 and 8 and for each of the remaining five DC inputs on the upper power shelf (PS0).
Step 10 Repeat Step 7 and 8 for each of the six DC inputs on the lower power shelf (PS1).
Step 11 Turn the facility power breakers for the upper (PS0) and lower (PS1) power shelf to the ON position.
Step 12 Turn the upper power shelf (PS0) 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) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).
Step 14 Turn the lower power shelf (PS1) circuit breaker 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 15 Turn the first PEM (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).

See Figure 25: LCC Front (PLIM) Side Slot Numbers, on page 49 figure for reference.

Step 16 Turn the I/O switches on all PEMs and both power shelves to the OFF position. Verify that no LEDs on the PEMs are active.
Step 17 Insert all boards into the chassis (For more information, Installing and Removing Line Cards, PLIMs, and Associated Components chapter).
Step 18 Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
Step 19 Turn all DC PEM 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 equipment is still receiving the correct input voltage measured in Step 7.

---

**What to do next**

For appropriate MSC, RP, or PLIM LED information, see the appropriate section in *Installing and Removing Line Cards, PLIMs, and Associated Components* or the specific documentation for the card.

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**Note**

To power down the chassis entirely, you must power down both of the power shelves by moving the power shelf power 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.

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

**Table 5: Fixed Configuration DC PEM LED Status Indicator Lights**

<table>
<thead>
<tr>
<th>LED Name</th>
<th>Color</th>
<th>Function or Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR OK</td>
<td>Green</td>
<td>PEM is operating normally in a powered up condition.</td>
</tr>
<tr>
<td>FAULT</td>
<td>Yellow</td>
<td>Fault has been detected within the PEM.</td>
</tr>
<tr>
<td>DC INPUT FAIL</td>
<td>Yellow</td>
<td>DC input is out of range or is not being provided to the PEM.</td>
</tr>
</tbody>
</table>
Converting from One Fixed Configuration Power System to Another

This section describes how to convert from one fixed configuration power system to another (either from fixed AC to fixed DC or from fixed DC to fixed AC).

Steps

To convert an LCC 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 Powering Up and Down a Chassis with Fixed Configuration AC Power or Power Up and Power Down a Chassis with Fixed Configuration DC Power.
2. Remove the alarm modules. See Removing a Fixed Configuration Alarm Module.
3. Remove the DC PEMs or AC rectifiers. See 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 Removing Fixed Configuration AC Power Cords and Removing Fixed Configuration DC Power Shelf Wiring.
5. Remove both power shelves. See Removing a Fixed Configuration Power Shelf.
6. Install the new power shelves. See Installing a Fixed Configuration Power Shelf.
7. Install the wiring on the rear of the power shelf. See Installing Fixed Configuration AC Power Cords section on page 2-20 or Installing Fixed Configuration DC Power Shelf Wiring.
8. Install the DC PEMs or AC rectifiers. See Installing an AC Rectifier or DC PEM.
9. Install the alarm module. See Installing a Fixed Configuration Alarm Module.
10. Replace the DC fuses or restore AC service.
11. Power the chassis back up. See Powering Up and Down a Chassis with Fixed Configuration AC Power or Power Up and Power Down a Chassis with Fixed Configuration DC Power.

**DETAILED STEPS**

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

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

**Step 3**  
Remove the DC PEMs or AC rectifiers. See 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 Removing Fixed Configuration AC Power Cords and Removing Fixed Configuration DC Power Shelf Wiring.

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

### LED Name | Color | Function or Meaning
--- | --- | ---
OT | Yellow | PEM is in an over temperature condition and shutdown has occurred.
CBREAKER TRIP | Yellow | PEM I/O switch is in the OFF position.

Cisco CRS Routers 16-Slot Line Card Chassis Installation Guide
Step 6
Install the new power shelves. See Installing a Fixed Configuration Power Shelf.

Step 7
Install the wiring on the rear of the power shelf. See Installing Fixed Configuration AC Power Cords section on page 2-20 or Installing Fixed Configuration DC Power Shelf Wiring.

Step 8
Install the DC PEMs or AC rectifiers. See Installing an AC Rectifier or DC PEM.

Step 9
Install the alarm module. See Installing a Fixed Configuration Alarm Module.

Step 10
Replace the DC fuses or restore AC service.

Step 11
Power the chassis back up. See Powering Up and Down a Chassis with Fixed Configuration AC Power or Power Up and Power Down a Chassis with Fixed Configuration DC Power.

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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.

---

Installing and Removing Modular Configuration Power Components

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

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 power self wiring, install the PMs and install the 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, see Converting a Chassis from Fixed Configuration Power to Modular Configuration Power.

---

Installing a Modular Configuration Power Shelf

This section describes how to install the modular configuration AC or DC power shelves in the LCC. For complete information on regulatory compliance and safety, see Regulatory Compliance and Safety Information for the Cisco CRS.

⚠️

Caution
Do not use the handles for lifting or supporting the power shelf, because 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.

The front and rear views of the modular configuration DC power shelves are shown in the following figures.

Figure 26: DC Modular Configuration Power Shelf, Front View

Figure 27: DC Modular Configuration Power Shelf, Rear View
Prerequisites

Remove the upper grilles from both the front (PLIM) and rear (MSC) sides of the chassis, if installed. Verify that the power shelf that you are about to install is the correct power shelf.
Required Tools and Equipment

- 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-16LCC-PSH-AC=), or
  - DC power shelf (Cisco product number CRS-16LCC-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 the next 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 (PLIM) side of the chassis.
5. Grasping both handles simultaneously, push both the left and right handles up in at the same time 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.
6. Using the wrench, 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.
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.

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

*Figure 31: Mounting Block Position in Chassis, One per Side*

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

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

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 (PLIM) side of the chassis.
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.

**Caution**

Grasping both handles simultaneously, push both the left and right handles up in at the same time 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.

**Caution**

Make sure both handles swing straight up. Use care not to bend the handles sideways.

*Figure 32: Ejector Handle*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ejector handle pulled away from the shelf</td>
</tr>
<tr>
<td>2</td>
<td>Ejector handle pushed up to slide in the shelf</td>
</tr>
</tbody>
</table>
Steps

Step 6 Using the wrench, 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.

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.

Figure 33: Shelf Handles Hooked Around Pins

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ejector handles section that fits around mounting pins</td>
</tr>
<tr>
<td>2</td>
<td>Mounting pins that are permanently installed in the chassis and cannot be moved or removed</td>
</tr>
</tbody>
</table>

Figure 34: Securing the Power Shelf Ejector Handle
Topmountingscrewinhandle.

Holesforthescrewthatattachesthepowershelftothemountingblockthoughthethandle.

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 Installing Power Shelf Grounding Brackets and Installing AC or DC Power Shelf Wiring for instructions.

Removing a Modular Configuration Power Shelf

This section describes how to remove the modular configuration power shelf from the LCC.

Prerequisites

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

Required Tools and Equipment

- 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, because 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 chassis.
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.
3. Using the screwdriver, unscrew captive screw on the left and right handles (see previous figure).
4. Grasping both handles simultaneously, pull both the left and right handles down at the same time 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 chassis.

*Figure 35: Remove Bolts that Secure Rear of Power Shelf to Chassis*

1. Bolts to be loosened that secure rear of power shelf to 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.
Figure 36: Unscrewing Power Shelf Ejector Handle

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

**Step 3**
Using the screwdriver, unscrew captive screw on the left and right handles (see previous figure).

**Note** The handles will fall down and slightly away from the shelf.

Figure 37: Mounting Handle Fallen Away from the Shelf

1. Initial position, with handle in place against 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 at the same time 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. After two people have placed the power shelf in position, one person can slide it into place.

What to do next

After performing this task, replace the upper grille on the front (PLIM) and rear (MSC) sides of the chassis.

Installing Power Shelf Grounding Brackets

This section describes how to install the external grounding brackets on the LCC 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 chassis ground cable must be installed in accordance with local electrical safety standards. For more information, see Bonding and Grounding Guidelines.

Prerequisites

Before performing this task, ensure that the chassis grounding cable and both power shelves are installed in the chassis. See Installing Power Shelf Grounding Brackets and Installing a Modular Configuration 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
- 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 (MSC) 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 (PLIM) 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 the next figure).

4. Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten (see the next figure).

5. Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Using the torque wrench, 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 grounding 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 front (PLIM) 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 the next figure).

**Step 4**
Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten (see the next figure).
**Figure 38: Grounding Brackets**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis ground cable</td>
</tr>
<tr>
<td>2</td>
<td>Two M6 hex bolts attaching ground lug to chassis</td>
</tr>
<tr>
<td>3</td>
<td>Shelf grounding bracket (Step 3)</td>
</tr>
<tr>
<td>4</td>
<td>Two M6 hex bolts attaching grounding L-bracket to chassis (Step 5)</td>
</tr>
<tr>
<td>5</td>
<td>Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (Step 4)</td>
</tr>
<tr>
<td>6</td>
<td>Grounding L-bracket (Step 5)</td>
</tr>
<tr>
<td>7</td>
<td>Four M6 hex bolts attaching shelf grounding bracket to power shelves (Step 3)</td>
</tr>
</tbody>
</table>

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

**Step 5**  
Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Using the torque wrench, tighten the M6 hex bolts to a torque of 20 in.-lb (2.26 N-m).
Removing Power Shelf Grounding Brackets

This section describes how to remove the power shelf grounding brackets for the LCC modular configuration power supply. 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 Power Up and Power Down a Chassis with Modular Configuration Power, Removing a Modular Configuration Power Module, Removing a Modular Configuration Alarm Module, and Removing AC or DC Power Shelf Wiring.

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, 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 (MSC) 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 grounding L-bracket to the power shelf. Do not fully remove.
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.
4. Use a 10 mm socket wrench to remove the two M6 hex bolts that attach the grounding L-bracket to the chassis.
5. Remove the two M6 hex nuts that attach the grounding L-bracket to the shelf grounding bracket.
6. Remove the grounding L-bracket.
7. Remove the four M6 hex bolts that attach the shelf grounding bracket to the power shelves.
8. Remove the shelf grounding bracket from the power shelves.
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 (MSC) 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 (MSC) 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 grounding L-bracket to the power shelf. Do not fully remove.

*Figure 39: Grounding Brackets*

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis ground cable</td>
</tr>
<tr>
<td>2</td>
<td>Two M6 hex bolts attaching ground lug to chassis</td>
</tr>
<tr>
<td>5</td>
<td>Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (Step 4)</td>
</tr>
<tr>
<td>6</td>
<td>Grounding L-bracket (Step 5)</td>
</tr>
</tbody>
</table>
**Installing AC or DC Power Shelf 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 LCC. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System*.

**Installing Modular Configuration DC Power Shelf 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 on the LCC.

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

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Shelf grounding bracket (Step 3)</td>
</tr>
<tr>
<td>4</td>
<td>Two M6 hex bolts attaching grounding L-bracket to chassis (Step 5)</td>
</tr>
<tr>
<td>7</td>
<td>Four M6 hex bolts attaching shelf grounding bracket to power shelves (Step 3)</td>
</tr>
</tbody>
</table>

**Note**

A 45-degree grounding lug is shown in the previous 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.

**Step 4**

Use a 10 mm socket wrench to remove the two M6 hex bolts that attach the grounding L-bracket to the chassis.

**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.

**Step 7**

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

**Step 8**

Remove the shelf grounding bracket from the power shelves.

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

Caution

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

Prerequisites

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

Note

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

Required Tools and Equipment

- 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 (PLIM) 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. For details on lugs, see DC Power Systems.
5. Using the 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 cover. For more information, see 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 (PLIM) 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. For details on lugs, see 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 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 cover. For more information, see Installing DC Terminal Block Covers.

**Installing DC Terminal Block Covers**

This figure shows the DC terminal block cover.
Install the terminal block cover after the input wiring is installed, but before power has been 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

**Steps**

To install the DC terminal block covers, go to the rear (MSC) 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 (PLIM) 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.
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 (PLIM) 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.

*Figure 42: Securing the Terminal Block Cover*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC terminal block.</td>
</tr>
<tr>
<td>5</td>
<td>Opening to align over mounting pins</td>
</tr>
</tbody>
</table>
Installing Modular Configuration AC Power Cords

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

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

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

**Prerequisites**
Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille from the rear (MSC) 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 more information, see the Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide.

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

**Required Tools and Equipment**
You need the following tools to perform this task:
- 6-in. long number 1 Phillips screwdriver

**Steps**
To install the input AC cord, go to the rear of the chassis and perform the following steps:

**SUMMARY STEPS**
1. Insert the cord into the cord clamp.
2. Use the screwdriver to tighten the screw that clamps the cord in place.
DETAILED STEPS

Step 1  Insert the cord into the cord clamp.

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

Figure 43: Cord Being Inserted into Cord Clamp

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screw that secures the cord clamp</td>
</tr>
<tr>
<td>2</td>
<td>Screwdriver tightening screw</td>
</tr>
<tr>
<td>3</td>
<td>Cord to be inserted into clamp</td>
</tr>
</tbody>
</table>

Note  In the 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 screw that clamps the cord in place.

What to do next  
After you install the DC input cables and DC terminal block covers, or AC input 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 LCC.
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.

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 from the rear (MSC) 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

- 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 (PLIM) 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 (PLIM) 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.
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.
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 DC 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 from the rear (MSC) 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**

- 6-in. long number 1 Phillips screwdriver

**Steps**

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

**SUMMARY STEPS**

1. Use the screwdriver to loosen the screws that clamp the cords in place.
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.
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 Removing a Modular Configuration Power Shelf.

Installing a Modular Configuration Alarm Module

This section describes how to install the alarm modules in a modular configuration power shelf in the LCC. This figure shows a modular configuration alarm module.
Prerequisites

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

Caution

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

Required Tools and Equipment

- 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 (PLIM) 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 (PLIM) 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 performing this task, install the modular configuration power modules and power module slot covers (if required) and re-install the upper grille on the front (PLIM) side of the chassis. See Installing a Modular Configuration Power Module and Installing a Power Module Slot Cover.

**Removing a Modular Configuration Alarm Module**

This section describes how to remove the alarm modules, shown in the previous figure, from the modular configuration power shelf installed in the LCC.

**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, 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, see Installing and Removing Exterior Cosmetic Components.
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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

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 performing this task, install a replacement alarm module (if necessary) and re-install the upper grille on the front (PLIM) side of the chassis.

Installing a Modular Configuration Power Module

This section describes how to install the AC or DC PMs in the LCC.

Figure 47: Modular Configuration PM
Prerequisites

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

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

Required Tools and Equipment

- 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 AC or DC 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 (PLIM) 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), screw the PM into the shelf. Do not exceed an install torque 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

Step 3  Flip up the ejector and with nominal install torque of 5.5 in.-lb (0.62 N-m), screw the PM into the shelf. Do not exceed an install torque of 10 in.-lb (1.13 N-m).
**Figure 48: Securing the PM to the 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 *Installing a Power Module Slot Cover*.

**Removing a Modular Configuration Power Module**

This section describes how to remove a PM from a modular configuration power shelf.
Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, go to Installing and Removing Exterior Cosmetic Components.
3. Using the screwdriver, unscrew the ejector from the PM.
4. Flip down the ejector, slide the PM out of the power shelf, and carefully place it 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

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

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

What to do next

After performing this task, install a replacement AC or DC PM if necessary (see Removing a Modular Configuration Power Module) and re-install the upper grille on the front (PLIM) side of the chassis.

Installing a 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 LCC.

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 (PLIM) 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 (PLIM) 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.
4. Push the left side of the PM slot cover gently until it clicks into place.

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Align the PM slot cover with the empty PM slot in the power shelf.</td>
</tr>
<tr>
<td>Step 3</td>
<td>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.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Push the left side of the PM slot cover gently until it clicks into place.</td>
</tr>
</tbody>
</table>
What to do next

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

Removing a 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.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) 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 (PLIM) 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, as shown in the previous figure.
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, as shown in the previous figure.
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 (PLIM) 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, as shown in the previous figure.

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, as shown in the previous figure.

Step 4  Set the PM slot cover aside.

What to do next

After performing this task, install an AC or DC PM, if necessary (Installing a Modular Configuration Power Module) and re-install the upper grille on the front (PLIM) 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 Removing a Modular Configuration Power Module and Removing a Modular Configuration Alarm Module.

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 systems, see Basic Chassis Power Details, AC Power Systems, and DC Power Systems.

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.
The figure shows the front (PLIM) side of the LCC with a modular configuration power system installed.

**Figure 50: LCC Front (PLIM) Side Slot Numbers**

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**Power Up a Chassis with Modular Configuration Power**

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

**Prerequisites**

Before performing this task, you must install and wire the power shelves, install the PMs and alarm modules, and install the route processor (RP) card. See Installing a Modular Configuration Power Shelf, Installing a Modular Configuration Power Module, Installing a Modular Configuration Alarm Module, and Installing an RP, PRP, or DRP Card . If you have a modular configuration DC power system installed, wiring at the BDFB or at the power plant should be complete.

**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 boards (RPs, PLIMs, SFCs, and FP s) are pulled-out and disconnected from the backplane.
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.
   d) Repeat 4a through 4c for each of the remaining DC inputs on the upper power shelf, Power A.
   e) Repeat 4a through 4d 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).

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 boards (RPs, PLIMs, SFCs, and FP s) 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.
   d) Repeat 4a through 4c for each of the remaining DC inputs on the upper power shelf, Power A.
   e) Repeat 4a through 4d 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 boards (RPs, PLIMs, SFCs, and FPs) in the chassis. For more information, see Installing and Removing Line Cards, PLIMs, and Associated Components.

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

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.

What to do next

Note  For appropriate line card LED information, see the appropriate section in Installing and Removing Line Cards, PLIMs, and Associated Components or the specific documentation for the card.

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.

Steps

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) to the OFF position. Repeat for the facility power breaker 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) to the OFF position. Repeat for the facility power breaker 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 supply.
Table 6: PM LED Status Indicator Lights—Modular Configuration Power

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

Converting from One Modular Configuration Power System to Another

This section describes how to convert from one modular configuration power system to another (either from modular AC to modular DC, or from modular DC to modular AC).

Steps

To convert an LCC 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.
2. Remove the AC or DC PMs.
3. Remove the alarm modules.
4. Remove the power shelves.
5. 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.
6. Install the new power shelves.
7. Install the power shelf wiring.
8. Install the alarm modules.
9. Install the AC or DC PMs.
10. Power the chassis back up.

**DETAILED STEPS**

- **Step 1** Power down the chassis completely and turn the facility power breakers to the OFF position.
- **Step 2** Remove the AC or DC PMs.
- **Step 3** Remove the alarm modules.
- **Step 4** Remove the power shelves.
Step 5  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.

Step 6  Install the new power shelves.

Step 7  Install the power shelf 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 more information, see the Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide.

Step 8  Install the alarm modules.

Step 9  Install the AC or DC PMs.

Step 10  Power the chassis back up.

---

**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.

---

**Converting 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 LCC 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 LCC 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 Power Up and Power Down a Chassis with Modular Configuration Power for more information.

**Steps**

To convert a chassis from fixed to modular configuration power, perform the following steps
installing and removing power components

summary steps

1. remove the alarm modules.
2. remove the AC rectifiers or DC PEMs.
3. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the fixed configuration power shelf.
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.
5. Install the modular configuration power shelves.
6. Install the AC or DC wiring on the rear of the power shelf.
7. Install the PMs.
8. Install the alarm modules.
9. Replace the DC fuses or restore AC service. Power the chassis back up.

detailed steps

step 1  remove the alarm modules.
step 2  remove the AC rectifiers or DC PEMs.
step 3  Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the fixed configuration power shelf.
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.
step 5  Install the modular configuration power shelves.

Note  Do not connect ground cables directly to a modular configuration power shelf.
step 6  Install the AC or DC wiring on the rear of the power shelf.
step 7  Install the PMs.
step 8  Install the alarm modules.
step 9  Replace the DC fuses or restore AC service. Power the chassis back up.
CHAPTER 3

Installing and Removing Air Circulation Components

This chapter provides instructions on how to install and replace Cisco CRS 16-Slot Line Card Chassis air circulation components.

Note

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

- Information About Air Circulation Components, on page 99
- How to Replace Air Circulation Components, on page 100

Information About Air Circulation Components

This section describes the air circulation components: the fan trays and the air filters.

The LCC has two fan trays (show in the 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 LCC fan tray operates in either the upper or lower fan tray slots. Each fan tray installs into the rear (MSC) 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.
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 (as shown in the figure). 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.

### How to Replace Air Circulation Components

This section contains the following procedures:

- Replacing a Fan Tray, on page 101
Replacing a Fan Tray

This section describes how to replace a fan tray (shown in the figure below) in the LCC. For information on fan trays, see Information About Air Circulation Components, on page 99.

Figure 52: Fan Tray

Prerequisites

Before performing this task, you must first open the chassis doors on the rear (MSC) side of the chassis, if installed. If you are replacing the upper fan tray, you must remove the upper grille from the rear (MSC) side of the chassis. If you are replacing the lower fan tray, you must remove the lower chassis cosmetic bezel from the rear (MSC) side of the chassis.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Fan tray—Cisco product number CRS-16-LCC-FAN-TR

Steps

To replace a fan tray, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2   Using the screwdriver, loosen the two captive screws on the fan tray faceplate. If necessary, use a step platform to reach the upper fan tray comfortably.

Step 3   Pull firmly on the cover to swing it free; some force may be required, as the rubber seals can stick.

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 4   Grasp the fan tray handle and pull it straight out to disconnect the fan tray from the connector mounted on the front of the fan tray bay on the rear (MSC) side of the chassis. Slide the fan tray halfway from the fan tray bay.

Step 5   Use your free hand to support the fan tray, then slide the fan tray completely from the fan tray bay.
Step 6  
Set the fan tray carefully aside.

Step 7  
To install the replacement fan tray, using two hands to support the fan tray, position it in front of the fan tray bay so that the fan tray connector that is on the back of the fan tray lip is aligned with the connector mounted on the front of the fan tray bay (on the rear [MSC] side of the chassis).

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 8  
Slide the fan tray into the fan tray bay. Stop when the fan tray makes contact with the chassis connector in the back of the fan tray bay.

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

Step 9  
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 (PLIM) side of the chassis.

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

Step 10  
Tighten the two captive screws on the fan tray faceplate.

What to do next

After performing this task, close the doors (if installed) and re-install the upper grille or lower chassis cosmetic bezel on the rear (MSC) side of the chassis, as necessary. For more information, see Installing the Default Rear (MSC) Side Cosmetic Components and Installing the Optional Rear (MSC) Side Cosmetic Components section in the Installing and Removing Exterior Cosmetic Components chapter.

Replacing the Air Filter

This section describes how to replace the air filter in the LCC. For further information, see Information About Air Circulation Components, on page 99.

Figure 53: Air Filter

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 assembly.
Prerequisites

Before performing this task, you must first open the doors and remove the lower grille on the front (PLIM) side of the chassis. For more information, see Removing the Front (PLIM) Side Cosmetic Components section in Installing and Removing Exterior Cosmetic Components chapter.

⚠️ Caution

Never operate the LCC without an air filter. Operating an LCC without a filter or leaving a fan tray cover off for an extended time can result in damage to the hardware.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Air filter—Cisco product number CRS-16-LCC-FILTER

Steps

To replace the air filter, perform the following 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2   Using the screwdriver, loosen the two captive screws on the fan tray cover faceplate. Pull firmly on the cover to swing it free; some force may be required, as the rubber seals can stick.

Step 3   Grasp the ridge at the front of the air filter and carefully slide it from the slot.

Step 4   Set the air filter carefully aside.

Step 5   To install the replacement air filter, using two hands to support the air filter, orient it so that the ridge on the front of the air filter faces outward from the front (PLIM) side of the chassis and the wire grid backing support is facing up.

⚠️ Caution  All four sides 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.

Step 6   Slide the air filter into the air filter slot until it is seated fully within the slot.

Step 7   Replace the fan tray cover and tighten the two captive screws on the front.

What to do next

After performing this task, re-install the lower grille and close the doors on the front (PLIM) side of the chassis. For more information, see Installing the Front (PLIM) Side Exterior Cosmetic Components section in Installing and Removing Exterior Cosmetic Components chapter.
CHAPTER 4

Installing and Removing Line Cards, PLIMs, and Associated Components

This chapter provides instructions on how to install and remove the Cisco CRS Carrier Routing System 16-Slot Line Card Chassis (LCC) cards, physical layer interface modules (PLIMs), and any associated components.

About Installing and Removing Cards and Associated Components

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

Guidelines for Card Installation and Removal

Guidelines for card installation and removal include the following:

- About Installing and Removing Cards and Associated Components, on page 105
- Installing or Removing a Slot Cover, on page 113
- Installing or Removing an Impedance Carrier, on page 115
- Installing or Removing a Pillow Block, on page 118
- Installing or Removing a Switch Fabric Card, on page 122
- Installing or Removing a Line Card, on page 130
- Installing or Removing the LCC Fan Controller Card, on page 138
- Installing or Removing an RP, PRP, or DRP PLIM, on page 144
- Installing or Removing a PLIM, on page 153
- Installing or Removing a Card-Based Hard Drive, on page 161
- Installing or Removing a PCMCIA Card, on page 163
- Installing or Removing Optical Modules, on page 166
- Installing or Removing a Cable Management Bracket, on page 166

Note

For CRS-X next generation line cards and fabric cards, we recommend that you use a modular configuration power system in the chassis.
Online (in-service) insertion and removal (OIR) is supported, enabling you to remove and install cards while the router is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. You do not need to notify the software or reset the power. You have the option of using the Cisco IOS XR `shutdown` command before removing a card.

**Note**

OIR removes power to a specific slot before the switch fabric card is replaced. The power remains on for all other slots.

- The different cards and PLIMs in the LCC are all attached to the chassis itself using a pair of ejector levers and captive screws. The two ejector levers release the card or PLIM from its midplane connector. The exact locations of the ejector levers and captive screws vary slightly from card to card, but are, in general, in the same locations: on the upper and bottom ends of the faceplate of the card. The following figure shows the locations of the ejector levers and captive screws (on a modular services card (MSC)).

![Figure 54: Ejector Levers and Captive Screws](image)

The following figure shows how to operate the ejector levers. Be sure to operate both levers simultaneously.
When you remove a card, always use the ejector levers to ensure that the connector pins disconnect from the midplane in the sequence expected by the router.

- You should install the cards in the following order during the chassis initial installation process:
  - Always install cards in the empty slots first from one side to the other. The chassis is shipped with all slots either containing impedance carriers or covered by slot covers to help maintain chassis stiffness and ensure that the chassis is undamaged during shipment. See the next section.
  - Install the route processor (RP) cards first, the left one before the right one. Tighten the screws only after fully inserting both RP cards.
  - Install the LCC fan controller cards in the same manner.
  - Install the switch fabric cards in the same manner, one shelf at a time.
  - For an MSC, FP, or LSP line card or a PLIM, remove one impedance carrier, install a functional board and tighten the screw, and then repeat the process until all line cards and PLIMs have been installed.
For information about the slot numbers, see Chassis Slot Numbers, on page 7 section.

**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.

### About Impedance Carriers and Slot Covers

When shipped, some slots in the chassis may contain impedance carriers or are covered by slot covers to help ensure that the chassis is undamaged during shipment. Four different types of impedance carriers and slot covers exist for the four different sizes of slots in the chassis (see Figure 56: RP Slot Cover, Figure 57: Switch Fabric Slot Cover, Figure 58: PLIM Slot Impedance Carrier, and Figure 59: MSC Slot Impedance Carrier).

*Figure 56: RP Slot Cover*
Figure 57: Switch Fabric Slot Cover
Figure 58: PLIM Slot Impedance Carrier
For further information on installing and removing the slot covers and impedance carriers, see Installing a Slot Cover, on page 113, Removing a Slot Cover, on page 114, Installing an Impedance Carrier, on page 115, and Removing an Impedance Carrier, on page 117.

**About Hard Drives and PCMCIA Cards**

Both replacement and additional optional hard drives and PCMCIA cards are available for both the RP and DRP cards.

The hard drive is an IDE hard drive used for gathering debugging information, such as core dumps from the RPs, DRPs, or line cards. The IDE hard drive is typically powered down and activated only when there is a need to store data. The drive is not vital to a functioning LCC and is optional.
Only the original route processor (RP) card uses a PCMCIA card. The performance route processor (PRP) card has a USB connector for using a flash drive.

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

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

The RP and DRP cards provide two PCMCIA flash slots, each card providing 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 RP or DRP, not removable, and for permanent storage of configurations and images.

About Cable Management Brackets

The chassis includes a cable management system that organizes the interface cables entering and exiting the different cards, keeping them out of the way and free of sharp bends.

Excessive bending of interface cables can cause damage to the cables.

The LCC arrives with a midchassis and upper-chassis horizontal cable management bracket preinstalled on the front (PLIM) side of the chassis, with an optional upper-chassis horizontal cable management bracket available for the rear (MSC) side of the chassis.

The following figure shows the midchassis cable management bracket.

*Figure 60: Midchassis Cable Management Bracket (Front [PLIM] Side of Chassis Only)*
Installing or Removing a Slot Cover

This section contains the following procedures:

Installing a Slot Cover

This section describes how to install a slot cover in the LCC. The chassis is shipped with slot covers over the switch fabric card and RP card slots; we advise installing slot covers over any empty slots in the chassis. Both slot cover types are installed in the same manner. The following figure shows an RP slot cover for reference.

*Figure 61: RP Slot Cover*
Prerequisites

Before performing this task, open the cosmetic doors (if installed) and ensure that the slot over which you are about to install the cover is empty. See Removing an RP, PRP, or DRP Card, on page 150 and Removing a Switch Fabric Card, on page 127.

Required Tools and Equipment

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

- ESD-preventive wrist strap
- Large Phillips screwdriver
- Slot cover

Steps

To install a slot cover, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Using the handle, hold the slot cover in place over the slot.
3. Partially tighten the four captive screws on the front panel of the slot cover (either by hand or with the screwdriver) to make sure that they are both engaged.
4. Use the screwdriver to fully tighten the captive screws to seat the slot cover firmly in place.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side of the chassis or a bare metal surface on the chassis.</td>
</tr>
<tr>
<td>2</td>
<td>Using the handle, hold the slot cover in place over the slot.</td>
</tr>
<tr>
<td>3</td>
<td>Partially tighten the four captive screws on the front panel of the slot cover (either by hand or with the screwdriver) to make sure that they are both engaged.</td>
</tr>
<tr>
<td>4</td>
<td>Use the screwdriver to fully tighten the captive screws to seat the slot cover firmly in place.</td>
</tr>
</tbody>
</table>

What to do next

After performing this task, close the front (PLIM) side cosmetic doors (if installed).

Removing a Slot Cover

This section describes how to remove a slot cover from the LCC. The chassis may be shipped with slot covers over the switch fabric card and RP card slots. Both slot cover types are removed in the same manner. The previous figure shows an RP slot cover for reference.
Prerequisites

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Large Phillips screwdriver

Steps

To remove a slot cover, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Grasp the slot cover with one hand.
3. Use the screwdriver to loosen the captive screws that attach the slot cover to the chassis.
4. Holding the slot cover by the handle, remove it, and set it carefully aside.

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side of the chassis or a bare metal surface on the chassis.</td>
</tr>
<tr>
<td>2</td>
<td>Grasp the slot cover with one hand.</td>
</tr>
<tr>
<td>3</td>
<td>Use the screwdriver to loosen the captive screws that attach the slot cover to the chassis.</td>
</tr>
<tr>
<td>4</td>
<td>Holding the slot cover by the handle, remove it, and set it carefully aside.</td>
</tr>
</tbody>
</table>

What to do next

After performing this task, store the slot cover for later reuse. You may now install a card in the uncovered slot. See Installing a Switch Fabric Card, on page 123 and Installing an RP, PRP, or DRP Card, on page 146.

Installing or Removing an Impedance Carrier

This section contains the following procedures:

Installing an Impedance Carrier

This section describes how to install an impedance carrier in the LCC. The chassis is shipped with impedance carriers installed in the MSC and PLIM slots. Both types of impedance carrier are installed in the same manner. The following figure shows an MSC impedance carrier for reference.
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 About Impedance Carriers and Slot Covers, on page 108, Removing an MSC, FP, or LSP Line Card, on page 134, or Removing a PLIM, on page 158 (depending on the slot in which you are installing an impedance carrier).

Required Tools and Equipment

- ESD-preventive wrist strap
- Large Phillips screwdriver
- Impedance carrier:
  - MSC impedance carrier—Cisco Product number CRS-MSC-IMPEDANCE=
or

- PLIM impedance carrier—Cisco Product number CRS-INT-IMPEDANCE=

Steps

To install an impedance carrier, follow these 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 (PLIM) side of the chassis or 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

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

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

Step 5  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, close the cosmetic doors (if installed).

Removing an Impedance Carrier

This section describes how to remove an impedance carrier from the LCC. Both types of impedance carrier types are removed in the same manner. The previous figure shows an MSC impedance carrier for reference.

Prerequisites

Before performing this task, open the cosmetic doors (if installed).

Required Tools and Equipment

- ESD-preventive wrist strap
- Large Phillips screwdriver
Steps

To remove an impedance carrier, follow these 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 (PLIM) side of the chassis or 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**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Attach the ESD-preventive wrist strap to your wrist and connect its leash to an ESD connection socket on the front (PLIM) side of the chassis or a bare metal surface on the chassis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>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.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Grasp the impedance carrier handle with one hand and gently pull it halfway from the slot.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Place one hand under the impedance carrier to guide it.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Holding the impedance carrier underneath and by the handle, pull it from the slot, and set it carefully aside.</td>
</tr>
</tbody>
</table>

**What to do next**

After performing this task, store the impedance carrier for future use. You may now install a card in the uncovered slot. See Installing an MSC, FP, or LSP Line Card, on page 130 and Installing a PLIM, on page 154.

**Installing or Removing a Pillow Block**

This section contains the following procedures:

**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 screwdriver (See item 1 in the following figure)

Steps

To install a pillow block, follow these 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 (PLIM) 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 screwdriver to install the top left screw (located above the pillow block pin). (See item number 2 in the following figure.)
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 (PLIM) 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 screwdriver to install the top left screw (located above the pillow block pin). (See item number 2 in the following figure.)
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, close the front cosmetic doors (if installed).

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 screwdriver (part of the Pillow block replacement kit—Cisco product number: CRS-PILLBLK=)
Steps

To remove a damaged pillow block, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Locate the pillow block to be replaced. Use the T10 Torx screwdriver to remove the lower right screw. (See item number 2 in the following 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

**Step 2**

Locate the pillow block to be replaced. Use the T10 Torx screwdriver to remove the lower right screw. (See item number 2 in the following figure.)

*Figure 64: Removing a Pillow Block*

---

**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 Installing a Pillow Block, on page 118 section).

Installing or Removing a Switch Fabric Card

This section contains the following procedures:

Note
Some switch fabric cards (SFCs) contain Class 1 lasers, while others contain Class 1M lasers; for details on the specifics of your card, see the Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description.

Note
For CRS-FP-X next generation line cards, we recommend that you use a modular configuration power system.

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
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
Installing a Switch Fabric Card

This section describes how to install a switch fabric card (SFC) in the LCC. The following figure shows the FQ123-140G switch fabric card for a single-chassis system (in other words, a system that has only a single LCC).
Installing a Switch Fabric Card

Figure 65: FQ123-140G Switch Fabric Card
Prerequisites

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

- ESD-preventive wrist strap
- Large Phillips screwdriver
- Switch fabric card:
  - FQ123—Cisco product number: CRS-16-FC/S=
  or
  - FQ123-140G—Cisco product number: CRS-16-FC140/S=
  or
  - FQ123-200G—Cisco product number: CRS-16-FC400/S

Steps

To install a switch fabric card, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the switch fabric card from its antistatic packaging.
3. Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot (see the following figure).
4. Position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.
5. Orient the switch fabric card so that the PCB faces left and the carrier is to the right; if the card does not slide easily into the slot, the orientation may be wrong and the misorientation rejection flange is stopping the card from going into the slot. Reorient the switch fabric card, if necessary.
6. Carefully slide the switch fabric card into the slot until the ejector levers meet the edges of the card cage, then stop when the ejector lever hooks catch the lip of the card cage. If they do not catch, try reinserting the switch fabric card until the ejector lever hooks are fully latched.
7. Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.
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 midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.
10. Use the screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot.
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 (PLIM) side of the chassis or a bare metal surface on the chassis.

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

Step 3  Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot (see the following figure).

Note  For easiest installation, install the cards from right to left sequentially, starting from the far right slot.

Step 4  Position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.

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

Figure 66: Installing a Switch Fabric Card

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Captive screw</td>
</tr>
<tr>
<td>2</td>
<td>Ejector lever</td>
</tr>
<tr>
<td>3</td>
<td>Direction of installation or removal</td>
</tr>
</tbody>
</table>

Step 5  Orient the switch fabric card so that the PCB faces left and the carrier is to the right; if the card does not slide easily into the slot, the orientation may be wrong and the misorientation rejection flange is stopping the card from going into the slot. Reorient the switch fabric card, if necessary.
Step 6 Carefully slide the switch fabric card into the slot until the ejector levers meet the edges of the card cage, then stop when the ejector lever hooks catch the lip of the card cage. If they do not catch, try reinserting the switch fabric card until the ejector lever hooks are fully latched.

Step 7 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

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

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

Step 9 To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

Note For easier installation, install all four switch fabric cards in each bay before securing any fasteners.

Step 10 Use the screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot.

What to do next

After performing this task, place the impedance carrier in an antistatic bag for storage and future use. Close the front (PLIM) side cosmetic doors (if installed) and verify that the card has been installed properly (Verifying the Installation of a Switch Fabric Card, on page 129). If you are performing the initial installation of the system, install the MSCs (Installing an MSC, FP, or LSP Line Card, on page 130) after you complete the installation of the switch fabric cards.

Removing a Switch Fabric Card

This section describes how to remove a switch fabric card (SFC) from the LCC. See Figure 65: FQ123 -140G Switch Fabric Card for an example of a switch fabric card (in this case, an FQ123-140G SFC).

Prerequisite

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

• ESD-preventive wrist strap
• Large Phillips screwdriver

Steps

To remove a switch fabric card, see the figure below and follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

2. Identify the switch fabric card 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 two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer switch fabric card) away from the front edge of the card carrier to unseat the card from the midplane connector.

4. Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repack it in its original shipping container.
**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 (PLIM) side of the chassis or a bare metal surface on the chassis.

**Step 2** Identify the switch fabric card 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 two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer switch fabric card) away from the front edge of the card carrier to unseat the card from the midplane connector.

**Step 4** Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in its original shipping container.

---

**What to do next**

After performing this task, put the PLIM into an antistatic bag and close the front (PLIM) side cosmetic doors (if installed).

---

**Verifying the Installation of a Switch Fabric Card**

This section tells you how to verify that a switch fabric card (SFC) has been properly installed. The following figure shows an FQ123-140G switch fabric card for a single-chassis system (in other words, a system that has only a single LCC). The FQ123 SFC is similar.

*Figure 68: FQ123-140G Switch Fabric Card Front View*

1. Status LED
2. Alphanumeric LEDs

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**Understanding the Alphanumeric LEDs**

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

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**Note**

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

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**Troubleshooting the Switch Fabric Card**

If the installed or replaced switch fabric card fails to operate or power up on installation:
• Make sure that the card is seated firmly in the LCC slot. One easy way to verify physical installation is to see whether the front faceplate of the switch fabric card is even with the fronts of the other cards installed in the card cage.
• Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the switch fabric card.
• Examine the alarm module to see if there are any active alarm conditions. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description for information on the alarm module.
• Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the Status LED, located on the switch fabric 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 a failure occurs during the board boot sequence, the two four-digit alphanumeric displays indicate the current boot phase to assist you in debugging the board failure.

Installing or Removing a Line Card

This section contains the following procedures:

Note

For CRS-MSC-X and CRS-FP-X next generation line cards, we recommend that you use a modular configuration power system.

Installing an MSC, FP, or LSP Line Card

This section describes how to install a modular services card (MSC), forwarding processor (FP) card, or label switch processor (LSP) in the LCC.

The MSC, FP, and LSP are Layer 3 forwarding engines.
• The MSCs include: CRS-MSC, CRS-MSC-B, CRS-MSC-140G, and CRS-MSC-X/CRS-MSC-X-L (200G).
• The FP include: CRS-FP-140, CRS-FP-X/CRS-FP-X-L (200G).
• The LSP is: CRS-LSP.

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

Caution

MSC-140G, FP-140, and LSP line cards should only be paired with 20-port and 14-port 10-GE XFP PLIMs and 1-port 100-GE CFP PLIMs. The MSC-40 line card should not be paired with 20-port and 14-port 10-GE XFP PLIMs or 1-port 100-GE CFP PLIMs. The MSC-40 line card can be paired with all previous PLIMs. See the release notes for details.
Prerequisites

Before performing this task, open the cosmetic doors (if installed).

Caution

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

- ESD-preventive strap
- Medium flat-head or Phillips screwdriver
- MSC, FP, or LSP (see the product data sheet for ordering details).

Steps

To install a line card, see the following figure and follow these steps:

Figure 70: Installing a Line Card

<table>
<thead>
<tr>
<th>1</th>
<th>Captive screw</th>
<th>3</th>
<th>Direction of installation or removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ejector lever</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Choose an available modular services card slot for the line card.
3. Remove the MSC impedance carrier from the slot you need to fill and set it aside.
4. Remove the replacement line card from the antistatic bag or mat.
5. Use both hands while inserting a line card. Use one hand on the faceplate and the other hand along the base of the line card to guide it into a slot.
6. Orient the line card so that the PCB faces left and the carrier is to the right; if the card does not slide easily into the slot, the orientation may be wrong and the misorientation rejection flange is stopping the card from going into the slot. Reorient the line card, if necessary.
7. Make sure that the ejector levers are oriented properly to engage with the pin as the line card slides into the slot. Carefully slide the line card into the slot until the ejector levers engage the catches, then stop.
8. Simultaneously pivot the ejector levers toward the faceplate of the line card. Do not force the line card; the ejector levers properly seat the line card against the midplane.
9. Use a screwdriver to tighten the captive screws next to each line card ejector lever to ensure proper EMI shielding and prevent the line card from becoming partially dislodged from the midplane.
10. Attach the bracket to the line card; use the screws that came with it.

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

Step 2
Choose an available modular services card slot for the line card.

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

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

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

Step 4
Remove the replacement line card from the antistatic bag or mat.

Step 5
Use both hands while inserting a line card. Use one hand on the faceplate and the other hand along the base of the line card to guide it into a slot.

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

Step 7
Make sure that the ejector levers are oriented properly to engage with the pin as the line card slides into the slot. Carefully slide the line card into the slot until the ejector levers engage the catches, then stop.

Step 8
Simultaneously pivot the ejector levers toward the faceplate of the line card. Do not force the line card; the ejector levers properly seat the line card against the midplane.

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

Step 9
Use a screwdriver to tighten the captive screws next to each line card ejector lever to ensure proper EMI shielding and prevent the line card from becoming partially dislodged from the midplane.
Removing an MSC, FP, or LSP Line Card

This section describes how to remove a line card from the LCC.

Prerequisites

Before performing this task, open the cosmetic doors (if installed).

Caution

Do not use the faceplate bracket to pull a line card from the slot; you could cause serious damage to the line card.

Required Tools and Equipment

- ESD-preventive strap
- Medium flat-head or Phillips screwdriver
- MSC Impedance carrier (Cisco product number: CRS-MSC-IMPEDANCE=)

Steps

To remove a line card, see the following figure and follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Use a screwdriver to loosen the captive screw next to each line card ejector lever.
3. Simultaneously pivot the ejector levers away from the faceplate to release the line card from the midplane connectors.
4. Grasp the ejector levers with both hands and gently pull the line card halfway from the slot. Do not use the bracket to pull the line card from the slot.
5. Move one hand under the line card to guide it. Avoid touching the line card printed circuit board, components, or any connector pins.
6. Place the removed line card on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
7. If the line card slot is to remain empty, install an MSC impedance carrier to keep dust out of the chassis and to maintain proper airflow through the line card compartment.
8. Use a screwdriver to tighten the captive screws next to each impedance carrier ejector lever to ensure proper EMI shielding and maintain proper airflow throughout 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2  Use a screwdriver to loosen the captive screw next to each line card ejector lever.

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

Step 3  Simultaneously pivot the ejector levers away from the faceplate to release the line card from the midplane connectors.

Step 4  Grasp the ejector levers with both hands and gently pull the line card halfway from the slot. Do not use the bracket to pull the line card from the slot.

Step 5  Move one hand under the line card to guide it. Avoid touching the line card printed circuit board, components, or any connector pins.

Step 6  Place the removed line card on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.

Step 7  If the line card slot is to remain empty, install an MSC impedance carrier to keep dust out of the chassis and to maintain proper airflow through the line card compartment.

Step 8  Use a screwdriver to tighten the captive screws next to each impedance carrier ejector lever to ensure proper EMI shielding and maintain proper airflow throughout the chassis.

What to do next

After performing this task, put the line card into an antistatic bag and close the rear (MSC) side cosmetic doors (if installed).

Verifying the Installation of an MSC, FP, or LSP Line Card

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

The following figure shows the MSC-140G front panel.

Figure 72: CRS-MSC-140G Front Panel

![Front Panel Diagram]

1 Status LED  2 Alphanumeric LEDs

The following figure shows the FP-140 front panel.
The following figure shows the CRS-LSP front panel.

**Understanding the Alphanumeric LEDs**

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

<table>
<thead>
<tr>
<th>Status LED</th>
<th>Alphanumeric LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

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

**Troubleshooting the MSC, FP, or LSP Card**

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

- Make sure that the card is seated firmly into the LCC slot. One easy way to verify physical installation is to see whether the front faceplate of the card is even with the fronts of the other cards installed in the card cage.
- Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the card.
- Examine the LCC alarm module to see if there are any active alarm condition. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description for information on the alarm module.
- Examine the LCC power shelves to see whether the chassis, as a whole, is receiving power.

Use the Status LED, located on the line card faceplate, to verify the correct installation of the line card:

- When the card is properly installed, the Status LED turns green. If this LED is off, verify that the card 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 or Removing the LCC Fan Controller Card

This section contains the following procedures:

#### Installing a LCC Fan Controller Card

This section describes how to install a LCC fan controller (LCFC) card in the LCC.

Two LCC fan controller cards, shown in the following figure, exist in every LCC.

---

**Note**  
The CRS-16-LCC-FAN-CT= fan controller card is no longer orderable. Use PID CRS-16-LCC-F-CT-B= to order a spare fan controller card.

---

**Note**  
You can have a mix of CRS-16-LCC-FAN-CT= and CRS-16-LCC-F-CT-B= in an LCC.
Prerequisites

Before performing this task, open the front (PLIM) cosmetic doors (if installed).

Required Tools and Equipment

- ESD-preventive wrist strap
- Large Phillips screwdriver
- LCC fan controller card—Cisco product number CRS-16-LCC-FAN-CT= or CRS-16-LCC-F-CT-B=

Note

The CRS-16-LCC-FAN-CT= fan controller card is no longer orderable. Use PID CRS-16-LCC-F-CT-B= to order a spare fan controller card.
To install an LCC fan controller card, see the figure below and follow these steps:

**Figure 76: Installing an LCC Fan Controller Card**

1. **Captive screw**
2. **Ejector lever**
3. **Direction of installation or removal**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Captive screw</td>
</tr>
<tr>
<td>2</td>
<td>Ejector lever</td>
</tr>
</tbody>
</table>

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

**Step 2** Remove the LCC fan controller card from its antistatic packaging.

**Step 3** Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot.
Note For easier installation, install the far left card first.

Step 4 Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

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

Step 5 Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

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

Step 6 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 slot.

Note The LCC fan controller card has guide pins that make initial contact with the midplane connector as you slide a card into its slot. After the guide pins make contact, continue pushing the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.

Step 7 To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

Note For easier installation, install both LCC fan controller cards before you tighten the fasteners.

Step 8 Use the screwdriver to turn the two captive screws on the front panel of the LCC fan controller card clockwise to seat the card firmly in the slot.

What to do next

After performing this task, place the impedance carrier in an antistatic bag for storage and future use. Close the front (PLIM) side cosmetic doors and verify that the card has been installed properly (Verifying the Installation of an LCC Fan Controller Card, on page 143). If you are performing the initial installation of the system, install the route processors (Installing an RP, PRP, or DRP Card, on page 146) after you complete the installation of the LCC fan controller cards.

Removing an LCC Fan Controller Card

This section describes how to remove a fan controller card from the LCC. Two LCC fan controller cards, shown in Figure 75: LCC Fan Controller Card, exist in every LCC.

Prerequisites

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Large Phillips screwdriver
Steps

To remove a LCC fan controller card, see the figure below and follow these steps:

*Figure 77: Removing an LCC Fan Controller Card*

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Captive screw</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Ejector lever</td>
<td></td>
</tr>
</tbody>
</table>

**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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Identify the LCC fan controller card 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 two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a new LCC fan controller card) away from the front edge of the card carrier to unseat the card from the midplane connector.
4. Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repack it in its original packaging.

**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 (PLIM) side of the chassis or a bare metal surface on the chassis.
Step 2 Identify the LCC fan controller card 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 two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a new LCC fan controller card) away from the front edge of the card carrier to unseat the card from the midplane connector.

Step 4 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repack it in its original packaging.

What to do next
After performing this task, close the front (PLIM) side cosmetic doors.

Verifying the Installation of an LCC Fan Controller Card

This section describes how to verify that the LCC fan controller card has been properly installed. The following figure shows the LCC fan controller front panel.

Figure 78: LCC Fan Controller Card Front Panel

Understanding the Alphanumeric LEDs

At one end of the faceplate, near an ejector lever, an LCC fan controller 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 LCC Fan Controller Card

If the installed or replaced LCC fan controller card fails to operate or to power up on installation:

• Make sure that the card is seated firmly in the LCC slot. One easy way to verify physical installation is to see whether the front faceplate of the LCC fan controller 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 LCC fan controller card.

• Examine the alarm module to see if there are any active alarm conditions. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description for information on the alarm module.
• Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the Status LED, located on the LCC fan controller 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 a failure occurs during the board boot sequence, the two four-digit alphanumeric display indicate the current boot phase to assist you in debugging the board failure.

Installing or Removing an RP, PRP, or DRP PLIM

This section contains the following topics:

⚠️ 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

About Distributed Route Processors and Distributed Route Processor PLIMs

The Cisco CRS Carrier Routing System provides distributed route processor (DRP) support through the installation of DRP PLIMs and DRP cards on the LCC. The installation of DRPs provides you with the ability to configure the system for logical router support and additional processor power for multichassis systems.
The distributed route processor (DRP) card and DRP PLIM have no dedicated slots. The DRP card is installed in an open MSC slot and the DRP PLIM is installed in the corresponding PLIM slot.

For DRP support, you must install both the DRP PLIM in a PLIM slot on the front (PLIM) side of the chassis and a DRP card in the corresponding slot on the rear (MSC) side of the chassis. The DRP PLIM and DRP cards are installed in the same manner as regular PLIMs and MSCs. See Installing or Removing a PLIM, on page 153 or Installing or Removing a Line Card, on page 130.
DRPs contain two CPU complexes, independent of each other, each with its own hard drive. In addition, the DRP provides you with two PCMCIA card slots, similar to the RP. For further information, see About Hard Drives and PCMCIA Cards, on page 111. For installation or removal information, see Installing or Removing a Card-Based Hard Drive, on page 161 or Installing or Removing a PCMCIA Card, on page 163.

**Installing an RP, PRP, or DRP Card**

This section describes how to install a route processor (RP), performance route processor (PRP), or a DRP card in the LCC. Every LCC contains two RP or PRP cards in dedicated slots on the PLIM side of the chassis (see the following figure).
AchassismaynotbepopulatedwithamixofRPandPRPcards.Bothrouteprocessorcardsshouldbeofthesame(type(RPorPRP).

Prerequisites

Becausechassisoperationmaybeimpactedbytheinstallationofarouteprocessorcard,performthesetasks onlyifoneofthefollowingconditionsexists:

- WhenyouarecertainthatthesecondRPinthechassisisoperationaland,ifnotalreadythemasterRP, readytoassumecontrol(thishappensautomatically)
- Whenthechassisisundergoingscheduledmaintenance
- WhentheLCCispowereddown

Failuretofollowtheseguidelinescanresultininterruptionsindatacommunicationsandnetworkconnectivity. Beforeperformingthistask,openthecosmeticdoors(ifinstalled).

Required Tools and Equipment

Youneedthefollowingtoolsandparttoperformthistask:

- ESD-preventivewriststrap
- LargePhillipscrewdriver
- RP,PRP,orDRPcard:
  - RPcard—Ciscoproductnumber:CRS-8-RP=
  - PRPcard—Ciscoproductnumber:CRS-16-PRP-6G=
  - PRPcard—Ciscoproductnumber:CRS-16-PRP-12G=
  - DRPcard—Ciscoproductnumber:CRS-DRP-CPU=

Steps

ToinstallanRP,PRP,orDRPcard,followthesesteps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect itsleash to one of the ESDconnection sockets on the front (PLIM) side of the chassis or a baremetal surface on the chassis.
2. Removethecardfromitsantistaticpackaging.
4. Usethescrewdriver toturnthetwocaptive screws on the front panel of the card counterclockwiseto loosen the card from the slot.
5. Graspthetwocardejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplaneconnector.
6. Touchingonlythemetallcardcarrier,slidesethecardfromtheslotandplaceitdirectlyintoanantistatic sack or other ESD-preventive container. Ifyouplantoreturnthedefectivecardtothefactory, repackage it in theshipping container you received with thereplacement card.
7. Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

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

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

10. 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.

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

12. Reattach any cables you removed in Step 3.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Remove the card from its antistatic packaging.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Identify the card to be replaced in the card cage. Remove any cables connected to the front panel of the RP card.</td>
</tr>
</tbody>
</table>
Step 4  Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.

Step 5  Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.
Step 6 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in the shipping container you received with the replacement card.

Step 7 Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

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

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

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

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

**Note** RP and PRP cards have 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 10 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 11 Use the screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot.

Step 12 Reattach any cables you removed in Step 3.

---

**What to do next**

After performing this task, place the impedance carrier in an antistatic bag for storage and future use. Close the front (PLIM) side cosmetic doors (if installed) and verify that the card has been installed properly (Verifying the Installation of an RP, PRP, or DRP Card, on page 152). If you are performing the initial installation of the system, install the PLIMs (Installing a PLIM, on page 154) after you complete the installation of the RP cards.

**Removing an RP, PRP, or DRP Card**

This section describes how to remove a route processor (RP), performance route processor (PRP), or distributed route processor (DRP) card from the LCC. Every LCC contains two route processor cards in dedicated slots on the PLIM side of the chassis (see the previous figure).

**Prerequisites**

Because chassis operation may be impacted by the removal of an RP or PRP card, perform these tasks only if one of the following conditions exists:

- When you are certain that the RP card in the chassis is operational and, if not already the Active RP, ready to assume control (this happens automatically)
- When the chassis is undergoing scheduled maintenance
- When the LCC is powered down
Failure to follow these guidelines can result in interruptions in data communications and network connectivity. Before performing this task, open the cosmetic doors (if installed).

**Required Tools and Equipment**

- ESD-preventive wrist strap
- Large Phillips screwdriver

**Steps**

To remove an RP, PRP, or DRP card, follow these 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 chassis or a bare metal surface on the chassis.
2. Identify the card to be removed from the card cage. Remove any cables connected to the front panel of the card.
3. PRP cards only—Before removing a PRP card, you must first push the OIR button (using a pointed object such as a pen), which causes the blue OIR Ready LED to start blinking. When the board is ready for removal, the blue LED glows solidly.
4. Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.
5. Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.
6. Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in the shipping container you received with the replacement card.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the chassis or a bare metal surface on the chassis.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Identify the card to be removed from the card cage. Remove any cables connected to the front panel of the card.</td>
</tr>
<tr>
<td>Step 3</td>
<td>PRP cards only—Before removing a PRP card, you must first push the OIR button (using a pointed object such as a pen), which causes the blue OIR Ready LED to start blinking. When the board is ready for removal, the blue LED glows solidly.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Use the screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in the shipping container you received with the replacement card.</td>
</tr>
</tbody>
</table>

**What to do next**

After performing this task, replace any front (PLIM) side cover plates.
Verifying the Installation of an RP, PRP, or DRP Card

This section describes how to verify and troubleshoot the installation of a route processor (RP), performance route processor (PRP), or distributed route processor (DRP) card, and how to verify that the card has been properly installed.

Figure 82: RP Card Front Panel

<table>
<thead>
<tr>
<th>1</th>
<th>Console port</th>
<th>7</th>
<th>Management Ethernet RJ45 port</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Aux port</td>
<td>8</td>
<td>Alphanumeric LED Display</td>
</tr>
<tr>
<td>3</td>
<td>Internal hard disk</td>
<td>9</td>
<td>Alphanumeric LED Display</td>
</tr>
<tr>
<td>4</td>
<td>PC card slot</td>
<td>10</td>
<td>PRIMARY LED—PRP active or standby indicator</td>
</tr>
<tr>
<td>5</td>
<td>Control Ethernet 0 port</td>
<td>11</td>
<td>STATUS LED—Card status indicator</td>
</tr>
<tr>
<td>6</td>
<td>Control Ethernet 1 port</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 83: Performance Route Processor Front Panel

<table>
<thead>
<tr>
<th>1</th>
<th>OIR push button—Press to initiate OIR process</th>
<th>8</th>
<th>Link/Active 0 LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>OIR Ready LED</td>
<td>9</td>
<td>Control Ethernet 0 port (SFP or SFP+)</td>
</tr>
<tr>
<td>3</td>
<td>USB socket</td>
<td>10</td>
<td>Link/Active 1 LED</td>
</tr>
<tr>
<td>4</td>
<td>Console port</td>
<td>11</td>
<td>Control Ethernet 1 port (SFP or SFP+)</td>
</tr>
<tr>
<td>5</td>
<td>Auxiliary port</td>
<td>12</td>
<td>Alphanumeric LED Display</td>
</tr>
<tr>
<td>6</td>
<td>Service Ethernet RJ45 port</td>
<td>13</td>
<td>PRIMARY LED—PRP active or standby indicator</td>
</tr>
<tr>
<td>7</td>
<td>Management Ethernet RJ45 port</td>
<td>14</td>
<td>STATUS LED—Card status indicator</td>
</tr>
</tbody>
</table>
Understanding the Alphanumeric LEDs

On the card front panel, the RP, PRP, or DRP card has an alphanumeric LED display that shows a sequence of messages indicating the state of the card.

---

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

Troubleshooting the RP, PRP, or DRP Card

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

- Make sure that the card is seated firmly in the LCC slot. One easy way to verify physical installation is to see whether the front faceplate of the card is even with the fronts of the other cards installed in the card cage.

---

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

- Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the card.
- Examine the alarm module to see if there are any active alarm conditions. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description for information on the alarm module.
- Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the card status LED, located on the RP and PRP card front panel, to verify the correct installation of the card:

- When the card is properly installed, the card status LED turns green. If this LED is off, verify that the card is installed correctly.
- When the card status LED is blinking yellow, a problem exists on the board.
- When the card 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 a failure occurs during the board boot sequence, the four-digit alphanumeric display indicates the current boot phase to assist you in debugging the board failure.

Installing or Removing a PLIM

This section contains the following procedures:

---

**Note**
Some PLIMs contain Class 1 lasers, while others contain Class 1M lasers; for details of your PLIM, see the Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description.
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

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

Installing a PLIM

This section describes how to install a PLIM in the LCC. For more detailed information on PLIMs.

Caution

MSC-140G, FP-140, and LSP line cards should only be paired with 20-port and 14-port 10-GE XFP PLIMs and 1-port 100-GE CFP PLIMs. The MSC-40 line card should not be paired with 20-port and 14-port 10-GE XFP PLIMs or 1-port 100-GE CFP PLIMs. The MSC-40 line card can be paired with all previous PLIMs. See the release notes for details.

A PLIM is paired with a line card through the midplane of the chassis. A PLIM provides the ability to choose several interfaces (for example, Packet-over-SONET [PoS]). The following figure shows a typical PLIM (in this case, a 14-port 10-GE XFP PLIM).
You can install a PLIM in any slot not occupied by an RP or LCC fan controller card. If you install a new line card or PLIM, remove the impedance carrier card from the available slot.

**Caution**

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

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

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

- ESD-preventive wrist strap
- Medium Phillips screwdriver
- PLIM

Steps

To install a PLIM, see the following figure and follow these 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 chassis or a bare metal surface on the chassis.
2. Remove the PLIM from its antistatic packaging.
3. Remove the PLIM impedance carrier from the slot you need to fill and set it aside.
4. Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot (see the following figure). Slide the card halfway into the far left slot. Avoid touching the card circuitry or any connectors.
5. Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.
6. 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.
7. To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.
8. Tighten the captive screws on the PLIM.
9. Install the optical modules, if applicable.
10. Install the PLIM cable management bracket.
11. Install the interface cables.

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 chassis or a bare metal surface on the chassis.

Step 2 Remove the PLIM from its antistatic packaging.

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

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

Step 4 Grasp the card carrier handle with one hand and place your other hand under the carrier to support and guide it into the correct slot (see the following figure). Slide the card halfway into the far left slot. Avoid touching the card circuitry or any connectors.
Figure 85: Installing a PLIM

1. Captive screw
2. Ejector lever
3. Direction of installation or removal

**Step 5**
Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.

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

**Step 6**
Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.

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

**Step 7**
To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.

**Step 8**
Tighten the captive screws on the PLIM.
Caution  To ensure adequate space for additional PLIMs, MSCs, FPs, or LSPs, always tighten the captive installation screws on each newly installed PLIM before you insert any additional PLIM, MSC, FP, or LSP. These screws also prevent accidental removal and provide proper grounding and EMI shielding for the system.

Step 9  Install the optical modules, if applicable.
Step 10  Install the PLIM cable management bracket.
Step 11  Install the interface cables.

What to do next

⚠️ Warning  Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Statement 70

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

After performing this task, close the front (PLIM) side cosmetic doors (if installed).

Removing a PLIM

This section describes how to remove a PLIM from the LCC.

⚠️ Caution  The following warning applies to removing very-short-reach (VSR) PLIMs: The router may indicate a hardware failure if you do not follow proper procedures. Remove or install only one PLIM at a time. Allow at least 15 seconds for the router to complete the preceding tasks before removing or installing another PLIM.

⚠️ Note  We strongly recommend that you use the Cisco IOS XR shutdown command before removing a PLIM to prevent anomalies when you reinstall a new or reconfigured PLIM.

Prerequisites

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Medium Phillips screwdriver

Steps

To remove a PLIM, see the following figure and follow these 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 chassis or a bare metal surface on the chassis.
2. Identify the card to be replaced.
3. Use the screwdriver to loosen the two captive screws holding the card in place.
4. Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer PLIM) away from the front edge of the card carrier to unseat the card from the backplane connector.
5. Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic sack or other ESD-preventive container.

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 chassis or a bare metal surface on the chassis.
Step 2  Identify the card to be replaced.
Step 3  Use the screwdriver to loosen the two captive screws holding the card in place.
Step 4  Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees (70 degrees for a newer PLIM) away from the front edge of the card carrier to unseat the card from the backplane connector.
Verifying the Installation of a PLIM

This section describes how to verify that the PLIM has been properly installed. The following figure shows an example of a PLIM front panel (in this case, a 14-port 10-Gigabit Ethernet XFP PLIM).

Figure 87: 14-Port 10-Gigabit Ethernet XFP PLIM front panel

| 1 Port LED (one per port) | 2 Status LED |

Troubleshooting the PLIM

If a PLIM fails to operate or to power up on installation:

• Make sure that the PLIM is seated firmly in the LCC slot. One easy way to verify physical installation is to see whether the front faceplate of the PLIM is even with the fronts of the other PLIMs installed in the card cage.
• Check whether the ejector levers are latched and that the captive screws are fastened properly. If you are uncertain, unlatch the levers, loosen the screws, and attempt to reseat the PLIM.
• Examine the alarm module to see if there are any active alarm conditions. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description for information on the alarm module.
• Examine the power shelves to see whether the chassis, as a whole, is receiving power.

Use the LEDs on the PLIM faceplate to verify the correct installation and operation of the card:

• Status LED—Indicates whether the card is properly seated and operating OK.
  • Green—Card is properly installed and operating OK.
  • Yellow—Problem exists on the card.
  • Off—PLIM is not properly seated or system power is off.
Port Status LED:
- On—Port is logically active and the laser is on.
- Off—Port is not active.

Installing or Removing a Card-Based Hard Drive

This section includes the following topics:

Installing a Hard Drive

This section describes how to install a hard drive in an RP or a DRP PLIM. Hard drives are available as an option on both the RP and DRP PLIM and are installed in the same manner. For more detailed information on the hard drives, see About Hard Drives and PCMCIA Cards, on page 111. The following figure shows the hard drive location on the RP card. (The hard drive for the DRP PLIM is in a similar location.)

![Figure 88: RP Card Hard Drive Location](image)

Prerequisites

Before performing this task, open the cosmetic doors (if installed).

Required Tools and Equipment

- ESD-preventive strap
- Medium flat-head screwdriver
- Hard drive

Steps

To install a hard drive, follow these 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 chassis or a bare metal surface on the chassis.
2. Use the screwdriver to loosen the captive screws at the left and right of the hard drive door on the faceplate of the card. If needed, use a screwdriver on the captive screws.
3. Remove the hard drive door and set it carefully aside.
4. Carefully align the hard drive sled (attached to the hard drive), and slowly insert it into the hard drive slot.
5. After the hard drive is in the slot, firmly press it all the way in so that it is properly seated. (When the hard drive is firmly seated, the release button on the card pops out slightly.)

6. Replace the hard drive door to keep dust out, and tighten the captive screws.

**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 chassis or a bare metal surface on the chassis.

**Step 2**
Use the screwdriver to loosen the captive screws at the left and right of the hard drive door on the faceplate of the card. If needed, use a screwdriver on the captive screws.

**Step 3**
Remove the hard drive door and set it carefully aside.

**Step 4**
Carefully align the hard drive sled (attached to the hard drive), and slowly insert it into the hard drive slot.

**Step 5**
After the hard drive is in the slot, firmly press it all the way in so that it is properly seated. (When the hard drive is firmly seated, the release button on the card pops out slightly.)

**Step 6**
Replace the hard drive door to keep dust out, and tighten the captive screws.

**What to do next**
After performing this task, replace any cosmetic cover plates.

After installing the hard disk, use the `proc restart hd_drv` and `proc mandatory on hd_drv` commands to reduce the chances of data corruption.

**Removing a Hard Drive**

This section describes how to remove a hard drive from an RP or a DRP PLIM. Hard drives are available as an option on both the RP and DRP PLIM and are removed in the same manner. For more detailed information on the hard drives, see About Hard Drives and PCMCIA Cards, on page 111. The previous figure shows the hard drive door location on the RP card. (The hard drive for the DRP PLIM is in a similar location.)

**Prerequisites**

The hard disk should be powered down prior to removal. This reduces the chances of data corruption. To power down the hard disk prior to removal, use the `proc mandatory off hd_drv` and `proc shutdown hd_drv` commands.

Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

**Required Tools and Equipment**

You need the following tools to perform this task:

- ESD-preventive strap
- Medium flat-head screwdriver

**Steps**

To remove the hard drive, follow these 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 chassis or a bare metal surface on the chassis.
2. Use the screwdriver to loosen the captive screws at the left and right of the hard drive door on the faceplate of the card. If needed, use a screwdriver on the captive screws.
3. Remove the hard drive door and set it carefully aside.
4. Press the release button to unseat the hard drive sled from the card.
5. Carefully pull the hard drive sled from the card.
6. Place the removed hard drive on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
7. If the hard drive slot is to remain empty, replace the door to keep dust out, and tighten the captive screws.

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 chassis or a bare metal surface on the chassis.
Step 2  Use the screwdriver to loosen the captive screws at the left and right of the hard drive door on the faceplate of the card. If needed, use a screwdriver on the captive screws.
Step 3  Remove the hard drive door and set it carefully aside.
Step 4  Press the release button to unseat the hard drive sled from the card.
Step 5  Carefully pull the hard drive sled from the card.
Step 6  Place the removed hard drive on an antistatic mat, or immediately place it in an antistatic bag if you plan to return it to the factory.
Step 7  If the hard drive slot is to remain empty, replace the door to keep dust out, and tighten the captive screws.

What to do next

If you need to install a new hard drive, see Installing a Hard Drive, on page 161.

Installing or Removing a PCMCIA Card

This section contains the following procedures:

Note

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

Installing a PCMCIA Card

This section describes how to install a PCMCIA card in an RP or a DRP card PCMCIA slot. For more detailed information on PCMCIA cards, see About Hard Drives and PCMCIA Cards, on page 111. The following figure
Prerequisites

If you are replacing a PCMCIA card, see Removing an RP PCMCIA Card, on page 165 section to remove the PCMCIA card from the 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
- Medium flat-head screwdriver
- PCMCIA card

Steps

To install a PCMCIA card, follow these 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 chassis or 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 flash card into the left slot of the PCMCIA card cage. When the card is fully inserted, the release button pops up. (If the button fails to pop up, you may not have the card in right side up; turn the card over and try again.)
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 one of the ESD connection sockets on the chassis or a bare metal surface on the chassis.

Step 2  Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.
Step 3 While lifting the hinged PCMCIA slot door up, carefully insert the new PCMCIA flash card into the left slot of the PCMCIA card cage. When the card is fully inserted, the release button pops up. (If the button fails to pop up, you may not have the card in right side up; turn the card over and try again.)

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

What to do next
After performing this task, close the cosmetic doors (if installed).

Removing an RP PCMCIA Card

This section describes how to install a PCMCIA card in an RP or a DRP card PCMCIA slot. The figure, RP Card PCMCIA Slot Door, shows you the location of the PCMCIA door in the RP card faceplate. (The PCMCIA cards for the DRP are in a similar location.)

Prerequisites
Before performing this task, open the front (PLIM) side cosmetic doors (if installed).

Required Tools and Equipment
You need the following tools to perform this task:

- ESD-preventive strap
- Medium Phillips screwdriver

Steps
To remove the PCMCIA card, follow these 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 chassis or 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 for 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 the new PCMCIA card.

**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 chassis or a bare metal surface on the chassis.

**Step 2** Using the screwdriver, loosen the captive screw at the bottom of the PCMCIA slot door on the faceplate of the card.
Step 3  While lifting the hinged PCMCIA slot door up, press the release button for the card slot to disengage the card from the card, 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 the new PCMCIA card.

---

**What to do next**

If you intend to install a new PCMCIA card, see Installing a PCMCIA Card, on page 163.

**What to Do Next**

If you intend to install a new PCMCIA card, see Installing a PCMCIA Card, on page 163.

---

**Installing or Removing Optical Modules**

See the Cisco CRS Carrier Routing System Ethernet Physical Layer Interface Module Installation Note for information on how to install or remove SFP, XFP, and other modules for your PLIM.

---

**Danger**

Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures. Statement 70

---

**Note**

After removing a PLIM, be sure to replace any front (PLIM) side cover plates.

---

**Installing or Removing a Cable Management Bracket**

This section contains the following procedures:

### Installing a Cable Management Bracket

This section describes how to install a cable management bracket in the LCC.

The horizontal cable management brackets provide cable management capabilities for the MSCs and PLIMs on the LCC. The following figure shows a midchassis cable management bracket installed on the front (PLIM) side of the chassis.
Figure 90: Cable Management Bracket

Prerequisites

Before performing this task, open the cosmetic doors (if installed) and be sure that there are no cables impeding your access to the area of the chassis on which you wish to install the bracket.

Required Tools and Equipment

- ESD-preventive wrist strap
- Medium Phillips screwdriver
- Cable management bracket (800-23374-03)

Steps

To install a cable management bracket, follow these 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 chassis or a bare metal surface on the chassis.
2. Position the cable management bracket on the chassis.
3. Insert and tighten the screws to secure the bracket to the chassis.

DETAILED STEPS

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the chassis or a bare metal surface on the chassis.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Position the cable management bracket on the chassis.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Insert and tighten the screws to secure the bracket to the chassis.</td>
</tr>
</tbody>
</table>

What to do next

Use the cable management bracket to organize the cables.
Removing a Cable Management Bracket

This section describes how to remove a cable management bracket in the LCC.

The horizontal cable management brackets provide cable management capabilities for the MSCs and PLIMs on the LCC. The following figure shows a midchassis cable management bracket installed on the front (PLIM) side of the chassis.

![Cable Management Bracket](image)

**Figure 91: Cable Management Bracket**

**Prerequisites**

The cable management bracket arrives preinstalled on the chassis. Before performing this task, open the cosmetic doors (if installed) and remove any cables from the bracket.

**Required Tools and Equipment**

- ESD-preventive wrist strap
- Medium Phillips screwdriver

**Steps**

To remove a cable management bracket, follow these 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 chassis or a bare metal surface on the chassis.
2. Use the screwdriver to loosen and remove the screws holding the bracket to the chassis.
3. Set the bracket carefully aside.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the chassis or a bare metal surface on the chassis.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Use the screwdriver to loosen and remove the screws holding the bracket to the chassis.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Set the bracket carefully aside.</td>
</tr>
</tbody>
</table>
What to do next

You can now install a replacement cable management bracket, if necessary.
CHAPTER 5

Installing and Removing Exterior Cosmetic Components

This chapter provides instructions on how to install and remove the LCC exterior cosmetic components. This chapter presents the following topics:

- Information About Exterior Cosmetic Components
- Installing the Front (PLIM) Side Exterior Cosmetic Components
- Removing the Front (PLIM) Side Cosmetic Components
- Installing the Default Rear (MSC) Side Cosmetic Components
- Installing the Optional Rear (MSC) Side Cosmetic Components
- Removing the Default Rear (MSC) Cosmetic Components
- Removing the Optional Rear (MSC) Side Cosmetic Components

- Information About Exterior Cosmetic Components, on page 171
- Removing the Front (PLIM) Side Cosmetic Components, on page 183
- Installing the Default Rear (MSC) Side Cosmetic Components , on page 190
- Installing the Optional Rear (MSC) Side Cosmetic Components, on page 194
- Removing the Default Rear (MSC) Cosmetic Components , on page 206
- Removing the Optional Rear (MSC) Side Cosmetic Components, on page 208

Information About Exterior Cosmetic Components

This section contains some general information about the exterior cosmetic components. The Cisco CRS 16 slot line card chassis is shipped with exterior cosmetic components for the front (PLIM) side and rear (MSC) side of the chassis.

Note

Some exterior cosmetic components are not required to be installed.

This figure shows the exterior cosmetics for the front (PLIM) side of a chassis with fixed configuration power shelves installed. The front view of a LCC with modular configuration power shelves installed is similar.
Figure 92: Front (PLIM) Side Exterior Cosmetic Components—Fixed Configuration Shown

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<table>
<thead>
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<tbody>
<tr>
<td>1</td>
<td>Lower grille</td>
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<tr>
<td>2</td>
<td>Doors</td>
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<tr>
<td>3</td>
<td>Logo bezel</td>
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<tr>
<td>4</td>
<td>Upper grille</td>
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<tr>
<td>5</td>
<td>Vertical cable troughs</td>
</tr>
<tr>
<td>6</td>
<td>Power shutoff extenders (fixed configuration power only)</td>
</tr>
<tr>
<td>7</td>
<td>Upper grille support</td>
</tr>
<tr>
<td>8</td>
<td>Unistruts</td>
</tr>
<tr>
<td>9</td>
<td>Lower grille frame</td>
</tr>
</tbody>
</table>
This figure shows the exterior cosmetics on the rear (MSC) side of a LCC, with fixed configuration power shelves installed. The upper air grille and vertical brackets are shipped with the LCC, but are not pre-installed on the system the system. The rear kick panel kit, shown in the figure, is not included as part of the default shipment and is available to be ordered separately (Cisco product number CRS-16-LCC-BCK-KP). The rear view of a LCC with modular configuration power shelves installed is similar.

*Figure 93: Rear (MSC) Side Exterior Cosmetic Components—Fixed Configuration Shown*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Upper air grille</td>
</tr>
<tr>
<td>2</td>
<td>Vertical brackets</td>
</tr>
<tr>
<td>3</td>
<td>Rear kick panel kit</td>
</tr>
</tbody>
</table>

The following figure shows the exterior cosmetics for the rear (MSC) side of an optional multi chassis system with fixed configuration power shelves installed. The rear view of an optional multi chassis system with modular configuration power shelves installed is similar.
Installing the Front (PLIM) Side Cosmetic Components

This section describes how to install the front (PLIM) side exterior cosmetic covers and accessories on the LCC. This Figure 92: Front (PLIM) Side Exterior Cosmetic Components—Fixed Configuration Shown shows
the exterior cosmetics for the front (PLIM) side of a chassis with fixed configuration power shelves installed. The front view of a LCC with modular configuration power shelves installed is similar.

Note
While it is possible to install the various exterior components on the LCC 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:

- Attaching the Unistruts
- Attaching the Upper Grille Support
- Attaching the Power Shelf Shutoff Extenders (fixed configuration power only)
- Attaching the Front Vertical Cable Troughs
- Installing the Cable Pass-through Accessory Plates (Optional)
- Installing the Upper Grille and Logo Bezel
- Installing the Lower Grille Screen and Frame Assembly
- Attaching the Lower Grille
- Attaching the Front Exterior Doors

Prerequisites
Before performing this task, you must first unpack and secure the chassis. See *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Unpacking, Moving, and Securing 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, bit size #1
- 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)
- Unistrut (Cisco product number 800-23375-XX)
- Upper grille support and power shelf shutoff extender (AC grille kit; Cisco product number 69-1163-XX, or DC grille kit; Cisco product number 69-1164-XX)
- Lower grille frame assembly (Cisco product number 800-23320-XX, which includes lower grille; Cisco product number 800-23487-XX)
- Vertical cable trough (Cisco product number 69-1199-XX)
- Optional cable pass-through accessory kit
- Logo bezel and support (Cisco product number 800-23488-XX)
- Exterior doors kit (Cisco product number 69-1160-XX)

Steps
To install front (PLIM) side exterior cosmetic components, perform the following tasks:
Attaching the Unistruts

SUMMARY STEPS

1. Attach each unistrut to the top of the chassis by inserting 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 (PLIM) side of the chassis.

2. Attach the upper grille support (see previous figure) to the unistruts by inserting four M4x14-mm long flat head screws, two for each unistrut, and tightening them to the unistruts with the screwdriver.

3. Attach the power shelf shutoff extenders (fixed configuration power only—number 3 in the previous figure) by inserting the four M4 panhead screws, two for each power shelf shutoff extender, and tightening them with the screwdriver.

4. Attach the vertical cable troughs—one right and one left—to the front (PLIM) side of the chassis (as shown in the next figure):

5. Remove the blank plates by unscrewing the four screws on each one.

6. Attach the inner cut-out panels using the four screws provided.

7. Attach the outer cut-out panel using the four screws provided.

8. Attach the 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 next figure).

9. Press the grille firmly against the grille support until it snaps onto the ball stud snaps.

10. Place the logo bezel (see the next figure) over the bezel support, and press firmly until the bezel snaps onto the ball stud snaps.

11. 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 next figure).

12. Attach the frame assembly to the chassis as in the previous figure 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.

13. Reattach the inlet grille screen (see the previous 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.

14. Attach the lower grille by carefully inserting the tabs on the grille into the hook hanger brackets on the inlet grille frame.

15. Press the lower grille firmly until it snaps onto the ball stud snaps.

16. Orient the doors so that the keyholes slots are pointing up (see the next figure).

17. Align the doors vertically in their appropriate positions so that you can determine where to thread the first two screws that are adjacent to the keyholes. Set the doors aside and thread the two screws.

18. 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.

19. Insert and slightly tighten all screws.

20. Ensure that the doors are properly aligned.

DETAILED STEPS

Step 1

Attach each unistrut to the top of the chassis by inserting 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 (PLIM) side of the chassis.

Note  

The right unistrut (as you face the front (PLIM) side of the chassis) has a cutaway in the rear to admit the chassis ground cable; the left strut does not.
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).

Caution

Figure 95: Attaching the Unistrut, Grille Support, and Power Shutoff Extenders—Fixed Configuration Power Shown

Attaching the Upper Grille Support

Step 2
Attach the upper grille support (see previous figure) to the unistruts by inserting four M4x14-mm long flat head screws, two for each unistrut, and tightening them to the unistruts with the screwdriver.

Attaching the Power Shelf Shutoff Extenders (fixed configuration power only)

Note Both fixed configuration power shelves must be installed in the chassis before installing the power shelf shutoff extenders.

Step 3
Attach the power shelf shutoff extenders (fixed configuration power only—number 3 in the previous figure) by inserting the four M4 panhead screws, two for each power shelf shutoff extender, and tightening them with the screwdriver.

Attaching the Front Vertical Cable Troughs

Step 4
Attach the vertical cable troughs—one right and one left—to the front (PLIM) side of the chassis (as shown in the next figure):

a) Tug all Velcro straps forward so that they are flush with the back side of the cable troughs (where the troughs attach to the chassis) to ensure that the troughs fit flush to the chassis.
b) Insert the cable trough hooks into guide slots, and let them slide down and lock into place.

c) Insert the 12 M4x14-mm flat head screws (six on each side) and use the screwdriver to turn the screws clockwise to attach the cable troughs firmly to the chassis.

d) Pull the Velcro cable straps taut to hook the troughs to the chassis.

*Figure 96: Front Vertical Cable Troughs Installed—Fixed Configuration Power Shown*

**Note** This option only works with trough kits 69-1199-03 and later.
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 the required cables. To resolve this issue, you can install two pass-through accessory plates to allow cables be guided outside the vertical trough.

**Installing the Cable Pass-through Accessory Plates (Optional)**

**Step 5** Remove the blank plates by unscrewing the four screws on each one.

**Step 6** Attach the inner cut-out panels using the four screws provided.

![Figure 97: Cut-out plate](image)

**Step 7** Attach the outer cut-out panel using the four screws provided.

**Installing the Upper Grille and Logo Bezel**

**Step 8** Attach the 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 next figure).

**Step 9** Press the grille firmly against the grille support until it snaps onto the ball stud snaps.

**Note** If you attach the upper grille, you must have the power shutoff extenders installed (fixed configuration power only-Step 3).

**Step 10** Place the logo bezel (see the next figure) over the bezel support, and press firmly until the bezel snaps onto the ball stud snaps.
Installing the Lower Grille Screen and Frame Assembly

**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 11**  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 next figure).
Step 12  Attach the frame assembly to the chassis as in the previous figure 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.

Step 13  Reattach the inlet grille screen (see the previous 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.

**Attaching the Lower Grille**

Step 14  Attach the lower grille by carefully inserting the tabs on the grille into the hook hanger brackets on the inlet grille frame.

Step 15  Press the lower grille firmly until it snaps onto the ball stud snaps.

**Attaching the Front Exterior Doors**

Step 16  Orient the doors so that the keyholes slots are pointing up (see the next figure).
Step 17 Align the doors vertically in their appropriate positions so that you can determine where to thread the first two screws that are adjacent to the keyholes. Set the doors aside and thread the two screws.

Caution The doors scratch easily, so they should be handled with care.

Step 18 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 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 (PLIM) side of the chassis, you need to use the other door.

Step 19 Insert and slightly tighten all screws.

Step 20 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 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 one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.

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 (PLIM) Side Cosmetic Components

This section describes how to remove exterior cosmetic components, shown in Figure 92: Front (PLIM) Side Exterior Cosmetic Components—Fixed Configuration Shown, from the front (PLIM) side of the chassis. This section includes all the steps you need to remove all the 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 cosmetic parts on the LCC separately, some parts (such as a unistrut) require that other parts be removed first.

This section describes how to perform the following tasks:

- Removing the Front Doors
- Removing the Front Lower Grille
- Removing the Logo Bezel and Upper Grille
- Removing the Front Vertical Cable Troughs
- Removing the Lower Grille Screen and Frame Assembly
- Removing the Front Upper Grille Support
- Removing the Unistruts

### Prerequisites

No prerequisites exist for this task.

### Required Tools and Equipment

You need the following tools to perform this task:
Steps

To remove the front (PLIM) 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 in the next figure) hold the doors to the chassis, lift the doors, and set them carefully aside.
3. Remove the front lower grille (see the next figure) 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, and then lift it clear of the support, and set it carefully aside.
5. Remove the logo bezel (see the next figure) 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 next figure) 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 vertical cable troughs (see the next figure)—one right and one left—from the front (PLIM) side 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 next figure).
10. Remove the four screws, two on each side, that attach the frame assembly to the chassis (see the next figure).
11. Rotate the assembly forward, lift it away from the front (PLIM) side of the chassis, and set it aside.
12. Remove the power shelf shutoff extenders (see the next figure) by unscrewing the four screws, two on each extender, and set the screw and the extenders aside.
13. Remove the Velcro cable straps from the strap slots in the upper and lower horizontal cable management trays.
14. Remove the upper grille support from the unistruts (see the next figure) by unscrewing the four M4x14-mm flat head screws, two for each unistrut.
15. Set the screws aside, then lift the grille support away from the chassis and set it aside.
16. 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 (as in the previous figure).

**DETAILED STEPS**

**Step 1**

Ensure that you have all the original packaging material for the cosmetic components available.

**Removing the Front Doors**

**Step 2**

Remove the front exterior doors by unscrewing all the screws except those adjacent to the keyholes (see in the next figure) 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.
Removing the Front Lower Grille

Step 3  Remove the front lower grille (see the next figure) 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, and then lift it clear of the support, and set it carefully aside.
Removing the Logo Bezel and Upper Grille

Step 5
Remove the logo bezel (see the next figure) 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 next figure) 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.
Removing the Front Vertical Cable Troughs

**Step 8**

Remove the vertical cable troughs (see the next figure)—one right and one left—from the front (PLIM) side of the chassis:

a) Use the screwdriver to turn the 12 flat head screws (six on each side) counterclockwise, remove them 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.
Removing the Lower Grille Screen and Frame Assembly

**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 next figure).

**Step 10**  
Remove the four screws, two on each side, that attach the frame assembly to the chassis (see the next figure).
Step 11  
Rotate the assembly forward, lift it away from the front (PLIM) side of the chassis, and set it aside.

**Removing the Front Upper Grille Support**

Step 12  
Remove the power shelf shutoff extenders (see the next figure) by unscrewing the four screws, two on each extender, and set the screw and the extenders aside.

Step 13  
Remove the Velcro cable straps from the strap slots in the upper and lower horizontal cable management trays.

Step 14  
Remove the upper grille support from the unistruts (see the next figure) by unscrewing the four M4x14-mm flat head screws, two for each unistrut.

Step 15  
Set the screws aside, then lift the grille support away from the chassis and set it aside.
Removing the Unistruts

Step 16
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 (as in the previous figure).

What to do next
Be sure that all parts have been carefully set aside and repackaged as appropriate.

Installing the Default Rear (MSC) Side Cosmetic Components

This section describes how to install the default rear (MSC) side exterior cosmetic components on the LCC. Figure 93: Rear (MSC) Side Exterior Cosmetic Components—Fixed Configuration Shown shows the exterior cosmetics on the rear (MSC) side of a LCC, with fixed configuration power shelves installed. The upper air grille and vertical brackets are shipped with the LCC. The rear kick panel kit, is not included as part of the default shipment and is available as an orderable option (Cisco product number CRS-16-LCC-BCK-KP). The rear view of a LCC with modular configuration power shelves installed is similar.

This section contains the following procedures:

• Installing the Vertical Brackets and Upper Air Grille (Default)
• Installing the Rear Kick Panel (Optional)
Installing the Vertical Brackets and Upper Air Grille (Default)

This section describes how to install the vertical brackets and upper air grille on the rear (MSC) side of the LCC.

Prerequisites

Before performing these tasks, ensure that the LCC power is off.

Required Tools and Equipment

You need the following tool to perform this task:

- 6-in long number 1 Phillips screwdriver

Steps

To install the vertical brackets and upper air grille on the rear (MSC) side of the chassis, perform the following steps:

**SUMMARY STEPS**

1. Attach the vertical brackets—one left and one right—to the rear of the chassis.
2. Using the large Phillips screwdriver, tighten the three panel fasteners on each vertical bracket.
3. Attach the upper air grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical brackets.
4. Press the upper air grille firmly against the vertical brackets until its ball studs snap onto the vertical bracket's ball stud retainers.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Attach the vertical brackets—one left and one right—to the rear of the chassis.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Using the large Phillips screwdriver, tighten the three panel fasteners on each vertical bracket.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Attach the upper air grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical brackets.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>Because the upper air grille must be installed at the top of the chassis, it is easier and safer to stand on a ladder while installing them.</td>
</tr>
<tr>
<td><strong>Note</strong></td>
<td>You may need to use the plastic tie wraps to attach the power shelf AC power cables to the rear of the power shelves to provide enough clearance for the upper air grille.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Press the upper air grille firmly against the vertical brackets until its ball studs snap onto the vertical bracket's ball stud retainers.</td>
</tr>
</tbody>
</table>

Installing the Rear Kick Panel (Optional)

The rear kick panel is a panel installed at the bottom of a standalone LCC, so that it matches the outward extent of the rear components (the upper air grille). This section describes how to attach the rear kick panel...
to the rear side of the LCC. The new rear kick panel is installed into the new rear kick panel bracket. The rear kick panel is available as an orderable option (Cisco Product Number CRS-16-LCC-BCK-KP=).

**Prerequisites**

There are no prerequisites for installing the rear kick panel.

**Required Tools and Equipment**

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

- 2.5 mm or 3/32-inch Allen wrench
- Rear kick panel kit (Cisco product number: CRS-16-LCC-BCK-KP=)

**Steps**

To attach the rear kick panel and bracket to the rear of the LCC, follow these steps:

**SUMMARY STEPS**

1. Using a 2.5 mm or 3/32-inch Allen wrench, remove the eight screws from the lower rear bay of the chassis as shown in Figure 107: Removing the Set of Screws from the Lower Chassis Bay.
2. Align the rear kick panel bracket with the screw holes you removed.
3. Using the Allen wrench, insert and tighten the screws into the holes in the rear kick panel bracket.
4. Pick up the Cisco CRS 16-slot rear kick panel in both hands.
5. Carefully slot the hook hanger brackets on the bottom of the rear kick panel over the tabs at the bottom of the rear kick panel bracket (see the next figure).
6. To secure the top fasteners, firmly press the top edge of the rear kick panel against the top of the rear kick panel bracket until it snaps onto the ball stud retainers.

**DETAILED STEPS**

**Step 1**

Using a 2.5 mm or 3/32-inch Allen wrench, remove the eight screws from the lower rear bay of the chassis as shown in Figure 107: Removing the Set of Screws from the Lower Chassis Bay.

**Tip**

To be able to access the bottom screws, the Allen wrench must be no longer than 3 inches.
Figure 107: Removing the Set of Screws from the Lower Chassis Bay

You do not need to remove the three screws in the bottom middle of the lower bay, nor the additional two screws behind the black powder-coated surfaces on each side.

Note

Step 2 Align the rear kick panel bracket with the screw holes you removed.

Step 3 Using the Allen wrench, insert and tighten the screws into the holes in the rear kick panel bracket.

When installed, the rear kick panel bracket looks as shown in the next figure.

Figure 108: Rear Kick Panel Bracket Installed

Step 4 Pick up the Cisco CRS 16-slot rear kick panel in both hands.

Step 5 Carefully slot the hook hanger brackets on the bottom of the rear kick panel over the tabs at the bottom of the rear kick panel bracket (see the next figure).
Installing the Optional Rear (MSC) Side Cosmetic Components

This section describes how to install the optional rear (MSC) side exterior cosmetic components, shown in Figure 94: Rear (MSC) Side Exterior Cosmetic Components—Optional Multi Chassis System, on the LCC. 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 contains the following procedures:

- Attaching the Rear Vertical Cable Troughs
- Attaching the Rear Door Strike Tube
- Attaching the Mid-chassis Horizontal Cable Management Bracket
- Attaching the Door Stop
- Installing the Rear Doors

**Step 6** To secure the top fasteners, firmly press the top edge of the rear kick panel against the top of the rear kick panel bracket until it snaps onto the ball stud retainers.
Prerequisites

Before performing these tasks, you must first unpack and secure the chassis. See Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Unpacking, Moving, and Securing Guide. If you purchased the rear cosmetics package after you installed the chassis, you must remove the rear upper air grille and short vertical brackets before installing the package. See Installing the Optional Rear (MSC) Side Cosmetic Components for more information.

Required Tools and Equipment

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

- 8-in. long number 1 Phillips screwdriver—magnetic head preferable #1
- 2-mm hex key wrench
- Rear vertical cable troughs
- Midchassis cable management bracket
- Rear door strike tube
- Door stop (700-16671-01)
- Lower chassis cosmetic bezel (800-23776-01)
- Rear louver grille (CRS-16-LCC-R-GRL—)
- Rear doors (right—800-25724-01; left—800-24569-01)

Steps

To install the rear (MSC) exterior cosmetic components, follow these steps:

SUMMARY STEPS

1. Unpack all cosmetic parts to prepare for installation.
2. Attach the rear vertical cable troughs—one left and one right—to the rear of the chassis (see the next figure) by inserting the 22 M4x14-mm flat head screws (11 on each side) and using the screwdriver to turn the screws clockwise to attach the cable troughs firmly to the chassis. (You might need to use a ladder to reach the upper screws.)
3. Attach the mid-chassis horizontal cable management bracket by inserting the four M4 8-mm (two on each side) wafer-head Phillips screws that attach the bracket to the chassis.
4. Tighten the screws to the chassis with the medium Phillips screwdriver.
5. Attach the rear door strike tube (see the previous figure) by inserting the four M4 8-mm wafer-head Phillips screws through the holes in the face of the strike tube and into the rear (MSC) side of the chassis.
6. Tighten the four screws to the chassis with the medium Phillips screwdriver.
7. Place the door stop tabs behind the attachment tabs on the vertical cable troughs (see the next figure).
8. Insert and tighten the two M4 8-mm (one on each side) wafer-head Phillips screws that attach the bracket to the cable troughs.
9. Attach the louver grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical cable troughs (see the next figure).
10. Press the louver grille firmly until its ball studs snap onto the ball stud retainers.
11. Carefully slot the hook hanger brackets on the bottom of the lower chassis cosmetic bezel over the tabs on the vertical cable troughs.
To secure the top fasteners, firmly press the top edge of the lower chassis cosmetic bezel against the vertical trough until it snaps onto the ball stud snaps.

Orient the doors so that the keyhole screws are pointing up.

Align the doors vertically in their appropriate positions so that you can determine where to thread the first two screws that are adjacent to the keyholes (see the next figure). Set the door aside, and thread the two screws.

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.

Insert and fully tighten all screws.

Ensure that the doors are properly aligned.

**DETAILED STEPS**

**Step 1**
Unpack all cosmetic parts to prepare for installation.

*Attaching the Rear Vertical Cable Troughs*

**Step 2**
Attach the rear vertical cable troughs—one left and one right—to the rear of the chassis (see the next figure) by inserting the 22 M4x14-mm flat head screws (11 on each side) and using the screwdriver to turn the screws clockwise to attach the cable troughs firmly to the chassis. (You might need to use a ladder to reach the upper screws.)

*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

Attach the mid-chassis horizontal cable management bracket by inserting the four M4 8-mm (two on each side) wafer-head Phillips screws that attach the bracket to the chassis.
Figure 111: Attaching the Rear Door Strike Tube and Mid-chassis Cable Management Bracket

Step 4
Tighten the screws to the chassis with the medium Phillips screwdriver.

Tip
Before tightening all four screws, we recommend that you insert and partially tighten the outer two screws first, followed by the inner two screws.

Attaching the Rear Door Strike Tube

Step 5
Attach the rear door strike tube (see the previous figure) by inserting the four M4 8-mm wafer-head Phillips screws through the holes in the face of the strike tube and into the rear (MSC) side of the chassis.

Step 6
Tighten the four screws to the chassis with the medium Phillips screwdriver.

Note
Make sure that the slot in the side of the strike tube faces to the right as you face the rear (MSC) side of the chassis.

Attaching the Door Stop

Step 7
Place the door stop tabs behind the attachment tabs on the vertical cable troughs (see the next figure).
Figure 112: Attaching the Door Stop

Step 8 Insert and tighten the two M4 8-mm (one on each side) wafer-head Phillips screws that attach the bracket to the cable troughs.

Note We recommend against using a power screwdriver to lessen the chance of stripping the screw heads.

Attaching the Rear Lower Grille

Step 9 Attach the louver grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical cable troughs (see the next figure).

Note Because the louver grille must be installed at the top of the chassis, it is easier and safer to stand on a ladder while installing them.

Note You may need to use the plastic tie wraps to attach the power shelf AC power cables to the rear of the power shelves to provide enough clearance for the louver grille.
Step 10  Press the louver grille firmly until its ball studs snap onto the ball stud retainers.

**Attaching the Rear Lower Bezel**

Step 11  Carefully slot the hook hanger brackets on the bottom of the lower chassis cosmetic bezel over the tabs on the vertical cable troughs.
**Figure 114: Attaching the Lower Chassis Cosmetic Bezel**

**Step 12**
To secure the top fasteners, firmly press the top edge of the lower chassis cosmetic bezel against the vertical trough until it snaps onto the ball stud snaps.

**Installing the Rear Doors**

**Step 13**
Orient the doors so that the keyhole screws are pointing up.

The part number for the right door is 800-25724-01; the part number for the left door is 800-24569-01. The door lock is on the left door.

**Caution** The doors scratch easily, so they should be handled with care.

**Step 14**
Align the doors vertically in their appropriate positions so that you can determine where to thread the first two screws that are adjacent to the keyholes (see the next figure). Set the door aside, and thread the two screws.
Figure 115: Attaching the Rear (MSC) Side Exterior Doors

**Step 15**
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 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 rear (MSC) side of the chassis, you need to use the other door.

**Step 16**
Insert and fully tighten all screws.

**Step 17**
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 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 one full turn. Snug the five screws that attach the vertical trough to the chassis and check the door alignment.

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, you can insert the rear horizontal Velcro cable bracket straps. Their use is optional when the chassis is lightly populated; you will need the straps as fiber starts filling the troughs above the top of the fiber retainers.

The front (PLIM) side of the fabric chassis has upper and middle horizontal cable troughs; the rear has a middle cable trough.

Installing the Lower Chassis Cosmetic Bezel

To install the lower chassis cosmetic bezel, follow these steps:

**SUMMARY STEPS**

1. Carefully slot the hook hanger brackets on the bottom of the lower chassis cosmetic bezel over the tabs on the vertical cable troughs.
2. To secure the top fasteners, firmly press the top edge of the lower chassis cosmetic bezel against the vertical trough until it snaps onto the ball stud snaps.

**DETAILED STEPS**

**Step 1** Carefully slot the hook hanger brackets on the bottom of the lower chassis cosmetic bezel over the tabs on the vertical cable troughs.
Figure 116: Attaching the Lower Chassis Cosmetic Bezel

Step 2 To secure the top fasteners, firmly press the top edge of the lower chassis cosmetic bezel against the vertical trough until it snaps onto the ball stud snaps.

Installing the Rear Louver Grille

This section describes how to install the rear upper louver grille to the LCC. The louver grille redirects the chassis exhaust airflow upward. The rear louver grille includes an internal grille that further improves airflow management.

The louver grille (see the next figure) can be installed in one of two configurations: If you did not order a full rear cosmetics kit for the chassis, the chassis is shipped by default with the louver grille and a pair of vertical air grille mounting brackets. See Installing the Vertical Brackets and Upper Air Grille (Default) for more information.
Prerequisites

Because of the small amount of clearance between the rear of the power shelf and the louver grille, we recommend that you tie the power cables to the rear of the power shelf with the tie-downs provided.

Required Tools and Equipment

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

- Rear louver grille kit—Cisco product number: CRS-16-LCC-R-GRL=
- Ladder or step platform

Steps

To install the louver grille, follow these steps:

SUMMARY STEPS

1. Attach the louver grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical support brackets (see the next figure).
2. Press the louver grille firmly against the brackets until its ball studs snap onto the support bracket's ball stud retainers.

DETAILED STEPS

Step 1 Attach the louver grille by carefully hooking the hanger brackets that are on top of the grille over the hook supports that are on top of the vertical support brackets (see the next figure).

Note Because the louver grille must be installed at the top of the chassis, it is easier and safer to stand on a ladder while installing them.
You may need to use the plastic tie wraps to attach the power shelf AC power cables to the rear of the power shelves to provide enough clearance for the louver grille.

**Note**

![Figure 118: Attaching the Rear Louver Grille](image)

**Step 2**

Press the louver grille firmly against the brackets until its ball studs snap onto the support bracket's ball stud retainers.

---

**What to do next**

You may now power up the chassis. The chassis is ready for use.

---

**Removing the Default Rear (MSC) Cosmetic Components**

This section describes how to remove the default cosmetic components, shown in Figure 93: Rear (MSC) Side Exterior Cosmetic Components—Fixed Configuration Shown, from the rear (MSC) side of the LCC.

This section includes the following procedures:

- Removing the Upper Air Grille and Vertical Brackets
- Removing the Rear Kick Panel
Removing the Upper Air Grille and Vertical Brackets

This section describes how to remove the upper air grille and vertical brackets from the rear (MSC) side of the LCC.

Prerequisites

Before performing these tasks, ensure that the LCC power is off.

Required Tools and Equipment

You need the following tool to perform this task:

- 6-inch large Phillips screwdriver

Steps

To remove the upper air grille and vertical brackets from the rear (MSC) side of the chassis, perform the following steps:

SUMMARY STEPS

1. Remove the upper air grille by unsnapping the bottom portion from the ball stud snaps on the vertical mounting brackets.
2. Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the brackets.
3. Set it carefully aside.
4. Using the large Phillips screwdriver, loosen the three panel fasteners on the two short vertical brackets installed on the rear of the chassis.
5. Remove the vertical brackets and carefully set them aside.

DETAILED STEPS

Step 1  Remove the upper air grille by unsnapping the bottom portion from the ball stud snaps on the vertical mounting brackets.
Step 2  Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the brackets.
Step 3  Set it carefully aside.
Step 4  Using the large Phillips screwdriver, loosen the three panel fasteners on the two short vertical brackets installed on the rear of the chassis.
Step 5  Remove the vertical brackets and carefully set them aside.

Removing the Rear Kick Panel

This section describes how to remove the rear kick panel from the rear side of the LCC.

Prerequisites

There are no prerequisites for removing the rear kick panel.
Steps

To remove the rear kick panel from the LCC, follow these steps:

**SUMMARY STEPS**

1. Remove the rear kick panel by unsnapping the top portion from the ball stud retainers on the rear kick panel bracket.
2. Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the tabs at the bottom of the rear kick panel bracket, and set it carefully aside.

**DETAILED STEPS**

**Step 1**
Remove the rear kick panel by unsnapping the top portion from the ball stud retainers on the rear kick panel bracket.

*Figure 119: Removing the Rear Kick Panel*

```
1 Hook hanger brackets 2 Ball studs
```

**Step 2**
Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the tabs at the bottom of the rear kick panel bracket, and set it carefully aside.

---

**Removing the Optional Rear (MSC) Side Cosmetic Components**

This section describes how to remove the rear (MSC) side exterior cosmetic components, shown in *Figure 94: Rear (MSC) Side Exterior Cosmetic Components—Optional Multi Chassis System*, from the chassis. This
section includes all the steps you need to remove all cosmetic parts from the chassis, but you are not required to do so.

This section contains the following procedures:

- Removing the Rear Doors
- Removing the Lower Chassis Cosmetic Bezel
- Removing the Louver Grille
- Removing the Door Stop
- Removing the Rear Door Strike Tube
- Removing the Mid-chassis Horizontal Cable Management Bracket
- Removing the Rear Vertical Cable Troughs

Note
While it is possible to remove most of the rear cosmetic parts on the fabric chassis 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 tool to perform this task:

- 8-in. number 1 Phillips screwdriver—magnetic head preferable

Removing the Rear Doors
To remove the rear (MSC) side cosmetic components, perform the following steps:

Removing the Rear Doors

SUMMARY STEPS

1. Remove the rear doors by unscrewing all the screws except those adjacent to the keyholes (see the next figure).
2. Lift the doors and set them carefully aside.
3. Remove the lower chassis cosmetic bezel (see the next figure) by unsnapping the top portion from the ball stud retainers on the vertical troughs.
4. Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the tabs at the bottom of the vertical troughs, and set it carefully aside.
5. Remove the louver grille by unsnapping the bottom portion from the ball stud snaps on the vertical cable troughs.
6. Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the troughs and set it carefully aside.

7. Remove the door stop from the vertical cable troughs by unscrewing the two flat head Phillips screws, one for each side, that attach the stop to the troughs.

8. Set the screws and stop carefully aside

9. Remove the rear door strike tube by unscrewing the four flat head Phillips screws that attach the strike tube to the chassis.

10. Set the screws and strike tube carefully aside

11. Remove the mid-chassis horizontal cable management bracket (as in the previous figure) by unscrewing the four flat head Phillips screws (two for each side) that attach the bracket to the chassis.

12. Set the screws and bracket carefully aside

13. Remove the rear vertical cable troughs—one left and one right—from the rear of the chassis (see the next figure).

DETAILED STEPS

**Step 1** Remove the rear doors by unscrewing all the screws except those adjacent to the keyholes (see the next figure).

**Step 2** Lift the doors and set them carefully aside.

**Caution** The doors scratch easily, so they should be handled with care.
Removing the Lower Chassis Cosmetic Bezel

**Step 3**
Remove the lower chassis cosmetic bezel (see the next figure) by unsnapping the top portion from the ball stud retainers on the vertical troughs.

**Step 4**
Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the tabs at the bottom of the vertical troughs, and set it carefully aside.
Removing the Louver Grille

Step 5

Remove the louver grille by unsnapping the bottom portion from the ball stud snaps on the vertical cable troughs.
Figure 122: Removing the Rear (MSC) Side Upper Louver Grille

Step 6  Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the troughs and set it carefully aside.

Removing the Door Stop

Step 7  Remove the door stop from the vertical cable troughs by unscrewing the two flat head Phillips screws, one for each side, that attach the stop to the troughs.
Step 8  Set the screws and stop carefully aside

Removing the Rear Door Strike Tube

Step 9  Remove the rear door strike tube by unscrewing the four flat head Phillips screws that attach the strike tube to the chassis.

Figure 124: Removing the Rear Mid-chassis Cable Management Bracket and Door Strike Tube
Step 10  Set the screws and strike tube carefully aside

Removing the Mid-chassis Horizontal Cable Management Bracket

Step 11  Remove the mid-chassis horizontal cable management bracket (as in the previous figure) by unscrewing the four flat head Phillips screws (two for each side) that attach the bracket to the chassis.

Step 12  Set the screws and bracket carefully aside

Removing the Rear Vertical Cable Troughs

Step 13  Remove the rear vertical cable troughs—one left and one right—from the rear of the chassis (see the next figure).

1.  Un螺丝 the 22 flat head Phillips screws (11 on each side) that attach it to the chassis (You might need to use a ladder to reach the upper screws).

2.  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 in place while the other person removes the screws.
What to do next

Be sure that all parts have been carefully set aside and repackaged appropriately.
Upgrading Chassis Components

This chapter provides instructions on how to upgrade chassis components on Cisco CRS 16-Slot Line Card Chassis.

This chapter presents the following topics:

- Upgrading the Inlet Grille Screen
- Installing the Exhaust Baffle
- Removing the Currently Attached Upper Rear Grille
- Removing the Upper Fan Tray
- Installing the Exhaust Baffle
- Reinstalling the Upper Fan Tray

- Upgrading the Inlet Grille Screen, on page 217
- Installing the Exhaust Baffle, on page 222

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 inlet grille screen in the LCC.

To install the inlet grille screen kit (CRS-16-SCREEN-KIT) as an update to an existing system, you must:

1. Remove the lower grille from the front (PLIM) 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 original lower grille on the front (PLIM) 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-16-SCREEN-KIT)

Removing the Currently Installed Front Inlet Grille

This section describes how to remove the currently installed front lower grille from the chassis.

Prerequisites

There are no prerequisites for this task.

Steps

To remove the front inlet grille from the chassis, perform the following steps:

SUMMARY STEPS

1. Remove the inlet grille by unsnapping the top portion from the ball stud snaps (see figure).
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 inlet grille by unsnapping the top portion from the ball stud snaps (see figure).

Figure 126: Removing the Front Inlet Grille

1 Hook hanger brackets
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 Inlet Grille Frame Assembly

Now that the inlet grille has been removed, you must remove the lower grille frame assembly.

Prerequisites

Before performing this task, ensure that the lower grille has been removed from the front (PLIM) side of the chassis. See Removing the Currently Attached Upper Rear Grille, on page 222 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 inlet grille frame assembly to the chassis (see figure).
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 inlet grille frame assembly to the chassis (see figure).
Step 2 Rotate the assembly forward, lift it away from the chassis, and set it aside.

**Installing the Inlet Grille Frame Assembly and Inlet Screen**

This section describes how to install the new inlet grille frame assembly and the inlet grille screen.

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.

**Prerequisites**

Before performing this task, ensure that the lower grille and lower grille frame assembly have been removed. See Removing the Currently Installed Front Inlet Grille and Removing the Currently Installed Inlet Grille Frame Assembly for more information.

**Steps**

To install the new inlet grille frame and screen, perform the following steps:
SUMMARY STEPS

1. Use the Phillips screwdriver to remove the four screws, two on each side, that secure the inlet grille screen to its frame assembly; then carefully set the screen aside.
2. Install the inlet grille 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. Attach the inlet grille screen 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.
4. Attach the inlet grille by carefully inserting the tabs on the grille into the hook hanger brackets on the inlet grille frame.
5. Press the grille firmly against the grille frame until it snaps onto the ball stud snaps.

DETAILED STEPS

Step 1 Use the Phillips screwdriver to remove the four screws, two on each side, that secure the inlet grille screen to its frame assembly; then carefully set the screen aside.

*Figure 128: Inlet Grille Screen and the Frame Assembly*

Step 2 Install the inlet grille 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.

Step 3 Attach the inlet grille screen 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 4  Attach the inlet grille by carefully inserting the tabs on the grille into the hook hanger brackets on the inlet grille frame.
Step 5  Press the grille firmly against the grille frame until it snaps onto the ball stud snaps.

## Installing the Exhaust Baffle

This section describes the procedure for installing the new exhaust baffle.

Installing the exhaust baffle and the rear louver grille is necessary only if you have ordered the exhaust baffle and louver grille as an upgrade to your existing LCC. New systems ship with the exhaust baffle pre-installed.

---

**Note**

The rear louver grille (with the internal grille) should always be used with the internal baffle installed. Using the new rear grille without the exhaust baffle causes degradation of the system thermal performance.

The new air exhaust components redirect the airflow from the back of the LCC away from eye level. This air exhaust redirection provides a more comfortable work environment if any work needs to be done in the back of the LCC while it is operational.

The main tasks for this procedure are:

- Remove the currently attached upper rear grille.
- Remove the upper fan tray.
- Install the exhaust baffle.
- Reinstall the fan tray.

## Removing the Currently Attached Upper Rear Grille

This section describes how to remove the upper rear grille that is currently attached to the LCC so that you can replace it with the updated louver grille.
Prerequisites

Ensure that all power to the LCC is OFF prior to initiating the tasks to install the exhaust baffle.

Steps

To remove the currently attached upper rear grille, follow these steps:

**SUMMARY STEPS**

1. Remove the upper grille by unsnapping the bottom portion from the ball stud snaps on the vertical mounting brackets.
2. Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the brackets.
3. Set it carefully aside.
4. Be sure that all parts have been carefully set aside and repackaged appropriately.

**DETAILED STEPS**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Step 1</td>
<td>Remove the upper grille by unsnapping the bottom portion from the ball stud snaps on the vertical mounting brackets.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Rotate the grille toward you on its hook hanger brackets, and then lift it clear of the brackets.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Set it carefully aside.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Be sure that all parts have been carefully set aside and repackaged appropriately.</td>
</tr>
</tbody>
</table>
What to do next

The next task is to remove the upper rear fan tray as described in the next section.

Removing the Upper Fan Tray

This section describes how to remove the upper fan tray from the LCC.

![Fan Tray Image]

Prerequisites

Before performing this task, you must first remove the upper rear grille as described in the previous section.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Large flat head screwdriver
- Step platform

Steps

To remove the upper fan tray, follow these 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 (PLIM) side of the chassis or a bare metal surface on the chassis.
2. If necessary, use a step platform to reach the upper fan tray comfortably.
3. Using the screwdriver, loosen the two captive screws on the fan tray cover faceplate.
4. Pull firmly on the cover to swing it free; some force may be required, as the rubber seals can stick.
5. Grasp the fan tray handle and pull it straight out to disconnect the fan tray from the connector mounted on the front of the fan tray bay on the rear (MSC) side of the chassis. Slide the fan tray halfway from the fan tray bay.
6. Use your free hand to support the fan tray, then slide the fan tray completely from the fan tray bay.
7. Set the fan tray 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 (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2  If necessary, use a step platform to reach the upper fan tray comfortably.

Step 3  Using the screwdriver, loosen the two captive screws on the fan tray cover faceplate.

Step 4  Pull firmly on the cover to swing it free; some force may be required, as the rubber seals can stick.

Caution  A fan tray weighs approximately 44 lbs (20 kg); use two hands when handling it.

Step 5  Grasp the fan tray handle and pull it straight out to disconnect the fan tray from the connector mounted on the front of the fan tray bay on the rear (MSC) side of the chassis. Slide the fan tray halfway from the fan tray bay.

Step 6  Use your free hand to support the fan tray, then slide the fan tray completely from the fan tray bay.

Step 7  Set the fan tray carefully aside.

What to do next
You are now ready to install the exhaust baffle, as described in the next section.

Installing the Exhaust Baffle

The new air exhaust components—the exhaust baffle and the rear louver grille (Product Number: CRS-16-LCC-R-GRL=)—redirect the airflow from the back of the LCC away from eye level. This air exhaust redirection provides a more comfortable work environment if any work needs to be done in the back of the LCC while it is operational.

Prerequisites
Before performing this task, you must first remove the upper rear grille upper fan tray as described in the previous sections.

Required Tools and Equipment
You need the following tools and components to perform this task:

• ESD-preventive wrist strap
• Cisco CRS Grille Kit: CRS-16-LCC-R-GRL=
• Number 1 flat-head screwdriver with at least a 9-inch shaft
• Step platform

Steps
To install the exhaust baffle, follow these 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 side of the chassis.
2. If necessary, use a step platform to reach the upper fan tray comfortably.
3. Observe the four retention brackets at the front and rear of the exhaust baffle.
4. Using both hands, lift the exhaust baffle and insert it into the open bay.
5. Align the rear retention brackets directly over the third rivets from the rear of the chassis; then let the exhaust baffle drop down over the rivets.
6. Pull the exhaust baffle toward you to make the retention brackets snug against the rivets.
7. To secure the exhaust baffle to the chassis, use the 9-inch Number 1 flat-blade screwdriver to tighten the four retention bracket screws.

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 side of the chassis.
Step 2  If necessary, use a step platform to reach the upper fan tray comfortably.
Step 3  Observe the four retention brackets at the front and rear of the exhaust baffle.

Figure 131: Exhaust Baffle and Retention Brackets

Step 4  Using both hands, lift the exhaust baffle and insert it into the open bay.
Observe the rivets on both sides of the open bay.

**Step 5** Align the rear retention brackets directly over the third rivets from the rear of the chassis; then let the exhaust baffle drop down over the rivets.

**Note** The front retention brackets will drop into the appropriate rivets.
**Step 6**  
Pull the exhaust baffle toward you to make the retention brackets snug against the rivets.

**Step 7**  
To secure the exhaust baffle to the chassis, use the 9-inch Number 1 flat-blade screwdriver to tighten the four retention bracket screws.

**Tip**  
Continue to pull the exhaust baffle toward you while you tighten the retention bracket screws.
Figure 134: Securing the Exhaust Baffle to the Chassis

1. Tightening retention bracket screw with 9-inch flat screwdriver

The exhaust baffle is now installed. You can now reinstall the upper fan tray.

What to do next
Reinstall the fan tray, as described in the next section.

Reinstalling the Upper Fan Tray

This section describes how to reinstall the upper fan tray in the LCC.

Prerequisites
Before performing this task, make sure the exhaust baffle is correctly and securely installed.
Required Tools and Equipment

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

- ESD-preventive wrist strap
- Large flat-head screwdriver
- Fan tray (Cisco product number CRS-16-LCC-FAN-TR)
- Step platform

Steps

To install the upper fan tray, follow these steps:

SUMMARY STEPS

1. If necessary, use a step platform to reach the upper fan tray comfortably.
2. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
3. Using two hands to support the fan tray, position it in front of the fan tray bay so that the fan tray connector that is on the back of the fan tray lip is aligned with the connector mounted on the front of the fan tray bay (on the rear side of the chassis).
4. Slide the fan tray into the fan tray bay. Stop when the fan tray makes contact with the chassis connector in the back of the fan tray bay.
5. 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 (PLIM) side of the chassis.
6. Replace the fan tray cover and tighten the two captive screws on the fan tray cover faceplate.

DETAILED STEPS

Step 1  If necessary, use a step platform to reach the upper fan tray comfortably.

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

Step 3  Using two hands to support the fan tray, position it in front of the fan tray bay so that the fan tray connector that is on the back of the fan tray lip is aligned with the connector mounted on the front of the fan tray bay (on the rear side of the chassis).

Caution  A fan tray weighs approximately 44 lbs (20 kg); use two hands when handling it.

Step 4  Slide the fan tray into the fan tray bay. Stop when the fan tray makes contact with the chassis connector in the back of the fan tray bay.

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

Step 5  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 (PLIM) side of the chassis.

Note  All electrical and control line connections are made automatically when the connectors mate.
Step 6  Replace the fan tray cover and tighten the two captive screws on the fan tray cover faceplate.

What to do next

Now you can install the upper rear louver grille.
CHAPTER 7

Technical Specifications

This chapter contains tables that list the specifications for the main components of the Line Card Chassis.

For a complete list of cards supported in the Cisco CRS 16-slot line card chassis, see Cisco Carrier Routing System Data Sheets.

The chapter includes the following topics:

- Line Card Chassis Specifications
- Fixed Configuration Power Specifications
- Modular Configuration Power Specifications
- Line Card Chassis Environmental Specifications
- Regulatory, Compliance, and Safety Specifications

- Line Card Chassis Specifications, on page 233
- Fixed Configuration Power Specifications, on page 235
- Modular Configuration Power Specifications, on page 236
- Line Card Chassis Environmental Specifications, on page 237
- Regulatory, Compliance, and Safety Specifications, on page 239

Line Card Chassis Specifications

The table lists the specifications for Cisco CRS Carrier Routing System 16-Slot Line Card Chassis.

Table 7: Cisco CRS 16-Slot Line Card Chassis Specifications

<table>
<thead>
<tr>
<th>Chassis Dimensions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>80 in. (203.2 cm) as shipped84 in. (213.4 cm) as installed</td>
</tr>
<tr>
<td>Width</td>
<td>23.6 in. (60.0 cm)26.1 in. (66.3 cm) with PDU and brackets</td>
</tr>
<tr>
<td>Depth</td>
<td>36 in. (91 cm) without doors and other cosmetics39.7 in. (101 cm) with front and rear doors</td>
</tr>
<tr>
<td>Chassis Dimensions</td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---</td>
</tr>
</tbody>
</table>
| 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 shipping weight | 1175 lb (532 kg) LCC 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 | 4.72 sq ft (4385 sq cm)  
Floor contact area | 680 sq in. (4385 sq cm)  
Maximum floor loading | Without cosmetics and doors:  
1585 lb/4.72 sq. ft = 335 lb/sq. ft  
719 kg/4385 sq. cm = 0.164 kg/sq. cm  
With cosmetics and doors:  
1695 lb/4.72 sq. ft = 359 lb/sq. ft  
769 kg/4385 sq. cm = 0.175 kg/sq. cm |
### Chassis Dimensions

| Cards/Ports/Slots | 1-port OC-768c/STM-256c packet over Synchronous Optical Network (POS)  
4-port OC-192c/STM-64c POS/Dynamic Packet Transport (DPT)  
16-port OC-48c/STM-16 POS/DPT  
8-port 10 Gigabit Ethernet  
4-port 10 Gigabit Ethernet  
CRS1-SIP-800 Carrier Card  
4-Port OC-3/STM-1 POS SPA  
8-Port 1 Gigabit Ethernet SPA  
1-port OC-768c/STM-256c Tunable WDMPOS  
4-port 10GE Tunable WDMPHY |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis Cooling</td>
<td>2 fan trays, push-pull configuration</td>
</tr>
<tr>
<td>Chassis airflow</td>
<td>Up to 2050 cubic ft (58,050 liters) per minute</td>
</tr>
<tr>
<td>Power shelf airflow</td>
<td>100 to 140 cubic ft (2832 to 3964 liters) per minute</td>
</tr>
<tr>
<td>AC power cord length</td>
<td>167 in. (4.25 m)</td>
</tr>
</tbody>
</table>

### Fixed Configuration Power Specifications

The table lists the fixed configuration power specifications for the LCC.

**Table 8: Line Card Chassis Fixed Configuration Power Specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power shelves</td>
<td>2 AC or 2 DC power shelves (Cannot mix AC and DC power shelves.)</td>
</tr>
<tr>
<td>DC power shelf</td>
<td>3 power entry modules (PEMs) per shelf</td>
</tr>
<tr>
<td>AC power shelf</td>
<td>3 PEMs per shelf</td>
</tr>
<tr>
<td>Maximum Input Power</td>
<td></td>
</tr>
<tr>
<td>Fixed configuration DC, chassis fully loaded</td>
<td>13,895 W (13.9 kW) 95% efficiency</td>
</tr>
<tr>
<td>Fixed configuration AC, chassis fully loaded</td>
<td>15,000 W (15.0 kW) 88% efficiency</td>
</tr>
<tr>
<td>Maximum Output Power</td>
<td></td>
</tr>
<tr>
<td>Chassis fully loaded (DC and AC)</td>
<td>12,744 W (12.7 kW)</td>
</tr>
</tbody>
</table>
### Description | Value
---|---
**Power Redundancy (2N)** | 2N: Requires 6 “A” battery plant feeds and 6 “B” battery plant feeds (up to 12 total)
**DC** | 2N: Requires two independent 3-phase AC sources
**AC, 3-phase** | 
**DC Input** | 
**Nominal input voltage** | –48 VDC North America–60 VDC European Community (range –42 to –75 VDC)
**Input current** | 50 A max at –48 VDC 40 A max at –60 VDC
**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** | 50/60 Hz (range 47 to 63 Hz)
**Recommended AC service** | 60 A
**AC Input, Wye 3-phase** | 3W+N+PE (3 wire + neutral + protective earthing\(^1\))
**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** | 50/60 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**

The table lists the modular configuration power specifications for Cisco CRS 16-Slot Line Card Chassis.

Table 9: Line Card Chassis Modular Configuration Power Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power shelves</td>
<td>2 AC or 2 DC power shelves (Cannot mix AC and DC power shelves.)</td>
</tr>
<tr>
<td>DC power shelf</td>
<td>Supports up to 8 DC power modules (PMs) 6 PMs are shipped per shelf</td>
</tr>
<tr>
<td>AC power shelf</td>
<td>Supports up to 6 DC power modules (PMs) 5 PMs are shipped per shelf</td>
</tr>
</tbody>
</table>
### Technical Specifications

#### Line Card Chassis Environmental Specifications

The table lists the environmental specifications for the line card chassis.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature</strong></td>
<td>Operating, nominal: 41°F to 104°F (5°C to 40°C)</td>
</tr>
<tr>
<td></td>
<td>Operating, short-term: 23°F to 122°F (–5°C to 50°C)</td>
</tr>
<tr>
<td></td>
<td>Nonoperating: –40°F to 158°F (–40°C to 70°C)</td>
</tr>
<tr>
<td><strong>Nominal input voltage</strong></td>
<td>–48 VDC North America – 60 VDC International Range: 40 to 72 VDC</td>
</tr>
<tr>
<td><strong>Input current</strong></td>
<td>40 A max at –48 VDC 30 A max at –60 VDC 50 A at –40 VDC (maximum)</td>
</tr>
<tr>
<td><strong>Nominal line frequency</strong></td>
<td>50/60 Hz (range 47 to 63 Hz)</td>
</tr>
<tr>
<td><strong>Recommended AC service</strong></td>
<td>20 A (North America) dedicated branch circuit 16 A (International)</td>
</tr>
<tr>
<td>Description</td>
<td>Value</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Humidity                          | Operating: 5 to 85% non-condensing  
Nonoperating: 5 to 90% non-condensing, 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                  | 47,408 BTU per hour (maximum) fixed configuration DC³  
51,180 BTU per hour—(maximum) fixed configuration AC⁴  
50,042 BTU per hour (maximum) modular configuration DC⁵  
48,955 BTU per hour—(maximum) modular configuration AC⁶                                                                                     |
| 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 59°F (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, maximum fan speed (5150 RPM)                                      |
| **Note**                          | Software controls the speed of the fans based on measurements from the chassis thermal sensors.                                            |
| Sound power level(fixed configuration power) | Room temp 27°C, sound power, 76.2dB with Arctic  
Room temp 40°C, sound power, 88 dB with Arctic  
Room temp 27°C, sound power, 82.2dB with TDI AC  
Room temp 27°C, sound power, 77.2dB with TDI DC  
Room temp 40°C, sound power, 89dB with TDI AC  
Room temp 40°C, sound power, 88dB with TDI |
| Sound power level(modular configuration power) | Fan speed 3300 RPM, temperature 80°F (27°C): 76.2 dB—modular configuration power  
Fan speed 5150 RPM, temperature 104°F (40°C): 88.0 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 Cisco CRS Series system conforms, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System*. 
Product IDs

This chapter provides information about the product structure and product IDs. It contains the following tables:

- Chassis Product IDs, on page 241
- Fabric Cables, on page 246

These tables list system components, their product IDs (the part numbers to use to order the component), and descriptions.

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

See Cisco online ordering and pricing tool for the most up-to-date information on the routing system and product IDs (Cisco login required).

Note

Chassis Product IDs

This table lists the high-level product IDs.

<table>
<thead>
<tr>
<th>Component</th>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multishelf System Components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRS multishelf system</td>
<td>CRS-MC-FC24</td>
<td>Cisco CRS Multishelf System</td>
</tr>
</tbody>
</table>

This table lists the PIDs for the fabric card chassis and its components.
<table>
<thead>
<tr>
<th>Component</th>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabric card chassis (complete)</td>
<td>CRS-FC24(=)</td>
<td>Cisco CRS FCC for a multishelf system(without switch fabric cards)</td>
</tr>
<tr>
<td>Fabric card chassis (chassis only)</td>
<td>CRS-FCC(=)</td>
<td>Cisco CRS routing system FCC (spare chassis)</td>
</tr>
<tr>
<td>Fan tray with fans</td>
<td>CRS-FCC-FAN-TR(=)</td>
<td>Cisco CRS FCC fan tray with fans (spare)(2 required for each chassis)</td>
</tr>
<tr>
<td>Cards and modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch fabric card (fabric chassis)</td>
<td>CRS-FCC-SFC(=)</td>
<td>S2 switch fabric cards for 40G system(8 required for each fabric chassis)</td>
</tr>
<tr>
<td></td>
<td>CRS-FCC-SFC-140(=)</td>
<td>S2 switch fabric cards for 140G system(8 required for each fabric chassis)</td>
</tr>
<tr>
<td>Switch fabric card blank</td>
<td>CRS-SFC-IMPEDANCE(=)</td>
<td>Blank card carrier for each switch fabric slot (used for shipment; must be replaced with fabric card)</td>
</tr>
<tr>
<td>22-port shelf controller card</td>
<td>CRS-FCC-SC-22GE(=)</td>
<td>22-port shelf controller Gigabit Ethernet (22-port SCGE) card(2 recommended for each fabric chassis)</td>
</tr>
<tr>
<td>OIM, single-width</td>
<td>CRS-FCC-OIM-1S(=)</td>
<td>Optical interconnect module (OIM)(1 required for each S2 fabric card in fabric chassis)</td>
</tr>
<tr>
<td>OIM blank</td>
<td>CRS-OIM-IMPEDANCE(=)</td>
<td>Blank carrier for each empty OIM slot</td>
</tr>
<tr>
<td>SFC and OIM eight pack bundle</td>
<td>CRS-FC24-SFC-8P(=)</td>
<td>Eight pack of S2 switch fabric cards and optional interconnect modules</td>
</tr>
<tr>
<td>FM-LED</td>
<td>CRS-FCC-LED(=)</td>
<td>Fiber module LED card (2 required for each fabric chassis)</td>
</tr>
<tr>
<td>FM-LED blank</td>
<td>CRS-FM-IMPEDANCE(=)</td>
<td>Blank carrier for each empty FM-LED slot(required for EMI compliance and cooling)</td>
</tr>
<tr>
<td>Fixed Configuration Power</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Delta power system</td>
<td>CRS-FCC-ACD-KIT(=)</td>
<td>AC Delta power system for fabric chassis(includes 2 power shelves and 6 AC rectifiers)</td>
</tr>
<tr>
<td>AC Wye power system</td>
<td>CRS-FCC-ACW-KIT(=)</td>
<td>AC Wye power system for fabric chassis(includes 2 power shelves and 6 AC rectifiers)</td>
</tr>
<tr>
<td>DC power system</td>
<td>CRS-FCC-DC-KIT(=)</td>
<td>DC power system for fabric chassis(includes 2 power shelves and 4 power modules)</td>
</tr>
<tr>
<td>AC power rectifier</td>
<td>CRS-16-AC-RECT(=)</td>
<td>AC power rectifier for line card chassis(6 required for each chassis; 3 required for each AC power shelf)</td>
</tr>
<tr>
<td>DC PEM</td>
<td>CRS-16-DC-PEM(=)</td>
<td>AC power entry module for line card chassis(6 required for each chassis; 3 required for each DC power shelf)</td>
</tr>
</tbody>
</table>
### Component | Product ID | Description
--- | --- | ---
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)

#### AC power cord

AC power cord—North America | CRS-AC-CAB-NA | AC power cord
AC power cord—Australia | CRS-AC-CAB-AU | AC power cord
AC power cord—United Kingdom | CRS-AC-CAB-UK | AC power cord
AC power cord—Europe | CRS-AC-CAB-EU | AC power cord
AC power cord—Italy | CRS-AC-CAB-IT | AC power cord

**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

This table lists the PIDs for the Cisco CRS 16-slot line card chassis and its components.
<table>
<thead>
<tr>
<th>Component</th>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line card chassis (complete)</td>
<td>CRS-16-LCC/M</td>
<td>Cisco CRS-1 40G LCC (with 2 route processors [RPs], S13 fabric cards, and optical array cables)</td>
</tr>
<tr>
<td></td>
<td>CRS-16LCC140/M</td>
<td>Cisco CRS-3 140G LCC (with 2 route processors [RPs], S13 fabric cards, and optical array cables)</td>
</tr>
<tr>
<td></td>
<td>CRS-16/S</td>
<td>Cisco CRS LCC (with 2 route processors [RPs] and S123 fabric cards)</td>
</tr>
<tr>
<td>Conversion Kit</td>
<td>CRS-16-MC-CONV CRS-16-MC140-CONV</td>
<td>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</td>
</tr>
<tr>
<td>Switch fabric cards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch fabric card (single-shelf system)</td>
<td>CRS-16-FC/S(=)</td>
<td>S123 switch fabric cards for CRS-1 system</td>
</tr>
<tr>
<td></td>
<td>CRS-16-FC140/S(=)</td>
<td>S123 switch fabric cards for CRS-3 system</td>
</tr>
<tr>
<td></td>
<td>CRS-16-FC400/S (=)</td>
<td>S123 switch fabric cards for CRS-X system (8 required for each line card chassis)</td>
</tr>
<tr>
<td>Switch fabric card (multi-shelf system)</td>
<td>CRS-16-FC/M(=)</td>
<td>S13 switch fabric cards for CRS-1 system</td>
</tr>
<tr>
<td></td>
<td>CRS-16-FC140/M(=)</td>
<td>S13 switch fabric cards for CRS-3 system</td>
</tr>
<tr>
<td></td>
<td>CRS-16-FC400/M (=)</td>
<td>S13 switch fabric cards for CRS-X system (8 required for each line card chassis)</td>
</tr>
<tr>
<td>Route processors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Route processor</td>
<td>CRS-16-RP(=)</td>
<td>Route processor (2 required for each line card chassis)</td>
</tr>
<tr>
<td>Performance route processor (PRP)</td>
<td>CRS-16-PRP-6G=</td>
<td>Performance route processor (6GB memory)</td>
</tr>
<tr>
<td></td>
<td>CRS-16-PRP-12G=</td>
<td>Performance route processor (12GB memory) (2 PRPs required for each line card chassis)</td>
</tr>
<tr>
<td>Distributed route processor (DRP)</td>
<td>CRS-DRP(=)</td>
<td>Additional route processor for the system (optional) (includes two cards, DRP CPU and DRP PLIM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To order DRP cards separately, use the following IDs (both cards are required for DRP operation):</td>
</tr>
<tr>
<td></td>
<td>CRS-DRP-B-CPU(=)</td>
<td>DRP card only (requires DRP PLIM)</td>
</tr>
<tr>
<td></td>
<td>CRS-DRP-B-PLIM(=)</td>
<td>DRP PLIM only (requires DRP CPU)</td>
</tr>
</tbody>
</table>

Fixed Configuration Power
<table>
<thead>
<tr>
<th>Component</th>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Delta power shelf</td>
<td>CRS-16-LCC-PS-ACD(=)</td>
<td>AC Delta power shelf for line card chassis (2 required for each chassis)</td>
</tr>
<tr>
<td>AC Wye power shelf</td>
<td>CRS-16-LCC-PS-ACW(=)</td>
<td>AC Wye power shelf for line card chassis (2 required for each chassis)</td>
</tr>
<tr>
<td>DC power shelf</td>
<td>CRS-16-LCC-PS(=)</td>
<td>DC power shelf for line card chassis (2 required for each chassis)</td>
</tr>
<tr>
<td>AC power rectifier</td>
<td>CRS-16-AC-RECT(=)</td>
<td>AC power rectifier for line card chassis(6 required for each chassis; 3 required for each AC power shelf)</td>
</tr>
<tr>
<td>DC PEM</td>
<td>CRS-16-DC-PEM(=)</td>
<td>AC power entry module for line card chassis(6 required for each chassis; 3 required for each DC power shelf)</td>
</tr>
<tr>
<td>Alarm module</td>
<td>CRS-16-ALARM(=)</td>
<td>Chassis alarm module(2 required for each chassis; 1 required for each power shelf)</td>
</tr>
</tbody>
</table>

**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     | AC power cord—North America                                               |
|                                 | CRS-AC-CAB-AU     | AC power cord—Australia                                                   |
|                                 | CRS-AC-CAB-UK     | AC power cord—United Kingdom                                              |
|                                 | CRS-AC-CAB-EU     | AC power cord—Europe                                                      |
|                                 | CRS-AC-CAB-IT     | AC power cord—Italy                                                       |

**Note** Length of each power cord is 4.25 m.

**Cable management and cosmetics**

<p>| Front cosmetics                  | CRS-16-LCC-FRNT(=) | Front cosmetics and cable management kit                                  |
| Rear cosmetics                   | CRS-16-LCC-BCK-CM(=) | Rear cosmetics and cable management kit                                  |</p>
<table>
<thead>
<tr>
<th>Component</th>
<th>Product ID</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front door</td>
<td>CRS-16-LCC-DRS-FR(=)</td>
<td>Front doors</td>
</tr>
<tr>
<td>Rear door</td>
<td>CRS-16-LCC-DRS-RR(=)</td>
<td>Rear doors</td>
</tr>
<tr>
<td>AC power grille</td>
<td>CRS-16-ACGRILLE(=)</td>
<td>Front grille for fixed configuration AC power shelves</td>
</tr>
<tr>
<td>DC power grille</td>
<td>CRS-16-DCGRILLE(=)</td>
<td>Front grille for fixed configuration DC power shelves</td>
</tr>
<tr>
<td>Modular power grille</td>
<td>CRS-16-PW-GRILL(=)</td>
<td>Front grille for modular configuration AC and DC power shelves</td>
</tr>
<tr>
<td>Chassis installation accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(included with chassis)</td>
</tr>
<tr>
<td>Drill hole template</td>
<td>CRS-LCC-DRILLTEMP(=)</td>
<td>Aluminum template showing where to drill the mounting holes to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>secure the chassis to the floor</td>
</tr>
<tr>
<td>Chassis access template</td>
<td>CRS-LCC-FLOORTEMP (=)</td>
<td>Mylar template showing chassis door swings and maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>access area</td>
</tr>
<tr>
<td>Chassis floor mounting kit</td>
<td>CRS-16-LCC-ALTMNT(=)</td>
<td>Alternate mounting kit for anchoring chassis to floor</td>
</tr>
</tbody>
</table>

For detailed specifications for Cisco CRS routing system PLIMs, RPs and other components refer see [Cisco CRS Data Sheets](#).

For additional information on Cisco CRS routing system SPA interface processor (SIP) and shared port adapters (SPAs), see the [Cisco CRS SIP and SPA Hardware Installation Guide](#).

## Fabric Cables

The table 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 this table, 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* and can be ordered separately.
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

<table>
<thead>
<tr>
<th>Fabric Cable Product ID</th>
<th>Description and Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCC/M-FC-FBR-10=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 10 meters (32.8 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-15=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 15 meters (49.2 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-20=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 20 meters (65.6 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-25=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 25 meters (82 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-30=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 30 meters (98.43)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-40=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 40 meters (131.2 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-50=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 50 meters (164 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-60=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 60 meters (197 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-70=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 70 meters (229.7)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-80=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 80 meters (262.5 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-90=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 90 meters (295.3 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-100=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Fiber 100 meters (328 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-10R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 10 meters (32.8 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-15R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 15 meters (49.2 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-20R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 20 meters (65.6)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-25R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 25 meters (82 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-30R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 30 meters (98.43 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-40R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 40 meters (131.2 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-50R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 50 meters (164 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-60R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 60 meters (197 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-70R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 70 meters (229.7)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-80R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 80 meters (262.5 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-90R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 90 meters (295.3 feet)</td>
</tr>
<tr>
<td>LCC/M-FC-FBR-100R=</td>
<td>Cisco CRS Line Card Chassis-Fabric Chassis Riser-rated 100 meters (328 feet)</td>
</tr>
</tbody>
</table>
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.