Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide

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CHAPTER 5

Preface

This document provides instructions for unpacking a Cisco NCS 6000 Series chassis and its components, attaching a dolly, moving the chassis, and securing the chassis to the floor.

The Cisco NCS 6008 Line Card Chassis (LCC) and the Cisco NCS 6000 Fabric Card Chassis (FCC) are products in the Cisco Network Convergence System 6000 Series family. The companion document to this guide is the *Cisco Network Convergence System 6000 Series Routers Site Planning Guide* that describes how to plan and prepare your site facilities for chassis installation.

Audience

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

Documentation Conventions

This document uses the following conventions:

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

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

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

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

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

Warning   IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS

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

Related Documentation

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

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

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

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

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

Changes to This Document

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

Table 1: Changes to This Document

Date	Summary
June 2017	Added support for the 12X100G QSFP + 8X100 CPAK line cards (NC6-20X100GE-M-C, NC6-20X100GE-L-C).
March 2017	Added support for Universal Fabric Card (NC6-FC2-U). Added procedure for migrating to a Back-to-Back system.
November 2016	Added support for version 2 fan tray (NC6-FANTRAY-2).
May 2016	Added support for NC6-LC-BLANK2= impedance card.
March 2015	Updated "Installing Fabric Cards" procedure in Chapter 5.
September 2014	Cable management brackets now ship preinstalled on the chassis. Updated procedures to reflect change. Reorganized document for better usability.
January 2014	Added support for the 60-Port 10Gbps Line Card with SFP+ Optics Module (Lean Core [NC6-60X10GE-L-S] and Multi-Service Core [NC6-60X10GE-M-S].
September 2013	Initial release of this document. This document introduces the Cisco NCS 6008 8-Slot Line Card Chassis.

Obtaining Documentation and Submitting a Service Request

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

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

C H A P T E R 1

Installation Roadmap

The following table lists the steps to install the Cisco NCS 6008 chassis and its components and prepare the system for operation. Use this table as a checklist to ensure that all components are properly installed in the correct order. For information about a step, see the respective section of this installation guide.

- Overview of Installation Steps, on page 1

Overview of Installation Steps

Step	See	Check
1	Verify that the chassis is securely bolted to the floor.	*Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide*	
2	Ground the chassis.	Installing the LCC Ground Cable	
3	Install the external cosmetics on the front of the chassis.	Installing the Front Exterior Cosmetics	
4	Install the external cosmetics on the rear of the chassis.	Installing the Rear Exterior Cosmetics	
5	Install either AC or DC input power connections to the power trays.	Installing AC Input Power Cords or Installing DC Input Power Cables	
6	Install power modules in the power trays.	Installing an AC or DC Power Module	
7	Power on the chassis.	Powering On the LCC	
8	Install cards and remaining components in the chassis.	Installing RP Cards, Line Cards, and Fabric Cards	

Step		See	Check
9	Connect the cables to the other chassis if you are installing a back-to-back or multi-chassis system.	Refer to the Cisco Network Convergence System 6000 Series Routers Migration Guide.	

CHAPTER 2

Chassis Overview

This chapter provides an overview of the Cisco NCS 6008 Line Card Chassis.

Chassis Overview

The Cisco NCS 6008 LCC is a single-chassis system that provides 8 Tbps of full-duplex network bandwidth through eight line cards. Each card delivers up to 1 Tbps throughput using a mix of 10-Gbps or 100-Gbps interfaces per card. The Cisco NCS 6008 LCC also provides modular optics options to meet a wide range of distance requirements. In a back-to-back configuration, the LCC can be expanded to support up to 16 Tbps of full-duplex forwarding throughput. In a multi-chassis configuration, the LCC can be expanded to support up to 128 Tbps of full-duplex forwarding throughput.

The Cisco NCS 6008 LCC is a highly scalable routing system with redundancy and reliability features that allow for nonstop operation even during service upgrades of equipment, with no single points of failure in hardware or software. The routing system has the potential to expand from a single-chassis to a back-to-back or multi-chassis configuration for even greater routing capacity. For information about setting up a back-to-back and multi-chassis configurations, refer to the Cisco Network Convergence System 6000 Series Routers Migration Guide.

The LCC contains a chassis midplane and packet interfaces on line cards cross-connected to each other through a switch fabric. The chassis has eight slots at the front for Line Cards (LCs), two slots at the rear for Route Processor (RP) cards, and six slots at the rear for Fabric Cards (FCs).

The LCC has an integrated rack and does not require an external rack. It is bolted to the facility floor. It contains its own power and cooling systems. Power systems are available using AC or DC power.

Note   The installation of a Cisco NCS 6008 LCC may require space, floor loading, power, and cooling modifications to a facility. Therefore, you should plan the site well in advance of the scheduled delivery of the chassis system. For site preparation information, see the Cisco Network Convergence System 6000 Series Routers Site Planning Guide.

The following figure shows the front view of the Cisco NCS 6008 LCC.

Figure 1: Front View of the Cisco NCS 6008 LCC
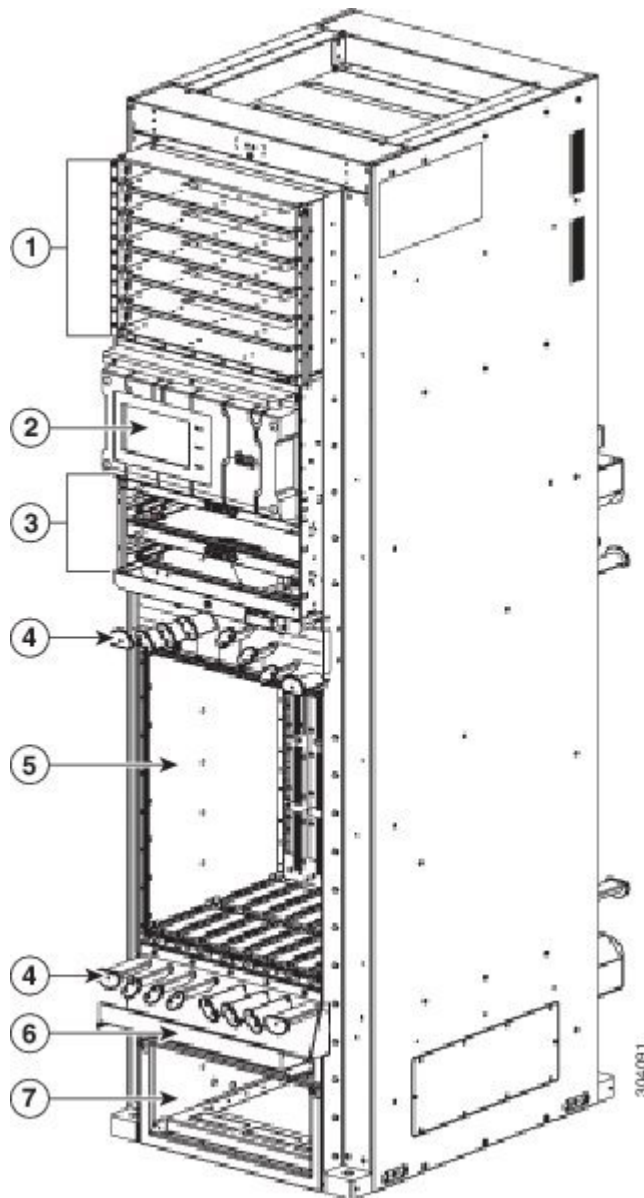
1	Six power trays	5	One card cage with eight LC slots
2	Craft panel display	6	Air filter access
3	Two fan trays	7	Air inlet plenum
4	Cable management brackets		

The following figure shows the rear view of the Cisco NCS 6008 LCC.

Figure 2: Rear View of the Cisco NCS 6008 LCC
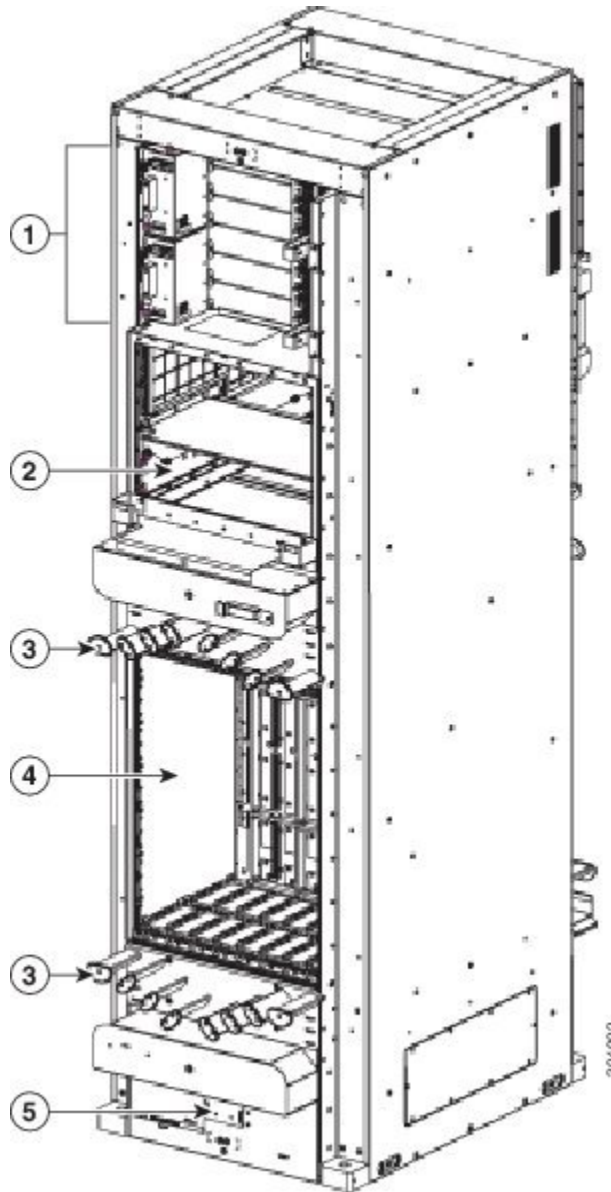
1	Power input feeds (AC or DC)	4	One card cage with slots for FCs and RP cards
2	Air exhaust plenum	5	Temperature sensor
3	Cable management bracket		

Chassis Components

The following table lists the main components of the Cisco NCS 6008 LCC. It identifies the components that are considered field replaceable units (FRUs), but where additional detail is useful, identifies sub-assemblies that are not field replaceable.

Table 2: Main Components of the Cisco NCS 6008 LCC

Component	Description
Chassis midplane	The chassis midplane distributes power and provides management, control, and data interconnections for other components in the system. Each LC is connected through the midplane to the FCs. The midplane is not field replaceable by the user.
Route Processor (RPs) Card	Two RP cards (RP0/RP1) are inserted into the rear of the LCC (Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5). These cards provide the intelligence of the system by functioning as the system controller and providing route processing and chassis management. The RP cards also monitor system alarms and control the system fans. The LEDs on the front panel indicate active alarm conditions.
Line Cards (LCs)	Up to eight LCs can be inserted into the front of the LCC (#unique_21 unique_21_Connect_42_fig_E593C4A6DB954C08B94EDD8CAFDC7884). These cards provide the physical interfaces and optical connections for the user data.
Fabric Cards (FCs)	Six FCs are inserted into the rear of the LCC (Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5). The FCs provide the switch fabric for the routing system and performs the cross-connect function of the routing system, connecting every LC to each other. The switch fabric receives ingress user data from one LC slot and performs the switching necessary to route the data to the appropriate egress LC slot.
Fan Trays	Two redundant fan trays are inserted into the front of the LCC (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4). Each fan tray contains six axial fans. The fans pull cooling air through the chassis from the bottom front to top rear. See the About the Fan Trays for information on the fan trays.
Air Filter	A removable air filter is located at the bottom of the LCC, below the card cage, and inside the front air intake (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4).
Power Trays	Six power trays provide redundant power to the LCC (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4). Both AC and DC power trays are available. Each AC power tray has three slots for AC PMs. Each DC power tray has four slots for DC PMs. Mixing AC and DC power supplies is not supported. The power trays are field-replaceable (after power down). The PMs are hot-swappable.
Cable management brackets	The LCC has cable management features on the front and rear sides of the chassis. These brackets organize the interface cables entering and exiting the different cards, keeping them out of the way and free of sharp bends that may damage the cables. Four horizontal cable management brackets are preinstalled on the LCC (two on the front side and two on the rear side of the LCC (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4 and Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5).

Component	Description
Cable troughs	Four vertical cable troughs for cable management (two on the front-side and two on the rear-side of the LCC) and Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4 and Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5.
Temperature sensor assembly	A temperature sensor is located on the lower rear side of the LCC (Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5).
Craft panel display	A craft panel display, located on the front of the LCC (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4), consists of an LCD touch-screen display and LEDs used to indicate system alarms. The craft panel has a basic interface used to monitor the operation of the LCC.

Chassis Cable Management

The distribution of the slot locations on the Cisco NCS 6000 LCC allows for the large number of optic fiber cables required for a fully-loaded routing system.

The NCS 6000 LCC cable management features include:

- Front and rear cable management brackets: One cable management bracket is located above the upper card cage and one cable management bracket below the lower card cage (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4 and Figure 2: Rear View of the Cisco NCS 6008 LCC , on page 5).
- Vertical cable troughs: Four troughs, two on the front side of the LCC, and two on the rear side of the LCC (Figure 7: Exterior Cosmetics for the Front of the LCC and Figure 13: Exterior Cosmetic For the Rear of the LCC).

Slot Numbers-Front and Rear Side

The following figure the slot numbers on the front (LC) side and rear (RP and FC) side of the LCC.

Figure 3: Cisco NCS 6008 LCC Slot Numbers-Front and Rear Side
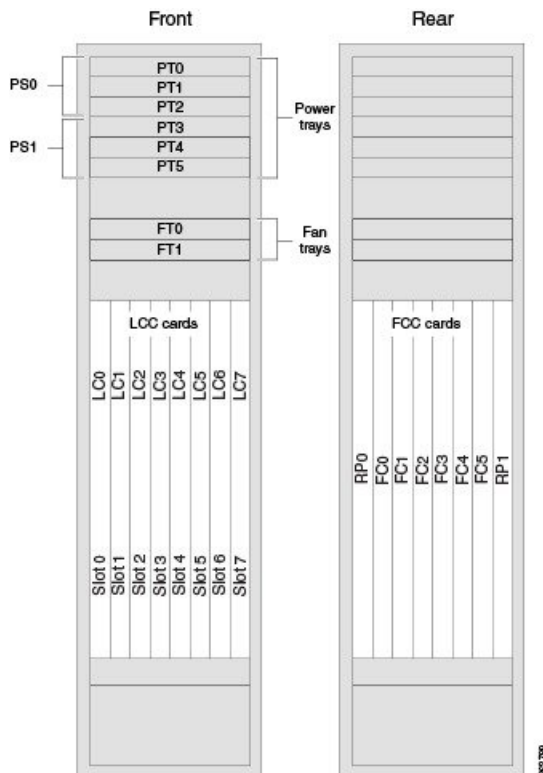
Front of the LC

The front (LC) side of the LCC has the following card slots:

- Eight LC slots (left to right: 0, 1, 2, 3, 4, 5, 6, 7).

- Two fan trays for redundancy. The fan trays are accessed from the front side of the LCC.

- Six power trays for redundancy.

The upper three power trays (0-2) are contained within power shelf 0 (PS0), and the lower three power trays (3-5) are contained within power shelf 1 (PS1).

Rear of the LC

The rear side of the LCC has the following card slots:

- Two RP card slots (RP0 on the far left of the LCC and RP1 on the far right)

- Six FC slots (left to right: 0, 1, 2, 3, 4, 5)

The FC slots can be populated with FCs for a standalone configuration, a back-to-back configuration, or a multi-chassis configuration.

Safety Guidelines

Before you perform any Cisco NCS 6008 LCC installation procedures, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.

Note Review the safety warnings listed in the Regulatory Compliance and Safety Information for the Cisco Network Convergence System 6000 Series Routers before installing, configuring, or troubleshooting any installed card.

Note Power off the system before removing or installing a power tray.

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

- 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 chassis components away from walk areas.

- Do not wear loose clothing, jewelry, and other items that could get caught in the chassis while working with the chassis and its 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 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 wrist 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 (Figure 4: ESD Jack—Front Side of the LCC, on page 10) or a bare metal surface on the LCC (ensure that the LCC is grounded).

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

The following figure shows an example of an ESD jack on the front side of the LCC. An ESD jack is located directly above the upper and lower cable management brackets on both sides of the LCC.

Figure 4: ESD Jack—Front Side of the LCC
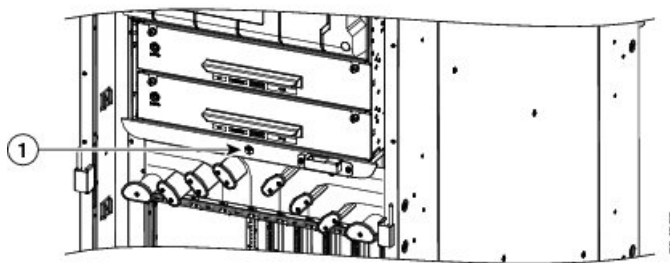
1	ESD jack (two on each side of the LCC)

Installing the Exterior Cosmetics

This chapter describes how to install the exterior cosmetics on the Cisco NCS 6000 LCC and includes the following topics:

Overview of the Exterior Cosmetics

The Cisco NCS 6008 LCC is shipped with exterior cosmetics for the front side and rear side of the LCC.

The following figure shows the exterior cosmetics for the front side the LCC.

Figure 5: Exterior Cosmetics—Front Side of the LCC
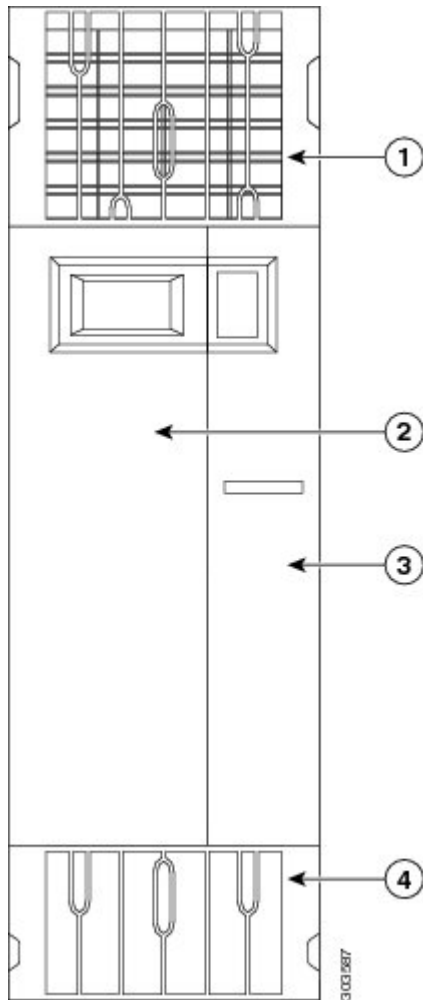
1	Top grille	3	Right door
2	Left door	4	Bottom grille

The following figure shows the exterior cosmetics for the rear side of the LCC.

Figure 6: Exterior Cosmetics—Rear Side of the LCC
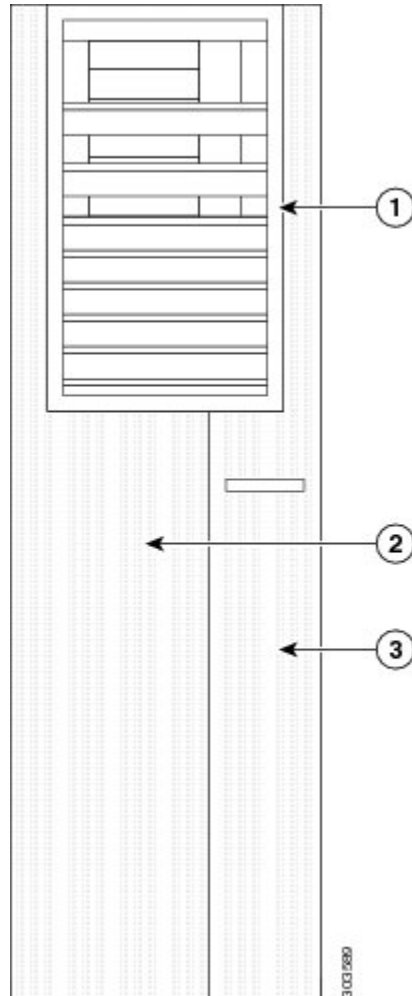
1	Rear exhaust air deflector	3	Right door
2	Left door		

Installing the Front Exterior Cosmetics

This section describes how to install the front-side exterior cosmetics on the Cisco NCS 6008 LCC. We recommend that you install the exterior cosmetics in the order outlined in this section.

Prerequisites

Before performing this task, you must unpack and secure the LCC. See the Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide .

Required Tools and Equipment

- 8-inch, number-1 Phillips screwdriver (magnetic head preferable)

- Two vertical cable troughs (left and right troughs are interchangeable)

- Three left and three right door hinges

- Front doors, left and right

- Two door grounding cables

- Craft panel cover

- Front top grille

- Front bottom grille

For information on the cosmetic PID numbers, see Appendix B, "System Product IDs."

Steps

To install the front exterior cosmetics, follow these steps:

Step 1   Attach the left and right vertical cable troughs to the front of the LCC (see figure below). The two vertical cable troughs are installed inverted from each other. Each trough is marked FRONT to ensure that you install the trough on the correct side of the LCC.

We recommend that you use two people to attach the vertical cable troughs; one person to hold the vertical cable troughs in place while the other person inserts and tightens the screws.

Figure 7: Exterior Cosmetics for the Front of the LCC
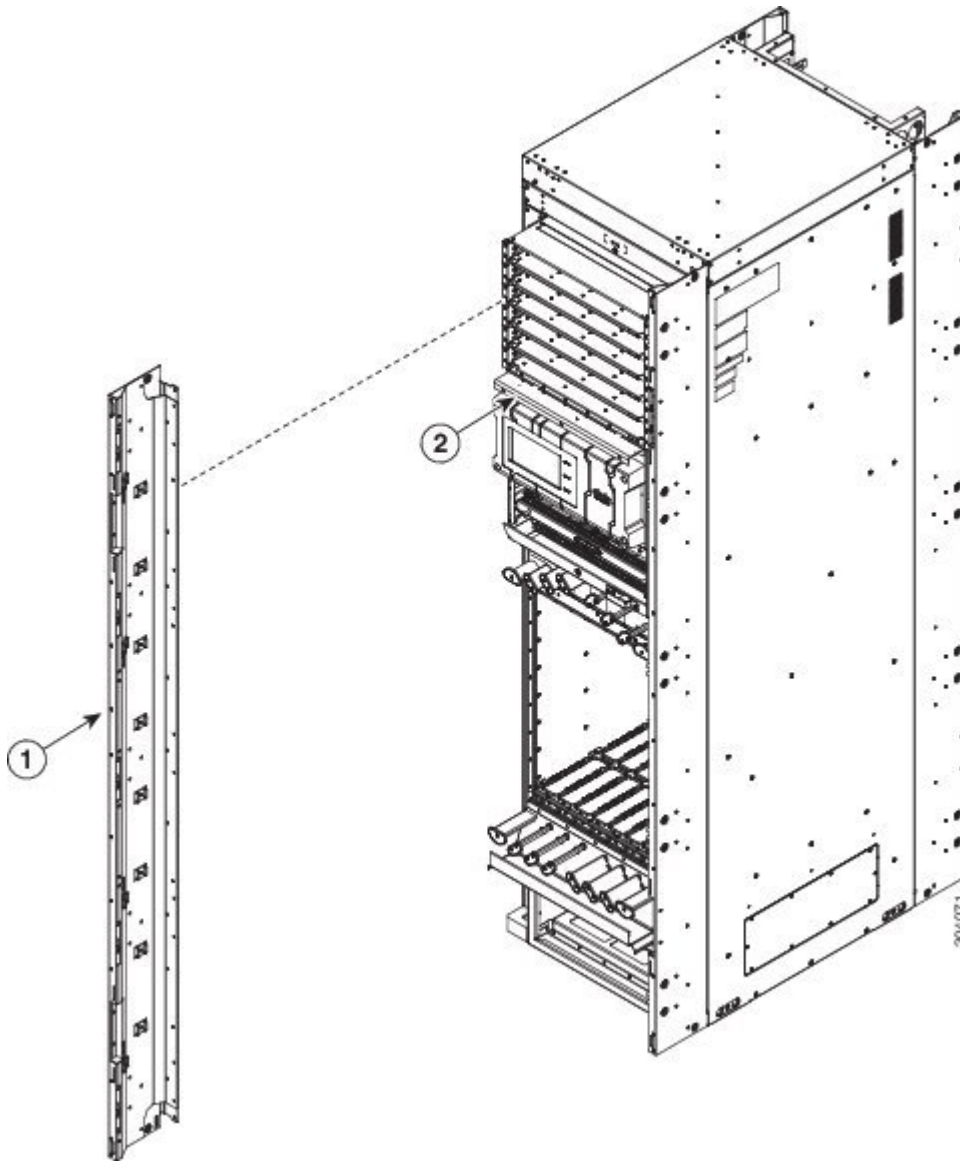
1	Vertical cable troughs (one per side), each attached to the LCC with eight pan-head screws	2	Craft panel display cover

Step 2 For each cable trough:

  a) Align the guide pins on the rear of the vertical cable trough with the positioning holes on the front of the LCC (see figure below).

  b) Loosely insert eight pan-head screws, and then use the screwdriver to tighten them clockwise to attach the vertical cable troughs firmly to the front of LCC. You might need to use a ladder to reach the upper screws.

Figure 8: Vertical Cable Troughs with Guide Pins
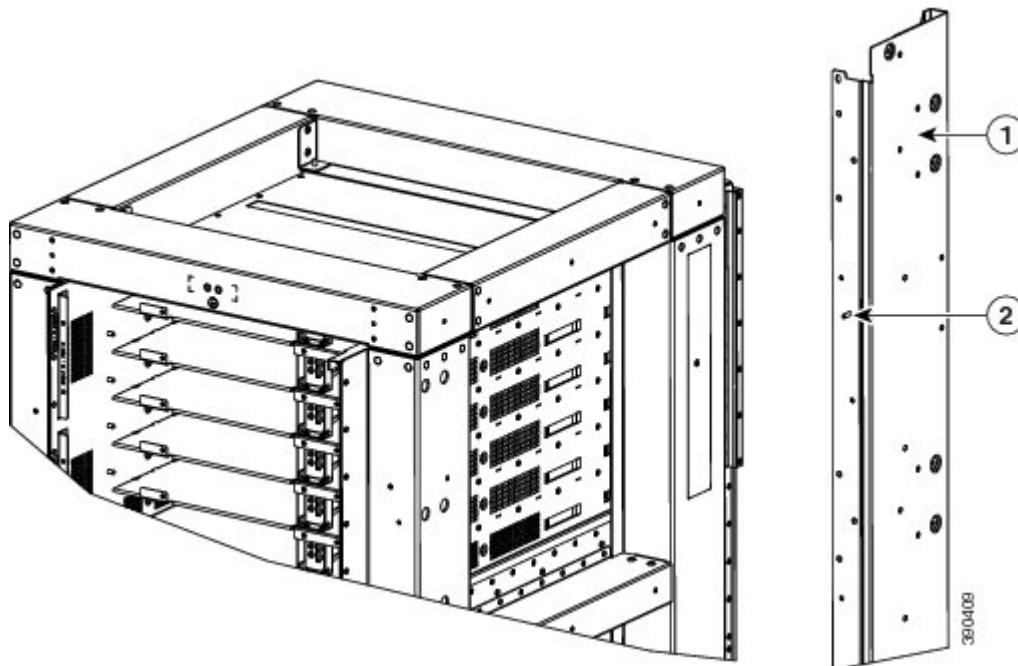
1	Vertical cable troughs	2	Guide pin

We recommend that you use two people to attach the vertical cable troughs; one person to hold the vertical cable troughs in place while the other person inserts and tightens the screws.

Step 3   Attach the door hinge attachments, three left and three right, using two pan-head screws each (see figure below).

We recommend that you use two people to lift the door onto the LCC.

Figure 9: Door Hinge Attachments—Front of the LCC
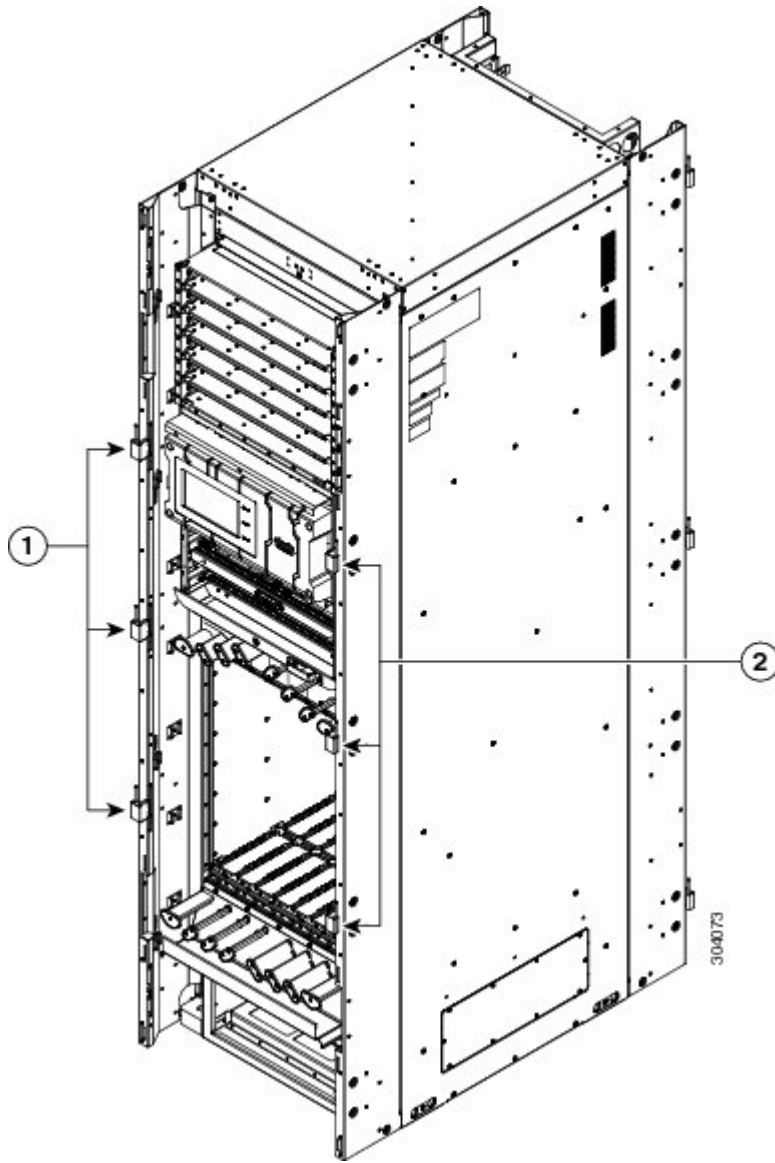
1	Left door hinge attachments	2	Right door hinge attachments

Step 4   Align the front door (see figure below) with the three door hinges on the LCC.

Figure 10: Front Doors
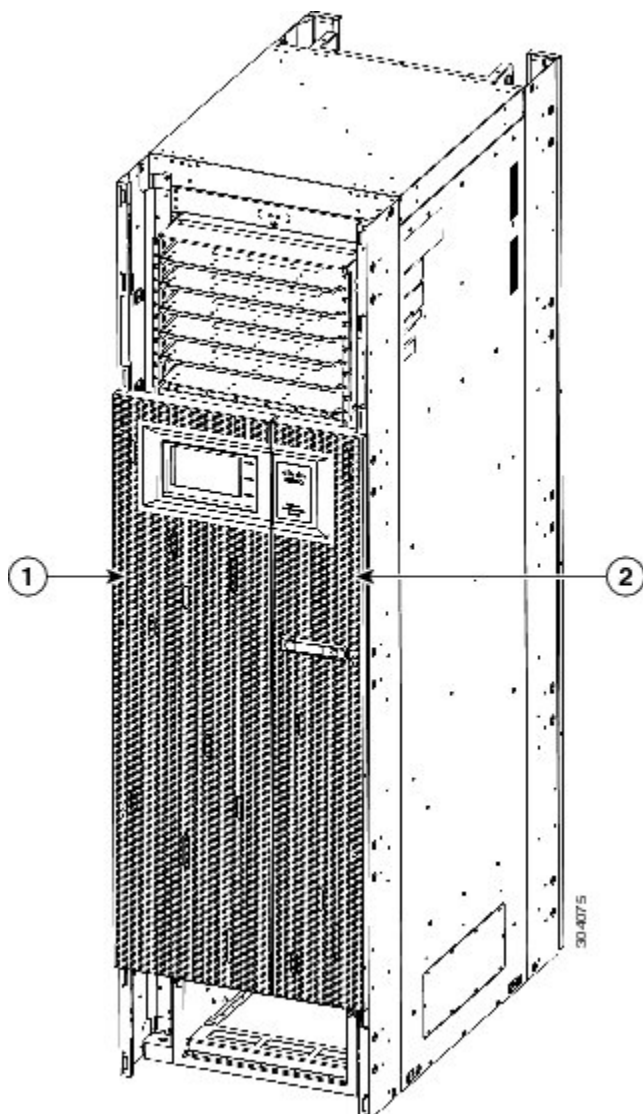
1	Left door	2	Right door

Step 5   Pivot and rotate the flange located behind each door hinge.

Step 6   Attach and orient the front doors so that the slot on the metal part in the middle of the doors is lined up with the tab on the vertical cable trough. The door will then drop into position onto the hinge attachment pins.

Step 7   Attach one grounding cable to each door, connecting the doors to the vertical cable troughs (see figure below).

a)   Insert and tighten one pan-head screw to attach one end of the ground cable to the inside of the door.

b)   Insert and tighten one pan-head screw to attach the other end of the ground cable to the vertical cable trough.

Figure 11: Grounding Cable for Each Door
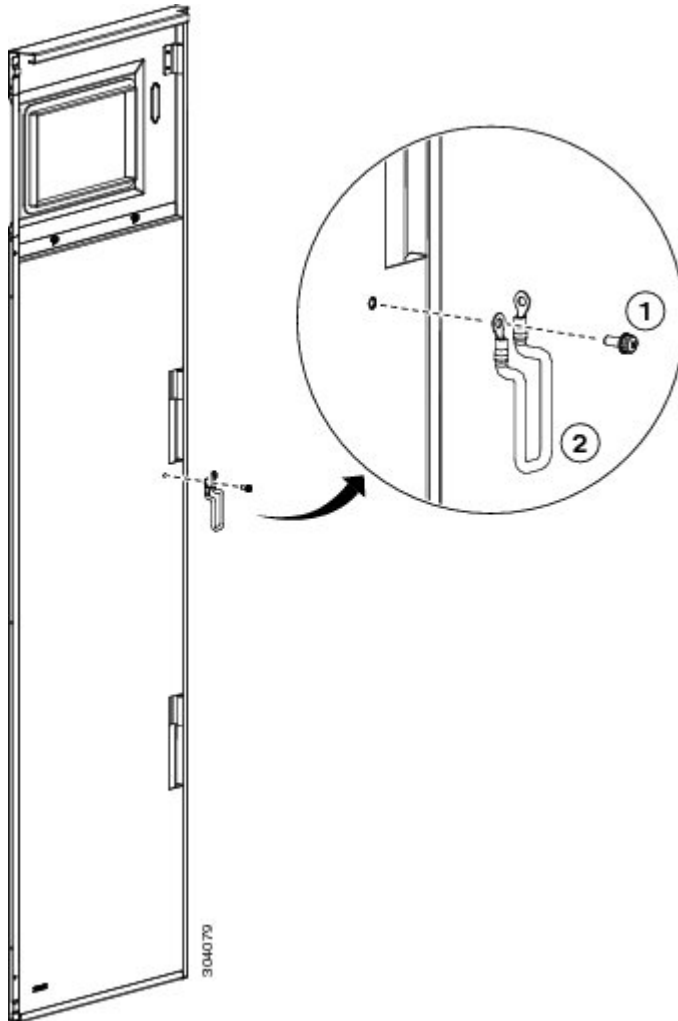
1	Pan-head screw	2	Grounding cable

Step 8   Attach the grilles to the troughs (see figure below).

a)   Attach the top grille by carefully inserting the bottom tabs on the grille into the snap joiners (facing-up) on the troughs. Press the grille firmly against the troughs until it snaps on.

b)   Attach the bottom grille by carefully inserting the top tabs on the grille into the snap joiners (facing-down) on the troughs. Press the grille firmly against the troughs until it snaps on.

Figure 12: Attaching the Front Grilles
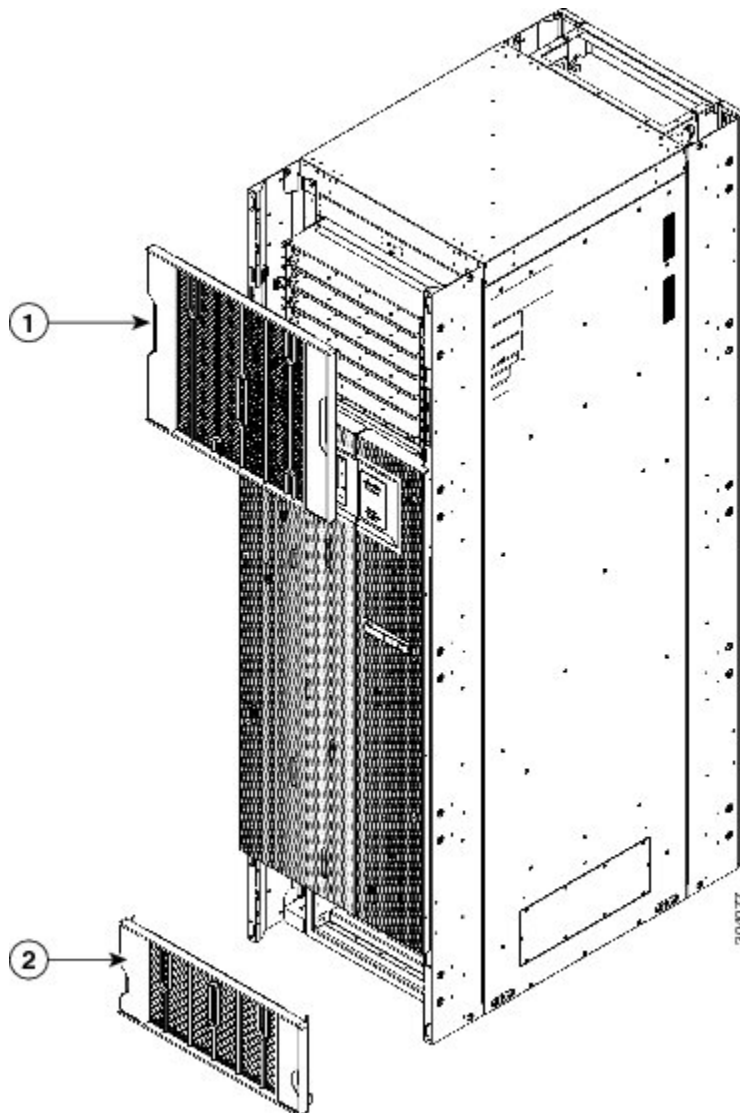
1	Front top grille	2	Front bottom grille

Step 9   Attach the craft panel display cover by inserting and tightening four captive screws. Do not overtighten.

Installing the Rear Exterior Cosmetics

This section describes how to install the rear-side exterior cosmetics on the Cisco NCS 6008 LCC. We recommend that you install the exterior cosmetic components in the order outlined in this section.

Before performing these tasks, you must first unpack and secure the LCC. See the Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide .

Required Tools and Equipment

- 8-inch, number-1 Phillips screwdriver (magnetic head preferable)

- Two vertical cable troughs (left and right are interchangeable)

- Top cap

- Exhaust plenum bracket

- Power cable bracket

- Three left door hinge attachments

- Three right door hinge attachments

- Rear doors, left and right

- Two door grounding cables

- Rear exhaust air deflector

Steps

To install the rear exterior cosmetics perform the following steps:

Step 1 Attach the left and right vertical cable troughs to the rear of the LCC as shown in the following figure. The two vertical cable troughs are inverted from each other.

Figure 13: Exterior Cosmetic For the Rear of the LCC
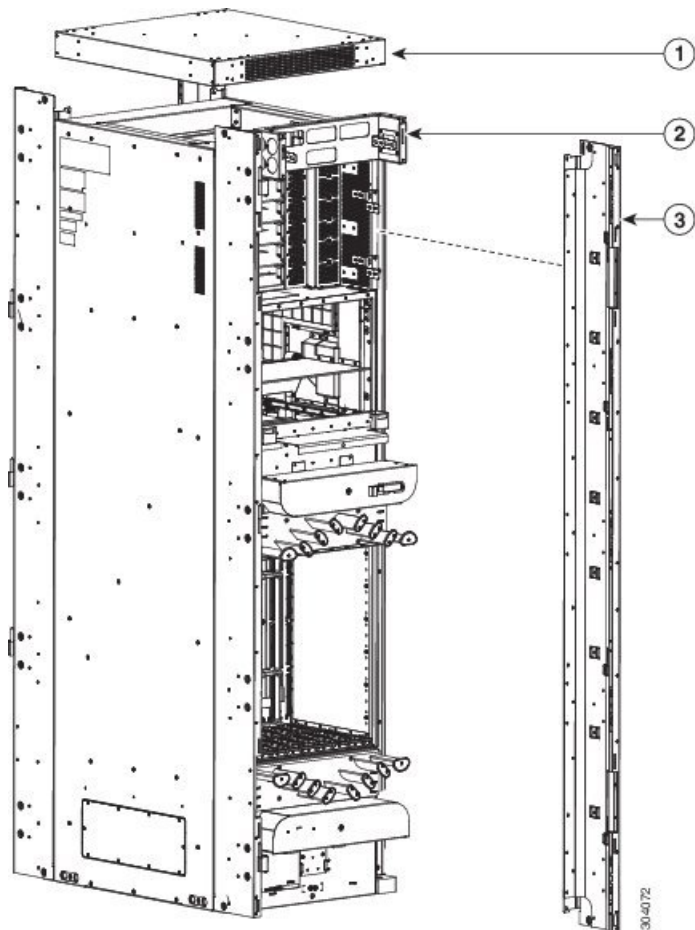
1	Top cap	3	Vertical cable troughs (one per side), each attached to the LCC with eight pan-head screws
2	Exhaust plenum bracket		

Step 2 For each vertical cable trough:

a) Align the guide pins on the rear of the vertical cable trough with the positioning holes on the LCC.

b) Insert eight pan-head screws, and use the screwdriver to tighten them clockwise in order to attach the vertical cable troughs firmly to the rear of LCC. You might need to use a ladder to reach the upper screws.

We recommend that you use two people to attach the vertical cable troughs; one person to hold the vertical cable troughs in place while the other person inserts and tightens the screws.

Step 3 Standing on either side of the LCC, slide the top cap on top of the LCC. Make sure that the perforated side faces the rear of the LCC. The top cap is held in place by one screw from each of the four vertical cable troughs.

Step 4 Attach the exhaust plenum bracket to the LCC (three cutouts facing up) with eight pan-head screws (four on each side).

Step 5   Attach the door hinge attachments, three left and three right, using two pan-head screws each. One hinge is near the top of the LCC, one hinge is near the bottom of the LCC, and one is adjacent to the cable management bracket (see figure below).

Figure 14: Door Hinge Attachments—Rear of Chassis
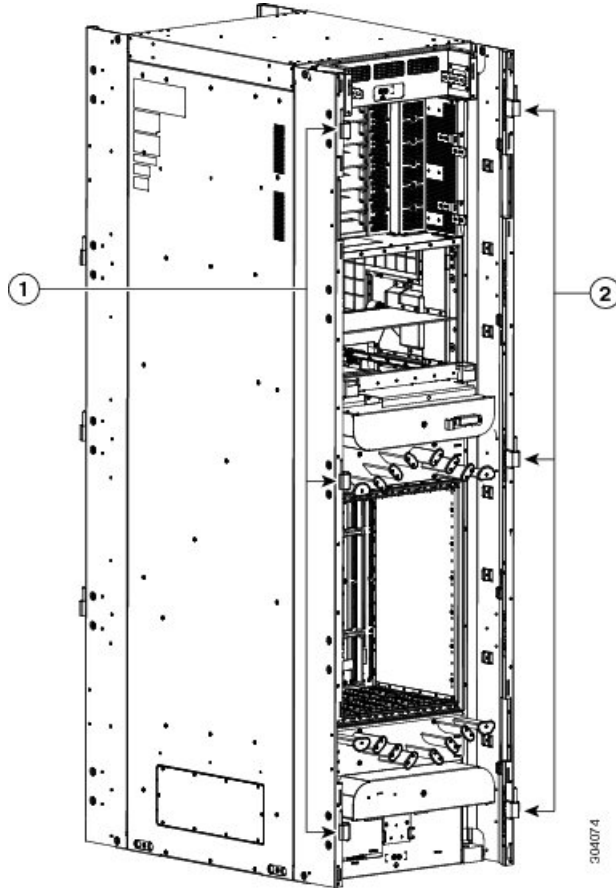
1		Left door hinge attachments	2		Right door hinge attachments

Step 6   Pivot and rotate the flange located behind each door hinge.

Step 7   Attach and orient the rear doors so that the slot on the metal part in the middle of the doors is lined up with the tab on the vertical cable trough. The door will then drop into position onto the hinge attachment pins (see figure below).

Figure 15: Rear Doors
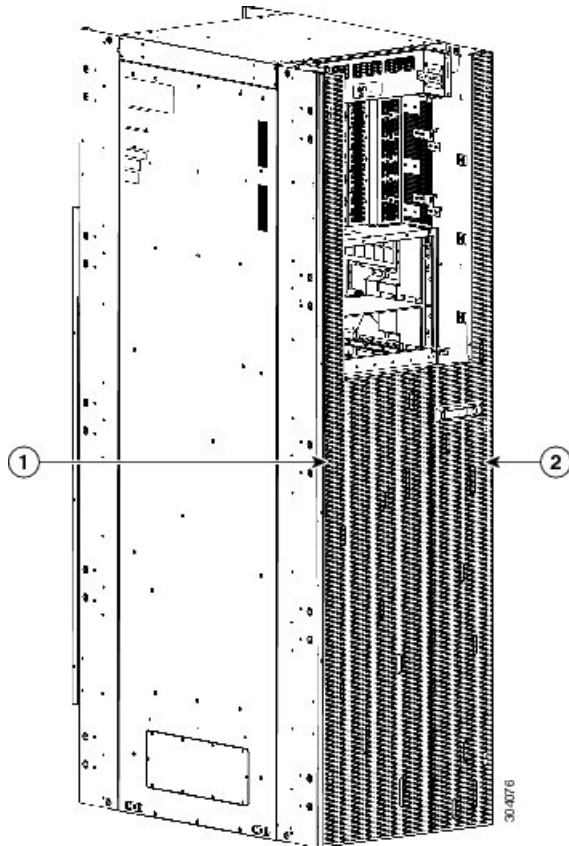
1	Left door	2	Right door

Step 8 Attach one grounding cable to each door, connecting the doors to the vertical cable troughs.

a) Insert and tighten one pan-head screw to attach one end of the ground cable to the inside of the door.

b) Insert and tighten one pan-head screw to attach the other end of the ground cable to the vertical cable trough.

Figure 16: Grounding Cable for Each Door
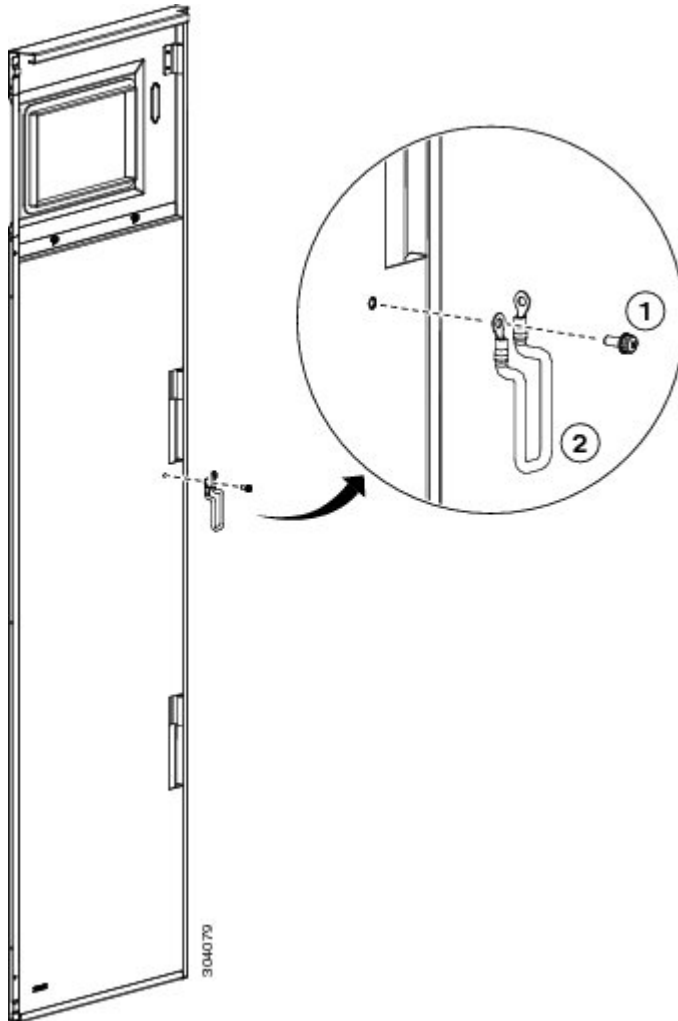
1	Pan-head screw	2	Grounding cable

Step 9 Attach the exhaust air deflector by carefully inserting its mounting tabs into the brackets on the vertical cable troughs. Press the deflector firmly against the vertical cable troughs until it snaps on.

Figure 17: Exhaust Air Deflector on the Rear of the LCC
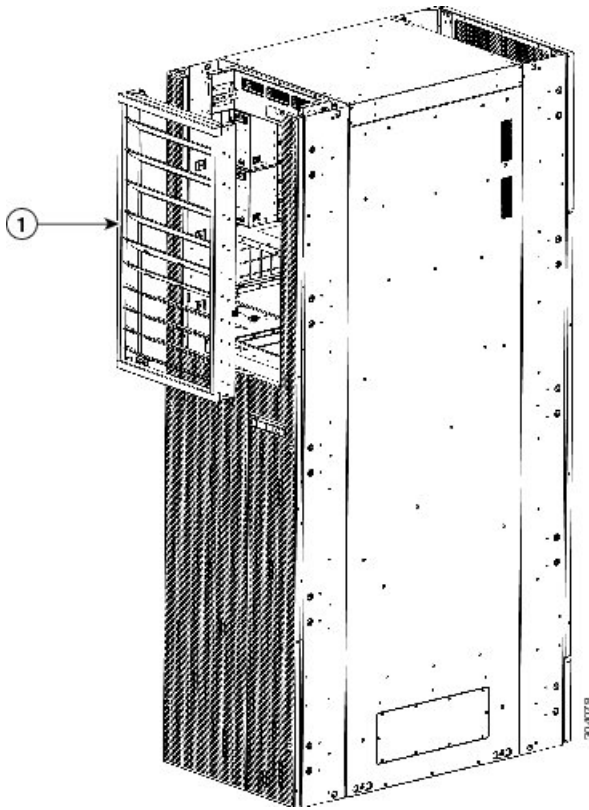
1	Exhaust air deflector

Installing Power Components

This chapter describes how to install the Cisco NCS 6008 LCC power components.

✎

Note   For information about removing power components, see the "Removing the Power Components" section.

Power System Overview

The LCC power system is made up of six AC or DC power trays that contain AC or DC PMs.

Basic Chassis Power Information

The Cisco NCS 6008 LCC can be configured with either an AC input power system or a DC input power system. Site power requirements differ, depending on the source voltage used.

For information about power safety requirements, see the Regulatory Compliance and Safety Information for the Cisco Network Convergence System 6000 Series Routers guide.

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

- Check the power at your site before installation to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner, if necessary.

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

There are two types of power trays: an AC tray and a DC tray. An AC power tray houses up to three AC PMs, while a DC power tray houses up to four DC PMs. It is required that you use only one type of power tray, either AC or DC, in a LCC at a time.

Bonding and Grounding Guidelines

The LCC has two safety earth ground connections. The LCC allows you to connect the central office ground system or interior equipment grounding system to either of the two grounding points on the rear side of the

LCC. Threaded ground inserts are located on a rear panel near the top of the LCC (above the power trays) and near the bottom of the LCC. The grounding points are also referred to as Network Equipment Building System (NEBS) bonding and grounding points.

Figure 18: NEBS Bonding and Grounding Points—Rear Side of LCC
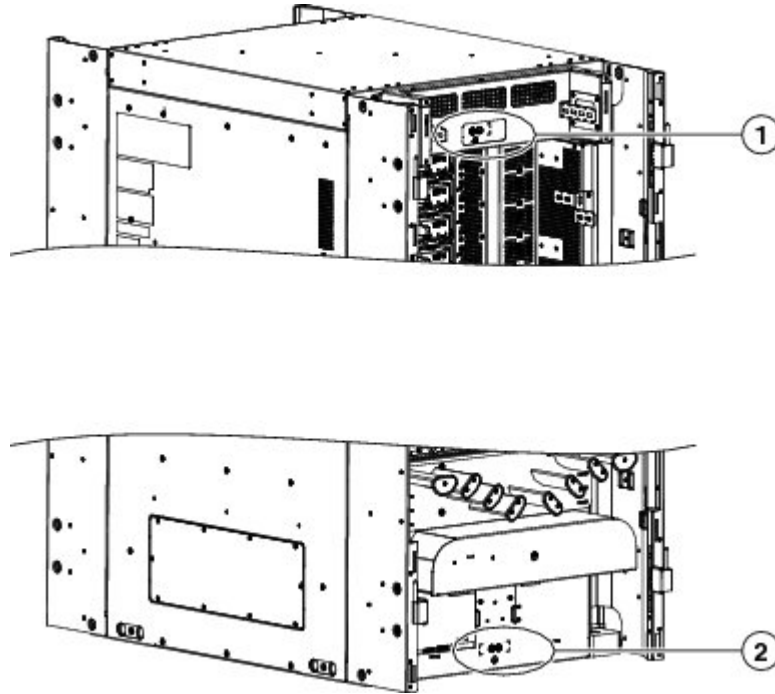
1	NEBS bonding and grounding point (upper)	2	NEBS bonding and grounding point (upper)

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

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

AC Power System

Each AC-powered LCC contains six AC power trays. The upper three AC power trays are contained within power shelf 0 (PS0), and the lower three AC power trays are contained within power shelf 1(PS1). Each power shelf has a Power bus Control Module (PCM) with its own 1/0 power switch. Each AC power tray can contain up to three AC PMs. The AC power trays and PMs are field replaceable.

Each inserted AC PM requires a single-phase, 50 to 60 Hz, 200 to 240 VAC input. Input current is variable and based on facility minimum voltage. For N+N redundancy, power feeds A must power the upper three AC

power trays and power feeds B must power the lower three AC power trays. Not all of the PM bays need to be filled.

The AC power system requires single-phase AC input power to each inserted PM. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco NCS power distribution unit (PDU)* is required to convert 3-phase AC input power to single-phase AC input power system.

Note If you have a 3-phase AC PDU installed, we recommend that you install three AC PMs in each AC power tray 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.

AC Power Distribution Unit

The AC PDU converts 3-phase AC input power to single-phase AC input power that connects directly to the rear of each PM. The AC PDU includes either an AC Delta (NCS-PDU-DELTA) or AC Wye (NCS-PDU-WYE) power interface, and has power input and power output cords entering and exiting the box.

Figure 19: Cisco NCS-PDU
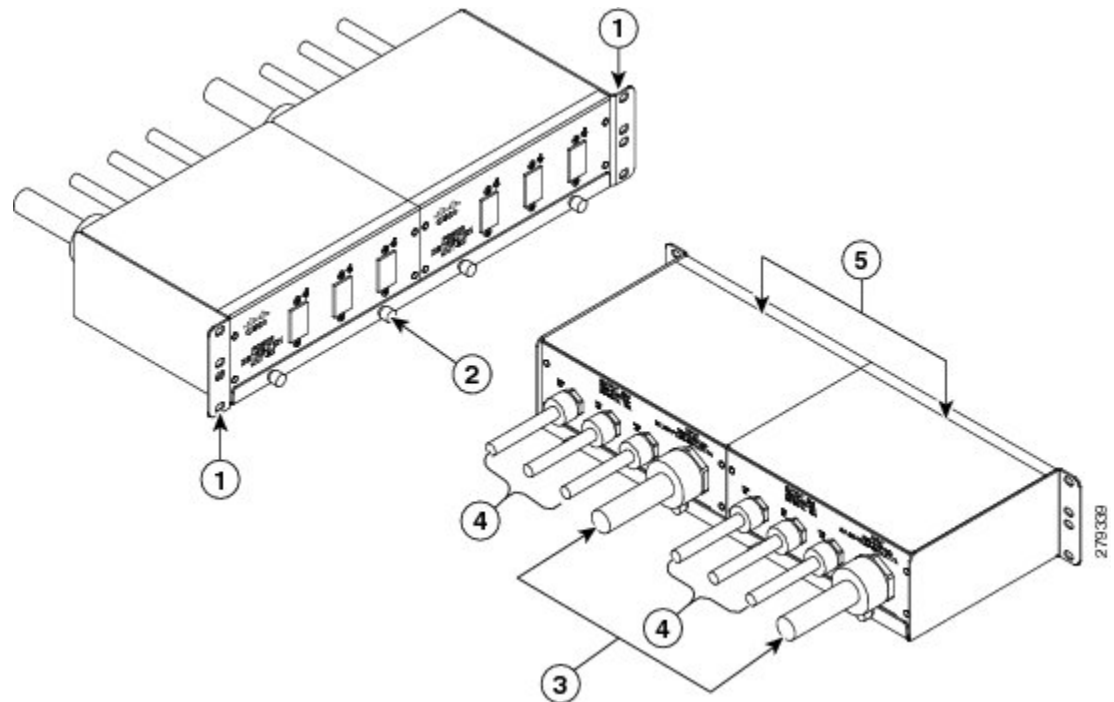
1	Rack mounting ears	4	Output cord
2	Rack tray	5	Two PDUs
3	Input cord		

For detailed information on AC PDUs, see the Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide .

Mounting the AC PDU

The AC PDU mounting bracket holds three AC PDUs. An AC PDU mounting bracket can be attached to the left and right sides of the LCC. The mounting brackets are attached to the chassis sides with the existing screws that hold the side panels on. The PDUs are attached to the mounting brackets with four M5 screws per AC PDU.

Figure 20: AC PDU Bracket Attached to the Side of the LCC
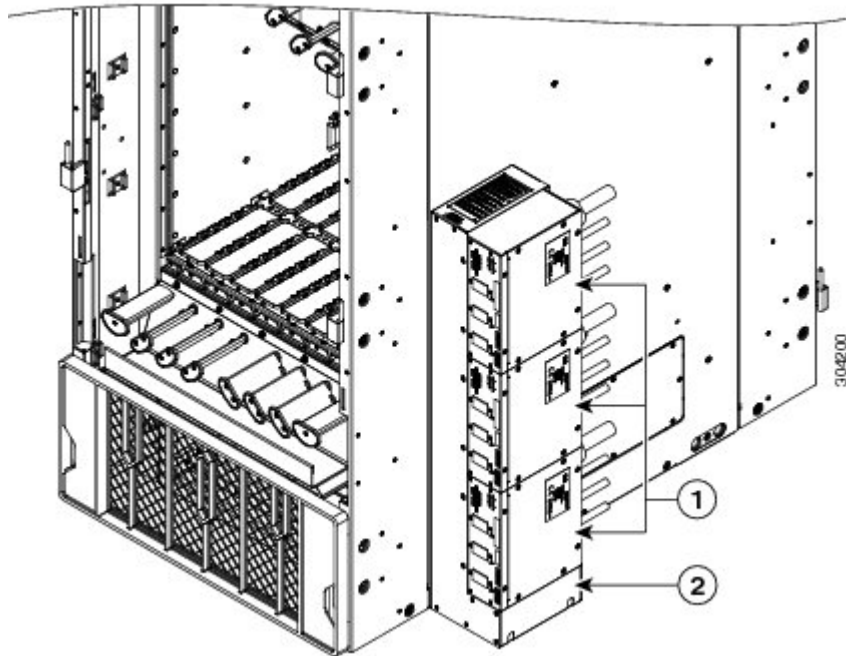
1	AC PDUs
2	Bracket

Optionally, you can mount the AC PDU in an external 19-inch rack by using six pan-head screws.

Figure 21: Mounting the AC PDU in an External 19-Inch Rack
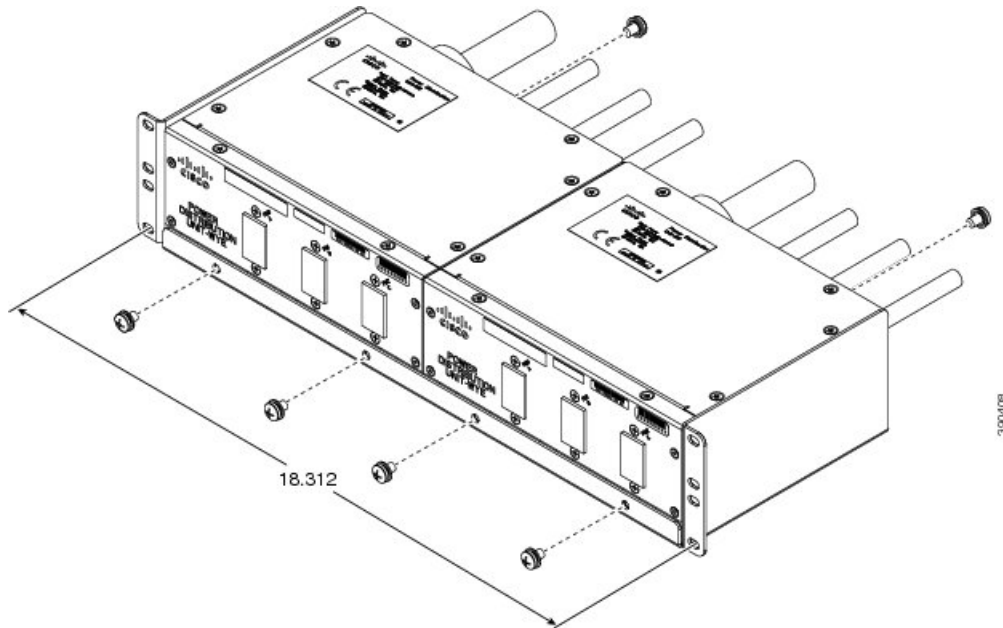
Tie-Down Bar and Cable Clamps

A 19-inch tie-down bar can be used to add strain relief for input power cables from the AC PDUs or cables routed from a raised floor. The following figure shows holes for two 10-32 x 0.50 inch screws that are pre-drilled on the top cap for attaching a tie-down bar.

Figure 22: 19″ Tie-Down Bar
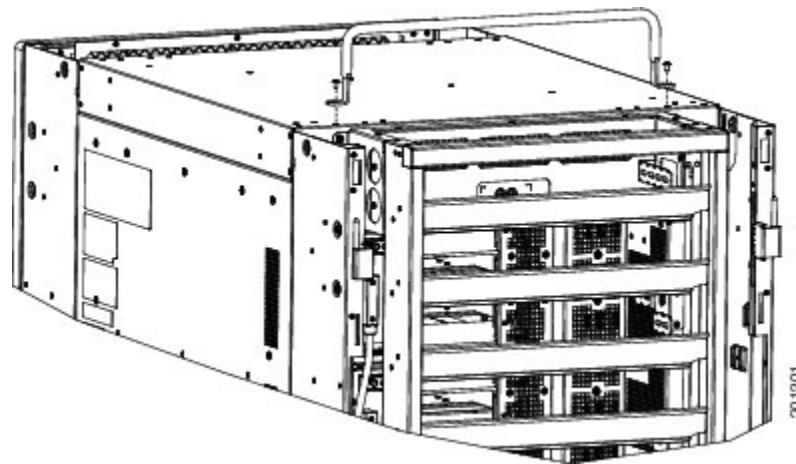
Optionally, you can install cable clamps on the top of the LCC to secure multi-fiber cables to the LCC. We recommend installing two cable clamp brackets with two stacked clamps on each bracket (four clamps for each trough), however you can configure the number of clamps according to your configuration.

Figure 23: Optional Cable Clamps for Multi-Fiber Cables
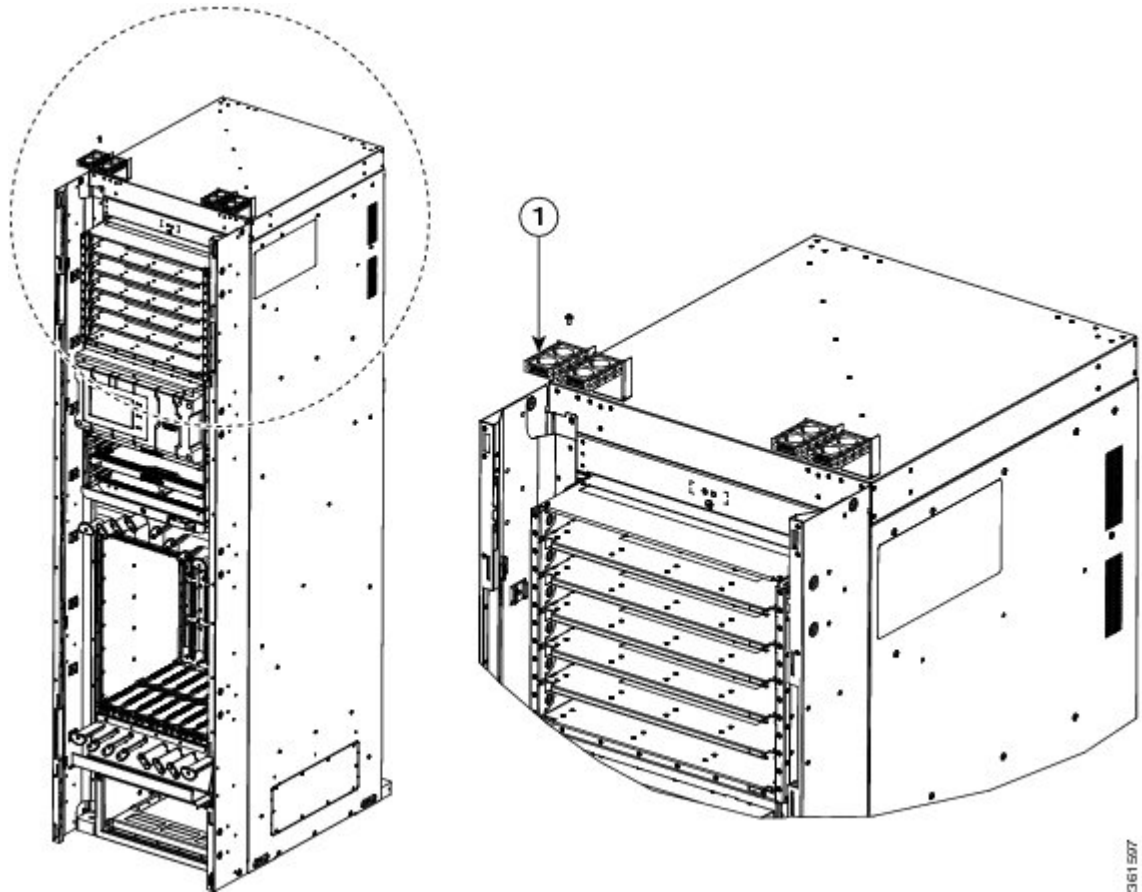
1	Cable clamps

DC Power System

Each DC-powered LCC contains six DC power trays. The upper three DC power trays are contained within power shelf 0, and the lower three DC power trays are contained within power shelf 1 (Each power shelf has a PCM with its own 1/0 power switch) Each DC power tray can contain up to four DC PMs. The DC power trays and PMs are field replaceable.

For N+N redundancy, power feeds A must power the upper three DC power trays and power feeds B must power the lower three DC power trays. Not all of the PM bays need to be filled.

This table lists the DC input current and voltage specifications.

Table 3: DC Input Current and Voltage Information

Nominal input voltage	–48 VDC or –60 VDC (tolerance range: –40 to –72 VDC)
Input line current	50 A maximum at –48 VDC
	40 A maximum at –60 VDC
	60 A maximum at –40 VDC

Each wiring block on the DC power tray 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 a power tray with a torque of 45 to 55 in-lb (5.1 to 6.2 N-m). The terminal block supports 2-6-AWG input wire.

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

Note An "allpole" separation of the power source is not required. The DC PM is an isolated DC/DC converter with no galvanic connection between "L+" and the LCC. In addition, the "L+" potentials of each PM are isolated from each other.

The power supply terminal posts are centered 0.63 inches (16 mm) apart and are 1/4-20 thread. We recommend that you use an appropriately sized 90-degree angle, industry-standard, dual-hole, standard barrel compression lug.

Figure 24: 90-Degree Angle Standard Barrel Compression Lug
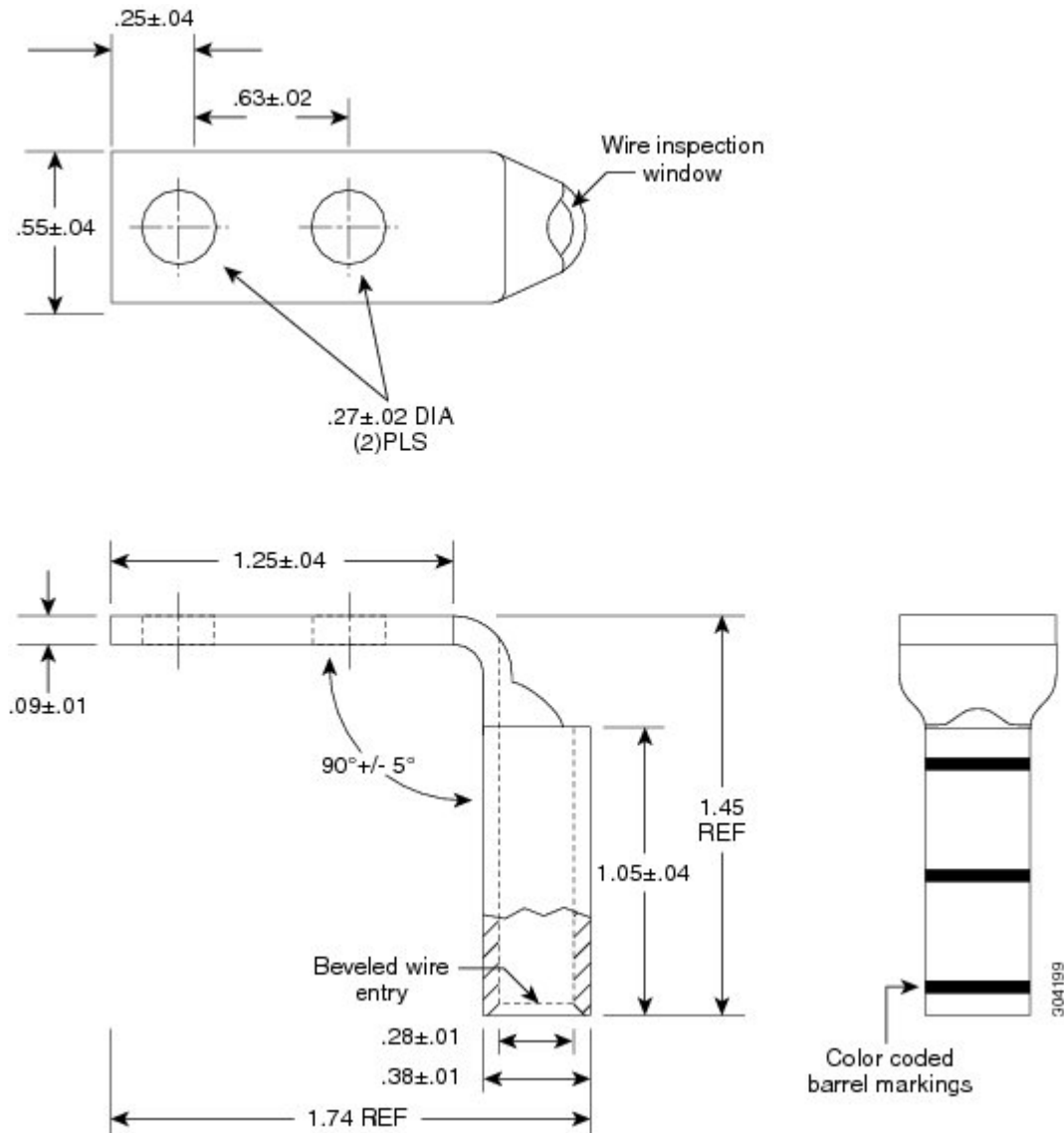
DC Input-Power-Present LEDs

The DC input-power-present LED provides a visual indication that there is voltage present across the input terminal connection. The DC input-power-present LED starts to light up when the input voltage reaches –20 VDC, gets brighter as the voltage increases, and is fully lit when the input voltage reaches –48 VDC.

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

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

Figure 25: DC Power Module Status Indicators
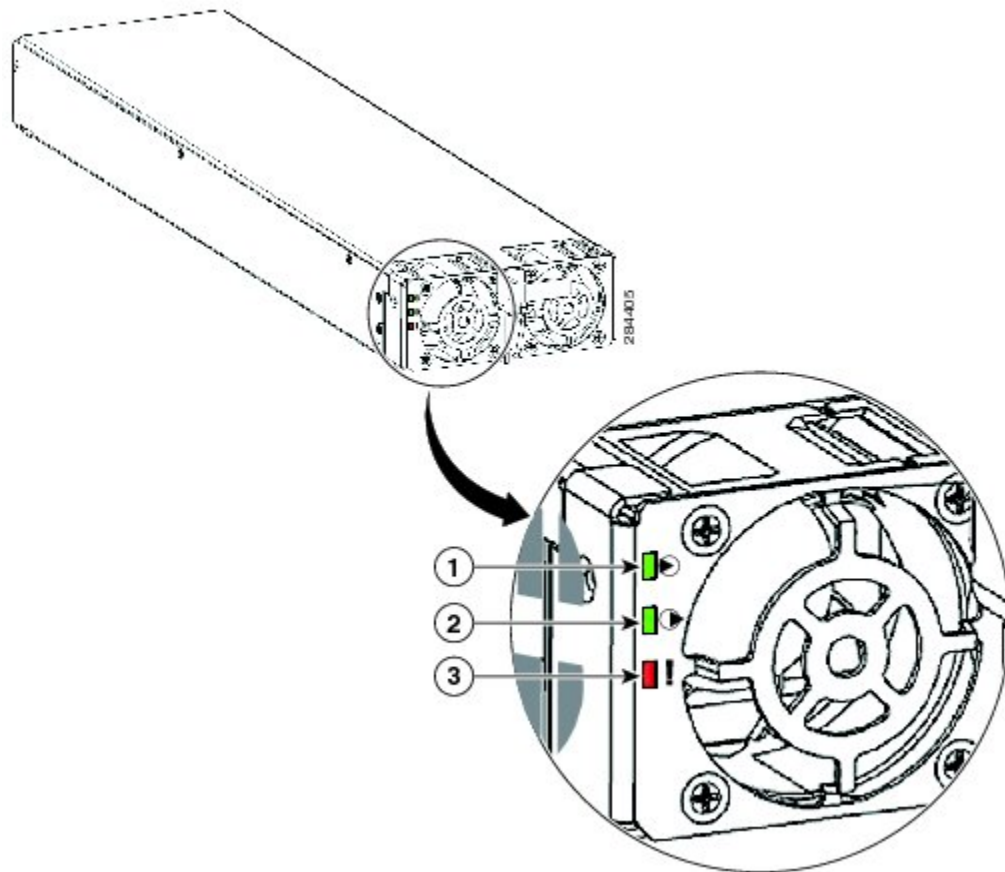
1	Input OK LED	ON when input voltage is present and within the correct range
2	Output OK LED	ON when output voltage is present
3	Fault LED	ON when an internal fault has occurred on the PM

AC Input-Power-Present LEDs

The AC input-power-present LED provides a visual indication that there is voltage present across the input terminal connection. The AC input-power-present LED lights up when the input voltage reaches within the acceptable range.

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

Figure 26: AC Power Module Status Indicators
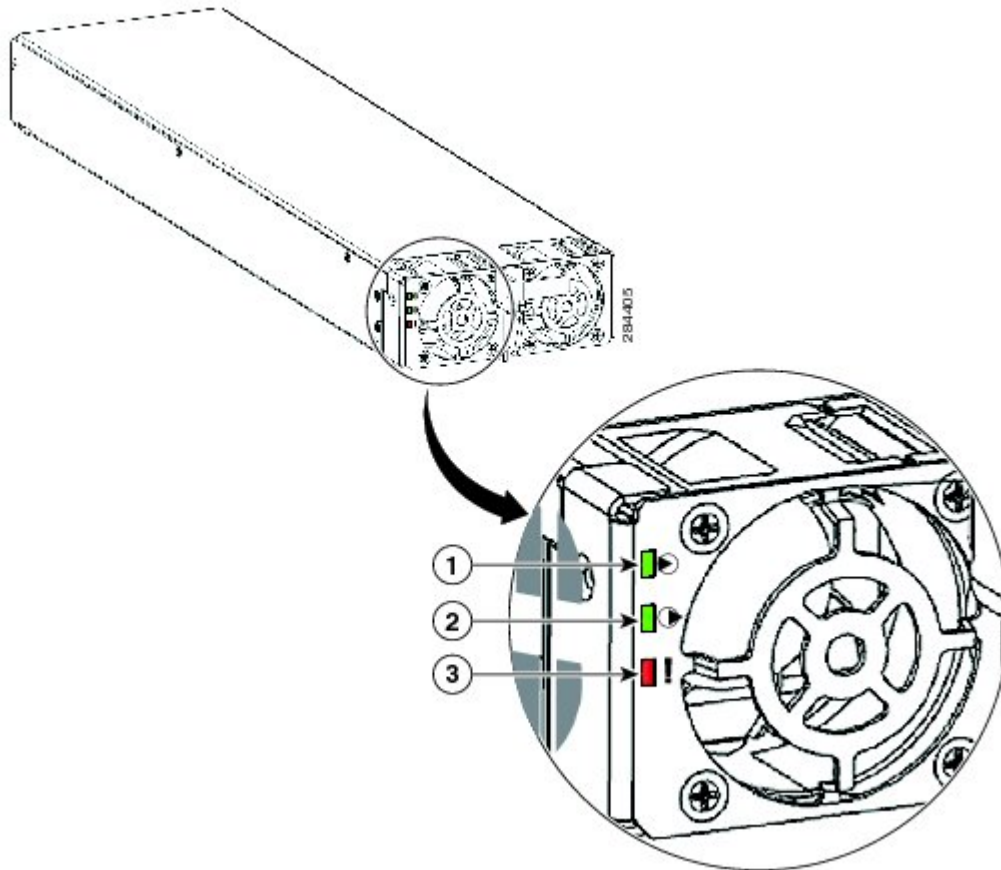
1	Input OK LED	ON when input voltage is present and within the correct range
2	Output OK LED	ON when output voltage is present
3	Fault LED	ON when an internal fault has occurred on the PM

Installing Power Components

This section describes how to install power components in the Cisco NCS 6008 LCC.

> **Note** Although there are differences between the AC and DC power trays and PMs, they are installed using the same procedures.

We recommend that you install the power components in the order outlined in this section.

Installing the LCC Ground Cable

This section describes how to install a ground cable to either NEBS bonding and grounding point on the rear of the Cisco NCS 6008 LCC.

Required Tools and Equipment

- Ground lug

- Ground cable

- Crimping tool and lug specific die

- 3/8-inch drive socket wrench

- 10-mm 6-pt. socket

- 3/8-inch drive torque wrench rated to include 30 in-lb (3.39 N-m)

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

- One 180-degree angle (straight) grounding lug that has two M6 bolt holes with 0.63 inch (16 mm) spacing center to center between them, and a wire receptacle able to accept a 2-6-AWG multistrand copper wire (see below figure).

- Four M6 bolts with integrated square cone locking washers (shipped pre-installed on the LCC, two at each grounding point).

- We recommend 2-6-AWG multistrand copper ground cable. This cable is not available from Cisco; it is available from any commercial cable vendor such as Panduit (see http://www.panduit.com). 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 LCC (DC-I: Isolated DC Return).

Figure 27: 180-Degree Angle Straight Barrel Grounding Lug
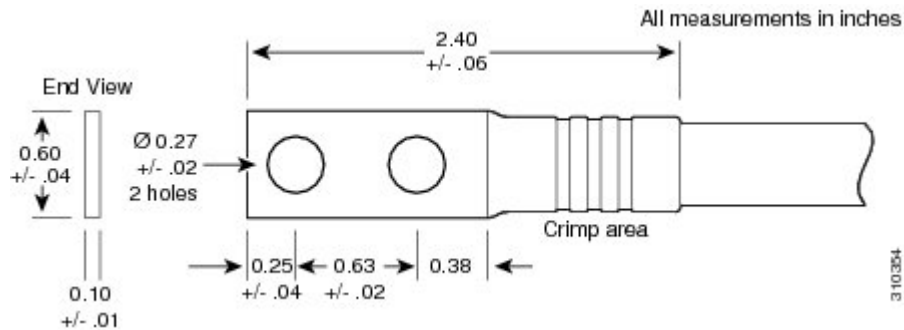
Steps

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

Step 1 Use the crimping tool mandated by the lug manufacturer to crimp the lug to the ground cable.

Step 2 Use the socket wrench to attach the lug and ground cable to either grounding point (see below figure).

Note The two bolts below each NEBS bonding and grounding point are required for proper bonding and grounding of the LCC and should not be removed.

Figure 28: Attaching to Either NEBS Bonding and Grounding Point
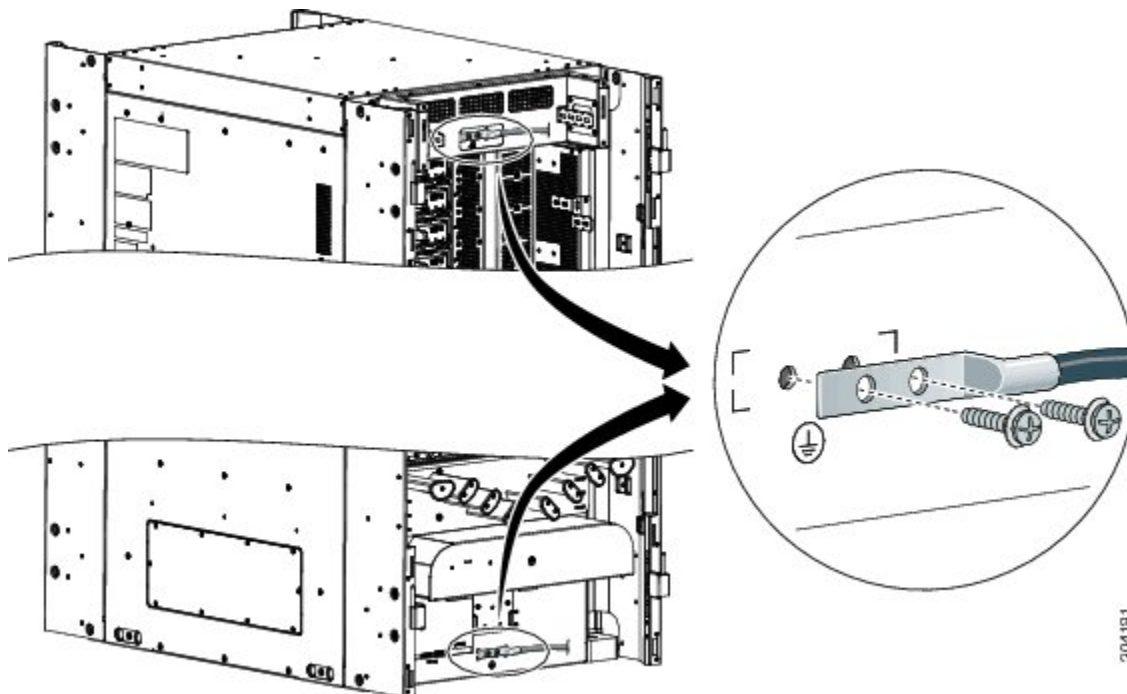
Step 3 Use the torque wrench to tighten the bolts to a torque of 30 in-lb (3.39 N-m).

Step 4 Connect the other end of the ground cable to a grounding point at your site, according to site requirements.

Installing an AC or DC Power Tray (Preinstalled)

AC or DC power trays are preinstalled in the shipped LCC. During normal operation, they should not have to be removed. However, they are field serviceable units (FRUs). If they need replacement, see the Removing an AC or DC Power Tray.

This section describes how to install an AC or DC power tray in the Cisco NCS 6008 LCC. Although there are differences between AC and DC power trays, they are installed by using the same procedures as described below. Once they are installed into a LCC that is properly grounded, external grounding to the power tray is not needed.

The following figures show the front and rear of an AC power tray.

Figure 29: AC Power Tray—Front View
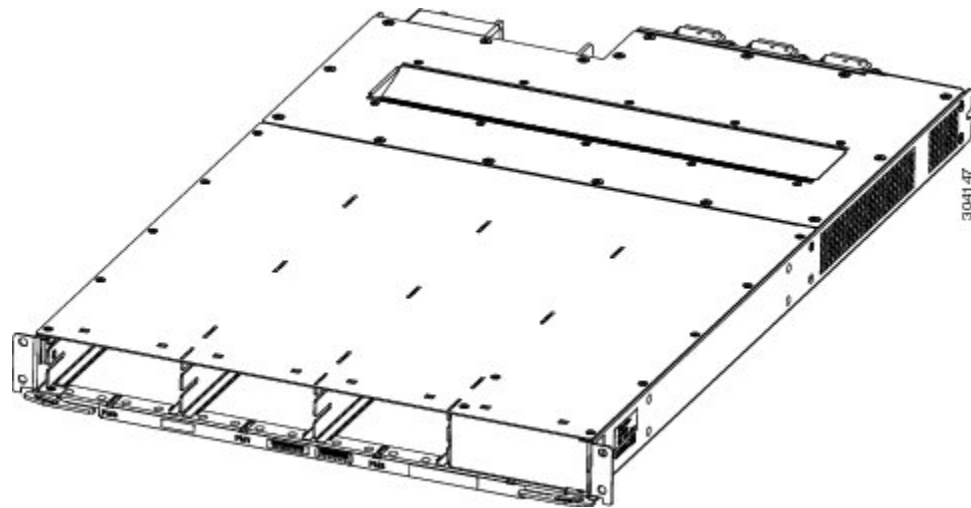
Figure 30: AC Power Tray—Rear View
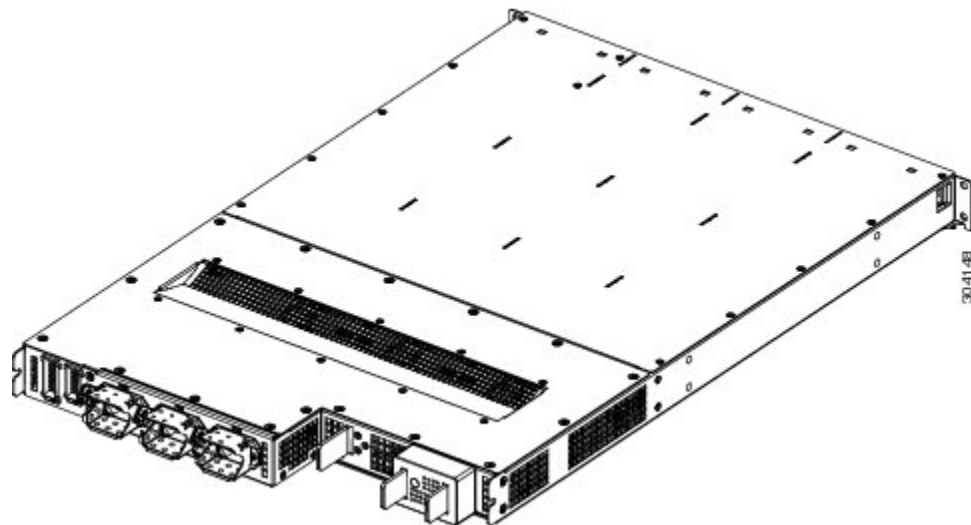
The following figures show the front and rear of a DC power tray.

Figure 31: DC Power Tray—Front View
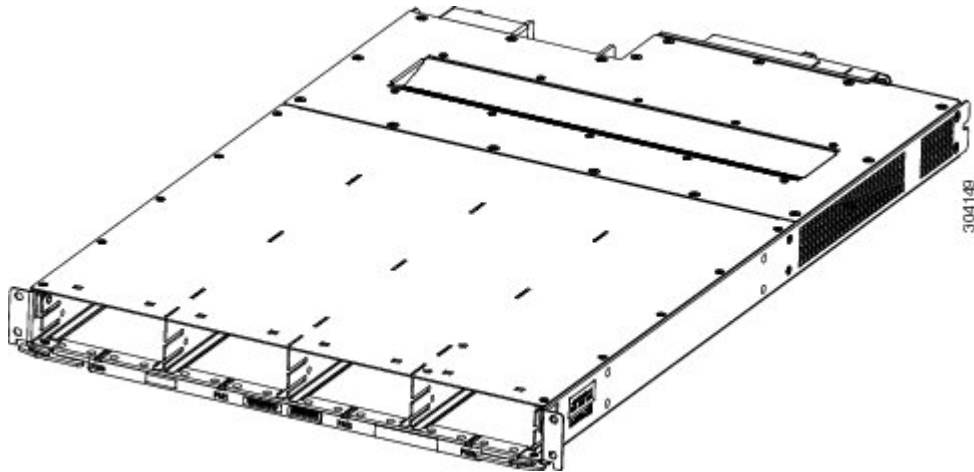
Figure 32: DC Power Tray—Rear View (Clear Plastic Safety Cover Removed)
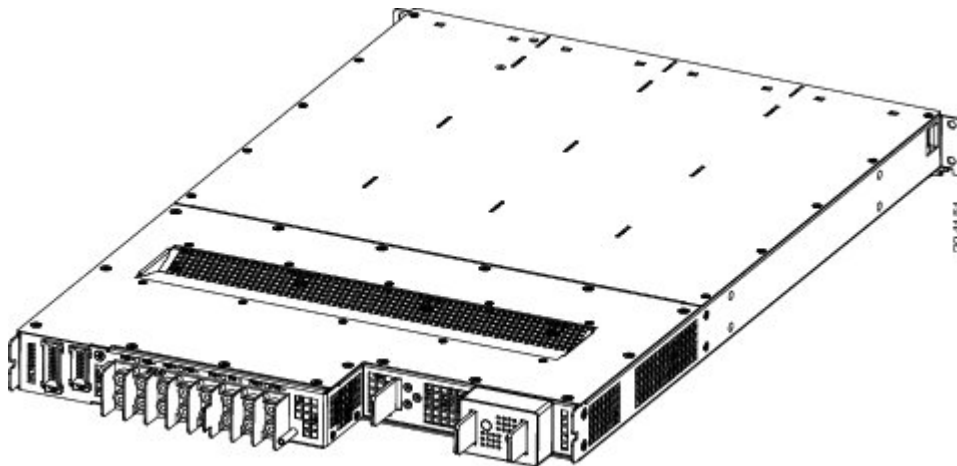
Prerequisites

Before you reinstall an AC or DC power tray, do the following:

- Power off the power shelf that houses the power tray you are about to install by using the 1/0 power switch on the respective PCM.

- Completely power off the entire system at the supply circuit breakers before installing a power tray.

- Remove the top grilles from both the front and rear sides of the LCC, if installed.

- Ensure the power tray you are about to install is empty. Do not install a power tray into the LCC with PMs already installed in the power tray.

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Caution The I/O switch on each power shelf only disables the output of the PMs in that shelf. The inputs to the PMs remain hot, as well as the system's internal busbar (due to the other power shelf).

Required Tools and Equipment

- Four M4 x 10 mm screws per power tray

- 6-inch, number-2 Phillips screwdriver

- Torque screwdriver with number-2 Phillips head and torque rated up to 55 in-lb (6.2 N-m)

- AC or DC power tray

    - AC power tray (Cisco PID NCS-AC-PWRTRAY=)

    - DC power tray (Cisco PID NCS-DC-PWRTRAY=)

Steps

To install an AC or DC power tray, perform the following steps:

Step 1 Using two people, one to support the power tray underneath and the other to keep it steady, lift the power tray up and slide it partially into a power tray slot on the front side of the LCC.

Caution Because of the weight of a power tray, 20 lb (9 kg), and the height at which a power tray is installed in the LCC, you should be especially careful while removing and carrying a power tray. To prevent injury, avoid sudden twists or lateral moves.

Step 2 Grasping both handles simultaneously, push both the left and right handles in at the same time to push the tray into the LCC. Slide the tray all the way into the LCC, until both power tray handles hook around the pins.

Caution Use care not to bend the handles.

Figure 33: Installing a Power Tray into the LCC
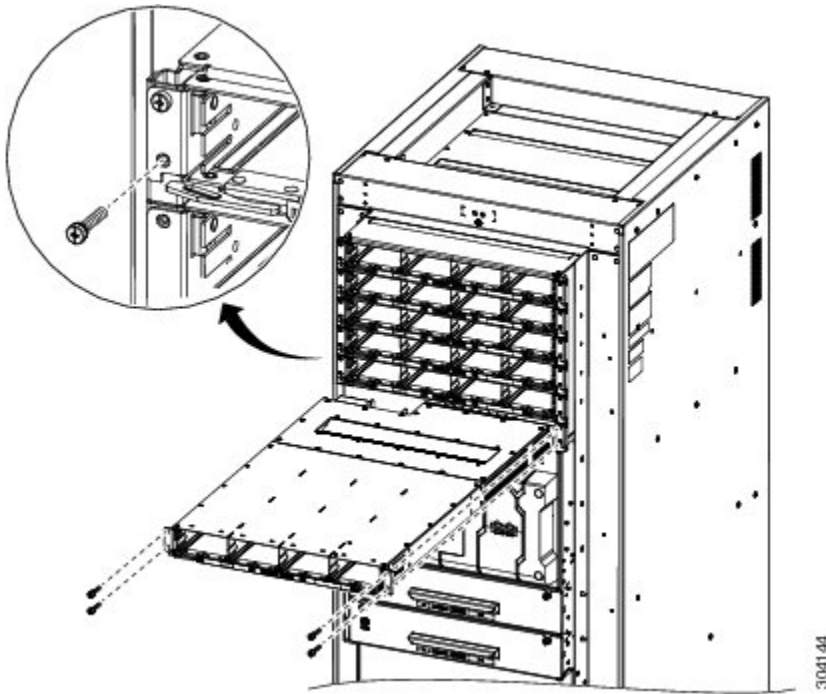
Step 3 Use the screwdriver to tighten the four M4 x 10 mm screws that attach the power tray to the LCC.

Step 4 Use the torque screwdriver to tighten the four screws to a torque value of 15 in-lb (1.69 N-m) to 20 in-lb (2.26 N-m).

Note The screws that attach a power tray to the LCC are relied upon for power tray bonding and grounding.

Installing an AC or DC Power Module

This section describes how to install AC or DC PMs into power trays in the Cisco NCS 6008 LCC. Although there are differences between the AC and DC PMs, they are installed using the same procedures.

The following figures show the front and rear of the AC PM.

Figure 34: AC Power Module—Front View
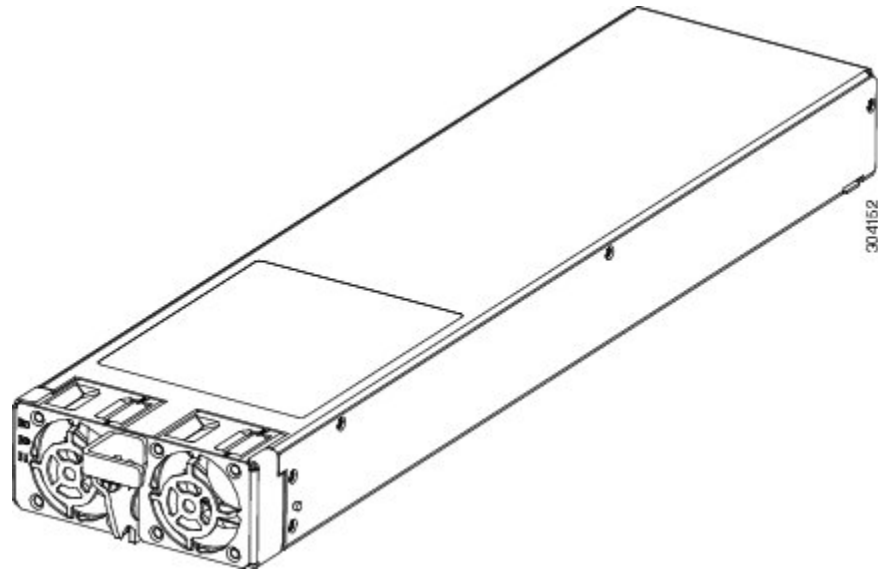
Figure 35: AC Power Module—Rear View
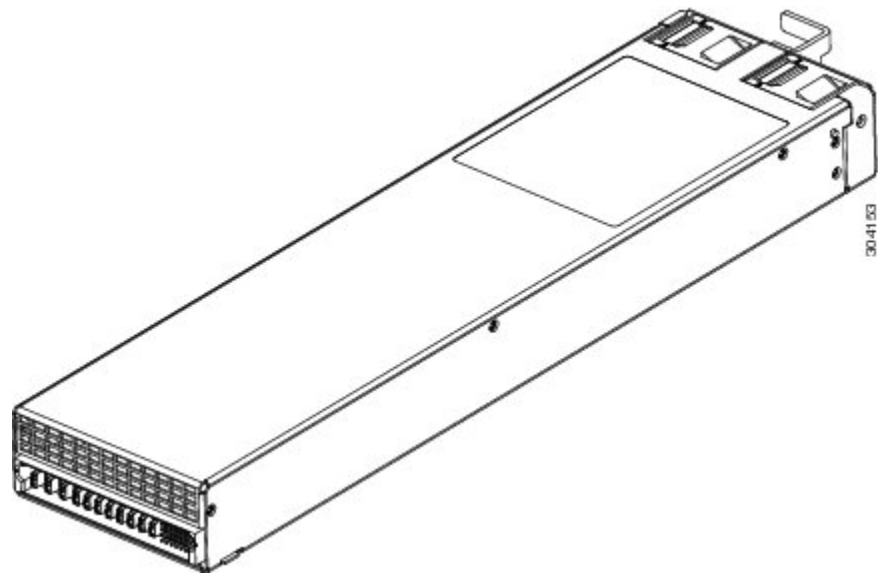
The following figures show the front and rear of the DC PM.

Figure 36: DC Power Module—Front View
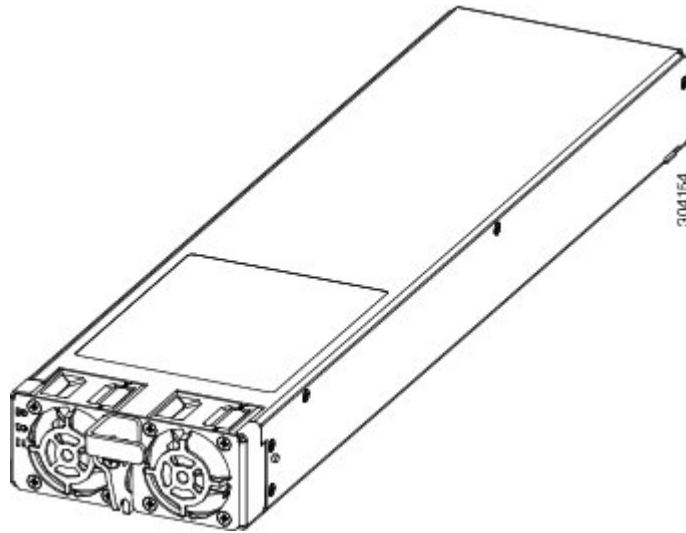
Figure 37: DC Power Module—Rear View
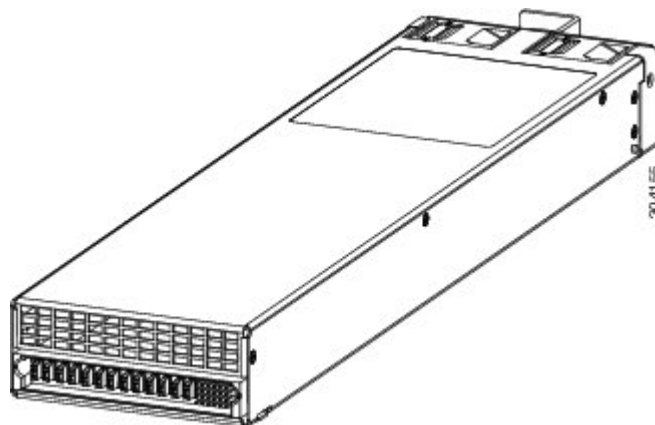
Each PM has three status LEDs located on the front left side of its faceplate. See the follow table for the meaning of each status LED.

Figure 38: AC and DC Power Module Status LEDs
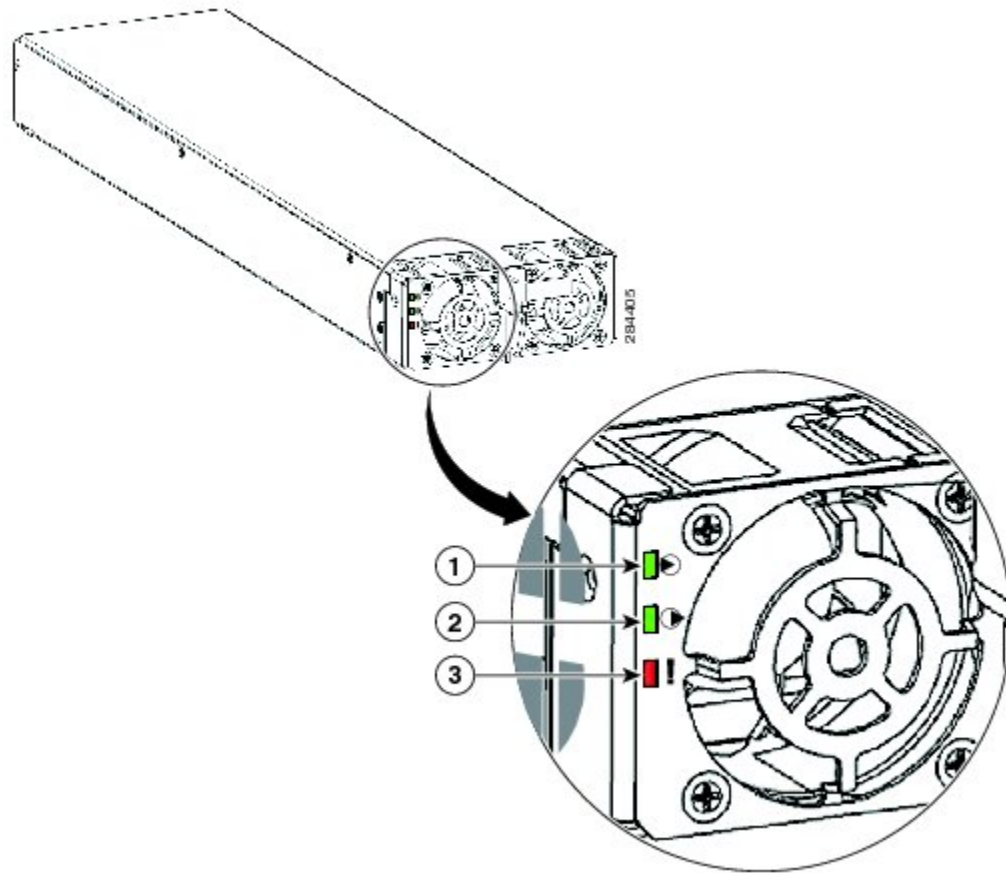
1	Input OK LED
2	Output OK LED
3	Fault LED

Table 4: Power Module LED Status Indicator Lights

LED Name	Color	Meaning
Input OK	Green	• On: The input voltage is present and within regulation range. • Blinking: The input voltage is present but out of regulation range. • Off: The input voltage is not present.
Output OK	Green	• On: The output voltage is on. • Blinking: The PM is in a power limit or Over Current condition. • Off: The output voltage is off.

LED Name	Color	Meaning
Fault	Red	• On: An internal fault is detected within the PM. • Off: No internal faults detected on the PM.

Prerequisites

- Installing the LCC Ground Cable, on page 37

- Installing an AC or DC Power Tray (Preinstalled), on page 39

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Caution   Do not attempt to install the PM until the power tray is in place and screwed into the LCC.

Related Topics

Installing an AC or DC Power Tray (Preinstalled), on page 39

Required Tools and Equipment

- ESD-preventive wrist strap

- 6-inch, number-1 Phillips screwdriver

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

- AC or DC PM

    - AC PM (Cisco PID PWR-3KW-AC-V2)

    - DC PM (Cisco PID PWR-2KW-DC-V2)

Steps

✎

Note   Power modules are keyed to prevent incorrect insertion.

To install a PM into a power tray, go to the front of the LCC and perform the following steps:

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the LCC (see Preventing Electrostatic Discharge, on page 9). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC.

Step 2   Using two hands to support and guide the PM, slide it into the power tray (see figure below).

Note   Though a PM can be inserted into any empty PM bay in any power tray, during the initial installation, install a PM into PM0 in PT0 first. Next, install PMs in ascending order into the remaining PM bays in PT0. Then, install PMs in ascending order into the remaining power trays.

Step 3   Rotate the ejector lever upwards to seat the PM into the power tray.

Step 4   Tighten the ejector lever screw to a nominal installation torque of 5.5 in-lb (0.62 N-m). Do not exceed a maximum installation torque of 10 in-lb (1.13 N-m).

Figure 39: Installing a PM into a Power Tray
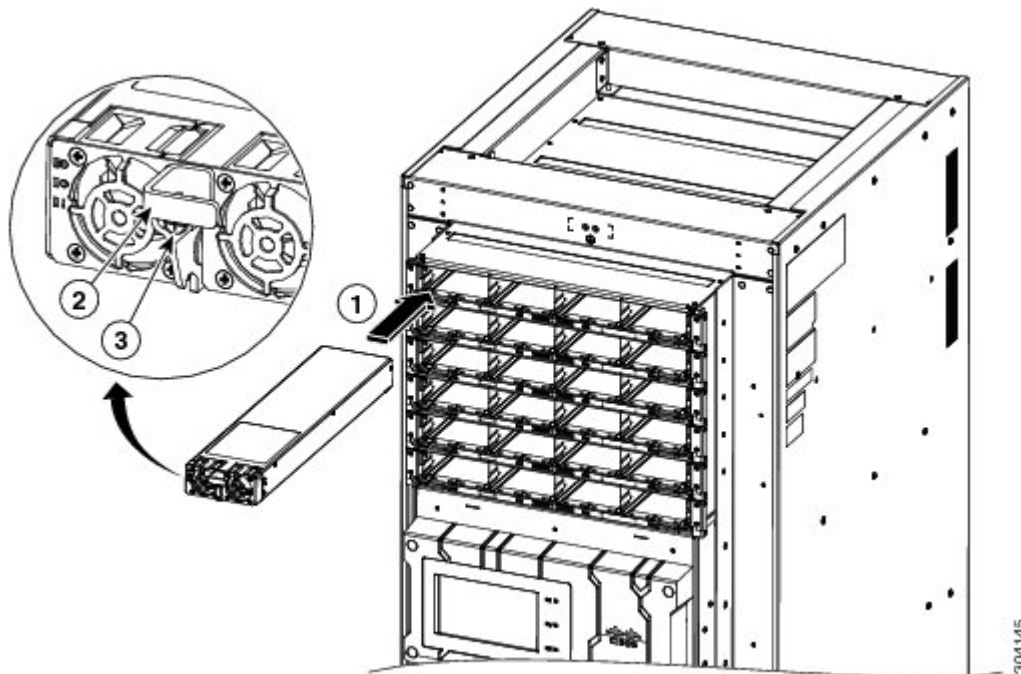
1	Insert the PM
2	Ejector lever
3	Ejector lever screw

Step 5   Fill the power tray, in PM ascending order, to the required configuration.

Step 6   If necessary, repeat these steps for the remaining power trays.

Installing a Power Module Slot Cover

This section describes how to install a PM slot cover into an empty PM slot.

Prerequisites

Before performing this task, you must remove the cosmetic grilles and install the PMs to the required configuration in each power tray.

Required Tools and Equipment

• ESD-preventive wrist strap

• 6-inch, number-1 Phillips screwdriver

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

• AC or DC PM

   • AC PM (Cisco PID PWR-3KW-AC-V2)

   • DC PM (Cisco PID PWR-2KW-DC-V2)

Steps

To install a PM slot cover in a power tray, perform the following steps:

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the LCC (see Preventing Electrostatic Discharge, on page 9). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC.

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

Step 3 Insert the two tabs on the top of the PM slot cover into the two holes on the top of the PM slot (See figure in Step 4).

Step 4 Push in the top of the PM slot cover gently until it clicks into place.

Figure 40: PM Slot Cover on the Front of a Power Tray
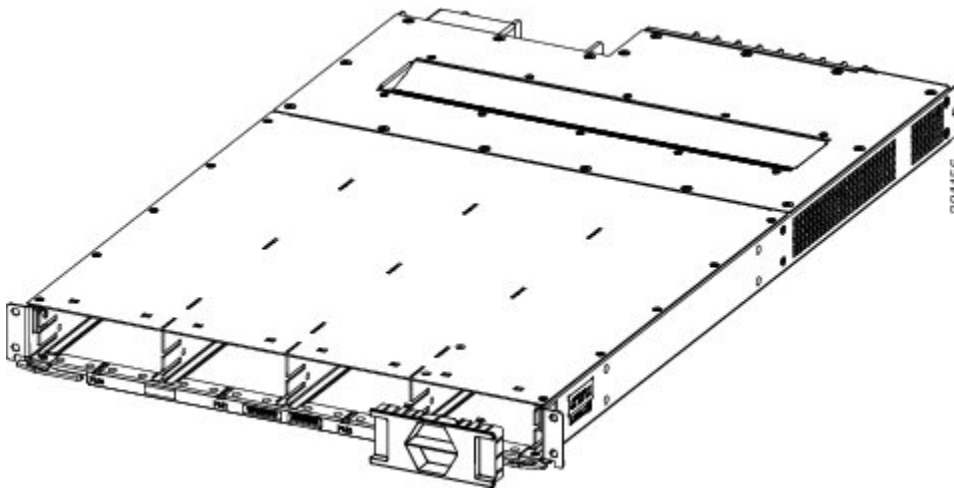
Installing AC Input Power Cords

This section describes how to connect the AC input power cords to the power modules.

Prerequisites

> **Note** Before connecting AC input power cords to the power system, make sure that the input power cords are not energized.

> **Note** Ensure that there is a readily accessible disconnect device incorporated in the building's installation wiring.

> **Note** The circuit breaker and fuse lockout procedures should follow the rules and regulations in the National Electrical Code (NEC) and any local codes.

> **Note** The AC power system requires single-phase AC input power to each PM. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco NCS 6008 LCC Power Distribution Unit (PDU)* is required to convert 3-phase AC input power to single-phase AC input power (Cisco PID NCS-PDU-DELTA or NCS-PDU-WYE). For more information, see the Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide .

Required Tools and Equipment

- 6-inch, number-1 Phillips screwdriver

- AC input power cords, depending on locale (see System Product IDs)

Steps

To install the AC input power cords and perform the following steps:

Step 1 On the rear of the LCC, insert the cord plug into the cord clamp following the labeling on the phase assignments from the PDU or the labeling on the single-phase power cords.

Step 2 Use the screwdriver to secure the screw that clamps the cord plug in place.

Figure 41: AC Input Power Cords Connected to the Power Tray
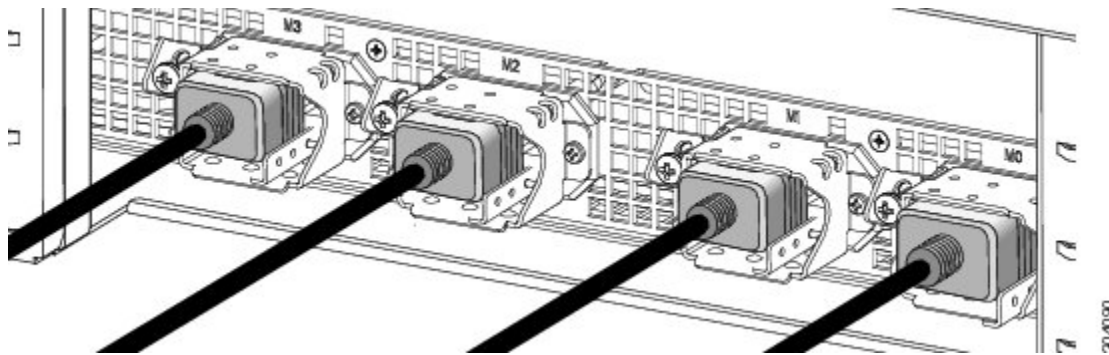
Installing DC Input Power Cables

This section describes how to connect DC input power cables and install DC terminal block covers. The DC terminal block cover is one piece that covers all four DC connections per tray.

This figure shows DC input power cabling. In this example, the cabling for power shelf 0 (power trays 0,1,2) route to the left. The cabling for power shelf 1 (power trays 3,4,5) route to the right.

Figure 42: DC Input Power Cabling
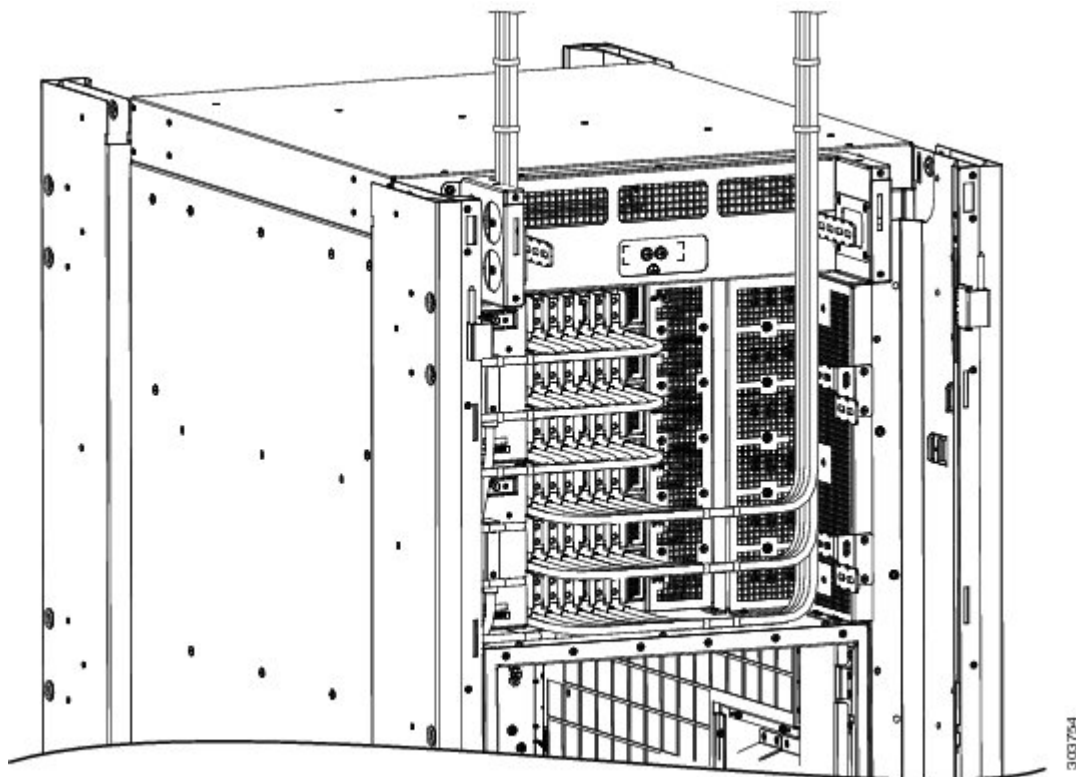
Prerequisites

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

Note Ensure that there is a readily accessible disconnect device incorporated in the building's installation wiring.

Note The circuit breaker and fuse lockout procedures should follow the rules and regulations in the National Electrical Code (NEC) and any local codes.

Required Tools and Equipment

- DC power cables

- DC power cable lugs

- Crimping tool and lug-specific die

- 3/8-inch ratchet wrench with 7/16-pt. socket

- Multimeter

- Torque wrench with torque value rated up to 55 in-lb (6.2 N-m)

- Terminal block cover

- Torque screwdriver with number-1 Phillips head 8-inch shank, and a torque rating of 5 to 7 in-lb (0.56 to 0.79 N-m)

Steps

To connect DC input power cables, go to the rear of the LCC and perform the following steps:

Step 1 Remove any DC terminal block covers, if installed.

Figure 43: DC Terminal Block Cover Installed on Rear of Power Tray
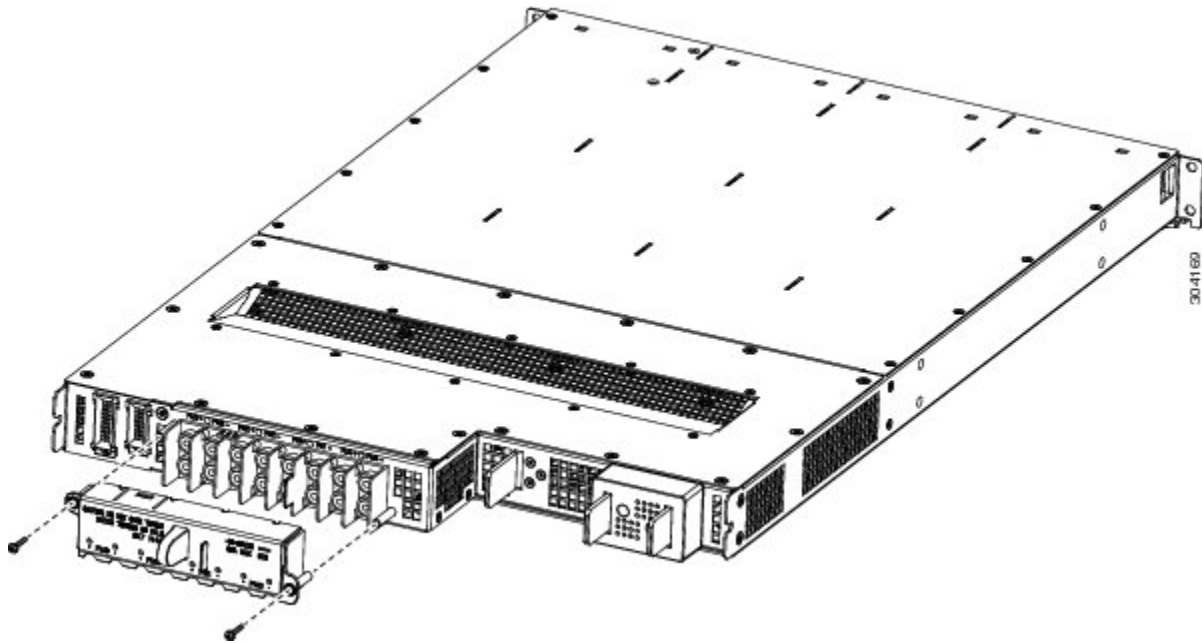
Step 2 Verify the following resistance values:

- 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 tray must be greater that 10 Mohm.

- The resistance between each negative terminal stud and bare metal surface on the power tray must be greater that 10 Mohm.

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

Step 3 Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC input cables. For details on lugs, see the DC Power System, on page 32.

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

Note The power supply terminal block lug width is 0.60 inches (1.50 cm). The terminal posts are centered 0.63 inches (16 mm) apart and are 1/4-20 thread. We recommend that you use an appropriately sized 90-degree, industry-standard, dual-hole, standard barrel compression lug.

Step 4 Using the wrench, attach the positive and negative cable pairs to each terminal block on the power tray (PT0). Start with PM0 (located on the right side) and move left, finishing with PM3 (located on the left side). Use the torque wrench to tighten to a torque of 45 to 55 in-lb (5.1 to 6.2 N-m).

Step 5 Align the DC terminal block cover with the cover latch tab.

Step 6 Slide the terminal block cover upwards to align the screw with the mounting standoff.

Step 7 Use the screwdriver to secure the screw into the mounting standoff and tighten to a torque of 5 to 7 in-lb (0.56 to 0.79 N-m).

Step 8   If necessary, repeat these steps for all power trays.

Powering On and Powering Off the LCC

This section describes how to power on and power off an AC or DC powered system.

Powering On the LCC

Prerequisites

>   • Installing the LCC Ground Cable
>
>   • Installing an AC or DC Power Tray (Preinstalled)
>
>   • Installing an AC or DC Power Module
>
>   • Installing AC Input Power Cords
>
>   • Installing DC Input Power Cables

Note   If you have a DC power system installed, wiring at the Battery Distribution Fuse Bay (BDFB) or at the power plant should be complete.

Required Tools and Equipment

>   • Voltmeter

Steps

To power on the LCC, perform the following steps:

Step 1   Make sure that the LCC is properly grounded (see the Bonding and Grounding Guidelines, on page 27).

Step 2   Make sure that the I/O switches on the rear are in the OFF position.

Figure 44: 1/0 Power ON/OFF Switches
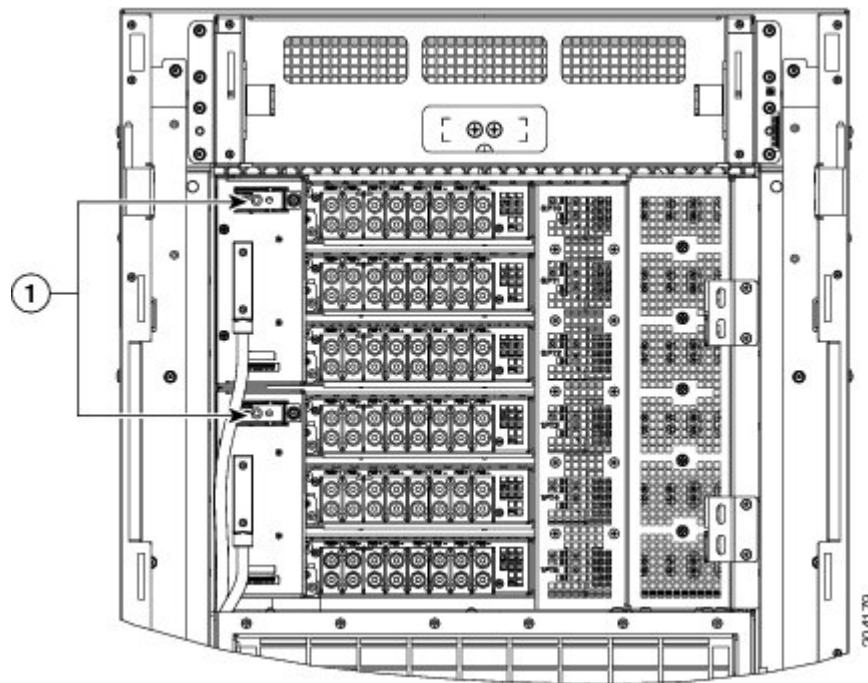
1	I/0 power ON/OFF switches

Step 3   Verify that none of the Output OK LEDs on the front of the PMs installed in the tray are green.

Step 4   If you have a DC power system installed, perform the following steps:

a) Insert the power fuse at the BDFB or power plant to energize power tray 0, PM 0.

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.

> **Caution**   Make sure that the polarity of the DC input power cabling is correct. This is a negative voltage system.

> **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.

c) Verify that the correct Input OK LED on the front of the PM is lit.

d) Repeat Steps a through b for each of the remaining DC inputs.

e) Continue to Step 7.

Step 5   If you have an AC power system installed, perform the following steps:

a) Open the circuit breaker for each feed on the PDU or the individual single-phase input for each installed PM at the circuit breaker cabinet.

b) Energize the individual single-phase breaker at the circuit breaker panel one at a time, and verify the correct input LED lights.

c) Close PM0 (AB) on the PDU and verify that the Input OK LED is lit on the front of the PM that is energized.

d) Repeat Step c for the remaining PMs.

Step 6   Turn the I/0 switches at the rear to the ON position, and verify the output LED is on.

Step 7   Verify that the fan tray status LEDs are lit and that the fans are running.

Step 8   Turn off the rear power breakers for power shelf 0 (PS0) and power shelf 1 (PS1).

Step 9   Install all cards (RP, FC, and LC) in the LCC. For more information, see *Installing Route Processor Cards, Line Cards, and Fabric Cards* chapter.

Step 10   Turn on the output breakers when done.

Powering Off the LCC

Steps

To power off the LCC, perform the following steps:

Step 1   Turn the I/0 switches at the rear to the OFF position.

Step 2   If you have a DC power system installed, remove the power fuse at the BDFB or power plant for each PM on all power trays.

Step 3   If you have an AC power system installed, turn off the source circuit breakers to de-energize the PMs in all power trays.

Step 4   Verify that all PM input LEDs are off.

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

Installing RP Cards, Line Cards, and Fabric Cards

This chapter provides instructions on how to install cards and their associated components in the Cisco NCS 6000 Line Card Chassis (LCC).

About Installing Cards and Associated Components

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 wrist strap whenever you handle network equipment or one of its components.

- 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 jack (Figure 2-4) or a bare metal surface on the chassis (ensure that the chassis is grounded).

- Handle a card by its ejector levers, when applicable, or its metal carrier only; avoid touching the board or connector pins (see the *Guidelines for Installing and Removing a Card* section).

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

- Be careful not to lay any tools on the aluminum honeycomb panel, or insert your fingers into the panel.

Guidelines for Installing and Removing a Card

- Every card has a label with an arrow on its faceplate showing which side is up for installation.

- The card connector of every FC, LC, and RP card is keyed to ensure that the card is installed correctly in the slot.

> **Note** RP card faceplates and the RP card slots on the LCC are labeled with the square symbol. FC faceplates and the FC slots on the LCC are labeled with the circle symbol.

- Online insertion and removal (OIR) is supported enabling you to install a card while the LCC is operating. OIR removes power to a specific slot before the card is replaced. The power remains on for all other card slots.

  OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. We recommend that you perform a graceful shutdown to shut down an FC, LC, or RP card prior to removing it from the LCC. See the Steps for OIR Card Removal section.

> **Note** Graceful shutdown is critical to prevent file system corruption on the SSD in the RP or LC.

- Prior to installing a fabric card, you must push the OIR button on both the upper and lower ejectors to release the mechanical latches.

- The ejector levers and captive screws on the cards secure the cards to the LCC and ensure proper electrical connection. The ejector levers and captive screws are located at the upper and bottom ends of the faceplate.

- The chassis is shipped with all card slots containing either impedance carriers or a plastic cover to help maintain chassis stiffness and prevent any damage to the chassis during shipment.

> **Note** The NC6-LC-BLANK impedance carrier is no longer supported. Replace the NC6-LC-BLANK with the NC6-LC-BLANK2 impedance carrier (front of the LCC) when installing new FCs or performing OIR on existing FCs (rear of the LCC).

- All unused card slots must be covered to ensure proper air circulation and cooling within the chassis. Install NC6-LC-BLANK2 impedance carriers in all slots that are not being used. This ensures proper air flow and maintains system EMC and safety compliance. See the Installing an Impedance Carrier section.

- Install LCs and NC6-LC-BLANK2 impedance carriers (front of the LCC) before installing the FCs and RP cards (rear of the LCC).

- Fully insert all FCs and RP cards into the chassis before tightening their captive screws.

- For information about the slot numbers, see the #unique_21 section.

⚠️

Caution   The chassis 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 chassis to complete its tasks before removing or installing another card.

Steps for OIR Card Removal

Follow these steps to perform a graceful OIR on the FC, LC, or RP card.

Step 1   If you are removing an FC, shut down the fabric plane *X* (where *X* is in the range of 0 to 5). If you are removing an LC or RP, go to Step 2.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# end
```

Step 2   Shut down the FC, LC, or RP card location *rack* /*slot* (where *rack* is the rack number in the range of 0 to 15 and F0 to F3, and *slot* is the slot in the range of 0 to 7 for an LC, FC0 to FC5 for an FC, and RP0 to RP1 for an RP). Confirm the shutdown.

Example:

```
sysadmin-vm:0_RP0# hw-module location 0/FC0 shutdown
Wed Aug  10 23:52:35.610 UTC
Shut down hardware module ? [no,yes] y
0/RP0/ADMIN0:Aug 10 23:52:47.042 : shelf_mgr[2897]: %INFRA-SHELF_MGR-4-CARD_SHUTDOWN :
Shutting down card 0/FC0
result Card graceful shutdown request on 0/FC0 succeeded.
```

Step 3   Before you remove the card, use the **show platform** command to verify that it is powered off. Do not remove the card until the output of the **show platform** command indicates that the card has been powered off.

Example:

```
sysadmin-vm:0_RP0# # show platform location 0/FC0
Wed Aug  10 23:54:02.366 UTC
Location   Card Type              HW State      SW State     Config State
-------------------------------------------------------------------------
0/FC0      NC6-FC                 POWERED_OFF   N/A          NSHUT
```

Step 4   Remove the card using the appropriate procedure:

- Removing a Line Card , on page 94
- Removing an RP Card, on page 122
- Removing a Fabric Card , on page 124

Step 5   Reinstall the card using the appropriate procedure:

- Installing a Line Card

- Installing a Route Processor Card

- Installing a Fabric Card

Step 6   Use the **show platform** command to verify that the card is operational .

Example:

```
sysadmin-vm:0_RP0# # show platform location 0/FC0
Wed Aug  10 23:54:02.366 UTC
Location   Card Type              HW State      SW State      Config State
-------------------------------------------------------------------------
0/FC0      NC6-FC                 OPERATIONAL   OPERATIONAL   NSHUT
```

Step 7   If you are installing a fabric card, unshut the fabric plane *X* .

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# no controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# end
```

About Cable Management Brackets

The Cisco NCS 6008 LCC has cable management features for both the front and rear sides of the chassis. These features organize the interface cables entering and exiting the different cards, keeping them out of the way and free of sharp bends that may damage the cables.

- The front and rear sides have horizontal cable management brackets above and below the card cages (see Figure 1: Front View of the Cisco NCS 6008 LCC and Figure 2: Rear View of the Cisco NCS 6008 LCC).

- The front and rear sides have vertical cable troughs on the left and right of the chassis.

- A vertical cable management bracket is preattached to the faceplate of a LC, FC, and RP card (see figure below).

Figure 45: LC Vertical Cable Management Bracket
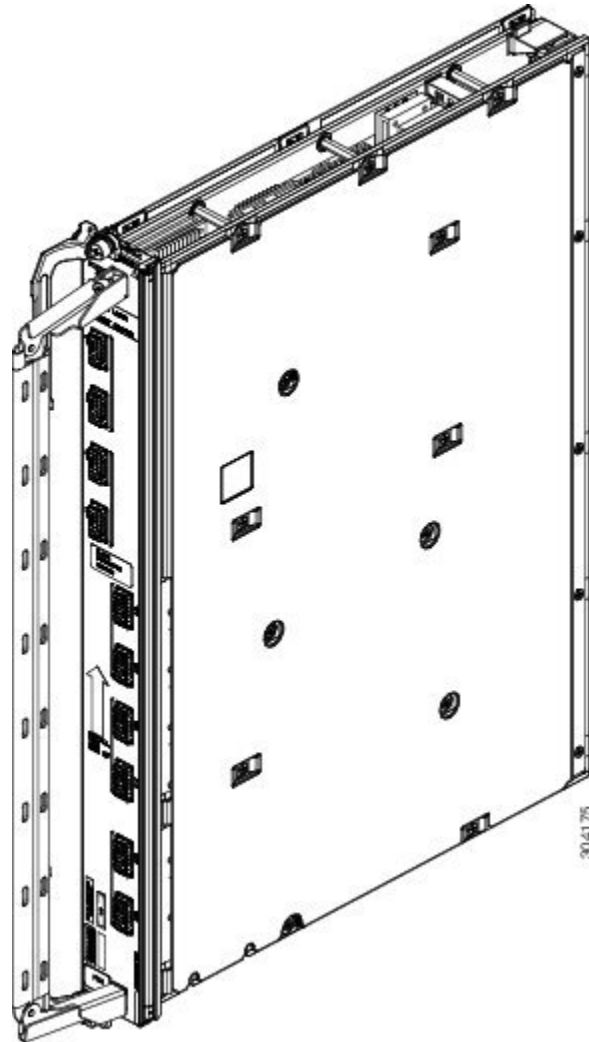
Installing and Removing an Impedance Carrier

The chassis ships with impedance carriers installed in the LC slots.

Note The NC6-LC-BLANK impedance carrier is no longer supported. Use PID NC6-LC-BLANK2= to order a spare impedance carrier.

Note The NC6-LC-BLANK2 uses captive screws and ejector levers to secure the impedance carrier to the LCC.

Figure 46: NC6-LC-BLANK2
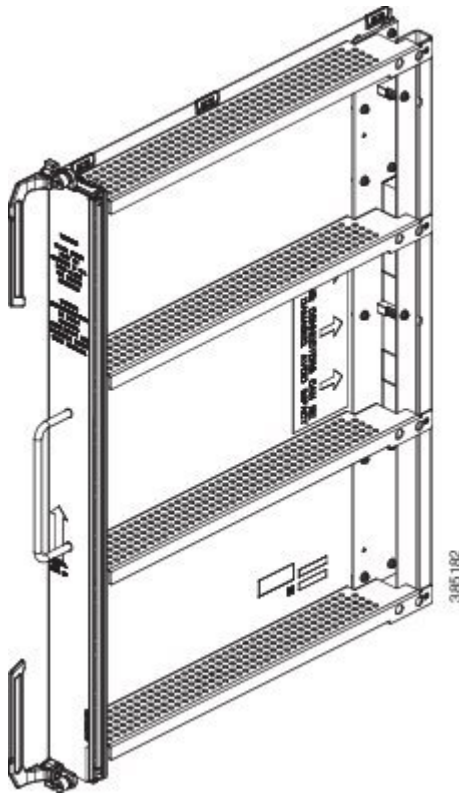
Installing an Impedance Carrier

This section describes how to install an impedance carrier in the Cisco NCS 6008 LCC.

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.

Required Tools and Equipment

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

• LC impedance carrier (NC6-LC-BLANK2)

Steps

To install the NC6-LC-BLANK2 impedance carrier, perform the following steps:

Step 1 Orient the impedance carrier according to the up arrow on the faceplate.

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 the slot.

Step 3   Carefully slide the impedance carrier into the slot until the ejector levers engage the catches, and then stop.

Step 4   Simultaneously pivot the ejector levers toward the faceplate of the impedance carrier. Do not force the impedance carrier; the ejector levers properly seat the impedance carrier against the midplane.

Figure 47: Installing NC6-LC-BLANK2 Impedance Carrier
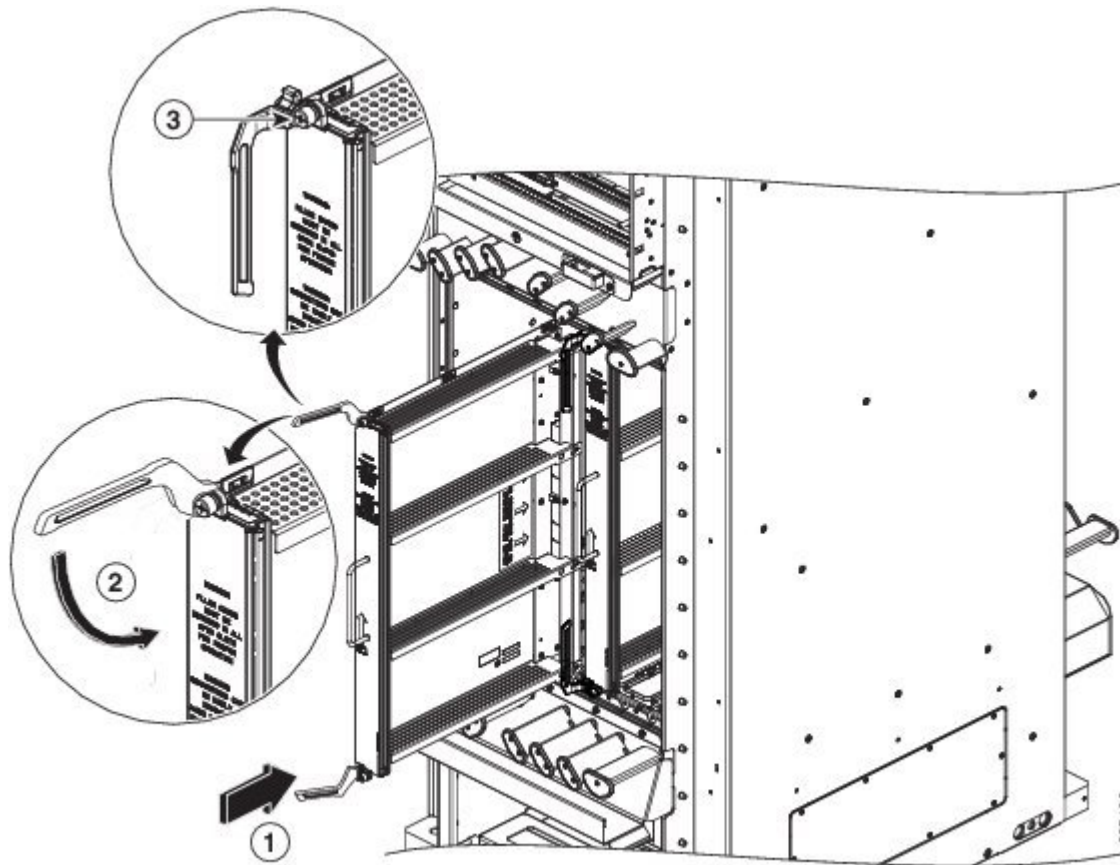
1	Direction of insertion	3	Captive screw
2	Ejector lever		

Step 5   Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to fully tighten the captive screws to seat the impedance carrier firmly in the slot.

Removing an Impedance Carrier

This section describes how to remove an impedance carrier from the Cisco NCS 6008 LCC.

Prerequisites

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

Required Tools and Equipment

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

Steps

To remove an impedance carrier, perform the following steps:

Step 1   Identify the impedance carrier to be removed from the card cage. Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen it from the slot.

Step 2   **For NC6-LC-BLANK2**, grasp the two card ejector levers and simultaneously pivot both ejector levers 70 degrees away from the front edge of the card carrier to unseat the impedance carrier from the midplane connector.

Figure 48: Removing the NC6-LC-BLANK2 Impedance Carrier
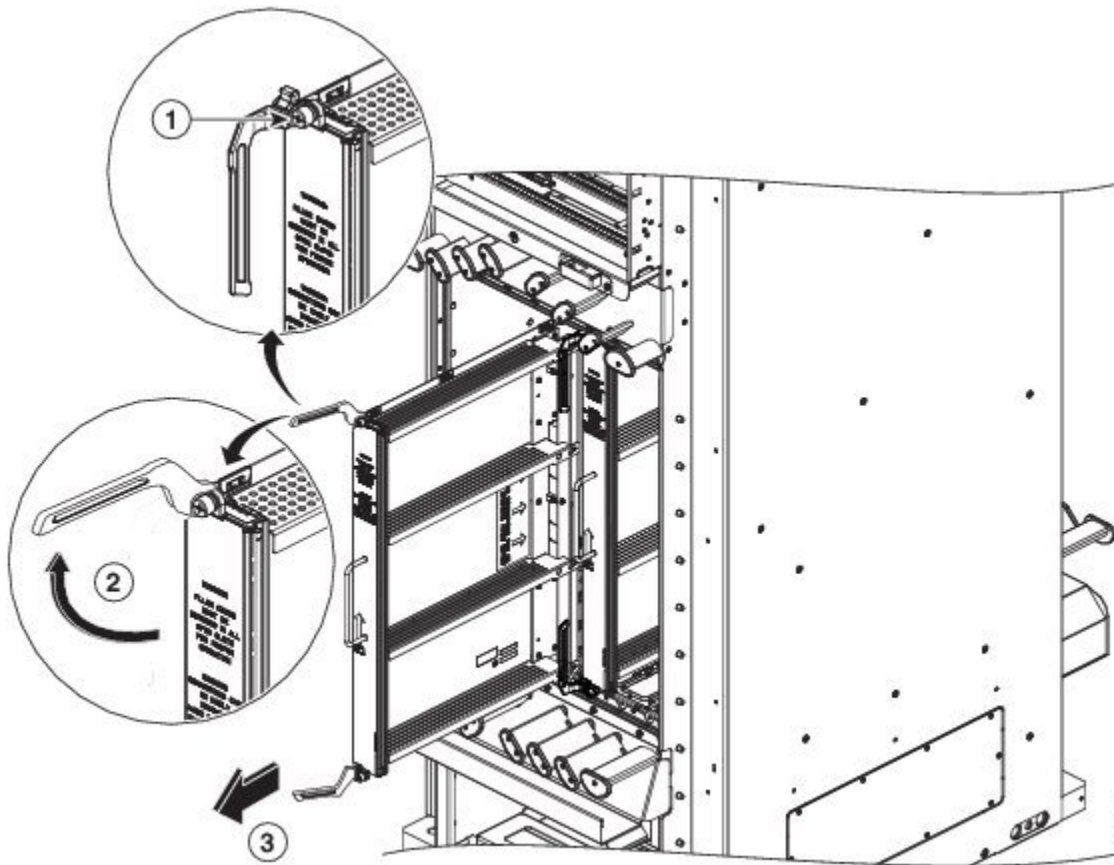
1	Captive screw	3	Direction of removal
2	Ejector lever		

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

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

Step 5   Holding the impedance carrier underneath and by the handle, pull it from the slot, and set it carefully aside.

Installing a Route Processor Card

Warning   Class 1 Laser Product. Statement 113

Warning   Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Statement 125

Installing an RP Card

Every Cisco NCS 6008 LCC contains two route processor (RP) cards in dedicated slots on the rear side of the chassis. The RP cards are identical. One RP card installs into slot RP0 on the left of the card cage, while the second RP card installs into slot RP1 on the right of the card cage.

Prerequisites

- Review the Guidelines for Installing and Removing a Card section.

- Before performing this task, open the cosmetic doors, if installed. The RP cards are hot-swappable.

Caution   Install one RP card at a time. Allow at least 15 seconds for the chassis to complete its tasks before installing another RP card. The chassis may indicate a hardware failure if you do not follow proper procedures.

Required Tools and Equipment

- ESD-preventive wrist strap

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

- RP card (Cisco PID NC6-RP)

Steps

To install an RP card, perform the following steps:

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks on the rear side of the chassis (see Preventing Electrostatic Discharge, on page 9). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2   Remove the card from its antistatic packaging.

Step 3   At the top and bottom of the card faceplate, press the OIR buttons to release the ejector levers.

Step 4   In the rear of the chassis, select the RP slot that you want to install the card in. The two slots at either end of the card cage are for RP cards only. For information about the location of the RP slots, see #unique_21.

Step 5   Locate the arrow on the faceplate and orient the card so that the arrow points up. The backplate of the card is on your left.

Step 6   For support, place one hand under the card and align the edges formed by the backplate of the card with rail guides in the slot. Avoid touching the card circuitry or any connectors.

Figure 49: Installing an RP Card
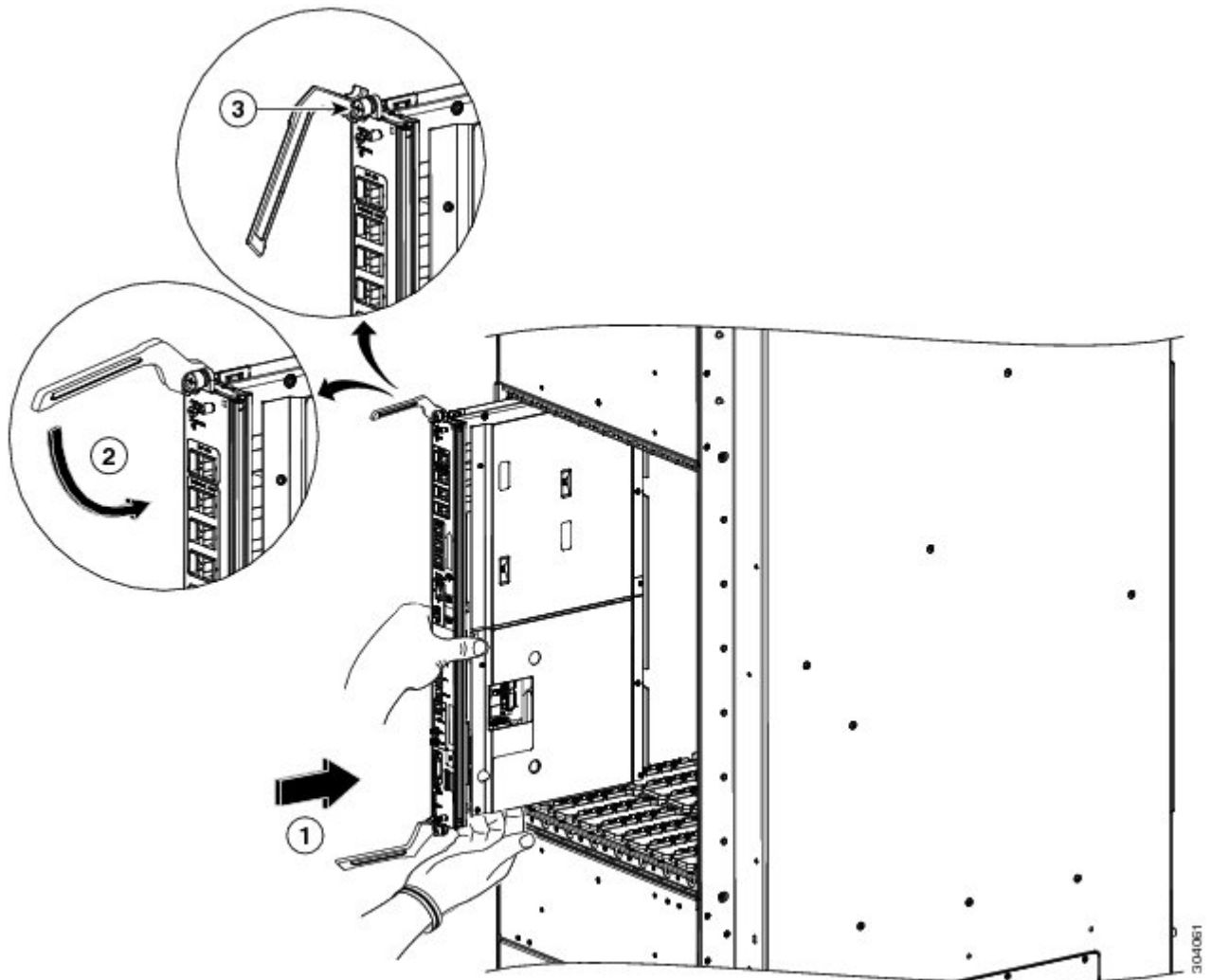
1	Direction of insertion	3	Captive screw
2	Ejector lever		

Step 7   Gently but firmly slide the card into the slot making sure that the edges stay within the rail guides until the card makes solid contact with the backplane and the ejector levers stiffen.

> **Note**   If the card does not slide easily into the slot during installation, the edges of the backplate may not be in the rail guides and the card is misaligned or the card is not installed in an RP slot.

Step 8   Gently but firmly close the ejector levers to secure the card in the slot. The card faceplate should be flush with the chassis structure.

> **Caution**   Do not force the levers to close. If there is undue resistance to closing the ejectors, remove the card completely and reinsert it.

Step 9   Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to turn the two captive screws on the front panel of the card clockwise to seat the card firmly in the slot.

Step 10   Attach the vertical cable management bracket to the faceplate of the RP card using the two screws that came with it (see About Cable Management Brackets , on page 60).

Verifying the Installation of an RP Card

This section describes how to verify that the RP card has been properly installed and to troubleshoot the installation in the Cisco NCS 6008 LCC.

This shows the front panel of the RP card.

Figure 50: RP Card Front Panel
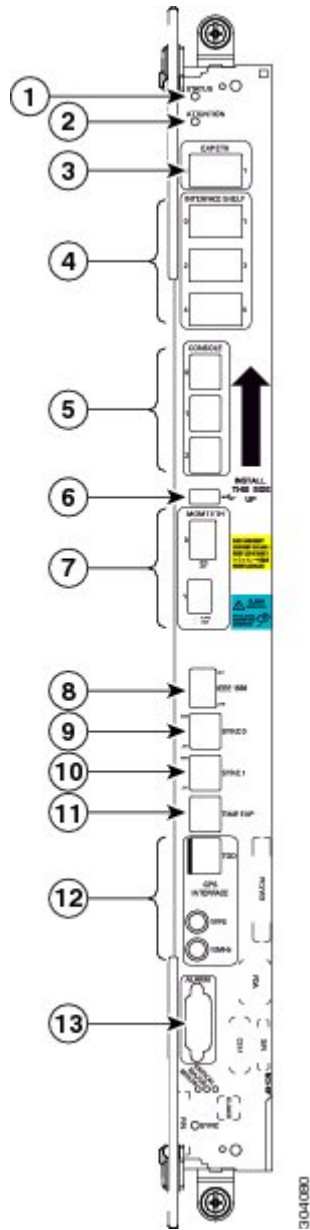
1	Status LED—Card status indicator	8	IEEE 1588 Ethernet port
2	Attention LED	9	SYNC0 (BITS/J.211) port
3	Expansion Ethernet ports	10	SYNC1 (BITS/J.211) port
4	Interface Shelf Ethernet ports	11	Time/Frequency Expansion port

5	Three console ports	12	GPS ToD interface (with 1-PPS and 10-MHz coax connectors)
6	External USB port	13	Alarm port
7	Two management LAN Ethernet ports		

Troubleshooting the RP Card

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

- When the card is properly installed and no faults are detected, the card status LED turns green.

- When the card status LED is solid yellow, either software initialization is in progress during bootup or a fault exists on the board.

- When the card status LED is blinking yellow, the card is not fully seated.

- When the card status LED is off, verify that the card is installed correctly. There could be no power applied to the card, a power fault, or a hardware fault.

- Verify that there is power to the card by looking at the indicators on the power tray.

Note To confirm the location of the card that needs attention, use the **hw-module attention-led location** *node-id* command in System Admin Config mode to enable the Attention LED.

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

- Ensure that the card is seated firmly in the Cisco NCS 6008 chassis 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.

- Ensure that 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 power system to see whether the chassis is receiving power.

Inserting a Previously Configured Card

On systems running IOS XR earlier than version 5.2.5: If you insert an RP card that was originally installed in another NCS 6000 system, the saved configuration from that RP card may overwrite the system admin configuration on the current system. To ensure that the system admin configuration is preserved on the current system, perform these steps on the previously configured card:

Step 1 Insert the previously configured card into a running NCS 6000 system. Inserting the card into a system that is shut down is not supported.

| **Note** | Do not connect anything to the management Ethernet interface on the previously configured card until the synchronization and internal PXE boot is complete. |

Step 2   Verify that the automatic synchronization of SMUs and internal PXE boot is complete using the **show install active** command. Compare the output from the previously configured card to that of the existing RP cards.

Step 3   Erase old configurations on the card from the System Administration mode.

```
attach location <card>
rm -rf /misc/config/confd/
exit
```

Step 4   Reload the card using **hw-module location** *card* **reload** command.

Step 5   Confirm that the card has come up fully using the **show platform** command.

Step 6   Commit a configuration change in the System Administration mode.

For example,

```
config
confdConfig cli timestamp disabled
commit
```

To change the configuration to its original value, run the command:

```
config
confdConfig cli timestamp enabled
commit
```

About Fabric Cards

The Cisco NCS 6000 switch fabric is a 3-stage cell based architecture with six fabric planes. The fabric cards (FCs) provide the switch fabric for the routing system and perform the cross-connect function of the routing system, connecting every line card (LC) to each other. The switch fabric receives ingress user data from one LC slot and performs the switching necessary to route the data to the appropriate egress LC slot.

| ⚠ Caution | Do not install fabric cards of different types in the same LCC. |

S123 Fabric Card (NC6-FC)

The NCS 6000 S123 Fabric Card (FC) implements all three stages of the switch fabric. It is designed to support standalone LCCs only. It has all of the fabric functionality embedded in the card and does not require support of an FCC. The S123 FC does not have optical components to connect to fabric cards in an FCC.

Figure 51: S123 Fabric Card Front Panel
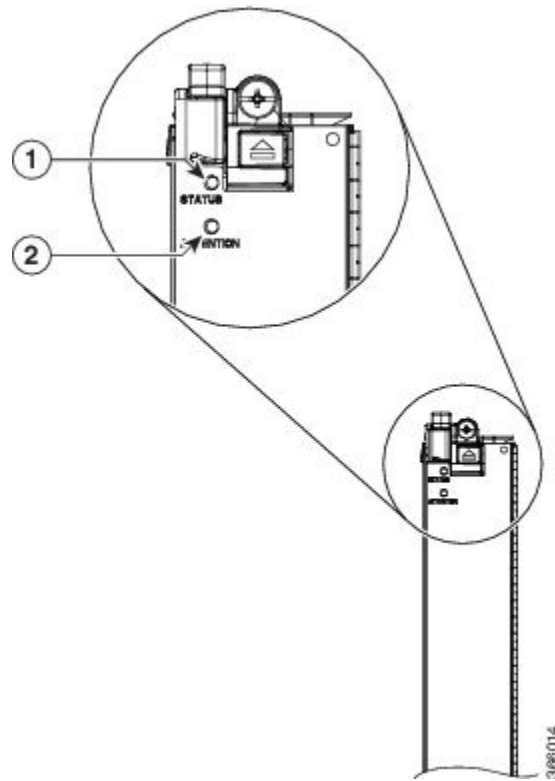
| 1 | Status LED | 2 | Attention LED |

The following table describes the LED indicators for the S123 Fabric Card.

Table 5: S123 Fabric Card LED Indicators

LED	LED Color	Description
STATUS	Green	The card is properly installed and no faults are detected.
	Yellow	The software initialization is in progress during bootup or a fault exists on the board.
	Flashing yellow (slow)	The card is not fully seated or the slot has detected a parity error.
	Off	No power is applied to the card.
ATTENTION	Blue	On: The card needs attention. Off: The card does not require attention.
Note		Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

Universal Fabric Card (NC6-FC2-U)

The Universal Farbic Card (UFC) implements all three stages of the switch fabric. It supports the following configurations:

- Standalone chassis (SC), acting as S123 fabric card

- Multi-chassis (MC) configuration, acting as S13 fabric card; requires Fabric Card Chassis (FCC) with S2 fabric card (1T mode using CXP transceiver modules) or second-generation S2 fabric card (2T mode using CXP2 transceiver modules)

- Back-to-back (B2B) configuration, in 1T mode using CXP transceiver modules or 2T mode using CXP2 transceiver modules—provides the same capacity and functionality as a 2+1 multi-chassis configuration

In a back-to-back configuration, the connections between the FCs in the LCCs are implemented through a number of bi-directional optical links using pluggable CXP optical modules. The CXP module uses a 24-fiber MPO connector that supports 12 bi-directional optical links up to 100 meters of OM-4 multi-mode fiber.

Note Install a CXP transceiver module or an EMI/dust plug (supplied) in all CXP ports. Do not operate the FC with an open port.

For information on cabling a back-to-back system, refer to the Cisco Network Convergence System 6000 Series Routers Migration Guide.

Figure 52: Universal Fabric Card Front Panel
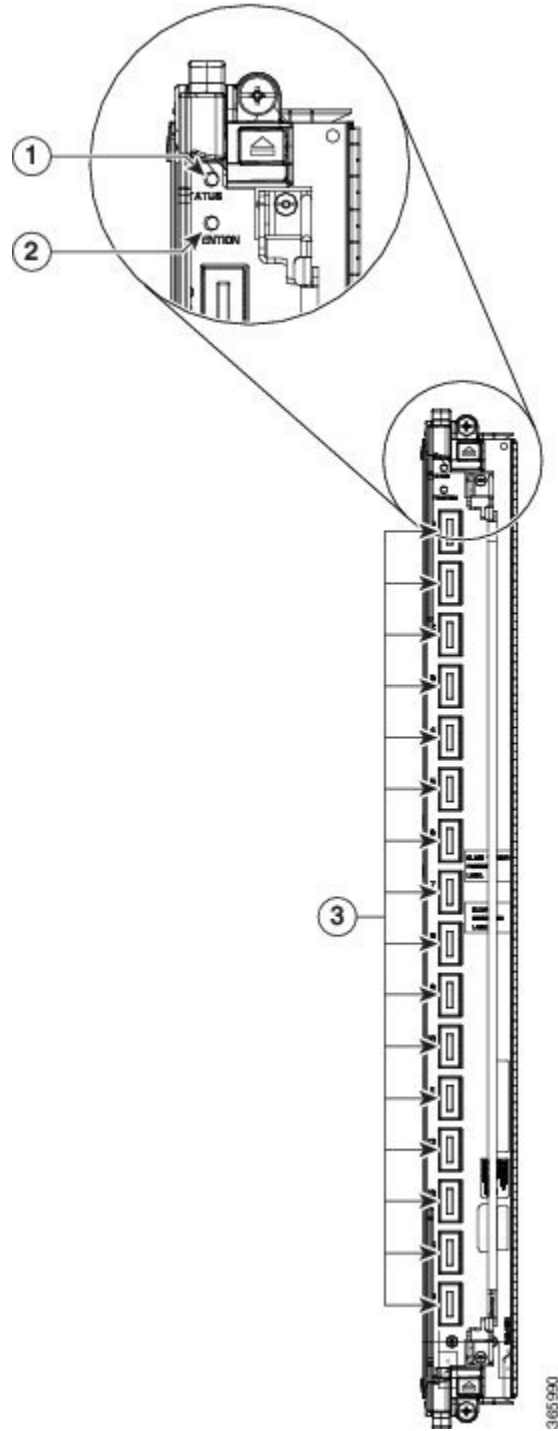
1	Status LED	3	16 CXP ports and LEDs
2	Attention LED		

The following table describes the LED indicators for the Universal Fabric Card.

Table 6: Universal Fabric Card LED Indicators

LED	LED Color	Description
STATUS	Green	The card is properly installed and no faults are detected.
	Yellow	The software initialization is in progress during bootup or a fault exists on the board.
	Flashing yellow (slow)	The card is not fully seated or the slot has detected a parity error.
	Off	No power is applied to the card.
ATTENTION	Blue	On: The card needs attention. Off: The card does not require attention.
Note		Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.
CXP (0 to 15)	Green	The port is correctly connected to the UFC on the second LCC.
	Red	One or more links are down or the CXP is connected to the wrong CXP port on the UFC in the second LCC. For troubleshooting information, see the System Administration Command Reference for the Cisco NCS 6000 Series Routers.
	Off	The CXP module is not present or is not fully inserted in the fabric card.

S13 Fabric Card (NC6-FC-MC)

The S13 Multi-Chassis (MC) FC implements the first and third stages of the switch fabric. The S13 MC FC is designed to be used in multi-chassis systems and includes optical ports to connect with S2 FCs in FCCs.

Note The S2 Fabric Card implements the second stage of the switch fabric and resides in the Fabric Card Chassis (FCC). See the *Cisco Network Convergence System 6000 Fabric Card Chassis Hardware Installation Guide* for more information.

The connections between the LCC and the FCC are implemented through a number of bi-directional optical links. CXP optical modules are used on the S2 FC and S13 FC to connect the two cards together. The CXP module uses a 24-fiber MPO connector that supports 12 bi-directional optical links up to 100 meters of OM-4 multi-mode fiber.

Figure 53: S13 MC Fabric Card Front Panel
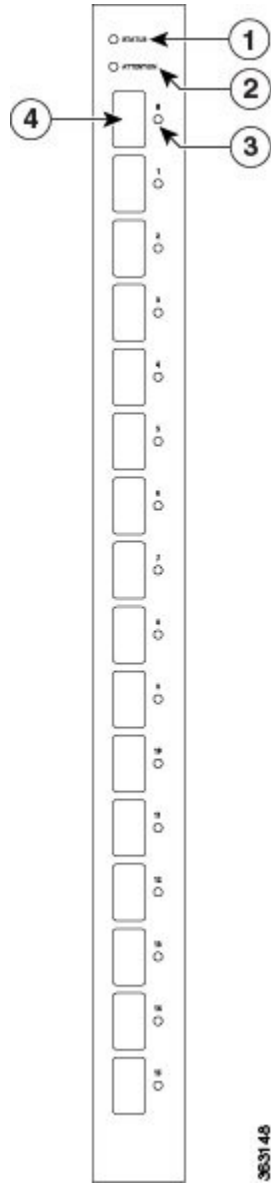
1	Status LED	3	16 CXP port LEDs (0 through 15, one per port)
2	Attention LED	4	16 CXP ports

The following table describes the LED indicators for the S13 MC Fabric Card.

Table 7: S13 MC Fabric Card LED Indicators

LED	LED Color	Description
STATUS	Green	The card is properly installed and no faults are detected.
	Yellow	The software initialization is in progress during bootup or a fault exists on the board.
	Flashing yellow (slow)	The card is not fully seated or the slot has detected a parity error.
	Off	No power is applied to the card.
ATTENTION	Blue	On: The card needs attention. Off: The card does not require attention.
Note	Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.	
CXP (0 to 15)	Green	The port is correctly connected to the S2 Fabric Card on the FCC.
	Red	One or more links are down. For troubleshooting information, see the System Administration Command Reference for the Cisco NCS 6000 Series Routers.
	Off	The CXP module is not present or is not fully inserted in the fabric card.

Installing a Fabric Card

This section describes how to install a fabric card in the Cisco NCS 6000 LCC.

Prerequisites

- Review the Guidelines for Installing and Removing a Card section.

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

⚠

Caution   Install one fabric card at a time. Allow at least 15 seconds for the chassis to complete its tasks before installing another fabric card. The chassis may indicate a hardware failure if you do not follow proper procedures.

Required Tools and Equipment

- ESD-preventive wrist strap
- Number-2 Phillips screwdriver or number-2 flat-head screwdriver
- Fabric card (NC6-FC, NC6-FC2-U, or NC6-FC-MC)

Steps

To install a fabric card in the NCS 6008 LCC, follow these steps:

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks on the rear side of the chassis (see Preventing Electrostatic Discharge, on page 9) . You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC.

Step 2 Remove the card from its antistatic packaging.

Step 3 At the top and bottom of the FC faceplate, press the OIR buttons to release the ejector levers.

Figure 54: Installing a Fabric Card in a Cisco NCS 6008 LCC
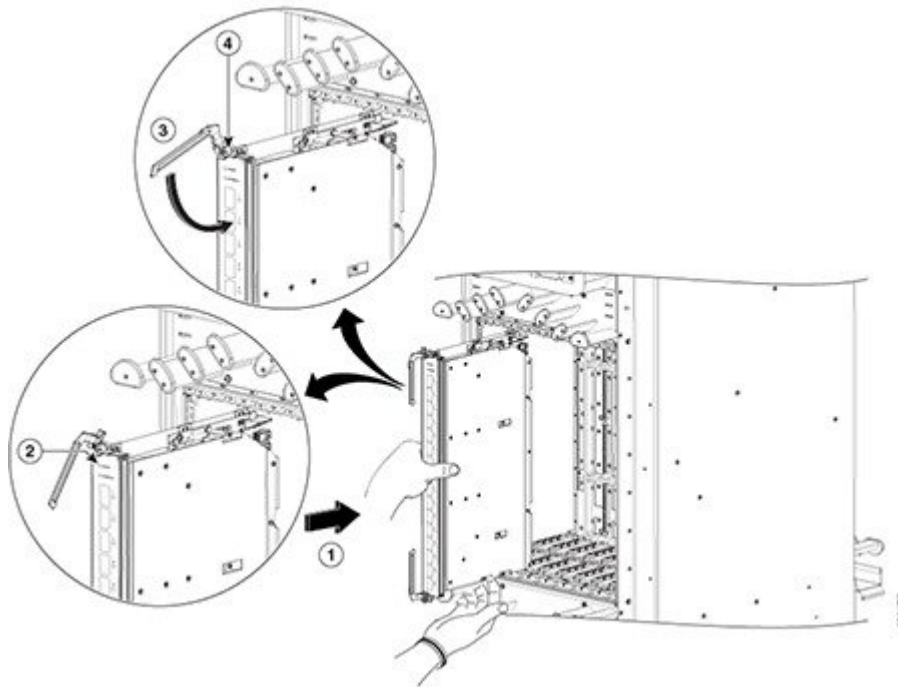
1	Direction of insertion	3	Ejector lever
2	OIR buttons (top and bottom of faceplate)	4	Captive screw

Step 4 In the rear of the chassis, select the FC slot that you want to install the card in. Each slot has rail guides in the top and bottom of the cage. For information about the location of the FC slots, see #unique_21.

Note Use the middle slots for FC cards. The slots at both ends of the cage are reserved for RP cards only.

TIMESAVER: We recommend that you install the FC cards from either left to right or right to left to avoid wedging a new FC card between two seated FC cards.

Step 5 Locate the arrow on the faceplate and orient the card so that the arrow points up. The backplate of the card is on your left.

Step 6 For support, place one hand under the card and align the edges formed by the backplate of the card with rail guides in the slot. Avoid touching the card circuitry or any connectors.

Step 7 Gently but firmly slide the card into the slot making sure that the edges stay within the rail guides until the card makes solid contact with the backplane and the ejector levers stiffen.

Note If the card does not slide easily into the slot during installation, the edges of the backplate may not be in the rail guides and the card is misaligned or the card is in a wrong slot. Remove the card and re-install it.

Note When properly installed the cards are flush against each other making for a very tight fit. For new installations, we recommend installing the cards in an adjacent manner.

Step 8 Gently but firmly press the card into the connector until the card clicks into place and the ejector levers snap erect.

Caution Do not force the card into the connector. Undue force can cause misaligned pins to bend or break or damage the pin sockets.

If there is undue resistance to the card mating with the connector, remove the card completely and reinsert it.

Step 9 Gently but firmly close the ejector levers to secure the card in the slot. The card faceplate should be flush with the chassis structure.

Caution Do not force the levers to close. If there is undue resistance to closing the ejectors, remove the card completely and reinsert it.

Tip For ease of installation, install all available FCs before tightening the lever fasteners.

Tip For ease of operation when performing maintenance or replacing an FC card, loosen the fasteners on the cards on both sides of the target FC but do not disengage (open the levers) or remove the adjacent cards.

Note A flashing yellow STATUS LED indicates that the card is not fully seated against the midplane. Apply additional pressure equally to the ejector levers (top and bottom) to further seat the card to the midplane.

Step 10 Repeat Step 2 through Step 9 for all of the FCs that you want to install at this time.

Step 11 Use a number-2 Phillips screwdriver or a number-2 flat-head 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 **For NC6-FC-MC and NC6-FC2-U:** Attach the vertical cable management bracket to the faceplate of the FC using the two screws that came with it.

Verifying the Installation of a Fabric Card

This section describes how to verify that a fabric card is properly installed and is working correctly in the Cisco NCS 6000 LCC. Use the Status LED, located on the faceplate of the card, to verify the correct installation of the card.

Note	Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

If the installed or replaced FC fails to operate or power on after installation:

- Ensure 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 FC is even with the fronts of the other cards installed in the card cage.

- Ensure that 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 FC.

- Examine the power system to see whether the LCC is receiving power.

About Line Cards

The line cards for the Cisco NCS 6008 chassis are monolithic assemblies with optical interfaces, packet processing, and CPU control plane fully integrated onto one board.

10-Port 100Gbps Line Card with CPAK Optics Module

The 10-port 100Gbps CPAK LC (Lean Core [NC6-10X100G-L-K] and Multi-Service Core [NC6-10X100G-M-K]) has:

- 10 ports that each accept a CPAK optics module

- Attention LED

- Status LED

- Port LEDs, one on each port

This figure shows the front panel of the 10-port 100Gbps CPAK LC.

Figure 55: 10-Port 100Gbps CPAK LC Front Panel
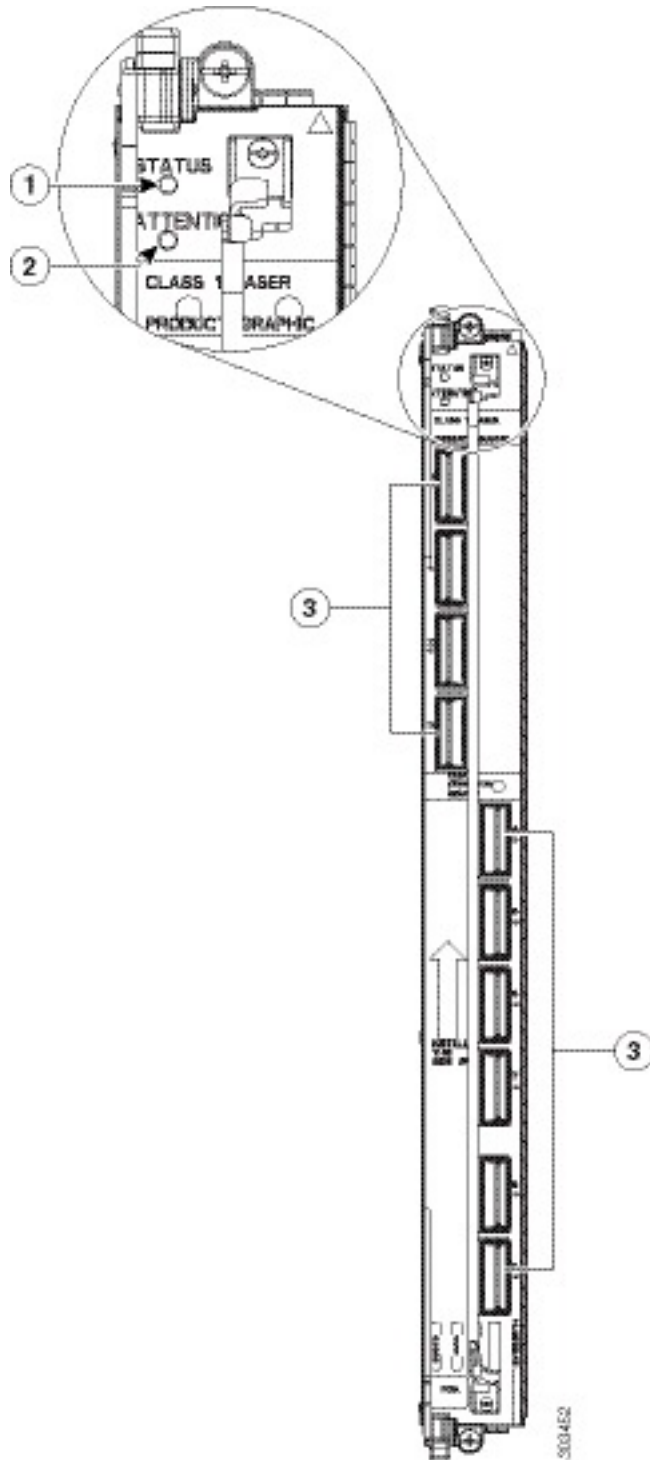
1	Status LED	3	Port LEDs (one LED on each port)

2	Attention LED		

This table describes the LEDs for the 10-port 100Gbps CPAK LC.

Table 8: 10-Port 100Gbps CPAK LC LED Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

Note Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—22.5 in. (57.2 cm)

- Depth—15.75 in.(40 cm)

- Width—2.1 in. (5.3 cm)

- Weight—28 lb (12.8 kg)

CPAK Optical Modules

The 10-port 100Gbps Line Card supports the following CPAK modules:

- CPAK-100G-LR4

- CPAK-100G-SR10

- CPAK-100G-SR4: It is specified to run only at 100GE and does not support OTU4.

- CPAK-10X10G-LR

- CPAK-100G-ER4L

- CPAK-10x10G-ERL

• CPAK-100G-PSM4

For transmit/receive and port cabling specifications, see the Optical Module Specifications section.

10-Port 100Gbps Line Card with CXP Optics Module

The 10-port 100Gbps CXP LC (Lean Core [NC6-10X100G-L-P] and Multi-Service Core [NC6-10X100G-M-P]) has:

- 10 ports that each accept a CXP optics module

- Attention LED

- Status LED

- Port LEDs, one on each port

This figure shows the front panel of the 10-port 100Gbps CXP LC.

Figure 56: 10-Port 100Gbps CXP LC Front Panel
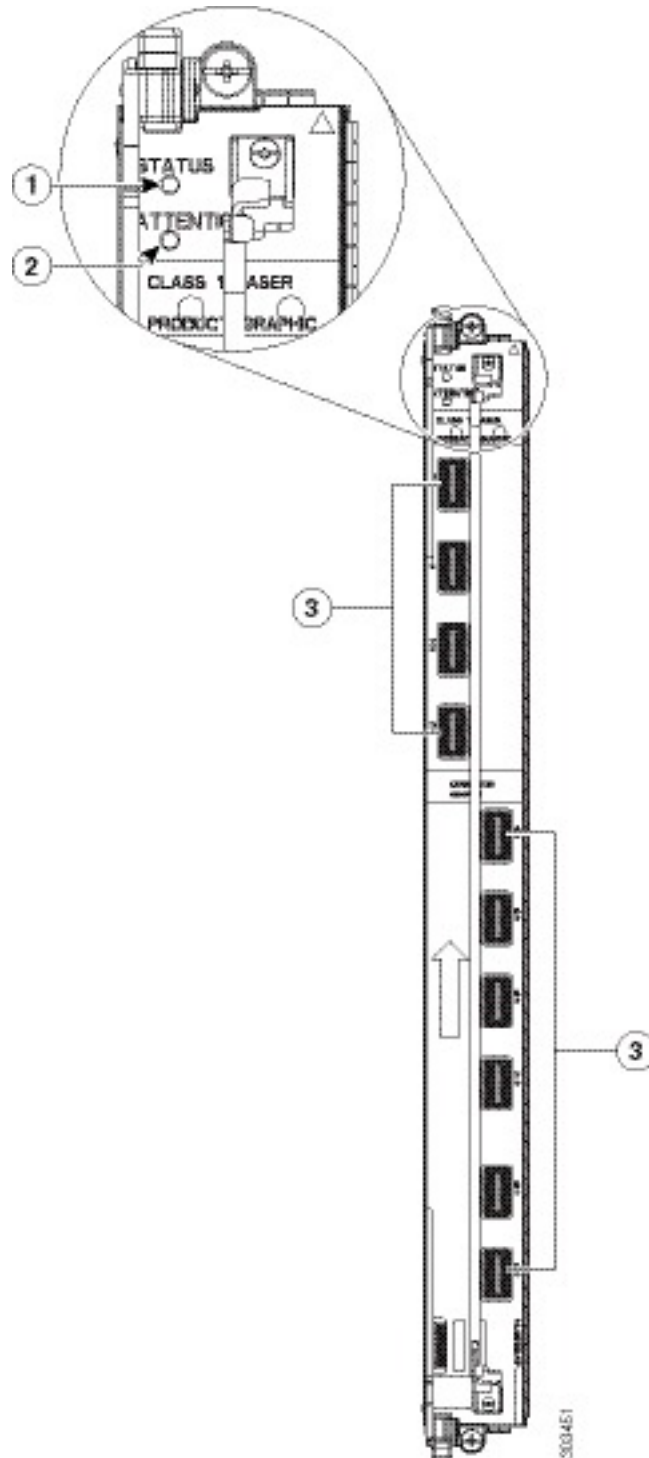
1	Status LED	3	Port LEDs (one LED on each port)

2	Attention LED		

This table describes the LEDs for the 10-port 100Gbps CXP LC.

Table 9: 10-Port 100Gbps CXP LC LED Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

Note Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—22.5 in. (57.2 cm)

- Depth—15.75 in.(40 cm)

- Width—2.1 in. (5.3 cm)

- Weight—27 lb (12.2 kg)

CXP Optical Module

The 10-port 100Gbps CXP Line Card supports the following CXP module:

- CXP-100G-SR10

For transmit/receive and port cabling specifications, see the Optical Module Specifications section.

20-port 100Gbps Line Card with 12 QSFP28 and 8 CPAK Optics Modules

Note The 20-port 100Gbps Line Card requires Universal Fabric Card (NC6-FC2-U) and Fan Tray 2 (NC6-FANTRAY-2). See the Guidelines for Installing the 20-Port 100Gbps Line Card appendix before you install the 20-port 100Gbps Line Card.

Note The 20-port 100Gbps Line Card is supported in a single-chassis, 2T multi-chassis, or 2T back-to-back configurations.

The 20-port 100Gbps LC (Lean Core [NC6-20X100GE-L-C] and Multi-Service Core [NC6-20X100GE-M-C]) has:

- 12 ports that each accept a QSPF28 optics module

- 8 ports that each accept a CPAK optics module

- OIR button

- Attention LED

- Status LED

- Port LEDs, one on each port

This figure shows the front panel of the 20-port 100Gbps LC.

Figure 57: 20-Port 100Gbps LC Front Panel
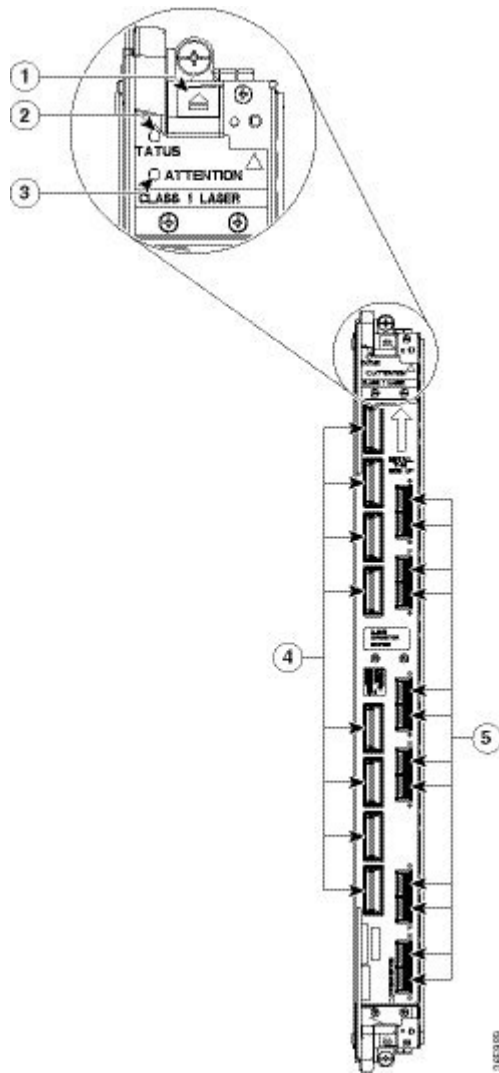
1	OIR button	4	CPAK ports (0 – 7) and port LEDs (one LED on each port)
2	Status LED	5	QSPF28 ports (8 – 19) and port LEDs (one LED on each port)
3	Attention LED		

This table describes the LEDs for the 20-port 100Gbps LC.

Table 10: 20-Port 100Gbps LC LED Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC is booting.
	Flashing yellow (slow)	The LC is not fully seated or the slot has detected a parity error.
	Flashing yellow (3 fast blinks)	Secure boot failure condition with the primary image. The LC is booting with the backup image. After the software boots, the Status LED is solid yellow (LC is booting), then green (LC is operational).
	Off	No power is applied to the LC.
Attention	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

Note Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—22.5 in. (57.2 cm)

- Depth—15.75 in.(40 cm)

- Width—2.1 in. (5.3 cm)

- Weight—28 lb (12.8 kg)

QSFP Optical Modules

The 20-port 100Gbps Line Card supports the following QSFP modules:

- QSFP-100G-SR4-S

- QSFP-100G-LR4-S

- QSFP-100G-CWDM4-S

> • QSFP-100G-PSM4-S
>
> • QSFP-100G-SM-SR

For transmit/receive and port cabling specifications, see the Optical Module Specifications section.

CPAK Optical Modules

The 20-port 100Gbps Line Card supports the following CPAK modules:

> • CPAK-100G-LR4
>
> • CPAK-100G-SR10
>
> • CPAK-100G-SR4
>
> • CPAK-10X10G-LR
>
> • CPAK-100G-ER4L
>
> • CPAK-10X10G-ERL
>
> • CPAK-100G-PSM4

For transmit/receive and port cabling specifications, see the Optical Module Specifications section.

60-Port 10Gbps Line Card with SFP+ Optics Module

The 60-port 10Gbps SFP+ LC (Lean Core [NC6-60X10GE-L-S] and Multi-Service Core [NC6-60X10GE-M-S]) has:

> • 60 ports that each accept a small form-factor plus (SFP+) optics module
>
> • Attention LED
>
> • Status LED
>
> • Port LEDs, one on each port

This figure shows the front panel of the 60-port 10Gbps SFP+ LC.

Figure 58: 60-Port 10Gbps SFP+ LC Front Panel
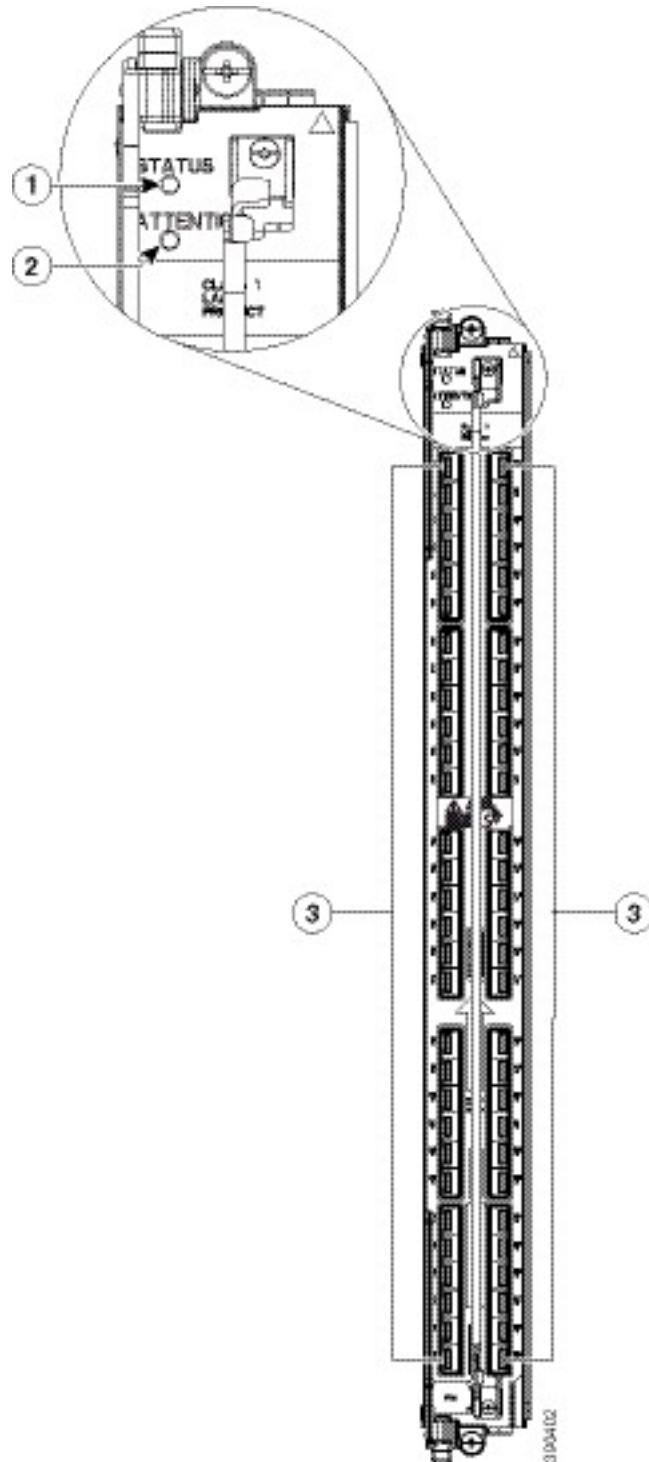
1	Status LED	3	Port LEDs (one LED on each port)

2	Attention LED		

This table describes the LEDs for the 60-port 10Gbps SFP+ LC.

Table 11: 60-Port 10Gbps SFP+ LC LED Descriptions

LED	State	Description
Status	Green	The LC is properly seated and operating correctly.
	Yellow	The LC has one or more errors detected.
	Off	No power is applied to the LC.
Attention	Blue	The card needs attention.
	Off	The card does not need attention.
Port	Green	The link is up (including internal loopback).
	Yellow	The link is down or a hardware failure has occurred.
	Off	The slice is unprovisioned by software, the optics module is missing, or the slice has been powered down.

Note Use the [**no**] **hw-module attention-led location** *node-id* command in System Admin Config mode to enable or disable the Attention LED. The Attention LED is useful for identifying and verifying which card needs attention.

Physical Characteristics

- Height—22.5 in. (57.2 cm)

- Depth—15.75 in.(40 cm)

- Width—2.1 in. (5.3 cm)

- Weight—26 lb (11.8 kg)

SFP+ Optical Modules

The 60-port 10Gbps SFP+ Line Card supports the following SFP+ optical modules:

- SFP-10G-SR

- SFP-10G-SR-X

- SFP-10G-LR

- SFP-10G-LR-X

- SFP-10G-ER

- SFP-10G-ZR

For transmit/receive and port cabling specifications, see the Optical Module Specifications section.

# Installing and Removing a Line Card

Installing a Line Card

Prerequisites

- Review the Guidelines for Installing and Removing a Card section.

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

⚠

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

Required Tools and Equipment

- ESD-preventive wrist strap

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

- LC

Installing a Line Card

To install a LC, perform the following steps:

Figure 59: Installing a LC
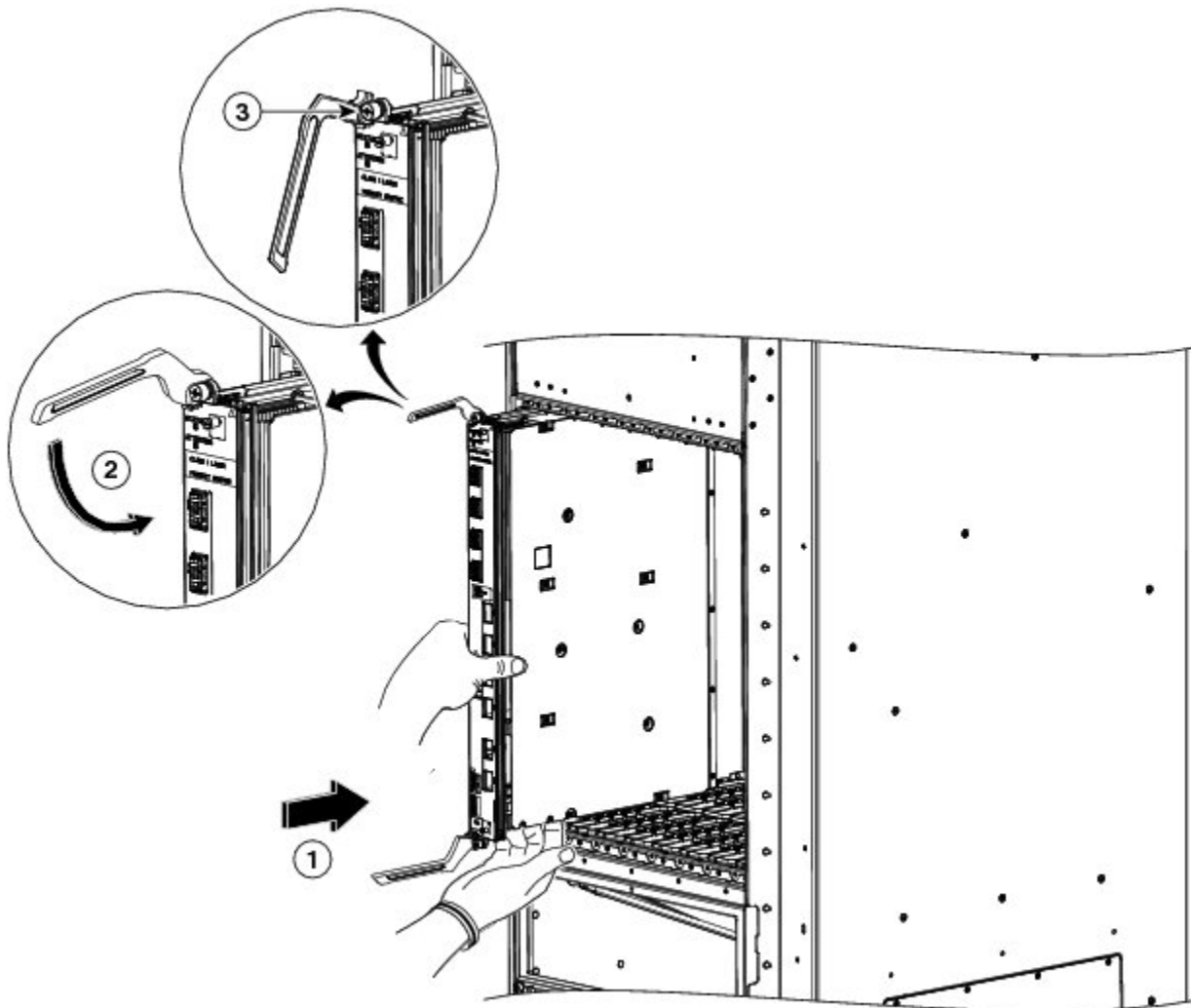
1	Direction of insertion	3	Captive screw
2	Ejector lever		

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the chassis (see Preventing Electrostatic Discharge, on page 9). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2   Remove the impedance carrier (see the Steps section) and set it aside.

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

Step 3   Remove the LC from the antistatic bag.

Step 4   **On the 20-port 100Gbps LC:** Press the OIR buttons on the top and bottom of the card faceplate to release the ejector levers.

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

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

Step 6   Orient the LC according to the up arrow on the faceplate. If the card does not slide easily into the slot, the orientation may be wrong and the rejection flange is stopping the card from going into the slot. Reorient the LC, if necessary.

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

Step 8   Simultaneously pivot the ejector levers toward the faceplate of the LC. Do not force the LC; the ejector levers properly seat the LC 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 LC is properly seated in the slot.

Step 9   Use a number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to tighten the captive screws next to each LC ejector lever to ensure proper EMI shielding and prevent the LC from becoming partially dislodged from the midplane.

Step 10   Attach the vertical cable management bracket to the faceplate of the LC using the two screws that came with it.

Verifying the Installation of a Line Card

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

- When the card is properly installed and no faults are detected, the card status LED turns green.

- When the card status LED is solid yellow, either software initialization is in progress during bootup or a fault exists on the board.

- When the card status LED is blinking yellow, the card is not fully seated.

- When the card status LED is off, verify that the card is installed correctly. There could be no power applied to the card, a power fault, or a hardware fault.

- Verify that there is power to the card by looking at the indicators on the power tray.

If the installed or replaced LC fails to operate or to power on after installation:

- Ensure that the card is seated firmly into the Cisco NCS 6008 chassis 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.

- Ensure that 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 power system to see whether the chassis is receiving power.

Removing a Line Card

⚠️

Warning   Class 1 Laser Product. Statement 113

⚠️

Warning   Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Statement 125

⚠️

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

Prerequisites

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

⚠️

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

Required Tools and Equipment

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

Removing a Line Card

To remove a LC, perform the following steps:

Figure 60: Removing a LC
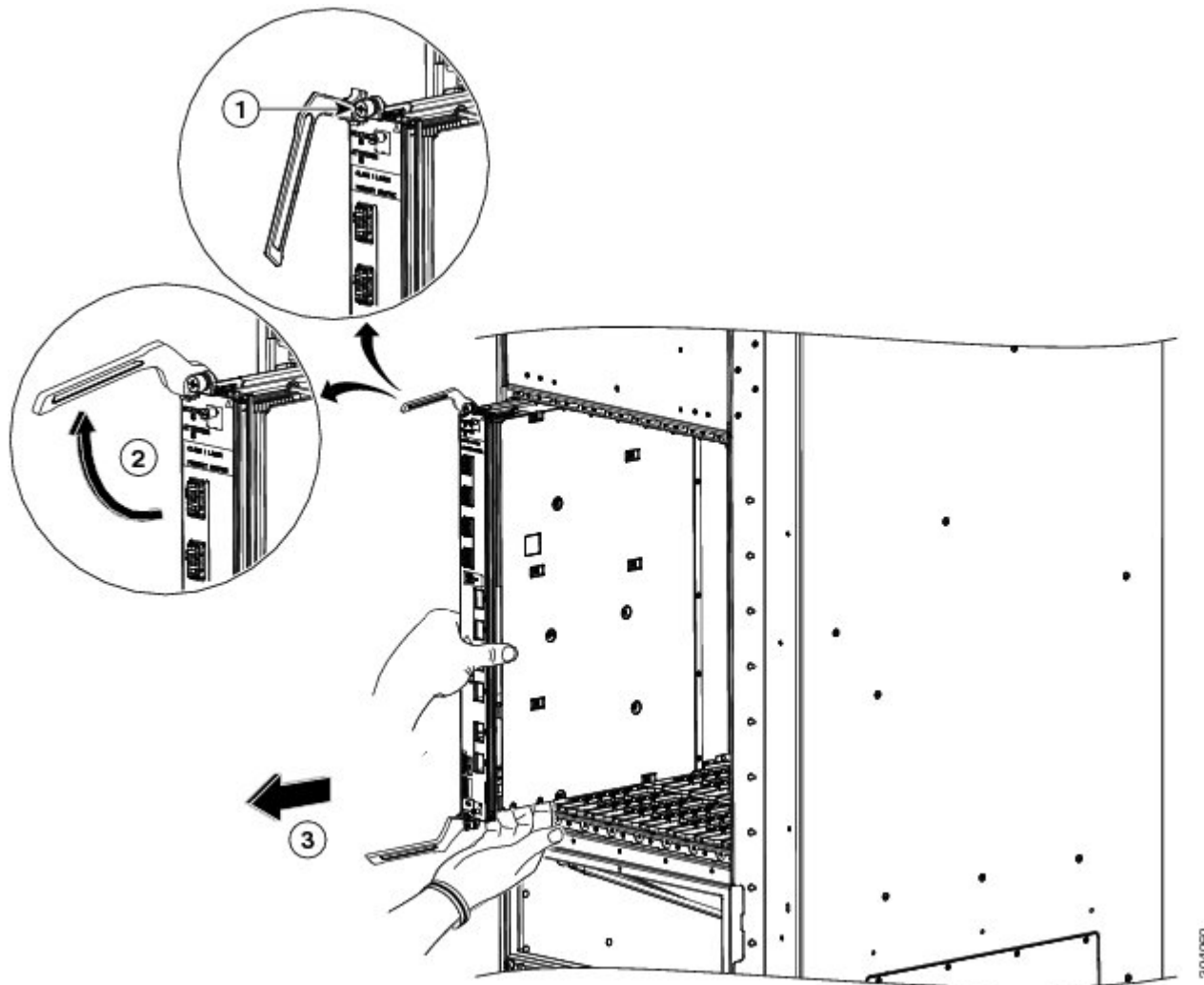
1	Captive screw	3	Direction of removal
2	Ejector lever		

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the chassis (see Preventing Electrostatic Discharge, on page 9). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2 Identify the card to be replaced. To verify which card needs attention, the Attention LED can be lit using the **hw-module attention-led location** *node-id* command in System Admin Config mode.

Step 3 Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to loosen the two captive screws holding the card in place.

Step 4   **On the 20-port 100Gbps LC:** Press the OIR buttons on the top and bottom of the card faceplate to release the ejector levers.

    Note   Wait for the STATUS LED to turn to yellow. This indicates that the card is ready for removal.

Step 5   Grasp the two card ejector levers and simultaneously pivot both ejector levers 70 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.

    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

Removing and Replacing Chassis Components

This chapter provides instructions on how to remove and replace components from the Cisco NCS 6008 LCC.

Removing the Exterior Cosmetics

This section describes how to remove the front-side and rear side exterior cosmetics on the Cisco NCS 6008 LCC. We recommend that you remove the cosmetics in the order outlined in this section.

Prerequisites

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

Required Tools and Equipment

8-inch, number-1 Phillips screwdriver (magnetic head preferable)

Removing the Front Exterior Cosmetics

Steps

To remove the front exterior cosmetics, perform the following steps:

Step 1 Remove the top and bottom front grilles by unsnapping them from the snap joiners on the LCC.

Figure 61: Removing the Front Grilles
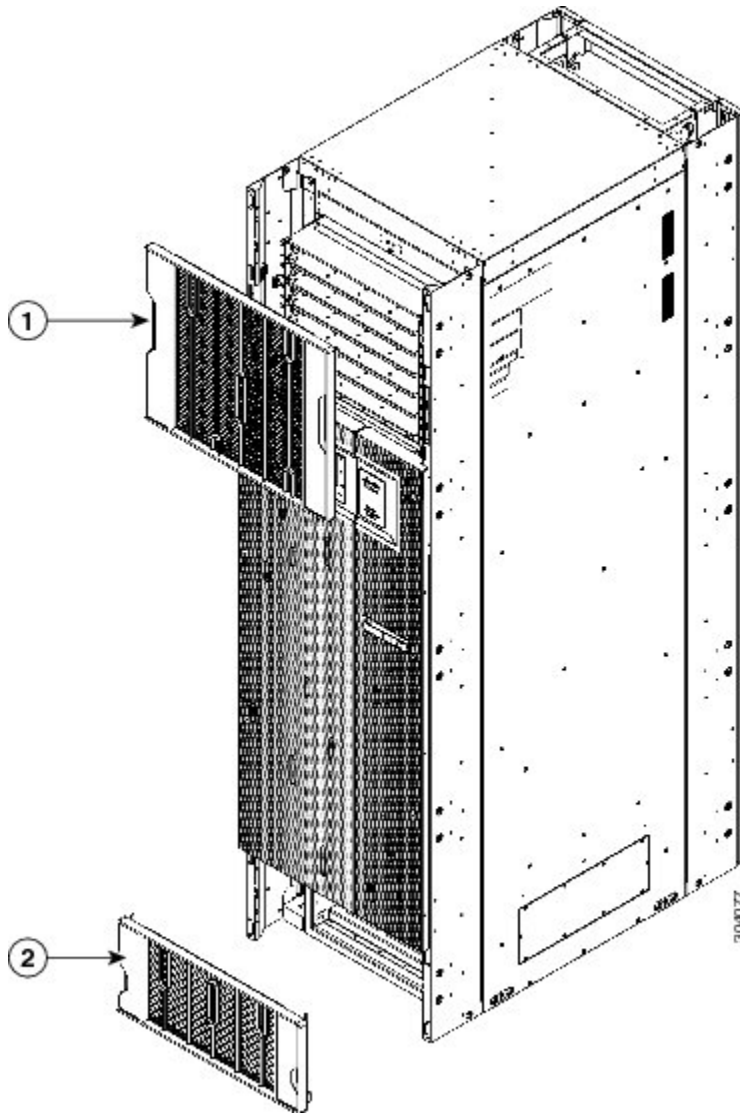
1		Front top grille	2		Front bottom grille

Step 2 Remove the front doors.

    a) Open the doors and remove the grounding cables by loosening and removing the pan-head screws (See below figure).

    b) Lift the doors up and off the hinge attachment pins and pull away from the LCC.

Figure 62: Grounding Cables
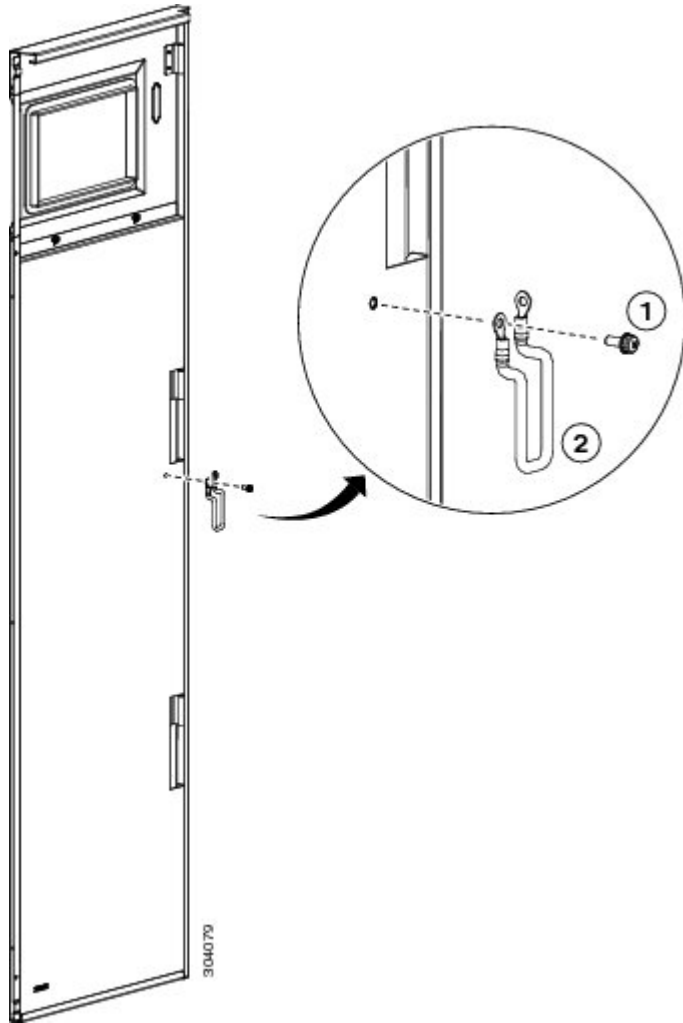
1	Pan-head screw	2	Grounding cable

Step 3   Remove the door hinge attachments, three left and three right, by removing two pan-head screws each (See below figure).

Figure 63: Removing the Door Hinge Attachments—Front of the LCC
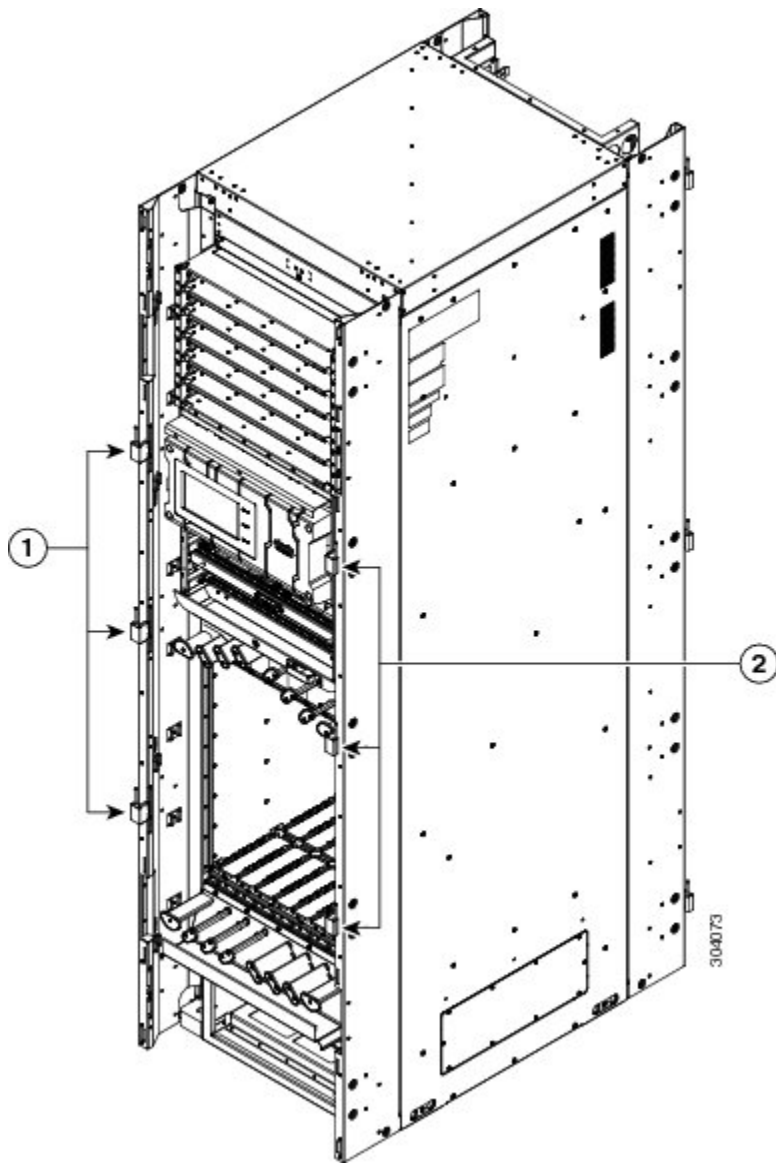
1	Left door hinge attachments	2	Right door hinge attachments

Step 4   Remove the left and right vertical cable troughs from the front of the LCC (See figure below)) by using the screwdriver to loosen the pan-head screws counterclockwise and remove them from the cable troughs.

Note   We recommend that you use two people to remove the vertical cable troughs, one person to hold the vertical cable troughs while the other person removes the pan-head screws.

Figure 64: Exterior Cosmetics for the Front of the LCC
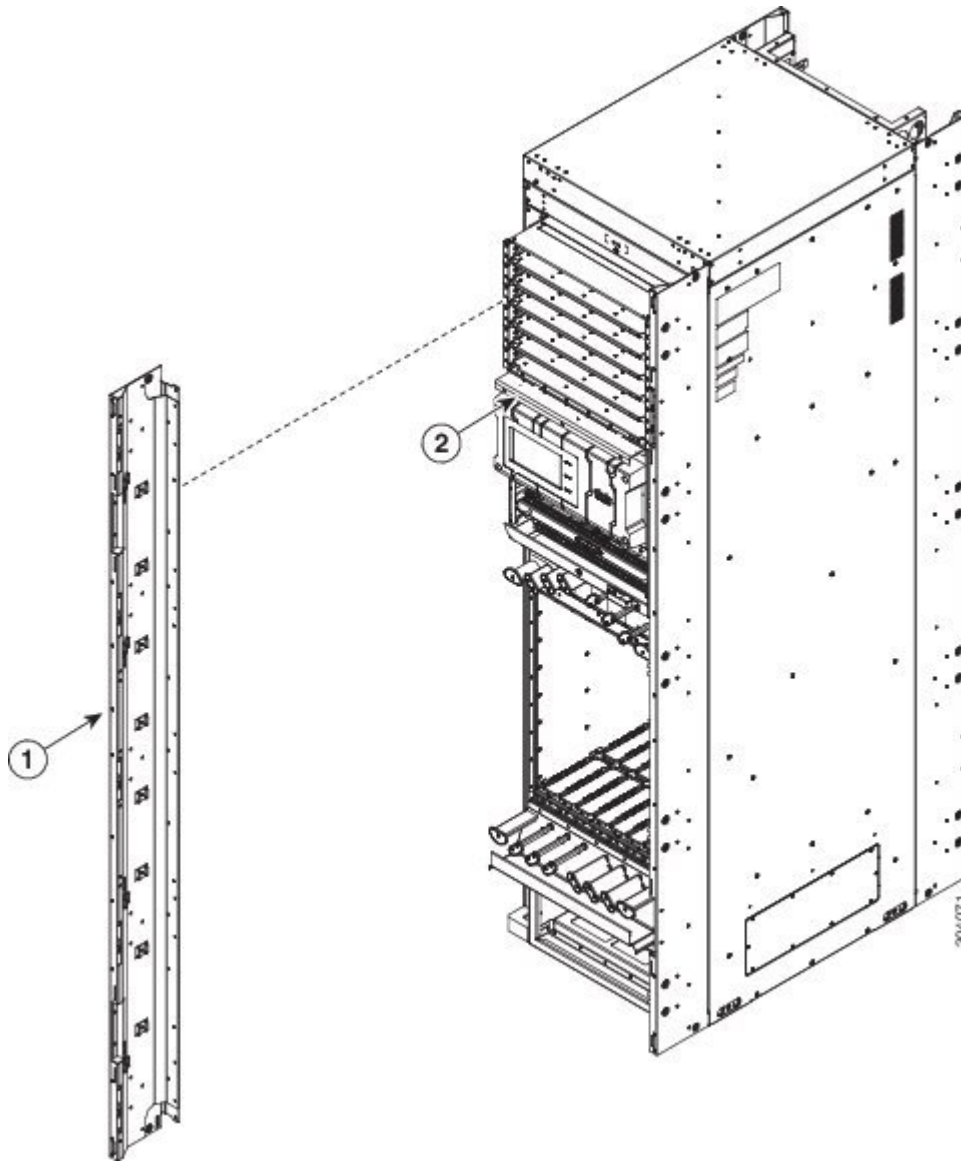
1	Vertical cable troughs (one per side), each attached to the LCC with eight pan-head screws	2	Craft panel display cover

Step 5   If necessary, remove the craft panel located on the front of the LCC (see above figure). Usually it is not necessary to remove this panel. The craft panel (Cisco PID NCS-CRFT=) is a field replaceable unit.

    a)   Loosen the four captive screws on the craft display panel.

    b)   Pull the craft display panel away from the LCC to remove.

    c)   Loosen the four captive screws on the sheet metal craft panel.

d)   Pull the craft panel away from the LCC to remove.

Removing the Rear Exterior Cosmetics

Note   While it is possible to remove most of the rear cosmetic parts on the fabric chassis separately, some parts (such as a vertical cable trough) require that other parts be removed first.

Steps

To remove the rear cosmetics, perform the following steps:

Step 1   Remove the exhaust air deflector by carefully pulling its mounting tabs away from the brackets on the vertical cable troughs.

Figure 65: Exhaust Air Deflector on the Rear of the LCC
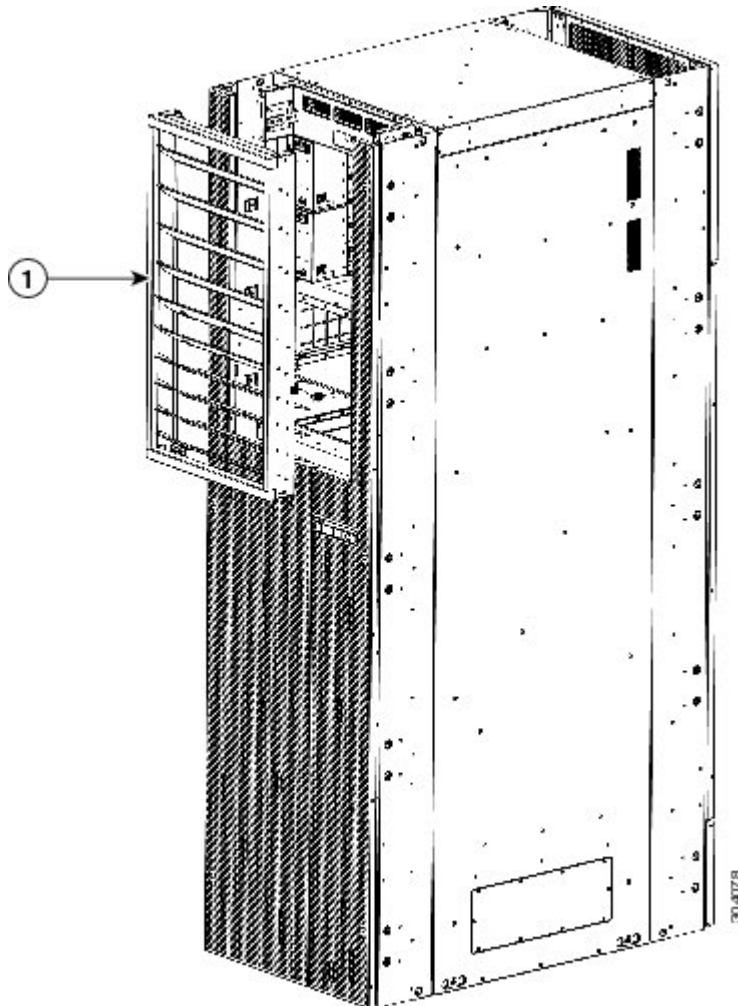
1	Exhaust air deflector

Step 2 Remove the Rear Doors

    a) Open the doors and remove the grounding cables by loosening and removing the pan-head screws.

    b) Lift the doors up and off the hinge attachment pins and pull away from the LCC.

Figure 66: Grounding Cables
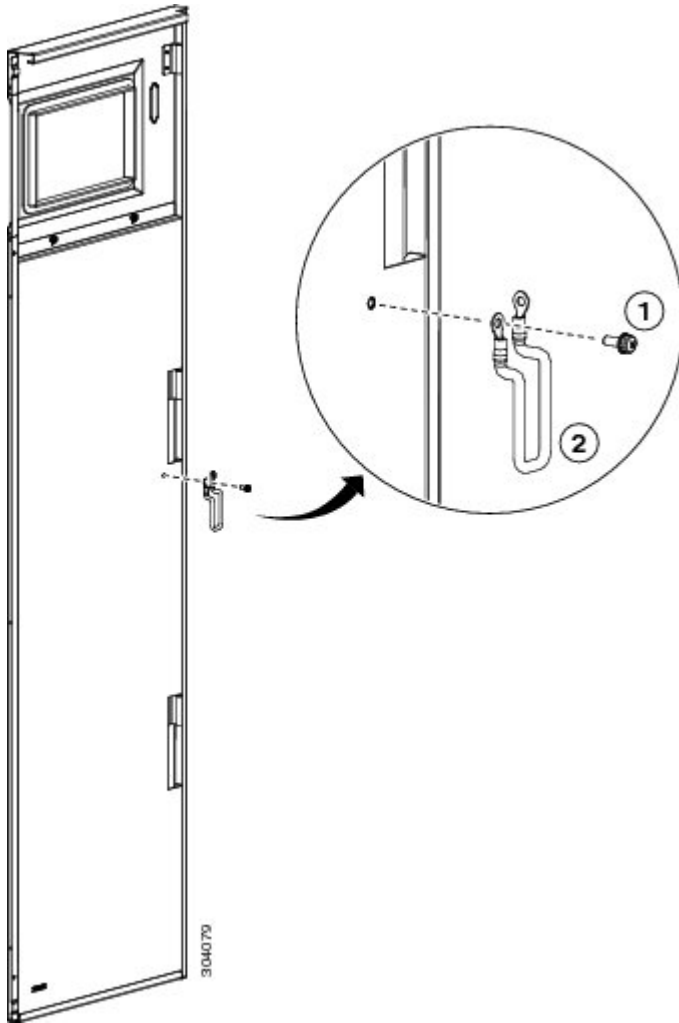
1	Pan-head screw	2	Grounding cable

Step 3   Remove the door hinge attachments, three left and three right, by removing the two pan-head screws each.

Figure 67: Door Hinge Attachments—Rear of Chassis
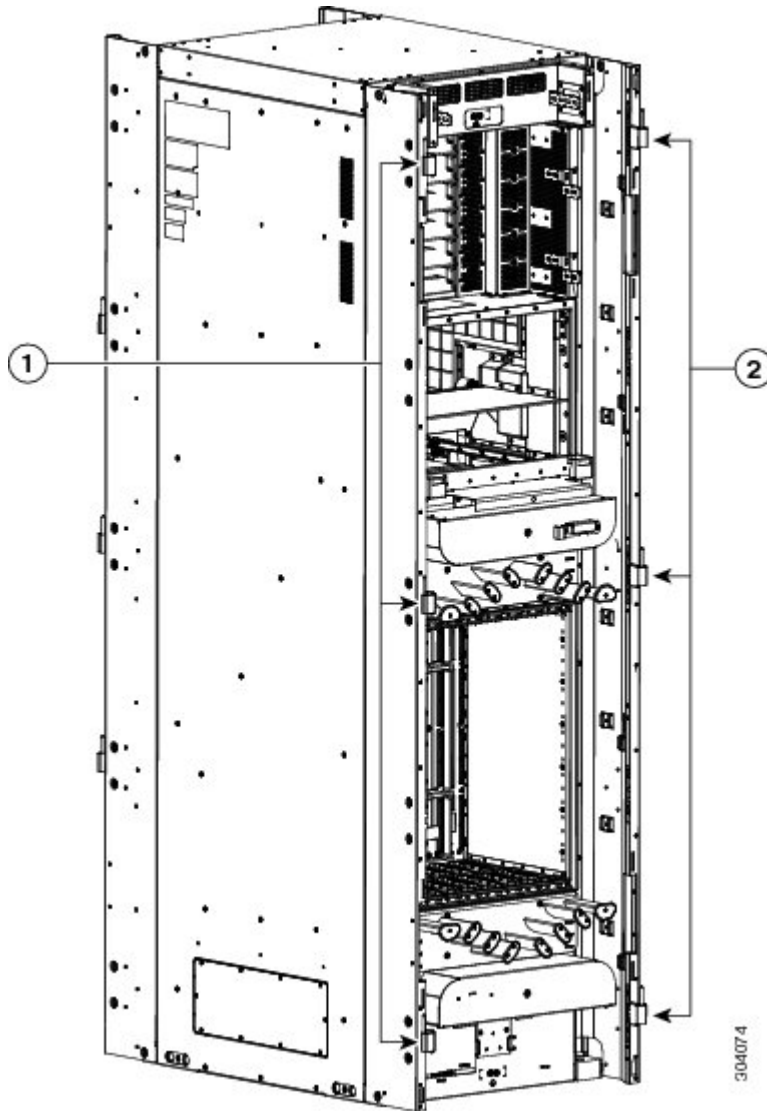
1	Left door hinge attachments	2	Right door hinge attachments

Step 4   Remove the exhaust plenum bracket by removing the eight pan-head screws (four on each side).

Figure 68: Exterior Cosmetic For the Rear of the LCC
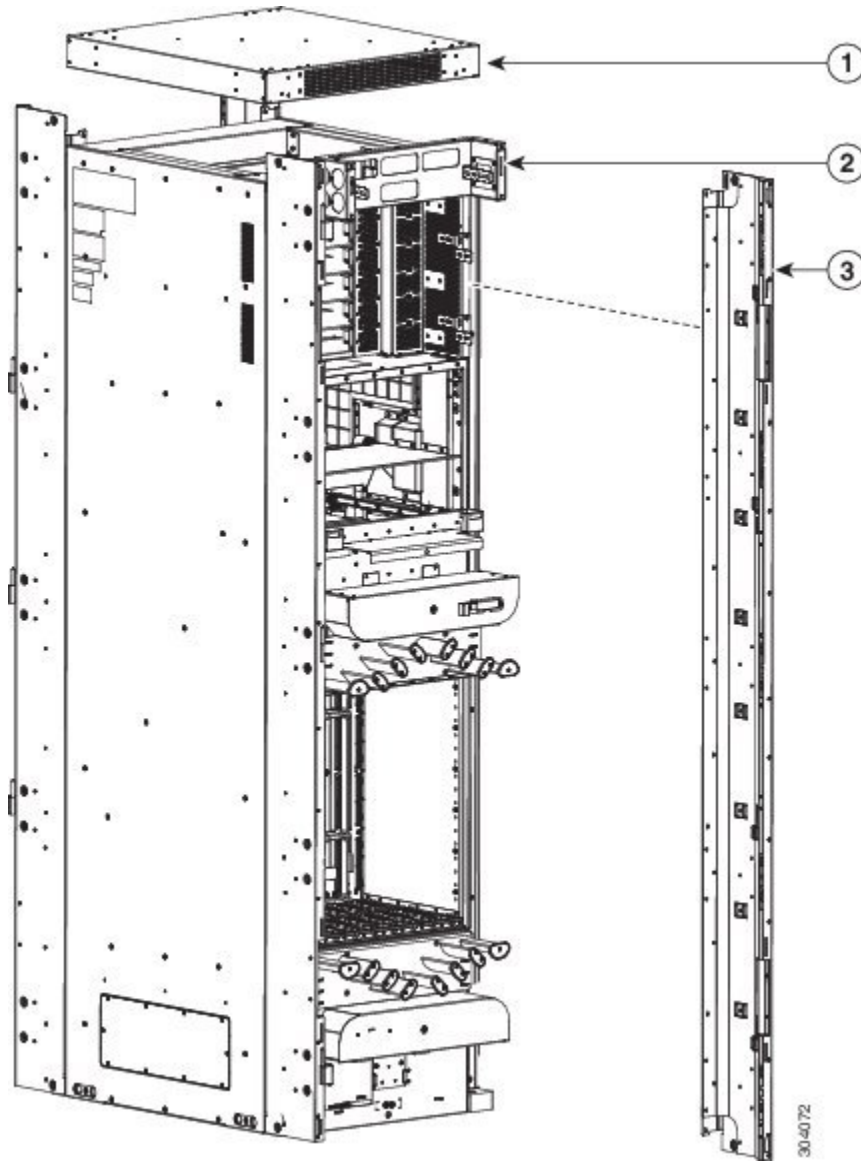
1	Top cap	3	Vertical cable troughs (one per side), each attached to the LCC with eight pan-head screws
2	Exhaust plenum bracket		

Step 5   Remove the top cap from the top of the LCC by removing the four screws from the tops of the vertical cable troughs.

Step 6   Remove the left and right vertical cable troughs by using the screwdriver to loosen the 16 pan-head screws counterclockwise and remove them from the cable troughs.

Note We recommend that you use two people to remove the vertical cable troughs, one person to hold the vertical cable troughs while the other person removes the pan-head screws.

Removing the Power Components

This section describes how to remove power components from the Cisco NCS 6008 LCC.

Note Although there are differences between AC and DC power trays and PMs, they are removed using the same procedures.

While it is possible to remove power components from the Cisco NCS 6008 LCC separately, some parts (such as the power tray) require that other parts be removed first.

We recommend that you remove the power components in the order outlined in this section.

Removing AC Input Power Cords

This section describes how to remove AC input power cords from a power tray.

Prerequisites

Remove the exhaust air deflector from the rear of the LCC. Power off the AC PMs in the tray you want to disconnect.

Note Before removal, make sure that the input power cables are not energized.

Required Tools and Equipment

- ESD-preventive wrist strap

- 6-inch, number-1 Phillips screwdriver

Steps

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

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD connection sockets on the rear of the LCC. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC. See Preventing Electrostatic Discharge, on page 9.

Step 2 Verify that the AC input source breaker is in the OFF position.

Step 3 Use the screwdriver to loosen the screws that clamp the cords in place.

Figure 69: AC Input Power Cords Connected to the Power Tray
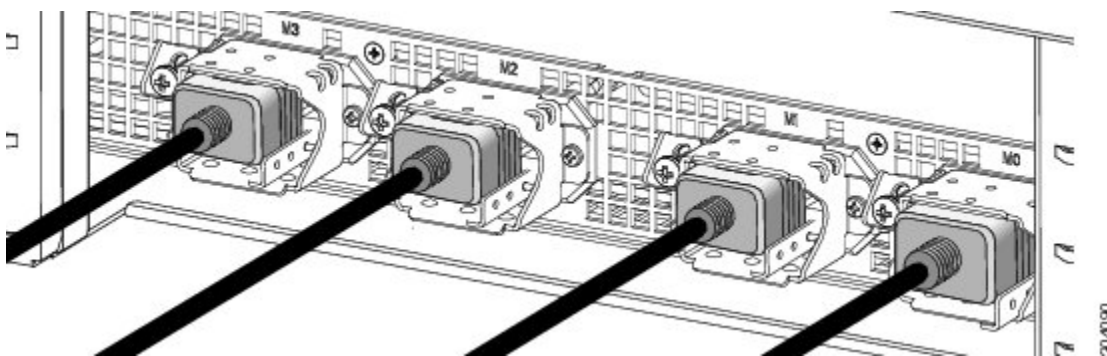
Step 4   Remove the cords from the cord clamps.

Removing DC Input Power Cables

This section describes how to remove DC input power cables from a power tray terminal block.

Prerequisites

Remove the exhaust air deflector from the rear of the LCC. Power off the DC PMs in the tray you want to disconnect.

Note   Before removal, make sure that the input power cables are not energized.

You need the following tools to perform this task:

- ESD-preventive wrist strap

- 6-inch, number-1 Phillips screwdriver

- 3/8-inch ratchet wrench with 7/16-pt. socket

- Voltmeter

Steps

To disconnect DC input power cables, go to the rear of the LCC and perform the following steps:

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD connection sockets on the rear of the LCC. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC. See Preventing Electrostatic Discharge, on page 9.

Step 2   Using the voltmeter, verify that there is no voltage on the cables that are about to be removed.

Step 3   Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.

Step 4   Slide the terminal block cover downwards.

Step 5   Remove the terminal block cover.

Step 6   Using the ratchet wrench, remove the positive and negative cable pairs from each terminal block.

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

Step 7   Replace the terminal block cover.

Removing a Power Module Slot Cover

This section describes how to remove a PM slot cover from a PM slot in an AC or DC power tray.

Prerequisites

Before performing this task, you must first remove the top grille on the front side of the LCC, if installed (see the Removing the Front Exterior Cosmetics, on page 97).

Steps

To remove a PM slot cover from the front of a power tray, perform the following steps:

Step 1   Gently pinch the tabs on the top of the PM slot cover to partially detach the slot cover from the slot.

Step 2   Slide the PM slot cover out by removing the tabs on the bottom of the PM slot cover from the two holes on the bottom of the slot.

Figure 70: PM Slot Cover on the Front of a Power Tray
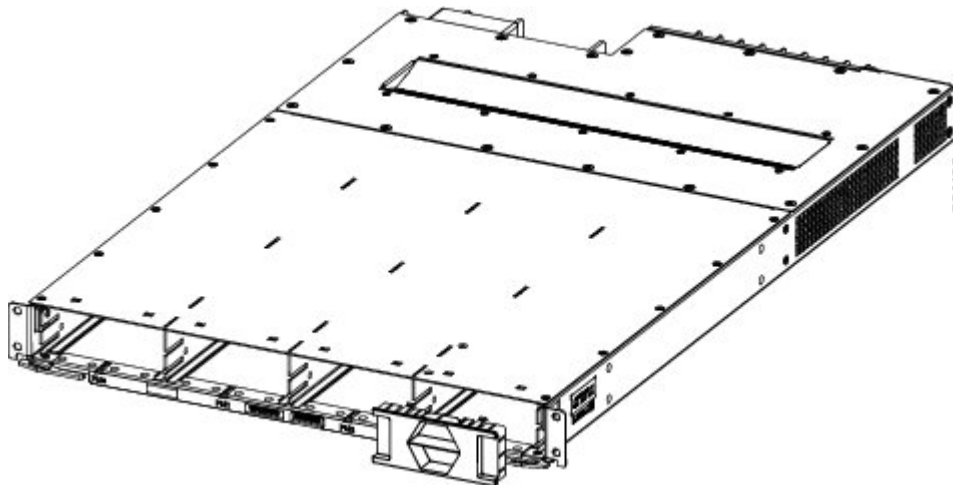
Removing an AC or DC Power Module

This section describes how to remove a power module from a power tray.

Prerequisites

Before performing this task, you must first remove the top grille on the front side of the LCC, if installed.

Note It is not necessary to turn off the switch on the power tray to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-inch, number-1 Phillips screwdriver

Steps

To remove a power module from the front of a power tray, perform the following steps:

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the LCC. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC.

Step 2 Using the screwdriver, unscrew the ejector lever screw.

Figure 71: Removing a PM from a Power Tray
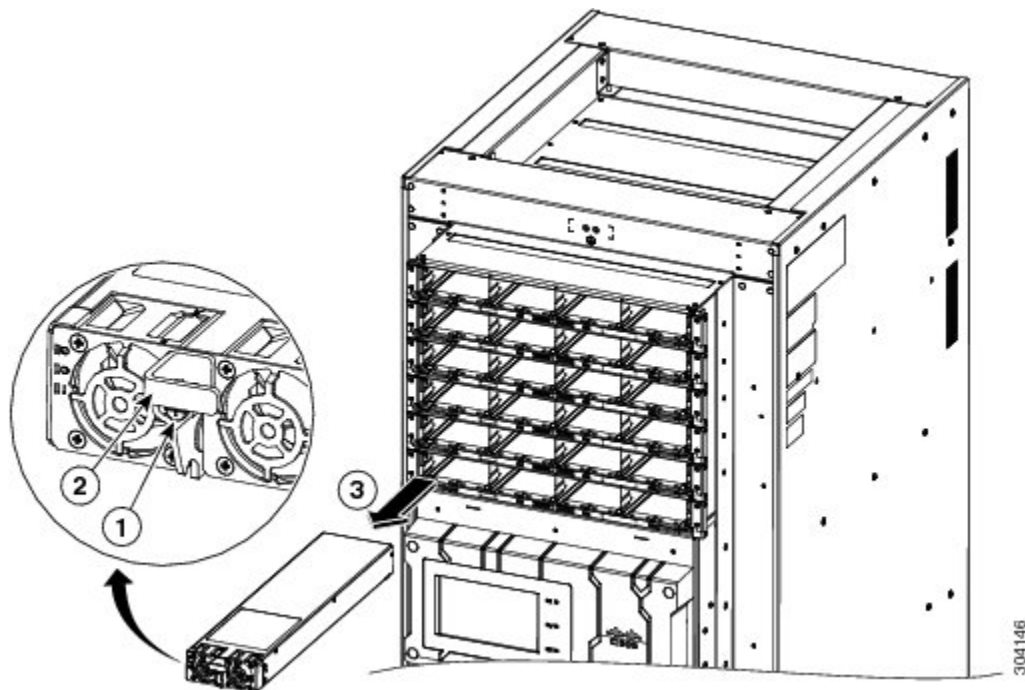
1	Ejector lever screw	3	Power module
2	Ejector lever		

Step 3   Rotate the ejector lever down to unseat the PM.

Step 4   Slide the PM out of its bay in the power tray while supporting it with your other hand.

Removing an AC or DC Power Tray

This section describes how to remove a power tray from the Cisco NCS 6008 LCC.

Note   As a requirement to receive Cisco support, all six power trays must be installed in the LCC.

Prerequisites

- Power off the power shelf that houses the power tray you are about to install by using the 1/0 power switch on the respective PCM.

- Completely power off the entire system at the supply circuit breakers before installing a power tray.

- Remove the top grilles from both the front and rear sides of the LCC, if installed.

- Ensure the power tray you are about to install is empty. It is not necessary to turn off the switch on the power tray to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

Caution   The I/O switch on each power shelf only disables the output of the PMs in that shelf. The inputs to the PMs remain hot, as well as the system's internal busbar (due to the other power shelf).

Required Tools and Equipment

- 6-inch, number-2 Phillips screwdriver

Steps

To remove an AC or DC power tray, perform the following steps:

Step 1   Use the screwdriver to loosen the four M4 x 10 mm screws that attach the power tray to the LCC.

Figure 72: Removing a Power Tray from the LCC
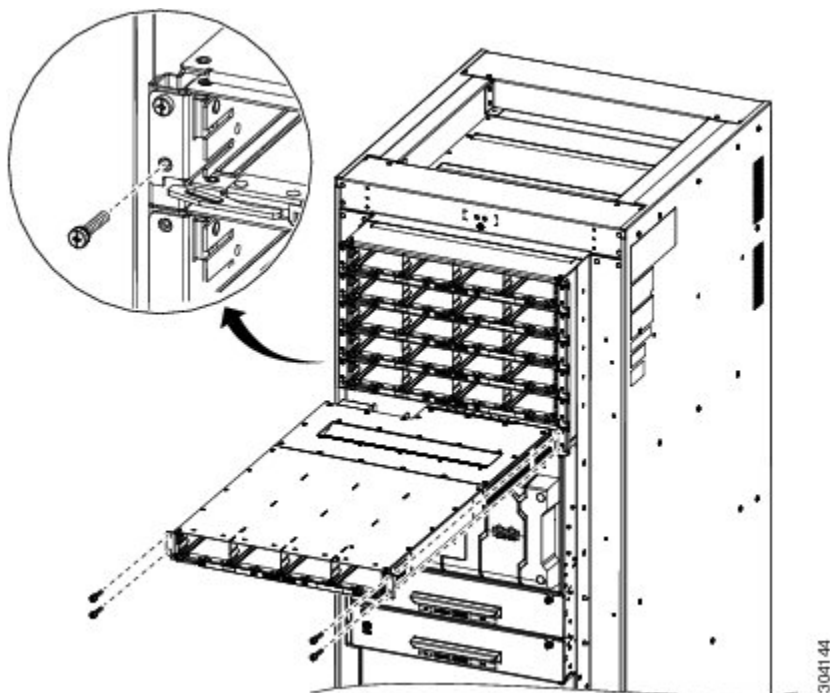
Step 2   Pull both the left and right ejector handles out at the same time to eject the power tray from the LCC. Slide the power tray all the way out of the LCC.

> **Caution**   Because of the weight of the power tray, 20 lb (9 kg), and the height at which the power tray is installed in the LCC, you should be especially careful while removing and carrying the power tray. To prevent injury, avoid sudden twists or lateral moves.

> **Caution**   Do not use the ejector handles for lifting or supporting the power tray, because this could severely damage the handles.

Removing the Chassis Ground Cable

This section describes how to remove the chassis ground cable on the Cisco NCS 6008 LCC.

Prerequisites

Before performing this task, completely power off the entire system. Remove all AC or DC input power connections.

⚠

> **Caution**   Do not remove the ground cable unless the LCC is powered off and to be replaced.

Required Tools and Equipment

- 3/8-inch drive socket wrench

- 10-mm 6-pt. socket

Steps

To remove the ground cable from the LCC, remove the two M6 bolts that attach the ground cable to the NEBS grounding point.

Figure 73: NEBS Bonding and Grounding Point
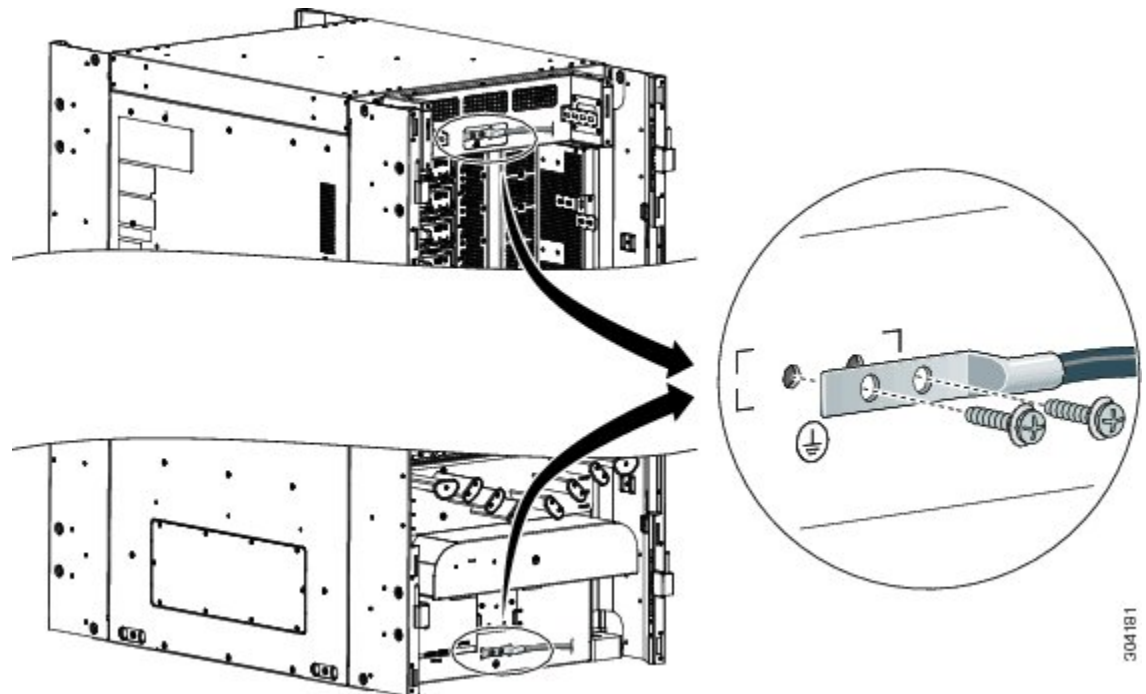
Removing a Power Control Module

This section describes how to remove a power control module (PCM) from the Cisco NCS 6008 LCC.

The LCC is shipped with two power control modules (PCMs) preinstalled. The PCM is not a field-replaceable unit, however you can order one from Cisco at the following URL (Cisco login required): https://cisco-apps.cisco.com/cisco/psn/commerce.

The PCMs are located behind the two power shelves (PS0 and PS1) on the back of the LCC. Each power shelf has a set of three power trays and a PCM with its own I/O power switch.

Required Tools and Equipment

- ESD-preventive wrist strap

- Number 1 Phillips-head screwdriver

- 8 to 10-inch Number 2 magnetic screwdriver

• Replacement PCM (NC6-PCM=)

Steps

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the LCC (as shown in the following figure). You can also connect the wrist strap to any bare metal surface on the LCC.

Figure 74: ESD Jack—Front Side of the LCC.
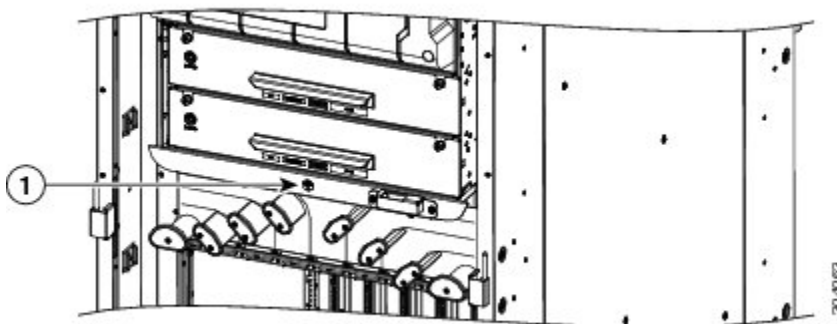
1	ESD jack (two on each side of the LCC)

Step 2 Power off each power shelf by using turning the I/O power switch to OFF on the respective PCM.

Step 3 Completely power off the entire system at the supply circuit breakers.

Step 4 Remove the four M4 Phillips pan-head screws from each power tray. Using the ejector handles, slide the three power trays forward just enough to disengage the connector to the PCM without removing the power cables (approximately 1-inch).

Note The power trays must be pushed out so that the PCM freely disengages from the connector.

Step 5 Using the magnetic screwdriver, remove the screws from the PCM.

a) Loosen and remove the two 6-32 pan-head screws on the left front face of the PCM.

b) Loosen and remove the three 6-32 flat-head screws on the right side flanges of the PCM.

Figure 75: Removing a PCM
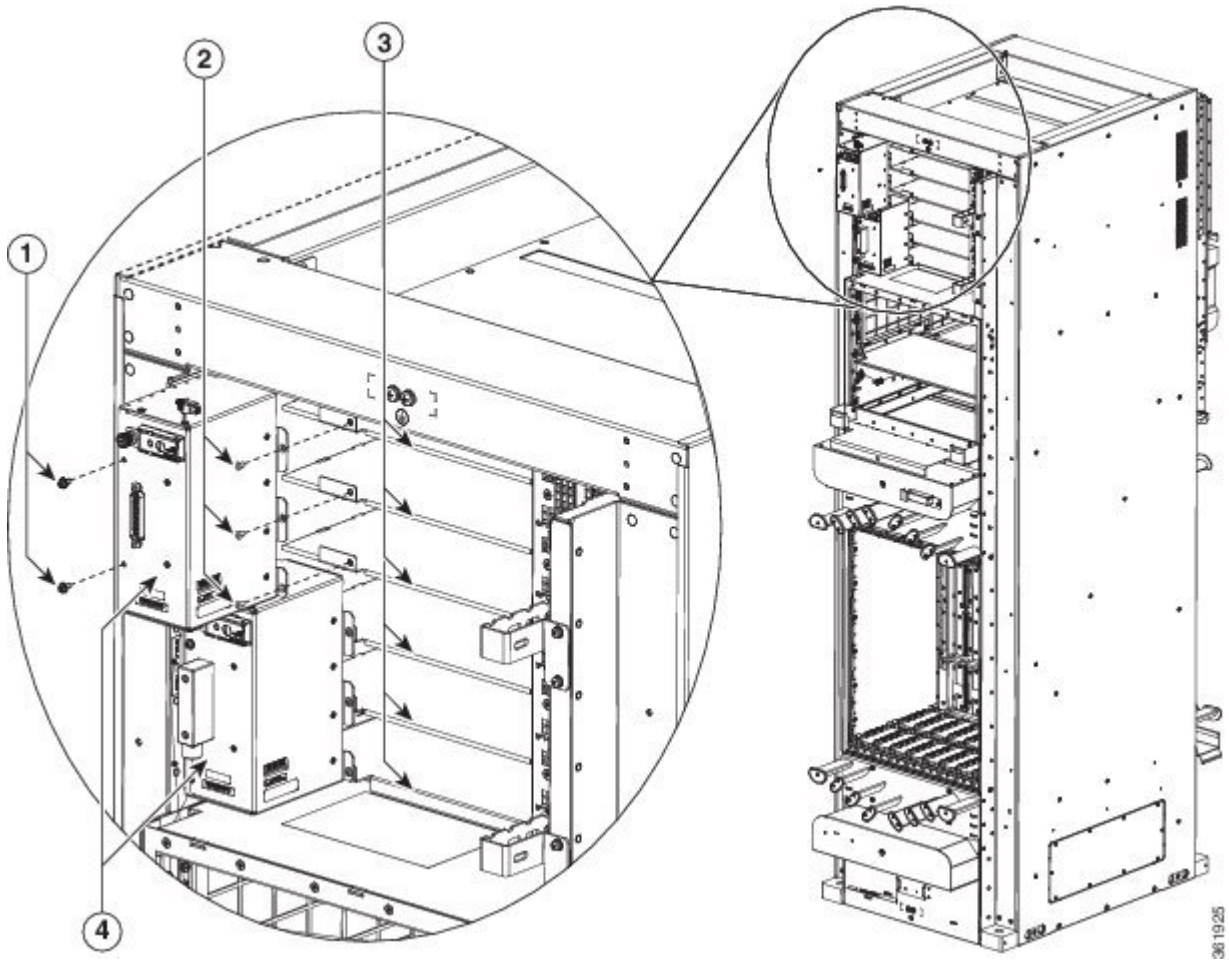
1		Two 6-32 pan-head screws	3		Power trays (three trays for each PCM)
2		Three 6-32 flat-head screws	4		Two PCMs

Step 6   Using the magnetic screwdriver, attach the replacement PCM.

  a) Re-insert and tighten the two 6-32 pan-head screws on the left front face of the PCM.
  b) Re-insert and tighten the three 6-32 flat-head screws on the right side flanges of the PCM.

Step 7   Push each power tray in until it engages with the power shelf connectors.

Step 8   Re-insert and tighten the four pan-head screws for each power tray.

Replacing the Fan Trays and Air Filter

✎

Note   The LCC is shipped with the two fan trays and an air filter preinstalled.

Information About the Air Circulation Components

About the Fan Trays

The NCS 6008 LCC is equipped with two fan trays to provide the cooling required to protect critical components throughout the system from overheating. This arrangement is designed to ensure high availability in the cooling system. Typically, the fan trays share the cooling load, but each is capable of cooling chassis in normal operating conditions (up to 40°C [104°F] ambient room temperature) if the other is down. This is a diagram of the air circulation in the NCS 6008 LCC.

Figure 76: Airflow Through the Cisco NCS 6008 LCC
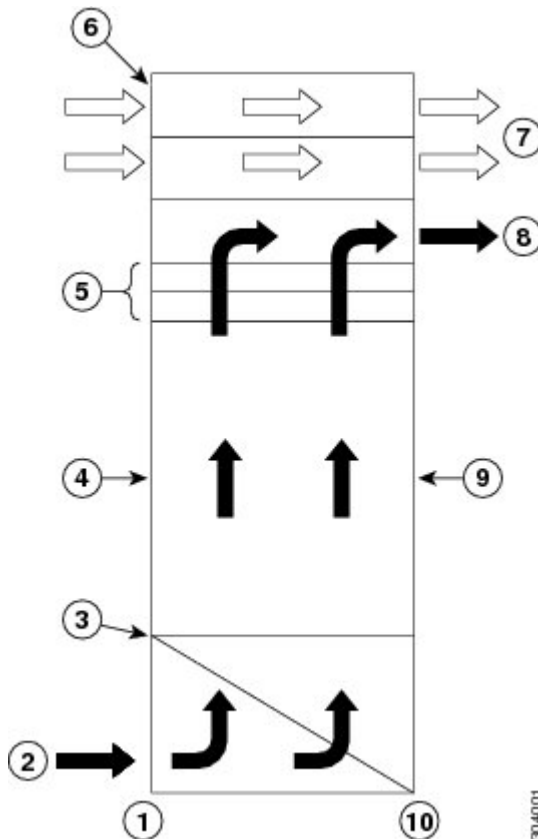
1	Front side of LCC	6	Air flow through PMs
2	Air inlet plenum	7	Exhaust air from PMs

3	Air filter	8	Air exhaust plenum
4	Front cage for LCs	9	Rear cage for FCs and RP cards
5	Fan trays	10	Rear side of LCC

Temperature sensors mounted on the critical components throughout the system are monitored by the system software. Whenever a component breeches the preliminary threshold set for that component, a message is sent to the fan tray to increase fan speed until the temperature returns to normal. If the critical threshold is breeched, the card is shut down to avoid permanent damage.

Normally, all fans operate in unison to provide the appropriate air circulation in the chassis. When an adjustment needs to be made in the air flow, messages are sent to both fan trays to increase or decrease fan speed. If one fan tray fails or is removed, a message is sent to other fan tray to increase fan speed to the maximum. Should both fan trays be down at the same time on a running system, a general alarm is issued and a CLI warning message sent stating that the system will shut down in 45 seconds to avoid component damage in the system. Any fan tray that is down or removed should be replaced as soon as possible to ensure adequate redundant protection in the chassis.

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

There are two fan tray models: NC6-FANTRAY and NC6-FANTRAY-2.

- NC6-FANTRAY is supported in Cisco IOS XR release 5.0.0 and later. However, it does not support the enhanced air flow and monitoring capabilities introduced in Cisco IOS XR release 6.1.2.

Figure 77: Fan Tray
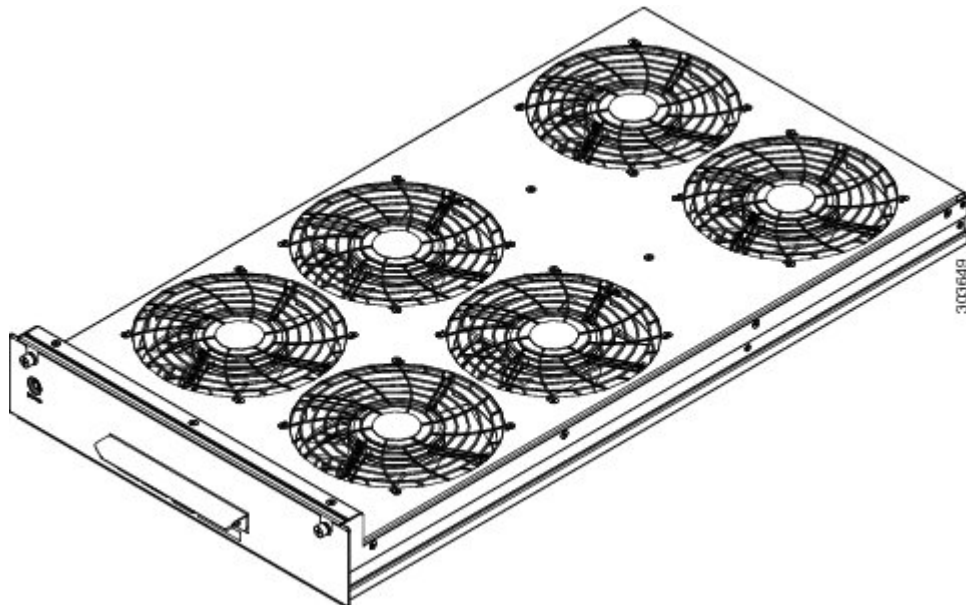
- The NC6-FANTRAY-2 is supported in Cisco IOS XR release XR 6.1.2 and later. Cisco IOS XR release 6.1.2 introduces enhanced air flow and monitoring capabilities.

Figure 78: Fan Tray 2
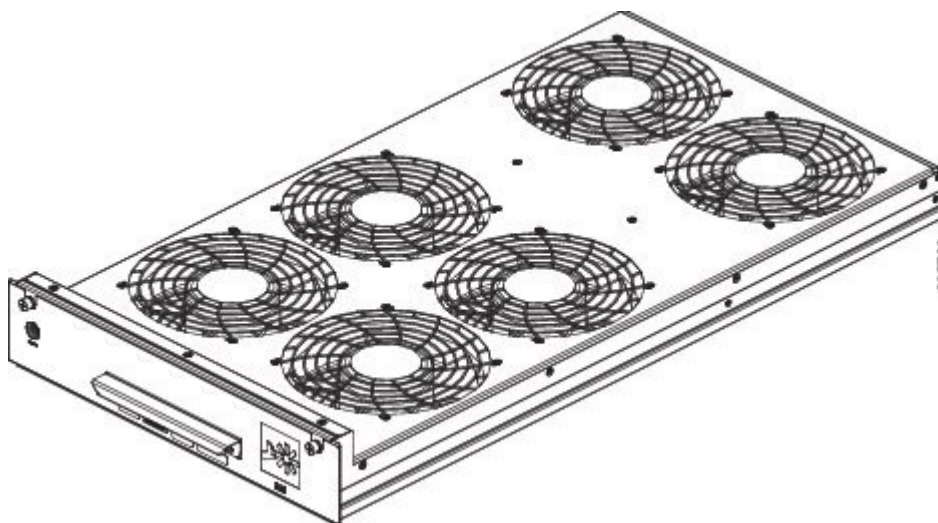
⚠️

Caution Both fan trays installed in a chassis must be the same type. Do not install NC6-FANTRAY and NC6-FANTRAY-2 fan trays in the chassis.

⚠️

Caution If you install two NC6-FANTRAY-2 in a system that is running software earlier than Cisco IOS XR 6.1.2, the software does not recognize the fan tray and the system will shut down within 45 seconds.

A bicolor status LED is located on the front panel of the fan tray. The LED signals the operational status of the fan tray. This table describes how the LED colors are used.

Table 12: Fan Tray LED

State	Description
Green	The fan tray is operating normally.
Yellow	The fan tray has one or more errors detected.
Off	No power is applied to the fan tray.

About the Air Filter

The Cisco NCS 6008 LCC has a serviceable air filter mounted in a slide-out tray accessible from the front of the LCC just below the card cage (Figure 1: Front View of the Cisco NCS 6008 LCC , on page 4). The air filter removes dust from the room air drawn into the LCC by the two fan trays. Once a month (or more often in dusty environments), you should examine the air filter. Replace it if it appears excessively dirty or damaged.

Failure to replace a compromised air filter can result in insufficient air circulation through the LCC and temperature-related environmental alarms. For information about replacing the air filter, see the Replacing the Air Filter, on page 120.

> **Note**   To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployments, the air filter must be replaced, not cleaned.

Replacing Air Circulation Components

Replacing the Fan Tray

Prerequisites

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

If you are installing Fan Tray 2 (NC6-FANTRAY-2), make sure the system is running Cisco IOS XR 6.1.2 or later.

> **Caution**   Both fan trays installed in a chassis must be the same type. Do not install NC6-FANTRAY and NC6-FANTRAY-2 fan trays in the chassis.

> **Caution**   If you install two NC6-FANTRAY-2 in a system that is running software earlier than Cisco IOS XR 6.1.2, the software will not recognize the fan tray and the system will shut down within 45 seconds.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-inch, number-1 Phillips screwdriver
- Fan tray (NC6-FANTRAY-2 or NC6-FANTRAY)

Steps

To replace a fan tray, perform the following steps:

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD connection socket on the front side of the LCC Figure 4: ESD Jack—Front Side of the LCC, on page 10. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the LCC.

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 fan tray handle to pull it free; two people are required to remove the fan tray.

> **Caution**   Because of the weight of the fan tray, approximately 30 lb (14 kg), two people are required to remove the fan tray. You should be especially careful while removing the fan tray from the LCC. 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 side of the LCC. Slide the fan tray halfway from the fan tray bay.

Step 5 Use your free hands to support the fan tray, and then slide the fan tray completely from the fan tray bay.

Step 6 To install the replacement fan tray, use both hands to support and position the fan tray in front of the fan tray bay (label is on top).

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

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

Step 8 Firmly push on the fan tray handle to seat the fan tray connector in the LCC connector. When completely seated, the fan tray faceplate flanges meet the rear side of the LCC.

> **Note**   All electrical and control line connections are made automatically when the connectors mate. The LED will light when the fan tray is inserted. The LED is yellow initially, until the system has confirmed it is functioning correctly.

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

Replacing the Air Filter

> **Note**   We recommend that you change the air filter every three months. The filter is sold in packs of 5 (Cisco PID NC6-5XFILTER=).

> **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.

> **Caution**   Never operate the Cisco NCS 6008 LCC without an air filter. Operating the LCC without a filter for an extended time can result in damage to the chassis hardware.

Steps

To replace the air filter, follow these steps:

Step 1 Remove the lower grille, if installed.

Step 2 Loosen the two captive screws on the filter cover. The filter will automatically drop down.
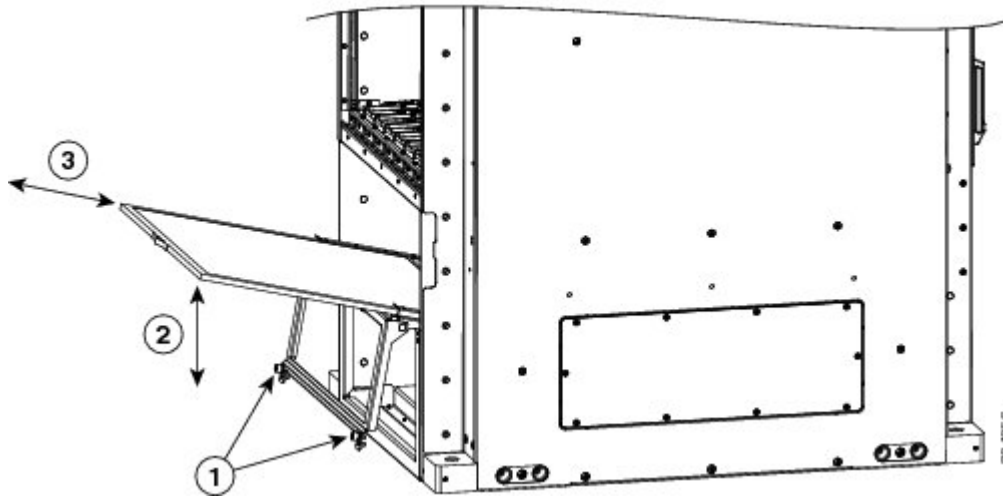
1		Two captive screws	3		Slide old air filter out, slide new air filter in.
2		Pull outward and swing down to access filter, swing up and push in after replacement.			

Step 3   Pull outward on the center of the filter door to pull it free.

Step 4   Grasp the pull tab in the center of the air filter, and slide it out from the slot.

Step 5   Install the replacement air filter.

> **Note**   Verify air flow direction when installing the new air filter. An air flow direction arrow is stamped on the air filter frame and should be installed pointing up.

a) Slide the new air filter into the slot.

b) Swing up and push in the filter cover.

c) Tighten the two captive screws on the front of the filter cover.

Removing the Route Processor Cards and Fabric Cards

This section describes how to remove the route processor (RP) cards and fabric cards (FCs) from the LCC.

Guidelines for Removing a Card

- Online (in-service) insertion and removal (OIR) is supported, enabling you to remove the cards while the LCC is operating. OIR is seamless to users on the network, maintains all routing information, and ensures session preservation. It is not necessary to notify the software or reset the power. OIR removes power to a specific slot before the card is replaced. The power remains on for all other card slots.

✎

Note We recommend that you perform a graceful shutdown to shut down a card prior to removing it from the LCC. See the Steps for OIR Card Removal.

- The different cards in the LCC are attached to the LCC itself using a pair of ejector levers and captive screws. The two ejector levers release the card from its backplane connector. The exact locations of the ejector levers and captive screws can vary slightly from card to card, but are generally in the same locations: on the upper and bottom ends of the faceplate.

- When you remove an FC, you must press the OIR button before using the ejector levers to ensure that the connector pins disconnect from the backplane in the sequence expected by the LCC.

- Any unused card slots that are uncovered allows air used for LCC cooling to escape. To ensure proper air flow and maintain system EMC and safety compliance, any unused FC slots must contain impedance carriers (see the Installing and Removing an Impedance Carrier and the Slot Numbers–Front and Rear Side).

Removing an RP Card

Prerequisites

Before performing this task, open the cosmetic doors, if installed. The RP cards are hot-swappable.

Perform these tasks when you are certain that the other RP card in the chassis is operational and, if not already the Active RP, is ready to assume control (this happens automatically). Failure to follow these guidelines can result in interruptions in data communications and network connectivity.

⚠

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

Required Tools and Equipment

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

Steps

To remove an RP card, perform the following steps:

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD connection sockets on the rear side of the chassis (Figure 4: ESD Jack—Front Side of the LCC, on page 10). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.

Step 2 Identify the card to be removed from the card cage. Remove any cables connected to the front panel of the card.

Step 3   Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to turn the two captive screws on the front panel of the card counterclockwise to loosen the card from the slot.

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

Figure 80: Removing an RP Card
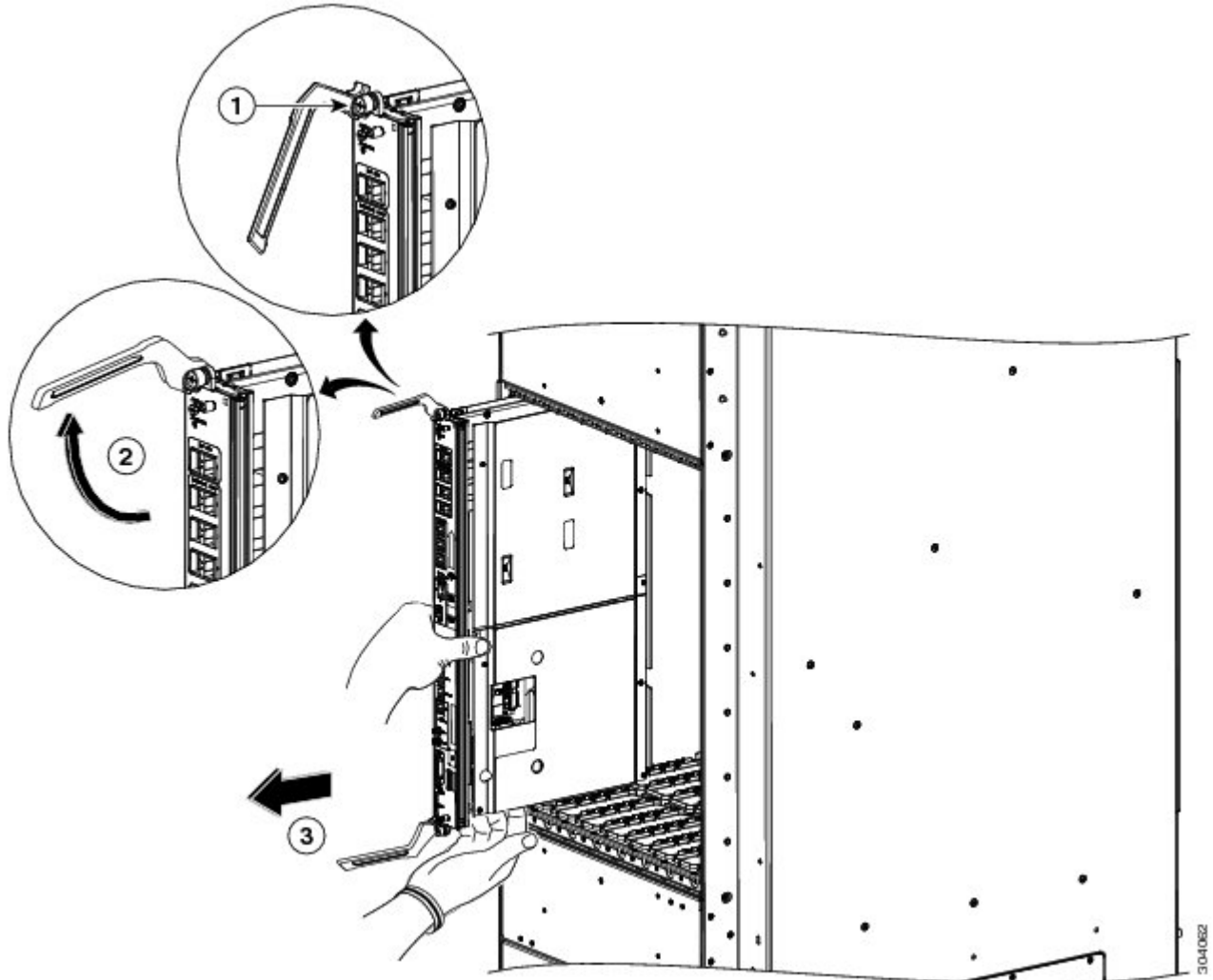
1	Captive screw	3	Direction of removal
2	Ejector lever		

Step 4   Simultaneously pivot the ejector levers away from the faceplate to release the RP card from the midplane connectors.

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

Step 7 Move one hand under the RP card to guide it. Avoid touching the RP card printed circuit board, components, or any connector pins.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 a defective card to the factory, repackage it in the shipping container that you received with the replacement card.

Removing a Fabric Card

Guidelines for Handling CXP2 Optical Modules

⚠

Warning **Hot surface.** Statement 1079

The metal surfaces on the CXP2 can run hot. Use caution when removing CXP2 optical modules from the Universal Fabric Card (UFC).
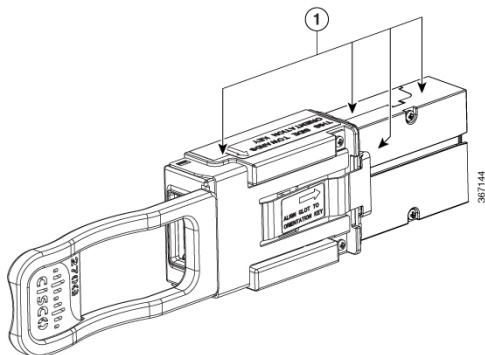
| 1 | Metal surfaces |

A thermoplastic sleeve is provided for each CXP2 port.

You can install the thermoplastic sleeve around the base of the CXP2 before you install the CXP2, as shown in the following figure.
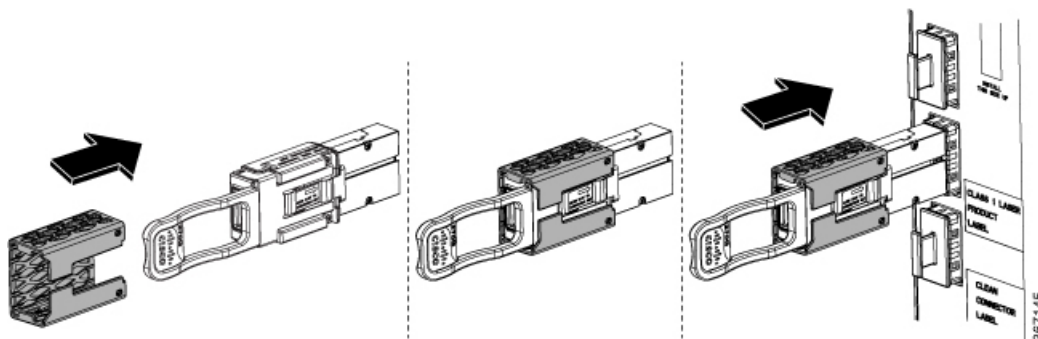
Note You can leave the sleeve on the CXP2 optical module while it is installed in the fabric card.

If a CXP2 is already installed, you can install the thermoplastic sleeve around the base of the CXP2 before you remove it from a transceiver socket, as shown in the following figure.
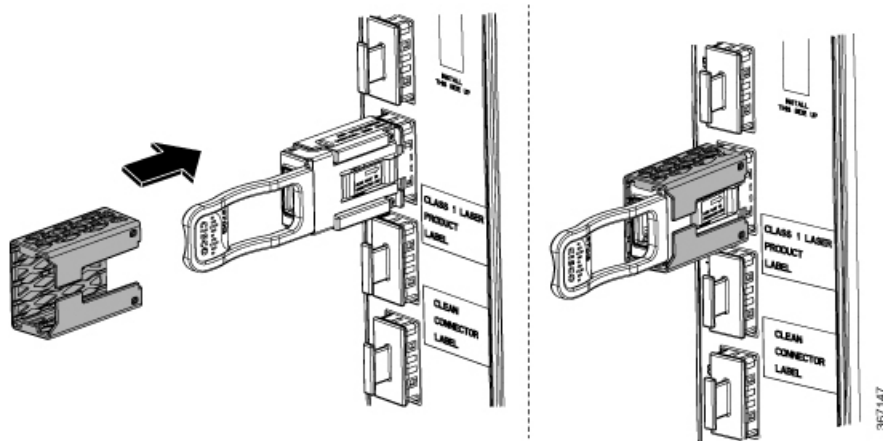
Alternatively, you can remove a CXP2 optical module (with or without the thermoplastic sleeve) and hold it in the provided silicon foam pad, as shown in the following figures.
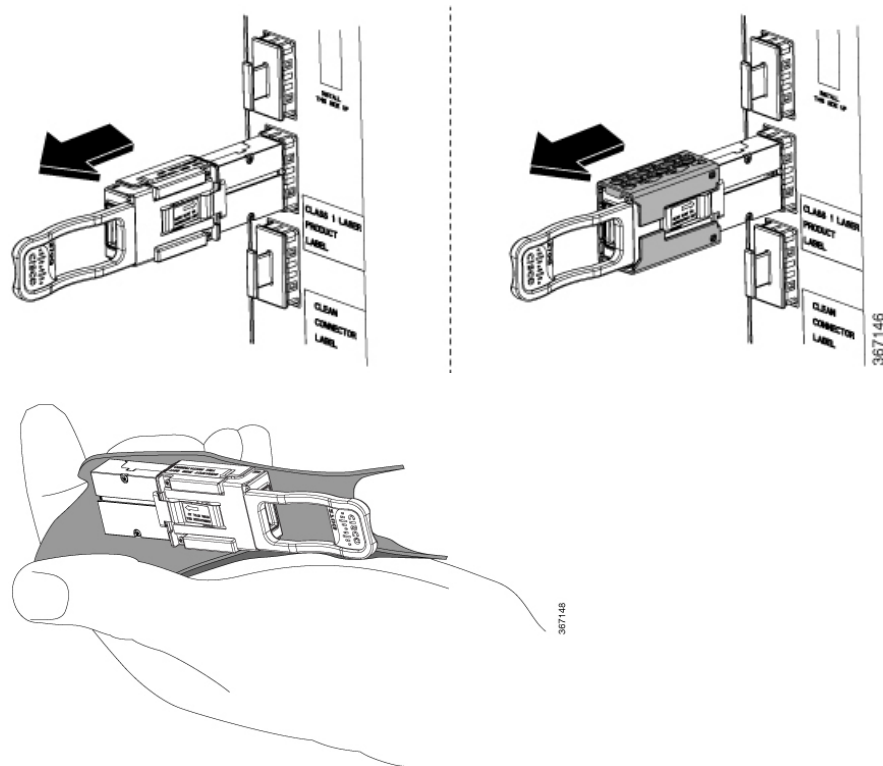
Prerequisites

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

Required Tools and Equipment

• ESD-preventive wrist strap

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

Steps

To remove a fabric card, perform the following steps:

Step 1   Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks on the rear side of the chassis (Figure 4: ESD Jack—Front Side of the LCC, on page 10). You can also connect the ESD-preventive wrist strap leash to any bare-metal surface on the chassis.

Step 2   Identify the FC to be removed from the card cage. Use the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver to turn the two captive screws, on the front panel of the card counterclockwise to loosen it from the slot.

Figure 81: Removing a Fabric Card
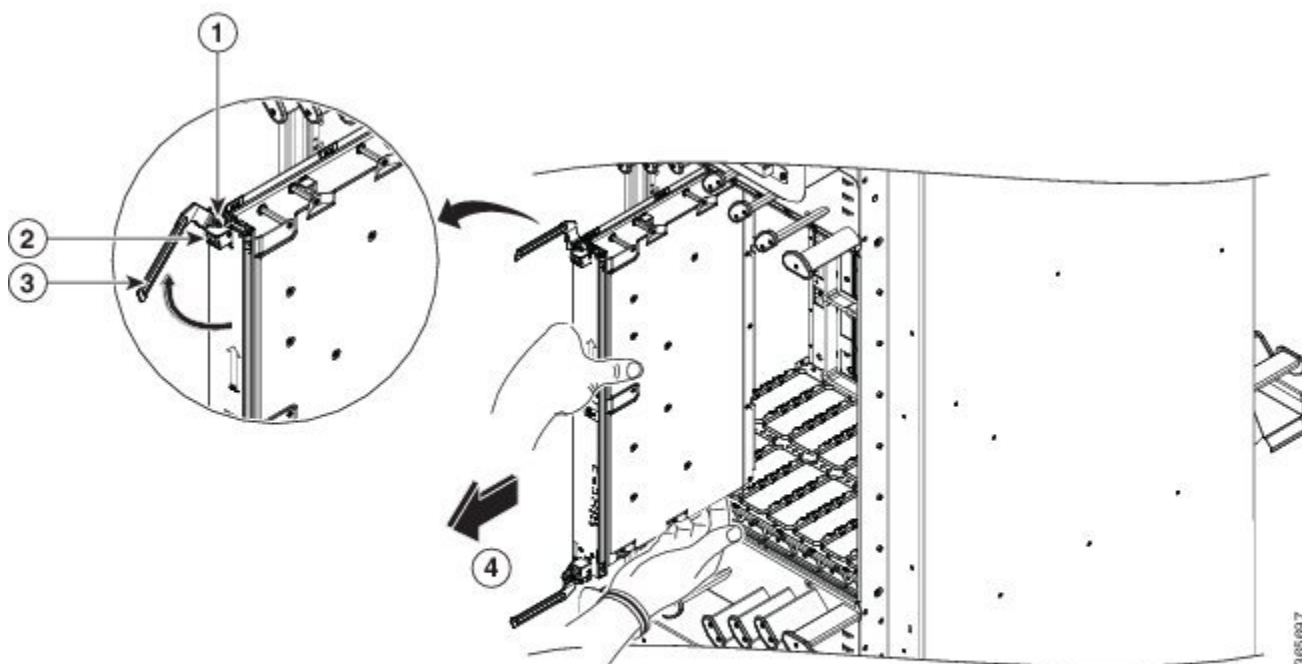
1	OIR button	3	Ejector lever
2	Captive screw	4	Direction of removal

Step 3   Press the OIR buttons on the top and bottom of the card faceplate to release the ejectors (Figure 6-18).

Note   Wait for the STATUS LED to turn to yellow. This indicates that the card is ready for removal.

Step 4 Grasp the two card ejector levers and simultaneously pivot both ejector levers 70 degrees away from the front edge of the card carrier to unseat the card from the midplane connector.

Step 5 Touching only the metal card carrier, slide the card from the slot and place it directly into an antistatic bag or other ESD-preventive container. If you plan to return the defective card to the factory, repackage it in its original shipping container.

System Specifications

This appendix contains tables that list the specifications for the main components of the Cisco NCS 6008 chassis.

Chassis Specifications

Table 13: Cisco NCS 6008 LCC Specifications

Supported Cards and Modules	Up to eight line cards, six fabric cards (FCs), two route processor (RP) cards, and two fan trays
Chassis Dimensions	
Height	81.0 in. (205.7 cm) as shipped 84.0 in. (213.4 cm) as installed with the top cap (The top cap in the cosmetic package attaches to the top of the chassis)
Width	23.6 in. (59.9 cm) 35.3 in. (89.7 cm) as installed with optional AC PDU brackets on each side of the chassis.
Depth	39.0 in. (99.1 cm) without exterior cosmetics 42.0 in. (106.7 cm) with all exterior cosmetics
Aisle spacing	To install the LCC (front): 48 in. (122 cm) To service FRUs (front): 31.7 in. (80.5 cm) To service FRUs (rear): 14.0 in. (35.6 cm)
Weights	

LCC as shipped	775 lb (352 kg)
LCC in shipping crate with pallet	1025 lb (466 kg)
LCC, fully loaded with power, fan trays, cards, and cosmetics	1450 lb (658 kg)
Floor Loading	
Chassis in rack footprint(floor contact area)	Chassis: 6.9 sq ft (0.64 sq m)
Maximum floor loading	210 lb/sq ft
Chassis Cooling	Two fan trays.
Chassis airflow	Fan Tray (NC6-FANTRAY): Up to 2500 cubic feet (70,792 liters) per minute
	Fan Tray 2 (NC6-FANTRAY-2): Up to 2900 cubic feet (83,048 liters) per minute

Power Specifications

Table 14: Cisco NCS 6008 LCC Power Specifications

Power trays	Either six AC or six DC power trays (cannot mix AC and DC power trays)
AC power tray	The AC power tray has three slots for AC PMs.
DC power tray	The DC power tray has four slots for DC PMs.
Power Redundancy (N+N)	
AC	Up to 18 power modules can be installed, and only 9 are needed to be active at any time. This allows support for 9+9 power redundancy by using two independent AC power sources (9 feeds each).
DC	Up to 24 power modules can be installed, and only 12 are needed to be active at any time. This allows support for 12+12 power redundancy through "A" and "B" battery plant feeds.
DC Input	
Nominal input voltage	–48 VDC to –60 VDC (tolerance range: –40 to –72 VDC)
Input current	50 A max at –48 VDC
	40 A max at –60 VDC
	60 A at –40 VDC (maximum)
AC Input	Single-phase
Nominal input voltage	200 to 240 VAC (range 180 to 264 VAC)

Nominal line frequency	50/60 Hz (range 47 to 63 Hz)
Recommended AC service	20-A (North America) dedicated branch circuit
	16-A (International) dedicated branch circuit
AC Power Cord Length	167 in. (4.25 m)

Environmental Specifications

Table 15: Cisco NCS 6008 LCC Environmental Specifications

Temperature	Operating, nominal: 41 to 104°F (5° to 40°C)
	Operating, short-term: 23 to 122°F (–5° to 50°C)[1]
	Nonoperating: –40 to 158°F (–40° to 70°C)
Humidity	Operating, nominal: 5 to 85%, noncondensing
	Operating, short-term: 5 to 90%, noncondensing
	Nonoperating: 5 to 93%, noncondensing
Altitude	Operating: –200 to 13,800 ft (–61 to 4206 m) at 104°F (40°C)
	Nonoperating: Up to 16,000 ft (4877 m) at –13°F (–25°C), short-term
Chassis airflow	Fan Tray (NC6-FANTRAY): Up to 2500 cubic feet (70,792 liters) per minute
	Fan Tray 2 (NC6-FANTRAY-2): Up to 2900 cubic feet (83,048 liters) per minute
Power system airflow	Up to 240 cubic feet per minute (6800 liters per minute)
Air exhaust temperature	140°F (60°C)—at room temperatures of 95 to 102°F (35 to 39°C)
	158°F (70°C)—maximum exhaust temperature on a fully loaded system during worst-case operating conditions (50°C and 6000 ft altitude)
	The air temperature rise is 68°F (20°C) on a fully loaded system with fans running at maximum speed.
Air velocity (at exhaust)	1000 ft/min (5.1m/s) under typical conditions 27°C
	2250 ft/min(11.4m/s) at maximum speed
	The software controls the speed of the fans based on measurements from the chassis thermal sensors.
Sound power level(AC and DC power)	76.4 dBA declared
Shock and vibration	Designed and tested to meet the NEBS shock and vibration standards defined in GR-63 Issue 4 2012.

[1] 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.

Optical Module Specifications

CPAK

Table 16: CPAK Optical Transmit and Receive Specifications

CPAK Modules	Type	Transmit Power (dBm) [2]	Receive Power (dBm) [3]	Transmit and Receive Center Wavelength Range (nm)
CPAK-100G-LR4	100GBASE-LR4 1310 nm SMF	Max: 4.5 per lane Min: -4.3 per lane	Max: 4.5 per lane Min: -10.6 per lane	Four lanes: • 1294.53 to 1296.59 • 1299.02 to 1301.09 • 1303.54 to 1305.63 • 1308.09 to 1310.19
CPAK-100G-SR10	100GBASE-SR10 850 nm MMF	Max: -1.0 per lane Min: -7.6 per lane	Max: 2.4 per lane Min: -9.5 per lane	Ten lanes: 850 to 860 nm
CPAK-100G-SR4	100GBASE-SR4 850 nm MMF	Max: 2.4 per lane Min: -8.4 per lane	Max: 2.4 per lane Min: -10.3 per lane	Four lanes: 840 to 860 nm
CPAK-10X10G-LR	1310 nm SMF	Max: 0.5 per lane Min: -8.2 per lane	Max: 0.5 per lane Min: -14.4 per lane	Ten lanes 1260 to 1355 nm
CPAK-10X10G-ERL	1550 nm SMF	Max: 4.0 per lane Min: -7.7 per lane	Max: 0.5 per lane Min: -14.4 per lane	Ten lanes 1530 to 1565 nm
CPAK-100G-ER4L	100GBASE-LR4 1310 nm SMF	Max: 2.9 per lane Min: -2.9 per lane	Max: 4.5 per lane Min: -14 per lane[4]	Four lanes: • 1294.53 to 1296.59 • 1299.02 to 1301.09 • 1303.54 to 1305.63 • 1308.09 to 1310.19

[2] Transmitter power is in averages, unless specified.

[3] Receiver power is in averages, unless specified.

[4] Receiver sensitivity does not fully meet IEEE 100GBASE-ER4 specifications. Application of this module is targeted for links less than 25km with links where Cisco CPAK modules are at both ends of the link.

Table 17: CPAK Module Port Cabling Specifications

CPAK Modules	Wavelength (nm)	Cable Type	Core Size (micron)	Modal Bandwidth (MHz/km) [5]	Cable Distance
CPAK-100G-LR4	1310	SMF	9 micron core SMF per G.652	—	6.2 miles (10 km) [6]
CPAK-100G-SR10	850	MMF	50	2000 (OM3) 4700 (OM4)	100 m 150 m [7]
CPAK-100G-SR4	850	MMF	50	2000 (OM3) 4700 (OM4)	70 m 100 m
CPAK-10X10G-LR	1310	SMF (24 fibers)	9-micron core SMF per G.652	—	6.2 miles (10 km)
CPAK-10X10G-ERL	1550	SMF (24 fibers)	9-micron core SMF per G.652	—	15.5 miles (25 km)
CPAK-100G-ER4L	1310	SMF Duplex	9-micron core SMF per G.652	—	15.5 miles (25 km)

[5] Specified at transmission wavelength.
[6] Minimum cabling distance for -LR4 modules is 2m, according to the IEEE 802.3ba.
[7] Considered an engineered link with maximum 1dB allocated to connectors and splice loss.

CXP

The CXP-100G-SR10 has a 24-fiber MPO/MTP connector (female).

Table 18: CXP Optical Transmit and Receive Specifications

CXP Modules	Type	Transmit Power (dBm)	Receive Power (dBm)	Transmit and Receive Center Wavelength Range (nm)
CXP-100G-SR10	100GBASE-SR10 850 nm MMF	Max: -1.0 per lane Min: -7.6 per lane	Max: 2.4 per lane Min: -9.5 per lane	Ten lanes: 850 to 860 nm

Table 19: CXP Module Port Cabling Specifications

CXP Modules	Wavelength (nm)	Cable Type	Core Size (micron)	Modal Bandwidth (MHz/km)[8]	Cable Distance
CXP-100G-SR10	850	MMF	50	2000 (OM3) 4700 (OM4)	100 m 150 m[9]

[8] Specified at transmission wavelength.
[9] Considered an engineered link with maximum 1dB allocated to connectors and splice loss.

SFP+

The SFP+ optical modules have LC duplex connectors.

Table 20: SFP+ Optical Transmit and Receive Specifications

SFP+ Modules	Type	Transmit Power (dBm) [10]	Receive Power (dBm) [11]	Transmit and Receive Center Wavelength Range (nm)
SFP-10G-SR	10GBASE-SR 850nm MMF	Max: -1.2 Min: -7.3	Max: -1.0 Min: -9.9	840 to 860
SFP-10G-SR-X	10GBASE-SR, 10GBASE-SW and OTU2e 850nm MMF			
SFP-10G-LR	10GBASE-LR 1310nm SMF	Max: 0.5 Min: -8.2	Max: 0.5 Min: -14.4	1260 to 1355
SFP-10G-LR-X	10GBASE-LR, 10GBASE-LW and OTU2e 1310nm SMF			
SFP-10G-ER	10GBASE-ER 1550nm SMF	Max: 4.0 Min: -4.7	Max: -1.0 Min: -15.8	1530 to 1565
SFP-10G-ZR	10GBASE-ZR 1550nm SMF	Max: 4.0 Min: 0.0	Max: -7.0 Min: -24.0	1530 to 1565

[10] Transmitter power is in averages, unless specified.
[11] Receiver power is in averages, unless specified.

Table 21: SFP+ Module Port Cabling Specifications

SFP+ Modules	Wavelength (nm)	Cable Type	Core Size (micron)	Modal Bandwidth (MHz/km) [12]	Cable Distance [13]
SFP-10G-SR	850	MMF	62.5	160 (FDDI)	26m
SFP-10G-SR-X			62.5	200 (OM1)	33m
			50.0	400	66m
			50.0	500 (OM2)	82m
			50.0	2000 (OM3)	300m
			50.0	4700 (OM4)	400m
SFP-10G-LR	1310	SMF	G.652	–	10 km
SFP-10G-LR-X					
SFP-10G-ER	1550	SMF	G.652	–	40 km [14]

SFP+ Modules	Wavelength (nm)	Cable Type	Core Size (micron)	Modal Bandwidth (MHz/km) [12]	Cable Distance[13]
SFP-10G-ZR	1550	SMF	G.652	–	80 km

[12] Specified at transmission wavelength.
[13] Minimum cabling distance for -SR, -LR, -ER modules is 2m, according to the IEEE 802.3ae.
[14] Links longer than 30km are considered engineered links as per IEEE 802.3ae.

QSFP

The QSFP-100G-SR4-S module has a 12-fiber MPO/MTP connector (female).

The QSFP-100G-LR4-S module has duplex LC connectors.

Table 22: QSFP Optical Transmit and Receive Specifications

QSFP Modules	Type	Transmit Power (dBm) [15]	Receive Power (dBm) [16]	Transmit and Receive Center Wavelength Range (nm)
QSFP-100G-SR4-S	100GBASE-SR4	Max: 2.4 per lane Min: -8.4 per lane	Max: 2.4 per lane Min: -10.3 per lane	840 to 860
QSFP-100G-LR4-S	100GBASE-LR4	Max: 4.5 per lane Min: -4.3 per lane	Max: 4.5 per lane Min: -10.6 per lane	Four lanes: • 1295 • 1300 • 1304 • 1309

[15] Transmitter power is in averages, unless specified.
[16] Receiver power is in averages, unless specified.

Table 23: QSFP Module Port Cabling Specifications

QSFP Modules	Wavelength (nm)	Cable Type	Core Size (micron)	Modal Bandwidth (MHz/km) [17]	Cable Distance
QSFP-100G-SR4-S	850	MMF	50 50	2000 (OM3) 4700 (OM4)	70 m 100 m [18]
QSFP-100G-LR4-S	1295, 1300, 1304, 1309	SMF	G.652	–	10 km

[17] Specified at transmission wavelength.
[18] Considered an engineered link with maximum 1dB allocated to connectors and splice loss.

LCC Regulatory, Compliance, and Safety Specifications

For information about the regulatory, compliance, and safety standards to which the Cisco NCS 6008 chassis conforms, see: Regulatory Compliance and Safety Information for the Cisco Network Convergence System 6000 Series Routers.

System Product IDs

This appendix provides information about the PIDs for the Cisco NCS 6008 LCC and its components.

These tables list the components that make up the routing system, their PIDs (part numbers used to order the components), and descriptions.

Note In the following tables, an equals sign (=) at the end of the PID indicates that the component can be ordered as a spare. For those components, be sure to include the equals sign as part of the PID.

Note Although this appendix provides PIDs for routing system components, the Cisco online ordering and pricing tool has the most up-to-date information on the routing system and PIDs. You can access the ordering tool at the following URL (Cisco login required), and enter a search term such as "NCS" to view a list of components: https://apps.cisco.com/Commerce/home

Component Product IDs

Table 24: Cisco NCS 6008 LCC Component Product IDs

Component	Product ID	Description
8-slot line card chassis	NCS-6008 NCS-6008= (spare)	Cisco NCS 6008 Line Card Chassis
8-slot routing system	NCS-6008-SYS-S	Cisco NCS 6008 LCC system (includes two route processor cards, six fabric cards, two fan trays, and six power trays)

Component	Product ID	Description
Route processor card	NC6-RP NC6-RP= (spare)	Cisco NCS 6008 RP card
Fan tray	NC6-FANTRAY NC6-FANTRAY= (spare)	Cisco NCS 6008 Fan Tray
	NC6-FANTRAY-2 NC6-FANTRAY-2= (spare)	Cisco NCS 6008 Fan Tray 2
Power bus control module [19]	NC6-PCM NC6-PCM= (spare)	Cisco NCS 6008 PCM
AC power tray	NCS-AC-PWRTRAY NCS-AC-PWRTRAY= (spare)	Cisco NCS AC PT
AC power module	PWR-3KW-AC-V2 PWR-3KW-AC-V2= (spare)	Cisco NCS AC PM
Power distribution unit bracket	NCS-PDU-BRKT NCS-PDU-BRKT= (spare)	Cisco NCS PDU bracket
Delta power distribution unit	NCS-PDU-DELTA NCS-PDU-DELTA= (spare)	Cisco NCS redundant 3-to-1 Phase Delta PDU
Wye power distribution unit	NCS-PDU-WYE NCS-PDU-WYE= (spare)	Cisco NCS redundant 3-to-1 Phase Wye PDU
AC power cord [20]	NC6-AC-CAB-NA NC6-AC-CAB-AU NC6-AC-CAB-UK NC6-AC-CAB-EU NC6-AC-CAB-IT	AC power cord—North America AC power cord—Australia AC power cord—United Kingdom AC power cord—Europe AC power cord—Italy
DC power tray	NCS-DC-PWRTRAY NCS-DC-PWRTRAY= (spare)	Cisco NCS DC PT
DC power module	PWR-2KW-DC-V2 PWR-2KW-DC-V2= (spare)	Cisco NCS DC PM
100x10GE patch panel SR	NCS-PP-100X10-S NCS-PP-100X10-SR= (spare)	Cisco NCS 100x10GE patch panel short reach

[19] The PCM can be serviced in the field by Cisco personnel or with proper guidance from Cisco technical support.
[20] The length of each power cord is 4.25 m.

Line Card Product IDs

Table 25: Cisco NCS 6008 LCC Product IDs

Component	Product ID	Description
10x100GE MS CPAK	NC6-10X100G-M-K NC6-10X100G-M-K= (spare)	Cisco NCS 6000 Series 10x100GE multi-service CPAK
10x100GE LSR CPAK	NC6-10X100G-L-K NC6-10X100G-L-K= (spare)	Cisco NCS 6000 Series 10x100GE LSR CPAK
10x100GE MS CXP	NC6-10X100G-M-P NC6-10X100G-M-P= (spare)	Cisco NCS 6000 Series 10x100GE multi-service CXP
10x100GE LSR CXP	NC6-10X100G-L-P NC6-10X100G-L-P= (spare)	Cisco NCS 6000 Series 10x100GE LSR CXP
60x10GE LC SFP+	NC6-60X10GE-L-S NC6-60X10GE-L-S= (spare)	Cisco NCS 6000 Series 60x10GE lean-core SFP+
60x10GE MS SFP+	NC6-60X10GE-M-S NC6-60X10GE-M-S= (spare)	Cisco NCS 6000 Series 60x10GE multi-service SFP+
20x100GE LSR QSPF28 and CPAK	NC6-20X100GE-L-C NC6-20X100GE-L-C= (spare)	Cisco NCS 6000 Series 20x100Gbps LSR QSPF28 and CPAK
20x100GE MC QSPF28 and CPAK	NC6-20X100GE-M-C NC6-20X100GE-M-C= (spare)	Cisco NCS 6000 Series 20x100Gbps multi-service QSPF28 and CPAK

Fabric Card Product IDs

Table 26: Fabric Card Product IDs

Component	Product ID	Description
S123 Fabric Card	NC6-FC NC6-FC= (spare)	NCS 6008 S123 Fabric Card
Universal Fabric Card	NC6-FC2-U NC6-FC2-U= (spare)	NCS 6008 Universal Fabric Card

Component	Product ID	Description
MC S13 Fabric Card	NC6-FC-MC NC6-FC-MC= (spare)	NCS 6008 S13 Multi-Chassis Fabric Card

Cosmetic Product IDs

Table 27: Cisco NCS 6008 LCC Cosmetic Product IDs

Component	Product ID	Description
Craft panel display	NCS-CRFT=	Cisco NCS craft panel display kit
Front left and right doors	NC6-DOOR-F=	Front left and right doors
Front top grille	NC6-GRILLE-FT=	Front top grille
Front bottom grille	NC6-GRILLE-FB=	Front bottom grille
Rear left and right doors	NC6-DOOR-R=	Rear left and right doors
Exhaust air deflector	NC6-GRILLE-R=	Exhaust air deflector, rear of the LCC

Accessory Product IDs

Table 28: Cisco NCS 6008 LCC Accessory Product IDs

Component	Product ID	Description
Drill hole template	NC6-DRILLTEMP=	Cisco NCS 6008 LCC drill hole template (spare)
Chassis filter	NC6-5XFILTER=	Cisco NCS 6008 LCC air filter, 5-pack (spare)
Vertical cable trough	NC6-TROUGH=	Cisco NCS 6008 vertical cable trough (spare)
Chassis lift dolly	NCS-LIFT NCS-LIFT= (spare)	Cisco NCS chassis lift dolly
Lift upgrade	NCS-LIFT-BRKT=	Cisco CRS lift upgrade to Cisco NCS chassis (spare)
AC/DC PM slot cover	A9K-PEM-V2-FILR	AC/DC PM slot cover
Line card slot cover	NC6-LC-BLANK= NC6-LC-BLANK2=	Cover for empty line card slot (spare)

Optical Module IDs

Table 29: Cisco NCS 6000 LCC Optical Module IDs

Component	Product ID	Description
Optical module set	NCS-FAB-OPT	Optical module set that includes 96 CXP-100G-SR12 modules for multi-chassis or back-to-back configurations.
	NCS-FAB-OPT2	Optical module set that includes 96 ONS-CXP2-SR25 modules for multi-chassis or back-to-back configurations.
Note	**For Multi-Chassis systems**: Two optical modules sets are required for each LCC: one set plugs into the S13 FCs on the LCC, and one set plugs into the S2 FC cards in the FCC. **For Back-to-Back systems**: Two optical modules sets are required: one for each LCC.	

Component	Product ID	Description
CPAK	CPAK-100G-LR4	The Cisco CPAK 100GBASE-LR4 module supports link lengths of up to 10 km over standard G.652 single-mode fiber with SC connectors. It delivers an aggregate data signal of 100 Gbps, carried over four LAN wavelength-division multiplexing (WDM) wavelengths operating at a nominal 25 Gbps per lane. Optical multiplexing and demultiplexing of the four wavelengths are managed within the module. Nominal power consumption is less than 5.5W.
	CPAK-100G-SR10	The Cisco CPAK 100GBASE-SR10 module delivers 100-Gbps links over 24-fiber ribbon cables terminated with MPO/MTP connectors. It can also be used in 10 x 10-Gb mode along with ribbon-to-duplex-fiber breakout cables for connectivity to ten 10GBASE-SR optical interfaces. It supports link lengths of 100m (150m) on laser-optimized OM3 (OM4) multifiber cables.
	CPAK-100G-SR4	The Cisco 100GBASE-SR4 CPAK module supports link lengths of up to 70m (100m) over OM3 (OM4) Multimode Fiber with MPO connectors. It primarily enables high-bandwidth 100G optical links over 12-fiber parallel fiber terminated with MPO multifiber connectors. CPAK-100GE-SR4 supports 100GBase Ethernet rate.
	CPAK-10X10G-LR	The Cisco CPAK 10x10G-LR module is used in 10 x 10-Gb mode along with ribbon-to-duplex SMF breakout cables for connectivity to ten 10GBASE-LR optical interfaces. It supports link lengths up to 10km over standard SMF, G.652. The module delivers 100-Gbps links over 24-fiber ribbon cables terminated with MPO/MTP connectors.
	CPAK-10x10G-ERL	The Cisco CPAK 10x10G-ERL module is used in 10 x 10Gb mode along with ribbon-to-duplex SMF breakout cables for connectivity to ten 10GBASE-ER optical interfaces. It supports link lengths up to 25km over standard SMF, G.652. The module delivers 100-Gbps links over 24-fiber ribbon cables terminated with MPO/MTP connectors.
	CPAK-100G-ER4L	The primary application of the Cisco CPAK 100GBASE-ER4 Lite module is to support 100-Gbps optical links over standard single-mode fiber (SMF, G.652) terminated with SC connectors. Nominal power consumption is less than 7.5W. The ER4 Lite module is compatible with the 100GBASE-ER4 standard and supports link lengths up to about 25 km over standard SMF, G.652. It delivers an aggregate data signal of 100 Gbps, carried over four LAN wavelength-division multiplexing (WDM) wavelengths operating at a nominal 25 Gbps per lane. The module can be used over longer distances in engineered links with CPAK-100G-ER4L modules at both ends. Optical multiplexing and demultiplexing of the four wavelengths are managed within the module.
	CPAK-100G-PSM4	The Cisco CPAK-100G-PSM4 module supports link lengths of up to 500 meters over SMF with MPO connectors. The 100 Gigabit Ethernet signal is carried over 12-fiber parallel fiber terminated with MPO multifiber connectors.
CXP	CXP-100G-SR10	The Cisco 100GBASE-SR10 CXP module supports link lengths up to 100m (<150m) over OM3 (OM4) multimode fiber (MMF) with MPO-24 connector.

Component	Product ID	Description
SFP+	SFP-10G-SR	The Cisco 10GBASE-SR module supports a link length of 26m on standard Fiber Distributed Data Interface (FDDI)-grade multimode fiber (MMF). Using 2000MHz*km MMF (OM3), up to 300m link lengths are possible. Using 4700MHz*km MMF (OM4), up to 400m link lengths are possible.
	SFP-10G-LR	The Cisco 10GBASE-LR module supports a link length of 10 kilometers on standard single-mode fiber (SMF, G.652).
	SFP-10G-SR-X	The Cisco SFP-10G-SR-X module is a multirate 10GBASE-SR, 10GBASE-SW and OTU2/OTU2e module for extended operating temperature range. It supports a link length of 26m on standard Fiber Distributed Data Interface (FDDI)-grade multimode fiber (MMF). Using 2000MHz*km MMF (OM3), up to 300m link lengths are possible. Using 4700MHz*km MMF (OM4), up to 400m link lengths are possible.
	SFP-10G-LR-X	The Cisco SFP-10G-LR-X module is a multirate 10GBASE-LR, 10GBASE-LW, and OTU2/OTU2e module for extended operating temperature range. It supports a link length of 10 kilometers on standard single-mode fiber (SMF, G.652).
	SFP-10G-ER	The Cisco 10GBASE-ER module supports a link length of up to 40 kilometers on standard single-mode fiber (SMF, G.652).
	SFP-10G-ZR	The Cisco SFP-10G-ZR module is a multirate 10GBASE-ZR, 10GBASE-ZW, and OTU2/OTU2e module. It supports link lengths of up to about 80 kilometers on standard single-mode fiber (SMF, G.652). This interface is not specified as part of the 10 Gigabit Ethernet standard and is instead built according to Cisco specifications.

Component	Product ID	Description
QSFP	QSFP-100G-SR4-S	The Cisco 100GBASE-SR4-S QSFP module supports link lengths of up to 70m (100m) over OM3 (OM4) Multimode Fiber with MPO connectors. It primarily enables high-bandwidth 100G optical links over 12-fiber parallel fiber terminated with MPO multifiber connectors. QSFP-100G-SR4-S supports 100GBase Ethernet rate.
	QSFP-100G-LR4-S	The Cisco 100GBASE-LR4-S QSFP module supports link lengths of up to 10km over a standard pair of G.652 single-mode fiber with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. QSFP-100GE-LR4-S supports 100GBase Ethernet rate.
	QSFP-100G-CWDM4-S	The Cisco QSFP-100G-CWDM4-S QSFP module supports link lengths of up to 2 km over a standard pair of G.652 single-mode fiber (SMF) with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device.
	QSFP-100G-PSM4-S	The Cisco QSFP-100G-PSM4-S QSFP module supports link lengths of up to 500 meters over SMF with MPO connectors. The 100 Gigabit Ethernet signal is carried over 12-fiber parallel fiber terminated with MPO multifiber connectors.
	QSFP-100G-SM-SR	The Cisco QSFP-100G-SM-SR QSFP module supports link lengths of up to 2 kilometers over a standard pair of G.652 Single-Mode Fiber (SMF) with duplex LC connectors. The 100 Gigabit Ethernet signal is carried over four wavelengths. Multiplexing and demultiplexing of the four wavelengths are managed within the device. The operating temperature range is from +10 to +60°C with an optical link budget of 4.2 decibels. This 4.2-decibel link budget offers the ability to support the loss from patch panels in the link in a data center environment. QSFP-100G-SM-SR is interoperable with QSFP-100G-CWDM4-S.

Guidelines for Installing the 20-Port 100Gbps Line Card

Before installing the 20-port 100Gbps Line Card, use the guidelines in the following sections.

Note The 20-port 100Gbps Line Card is supported with Cisco IOS XR release 6.2.2 and later.

Verify Power Requirements

The NCS 6008 LCC system with the 20-Port 100Gbps Line Card requires additional power. Use the following information to determine the proper number of power modules to install.

Note The NC6-FANTRAY-2 supports a "power save mode" when there are no 20-Port 100Gbps Line Cards installed. In a system with no 20-Port 100Gbps Line Cards, the output of the **show environment power** command displays "Power Allocated Watts" as 1000W for the NC6-FANTRAY-2. When a 20-Port 100Gbps Line Card is installed and detected by the system, the power save mode is canceled and the "Power Allocated Watts" changes to 2000W.

Table 30: Allocated Power

System with 10-Port 100Gbps Line Card	Allocated Power (W)	System with 20-Port 100Gbps Line Card	Allocated Power (W)	Difference (per unit)	Difference (maximum units per system)[21]
NCS6-RP	250	NCS6-RP	250	–	–
NCS-FANTRAY	1000	NCS-FANTRAY-2	2000	1000	2000

System with 10-Port 100Gbps Line Card	Allocated Power (W)	System with 20-Port 100Gbps Line Card	Allocated Power (W)	Difference (per unit)	Difference (maximum units per system)[21]
NCS-FC	150	NC6-FC2-U	455	305	1830
Impedance card (no line card)	250	Impedance card (no line card)	250	–	–
NC6-10X100G-M-K	1350	NC6-20X100GE-M-C	2030	680	5440
NC6-10X100G-L-K	1350	NC6-20X100GE-L-C	1930	580	4640
NC6-60X10GE-M-S	1320	N/A	–	–	–

[21] 2 x RP, 2 x Fantray-2, 6 x FC, 8 x line card

The total power allocated to support the 20-Port 100Gbps Multi-Service Line Card (NC6-20X100GE-M-C) in a fully loaded chassis is 23470W. A fully loaded redundant system would require 46940 W (16 3000W AC power modules, or 23 2100W DC power modules).

The total power allocated to support the 20-Port 100Gbps Lean Core Line Card (NC6-20X100GE-L-C) in a fully loaded chassis is 22670W. A fully loaded redundant system would require 45340 W (16 3000W AC power modules, or 22 2100W DC power modules).

Remove Line Card Slice Configurations

The 10-Port 100Gbps Line Card with CPAK optics modules and the 20-port 100Gbps Line Card with QSFP28 and CPAK optics modules support a multi-slice architecture.

The 10-Port 100Gbps Line Card supports 5 slices (0 – 4). Each slice controls two 100 GE ports that can be configured to operate at 100 GE, 10X10 GE, or OTU4 (OTN).

The 20-port 100Gbps Line Card supports 5 slices (0 – 4). Each slice controls four 100 GE ports. However, only slice 0 (ports 0 - 3) and slice 1 (ports 4 - 7) support 10X10 GE breakout or OTU4 (OTN).

If you have configured 10GE breakout or OTN on a 10-Port 100Gbps Line Card, the configuration will be applied to a different set of ports on the 20-port 100Gbps Line Card after migration.

Use the **show running-config** | **include hw-module** command to display any line card slice configurations.

This example shows that no line card slice configurations are present; no changes are needed:

```
RP/0/RP0/CPU0:router# show running-config | include hw-module
Fri May  5 14:31:41.277 PDT
Building configuration...
RP/0/RP0/CPU0:ios#
```

This example shows line card slice configurations are present:

```
RP/0/RP0/CPU0:router# show running-config | include hw-module
Wed May  3 15:23:42.163 PDT
Building configuration...
hw-module location 0/7/CPU0 slice 0 breakout 10G
```

```
hw-module location 0/7/CPU0 slice 1 framer-mode OTU4
```

Use the **no hw-module location** *rack*/*slot*/*CPU* **slice** *slice_number* {**breakout 10G** | **framer-mode OTU4**} command to remove the slice configuration.

Note Failure to remove slice configurations before installing the 20-port 100Gbps Line Card will result in an inconsistency alarm. Use the **clear configuration inconsistency** command to clear the inconsistency alarm and remove the failed configuration. Refer to the clear configuration inconsistency command in the *System Management Command Reference for Cisco NCS 6000 Series Routers*.

Install Fan Tray 2

The 20-port 100Gbps Line Card requires Fan Tray 2 (NC6-FANTRAY-2). See the Replacing the Fan Trays and Air Filter section for fan tray replacement information.

Install Universal Fabric Cards

Note This procedure must be completed for each fabric plane.

The 20-port 100Gbps Line Card requires Universal Fabric Card (NC6-FC2-U).

To replace a legacy fabric card with a Universal Fabric Card, perform the following steps:

Before you begin

All card slots must be covered to ensure proper air circulation and cooling within the chassis. Install impedance carriers (NC6-LC-BLANK2) in all slots that are not being used. This ensures proper air flow and maintains system EMC and safety compliance. See the Installing an Impedance Carrier section.

Note Mixed fabric card operation is not supported beyond the short migration window.

Step 1 From SysAdmin VM configuration mode, shut down the fabric plane.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 2 Use the **show controller fabric plane all detail** command to verify that the fabric plane Admin State and Plane State are down.

Example:

```
sysadmin-vm:0_RP0# show controller fabric plane all detail

Plane Admin Plane Plane up->dn   up->mcast Total   Down    PPU
Id    State State Mode  counter  counter   Bundles Bundles State
--------------------------------------------------------------------
0     DN    DN    SC         0         0    16       0     NA
1     UP    UP    SC         0         0    16       0     NA
2     UP    UP    SC         0         0    16       0     NA
3     UP    UP    SC         0         0    16       0     NA
4     UP    UP    SC         0         0    16       0     NA
5     UP    UP    SC         0         0    16       0     NA
```

Step 3 From SysAdmin VM mode, power off the fabric card.

Example:

```
sysadmin-vm:0_RP0# hw-module location 0/FC0 shutdown
Mon Dec  5  23:54:02.366 UTC
Shutdown hardware module ? [no,yes] yes
0/RP0/ADMIN0:Apr 13 16:45:55.724 : shelf_mgr[2973]: %INFRA-SHELF_MGR-6-USER_ACTION : User
root(127.0.0.1)
 requested CLI action 'graceful card shutdown' for location 0/FC0
0/RP0/ADMIN0:Apr 13 16:46:05.755 : shelf_mgr[2973]: %INFRA-SHELF_MGR-4-CARD_SHUTDOWN : Shutting
down card 0/FC0
result Card graceful shutdown request on 0/FC0 succeeded.
sysadmin-vm:0_RP0:l7# 0/RP0/ADMIN0:Apr 13 16:46:06.908 : shelf_mgr[2973]: %INFRA-SHELF_MGR-6-HW_EVENT
 :
 Rcvd HW event HW_EVENT_POWERED_OFF, event_reason_str 'power_zone:0 off' for card 0/FC0
```

Step 4 Use the **show platform location** command to verify that the fabric card is powered off.

Example:

```
sysadmin-vm:0_RP0# # show platform location 0/FC0
Mon Dec  5  23:54:02.366 UTC
Location  Card Type            HW State       SW State       Config State
----------------------------------------------------------------------------
0/FC0     NC6-FC               POWERED_OFF    N/A            NSHUT
```

Step 5 Remove the legacy fabric card following the steps in the Removing a Fabric Card section.

Step 6 Install the UFC following the steps in the Installing a Fabric Card section.

Note Do not connect any cables to the UFC.

Wait for the UFC to power up and become operational.

```
sysadmin-vm:0_RP0:l7# 0/RP0/ADMIN0:Apr 12 17:53:44.661 : shelf_mgr[3284]: %INFRA-SHELF_MGR-6-HW_EVENT
 :
 Rcvd HW event HW_EVENT_OK, event_reason_str 'remote card ok' for card 0/FC0
0/RP0/ADMIN0:Apr 12 17:53:44.661 : shelf_mgr[3284]: %INFRA-SHELF_MGR-6-CARD_HW_OPERATIONAL :
 Card: 0/FC0 hardware state going to Operational
```

Step 7   Use the **show platform location** command to verify that the fabric card is operational.

Example:

```
sysadmin-vm:0_RP0# show platform location 0/FC0
Mon Dec  5  23:54:02.366 UTC
Location   Card Type              HW State      SW State       Config State
-------------------------------------------------------------------------
0/FC0      NC6-FC2-U              OPERATIONAL   OPERATIONAL    NSHUT
```

Step 8   Use the **show hw-module fpd** command to verify the status of all FPDs.
Verify that no FPD components require an upgrade (as indicated by NEED UPGD in the Status field) and that the
Running and Programmed fields display the same version. For any FPD components that show status as NEED UPGD,
use the **upgrade hw-module location** *location* **fpd** command. For any FPD components that show status as RLOAD
REQ, use the **hw-module location** *location* **reload** command.

Step 9   From SysAdmin VM configuration mode, unshut the fabric plane.

Example:

```
sysadmin-vm:0_RP0# config
sysadmin-vm:0_RP0(config)# no controller fabric plane 0 shutdown
sysadmin-vm:0_RP0(config)# commit
sysadmin-vm:0_RP0(config)# exit
```

Step 10   Use the **show controller fabric plane all detail** command to verify that the Admin State and Plane State are up.

Example:

```
sysadmin-vm:0_RP0# show controller fabric plane all detail

Plane Admin Plane  Plane  up->dn  up->mcast Total   Down    PPU
Id    State State  Mode   counter   counter Bundles Bundles State
----------------------------------------------------------------
0     UP    UP     SC       0         0      16      0      NA
1     UP    UP     SC       0         0      16      0      NA
2     UP    UP     SC       0         0      16      0      NA
3     UP    UP     SC       0         0      16      0      NA
4     UP    UP     SC       0         0      16      0      NA
5     UP    UP     SC       0         0      16      0      NA
```

Step 11   Repeat these steps for each remaining fabric plane (FC1, FC2, FC3, FC4, and FC5) until all six fabric planes have been
migrated.

After all six fabric planes have been migrated, the following log message is displayed:

```
. . .

%DRIVER-CCC-4-CHASSIS_COMPLETED_MIGRATION : Chassis completed migration. Currently in: 2T
fabric mode

. . .
```

What to do next

After you have migrated all six fabric planes, install the 20-port 100Gbps Line Card following the steps in the Installing a Line Card section.