



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

**First Published:** 2014-07-24

**Last Modified:** 2018-03-30

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## Preface

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This document describes how to install a Cisco Network Convergence System (NCS) 6000 Fabric Card Chassis and its components. The Cisco NCS 6000 Fabric Card Chassis (FCC) is a product in the Cisco Network Convergence System 6000 Series family. The chassis specifications are included in Appendix A “System Specifications.” The Cisco product IDs (PIDs) are listed in Appendix B “System Product IDs.”

- [Audience, page xi](#)
- [Documentation Conventions, page xi](#)
- [Related Documentation, page xiii](#)
- [Changes to This Document, page xiii](#)
- [Obtaining Documentation and Submitting a Service Request, page xiii](#)

## Audience

This guide is intended for chassis installers and Cisco installation partners who are responsible for installing the Cisco NCS 6000 FCC and its components. The installers are expected to have installed networking hardware in the past. No additional knowledge of routing or the Cisco IOS XR software is assumed.

## Documentation Conventions

This document uses the following conventions:

Convention	Description
<b>bold font</b>	Commands and keywords and user-entered text appear in <b>bold font</b> .
<i>Italic font</i>	Document titles, new or emphasized terms, and arguments for which you supply values are in <i>italic font</i> .
[ ]	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.
<code>courier font</code>	Terminal sessions and information the system displays appear in <code>courier font</code> .
	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 Series Routers 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
January 2018	Added support for the 2nd generation S2 fabric card (NCS-F-FC2) and CXP2 optics modules (ONS-CXP2-SR25).
September 2014	Added Telercordia GR-63 requirements for air filter and other minor updates.
July 2014	This document introduces the Cisco NCS 6000 Fabric 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, and Cisco currently supports RSS Version 2.0.





## CHAPTER

# 1

## Installation Roadmap

- [Installation Roadmap](#) , page 1

## Installation Roadmap

The following table lists the tasks to install the Cisco NCS 6000 Fabric Card Chassis (FCC) 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.

**Table 2: Overview of Installation Steps**

Step	See	Check
1. Verify that the FCC is securely bolted to the floor.	<a href="#">Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide</a>	
2. Install the power enclosure.	<a href="#">About the Power Enclosure</a> , on page 13 section	
3. Ground the FCC.	<a href="#">Installing the Fabric Card Chassis Ground Cable</a> , on page 35 section	
4. Install the power trays.	<a href="#">Installing an AC or DC Power Tray</a> , on page 18 section	
5. Install the external cosmetics on the front of the FCC.	<a href="#">Installing the Front Exterior Cosmetics</a> , on page 22 section	
6. Install the external cosmetics on the rear of the FCC.	<a href="#">Installing the Rear Exterior Cosmetics</a> , on page 28	
7. Install power modules in the power trays.	<a href="#">Installing an AC or DC Power Module</a> , on page 46 section	

Step	See	Check
8. Install either AC or DC input power connections to the power trays.	<a href="#">Installing AC Input Power Cords, on page 53</a> or <a href="#">Installing DC Input Power Cables, on page 55</a> section	
9. Power on the FCC.	<a href="#">Powering On the Fabric Card Chassis, on page 57</a> section	
10. Install the shelf controller cards and fabric cards in the FCC.	<a href="#">Installing the Shelf Controller Cards and Fabric Cards, on page 61</a> section	
11. Connect the cabling for multi-chassis configuration.	<a href="#">Cabling a Multi-Chassis Configuration, on page 137</a> section	





## Overview

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This chapter provides an overview of the Cisco NCS 6000 Fabric Card Chassis.

- [About the Cisco NCS 6000 Fabric Card Chassis, page 3](#)
- [Fabric Card Chassis Components, page 4](#)
- [Slot Numbers, page 8](#)
- [Cable Management , page 10](#)
- [Safety Guidelines, page 10](#)

## About the Cisco NCS 6000 Fabric Card Chassis

The Cisco NCS 6000 Fabric Card Chassis is a highly scalable core routing platform designed for service providers to build next generation multi-service networks that provide video, data and voice services. The fabric card chassis, also known as a switch fabric chassis, is referred to in this document as the Cisco NCS 6000 FCC.

The Cisco NCS 6000 FCC is part of the Cisco NCS 6000 Multi-Chassis system that also includes the Cisco NCS 6008 8-slot line card chassis (LCC). The system can expand from a single chassis to various multi-chassis configurations for increased routing capacity and is capable of supporting up to 16 LCCs interconnected to 4 FCCs.

The Cisco NCS 6000 Multi-Chassis system scales by interconnecting up to 16 LCCs through up to four FCCs. These connections are made from the LCC switch fabric cards to the FCC fabric cards through CXP or CXP2 optical interconnects. The NCS 6000 has a 3-stage switch fabric architecture. In a multi-chassis configuration, the first and third stages are implemented by the S13 fabric cards on the LCC, and the second stage is performed by the S2 fabric cards on the FCC. For an overview of the fabric system and multi-chassis cabling configurations, see [About the Cisco NCS 6000 Multi-Chassis System, on page 137](#).

The Cisco NCS 6000 FCC has an integrated rack and is bolted to the facility floor (no external rack is required). The FCC contains its own power and cooling systems. Power systems are available using either AC or DC power.

This installation guide provides the installation procedures for the FCC. For installation information about the LCC, see the [Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide](#).

**Note**

The installation of a Cisco NCS 6000 FCC 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 FCC. For site preparation information, see the [Cisco Network Convergence System 6000 Series Routers Site Planning Guide](#).

## Fabric Card Chassis Components

**Table 3: Main Components of the Cisco NCS 6000 FCC**

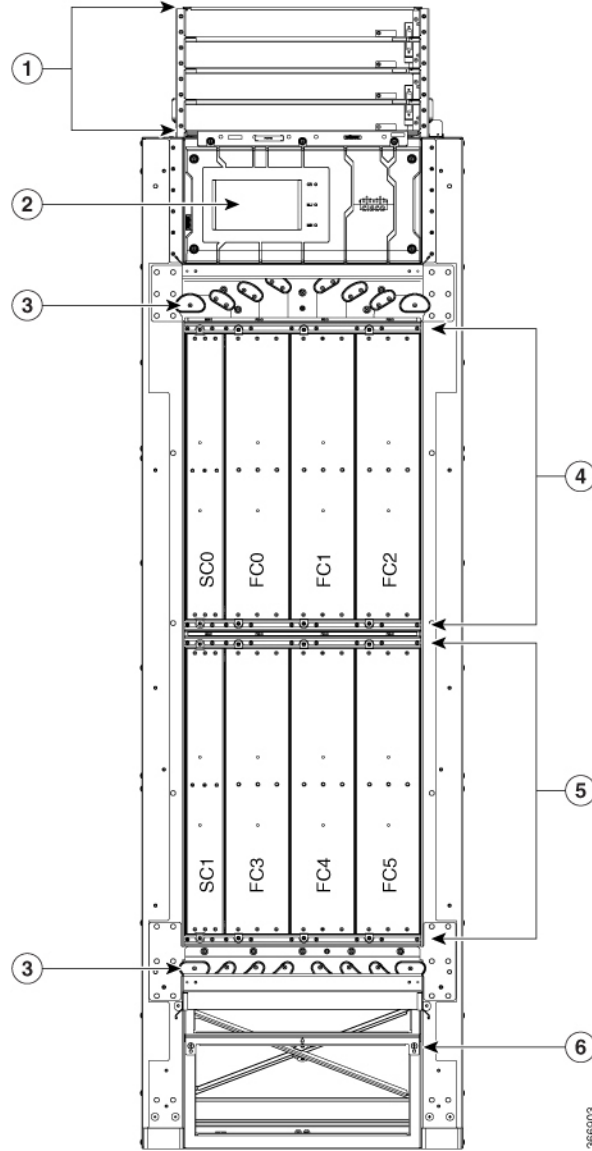
Component	Description
Chassis midplane	The chassis midplane distributes power and provides interconnections for other components in the system. Each S2 FC is connected through the midplane to the FCC. The midplane is not a field-replaceable unit (FRU).
S2 Fabric Cards (FCs)	<p>The FCC has 12 FC slots: Six FC slots on the front side of the FCC (three slots on the upper cage and three slots on the lower cage) and six FC slots on the rear side of the FCC (three slots on the upper cage and three slots on the lower cage). See <a href="#">Figure 3: Cisco NCS 6000 FCC Slot Numbers</a>. For an overview of the fabric, see <a href="#">Fabric Overview, on page 150</a>.</p> <p>Each S2 FC supports up to 32 CXP modules. Each S2 FC2 supports up to 32 CXP2 modules.</p>
CXP/CXP2 optical modules and connectors	<p>The connections between the LCC and the FCC are implemented through a number of bi-directional optical links. Pluggable CXP/CXP2 optics are used for these interconnects.</p> <ul style="list-style-type: none"> <li>• In 1T multi-chassis (MC) mode, CXP optical modules connect the S2 FC and S13 FC together.</li> <li>• In 2T MC mode, CXP2 optical modules connect the S2 FC2 and UFC together.</li> </ul> <p>The CXP module (CXP-100G-SR12) and the CXP2 module (ONS-CXP2-SR25) use a 24-fiber MPO connector that supports 12 bi-directional optical links up to 100 meters of OM-4 multi-mode fiber.</p>

Component	Description
Shelf Controller Cards	<p>The Cisco NCS 6000 FCC offers two types of shelf controller cards: the SC card and the SC-SW card.</p> <ul style="list-style-type: none"> <li>• The SC-SW card is a 56-port combination card that integrates a shelf controller and switch for the NCS 6000 Control Ethernet into one physical card. The shelf controller (SC) portion controls the route processing and management functions for the FCC and its components. The switch (SW) portion interconnects all the route processors (RPs) and SCs in a multi-chassis system. The LEDs on the SC-SW indicate active alarm conditions.</li> <li>• The SC card is a shelf-controller-only card.</li> </ul> <p>For detailed information about the SC-SW and SC cards, see <a href="#">About the SC and SC-SW Cards, on page 69</a>.</p> <p>The FCC ships with two shelf controller cards, either two SC-SW cards or a combination of one SC-SW card and one SC card pre-installed in the FCC. The cards are inserted into two dedicated slots on the front of the FCC. One SC-SW or SC card installs into slot SC0 on the upper card cage and the other SC-SW or SC card installs into slot SC1 on the lower card cage (<a href="#">Figure 3: Cisco NCS 6000 FCC Slot Numbers</a>). Both the upper and lower card slots are identical. The secondary card is installed for redundancy, so that the loss or removal of a single card does not bring down the FCC. At least one SC-SW or SC card must be operational for the FCC to function.</p> <p><b>Note</b> In a multi-chassis system with more than one FCC, we recommend that the SC-SW cards are not installed in the same FCC.</p>
Power enclosure	<p>The power enclosure is a separate unit that is installed at the top of the FCC (<a href="#">Figure 5: FCC Power Enclosure—Front and Rear Views</a>). The enclosure has four slots for AC or DC power trays, and two power control modules (PCMs). Each set of power trays has a PCM with its own I/O power switch.</p> <ul style="list-style-type: none"> <li>• Each AC power tray has three slots for power modules (PMs). Each DC power tray has four slots for PMs.</li> <li>• Mixing AC and DC power supplies in the FCC is not supported.</li> </ul> <p>The AC and DC power trays are field-replaceable (after power down). The PMs are hot-swappable.</p>
Fan trays	<p>Two redundant fan trays are inserted into the rear of the FCC (<a href="#">Figure 2: Rear View of the Cisco NCS 6000 FCC</a>). Each fan tray contains four axial fans. The fans pull cooling air through the FCC from the front to the back of the FCC.</p>
Air filter	<p>A removable air filter is located below the lower cable management bracket and inside the front air intake on the front of the FCC (<a href="#">Figure 1: Front View of the Cisco NCS 6000 FCC</a>).</p>

Component	Description
Cable management brackets	<p>The FCC has cable management features on the front and rear sides of the FCC. 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.</p> <p>Four horizontal cable management brackets are preinstalled on the FCC (two on the front side and two on the rear side of the FCC (<a href="#">Figure 1: Front View of the Cisco NCS 6000 FCC</a> and <a href="#">Figure 2: Rear View of the Cisco NCS 6000 FCC</a> ). Each side of the FCC has one cable management bracket above the upper card cage and one cable management bracket below the lower card cage.</p>
Cable troughs	Four vertical cable troughs are supplied for cable management, two on the front side of the FCC and two on the rear side of the FCC.
Temperature sensor assembly	A temperature sensor is located on the lower rear side of the FCC.
Craft panel display	A craft panel display, located on the front of the FCC ( <a href="#">Figure 1: Front View of the Cisco NCS 6000 FCC</a> ), 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 FCC.

The following figure shows the front view of the Cisco NCS 6000 FCC.

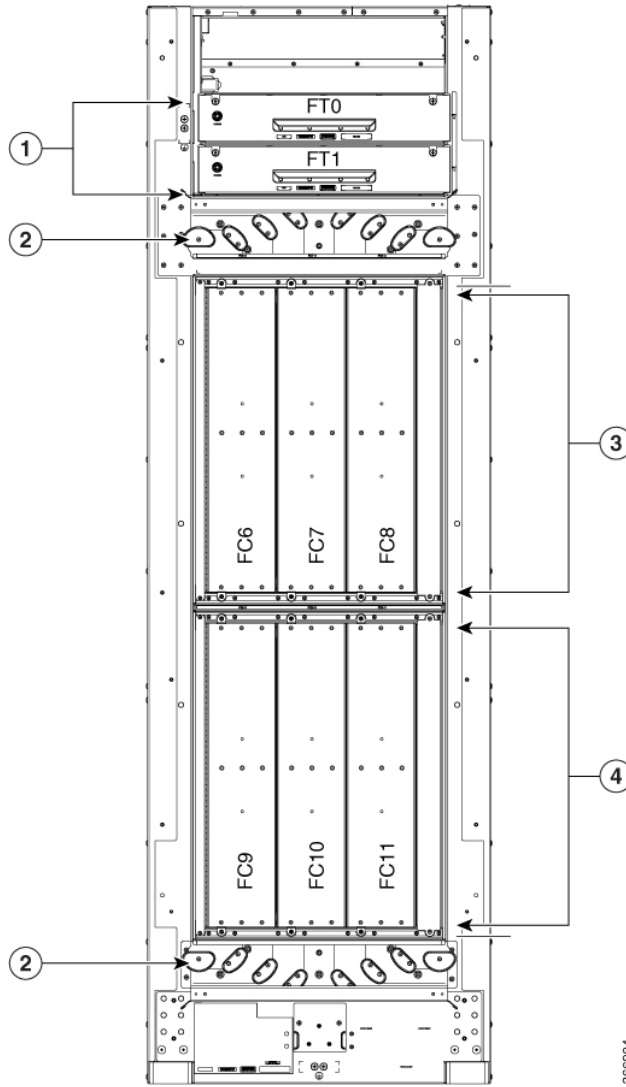
**Figure 1: Front View of the Cisco NCS 6000 FCC**



1	Power enclosure	4	Upper card cage
2	Craft panel display	5	Lower card cage
3	Cable management brackets	6	Removable air filter

The following figure shows the rear view of the Cisco NCS 6000 FCC.

**Figure 2: Rear View of the Cisco NCS 6000 FCC**



1	Two fan trays	3	Upper card cage
2	Cable management brackets	4	Lower card cage

## Slot Numbers

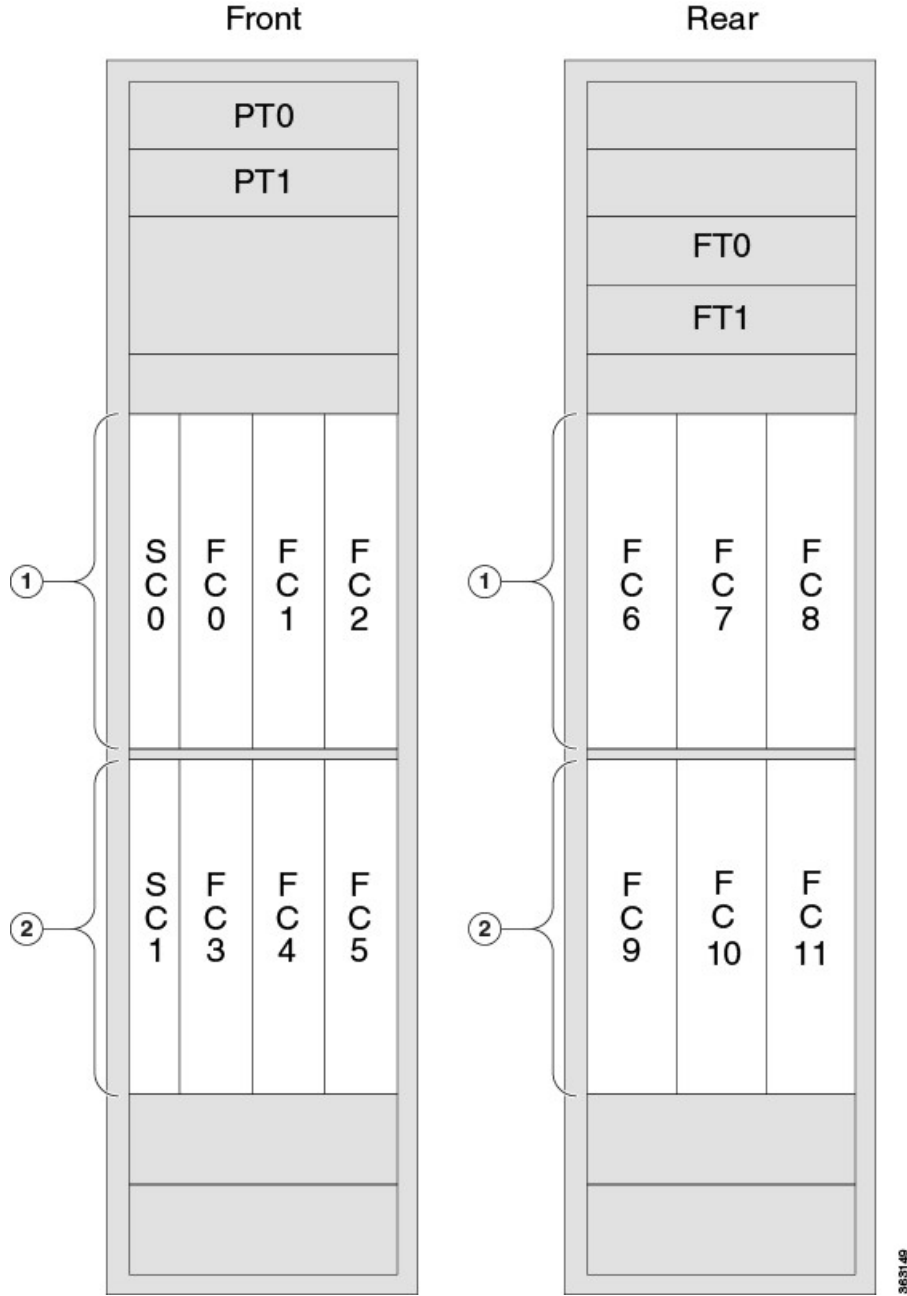
This section identifies the location and slot numbers for system components that plug into the Cisco NCS 6000 FCC. The following figure shows the slot number locations on the front and rear of the LCC.



**Note**

The four power trays slots (PT0–PT3) are part of the power enclosure described in the [About the Power Enclosure, on page 13](#) section.

**Figure 3: Cisco NCS 6000 FCC Slot Numbers**



The FCC has the following slots:

### Front of the FCC

- Four power trays for redundancy. The upper two power trays (PT0 and PT1) are referred to as power shelf 0 (PS0) and the lower two power trays (PT2 and PT3) are referred to as power shelf 1 (PS1).
- Two SC slots for redundancy (for SC and SC-SW cards) and six FC slots.
  - Upper card cage: (left to right: SC0, FC0, FC1, FC2)
  - Lower card cage: (left to right: SC1, FC3, FC4, FC5)

### Rear of the FCC

- Two fan trays for redundancy.
  - Upper fan tray: FT0
  - Lower fan tray: FT1
- Six FC slots
  - Upper card cage: (left to right: FC6, FC7, FC8)
  - Lower card cage: (left to right: FC9, FC10, FC11)

## Cable Management

The distribution of the slot locations on the Cisco NCS 6000 FCC allows for the large number of optic fiber cables required for a fully-loaded routing system. Splitting the FCs front and back maximizes the space around each connector and simplifies cable management.

The NCS 6000 FCC 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 6000 FCC](#) and [Figure 2: Rear View of the Cisco NCS 6000 FCC](#)).
- Vertical cable troughs: Four troughs, two on the front side of the FCC, and two on the rear side of the FCC ([Figure 14: Front Door Trough Hinges, Latches, and Retention Brackets](#) and [Figure 17: Rear Door Trough Hinges, Latches, and Retention Brackets](#)).

## Safety Guidelines

Before performing any installation procedures, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.



### Note

Review the safety warnings listed in [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 PCM output switch and the power to the associated two power trays prior to removing 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 FCC components away from walk areas.
- Do not wear loose clothing, jewelry, and other items that could get caught in the FCC while working with the FCC 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**

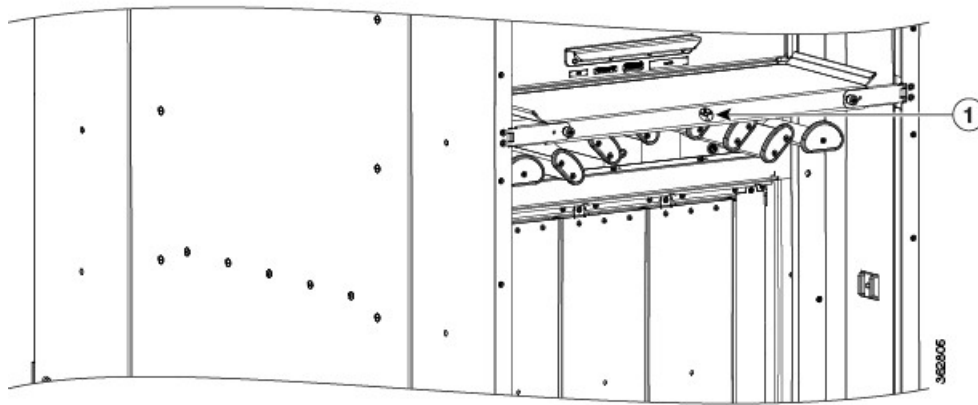
Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend use of an ESD-preventive wrist strap whenever you handle network equipment or one of its components.

To prevent 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 jack or a bare metal surface on the FCC (ensure that the FCC 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 the ESD jack on the FCC. An ESD jack is located directly above the upper and lower cable management brackets on both sides of the FCC.

**Figure 4: ESD Jack**



1	ESD jack (two on each side of the FCC)
---	--



## Installing the Power Enclosure, Power Trays, and Exterior Cosmetics

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This chapter provides instructions on installing the Cisco NCS 6000 Fabric Card Chassis power enclosure, power trays, and exterior cosmetics.

- [About the Power Enclosure, page 13](#)
- [Installing the Power Trays, page 16](#)
- [Installing the Exterior Cosmetics, page 20](#)

### About the Power Enclosure

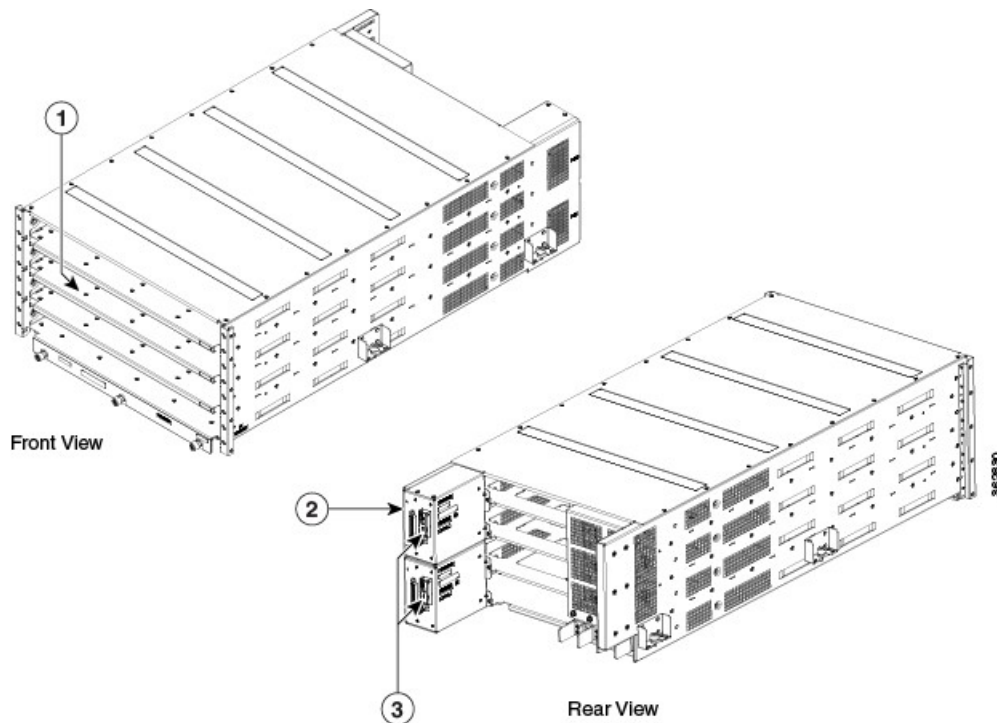
The Cisco NCS 6000 FCC ships with a separate empty power enclosure (Cisco PID NCS-F-PWR-SHELF). The power enclosure consists of one power shelf, four slots for AC or DC power trays, and two power control modules (PCMs).

The upper two power trays (PT0 and PT1) are referred to as power shelf 0 (PS0), and the lower two power trays (PT2 and PT3) are referred to as power shelf 1 (PS1) [Figure 3: Cisco NCS 6000 FCC Slot Numbers](#). Each set of power trays has a power control module (PCM) with its own I/O power switch. Three AC power modules or four DC power modules can be installed in each power tray. See the [Installing an AC or DC Power Module](#), on [page 46](#) section.

**Note**

Usually, it is not necessary to remove the power enclosure although it is field-serviceable. For information about removing the power enclosure components, see the [Replacing an AC or DC Power Tray](#), on page 99 section.

**Figure 5: FCC Power Enclosure—Front and Rear Views**



1	Four power tray slots for AC or DC power trays	3	PCM I/O power switches (one per PCM)
2	Two PCMs		

## Installing the Power Enclosure

This section describes how to install the power enclosure in the Cisco NCS 6000 FCC.

### Required Tools and Equipment

- 6-inch, Number-2 Phillips screwdriver
- Power enclosure (Cisco PID NCS-F-PWR-SHELF)

**Note**

The power enclosure weighs approximately 30 pounds and sits on top of the FCC. To prevent injury, we recommend that you use a ladder and use two people when installing the power shelf.

## Steps

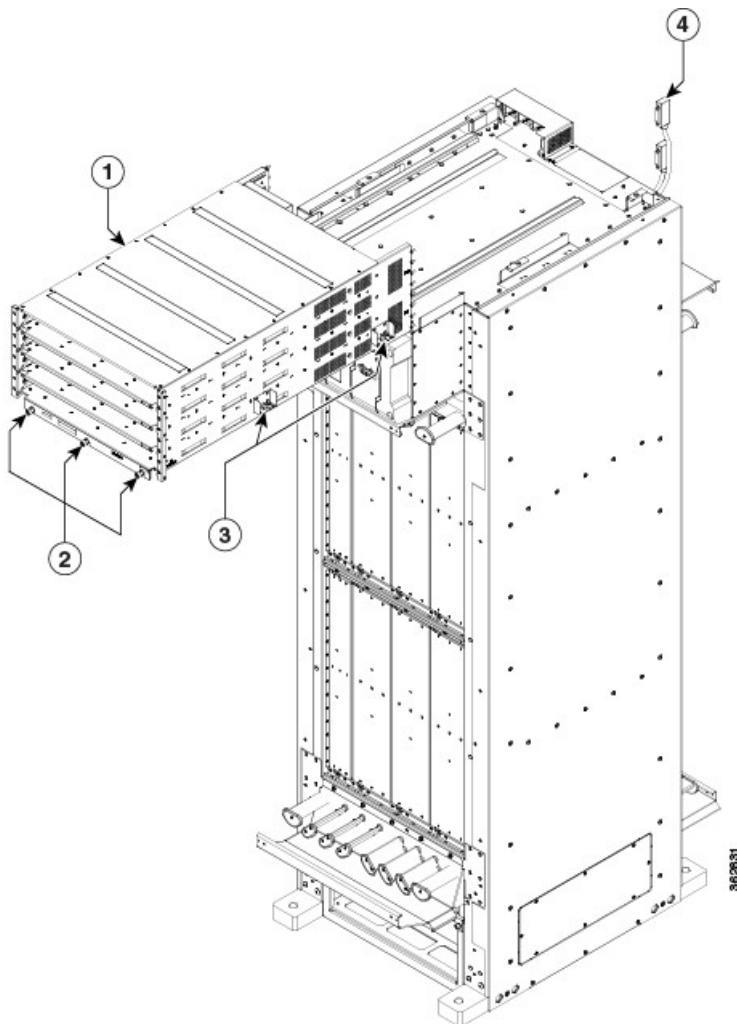
Follow these steps to attach the power enclosure to the FCC:

### Step 1

Lift and place the power enclosure (busbar facing back) at the top of the FCC.

**Caution** Handle the power shelf by lifting it at the sides and along the bottom of the shelf when installing it into the FCC. Avoid lifting the shelf from the center bottom.

**Figure 6: Attaching the Power Enclosure to the FCC**



1	Power enclosure	3	Side captive screws (two per side)
2	Three front captive screws	4	D-Sub connector cables (one per PCM)

- Step 2** Position and align the two rails on each side of the underside of the power enclosure with the two rails at the top of the FCC. When the shelf is aligned properly, it will easily slide in place.
- Step 3** Slowly push the power enclosure forward until the front flange with the three captive screws engages with the front of the FCC.
- Step 4** Loosely tighten the captive screws (two per side) on the power enclosure, and then loosely tighten the three captive screws on the front flange.
- Step 5** Repeat Step 4, tightening all captive screws to firmly attach the power enclosure to the FCC.
- Step 6** Attach the two D-Sub connector cables to the two PCM connectors on back of the power enclosure and tighten the captive screws on each cable connector. The individual PCMs are labeled PCM0 and PCM1.
- Step 7** Tighten the captive screws on each cable connector.

## Installing the Power Trays

This section describes how to install an AC or DC power tray in the power enclosure and includes the following topics:



### Note

Although there are differences between AC and DC power trays, they are installed by using the same procedures described in this section. Once they are installed into an FCC that is properly grounded, external grounding to the power tray is not needed.

## About the AC and DC Power Trays

The Cisco NCS 6000 FCC power enclosure supports either four AC power trays or four DC power trays. An AC power tray houses up to three AC power modules, while a DC power tray houses up to four DC power modules. See the [Installing an AC or DC Power Module](#), on page 46 section.



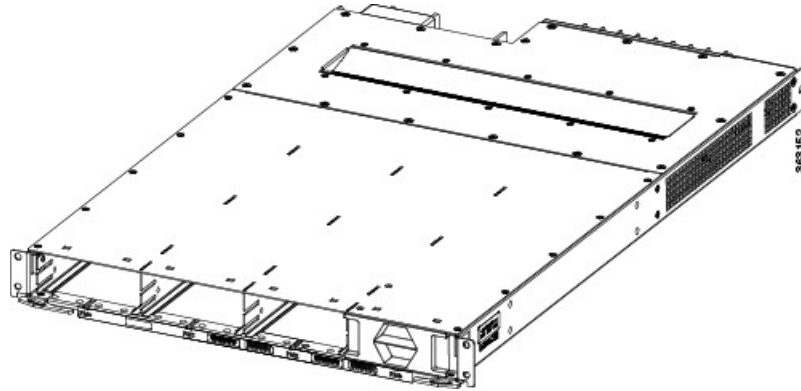
### Note

Only one type of power tray can be installed in the power enclosure. You cannot mix AC and DC power trays.

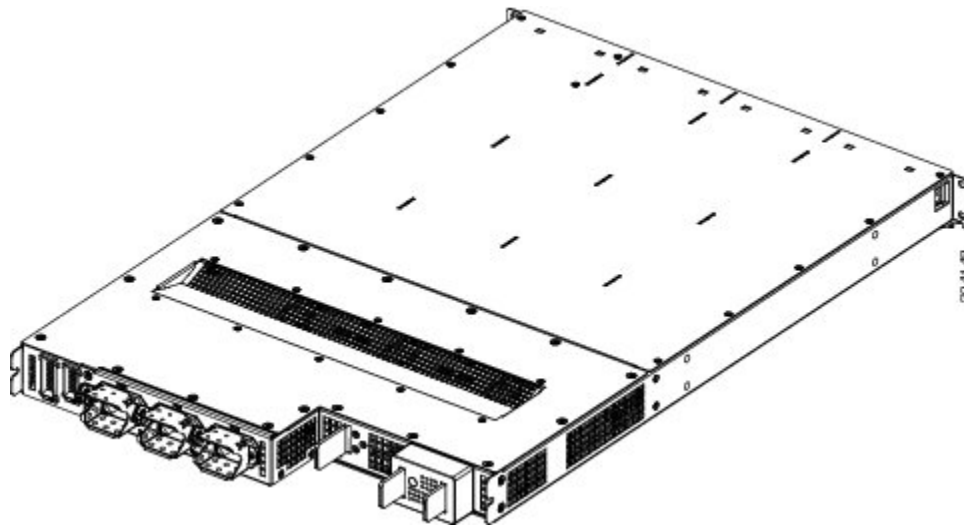
**Note**

For a DC power tray, the rear input 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.

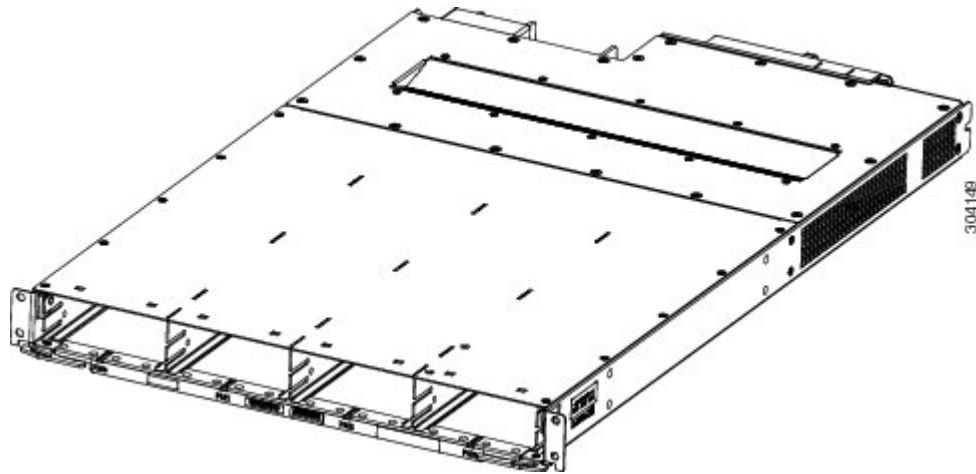
**Figure 7: AC Power Tray—Front View**



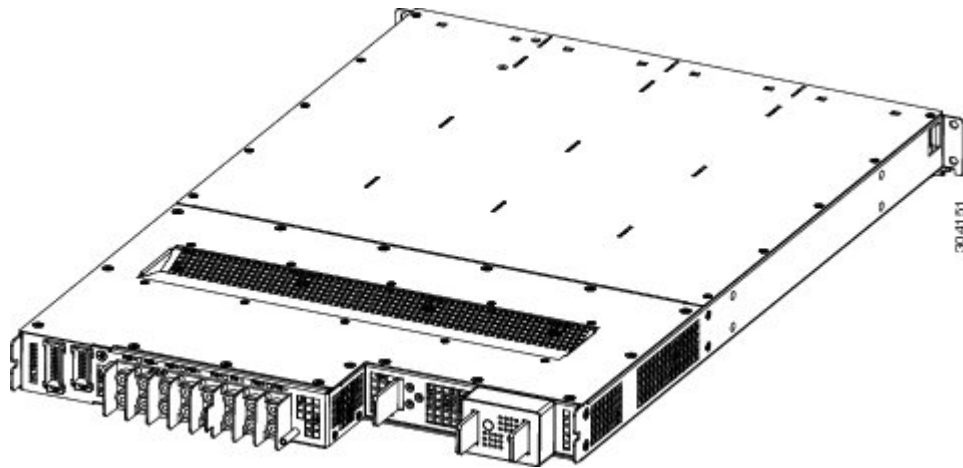
**Figure 8: AC Power Tray—Rear View (Clear Plastic Safety Cover Removed)**



**Figure 9: DC Power Tray—Front View**



**Figure 10: DC Power Tray—Rear View (Clear Plastic Safety Cover Removed)**



## Installing an AC or DC Power Tray

This section describes how to install an AC or DC power tray in the Cisco NCS 6000 FCC.



**Note**

For information about removing a power tray, see the [Replacing an AC or DC Power Tray](#), on page 99 section.

### Prerequisites

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

- Remove the top grilles from both the front and rear sides of the FCC, if installed.
- Ensure the power tray you are about to install is empty. Do not install a power tray into the FCC with the PMs installed in the power tray.



## Required Tools and Equipment

- Four M4 x 10 mm screws per power tray
- 6-inch, Number-2 Phillips screwdriver
- Number-2 Phillips torque screwdriver with 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)

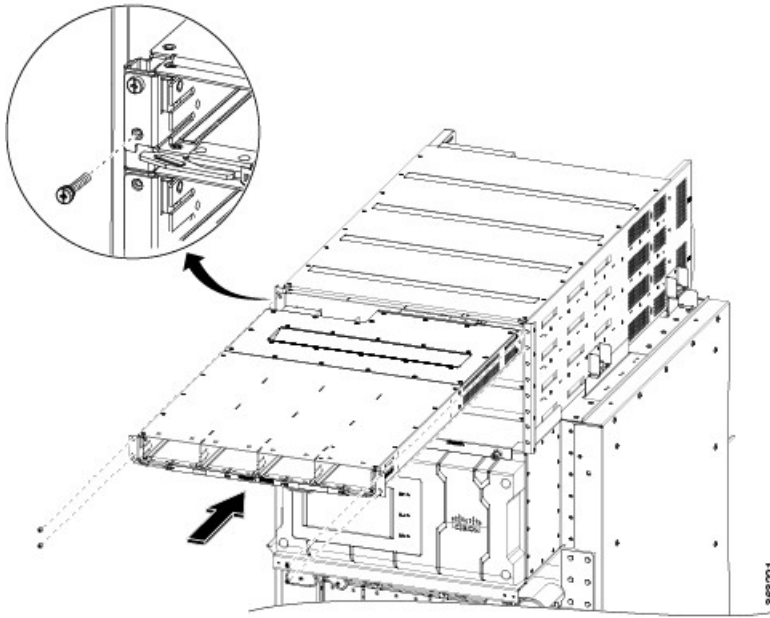
## Steps

To install an AC or DC power tray, follow these 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 power enclosure.
- 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 FCC, 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 power enclosure. Slide the tray all the way into the enclosure until both power tray handles engage the slots.

**Caution** Use care not to bend the handles.

**Figure 11: Installing a Power Tray into the Power Enclosure—DC Power Tray Shown**



**Step 3** Use the screwdriver to loosely tighten the four M4 x 10 mm screws that attach the power tray to the power enclosure.

**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 power shelf are relied upon for power tray bonding and grounding.

## Installing the Exterior Cosmetics

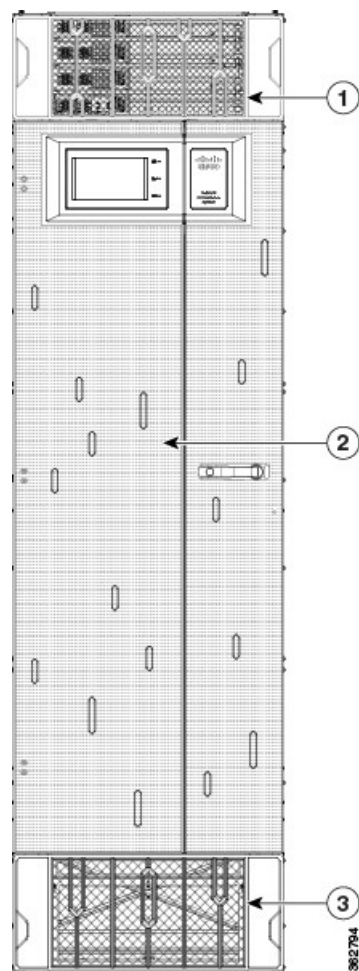
This section describes how to install the exterior cosmetics on the Cisco NCS 6000 FCC and includes the following topics:

For information about removing the external cosmetics, see the [Removing the Exterior Cosmetics](#), on page 87 section.

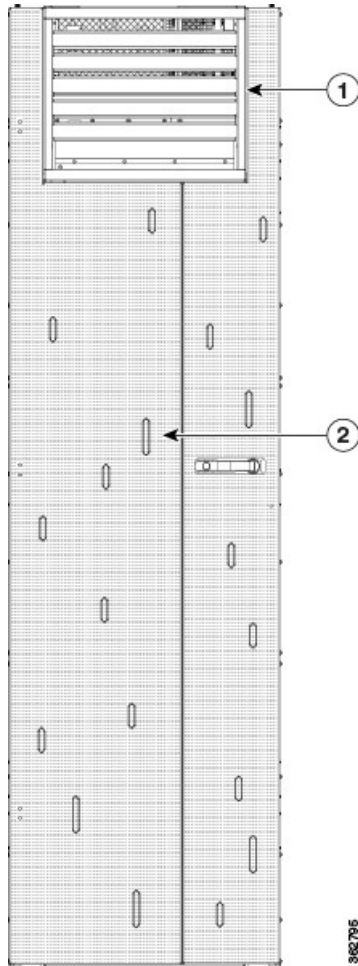
## Overview of the Exterior Cosmetics

The Cisco NCS 6000 FCC is shipped with exterior cosmetics for the front side and rear side of the FCC.

**Figure 12: Exterior Cosmetics—Front Side of the FCC**



1	Top grille	3	Bottom grille
2	Front door		

**Figure 13: Exterior Cosmetics—Rear Side of the FCC**

1	Rear exhaust air deflector
2	Rear door

## Installing the Front Exterior Cosmetics

This section describes how to install the front side exterior cosmetics on the Cisco NCS 6000 FCC. We recommend that you install the exterior cosmetics in the order outlined in this section.



### Note

Before performing these tasks, you must first unpack and secure the chassis. See the [Cisco Network Convergence System 6000 Series Routers Unpacking, Moving, and Securing Guide](#).

## Prerequisites

[Installing the Power Enclosure](#) , on page 14

## Required Tools and Equipment

- 8-inch, Number-1 Phillips screwdriver (magnetic head preferable)
- Two vertical cable troughs (left and right troughs are interchangeable)
- Three door hinges
- Three door latches
- Four trough retention brackets
- Front door
- Door grounding cable
- Craft panel cover
- Front top grille
- Front bottom grille

For information on the cosmetic PID numbers, see [Cosmetic Product IDs](#), on page 134.

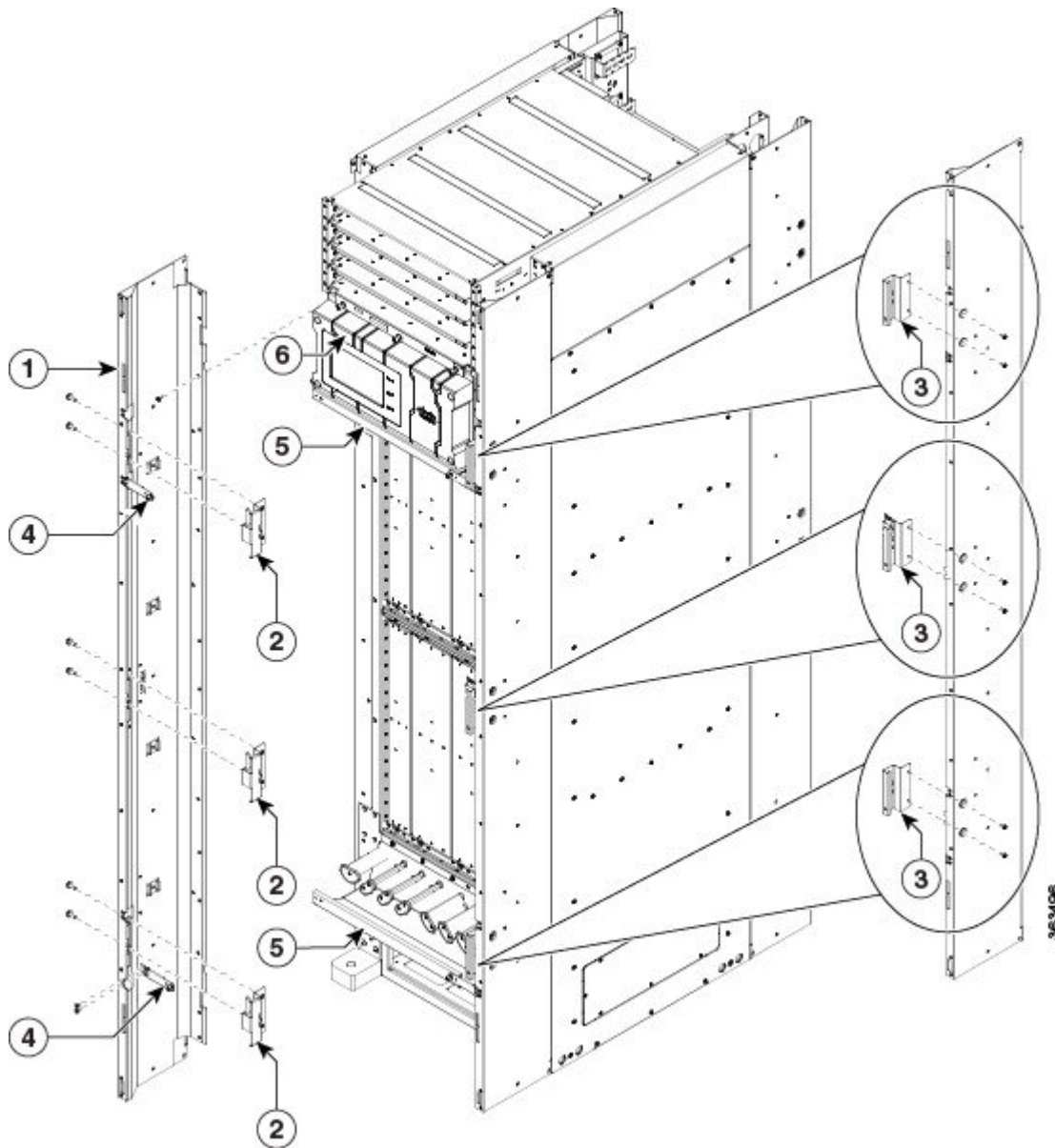
## Steps

To install the front exterior cosmetics, follow these steps:

- 
- Step 1** Remove the upper and lower horizontal cable management brackets (preinstalled on the FCC) by loosening and removing the eight pan-head screws (four per bracket). One bracket is located above the upper card cage and the other bracket is below the lower card cage.
- Step 2** Attach the left and right vertical cable troughs to the front of the FCC. 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 FCC.

**Note** 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 14: Front Door Trough Hinges, Latches, and Retention Brackets**



1	Vertical cable troughs (one per side), each attached to the FCC with eight pan-head screws	4	Trough retention brackets (two per trough)
2	Three door hinges	5	Two horizontal cable management brackets (preinstalled)

3	Three door latches: Door stop latch, top and bottom (700-39150-01) Door latch, middle (700-46854-01)	6	Craft panel display cover
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For each vertical cable trough

- 1 Align the guide pins on the rear of the vertical cable trough with the positioning holes on the front of the FCC.
- 2 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 the FCC. You might need to use a ladder to reach the upper screws.
- 3 Attach two trough retention brackets to each vertical trough with two 8-32 flat-head screws (two per trough).
- 4 Using the captive screw, insert the trough retention brackets into each upper and lower horizontal cable troughs (two screws per side).

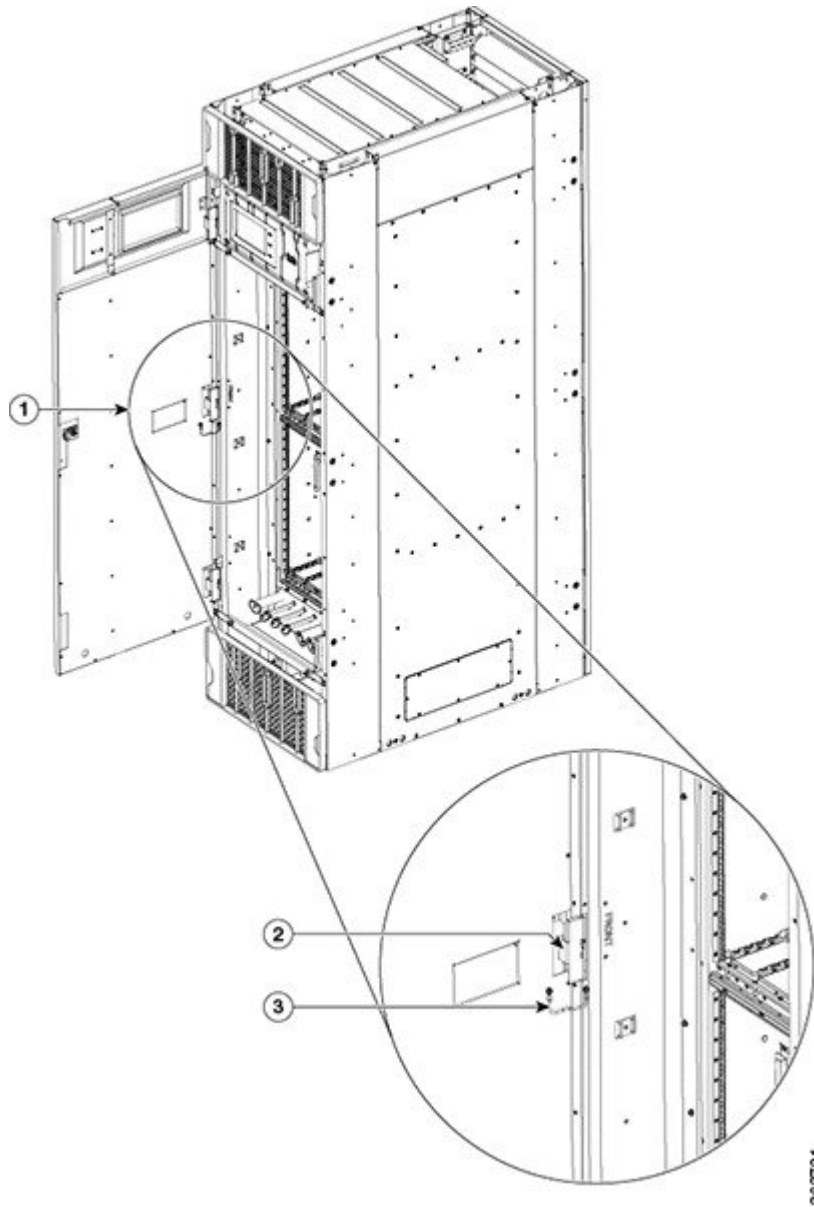
**Step 3** Reattach the upper and lower horizontal cable management brackets by inserting and tightening the eight pan-head screws (four per bracket).

**Step 4** Attach the three door hinges and the three door latches by using two pan-head screws each.

**Step 5** Align the front door (see the following figure) with the three door hinges on the FCC. The door will then drop into position onto the hinge attachment pins.

**Note** We recommend that you use two people to lift the door onto the FCC.

**Figure 15: Attaching the Front Door**



1	Front door	3	Grounding cable
2	Door hinges		



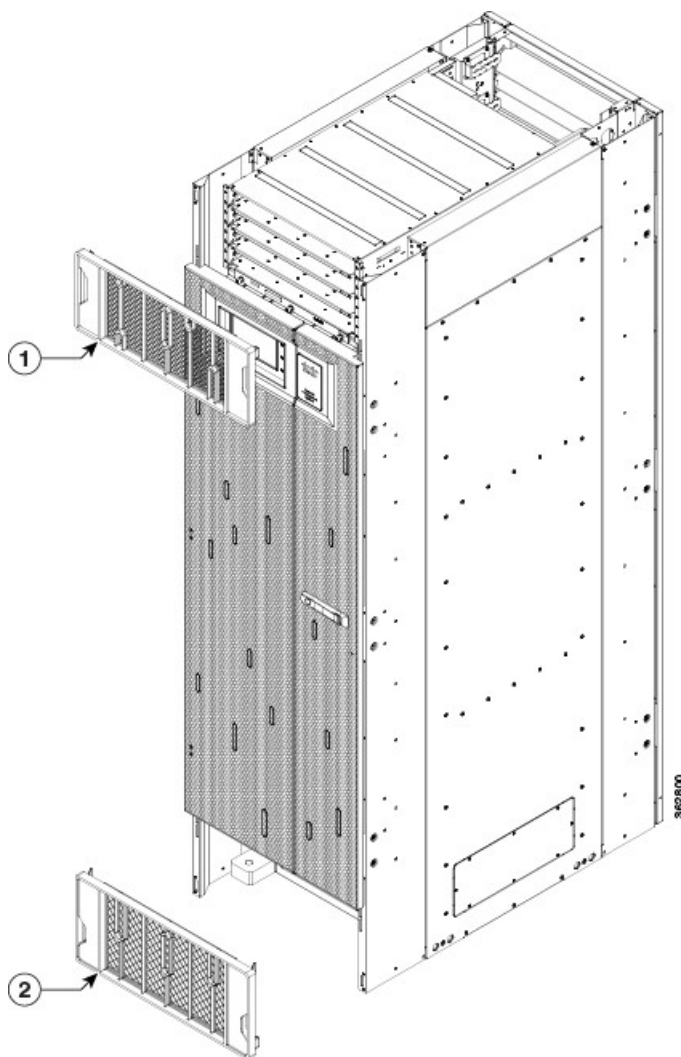
**Step 6** Attach the grounding cable to the front door.

- 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.

**Step 7** Attach the grilles to the troughs (see the following figure).

- a) Attach the top grille by carefully inserting the bottom tabs into the slots on the bottom of the grille. Press the grille firmly against the troughs until the snap joiners on the top of the grille snap into place.
- b) Attach the bottom grille by carefully inserting the top tabs into the slots on the top of the grille. Press the grille firmly against the troughs until the snap joiners on the bottom of the grille snaps into place.

**Figure 16: Front Grilles**



1	Front top grille	2	Front bottom grille
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## Installing the Rear Exterior Cosmetics

This section describes how to install the rear side exterior cosmetics on the Cisco NCS 6000 FCC. We recommend that you install the exterior cosmetic components in the order outlined in this section.

### Prerequisites

[Installing the Power Enclosure](#) , on page 14

[Installing the Front Exterior Cosmetics](#), on page 22

### Required Tools and Equipment

- 8-inch, Number-1 Phillips screwdriver (magnetic head preferable)
- Two vertical cable troughs (left and right are interchangeable)
- Three door hinges
- Three door latches
- Four trough retention brackets
- Exhaust plenum bracket
- Rear door
- Door grounding cable
- Rear exhaust air deflector

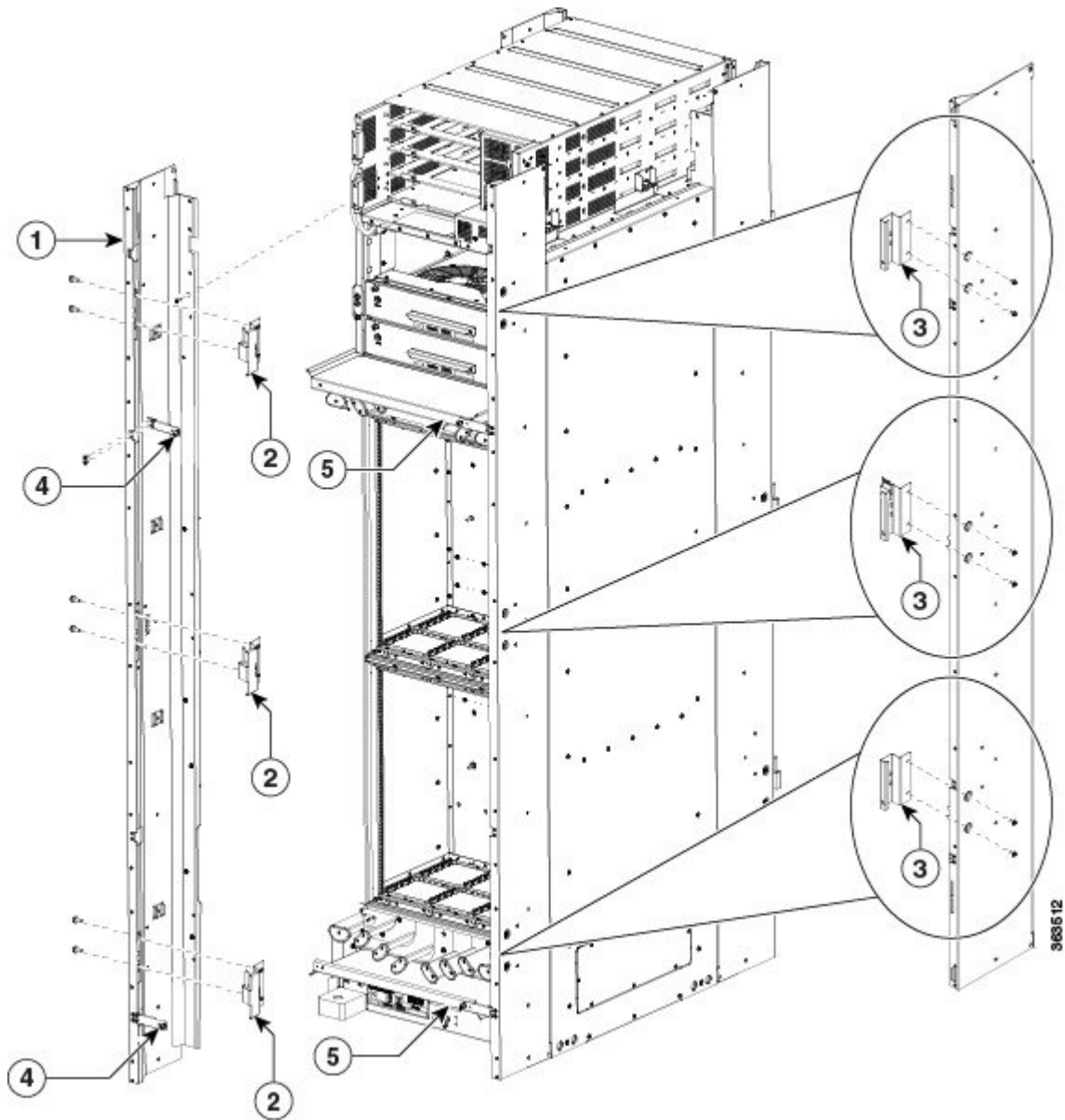
### Steps

To install the rear exterior cosmetics, follow these steps:

- 
- Step 1** Remove the upper and lower horizontal cable management brackets (preinstalled on the FCC) by loosening and removing the eight pan-head screws (four per bracket). One bracket is located above the upper card cage and the other bracket is below the lower card cage.
- Step 2** Attach the left and right vertical cable troughs to the rear of the FCC. The two vertical cable troughs are inverted from each other. Each trough is marked REAR to ensure that you install the trough on the correct side of the FCC.

**Note** 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 17: Rear Door Trough Hinges, Latches, and Retention Brackets**



1	Vertical cable troughs (one per side), each attached to the FCC with eight pan-head screws	4	Trough retention brackets (two per trough)
2	Three door hinges	5	Two horizontal cable troughs (preinstalled)

3	Three door latches: Door stop latch, top and bottom (700-39150-01)Door latch, middle (700-46854-01)		
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For each vertical cable trough:

- a) Align the guide pins on the rear of the vertical cable trough with the positioning holes on the rear of the chassis.
- 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 the FCC. You might need to use a ladder to reach the upper screws .
- c) Attach the trough retention brackets to each vertical trough with two 8-32 flat-head screws (two per trough).
- d) Using the captive screw, insert the trough retention brackets into each upper and lower horizontal cable troughs on the FCC (two screws per side).

### Step 3

Reattach the upper and lower horizontal cable management brackets by inserting and tightening the eight pan-head screws (four per bracket).

### Step 4

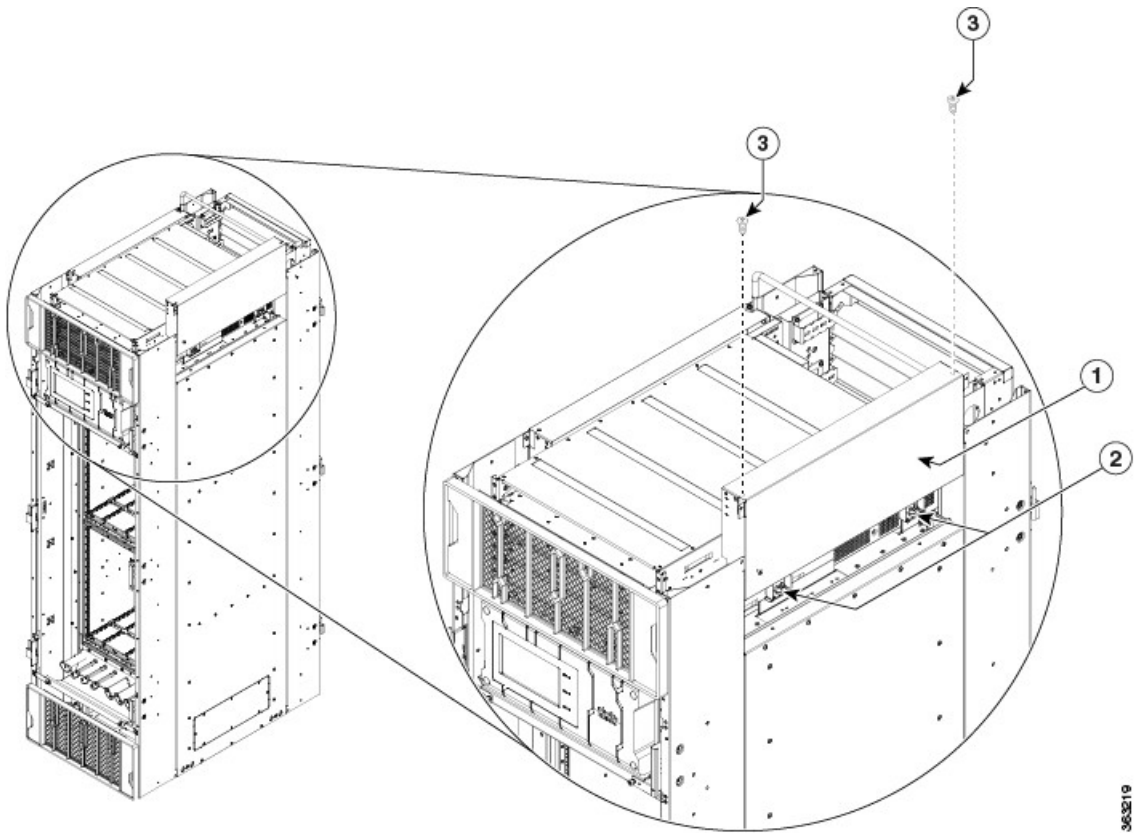
Attach the side filler panels.

For each filler panel:

- a) Align the guide pins on the filler panel with the positioning holes on top of the FCC.
- b) Insert the filler panel into the FCC and slide it down until it is fully seated.

- c) Loosely attach the filler panel to the FCC with two 8-32 screws.

**Figure 18: Side Filler Panels**

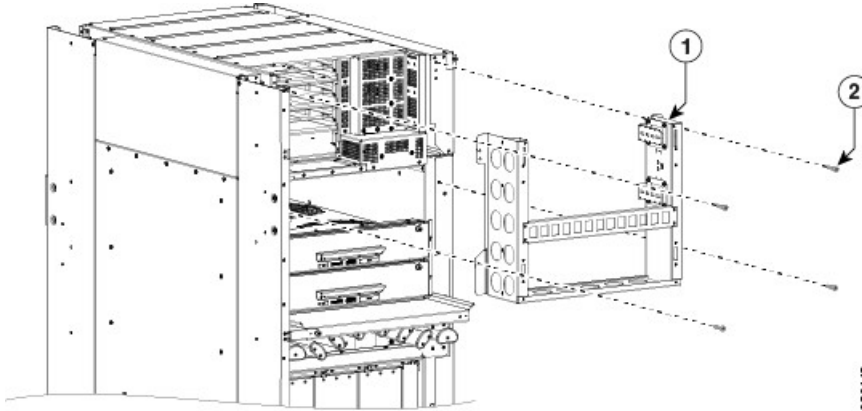


1	Side filler panel (one each side)	3	Two 8-32 screws
2	Guide pins		

**Step 5** Attach the exhaust plenum bracket to the FCC (cutouts facing up) using six pan-head screws, three screws each side. Before installing the bracket, remove the topmost screw on each of the vertical troughs.

**Step 6** Tighten the two 8-32 screws on the filler panel (that you previously installed) securely to the FCC.

**Figure 19: Exhaust Plenum Bracket**



1	Exhaust plenum bracket	2	Six pan-head screws (three per side)
---	------------------------	---	--------------------------------------

**Step 7** Attach the three door hinges and the three door latches by using two pan-head screws each ([Figure 17: Rear Door Trough Hinges, Latches, and Retention Brackets](#)).

**Step 8** Align the rear door with the three door hinges on the FCC ([Figure 15: Attaching the Front Door](#)). The door will then drop into position onto the hinge attachment pins.

**Note** We recommend that you use two people to lift the door onto the FCC.

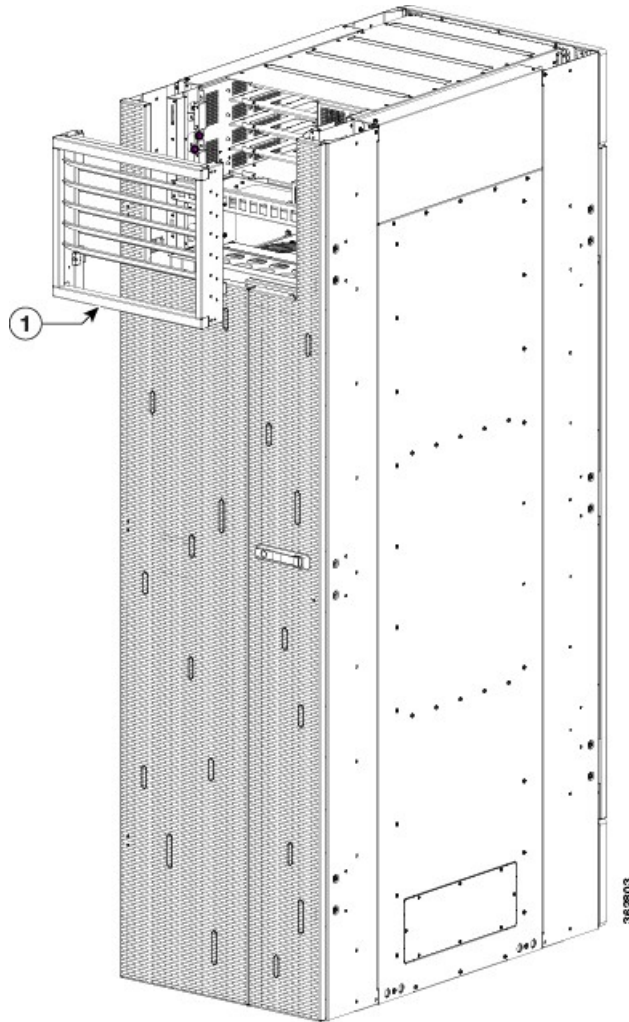
**Step 9** Attach the grounding cable to the rear door (step 7).

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.

**Step 10** Attach the exhaust air deflector by carefully inserting its mounting tabs into the exhaust plenum brackets. Press the deflector firmly against the vertical cable troughs until it snaps on.

**Figure 20: Exhaust Air Deflector—Rear of the Chassis**



1	Exhaust air deflector
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## Installing the Power Components

This chapter provides an overview of the AC and DC power systems and how to install the power modules and input power cables into the Cisco NCS 6000 Fabric Card Chassis (FCC). For information about removing power components, see the [Removing the Power Components, on page 96](#) section.

- [Power System Overview, page 35](#)
- [Installing the Power Modules and Input Power Cables, page 45](#)
- [Powering On and Powering Off the Fabric Card Chassis, page 57](#)

### Power System Overview

The Cisco NCS 6000 FCC 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](#).

### Prerequisites

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

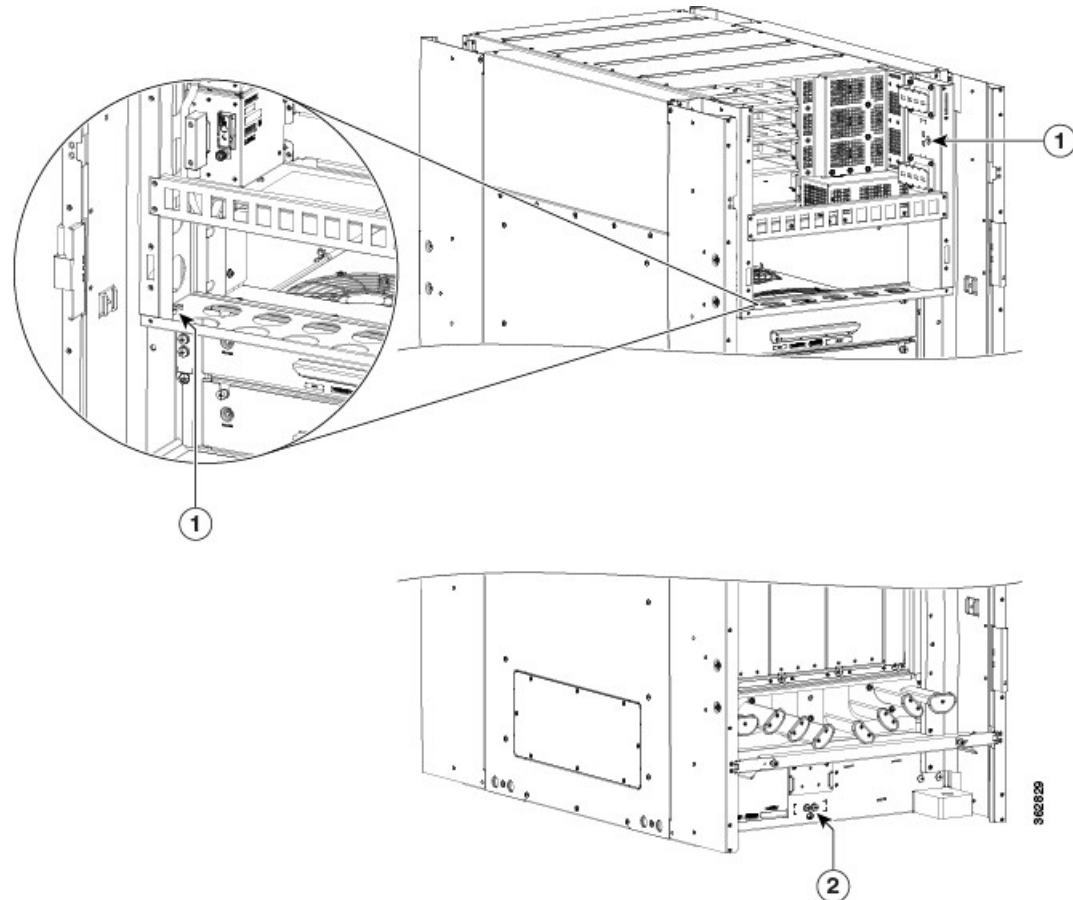
- Check the power at your site before installation to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner, if necessary.
- Install proper grounding to avoid damage from lightning and power surges.

### Installing the Fabric Card Chassis Ground Cable

The FCC has two safety earth ground connections. You can connect the central office ground system or interior equipment grounding system to either of these grounding points on the rear side of the FCC. One chassis ground is located near the top of the FCC and one chassis ground is located at the bottom of the FCC. These

grounding points are also referred to as Network Equipment Building System (NEBS) bonding and grounding point, and are provided to satisfy the Telcordia NEBS safety requirements.

**Figure 21: NEBS Bonding and Grounding Points—Rear Side of the FCC**



1	NEBS bonding and grounding points (upper)	2	NEBS bonding and grounding point (lower)
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**Caution**

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

## Required Tools and Equipment

You will need to provide the following tools and equipment:

- Number-2 Phillips screwdriver
- Ground lug
- Ground cable

- Crimping tool and lug specific die
- 3/8-inch drive torque wrench rated to include 30 in-lb (3.39 N-m)

To ensure a satisfactory ground connection:

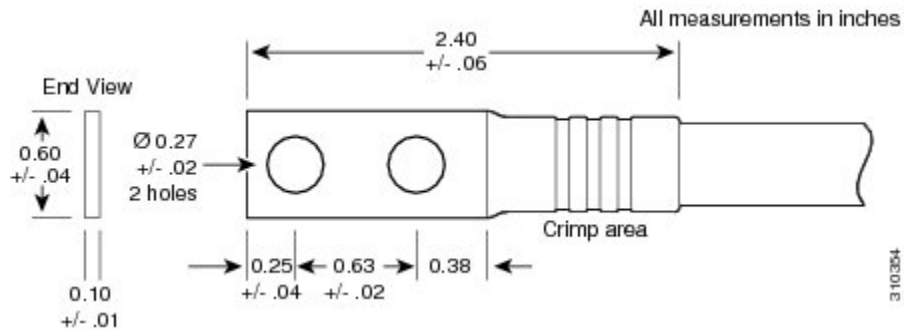
- One 180-degree angle (straight) grounding lug that has two M6 bolt holes with 0.63 inch (16 mm) spacing center to center between them, and a wire receptacle able to accept a 2-6-AWG multistrand copper wire.
- Two M6 bolts with integrated square cone locking washers (shipped pre-installed on the FCC, two at each grounding point).
- 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 FCC (DC-I: Isolated DC Return).

**Figure 22: 180-Degree Angle Straight Barrel Grounding Lug**

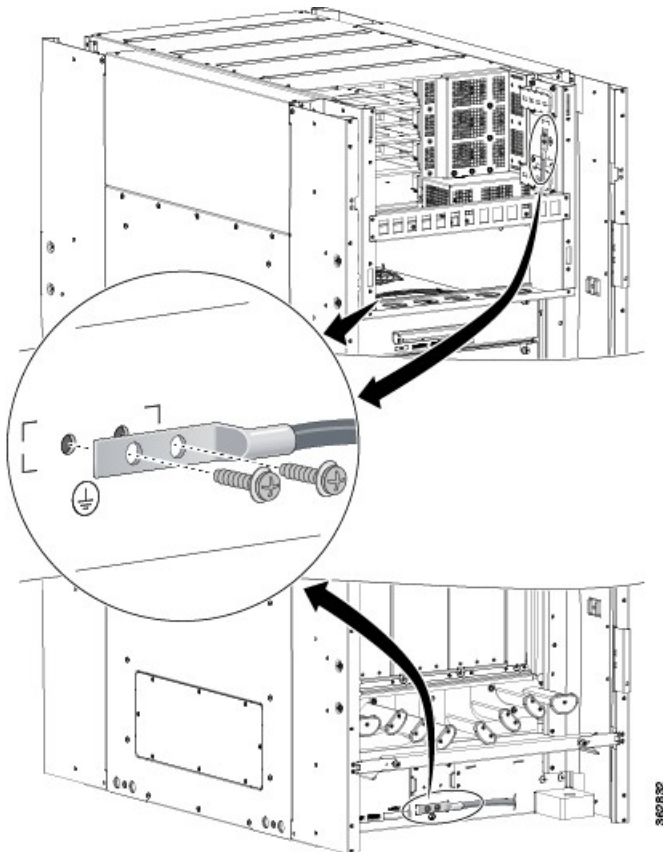


## Steps

To attach the ground cable to the FCC, follow these 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 one the NEBS grounding point ([Figure 21: NEBS Bonding and Grounding Points—Rear Side of the FCC](#)).

**Figure 23: Attaching the Ground Cable to a 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.
-

# AC Power System

## Overview of the AC Power System

An AC-powered Cisco NCS 6000 FCC contains four AC power trays that are part of the FCC power enclosure (Figure 5: FCC Power Enclosure—Front and Rear Views). The upper two power trays (PT0 and PT1) are referred to as PS0, and the lower two power trays (PT2 and PT3) are referred to as PS1. Figure 3: Cisco NCS 6000 FCC Slot Numbers. Each set of power trays has a power control module (PCM) with its own I/O power switch.

Each AC power tray has three slots for PMs. The AC power trays are field-replaceable (after power down), however the PMs are hot-swappable.

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 two AC power trays and power feeds B must power the lower two AC power trays (not all of the power module bays need to be filled). This allows the system to balance its load across each set of power trays and across the power modules within each tray.

The AC power system requires single-phase AC input power to each inserted PM. If you have a 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**

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If you plan to use a three-phase AC PDU we recommend that you install three AC PMs in each AC power tray to maintain a balanced three-phase power load.

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**Note**

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

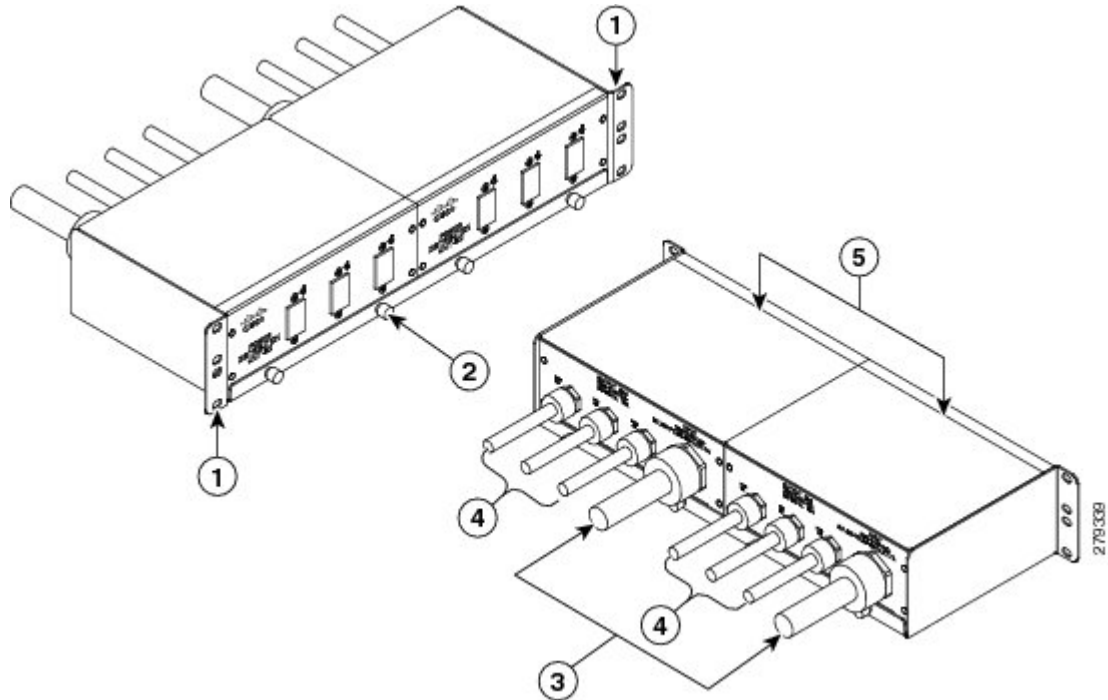
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## Installing an AC Power Distribution Unit

The AC PDU converts three-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 (Cisco PID NCS-PDU-DELTA) or AC Wye

(Cisco PID NCS-PDU-WYE) power interface, and has power input and power output cords entering and exiting the box.

**Figure 24: Cisco NCS-PDU**



1	Rack mounting ears	4	Output cord
2	Rack tray	5	Two PDUs
3	Input cord		

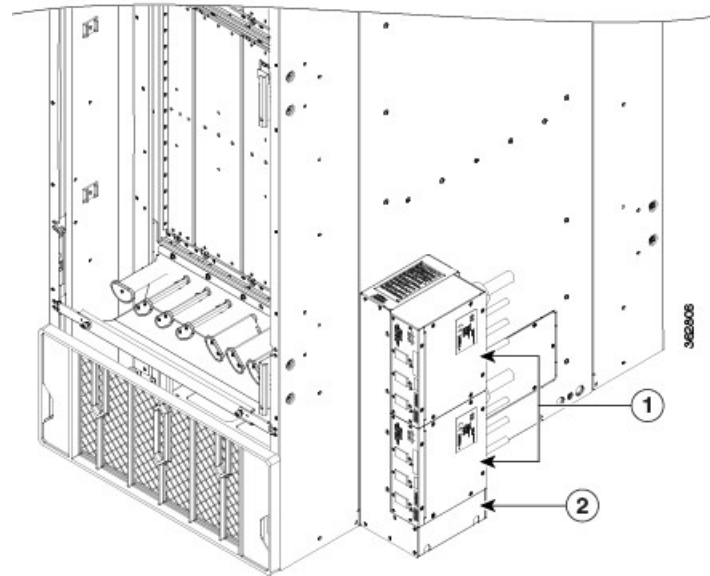
For detailed information on AC PDUs, see the [Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide](#).

### Mounting the PDU

The AC PDU mounting bracket holds two AC PDUs. The mounting bracket can be attached to both sides of the FCC by using the existing screws that hold the side panels on ([Figure 25: AC PDU Bracket Attached to the Side of the FCC](#)). The PDUs are attached to the mounting brackets with four M5 screws per AC PDU.

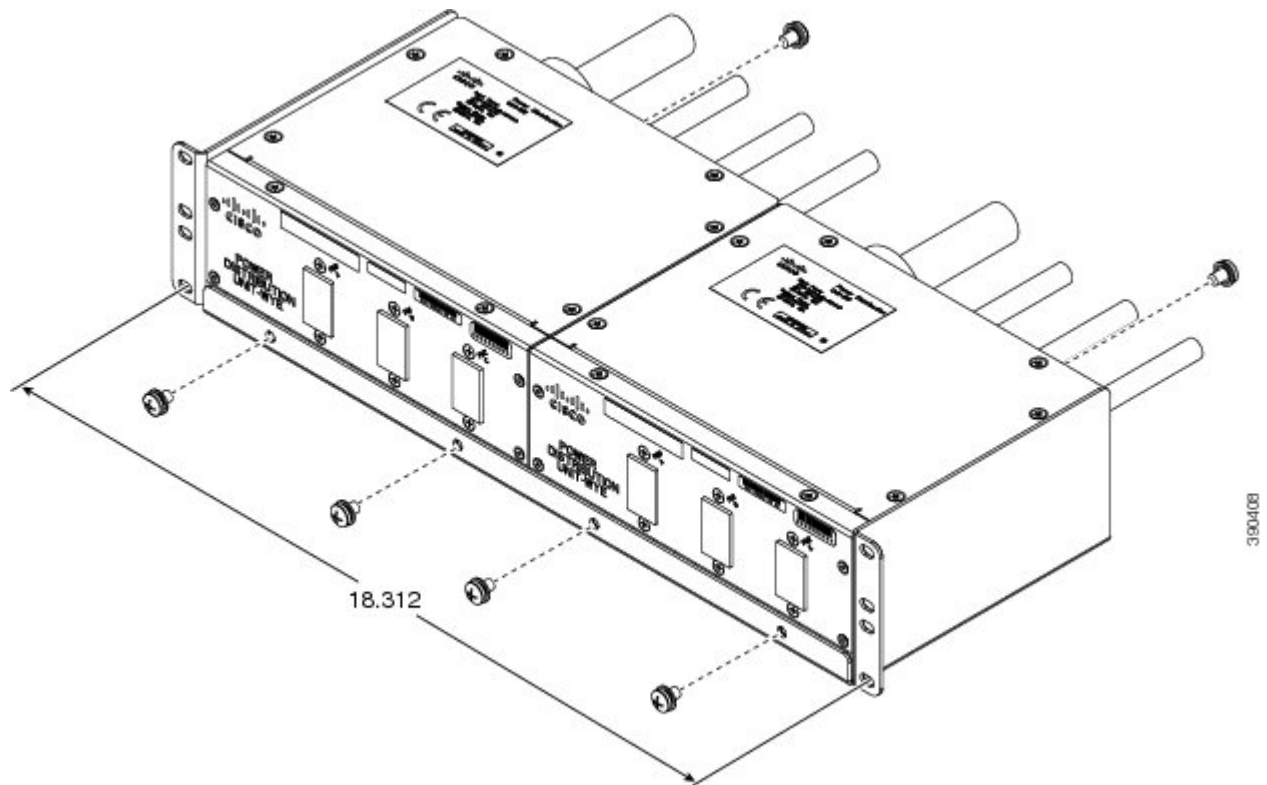
Optionally, you can mount the AC PDU in an external 19-inch rack by using six pan-head screws ([Figure 26: Rack Mounting the AC PDU in a 19-Inch Rack](#)).

**Figure 25: AC PDU Bracket Attached to the Side of the FCC**



1	AC PDUs (one each side)	2	PDU bracket (chassis mount)
---	-------------------------	---	-----------------------------

**Figure 26: Rack Mounting the AC PDU in a 19-Inch Rack**



## Installing the Tie-Down Bar

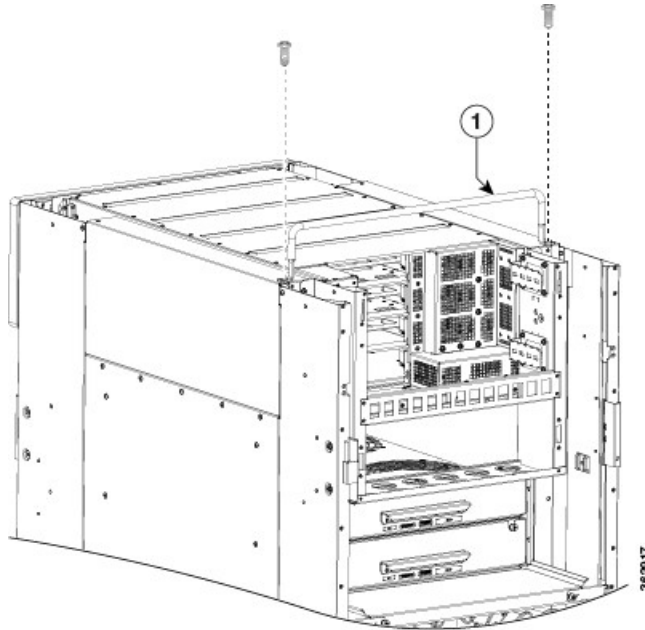
A 19-inch tie-down bar can be used to add strain relief for input power cables from the AC PDUs or cables routed from a raised floor. The following figure shows holes for two 10-32 x 0.50 inch screws that are pre-drilled on the FCC for attaching a tie-down bar.



**Note**

The 19-inch tie-down bar and screws are not supplied by Cisco. You can order these parts from a commercial vendor such as Panduit.

**Figure 27: 19-Inch Tie-Down Bar**



1	Tie-down bar
---	--------------

## DC Power System

A DC-powered Cisco NCS 6000 FCC contains four DC power trays that are part of the FCC power enclosure ([Figure 5: FCC Power Enclosure—Front and Rear Views](#)). The upper two power trays (PT0 and PT1) are referred to as power shelf 0 (PS0), and the lower two power trays (PT2 and PT3) are referred to as power shelf 1 (PS1). [Figure 3: Cisco NCS 6000 FCC Slot Numbers](#). Each set of power trays has a power control module (PCM) with its own I/O power switch.

The DC power tray has four slots for PMs. The DC power trays are field-replaceable (after power down), however the PMs are hot-swappable.

For N+N redundancy, “A” power feeds must power the upper two DC power trays and “B” power feeds must power the lower two DC power trays (not all of the PM bays need to be filled). This allows the system to balance its load across the two set of power trays and across the power modules within each tray.

The following table lists the DC input current and voltage specifications.

**Table 4: 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 4-6-AWG input wire.

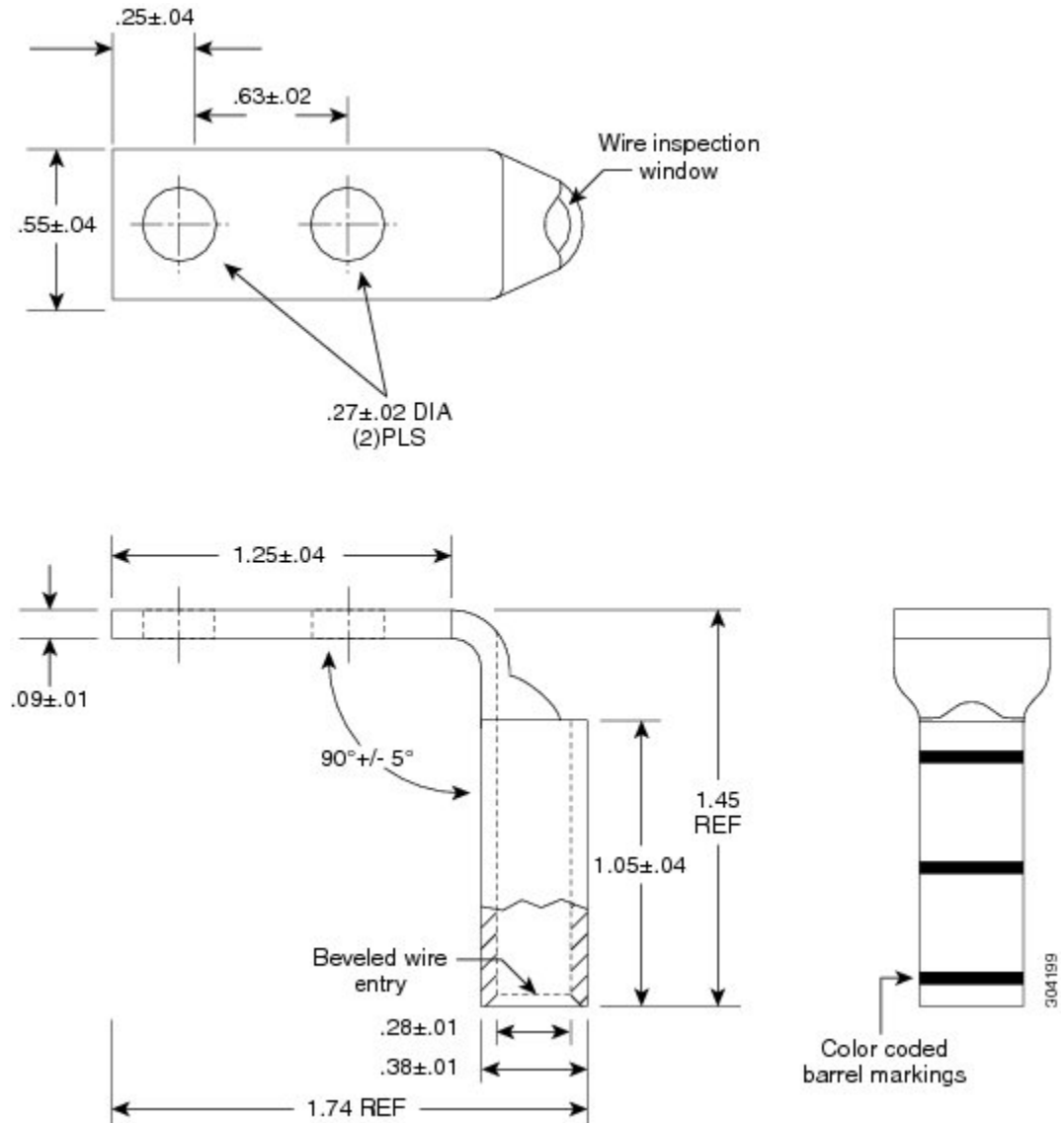
The cable should be sized according to local and national installation requirements. Use only copper cable.

**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 FCC. 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 28: 90-Degree Angle Standard Barrel Compression Lug**



## Installing the Power Modules and Input Power Cables

This section describes how to install the power modules and AC and DC power cables in the Cisco NCS 6000 FCC. We recommend that you perform the installation in the order outlined in this section.

**Note**

---

Ensure that the ground cable is installed on the FCC before you install the power modules and input power cables. See the [Installing the Fabric Card Chassis Ground Cable](#), on page 35.

---

## Installing an AC or DC Power Module

This section describes how to install an AC or DC power module (PM) into the power trays in the Cisco NCS 6000 FCC. Although there are differences between the AC and DC PMs, they are installed by using the same procedures.

**Note**

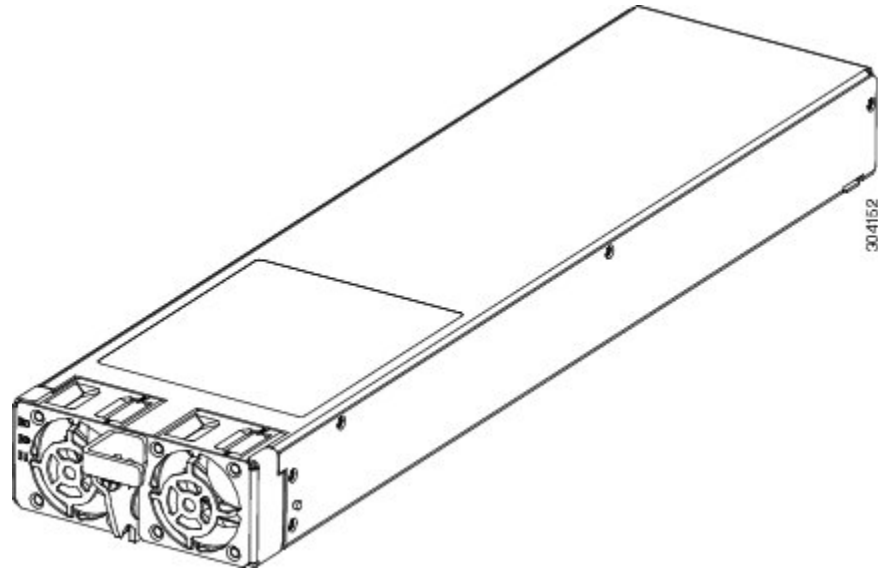
---

An AC-powered FCC supports up to 12 AC PMs (three per power tray). A DC-powered FCC supports up to 16 DC PM (four per power tray).

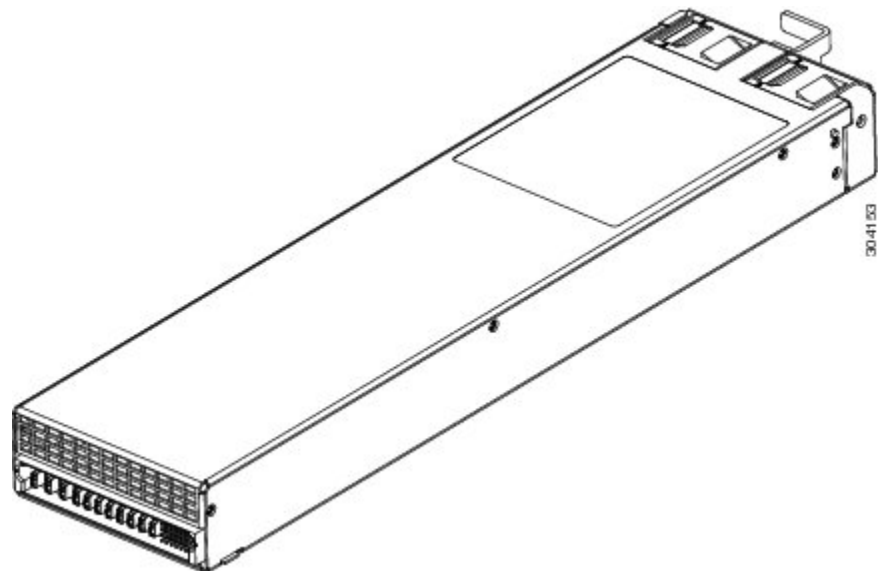
---

Each PM has three status LEDs located on the front left side of its faceplate (Figure 34: AC and DC Power Module Power Module Status Indicators). See Table 5: Power Module LED Status Indicator Lights for the meaning of each status LED.

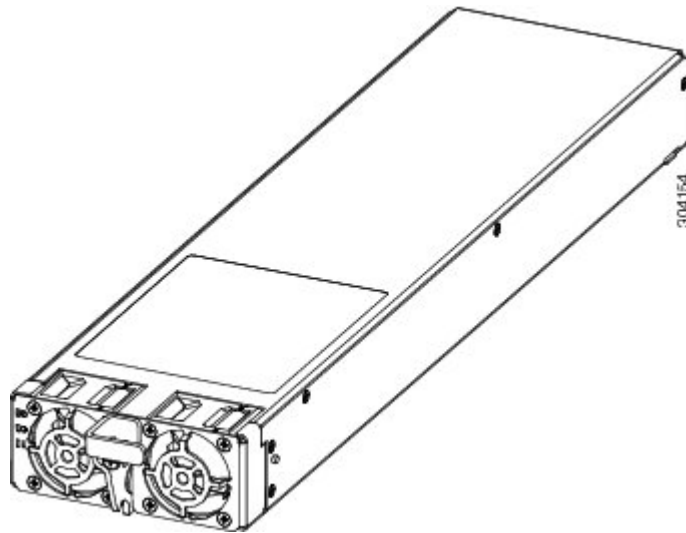
**Figure 29: AC Power Module—Front View**



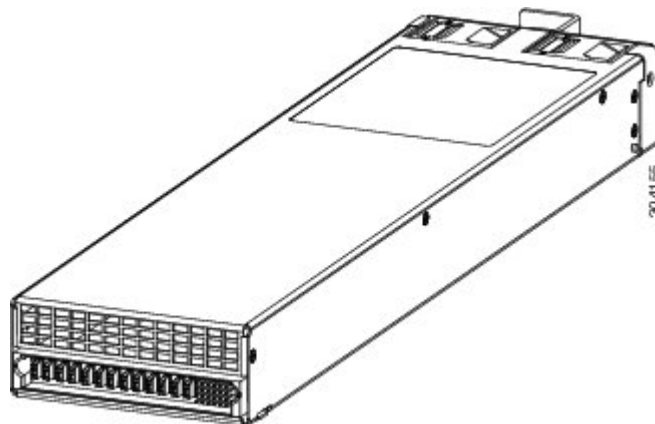
**Figure 30: AC Power Module—Rear View**



**Figure 31: DC Power Module—Front View**



**Figure 32: DC Power Module—Rear View**



## Prerequisites

- [Installing the Exterior Cosmetics](#), on page 20
- [Installing the Fabric Card Chassis Ground Cable](#), on page 35



### Caution

Do not install a power module into an AC or DC power tray until the power tray is securely screwed into the power enclosure.

## Required Tools and Equipment

- ESD-preventive wrist strap
- 6-inch, Number1 Phillips-head 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 into the power tray.

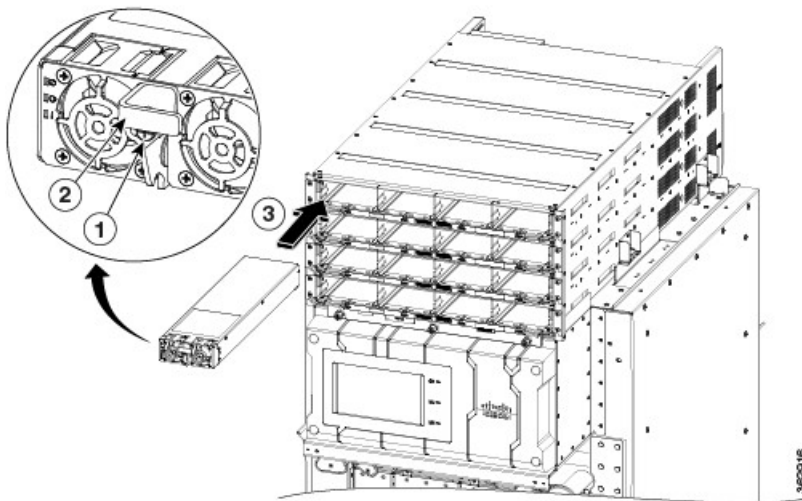
---

To install a PM into a power tray, follow these steps:

- 
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the front side of the FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- Step 2** Use two hands to support and guide the PM, and then slide it into the power tray.
- 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 33: Installing a Power Module into a Power Tray—DC Power Tray Shown**



1	Power module	3	Ejector lever screw
2	Ejector lever		

- 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.

## About the Power Module Status Indicators

The input-power-present LED on the AC and DC power modules provide a visual indication that voltage is present across the input terminal connection.

- For DC power modules, the DC input LED lights up when the input voltage reaches within the acceptable range.
- For AC power modules, the AC Input LED lights up when the input voltage reaches within the acceptable range.



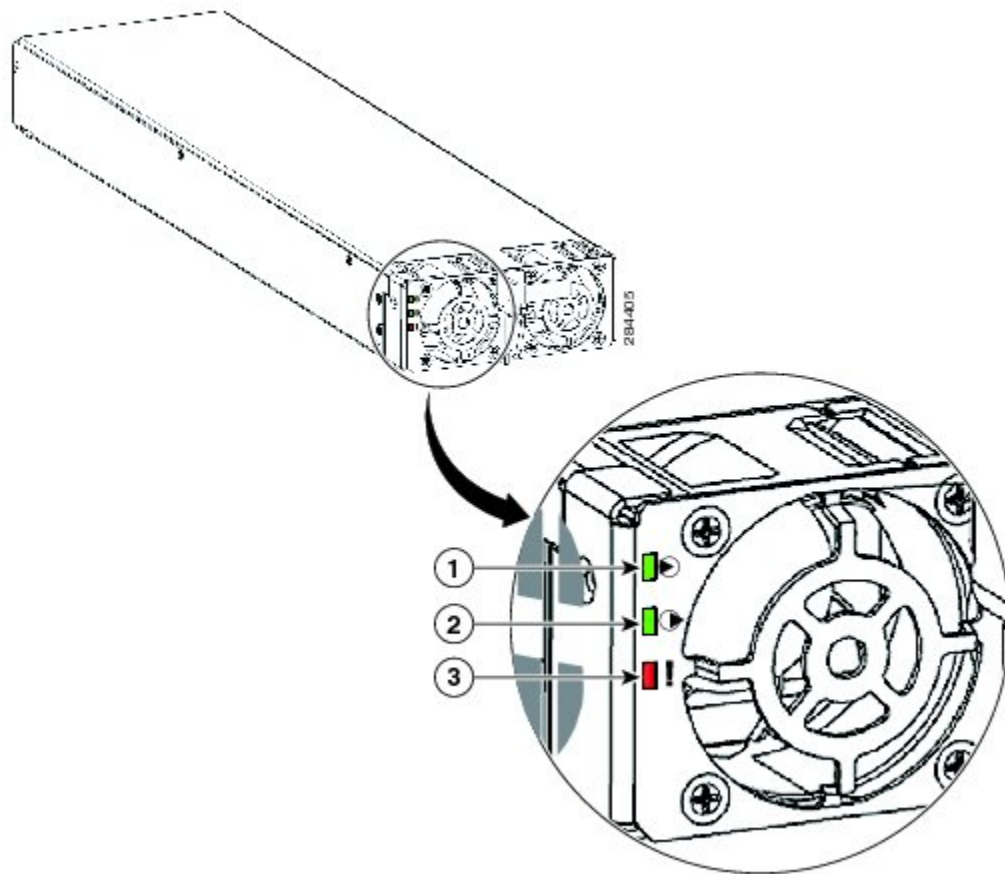
**Note**

Always disconnect power servicing the input power connection.

**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 34: AC and DC Power Module Power Module Status Indicators**



1	Input OK LED	3	Fault LED
2	Output OK LED		

**Table 5: 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.
Fault	Red	On: An internal fault is detected within the PM. Off: No internal faults detected on the PM.

## Installing an AC or DC Power Module Slot Cover

This section describes how to install a PM slot cover into an empty PM slot on an AC or DC power tray.

### 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

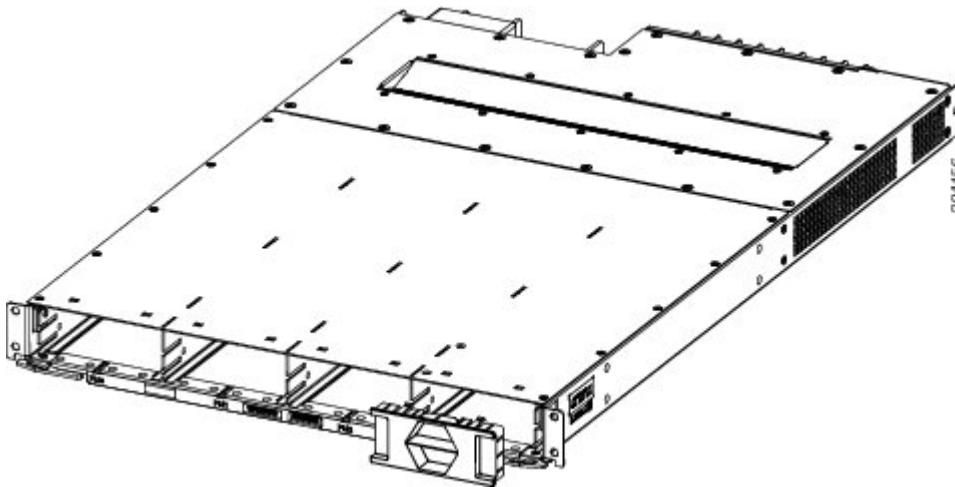
- ESD-preventive wrist strap
- AC or DC PM slot cover (Cisco PID A9K-PEM-V2-FILR)

## Steps

To install a PM slot cover in an AC or DC power tray, follow these steps:

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the front side of the FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- 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.
- Step 4** Push in the top of the PM slot cover gently until it clicks into place.

*Figure 35: PM Slot Cover on the Front of a Power Tray—DC Power Tray Shown*



## Installing AC Input Power Cords

This section describes how to connect the AC input power cords to the power modules and includes the following topics:

### Prerequisites

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



#### Caution

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

**Caution**

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 6000 Series 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 Cisco PID NCS-PDU-WYE). For more information, see the [Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide](#).

## Required Tools and Equipment

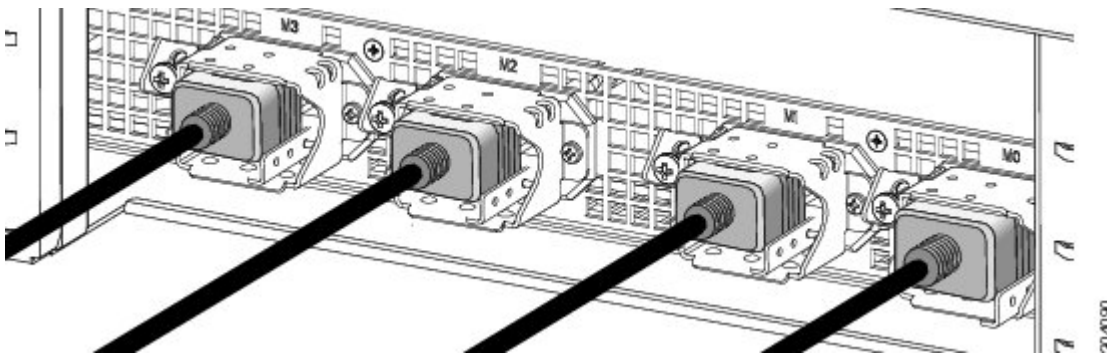
- 6-inch, Number 1 Phillips-head screwdriver
- AC input power cords, depending on the locale (Appendix B, “System Product IDs.”)

## Steps

To install the AC input power cords, follow these steps:

- Step 1** On the rear of the FCC, 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 36: AC Input Power Cords Connected to the Power Tray**

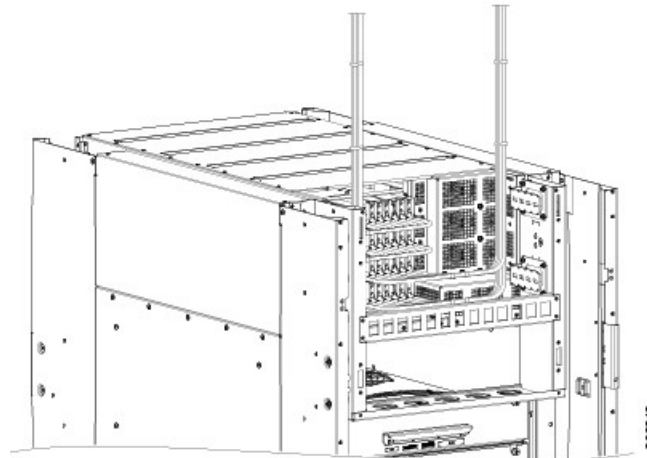


## Installing DC Input Power Cables

This section describes how to connect the 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.

The following figure shows the DC input power cabling on the rear of the power enclosure. In this example, the cabling for the four power trays all route to the right.

**Figure 37: DC Input Power Cabling**



### Prerequisites

- [Installing the Exterior Cosmetics](#), on page 20
- [Installing an AC or DC Power Tray](#), on page 18
- [Installing an AC or DC Power Module](#), on page 46



**Note** Before installing the cabling on the power tray, ensure 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

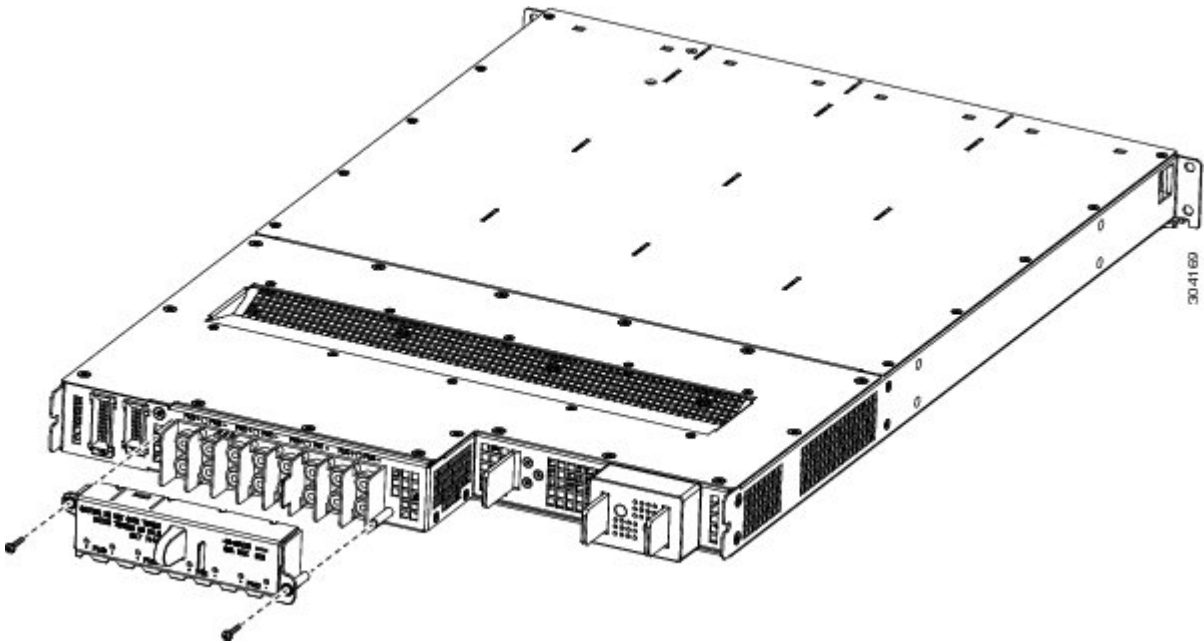
- DC power cable lugs
- Crimping tool and lug-specific die
- 3/8-inch ratchet wrench with 7/16-pt. socket
- Multimeter
- Torque wrench with torque value rated up to 55 in-lb (6.2 N-m)
- Terminal block cover
- Torque screwdriver with Number-1 Phillips 8-inch shank, and a torque rating of 5 to 7 in-lb (0.56 to 0.79 N-m)

## Steps

To connect the DC input power cables, follow these steps:

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

**Figure 38: DC Terminal Block Cover Installed on Rear of the 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 than 10 Mohm.

- The resistance between each negative terminal stud and bare metal surface on the power tray must be greater than 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 43.  
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).

**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.

**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** Repeat these steps for all the power trays.

## Powering On and Powering Off the Fabric Card Chassis

This section describes how to power on and power off an AC-powered or DC-powered Cisco NCS 6000 FCC.

### Powering On the Fabric Card Chassis

#### Prerequisites

- [Installing an AC or DC Power Module](#), on page 46
- [Installing an AC or DC Power Module Slot Cover](#), on page 52
- [Installing AC Input Power Cords](#), on page 53
- [Installing DC Input Power Cables](#), on page 55

Ensure that the FCC is properly grounded (see the [Installing the Fabric Card Chassis Ground Cable](#), on page 35 section).

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

## Required Tools and Equipment

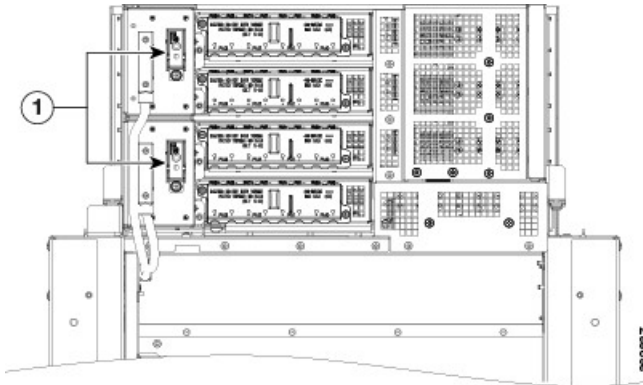
- Voltmeter

## Steps

To power on the FCC, follow these steps:

**Step 1** Ensure that the I/O switches on the PCMs on the rear of the FCC are in the OFF position.

**Figure 39: PCM I/O Power ON/OFF Switches**



1	I/O power ON/OFF switches
---	---------------------------

**Step 2** Verify that none of the Output OK LEDs on the front of the PMs installed in the tray are green ([Table 5: Power Module LED Status Indicator Lights](#)).

**Step 3** If you have a DC power system installed, follow these steps:

- Insert the power fuse at the BDFB or power plant to energize power tray 0, PM 0.
- 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  $-48$ V terminal.

- Verify that the correct Input OK LED on the front of the PM is lit ([Figure 34: AC and DC Power Module Power Module Status Indicators](#)).
- Repeat Steps **a** through **c** for each of the remaining DC inputs.
- Continue to Step **5**.

**Step 4** If you have an AC power system installed, follow these steps:



- a) For the individual single-phase input, open the individual circuit breaker for each PM installed at the circuit breaker cabinet.
- b) Energize the individual single-phase breaker at the circuit breaker panel one at a time and verify that the Input OK LED is lit on the front of the PM that is energized. Continue to Step 5.
- c) For AC PDU; Ensure that the PDU circuit breakers are in the open position
- d) Plug in the 3-phase commando plug for the first three-phase circuit into the source three-phase plug.
- e) Close PM0 (AB) on the PDU and verify that the Input OK LED is lit on the front of the PM that is energized and that the correct input LED lights.
- f) Repeat Steps c through e for the remaining PMs.

**Step 5** Turn the I/O switches on the PCMs to the ON position, and verify that the output LED is on ([Figure 39: PCM I/O Power ON/OFF Switches](#) ).

**Step 6** Verify that the fan tray status LEDs are lit and that the fans are running.

**Step 7** Turn off the rear power breakers for power trays (FT0) and power trays (FT1).

**Note** If the fault LED on any of the PMs are lit, we recommend that you replace the PM (see the [Component Product IDs, on page 131](#) for the Cisco PID). If the problem continues, please contact your Cisco support representative for assistance.

**Step 8** Install all cards in the FCC. For installation information, see [Installing the Shelf Controller Cards and Fabric Cards](#) , on [page 61](#)

**Step 9** Turn on the output breakers when finished.

---

## Powering Off the Fabric Card Chassis

This section describes how to power off an AC-powered or DC-powered Cisco NCS 6000 FCC.

### Steps

To power off the FCC follow these steps:

---

**Step 1** Turn the I/O switches on the PCMs to the OFF position ([Figure 39: PCM I/O Power ON/OFF Switches](#) ).

**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 the power trays.

**Step 4** Verify that all PM input LEDs are off ([Figure 34: AC and DC Power Module Power Module Status Indicators](#)).

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

---





# Installing the Shelf Controller Cards and Fabric Cards

This chapter provides instructions on installing the shelf controller cards and fabric cards in the Cisco NCS 6000 Fabric Card Chassis (FCC).



**Note**

This chapter also includes instructions for installing a multi-chassis fabric card in the Cisco NCS 6000 Line Card Chassis (LCC) which is a component of the Cisco NCS 6000 Multi-Chassis system.

Throughout this chapter, abbreviated terms are used to identify the formal names of the cards that make up the Cisco NCS 6000 Multi-Chassis system.

**Table 6: Abbreviated Terms for Cisco NCS 6000 Shelf Controller and Fabric Cards**

Cisco Product Name	Cisco Product ID	Abbreviated Term
NCS FCC Shelf Controller	NCS-F-SC	SC card
NCS FCC (Combo) Shelf Controller Switch Card	NCS-F-SCSW	SC-SW card
NCS FCC S2 Fabric Card	NCS-F-FC	S2 FC
NCS FCC S2 Fabric Card, 2nd Generation <a href="#">1</a>	NCS-F-FC2	S2 FC2
NCS 6008 Multi-Chassis Fabric Card	NC6-FC-MC	S13 MC FC
NCS 6008 Universal Fabric Card	NC6-FC2-U	UFC

<sup>1</sup> Required for 2T multi-chassis mode



**Note**

The Cisco NCS 6000 FCC ships with a minimum of six S2 FCs, six impedance carriers ([Figure 42: S2 FC Impedance Carrier](#)), and either one or two SC cards or SC-SW cards preinstalled in the FCC.

- [About Installing Cards and Associated Components](#) , page 62
- [Installing and Removing an Impedance Carrier](#) , page 66
- [About the SC and SC-SW Cards](#), page 69
- [Installing an SC or SC-SW Card](#), page 71
- [Verifying the Installation of an SC or SC-SW Card](#), page 74
- [About the Fabric Cards](#), page 77
- [Installing the Fabric Cards](#), page 79

## 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 the 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 (see [Figure 4: ESD Jack](#), on page 12) or a bare metal surface on the chassis (ensure that the chassis 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 a Card](#), on page 62 section).
- Place a removed card board-side-up on an anti-static 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 a Card

- Every card has a label (with an arrow) on its faceplate showing which side is up for installation.
- All card faceplates and card slots on the FCC are labeled with a round purple symbol.
- Every card has a key mounted on the board that matches a corresponding slot on the chassis side (top of each card slot). This key-slot mechanism prevents a card from being inserted into the wrong, non-matching card slot. It also prevents a card from being inserted upside down. If you insert a card into the wrong card slot or upside down, the key gets blocked against the chassis card guide and will not slide through the slot. If the key is blocked, remove the card and find the correct card slot.
- Online insertion and removal (OIR) is supported, enabling you to install a card while the FCC is operating. 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 a fabric card prior to removing it from the FCC. See [Steps for OIR Fabric Card Removal](#), on page 63.

- When installing a fabric card, you must first push the OIR button on both the upper and lower ejectors for the mechanical latch to be released.
- The different cards in the FCC are attached to the FCC itself by a pair of ejector levers and captive screws. The two ejector levers release the card from its midplane 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.
- The FCC is shipped with the card slots containing either impedance carriers or a plastic cover to help maintain the chassis stiffness and prevent any damage to the chassis during shipment.

**Note**

Any unused card slots that are uncovered allows air used for the FCC cooling to escape. To ensure proper air flow and maintain system EMC and safety compliance, any unused fabric card slots must contain impedance carriers, and all SC and SC-SW cards must remain installed in their card slots (see the [Installing and Removing an Impedance Carrier](#), on page 66 and the [Slot Numbers](#), on page 8).

**Caution**

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

## Steps for OIR Fabric Card Removal

Follow these steps to perform a graceful OIR on the fabric card by using the Cisco IOS XR **shutdown** command.

---

**Step 1** Shut down plane *X* (where *X* is in the range of 0 to 5).

**Example:**

```
config
controller fabric plane X
shutdown
commit
```

**Step 2** Shut down FC card location R/FCS (where R is the rack number in the range of 0 to 15 and F0 to F3, and S is the slot in the range of 0 to 5 for the LCC and 0 to 11 for the FCC).

**Example:**

```
config
hw-module location R/S shutdown
commit
...
...
```

**Step 3** Unshut FC location.

**Example:**

```
config
no hw-module location R/S shutdown
```

```
commit
```

**Step 4** Unshut plane X.

**Example:**

```
config
controller fabric plane X
no shutdown
commit
```

---

## About Cable Management Brackets

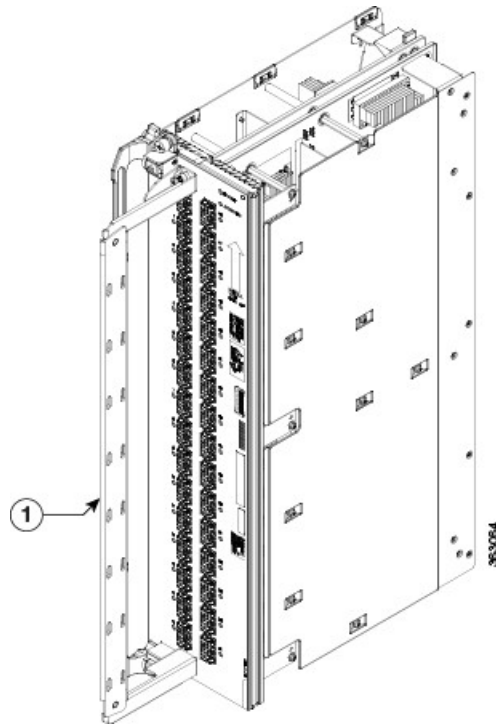
The Cisco NCS 6000 FCC has cable management features on the front and rear sides of the FCC. These brackets organize the interface cables entering and exiting the different cards, keeping them out of the way and free of sharp bends that may damage the cables.

- The front and rear sides of the FCC have horizontal cable management brackets above and below the card cages ([Figure 1: Front View of the Cisco NCS 6000 FCC](#) and [Figure 2: Rear View of the Cisco NCS 6000 FCC](#)).
- The front and rear sides of the FCC have vertical cable troughs on the left and right sides of the FCC used for routing the cables ([Figure 14: Front Door Trough Hinges, Latches, and Retention Brackets](#) and [Figure 13: Exterior Cosmetics—Rear Side of the FCC](#)).
- A vertical cable management bracket is preattached to the faceplate of an S2 FC, S2 FC2, S13 MC FC, UFC, and SC-SW card.



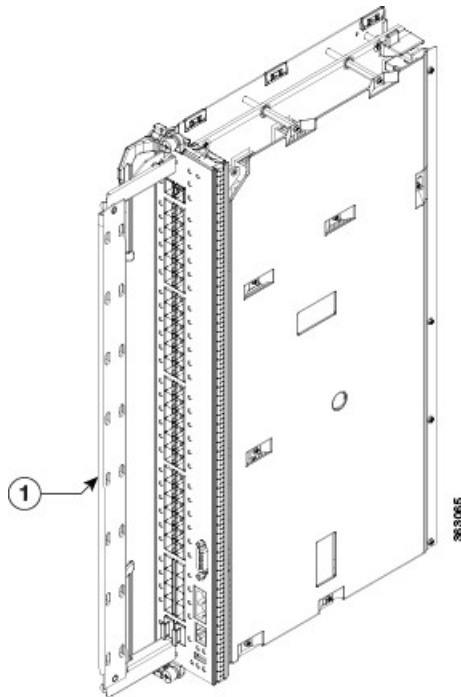
**Note** The SC card does not have a cable management bracket.

**Figure 40: S2 FC and S2 FC2 Vertical Cable Management Bracket**



1	Cable management bracket
---	--------------------------

**Figure 41: SC-SW Card Vertical Cable Management Bracket**



1	Cable management bracket
---	--------------------------

## Installing and Removing an Impedance Carrier



**Caution**

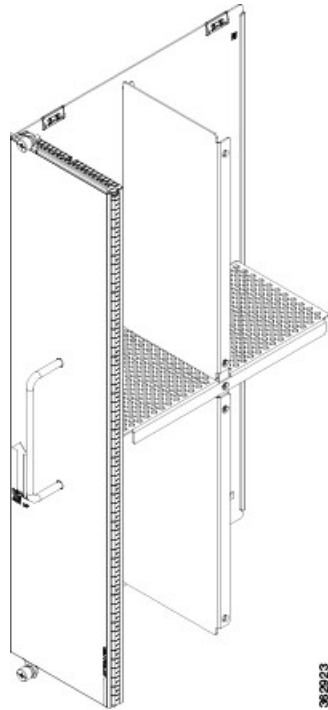
When an FCC slot is not occupied by a card, a blank, also known as an impedance carrier, must be installed in the empty slot to ensure proper cooling of the system. The FCC ships with impedance carriers preinstalled in any empty slots.



**Note**

The SC0 and SC1 slots on the front of the FCC do not have impedance carriers as these slots on the front of the FCC must be populated with either two SC or SC-SW cards at all times.

**Figure 42: S2 FC Impedance Carrier**



## Installing an S2 Fabric Card Impedance Carrier

This section describes how to install an S2 fabric card impedance carrier in the Cisco NCS 6000 FCC.

### 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
- Fabric card impedance carrier (Cisco PID NCS-F-FC-BLANK)

## Steps

To install an impedance carrier, follow these steps:

- 
- Step 1** 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 2** Slide the impedance carrier into the FCC until the captive screw plates are flush with the FCC.
- Step 3** Partially tighten the two captive screws on the front panel of the impedance carrier (either by hand or with the number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver) to make sure that they are both engaged.
- Step 4** 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 S2 Fabric Card Impedance Carrier

This section describes how to remove an S2 fabric card impedance carrier from the Cisco NCS 6000 FCC.

### 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 from the FCC, follow these steps:

- 
- Step 1** Identify the impedance carrier to be removed from the card cage.
- Step 2** 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 3** Grasp the impedance carrier handle with one hand and gently pull it halfway from the slot. Place one hand under the impedance carrier to guide it.
- Step 4** Hold the impedance carrier underneath and by the handle, pull it from the slot, and set it carefully aside.
-

## About the SC and SC-SW Cards

The Cisco NCS 6000 FCC offers two types of shelf controller cards: The SC-SW (shelf-controller switch card) and SC (shelf-controller-only) card. Because a maximum of two SC-SW cards are allowed in an entire multi-chassis system, two different options are provided,

The SC-SW card is a 56-port combination card that integrates a shelf controller and switch for the NCS 6000 Control Ethernet into one physical card. The shelf-controller (SC) portion controls the route processing and management functions for the FCC and its components. The switch (SW) portion interconnects all the route processors (RPs) and SCs in a multi-chassis system. The LEDs on the SC-SW indicate active alarm conditions (Figure 46: SC Card Front Panel and LEDs).

The FCC ships with two shelf controller cards, either two SC-SW cards or a combination of one SC-SW card and one SC card pre-installed in the FCC. The cards are inserted into two dedicated slots on the front of the FCC. One SC-SW or SC card installs into slot SC0 on the upper card cage and the other SC-SW or SC card installs into slot SC1 on the lower card cage. Both the upper and lower card slots are identical. The secondary card is installed for redundancy, so that the loss or removal of a single card does not bring down the FCC. At least one SC card or SC-SW card must be operational for the FCC to function.



### Note

Only two SC-SW cards are supported in an entire multi-chassis system. In a system with more than one FCC, we recommend that the SC-SW cards are not installed in the same FCC.

The following table lists the physical characteristics for the SC and SC-SW cards.

**Table 7: SC Card and SC-SW Card Physical Characteristics**

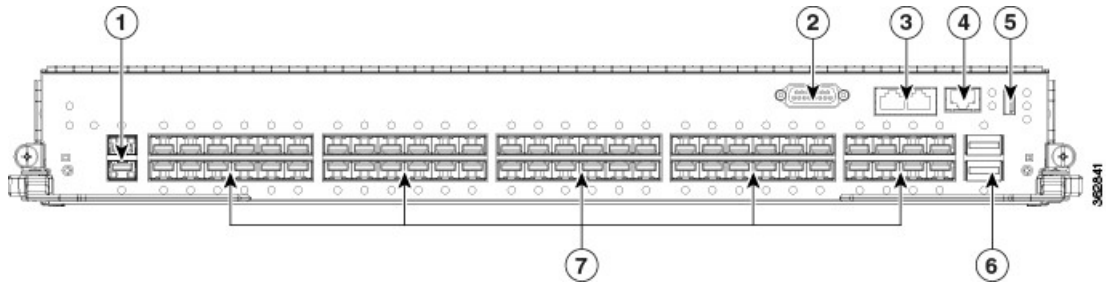
Card Type	Height	Depth	Width	Weight
SC	21 in. (53.3 cm)	13.0 in. (33.0 cm)	2.820 in. (7.16 cm)	10.1 lb. (4.58 kg)
SC-SW	21 in. (53.3 cm)	13.0 in. (33.0 cm) <sup>2</sup>	2.820 in. (7.16 cm)	12.9 lb. (5.85 kg)

<sup>2</sup> 14.8 in. (37.6 cm) with cable management bracket installed.

## Front Panel Ports

The section describes the front panel ports for the SC-SW and SC cards.

**Figure 43: SC-SW Front Panel Ports**



1	Two 10GE expansion ports (EXP 0 and EXP 1)	5	USB 2.0 port
2	DB15 connector alarm port	6	Two QSFP+ 40GE optical ports (HS0 and HS1)
3	Two EIA232 serial console ports: (CON 0 and CON1)	7	56 SFP+ 10GE optical ports, left to right(0 through 27 on bottom, 28 though 55 on top)
4	RJ-45 Ethernet management port		

The Shelf-Controller (SC) external ports include:

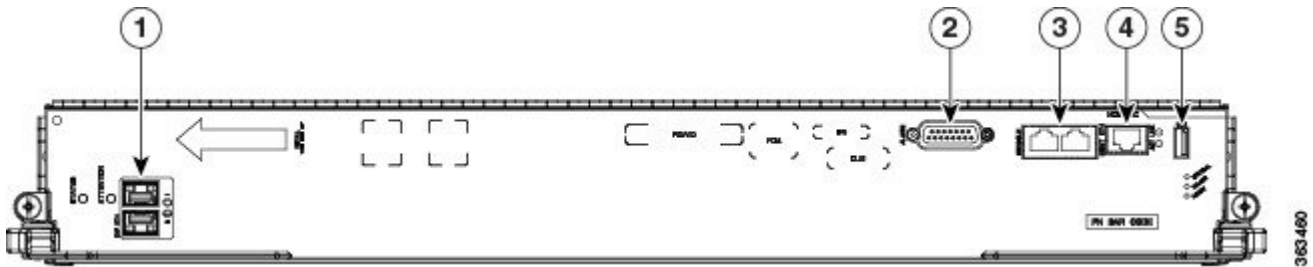
- 10GE expansion ports: used to expand the internal control Ethernet network to the LCC by connecting through the SW switch ports. The ports are identical in functionality. Each port is capable of 10GE operation via SFP+ modules. The SFP+ modules supported are: SFP+10GE-L and SFP+10GE-S.
- DB15 connector: Alarm port that uses a standard DB15 connector.
- EIA-232 serial console ports.
- RJ-45 Ethernet management port: RJ-45 copper 10/100/1000 Mbps full duplex port.
- USB 2.0 port (type A receptacle): used to attach storage device to the FCC. This USB port is used only for storage devices.
- QSFP+ 40GE optical ports: Quad Small-Form-factor Pluggable (QSFP) 40GE ports used for communication between the FCC and Route Processor (RP) cards on the LCC.
- SFP+ 10GE optical ports: controls plane connectivity between the FCC and the LCC.

The Switch (SW) external ports include:

- 56 SFP+ 10GE ports: controls the plane connectivity between the FCC and the LCC and two 40GE ports.

- 32 of the 10GE ports connect to up to 16 LCC (one 10GE port per RP). The 40GE connection interconnects two SC-SW cards.

Figure 44: SC Card Front Panel Ports



1	Two 10GE expansion ports (EXP 0 and EXP 1)	4	RJ-45 Ethernet management port
2	DB15 connector alarm port	5	USB 2.0 port
3	Two EIA232 serial console ports (CON 0 and CON1)		

See [Verifying the Installation of an SC or SC-SW Card](#), on page 74 for the description of the card LEDs and troubleshooting information.

## Installing an SC or SC-SW Card

Every Cisco NCS 6000 FCC chassis contains either one SW-SW card or one SC card preinstalled in dedicated slots on the front of the FCC. One SC-SW card installs into the upper card cage and the SC card installs into the lower card cage.

Follow the steps in this section if you are adding a secondary SC-SW or SC card to the FCC.



**Note**

The SC and SC-SW cards are hot-swappable, meaning that each card can be replaced without disrupting data flow in the router.



**Caution**

To prevent electromagnetic interference, the SC-SW card ships with two QSFP plugs installed on the two QSFP ports. A QSFP plug must be installed on any empty QSFP ports at all times.



**Warning**

**Class 1 Laser Product.** Statement 113



**Warning**

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

**Caution**

---

Always use an electrostatic (ESD) wrist strap when handling SC or SC-SW cards.

---

## 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
- SC card (Cisco PID NCS-F-SC) or SC-SW card (Cisco PID NCS-F-SCSW)

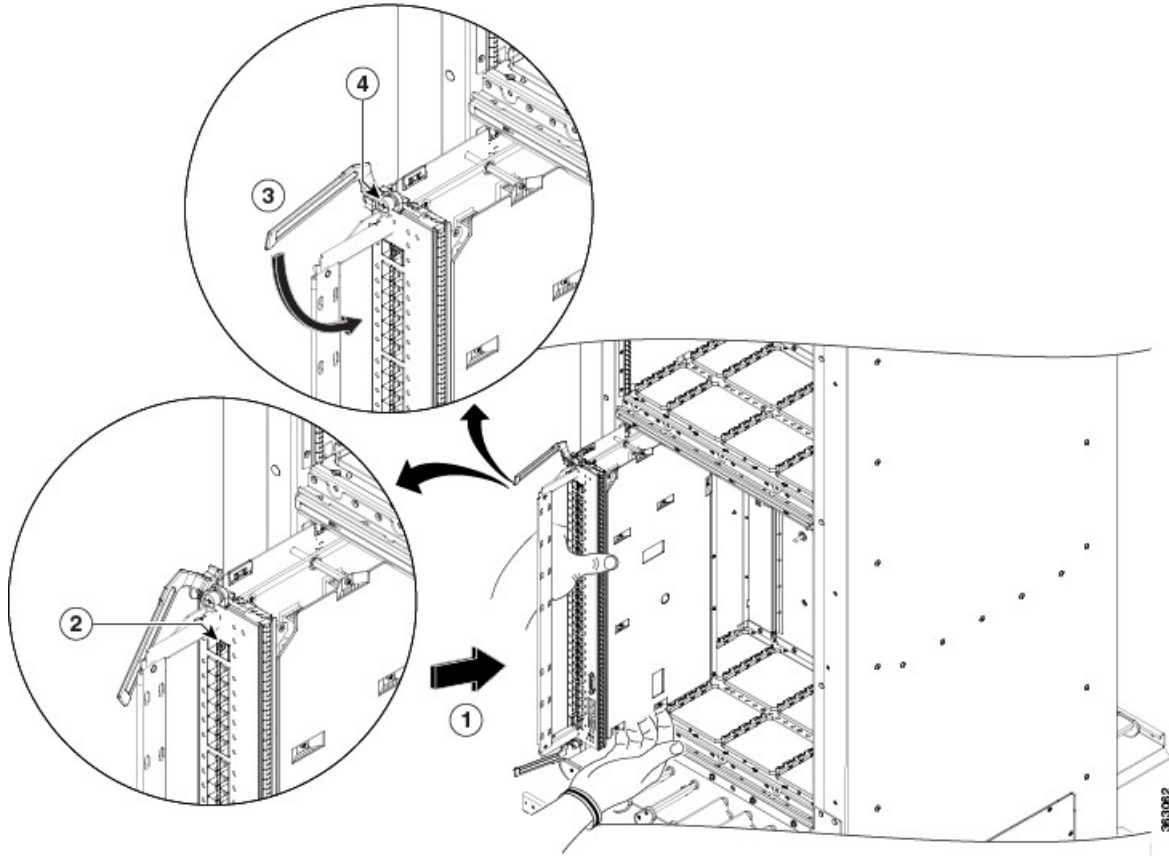
## Steps

To install an SC or SC-SW card, 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 FCC (see [Figure 4: ESD Jack, on page 12](#)). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- Step 2** Remove the card from its antistatic packaging.
- Step 3** Orient the card according to the up arrow on the faceplate.

**Note** If the card does not slide easily into the slot during installation, the orientation may be wrong or the slot is not for an SC or SC-SW card. Reorient the card, if necessary.

**Figure 45: Installing an SC-SW or SC Card—SC-SW Card Shown**



1	Direction of insertion	3	Ejector lever
2	OIR button	4	Captive screw

#### Step 4

Place one hand under the card to support and guide it into the correct slot. Slide the card halfway into the slot. Avoid touching the card circuitry or any connectors.

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

- Step 5** Press the OIR buttons on the top and bottom of the card faceplate to release the ejectors (SC-SW card only).
- Step 6** Carefully slide the card into the slot until the ejector levers meet the edges of the card cage, and then *stop* when the ejector lever hooks catch the card cage. If they do not catch, try reinserting the card until the ejector lever hooks are fully latched.
- Step 7** Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage slot.
- Caution** Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers might bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.
- Step 8** Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the tabs on each side of the card cage slot.
- Note** The SC-SW and SC cards both have guide pins that make initial contact with the backplane connector as you slide the card into its slot. After the guide pins make contact, continue pushing on the card carrier until the card ejector levers begin pivoting forward toward the handle in the card carrier.
- Step 9** To seat the card in the backplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.
- Step 10** Use the 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.
- 

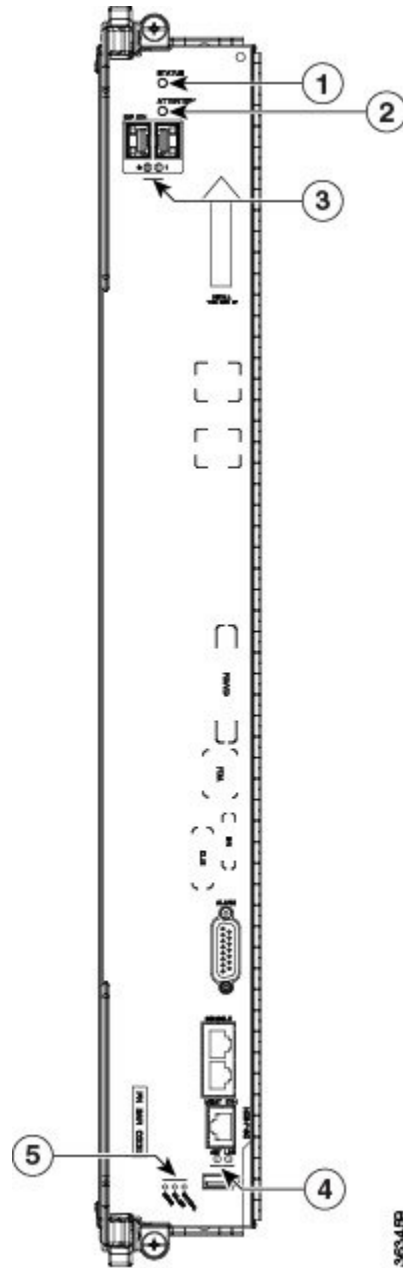
## Verifying the Installation of an SC or SC-SW Card

This section describes how to verify that an SC or SC-SW card is properly installed and is working correctly in the Cisco NCS 6000 FCC.



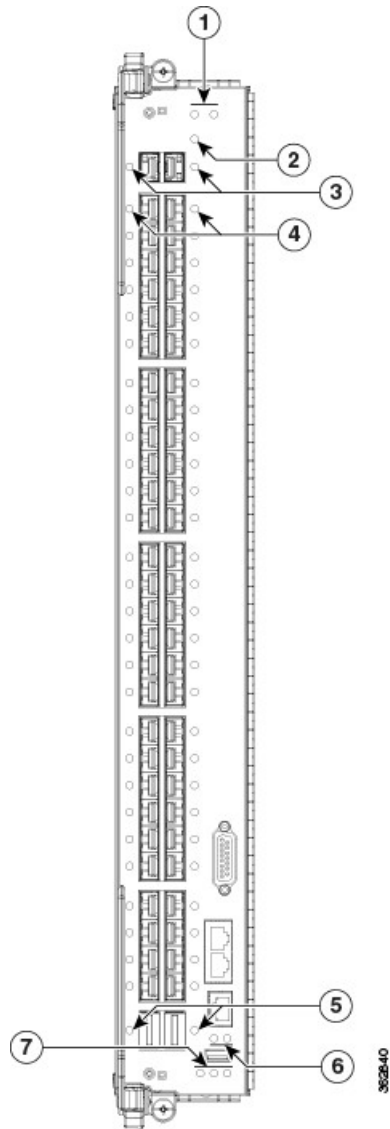
Use the Status LED, located on the faceplates of an SC or SC-SW card, to verify the correct installation of the card.

**Figure 46: SC Card Front Panel and LEDs**



1	Status LED	4	MGMT port LEDs (Link and Activity)
2	Attention LED	5	Three alarm LEDs (Critical, Major, Minor)
3	Two expansion port LEDs (EXP0 and EXP1)		

Figure 47: SC-SW Card LEDs



1	Status LED (left to right, SC status and SW status)	5	Two QSFP LEDs (Q1 port 56 and Q0 port 57)
2	Attention LED	6	MGMT port LEDs (Link and Activity)
3	Two expansion port LEDs (EXP0 and EXP1)	7	Three alarm LEDs (Critical, Major, Minor)
4	56 SFP LEDs (left side 0 to 27 on left, 28 to 55 on right)		

Table 8: SC and SC-SW LED Indicators

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.
	Blinking yellow (slow)	The card is not fully seated, or the slot has detected a parity error.
	Off	The card is not receiving power, or a power or hardware fault occurred. Verify that there is power to the card by looking at the indicators on the power tray.
Attention	Blue	On: The card needs attention. Off: The card does not require attention.

**Note**

Every QSFP LEDs, SFP LEDs, MGMT port LEDs, expansion port LEDs, and alarm LEDs are green when the port is working correctly. When the port is transmitting (Tx) and receiving (Rx) data, the LED flashes green.

**Note**

To confirm the location of the card that needs attention, the Attention LED can be lit by using the hw-module attention-led location command.

## Troubleshooting the SC or SC-SW Card

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

- Ensure that the card is seated firmly in the FCC slot. One easy way to verify physical installation is to see whether the front faceplate of the 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 FCC is receiving power.

## About the Fabric Cards

The Cisco NCS 6000 switch fabric is a 3-stage cell-based architecture with six fabric planes. The S2 Fabric Card (FC) and S2 FC2 cards implement the second stage of the switch fabric. The S13 Multi Chassis (MC) FC and Universal fabric Card (UFC) cards implement the first and third stages of the switch fabric and reside in the Cisco NCS 6008 Line Card Chassis (LCC). The FCs provide the switch fabric for the routing system and perform 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.

The connections between the LCC and the FCC are implemented through a number of bi-directional optical links. Pluggable CXP form-factor optics are used for these interconnects.

- In 1T multi-chassis (MC) mode, CXP optical modules are used on the S2 FC and S13 FC to connect the two cards together.
- In 2T MC mode, CXP2 optical modules are used on the S2 FC2 and UFC to connect the two cards together.

The CXP and CXP2 modules use a 24-fiber MPO connector that supports 12 bi-directional optical links up to 100 meters of OM-4 multi-mode fiber.

## S2 Fabric Card

Every Cisco NCS 6000 FCC can accommodate up to 12 S2 fabric cards. When multiple FCCs are installed in a multi-chassis system, the S2 FCs are distributed across the FCCs. Each S2 FC supports up to 32 CXP modules. Each S2 FC2 supports up to 32 CXP2 modules. The following table lists the physical characteristic for the S2 FC.

**Table 9: S2 Fabric Card Physical Characteristics**

S2 Fabric Card	Height	Depth	Width	Weight
S2 FC	21 in. (53.3 cm)	13.0 in. (33.0 cm) <sup>3</sup>	4.80 in. (12.2 cm)	19.8 lb (8.6 kg)
S2 FC2	21 in. (53.3 cm)	13.0 in. (33.0 cm) <sup>4</sup>	4.80 in. (12.2 cm)	23.8 lb (10.8 kg)

<sup>3</sup> 15.8 in. (40.1 cm) with cable management bracket installed.

<sup>4</sup> 15.8 in. (40.1 cm) with cable management bracket installed.

## S13 and Universal Fabric Card

The S13 multi-chassis fabric cards and universal fabric cards (UFC) are installed in Cisco NCS 6008 LCC to communicate with the FCC. Six S13 FCs or UFCs must be installed in the LCC for multi-chassis configuration. The following table lists the physical characteristics for the S13 FC and UFC.

**Table 10: S13 Fabric Card Physical Characteristics**

S13 Fabric Card	Height	Depth	Width	Weight
S13 FC	22 in. (55.8 cm)	15.0 in. (38.1 cm) <sup>5</sup>	2.125 in. (5.40 cm)	15.2 lb (6.9 kg)
UFC	22 in. (55.8 cm)	15.0 in. (38.1 cm) <sup>6</sup>	2.125 in. (5.40 cm)	14.5 lb (6.58 kg)

<sup>5</sup> 17.7 in. (45.0 cm) with cable management bracket installed

<sup>6</sup> 17.7 in. (45.0 cm) with cable management bracket installed

# Installing the Fabric Cards

## Installing an S2 Fabric Card



**Note** Unless otherwise noted, the information in this section applies to the NCS-F-FC and NCS-F-FC2 fabric cards.

This section describes how to install an S2 fabric card in the Cisco NCS 6000 FCC.

### Prerequisites

- Use the **show running-config controller fabric plane** command to display the configured fabric planes and the associated S2 fabric cards for each fabric plane. Then shut down the fabric plane to avoid traffic loss. The following example shows how to shut down plane X (where X is in the range of 0 to 5).

```
config
controller fabric plane X
shutdown
commit
```

- 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
- S2 Fabric Card (Cisco PID NCS-F-FC or NCS-F-FC2)

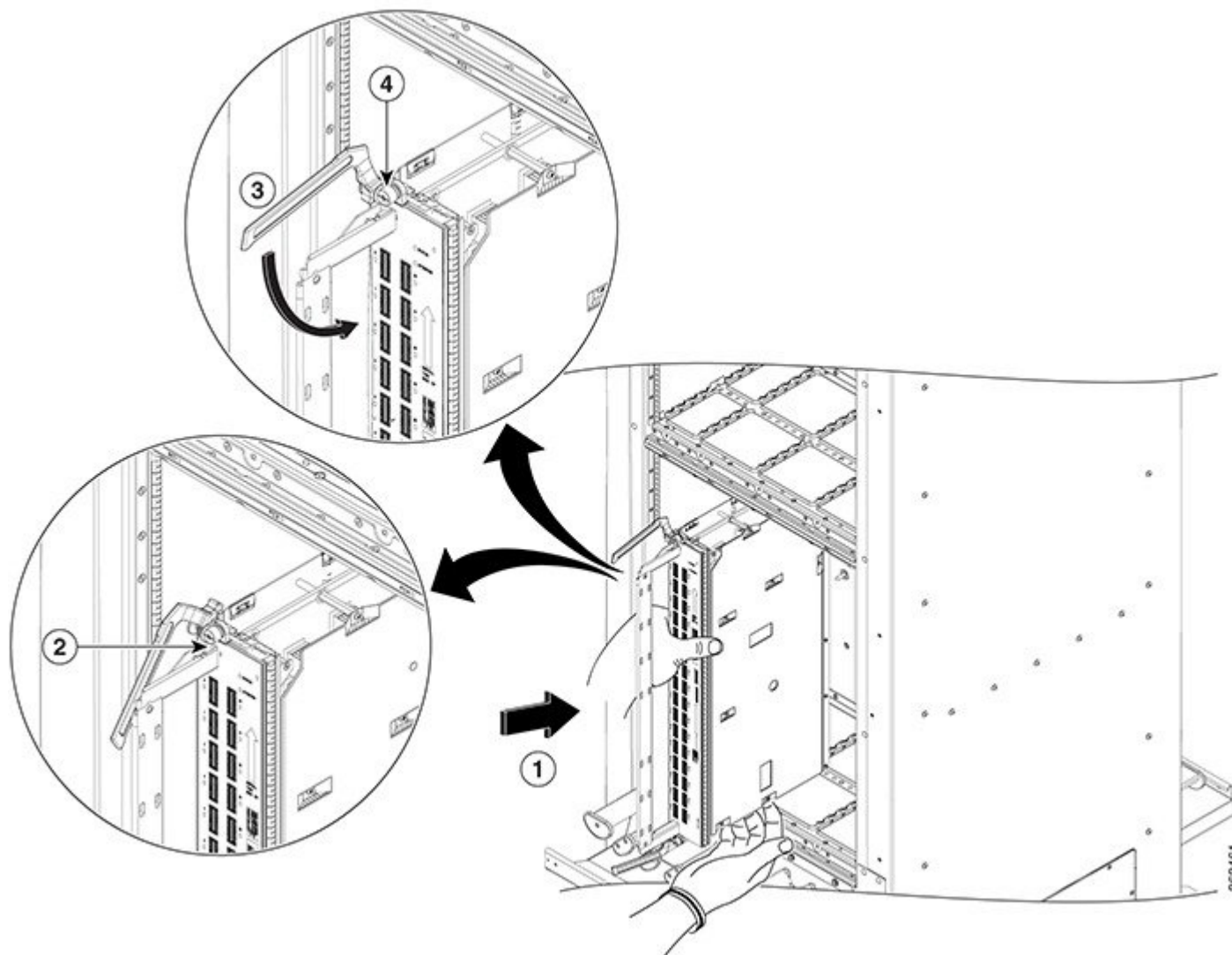
## Steps

To install an S2 FC, 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 FCC (see [Preventing Electrostatic Discharge](#), on page 11). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.

**Figure 48: Installing an S2 Fabric Card**



1	Direction of insertion	3	Ejector lever
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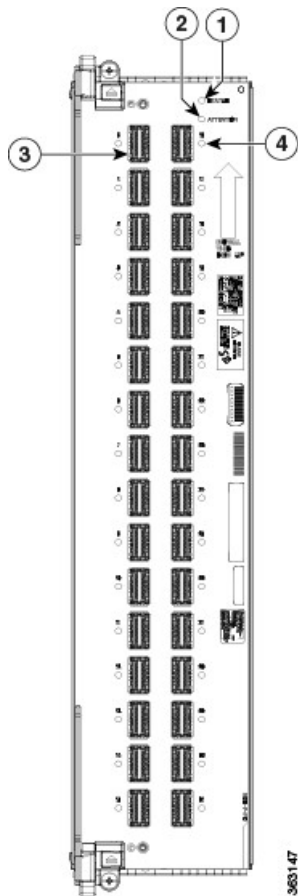
2	OIR button	4	Captive screw
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- Step 2** Remove the S2 FC from its antistatic packaging.
- Step 3** Determine the FC slot where the card will be installed. For a description of the slot locations, see [Figure 3: Cisco NCS 6000 FCC Slot Numbers](#).
- Step 4** Orient the FC according to the up arrow on the faceplate.  
**Note** If the card does not slide easily into the slot during installation, the orientation may be wrong or the slot is not for an S2 FC.
- Step 5** Place one hand under the card to support and position the card for insertion into the card cage slot. Avoid touching the card circuitry or any connectors.  
**Note** Alignment grooves exist on each slot in the card cage. When you install a card in the card cage, make sure that you align both edges of the card carrier in the slot grooves.
- Step 6** Press the OIR buttons on the top and bottom of the card faceplate to release the ejectors.
- Step 7** Carefully slide the card into the slot until the ejector levers meet the edges of the card cage, and then *stop* when the ejector lever hooks catch the card cage. If they do not catch, try reinserting the card until the ejector lever hooks are fully latched.
- Step 8** Pivot both card ejector levers so that the openings on the card ejector cams at the top and bottom of the card pass over the tabs on each side of the card cage.  
**Caution** Verify that the openings on the card ejector cams pass over the tabs; otherwise, one or both ejector levers might bind when you attempt to close the ejector levers, thereby damaging or breaking one or both ejector levers.
- Step 9** Continue sliding the card into the card cage slot until the openings on the card ejector cams engage the cams on each side of the card cage slot.  
**Note** FCs have guide pins that make initial contact with the midplane connector as you slide a card into its slot. After the guide pins make contact, continue pushing the card carrier until the card ejector levers begin pivoting forward, toward the handle in the card carrier.
- Step 10** To seat the card in the midplane connector, grasp both card ejector levers and pivot them inward toward the handle in the card carrier until they are flush against the front edge of the card carrier.  
**Note** **New Installation Only:** Do not tighten any fabric cards until all cards have been inserted and seated. For maintenance or replacement of a failed FC, loosen the captive screws of the FCs on both sides of the failed FC as well as the FC to be replaced. Only remove the FC card being replaced.
- Step 11** 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.
-

## Verifying the Installation of an S2 Fabric Card

This section describes how to verify that an S2 FC or S2 FC2 card is properly installed and is working correctly in the Cisco NCS 6000 FCC. Use the Status LED, located on the faceplate of the card to verify the correct installation of the card. The following figure shows the front panel of the card.

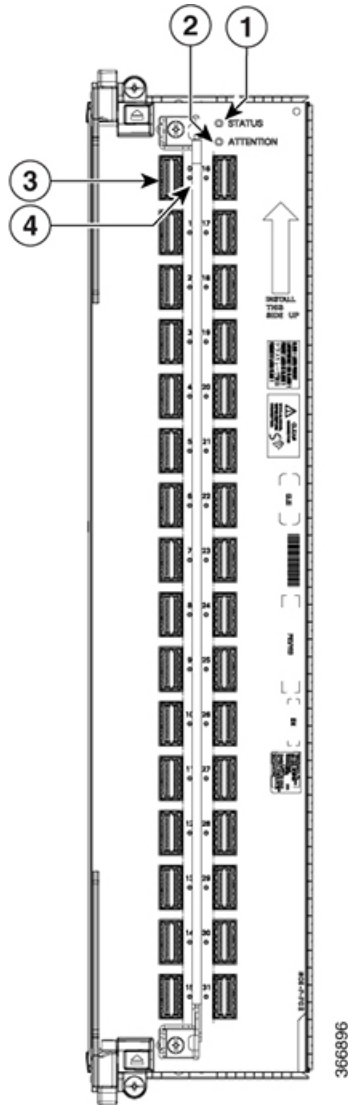
**Figure 49: S2 FC Front Panel**



1	Status LED	3	32 CXP ports (left side 0 through 15, right side 16 through 31)
2	Attention LED	4	32 CXP port LEDs (one per port)



Figure 50: S2 FC2 Front Panel



1	Status LED	3	32 CXP2 ports (left side 0 through 15, right side 16 through 31)
2	Attention LED	4	32 CXP2 port LEDs (one per port)

## S2 Fabric Card LEDs

The following table describes the LED indicators for the S2 FC and SC FC2.

- The 32 CXP LEDs indicate the status of the CXP links. Each LED is a bi-color red and green LED. Note that each S2 FC slot must be configured as a fabric instance for the CXP LED to light up. For example:

```
controller fabric plane 0
  instance 0
location F0/FC0
```

**Table 11: S2 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.
ATTN	Blue	On: The card needs attention. Off: The card does not require attention.
CXP (0-31)	Green	The port is correctly connected to the S13 FC or UFC on the LCC.
	Red	One or more links are down. For troubleshooting information, see the <a href="#">System Administration Command Reference for the Cisco NCS 6000 Series Routers</a> .
	Off	The CXP/CXP2 module is not present or is not fully inserted in the card.



**Note**

To verify which card needs attention, the Attention LED can be lit using the **hw-module attention-led location** command.

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

- Ensure that the card is seated firmly in the FCC slot. One easy way to verify physical installation is to see whether the front faceplate of the 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 FCC is receiving power.

## Installing an S13 MC Fabric Card or Universal Fabric Card

For information on installing the S13 Fabric Card (NC6-FC-MC) or Universal Fabric Card (NC6-FC2-U) in a Cisco NCS 6000 LCC, see [Installing a Fabric Card](#) in the [Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide](#).





## Removing and Replacing Chassis Components

This chapter provides instructions on how to remove and replace components in the Cisco NCS 6000 Fabric Card Chassis (FCC).

- [Removing the Exterior Cosmetics](#) , page 87
- [Removing the Power Components](#), page 96
- [Replacing the Fan Trays and Air Filter](#), page 110
- [Removing the Shelf Controller Cards and Fabric Cards](#), page 115

### Removing the Exterior Cosmetics

This section describes how to remove the front side and rear side exterior cosmetics on the FCC. We recommend that you remove the cosmetics in the order outlined in this section.



**Note**

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

### Prerequisites

Ensure that you have all the original packaging material that shipped with the FCC, or any other packaging suitable for packing the cosmetics.

### Required Tools and Equipment

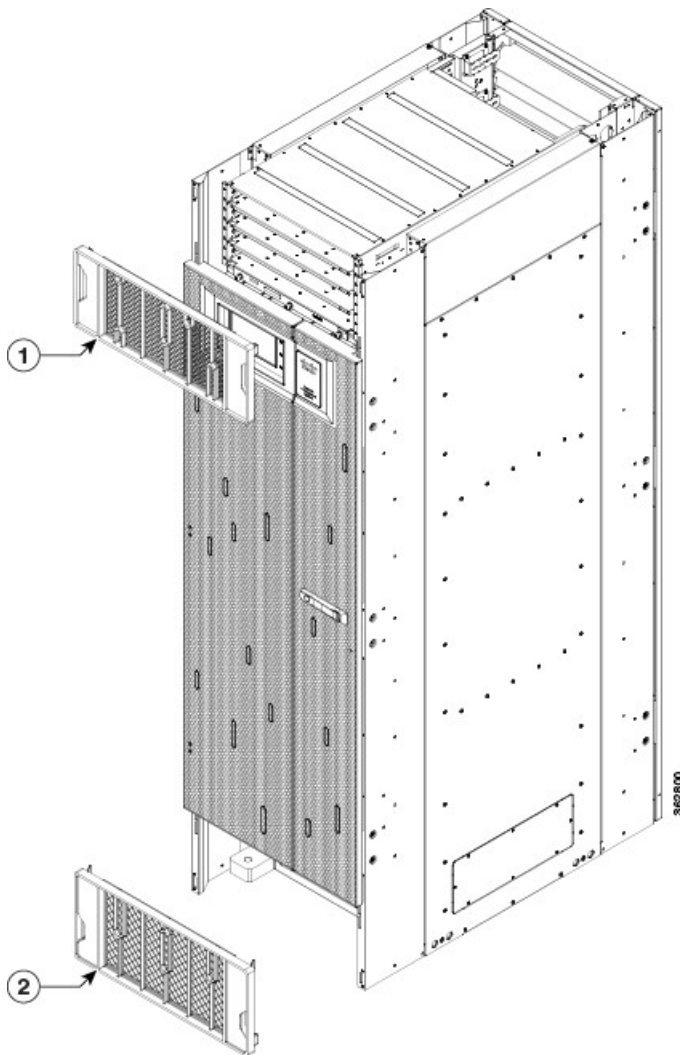
- 8-inch, Number-1 Phillips screwdriver (magnetic head preferable)

## Removing the Front Exterior Cosmetics

To remove the front exterior cosmetics, follow these steps:

**Step 1** Remove the top and bottom front grilles by unsnapping them from the snap joiners located behind each grille.

**Figure 51: Removing the Front Grilles**

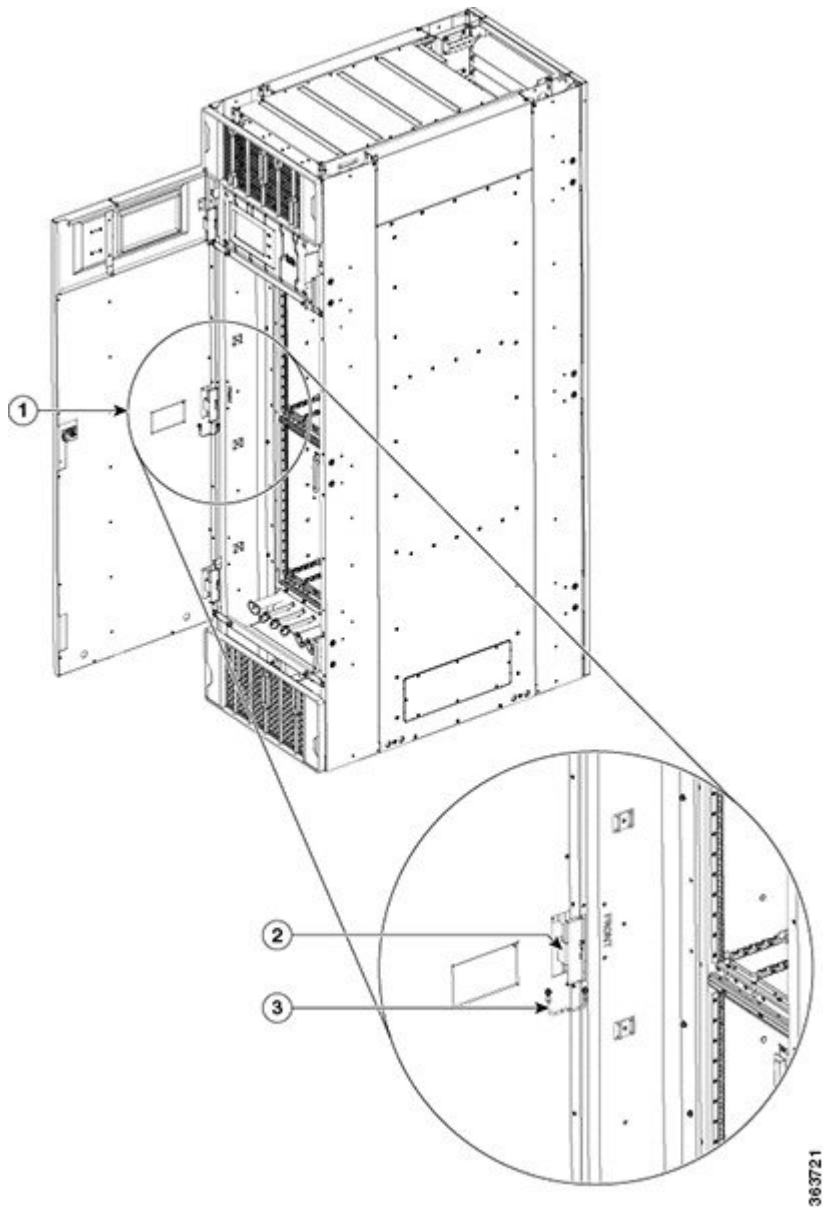


1	Front top grille	2	Front bottom grille
---	------------------	---	---------------------

**Step 2** Remove the front door.

- a) Remove the grounding cable by loosening and removing the two pan-head screws.
- b) Lift the door up and off the hinge attachment pins and pull it away from the FCC.

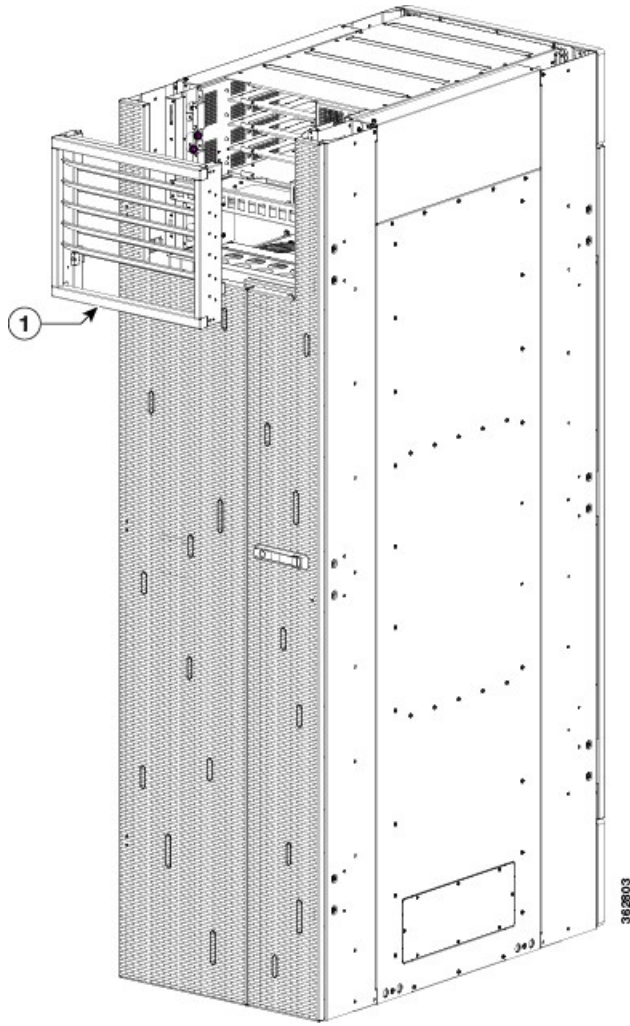
**Figure 52: Removing the Door Grounding Cable—Front Door Shown**



1	Front door	3	Grounding cable
2	Door hinges		

- Step 3** Remove the side filler panels.
- a) Open the door.
  - b) Remove the exhaust air deflector.

**Figure 53: Removing the Exhaust Air Deflector—Rear of the FCC**

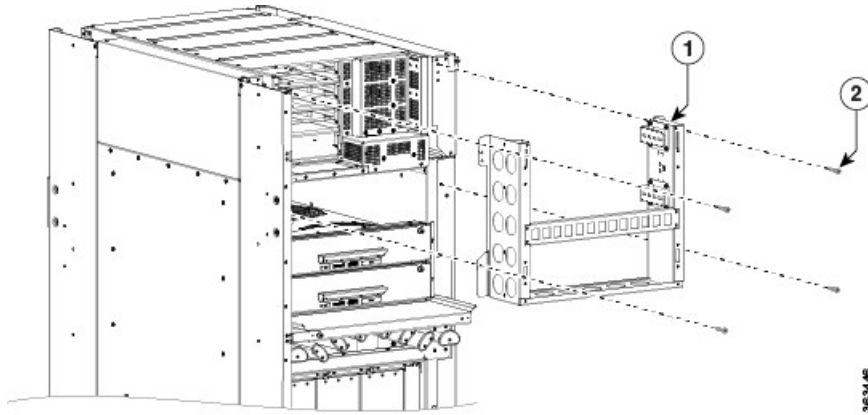


1	Exhaust air deflector
---	-----------------------



- c) Remove the exhaust plenum bracket by loosening and removing the six pan-head screws (three per side) on each side of the plenum bracket. For DC installations, make sure that you disconnect the DC cables from the bracket first.

**Figure 54: Removing the Exhaust Plenum Bracket—Rear of the FCC**

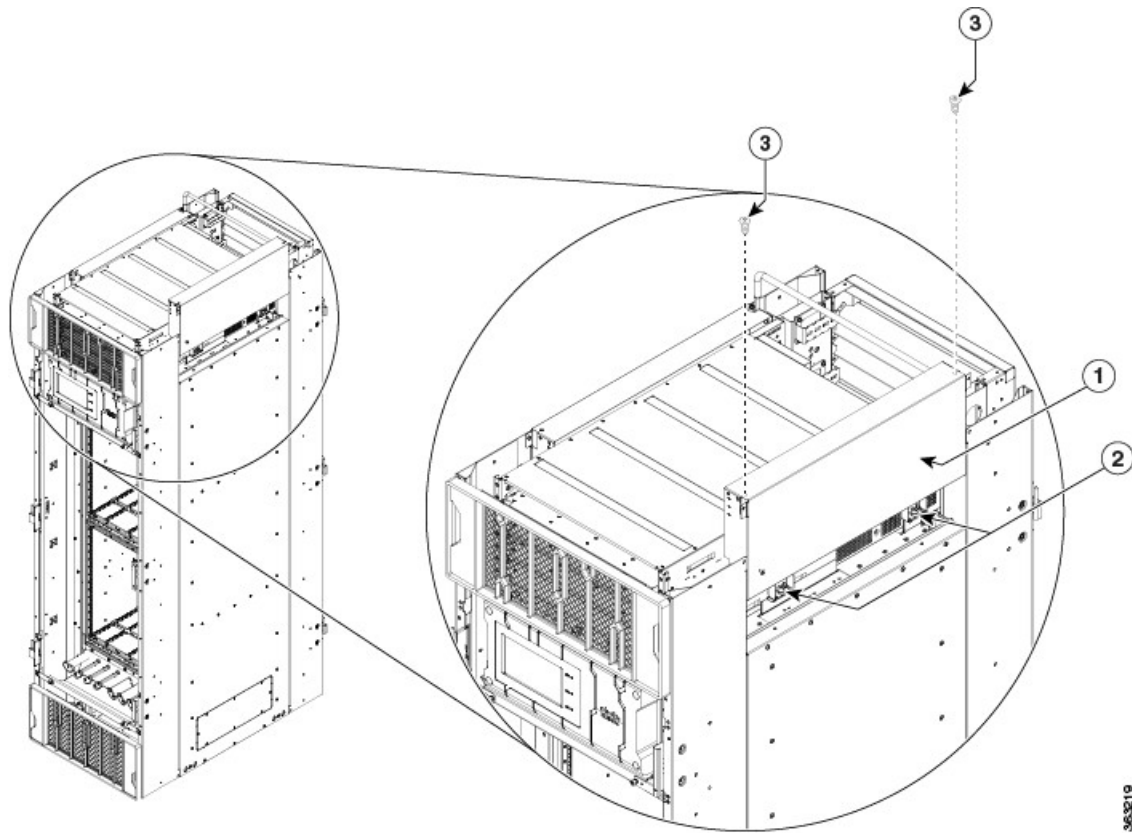


1	Exhaust plenum bracket	2	Six pan-head screws (three per side)
---	------------------------	---	--------------------------------------

- d) Loosen and remove the two 8-32 screws on each filler panel.

- e) Remove the filler panels from the FCC.

**Figure 55: Removing the Filler Panels**



1	Filler panel (one each side)	3	Two 8-32 screws
2	Guide pins		

**Step 4** Remove the two upper and lower horizontal cable management brackets by loosening and removing the eight pan-head screws (four per bracket).

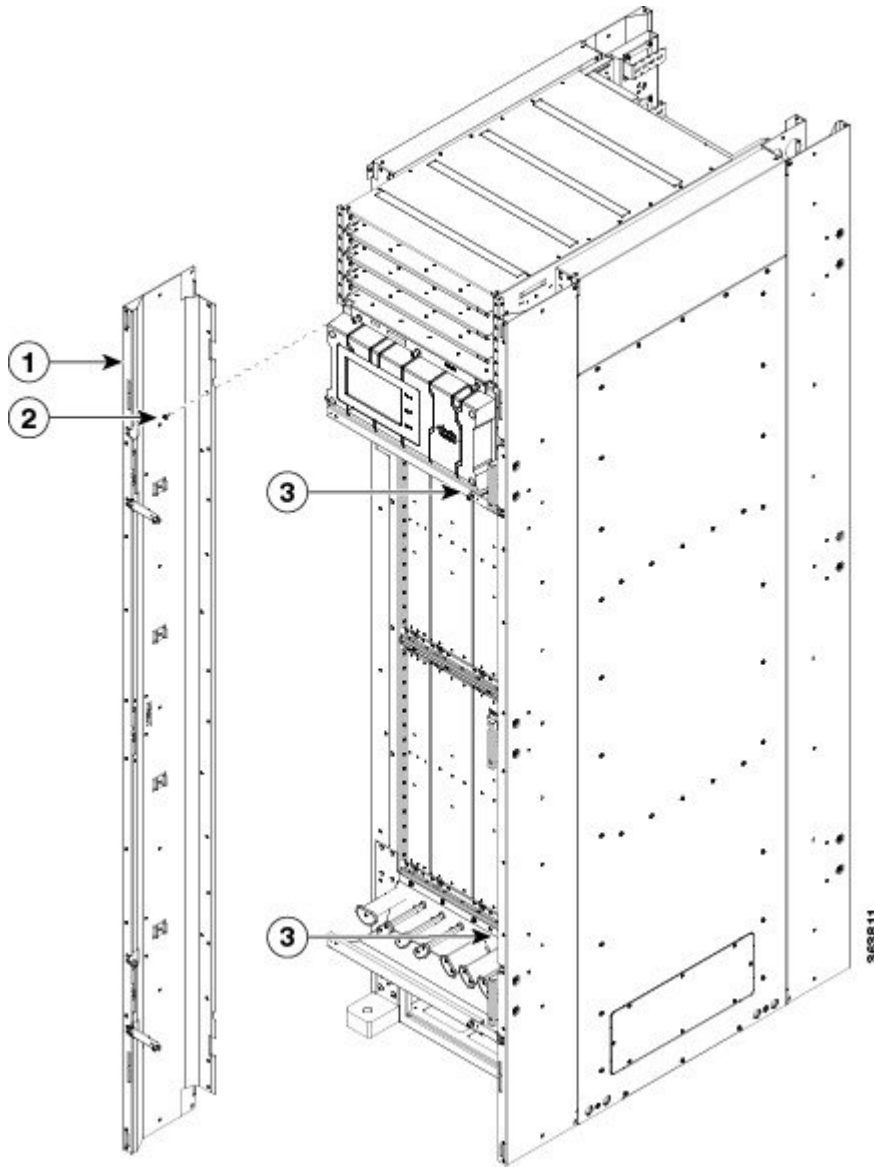
**Step 5** Remove the left and right vertical cable troughs from the front of the FCC.  
**Note** We recommend that you use two people to remove the vertical cable troughs, one person to hold the vertical cable troughs while the other person removes the pan-head screws.  
 For each vertical trough:

- a) Loosen the captive screw on the two trough retention brackets and swing the brackets away.

b) Loosen and remove the eight pan-head screws from the trough.

**Step 6** Pull the trough away and carefully remove it from the FCC.

**Figure 56: Removing the Front Vertical Cable Troughs**



1	Vertical cable troughs (one per side)	3	Two cable management baskets
2	Pan-head screws (eight per trough)		

- Step 7** If needed, remove the craft panel located on the front of the FCC (see the above figure). In most cases, it is not necessary to remove the craft panel although the assembly is a field-replaceable unit (PID NCS-CRFT=).
- a) Loosen the four captive screws on the craft display panel.
  - b) Pull the craft display panel away from the FCC to remove it.
  - c) Loosen the four captive screws on the sheet metal craft panel.
  - d) Pull the craft panel away from the FCC to remove it.
- 

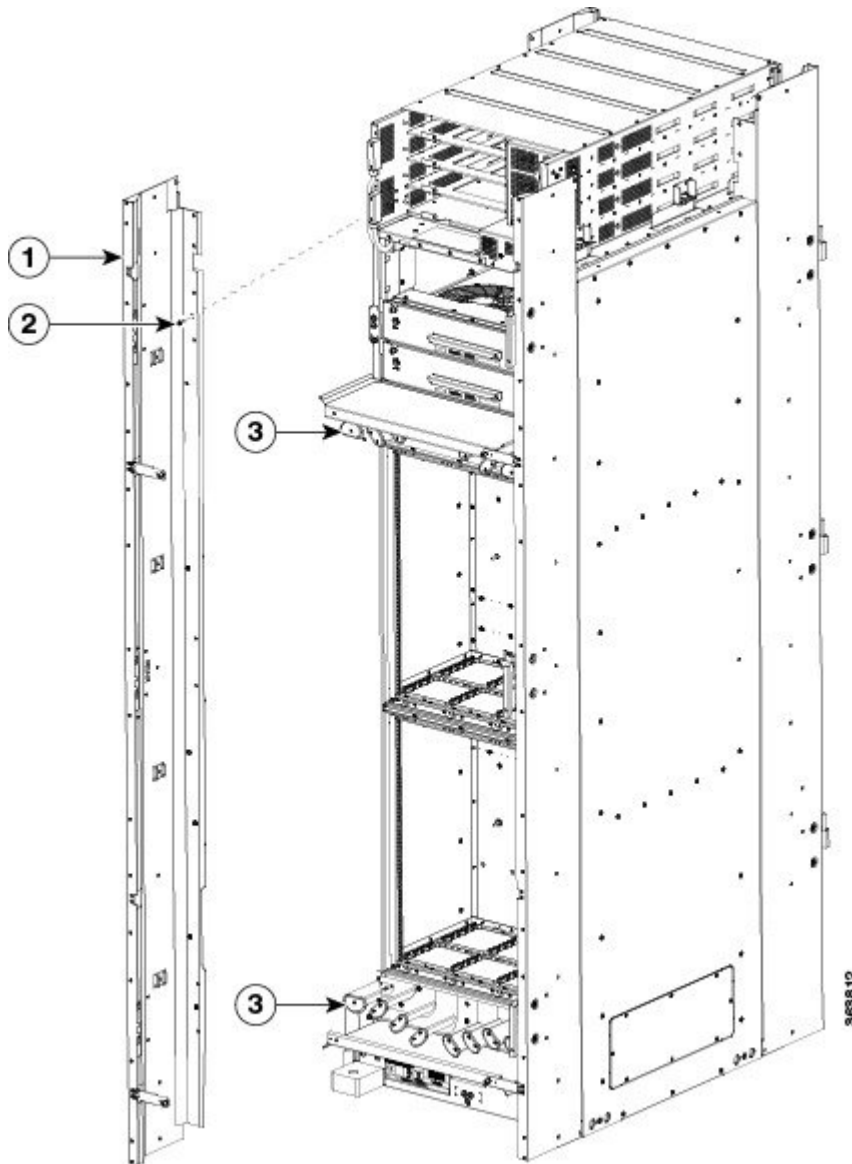
## Removing the Rear Exterior Cosmetics

To remove the rear exterior cosmetics, follow these steps:

- 
- Step 1** Remove the rear door.
- a) Open the door and remove the grounding cable by loosening and removing the pan-head screws ([Figure 52: Removing the Door Grounding Cable—Front Door Shown](#)).

- b) Lift the door up and off the hinge attachment pins and pull it away from the FCC.

**Figure 57: Removing the Rear Vertical Cable Troughs**



1	Vertical cable troughs (one per side)	3	Two cable management brackets
2	Pan-head screws (eight per trough)		

- Step 2** If applicable, remove the exhaust plenum bracket by removing the eight pan-head screws, four on each side (Figure 54: [Removing the Exhaust Plenum Bracket—Rear of the FCC](#)).
- Step 3** Remove the two upper and lower horizontal cable management brackets by loosening and removing the eight pan-head screws (four per bracket).
- Step 4** Remove the left and right vertical cable troughs from the rear of the FCC.  
**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.  
 For each vertical trough:
- Loosen the captive screw on the trough retention brackets (two each side) and swing the brackets away from the FCC.
  - Loosen and remove the eight pan-head screws from the trough.
- Step 5** Pull the trough away and carefully remove it from the FCC.
- 

## Removing the Power Components

This section describes how to remove and replace the power components and power enclosure from the Cisco NCS 6000 Fabric Card Chassis (FCC).



### Note

While it is possible to remove power components from the FCC separately, some parts (such as the power trays) 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 Cisco NCS 6000 FCC. Power off the AC PMs in the tray that you want to disconnect.



### Note

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

### Required Tools and Equipment

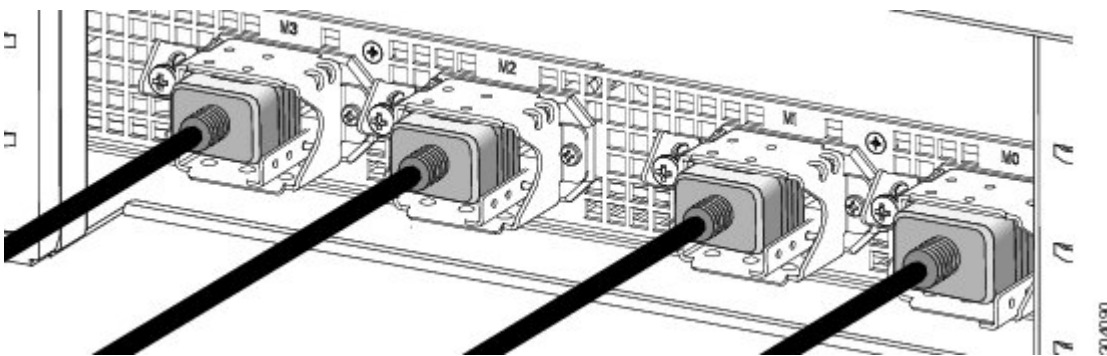
- ESD-preventive wrist strap
- 6-inch, Number-1 Phillips screwdriver

## Steps

To remove the AC input power cords, go to the rear of the FCC and 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 (see [Preventing Electrostatic Discharge](#), on page 11) on the rear of the FCC. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- 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.
- Step 4** Remove the cords from the cord clamps.

**Figure 58: AC Input Power Cords Connected to the Power Tray**



## Removing DC Input Power Cables

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

### Prerequisites

Power off the PCM output switch for the DC PMs in the tray that you want to disconnect ([Figure 39: PCM I/O Power ON/OFF Switches](#)). Ensure that you have redundant power to avoid the router from being shut down in error.



#### 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

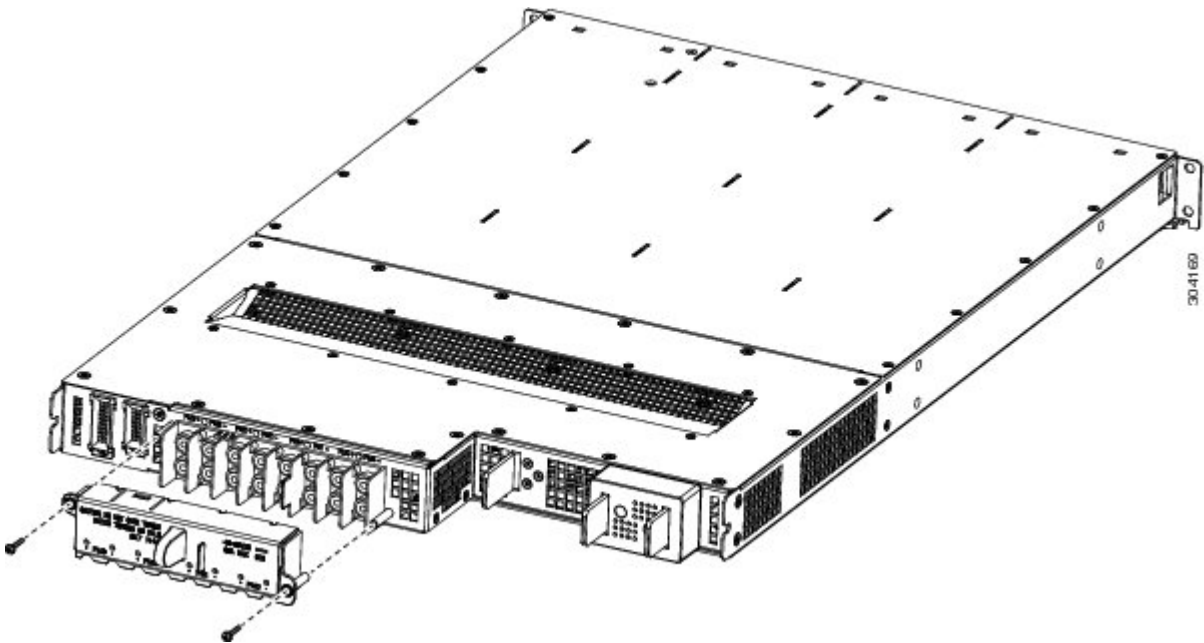
- 3/8-inch ratchet wrench with 7/16-pt. socket
- Voltmeter

## Steps

To disconnect the DC input power cables, 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 (see [Preventing Electrostatic Discharge](#), on page 11) on the rear of the FCC. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- Step 2** Open the input circuit breakers/fuses for the DC cables to be removed and 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 bolts that secure the terminal block cover into the mounting standoff.

*Figure 59: DC Terminal Block Cover Installed on Rear of the Power Tray*



- 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 you wrap the cable lug with standard black electrical tape.
- Step 7** Replace the terminal block cover.
-



## Replacing an AC or DC Power Tray

This section describes how to replace an AC or DC power tray in the FCC power enclosure. Although there are differences between AC and DC power trays, they are reinstalled by using the same procedures described below. Once they are installed into an FCC that is properly grounded, external grounding to the power tray is not needed.

**Note**

---

As a requirement to receive Cisco support, all four power trays must be installed in the FCC.

---

**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 FCC, you should be especially careful while removing and carrying the power tray. To prevent injury, avoid sudden twists or lateral moves.

---

### Prerequisites

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

- Remove the exhaust air deflector from the rear of the Cisco NCS 6000 FCC.
- Power off the power shelf that houses the power tray you are about to install by using the I/O power switch on the respective PCM.
- Power off the AC PMs in the tray that you want to disconnect.
- Remove the AC or DC input cables from the rear of the power enclosure.
- Remove the top grilles from both the front and rear sides of the FCC, if installed.
- Ensure the power tray you are about to remove is empty. Do not install a power tray into the FCC with PMs already installed in the power tray.

**Caution**

---

The I/O switch on each power shelf only disables the output of the PMs in that shelf. Make sure that the other power trays provide redundant power. 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
- 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=)

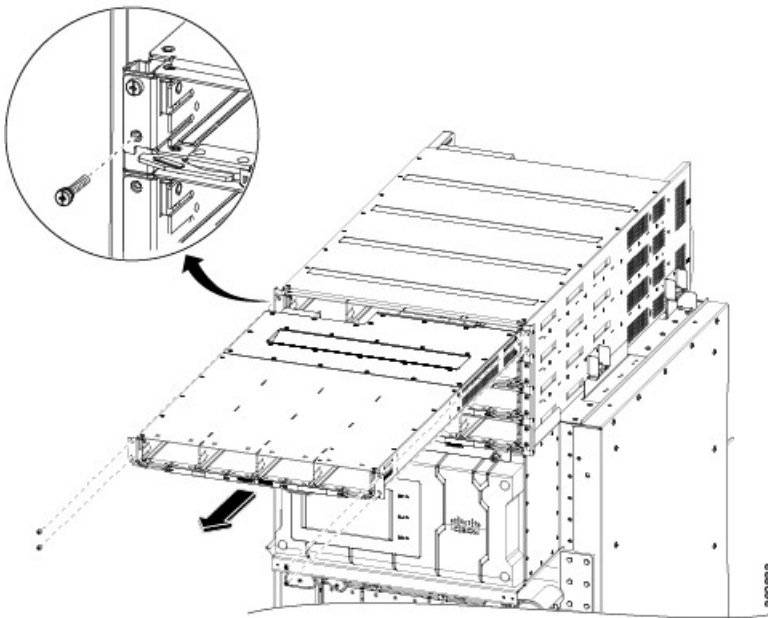
## Steps

To replace an AC or DC power tray, follow these steps:

**Step 1** Remove the power tray that you are replacing.

- Remove the power modules from the power tray (Figure 62: Removing a PM from a Power Tray).
- Loosen and remove the four M4 x 10 mm screws that attach the power tray to the power enclosure (Figure 60: Removing a Power Tray from the Power Enclosure).

**Figure 60: Removing a Power Tray from the Power Enclosure**



- Pull both the left and right ejector handles out at the same time to eject the power tray from the FCC. Slide the power tray all the way out of the power enclosure.

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

**Step 2** Install the replacement power tray.

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

**Caution** Use care not to bend the handles.

- Use the screwdriver to tighten the four M4 x 10 mm screws that attach the power tray to the FCC.
- 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 power enclosure are relied upon for power tray bonding and grounding.

---

## 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

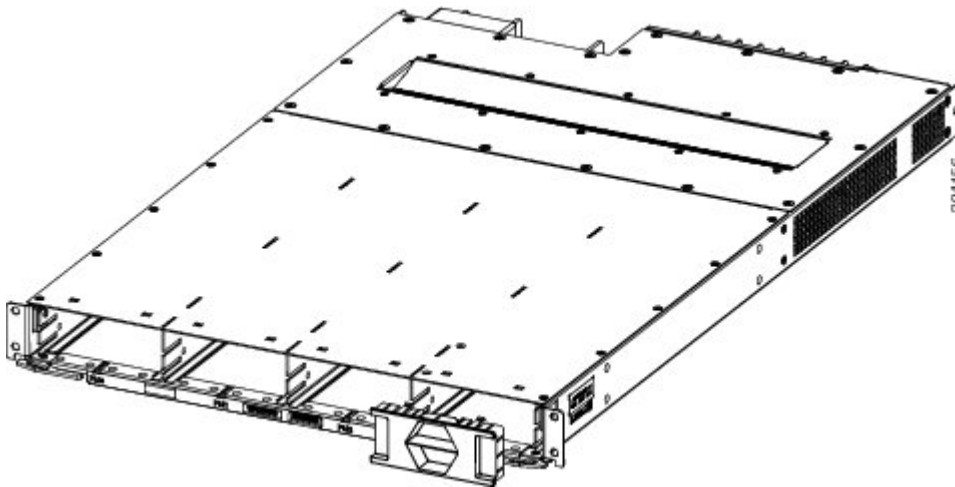
Before performing this task, you must first remove the top grille on the front side of the FCC, if installed. See the [Removing the Front Exterior Cosmetics](#), on page 88.

### Steps

To remove a PM slot cover from the front of a power tray, follow these 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 61: PM Slot Cover on the Front of a Power Tray—DC Power Tray Shown**



## 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 FCC, if installed. See the [Installing the Front Exterior Cosmetics](#), on page 22.



---

**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

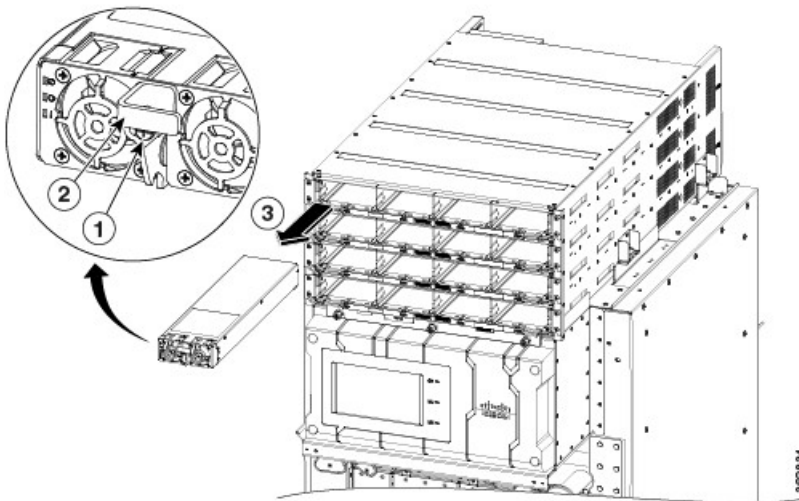
- ESD-preventive wrist strap
- 6-inch, Number-1 Phillips screwdriver

## Steps

To remove a power module from the front of a power tray, follow these steps:

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the front side of the FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- Step 2** Using the screwdriver, unscrew the ejector lever screw.

**Figure 62: Removing a PM from a Power Tray**



1	Ejector lever screw	3	Power module (PM)
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 the FCC Ground Cable

This section describes how to remove the FCC ground cable on the Cisco NCS 6000 FCC.

## Prerequisites

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

**Caution**

---

Do not remove the FCC ground cable unless the FCC is powered off and to be replaced.

---

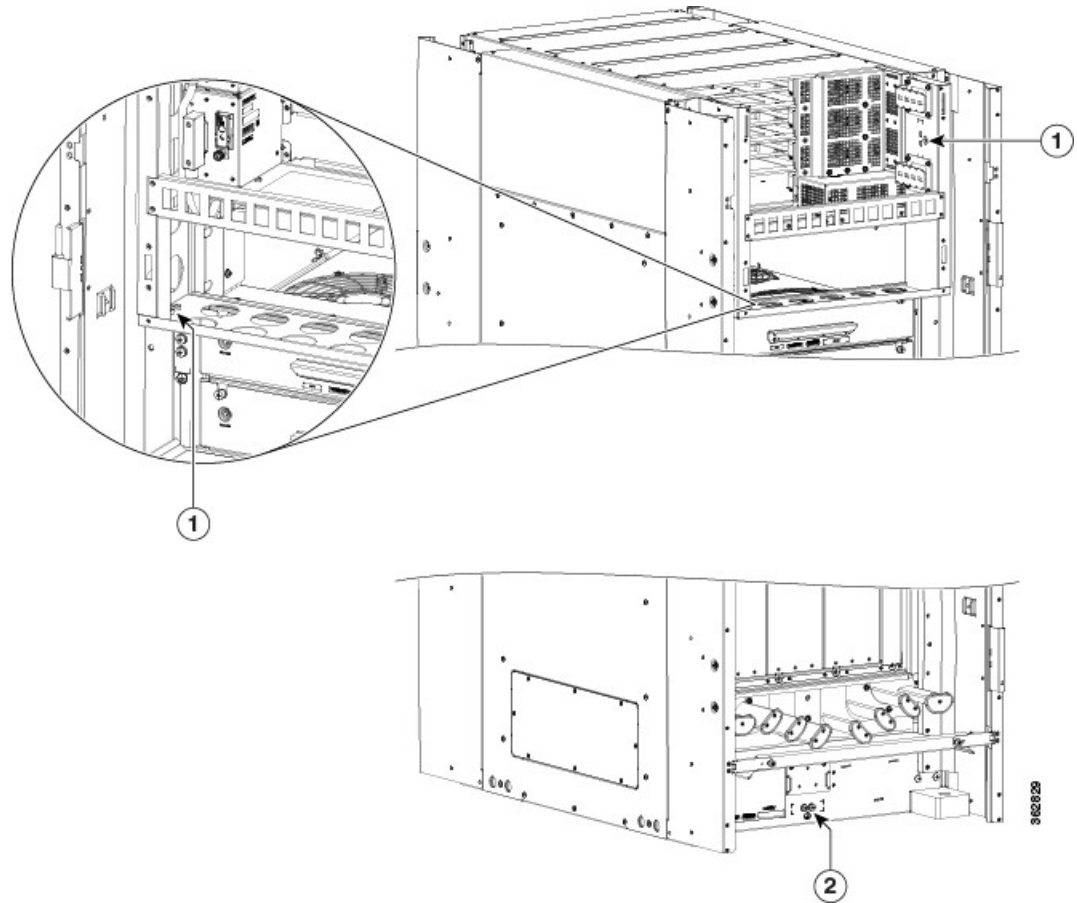
## Required Tools and Equipment

- 3/8-inch drive socket wrench
- 10-mm 6-pt. socket

### Steps

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

**Figure 63: NEBS Bonding and Grounding Points—Rear Side of the FCC**



1	NEBS bonding and grounding points (upper)	2	NEBS bonding and grounding point (lower)
---	---	---	--

## Replacing a Power Control Module

This section describes how to remove and reinstall a PCM from the Cisco NCS 6000 FCC. The FCC ships with two power control modules (PCMs) attached to the power enclosure. The PCMs are located behind the two set of power trays (FT0 and FT1) on the rear of the FCC (Figure 64: Removing a PCM).

**Note**

The PCM is a field-replaceable unit. If needed, you can order a replacement module from Cisco at the following URL (Cisco login required): <https://cisco-apps.cisco.com/cisco/psn/commerce>

## Required Tools and Equipment

- ESD-preventive wrist strap
- Number-1 Phillips magnetic screwdriver
- Replacement PCM (Cisco PID NC6-PCM=)

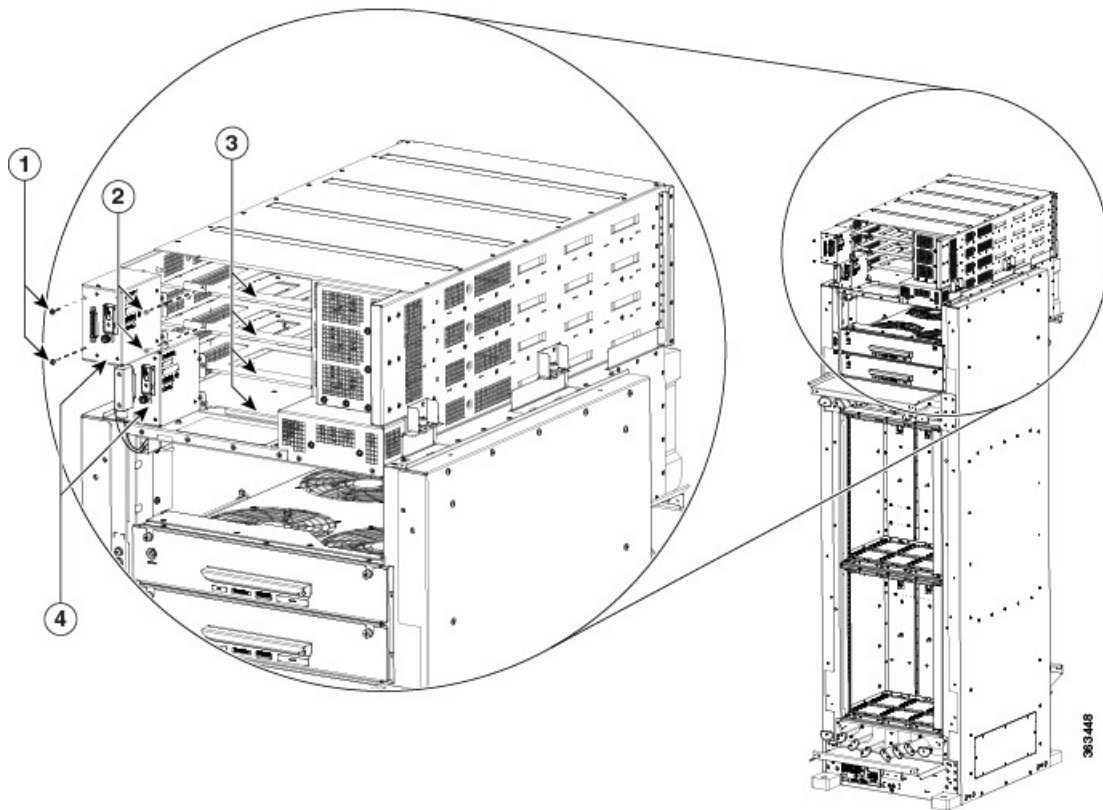
## Steps

- 
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the front side of the FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the wrist strap to any bare metal surface on the FCC.
- Step 2** Power off each set of power trays 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 power tray 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 ([Figure 64: Removing a 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 64: Removing a PCM**



1	Two 6-32 pan-head screws	3	Four power trays (2 trays for each PCM)
2	Two 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 enclosure connectors.

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

## Removing the Power Enclosure

This section describes how to remove a power enclosure from the Cisco NCS 6000 FCC. In most cases, it is not necessary to remove the power enclosure although it is field-replaceable (Cisco PID NCS-F-PWR-SHELF=).



---

**Note** When removing the power enclosure, you must first remove the power modules and the power trays. See the [Replacing an AC or DC Power Tray, on page 99](#) section and the [Removing an AC or DC Power Module, on page 102](#) section.

---

## Required Tools and Equipment

- 6-inch, Number-2 Phillips screwdriver



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**Note** The power enclosure weighs approximately 30 lb (13.7 kg) and sits on top of the FCC. To prevent injury, we recommend that you use a ladder and two people when removing the power enclosure.

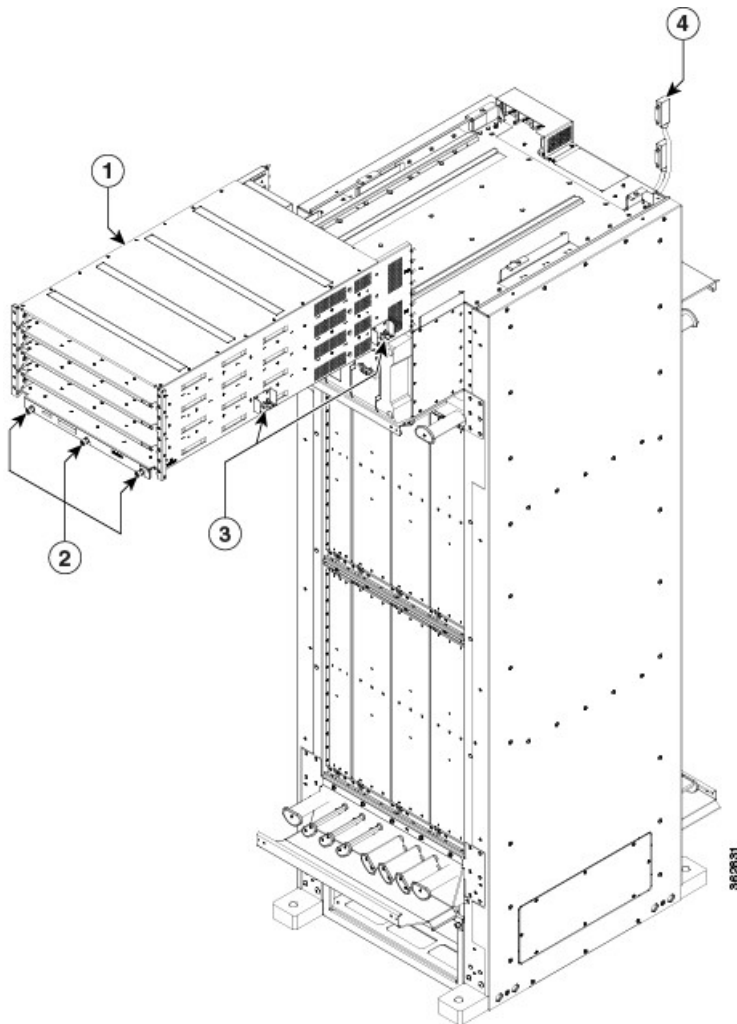
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## Steps

Follow these steps to remove the power enclosure from the FCC.

- Step 1** Disconnect the two D-Sub connector cables from the PCMs on the rear of the power enclosure.
- Step 2** Untighten the two captive screws on each side of the power enclosure and the three captive screws on the front flanges.
- Step 3** Standing in front of the FCC, slide the power enclosure towards you, grasping it with one hand on the side of the power shelf and the other hand underneath it for support.
- Step 4** Carefully lift the power enclosure and remove it completely from the FCC.

**Figure 65: Removing the Power Enclosure**



1	Power enclosure	3	Side captive screws (two per side)
---	-----------------	---	------------------------------------

2	Three front captive screws	4	D-Sub connector cables (one per PCM)
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## Replacing the Fan Trays and Air Filter

This section describes how to replace a fan tray and air filter from the Cisco NCS 6000 FCC and includes the following topics:



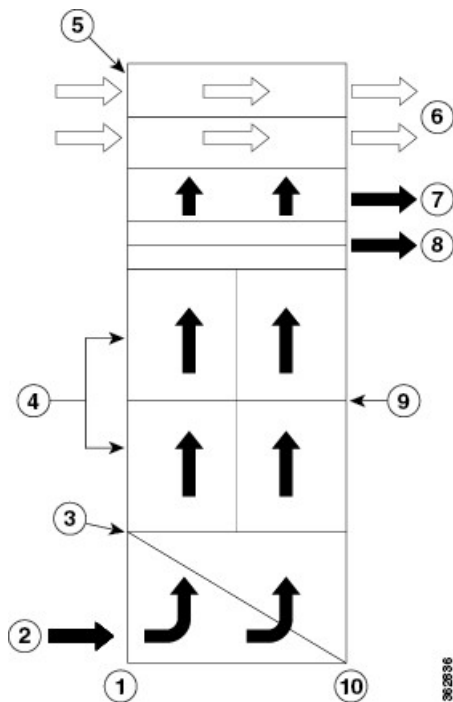
**Note**

The NCS 6000 FC is shipped with the air filter preinstalled.

### About the Fan Trays and Air Filter

This section provides an overview of the fan trays and air filter for the Cisco NCS 6000 FCC. These components help circulate and filter the airflow throughout the FCC.

**Figure 66: FCC Airflow**



1	Front side of the FCC	6	Exhaust air from PMs
---	-----------------------	---	----------------------

2	Air inlet plenum	7	Air exhaust plenum
3	Air filter	8	Fan trays (rear)
4	Front upper and lower card cages	9	Rear upper and lower card cages
5	Air flow through PMs	10	Rear side of the FCC

The airflow volumes for a fully loaded Cisco NCS 6000 FCC are as follows:

- Chassis airflow: Up to 1980 cubic feet (56,6000 liters) per minute
- DC power system airflow: Up to 120 cubic feet (3400 liters) per minute
- AC power system airflow: Up to 88 cubic feet (2500 liters) per minute

## About the Fan Trays

The Cisco NCS 6000 FCC has two fan trays located directly above the upper cable management bracket on the rear of the FCC (Figure 2: [Rear View of the Cisco NCS 6000 FCC](#) ).

When there is one or more fan failures, the system monitors the temperature sensors mounted on the critical components within the various boards and increases fan throughput to hold temperatures below their critical threshold. The system does this monitoring even when all the fans are operating correctly (so that it protects the components if the air intake is blocked for example). If temperatures exceed the critical threshold, the associated cards are shut down to avoid permanent damage.

If either fan tray is removed from the FCC, the other fan tray will immediately spin up to maximum speed to provide sufficient cooling performance. Although the system can operate indefinitely at full capacity with just one operational fan tray up to an ambient room temperature of 40°C (104°F) without overheating, there is no longer any redundancy offered, so immediate replacement of the missing fan tray is advised.

When both fan trays are removed, a critical alarm is generated, along with a syslog message warning you to install a fan tray or the entire FCC will shut down in 45 seconds.



**Note**

The upper and lower fan trays are interchangeable so the fan tray installation is the same.

## Fan Tray LEDs

The green/yellow LED lights when the fan tray is inserted into the fan tray slot. The following table describes the fan tray LEDs and their meanings.

**Table 12: NCS 6000 FCC Fan Tray LEDs**

LED Color	Description
Green	The fan tray is operating normally.
Yellow	The fan tray has one or more errors detected.

LED Color	Description
Off	No power is applied to the fan tray.

## About the Air Filter

The Cisco NCS 6000 FCC has a serviceable air filter mounted in a slide-out tray accessible from the front of the FCC just below the lower cable management bracket ([Figure 1: Front View of the Cisco NCS 6000 FCC](#)). The air filter removes dust from the room air drawn into the FCC 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 FCC and temperature-related environmental alarms. For information about replacing the air filter, see the [Replacing the Air Filter](#), on page 114 section.



### Note

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

## Replacing the Fan Tray

### Prerequisites

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

### Required Tools and Equipment

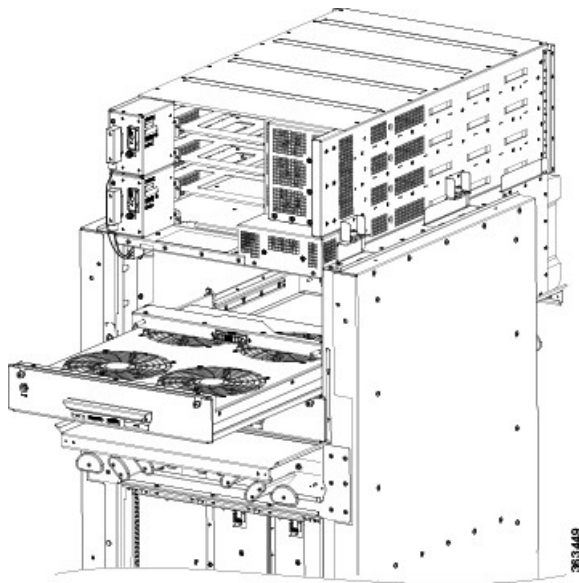
- ESD-preventive wrist strap
- 6-inch, Number-1 Phillips screwdriver
- Fan tray (Cisco PID NC6-FANTRAY=)

## Steps

To replace a fan tray, follow these steps:

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the front side of the FCC (see [Preventing Electrostatic Discharge](#), on page 11). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
- 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. Be especially careful while removing the fan tray from the FCC. 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 FCC. 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 (the labels are located on the bottom of the fan tray).

**Figure 67: Replacing a Fan Tray**



- Step 7** Slide the fan tray into the fan tray bay. Stop when the fan tray makes contact with the FCC connector in the back of the fan tray bay.
- Caution** To prevent damage to the FCC 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 FCC connector. When the fan tray is completely seated, the fan tray faceplate flanges meet the rear side of the FCC.
- 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 captive screws on each side of the fan tray faceplate.
- 

## Replacing the Air Filter

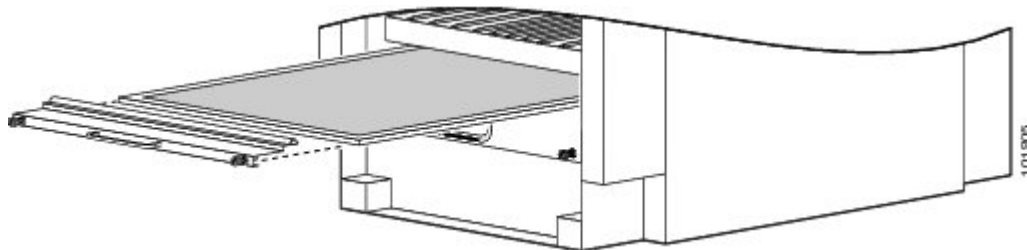
This section describes how to install an air filter in the Cisco NCS 6000 FC. The following figure shows the FCC air filter. The air filter is located on the front of the FCC as shown in [Figure 1: Front View of the Cisco NCS 6000 FCC](#).



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

---

**Figure 68: FCC Air Filter**



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

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**Caution** Never operate the FCC without an air filter. Operating the FCC without a filter for an extended time can result in damage to the FCC hardware.

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## Steps

To replace the air filter, follow these steps:

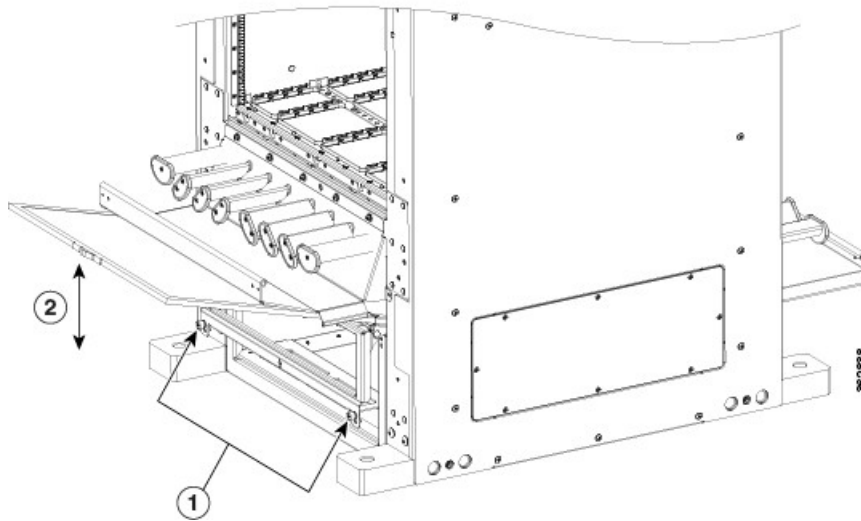
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- Step 1** Remove the filter you are replacing.



- a) Remove the lower grille, if installed.
- b) Loosen the two captive screws on the filter cover. The filter will automatically drop down.
- c) Pull outward on the center of the filter door to pull it free.
- d) Grasp the pull tab in the center of the air filter, and slide it out from the slot.

**Figure 69: Replacing the Air Filter—Front Side of the FCC**



1	Two captive screws	2	Air filter
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**Step 2**

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 Shelf Controller Cards and Fabric Cards

This section describes how to remove the shelf controller cards and fabric cards from the FCC.

## Guidelines for Removing a Card

- Online (in-service) insertion and removal (OIR) is supported, enabling you to remove the cards while the FCC 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** For a graceful shutdown, we recommend that you use the Cisco IOS XR **shutdown** command to shut down a fabric card prior to removing it from the FCC.

---

- The different cards in the FCC are attached to the FCC 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 a card, 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 FCC (only applies to FCs).
- Any unused card slots that are uncovered allows air used for FCC cooling to escape. To ensure proper air flow and maintain system EMC and safety compliance, any unused FC slots must contain impedance carriers, and all SC and SC-SW cards must remain installed in their card slots (see the [Installing and Removing an Impedance Carrier](#), on page 66 and the [Figure 3: Cisco NCS 6000 FCC Slot Numbers](#), on page 9 sections).

## Removing an SC or SC-SW Card

This section describes how to remove an SC or SC-SW card from the Cisco NCS 6000 FCC.

### Prerequisites

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




---

**Note** The SC and SC-SW cards are hot-swappable. Perform these tasks when you are certain that the secondary SC or SC-SW card in the FCC is operational. The secondary card will automatically assume control. Failure to follow these guidelines can result in interruptions in data communications and network connectivity.

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**Warning** **Class 1 Laser Product.** Statement 113

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**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

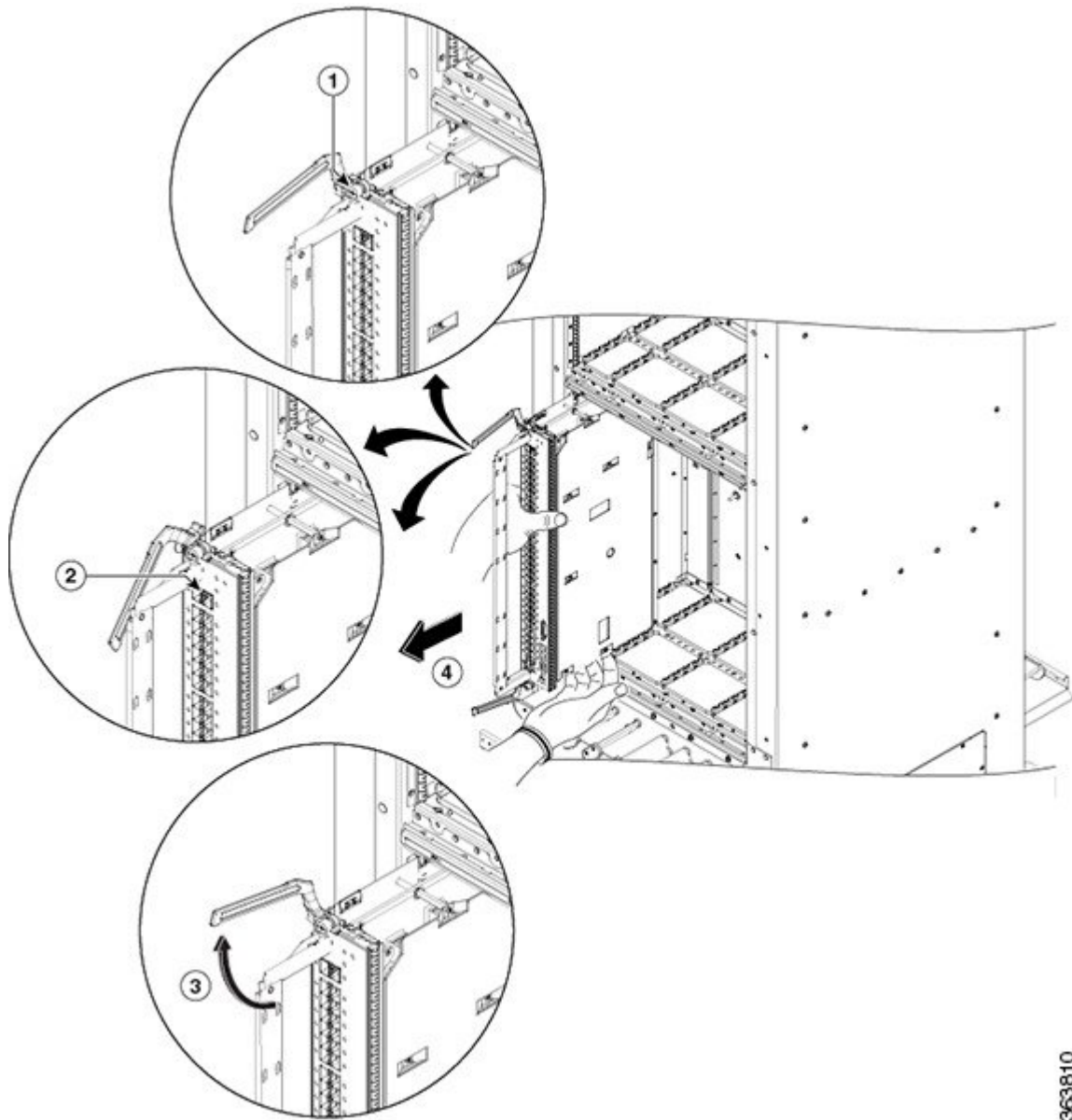
- ESD-preventive wrist strap
- Number-2 Phillips screwdriver or Number-2 common (flat-head) screwdriver

## Steps

To remove an SC or SC-SW card, 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 FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.
  - 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.

**Figure 70: Removing a Shelf Controller Card—SC-SW Card Shown**



363810

1	Captive screw	3	Ejector lever
2	OIR button	4	Direction of removal

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

- Step 4** Press the OIR buttons on the top and bottom of the card faceplate to release the ejectors (SC-SW card only).
- Step 5** Simultaneously pivot the ejector levers away from the faceplate to release the card from the midplane connectors.
- Step 6** Grasp the two card ejector levers and simultaneously pivot both ejector levers 90 degrees away from the front edge of the card carrier to unseat the card from the backplane connector.
- Step 7** Grasp the ejector levers with both hands and gently pull the card halfway from the slot.
- Step 8** Move one hand under the card to guide it. Avoid touching the card's printed circuit board, components, or any connector pins.
- Step 9** 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 an S2 Fabric Card



### Note

Unless otherwise noted, the information in this section applies to the NCS-F-FC and NCS-F-FC2 fabric cards.

This section describes how to remove an S2 fabric card from the Cisco NCS 6000 FCC.

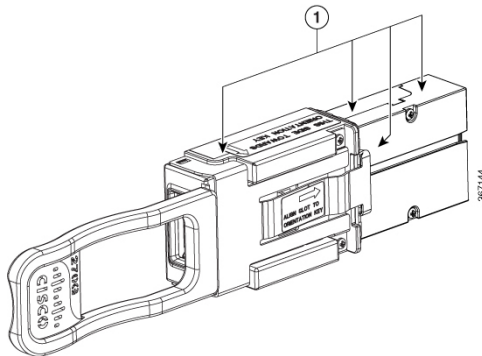
## Guidelines for Handling CXP2 Optical Modules



### Warning

**Hot surface.** Statement 1079

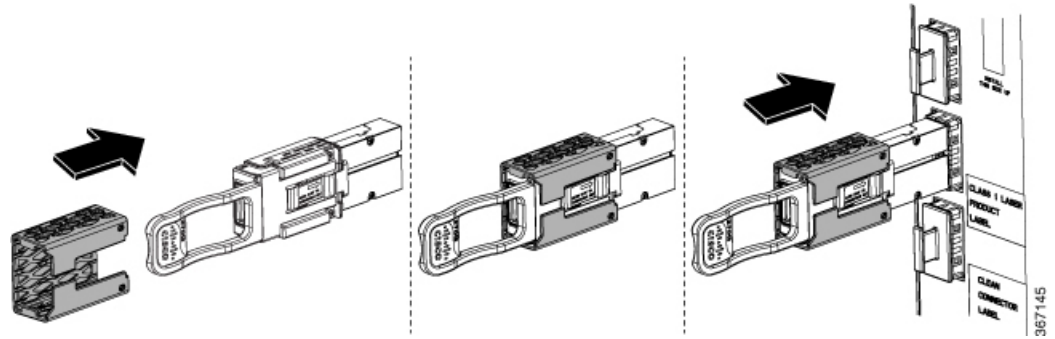
The metal surfaces on the CXP2 can run hot. Use caution when removing CXP2 optical modules from the second generation S2 Fabric Card (S2 FC2).



1	Metal surfaces
---	----------------

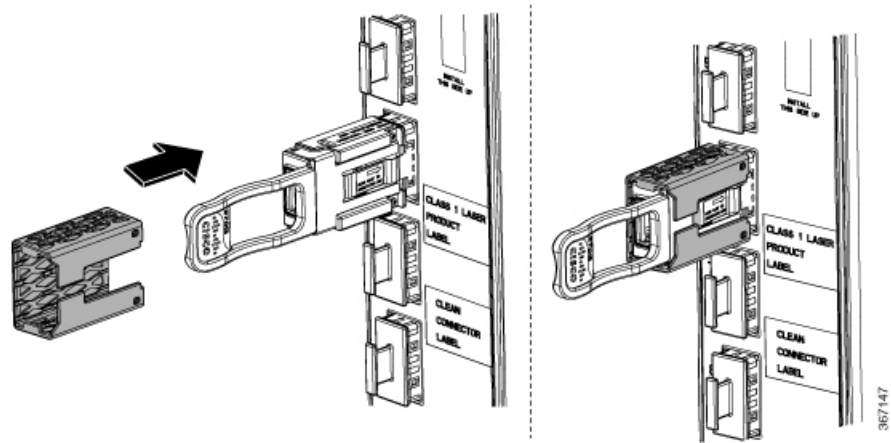
A thermoplastic sleeve is provided for each CXP2 port.

You can install the thermoplastic sleeve around the base of the CXP2 before you install the CXP2, as shown in the following figure.

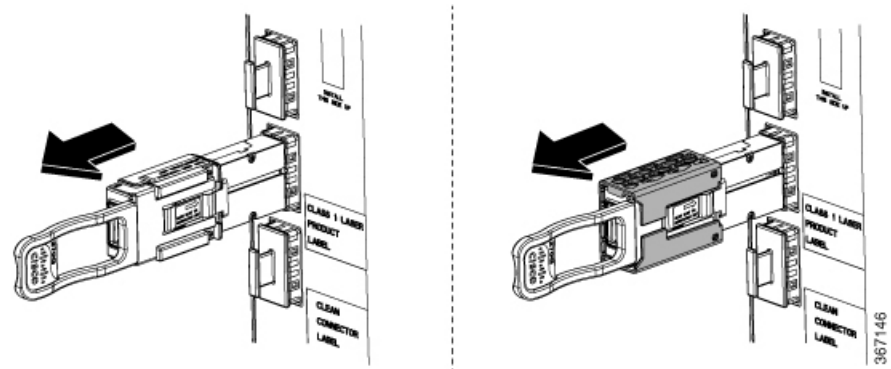


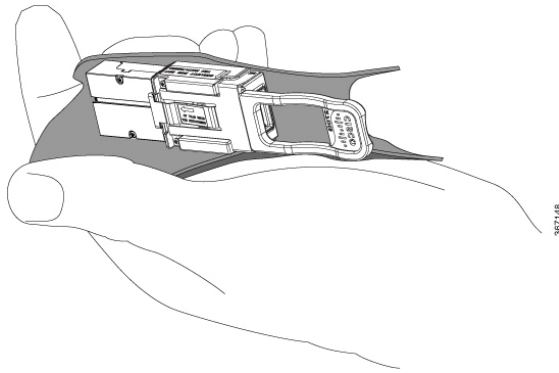
**Note** You can leave the sleeve on the CXP2 optical module while it is installed in the fabric card.

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

The required prerequisites for removing an FC are:

- Identify the FC to be removed and check the fabric plane it is configured on.
- Shut down the fabric plane, if configured, to avoid traffic loss. The following example shows how to shut down plane X (where X is in the range of 0 to 3).

```
config
controller fabric plane X
shutdown
commit
```

- Open the chassis door.

## Required Tools and Equipment

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

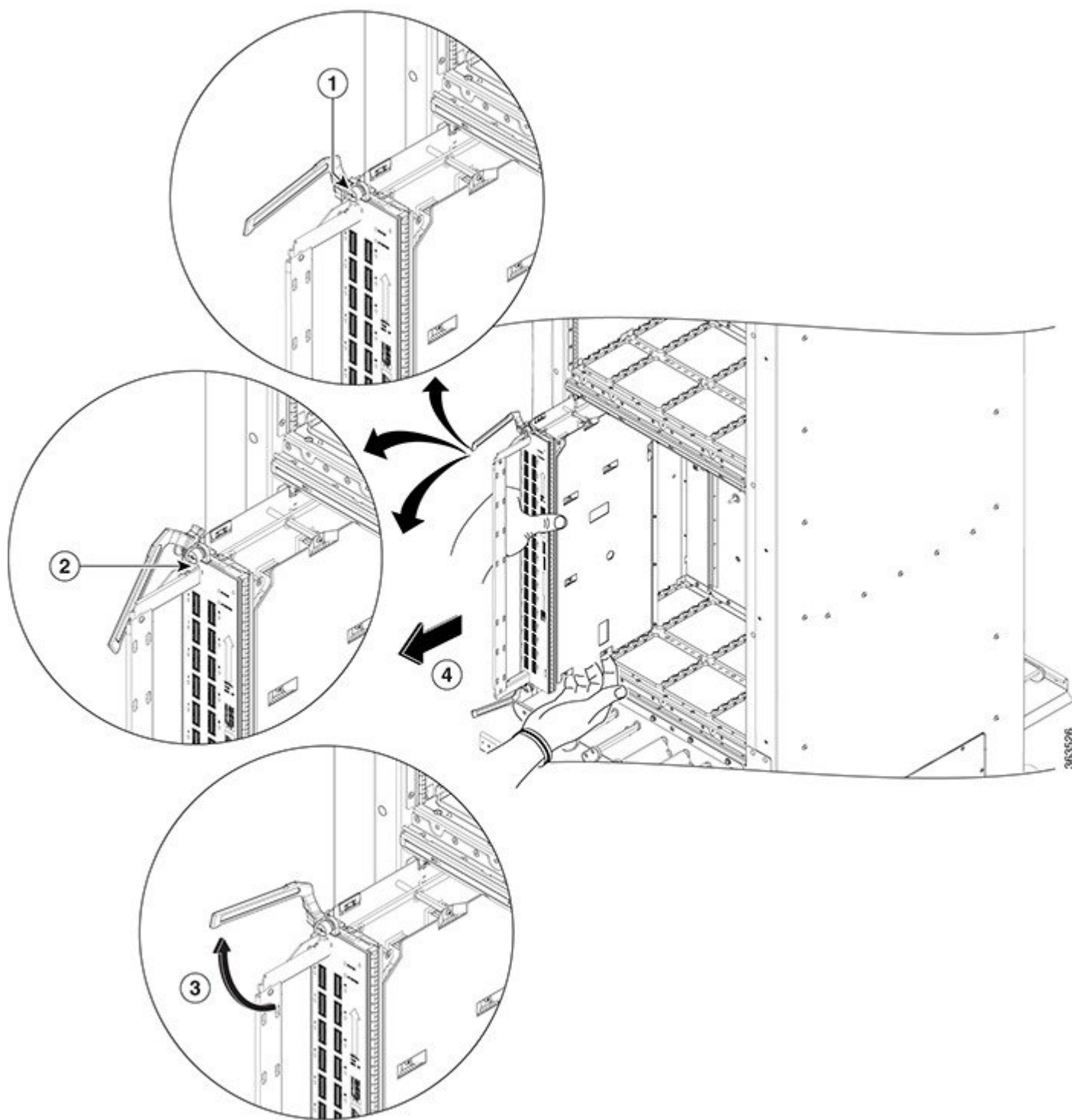


## Steps

To remove an S2 FC, 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 FCC (see [Preventing Electrostatic Discharge, on page 11](#)). You can also connect the ESD-preventive wrist strap leash to any bare-metal surface on the FCC.
- Step 2** Identify the card 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 71: Removing an S2 FC**



1	Captive screw	3	Ejector lever
2	OIR button	4	Direction of removal

**Step 3** Press the OIR buttons on the top and bottom of the card faceplate to release the ejectors.

**Note** Wait for the S2 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.

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.

---

## Removing an S13 Multi-Chassis Fabric Card

For information about removing a fabric card from the Cisco NCS 6008 LCC, see the [Cisco Network Convergence System 6000 Series Routers Hardware Installation Guide](#).

The procedures for removing the S13 fabric card are the same as those for removing the fabric cards defined in this guide.





## APPENDIX **A**

# System Specifications

This appendix contains tables that list the specifications for the main components of the Cisco NCS 6000 Fabric Card Chassis (FCC).

- [Fabric Card Chassis Specifications, page 127](#)
- [Power Specifications, page 128](#)
- [Environmental Specifications, page 129](#)
- [Regulatory, Compliance, and Safety Specifications, page 130](#)

## Fabric Card Chassis Specifications

**Table 13: Cisco NCS 6000 FCC Chassis Specifications**

<b>Supported Cards and Modules</b>	Up to 12 S2 fabric cards (FCs), two SC or SC-SW shelf controller cards, and two fan trays.
<b>Fabric Chassis Dimensions</b>	
Height	76.60 in. (205.7 cm) as shipped 84.0 in. (213.4 cm) as installed with the power shelf
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 FCC
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 FCC (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)

<b>Weights</b>	
FCC as shipped	708 lb (321 kg)
FCC in shipping crate with pallet	925 lb (420 kg)
FCC, fully loaded with power enclosure, cards, and cosmetics	1130 lb (513 kg)
<b>Floor Loading</b>	
FCC in rack footprint(floor contact area)	FCC: 6.9 sq ft (0.64 sq m)
Maximum floor loading	164 lb/sq ft
<b>Fabric Chassis Cooling</b>	
FCC airflow	Up to 1980 cubic feet (56,6000 liters) per minute
DC power system airflow	Up to 120 cubic feet (3400 liters) per minute
AC power system airflow	Up to 88 cubic feet (2500 liters) per minute

## Power Specifications

**Table 14: Cisco NCS 6000 FCC Power Specifications**

<b>Power Enclosure Components</b>	
Power Trays	Either four AC or four DC power trays. AC and DC power trays cannot be mixed.
Power modules (PMs)	The AC power tray has three slots for AC PMs. The DC power tray has four slots for DC PMs.
Power control modules (PCMs)	Two PCMs are preinstalled in the power enclosure (one per each set of power trays).
Power Redundancy (N+N)	<p>AC: Up to 12 power modules can be installed, and only 6 are needed to be active at any time. This allows support for 6+6 power redundancy by using two independent AC power sources (6 feeds each).</p> <p>DC: Up to 16 power modules can be installed, and only 8 are needed to be active at any time. This allows support for 8+8 power redundancy through "A" and "B" battery plant feeds.</p>
<b>DC Input</b>	
Nominal input voltage	-48 VDC or -60 VDC (tolerance range: -40 to -72 VDC)

Power Enclosure Components	
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 6000 FCC Environmental Specifications**

Temperature	Operating, nominal: 41 to 104°F (5° to 40°C) Operating, short-term: 23 to 122°F (-5° to 50°C) <sup>7</sup> 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
FCC airflow	2000 CFM (Cubic Feet per Minute) Up to 56,600 liters per minute
Power system airflow	Up to 3400 liters per minute
Air exhaust temperature	122°F (50°C)—at room temperatures of 95 to 102°F (35 to 39°C) 140°F (60°C)—maximum exhaust temperature on a fully loaded system during worst-case operating conditions (50°C and 6000 ft altitude)

Air velocity (at exhaust)	1000 ft/min (5.1m/s) under typical conditions 27°C 2250 ft/min(11.4m/s) at maximum speed <b>Note</b> Software controls the speed of the fans based on measurements from the fabric chassis thermal sensors.
Sound power level(AC and DC power)	76.6 dBA declared
Shock and vibration	Designed and tested to meet the NEBS shock and vibration standards defined in GR-63 Issue 4 2012.

<sup>7</sup> 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.

## Regulatory, Compliance, and Safety Specifications

For information about the regulatory, compliance, and safety standards to which the Cisco NCS 6000 Fabric Card Chassis conforms, see: [Regulatory Compliance and Safety Information for the Cisco Network Convergence System 6000 Series Routers](#).





## System Product IDs

This appendix provides the product ID information for the Cisco NCS 6000 Fabric Card Chassis and its components.

These tables list the components that make up the FCC, the PIDs (part numbers used to order the components), and product ID 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://cisco-apps.cisco.com/cisco/psn/commerce>.

- [Component Product IDs, page 131](#)
- [Fabric Card Product IDs, page 133](#)
- [Cosmetic Product IDs, page 134](#)
- [Accessory Product IDs, page 134](#)
- [Optical Module IDs, page 135](#)

## Component Product IDs

**Table 16: Component Product IDs**

Component	Product ID	Description
Fabric card chassis	NCS-F-CHASS NCS-F-CHASS= (spare)	Cisco NCS 6000 Fabric Card Chassis (chassis only)

Component	Product ID	Description
Fabric routing system	NCS-F-SYS-S	Cisco NCS 6000 Fabric System: includes two SC or two SC-SW cards, 12 FCs, two fan trays, power enclosure, four power trays (AC or DC), power modules (AC or DC), and power cords for AC option
	NCS-F-SYS2	Cisco NCS 6000 2T Fabric System: includes six FC2s, two fan trays, power enclosure, four power trays (AC or DC), power modules (AC or DC), and power cords for AC option
Craft panel display	NCS-CRFT=	NCS craft panel display kit
Fan tray	NCS-F-FANTRAY NCS-F-FANTRAY= (spare)	NCS Fabric Card Chassis fan tray
Power enclosure	NCS-F-PWR-SHELF NCS-F-PWR-SHELF= (spare)	NCS Fabric Card Chassis power shelf
AC power tray	NCS-AC-PWRTRAY NCS-AC-PWRTRAY= (spare)	Cisco NCS AC power tray
DC power tray	NCS-DC-PWRTRAY NCS-DC-PWRTRAY= (spare)	Cisco NCS DC power tray
AC power module	PWR-3KW-AC-V2 PWR-3KW-AC-V2= (spare)	Cisco NCS AC PM
DC power module	PWR-2KW-DC-V2 PWR-2KW-DC-V2= (spare)	Cisco NCS DC PM
Power control module (PCM) <sup>8</sup>	NCS-F-PCM NCS-F-PCM=	PMbus module
Power distribution unit bracket (chassis mount)	NCS-PDU-BRKT NCS-PDU-BRKT= (spare)	Cisco NCS PDU bracket
Power distribution unit bracket (19-inch rack mount)	NCS-PDU-BRK-MNT NCS-PDU-BRK-MNT=	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

Component	Product ID	Description
AC power cord	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 <b>Note</b> Length of each power cord is 167 in (4.25m)

<sup>8</sup> The PCM can be serviced in the field by Cisco personnel or with proper guidance from Cisco technical support.

## Fabric Card Product IDs

**Table 17: Fabric Card Product IDs**

Component	Product ID	Description
MC S13 Fabric Card (FC)	NC6-FC-MC NC6-FC-MC= (spare)	NCS 6008 S13 Multi-Chassis Fabric Card (installed in the LCC), for 1T multi-chassis mode
Universal Fabric Card (UFC)	NC6-FC2-U NC6-FC2-U= (spare)	NCS 6008 Universal Fabric Card (installed in the LCC), for 2T multi-chassis mode
FCC SC card (up to two cards per chassis)	NCS-F-SC NCS-F-SC= (spare)	NCS Fabric Card Chassis shelf controller
FCC SC-SW card (up to two cards per chassis)	NCS-F-SCSW NCS-F-SCSW= (spare)	NCS Fabric Card Chassis shelf controller and switch card
FCC S2 FC (up to 12 cards per chassis: SC=0, SC-SW=2 for N+1 configurations)	NCS-F-FC NCS-F-FC= (spare)	NCS Fabric Card Chassis S2 Fabric Card, for 1T multi-chassis mode
FCC S2 FC2 (up to 12 cards per chassis: SC=0, SC-SW=2 for N+1 configurations)	NCS-F-FC2 NCS-F-FC2= (spare)	NCS Fabric Card Chassis S2 Fabric Card (2nd Generation), for 2T multi-chassis mode
FCC blank	NCS-F-FC-BLANK NCS-F-FC-BLANK= (spare)	NCS Fabric Card blank

## Cosmetic Product IDs

**Table 18: Cosmetic Product IDs**

Component	Product ID	Description
Front door	NCS-F-DOOR-F NCS-F-DOOR-F= (spare)	NCS Fabric Card Chassis door front
Rear door	NCS-F-DOOR-R NCS-F-DOOR-R= (spare)	NCS Fabric Card Chassis door rear
Upper grille	NCS-F-GRILLE-UF= (spare)	NCS Fabric Card Chassis grille upper front
Lower grille	NCS-F-GRILLE-UR= (spare)	NCS Fabric Card Chassis grille upper rear
Vertical cable trough	NCS-F-V-TROUGH= (spare)	NCS Fabric Card Chassis front and rear vertical cable trough
Horizontal cable trough	NCS-F-H-TROUGH= (spare)	NCS Fabric Card Chassis front and rear horizontal cable trough

## Accessory Product IDs

**Table 19: Accessory Product IDs**

Component	Product ID	Description
Drill hole template	NC6-DRILLTEMP= (spare)	Cisco NCS 6000 Fabric Card Chassis drill hole template
Chassis filter	NC6-5XFILTER= (spare)	Cisco NCS 6000 Fabric Card Chassis air filter, 5-pack
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

# Optical Module IDs

**Table 20: Optical Module IDs**

Component	Product ID	Description
SFP modules	SFP-10G-SR	Short reach SFP 10GE transceiver module
	SFP-10G-LR	Long reach SFP 10GE transceiver module
QSFP modules	QSFP-40G-SR4	Short reach QSFP 40GE optical module (SC-SW card only)
	QSFP-40G-LR4	Long reach 40GE QSFP optical module (SC-SW card only)
Optical module set	NCS-FAB-OPT	Optical module set that includes 96 CXP-100G-SR12 modules for multi-chassis configurations.  Two optical modules sets are required for each LCC: one set plugs into the MC S13 FCs on the LCC, one set plugs into the S2 FC cards in the FCC.
	NCS-FAB-OPT2 <a href="#">9</a>	Optical module set that includes 96 ONS-CXP2-SR25 modules for 2T multi-chassis configurations.  Two optical modules sets are required for each LCC: one set plugs into the UFCs on the LCC, one set plugs into the S2 FC2 cards in the FCC.

<sup>9</sup> Required for 2T multi-chassis mode





## Cabling a Multi-Chassis Configuration

This appendix provides an overview of the Cisco NCS 6000 Multi-Chassis system and describes how to physically cable the fabric planes between each LCC and FCC in the system.

The Cisco NCS 6000 Multi-Chassis system currently supports these multi-chassis configurations:

- 2+1—Two LCCs + one FCC (with six or twelve FCs)
- 2+2—Two LCCs + two FCC (with six or twelve FCs in each FCC)
- 4+2—Four LCCs + two FCCs (with six or twelve FCs in each FCC)
  
- [About the Cisco NCS 6000 Multi-Chassis System, page 137](#)
- [Prerequisites, page 138](#)
- [Cabling Requirements, page 138](#)
- [Required Tools and Equipment, page 142](#)
- [Cabling Overview, page 143](#)
- [Cabling the Ethernet Control Plane Network, page 145](#)
- [Cabling the Fabric, page 149](#)

## About the Cisco NCS 6000 Multi-Chassis System

This section provides an overview of the Cisco NCS 6000 Multi-Chassis system and describes what is required to interconnect the system components. The Cisco NCS 6000 Multi-Chassis system is also referred to as the “multi-chassis system” throughout this chapter.

The Cisco NCS 6000 Multi-Chassis system is a highly scalable routing platform designed for service providers to build next generation multi-service networks that provide video, data and voice services. The multi-chassis system consists of two major components: The line card chassis (LCC) and fabric card chassis (FCC). The LCC has 16 slots: eight line card (LC) slots, six fabric card slots, and two RP slots. The FCC has 14 slots: 12 fabric card slots and two slots for the SC or SC-SW shelf controller cards.

The interconnectivity of FCCs and the LCCs allows the system capacity of the NCS 6000 to scale from 8 Tbps to 128 Tbps of data. The multi-chassis system can support up to 16 LCCs interconnected to 4 FCCs.

### Multi-Chassis System Hardware Requirements

The multi-chassis (MC) system is described as 1T or 2T, depending on the installed fabric cards and line cards. In a 1T system, each line card delivers up to 1 Tbps throughput. In a 2T system, each line card delivers up to 2 Tbps throughput. The following table lists the 1T and 2T multi-chassis hardware requirements.

Component	1T Multi-Chassis	2T Multi-Chassis
<b>Fabric Card Chassis (FCC)</b>		
S2 Fabric Cards	NCS-F-FC	NCS-F-FC2
Fabric Card Optics	CXP	CXP2
<b>Line Card Chassis (LCC)</b>		
S13 Fabric Cards	NC6-FC-MC	NC6-FC2-U
Fabric Card Optics	CXP	CXP2
Fan Tray	NC6-FANTRAY	NC6-FANTRAY-2
Line Cards	NC6-10X100G-L-K NC6-10X100G-M-K NC6-10X100G-L-P NC6-10X100G-M-P NC6-60X10GE-L-S NC6-60X10GE-M-S	NC6-20X100GE-L-C NC6-20X100GE-M-C

## Prerequisites

Before cabling the system, install each line card chassis (LCC) and fabric card chassis (FCC) in the planned location. Ensure that you have adequate floor space to cable the multi-chassis system and an environment that meets the recommended specifications. For more information, see [Cisco Network Convergence System 6000 Series Routers Site Planning Guide](#).

## Cabling Requirements

The following cables and optics are required to interconnect the LCC and FCC in a Cisco NCS 6000 Multi-Chassis system.



### Note

Cisco provides the optical modules but does not provide the cables specified below. You can order these cables from a Cisco approved vendor such as Tyco Electronics or Molex. To obtain the optics, please contact your Cisco sales representative for further information.



For connections from each route processor (RP) and SC (or SC portion of the SC-SW) card:

- Four 10G-SFP modules and two cables

Use SFP-10G-SR transceiver modules and 62.5/125 or 50/125 multi-mode fiber (MPO) cables, or SFP-10G-LR modules and 9/125 single-mode fiber (SMF) cables

For connections between the SC-SW cards in the FCC:

- QSFP-40GE-LR4 (long-reach) optical modules and standard SMF cables (recommended optic), or QSFP-40GE-SR4 (short-reach) MMF optical modules and MPO-12 ribbon cables

For connecting the fabric:

- 96 MPO-24 crossover cables for each LCC
- Two CXP optical module sets for each LCC. Each set includes 96 optical modules, for a total of 192 modules:
  - NCS-FAB-OPT—Includes 96 CXP-100G-SR12 modules for 1T multi-chassis systems.
  - NCS-FAB-OPT2—Includes 96 ONS-CXP2-SR25 modules for 2T multi-chassis systems.

**Note**

---

The CXP and CXP2 modules use a 24-fiber MPO connector that supports bidirectional transmission across the fibers (12 Tx + 12 Rx), and provide 2-wire serial (I2C) management interface and digital diagnostics, including Tx and Rx optical power monitoring per wavelength.

The CXP pluggable transceiver module has 12 dedicated transmit (Tx) channels and 12 receive (Rx) channels per transceiver with data rates up to 10.3125 Gbps and OTN rates up to 11.25 Gbps.

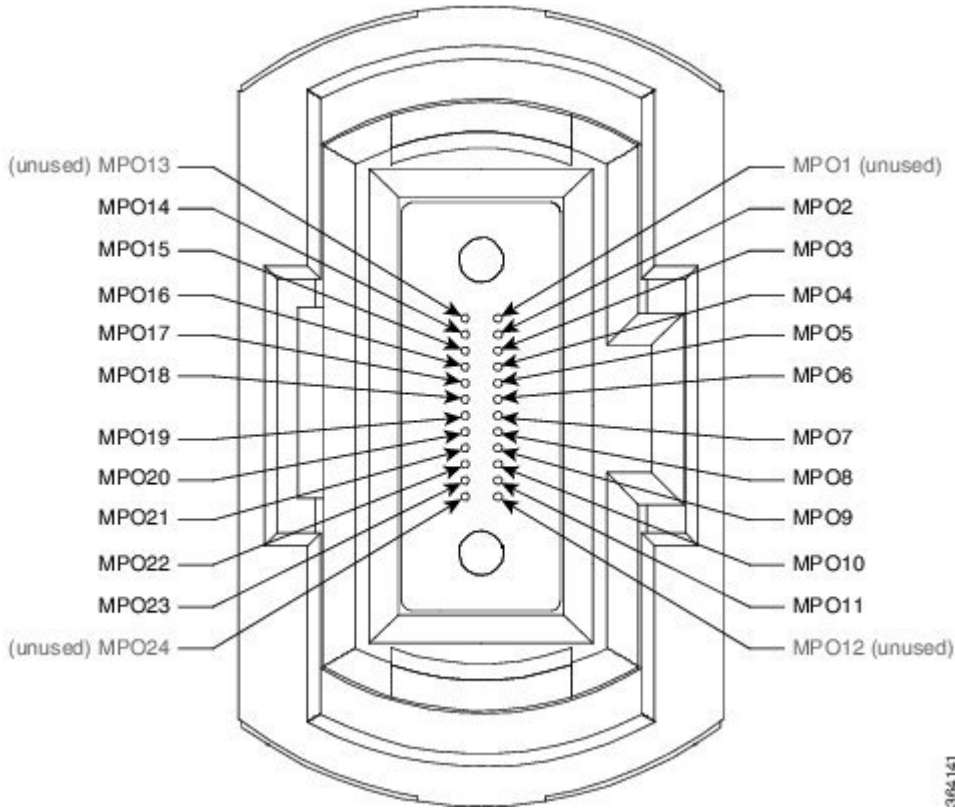
The CXP2 pluggable transceiver module has 12 dedicated transmit (Tx) channels and 12 receive (Rx) channels per transceiver with data rates up to 25 Gbps. CXP2 supports data rates up to 10.3125 Gbps and OTN rates up to 11.25 Gbps when connected to legacy CXP transceiver modules.

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# MPO-24 Cable Specifications

The following figure shows the MPO-24 connector pinouts.

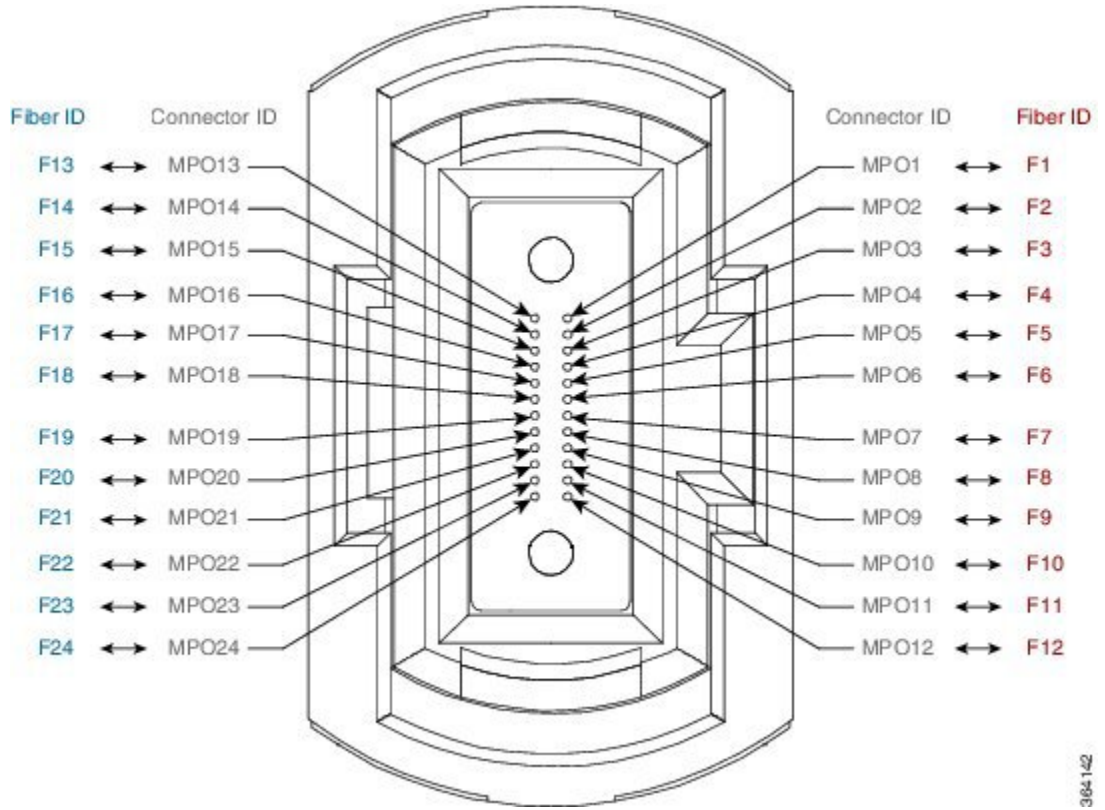
Figure 72: MPO-24 Connector Pinouts



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The following figure shows the MPO-24 connector fiber assignments.

**Figure 73: MPO-24 Connector Fiber Assignments**



The following table lists the 100G to 100G crossover cable connections.

**Table 21: Crossover Cable Connections**

MPO Connector		CXP Module		Connector		CXP Module	
Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)	Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)
MPO1	F1	1	RX	MPO1	F13	1	RX
MPO2	F2	2	RX	MPO2	F14	2	RX
MPO3	F3	3	RX	MPO3	F15	3	RX
MPO4	F4	4	RX	MPO4	F16	4	RX
MPO5	F5	5	RX	MPO5	F17	5	RX
MPO6	F6	6	RX	MPO6	F18	6	RX

MPO Connector		CXP Module		Connector		CXP Module	
Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)	Connector ID	Fiber ID	Pin	Transmit (TX) Receive (RX)
MPO7	F7	7	RX	MPO7	F19	7	RX
MPO8	F8	8	RX	MPO8	F20	8	RX
MPO9	F9	9	RX	MPO9	F21	9	RX
MPO10	F10	10	RX	MPO10	F22	10	RX
MPO11	F11	11	RX	MPO11	F23	11	RX
MPO12	F12	12	RX	MPO12	F24	12	RX
MPO13	F13	13	TX	MPO13	F1	13	TX
MPO14	F14	14	TX	MPO14	F2	14	TX
MPO15	F15	15	TX	MPO15	F3	15	TX
MPO16	F16	16	TX	MPO16	F4	16	TX
MPO17	F17	17	TX	MPO17	F5	17	TX
MPO18	F18	18	TX	MPO18	F6	18	TX
MPO19	F19	19	TX	MPO19	F7	19	TX
MPO20	F20	20	TX	MPO20	F8	20	TX
MPO21	F21	21	TX	MPO21	F9	21	TX
MPO22	F22	22	TX	MPO22	F10	22	TX
MPO23	F23	23	TX	MPO23	F11	23	TX
MPO24	F24	24	TX	MPO24	F12	24	TX

## Required Tools and Equipment

- ESD (Electrostatic Discharge) wrist strap (for inserting a CXP or SFP module)
- Number-2 Phillips screwdriver
- (Optional) Medium flat-blade screwdriver (1/4 inch [60 to 70 mm]) used for opening the bale latches on small form-factor pluggable [SFP] or Gigabit Interface Converter [GBIC] transceivers

- Cable Director (P/N 2123610-1), to provide support and strain relief for fabric cable connections (provided by Cisco approved vendor Tyco Electronics)
- Supply of Velcro tie wraps (to bundle cables)
- Ladder

# Cabling Overview

## Cable Routing Considerations

### Cabling Routing

Whether the cables will be run overhead or under the floor, consider the airflow and cable characteristics of the combined cable sets to ensure that your cable management structures support the total capacity of cables for the Cisco NCS 6000 Multi-Chassis system installation.

### Raised Floor Installations

To plan cable routing in an installation with a raised floor, consider all the characteristics of each cable required for the installation. Allow slack for cabling so that cables can be pooled under the floor for future expansion without exceeding bend radius or cable length limitations. Riser cables are not rated for installation in air plenum passages, nor are they designed for use in LSZH (low smoke zero halogen) applications.

### Cable Characteristics

Plan your cable runs, consider the characteristics of each cable, such as the cable length limitations, combined diameter of bundled cables (such as power cables), weight of the cable groups, and bend radius of the cable or cables. Couple these considerations with the cable infrastructure available (or needed) at your facility. The infrastructure could include structures like the overhead cabling monorail or J-hook system, sleeve and riser diameters, and distances between floors or elements of the Cisco NCS 6000 Multi-Chassis system.

Analyze the cabling infrastructures, risers, and racking available in your facility to determine if the capacity of the cabling management systems at your facility will accommodate the required capacities of the multi-chassis system cabling.

### Cable Length

The limit of the cables is 100 meters (328 feet). Consider this distance when planning the physical locations of the LCCs and FCCs. For more information on the range of lengths available for the OM4 fabric cables, contact a Cisco approved vendor such as Tyco Electronics or Molex.

### Cable Bend Radius

Exceeding the bend radius allowed for a cable can break the glass in the cable or cause attenuation or loss of signal. Do not bend a cable more than the allowable bend radius.

See the [Cisco Network Convergence System 6000 Series Routers Site Planning Guide](#) for information on planning component locations and cable runs.

## General Cabling Procedures

Observe these procedures as you attach every cable:

- Strap the bundles to the horizontal cable management brackets on the chassis.  
Four horizontal cable management brackets are preinstalled on both the LCC and FCC (two on the front side and two on the rear side of each chassis).
- Handle all fiber-optic cables carefully.
  - Do not allow a fiber-optic cable to bend in a radius smaller than the allowable bend radius specified for that cable type.
  - Fiber-optic cables are glass. Do not step on fiber-optic cables or handle them roughly. Do not twist or stretch the cables.
  - To keep optical connections clean, do not remove the cable dust cover until immediately before you install the cable.
  - After you install a cable, immediately reserve each dust cover for storage by office personnel in a dust-free storage area. After all of the cables have been installed ensure that all the reserved dust covers are stored by office personnel in a dust free area for future use.
  - Install clean dust covers on every unused connection.
  - Consider labeling the chassis interconnection cables or creating a diagram of the cabling to ensure that the cables are connected correctly during system installation.
  - Consider labeling the chassis. Consider whether each chassis need to be physically positioned in sequence. Label each cable with the location of each termination as you install each cable

## Safety Guidelines

Before you perform any procedures, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment. The following guidelines are for your safety and to protect equipment. The guidelines do not include all hazards. Be alert.

- Review the safety warnings listed in the [Regulatory and Compliance Guide for the Cisco NCS 6000 Series Routers](#) before installing, configuring, or troubleshooting any installed card.
- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Keep the work area clear and dust free during and after installation. Do not allow dirt or debris to enter into any laser-based components.
- Keep tools and router components away from walk areas.
- Do not wear loose clothing, jewelry, or other items that could get caught in the router while working with cards, modules, and their associated components.
- Cisco equipment operates safely when used in accordance with its specifications and product-usage instructions.
- Do not work alone if potentially hazardous conditions exist.

- The installation must follow 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.

## Cabling the Ethernet Control Plane Network

This section describes how to cable the control plane network for the Cisco NCS 6000 Multi-Chassis system. These connections control the network connectivity for the multi-chassis system. The following cabling configurations are described:

The control plane network carries all the signaling, routing updates, system configuration and management packets for the NCS 6000. The control network must be cabled before the NCS 6000 system can become fully operational.

The control plane of the multi-chassis system is connected between the LCC and FCC with four paths per LCC (two per RP). The ports between the LCC and FCC are connected with SFP+ modules. Each RP on the LCC has 10GE connections that connect to each of the two SC-SW cards in the FCCs. The SC-SW cards provide the control plane network between all chassis.

Each SC-SW card has 56 10GE connections and two 40GE connections. Two SC-SW cards are used for redundancy purposes. These cards interconnect to each other through their 40GE QSFP optical ports. Each RP and each SC in a multi-chassis system connects to both switches. Note that an SC must be externally connected to both SC-SW switch cards through a 10GE port even if the SC and SC-SW cards are installed in the same FCC.

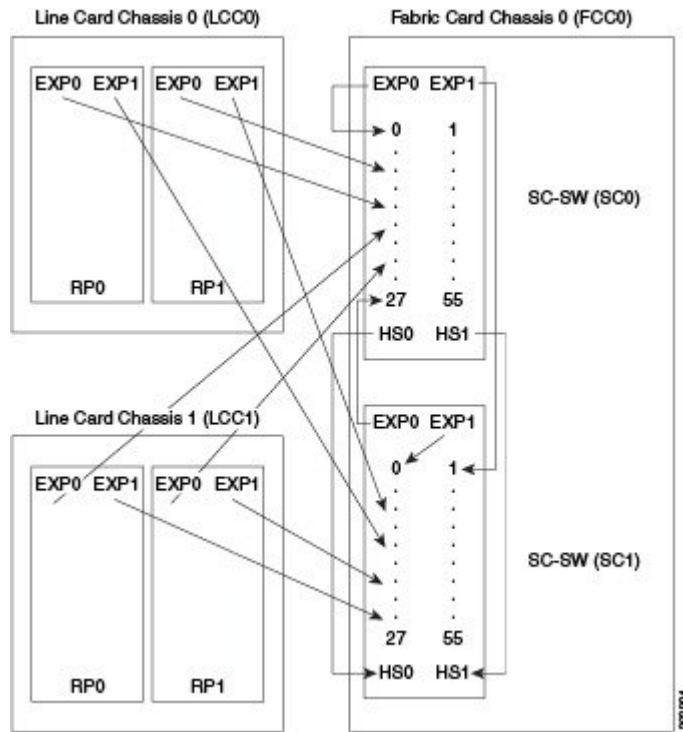
## Cabling the Control Plane for a 2+1 Multi-Chassis system

The following figure shows the control plane cabling for a 2+1 multi-chassis system.

**Note**

The RPs can be attached to any port on the SC-SW card.

**Figure 74: Control Plane Cabling for a 2+1 Multi-Chassis System**



**Table 22: RP Cards to SC-SW Card Connections (2+1 Configuration)**

	From RP Port	To SC-SW Card
LCC0	RP0, EXP0	FCC0, SC0 any switch port
	RP1, EXP0	FCC0, SC0 any switch port
	RP0, EXP1	FCC0, SC1 any switch port
	RP1, EXP1	FCC0, SC1 any switch port
LCC1	RP0, EXP0	FCC0, SC0 any switch port
	RP1, EXP0	FCC0, SC0 any switch port
	RP0, EXP1	FCC0, SC1 any switch port
	RP1, EXP1	FCC0, SC1 any switch port



**Table 23: FCC0 SC-SW to SC-SW Card Connections (2+1 Configuration)**

<b>From SC-SW Card</b>	<b>To SC-SW Card</b>
SC0 EXP0	SC0, any switch port
SC0 EXP1	SC1, any switch port
SC1 EXP0	SC0, any switch port
SC1 EXP1	SC1, any switch port
SC0 HS0 (40GE)	SC1 HS0 (40GE)
SC0 HS1 (40GE)	SC1 HS1 (40GE)

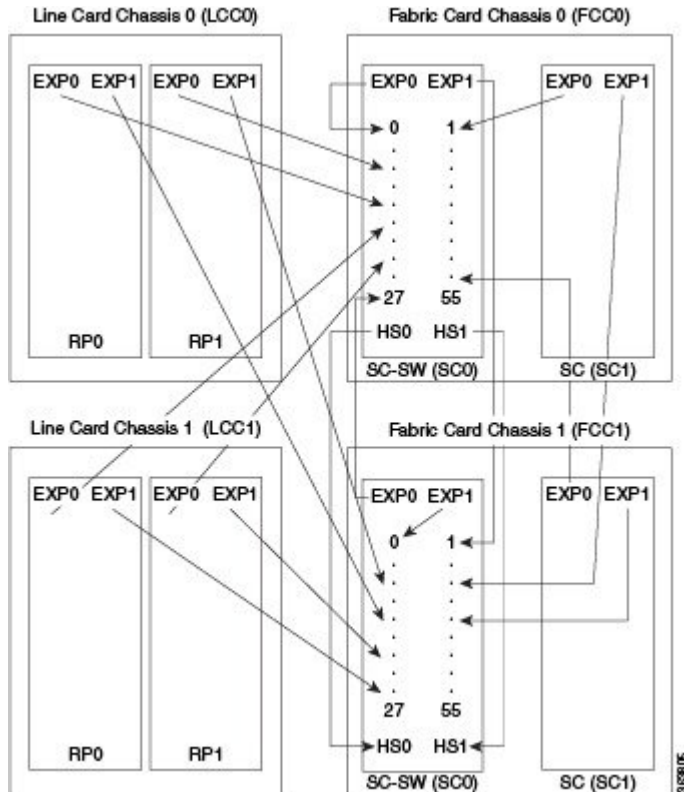
## Cabling the Control Plane for a 2+2 Multi-Chassis System

The following figure shows the control plane cabling for a 2+2 multi-chassis system.

**Note**

The cabling may differ depending on the type of SFP modules that you use. For SFP-10G-SR (short-reach) transceiver modules, use 65/125 or 50/125 multi-mode cables. For SFP-10G-LR (long-reach) transceiver modules, use 9/125 single-mode cables. To connect the QSFP 40GE optical modules between the SC-SW cards, we recommend that you use QSFP supported cables.

**Figure 75: Control Plane Cabling for a 2+2 Multi-Chassis System**



**Table 24: RP Cards to SC-SW Card Connections (2+2 Configuration)**

From Line Card Chassis	LCC RP Port	To SC-SW Cards in Fabric Card Chassis
LCC0	RP0, EXP0	FCC0, SC0 any switch port
	RP1, EXP0	FCC0, SC0 any switch port
	RP0, EXP1	FCC1, SC0 any switch port
	RP1, EXP1	FCC1, SC0 any switch port

From Line Card Chassis	LCC RP Port	To SC-SW Cards in Fabric Card Chassis
LCC1	RP0, EXP0	FCC0, SC0 any switch port
	RP1, EXP0	FCC0, SC0 any switch port
	RP0, EXP1	FCC1, SC0 any switch port
	RP1, EXP1	FCC1, SC0 any switch port

**Table 25: SC-SW and SC Card Connections (2+2 Configuration)**

From SC-SW Card	To SC-SW Card
FCC0, SC0 EXP0	FCC0, SC0 any switch port
FCC0, SC0 EXP1	FCC1, SC0 any switch port
FCC1, SC0 EXP0	FCC0, SC0 any switch port
FCC1, SC0 EXP1	FCC1, SC0 any switch port
FCC0, SC0 HS0 (40GE)	FCC1, SC0 HS0 (40GE)
FCC0, SC0 HS1 (40GE)	FCC1, SC0 HS1 (40GE)
From SC Card	To SC-SW Card
FCC0, SC1 EXP0	FCC0, SC0 any switch port
FCC0, SC1 EXP1	FCC1, SC0 any switch port
FCC1, SC1 EXP0	FCC0, SC0 any switch port
FCC1, SC1 EXP1	FCC1, SC0 any switch port

## Cabling the Fabric

This section describes how to configure the fabric cabling between the LCCs and the fabric components in the FCCs. The fabric provides the data connection for router traffic between all the CXP optical ports in the LCCs. The fabric cabling must be completed to enable data communications through the Cisco NCS 6000 Multi-Chassis system.

## Fabric Overview

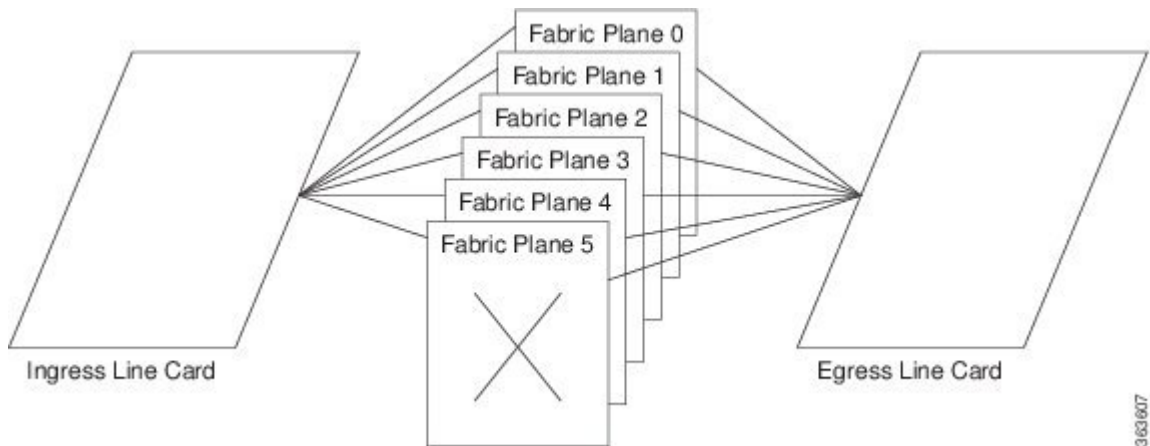
The Cisco NCS 6000 switch fabric is a three-stage cell based architecture with six fabric planes.

In a back-to-back system, the Universal Fabric Card (UFC) in the Cisco NCS 6008 Line Card Chassis (LCC) implements all 3 stage. The Cisco NCS 6000 back-to-back system has six fabric planes that support data traffic between the lines connected to the LCCs. The fabric planes are numbered 0 through 5.

In a multi-chassis system, Stage 1 and Stage 3 (S13) of the fabric are implemented in the Cisco NCS 6008 Line Card Chassis (LCC). Stage 2 (S2) of the fabric is implemented in the Cisco NCS 6000 Fabric Card Chassis (FCC). Inter-stage connections between the LCC the FCC are implemented through a number of bi-directional optical links.

The following figure shows a simplified view of the relationship between the line cards and the fabric. The fabric planes are numbered 0 through 5.

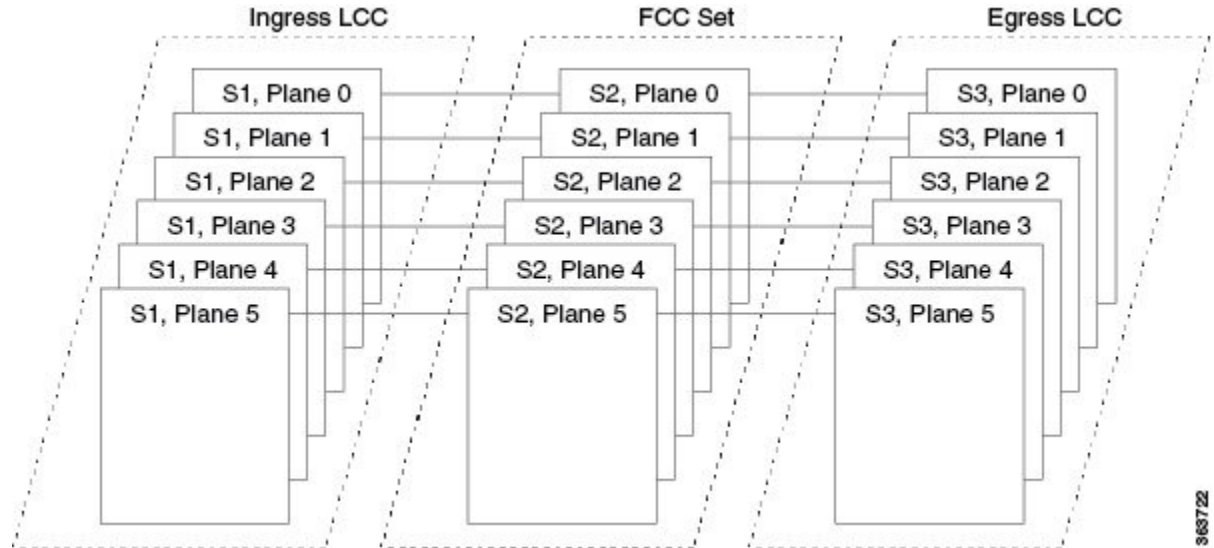
**Figure 76: Relationship of Line Cards and Fabric Cards**



For multi-chassis systems, each fabric plane is divided into three components or stages, which are numbered S1, S2, and S3. Data arrives at the S1 stage in an LCC, passes over the fabric cables to the S2 stage in the

FCC, and then passes over the fabric cables again to the S3 stage in the destination LCC. The following figure shows a simplified view between the LCC and the FCC.

**Figure 77: Fabric Plane Stages**



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## LCC

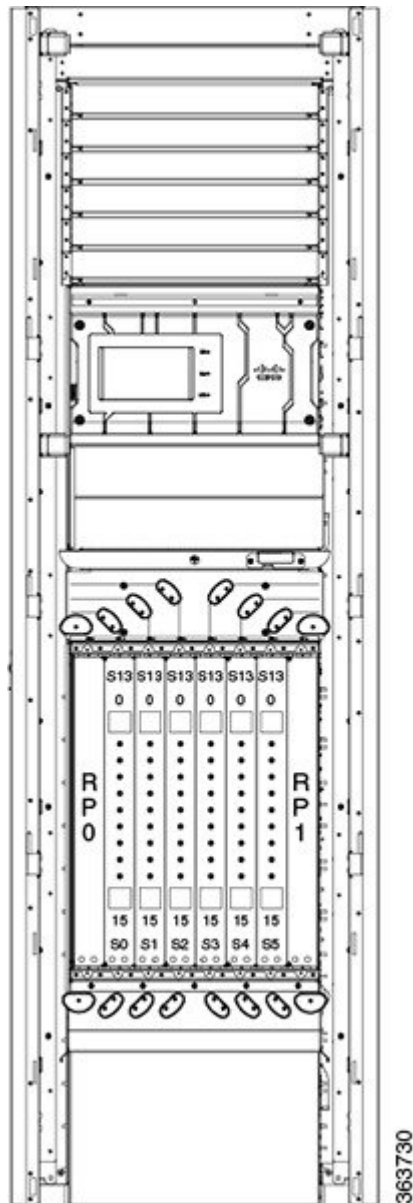
In a back-to-back configuration, each LCC uses six Universal Fabric Cards (UFCs) with 16 CXP (in 1T mode) or CXP2 (in 2T mode) modules each.

In a multi-chassis configuration, the LCC uses either six S13 multi-chassis (MC) fabric cards with 16 CXP modules each that connect to the S2 fabric cards on the FCC (for 1T mode), or six Universal Fabric Cards (UFCs) with 16 CXP2 modules each that connect to the 2nd generation S2 fabric cards on the FCC (for 2T mode).

The planes do not interconnect with each other but operate independently. Because there are a total of six fabric cards in the LCC, the fabric is referred to as having six planes. For example: Slot 0 in LCC0, LCC1, and so forth are all part of plane 0.

The following figure shows the location of the fabric cards in the LCC and how the CXP connectors are labeled. The fabric planes are numbered S0 through S5 and are installed in slot numbers 0 through 5. Each fabric cable connects to one of the FC connectors (0 through 15), and to a single S2 FC in an FCC.

**Figure 78: How S13/UFC Cards are Numbered in the LCC (0 through 5)**



## FCC

The Fabric Card Chassis (FCC) supports up to 12 S2 fabric cards. When multiple FCCs are installed in a multi-chassis system, the S2 fabric cards are distributed across the FCCs. Depending on the maximum number of LCC in the multi-chassis system, each Stage 2 fabric plane consists of one or more S2 fabric cards. Each S2 fabric card supports up to 32 CXP modules. Each 2nd generation S2 fabric card (S2 FC2) supports up to 32 CXP2 modules. The S2 FC's that belong to a plane can be placed in any FCC but it is recommended to

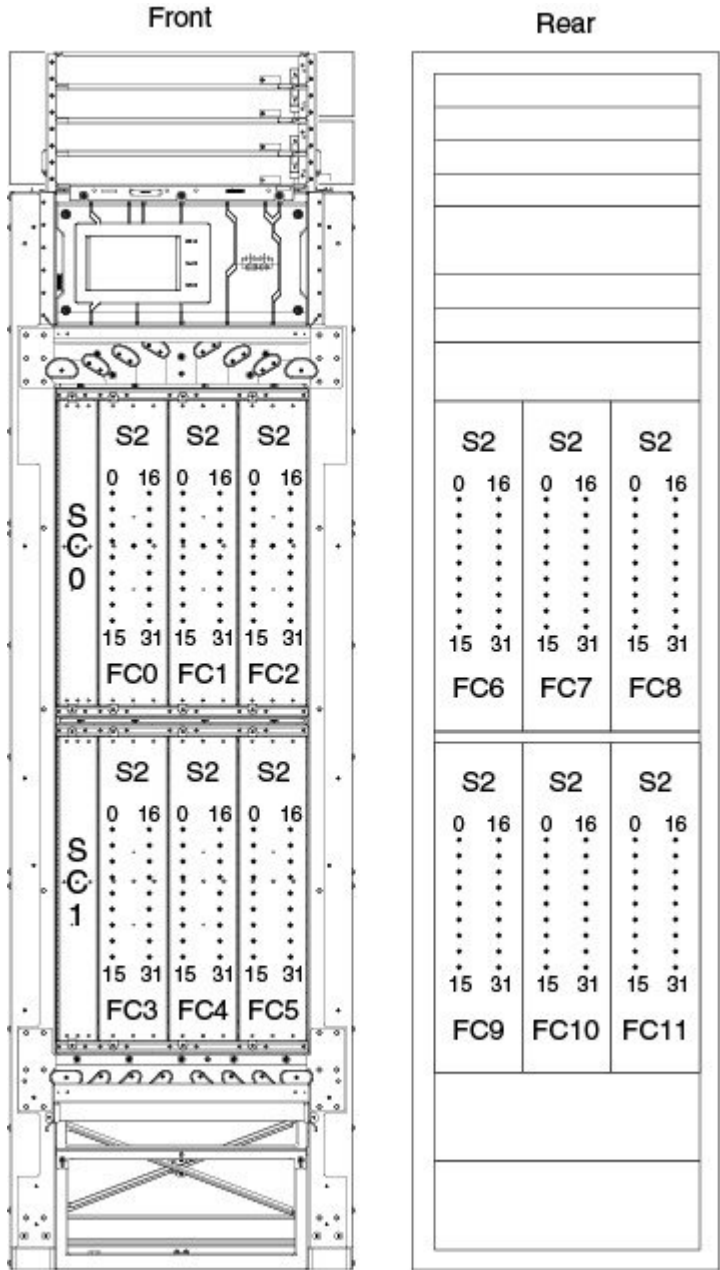
distribute the planes evenly among all the FCCs. As more FCCs are added, the planes are distributed among the FCCs.

Depending on the size of the system (i.e the number of LCCs you want to connect to), a number of S2 FCs can be grouped together as part of the plane. You can have as few as six S2 fabric cards installed in the FCC (only 6 FC slots populated), or as many as 12 S2 fabric cards for a fully populated chassis.

The following figure shows 12 SC FCs installed in an FCC and how the CXP connectors are labeled. Unlike the fabric planes in an LCC, the FCC slots are not preconfigured for specific plane numbers. The plane number

served by a slot is defined during the system configuration. This approach provides the flexibility to distribute the fabric planes between FCCs.

Figure 79: How S2 Cards are Numbered in the FCC (0 though 11)



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## Multi-Chassis 2+1 Configuration

This section describes how to configure a multi-chassis 2+1 configuration. In this configuration, two LCCs (LCC0 and LCC1) connect to one FCC. The configuration differs depending on the number of S2 FCs that are installed in the FCC. The configurations described here include:

**Note**

---

At the LCC end of a fabric cable, the plane number is determined by the slot to which the cable is connected. The other end of each fabric cable must connect to the S2 fabric card designated for the same plane number.

---

### Prerequisites

For connecting the fabric, you need the following:

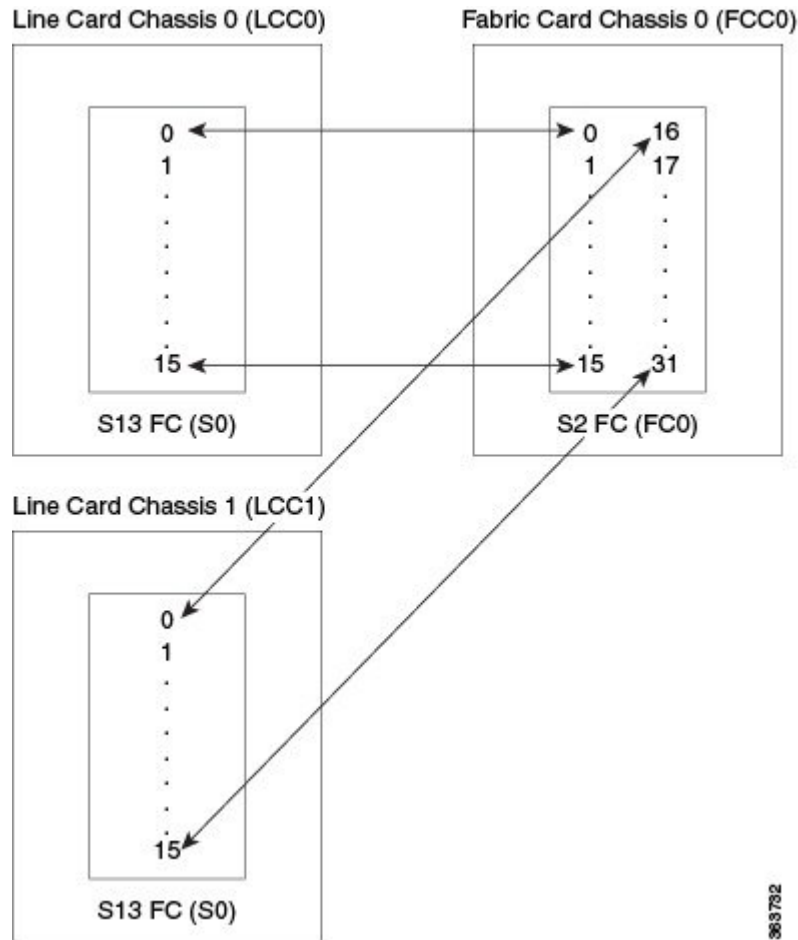
- 192 MPO-24 fiber cables (96 per LCC)
- Optical module sets:
  - **In 1T multi-chassis 2+1 mode:** Four CXP optical module sets (Cisco PID NCS-FAB-OPT). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 CXP-100G-SR12 modules for a total of 384 modules.
  - **In 2T multi-chassis 2+1 mode:** Four CXP2 optical module sets (Cisco PID NCS-FAB-OPT2). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 ONS-CXP2-SR25 modules for a total of 384 modules.

### Configuring a 2+1 Configuration with Six S2 FCs

The following figure shows two line card chassis (LCC0 and LCC1) connected to one fabric card chassis (FCC0) that has six S2 FCs installed. The figure shows the 2+1 connections for one fabric plane. To complete

the configuration, you must repeat the cabling for the remaining five fabric planes until all six S2 cards are connected.

**Figure 80: Cisco NCS 6000 Multi-Chassis 2+1 Configuration (Six S2 Fabric Cards)**



**Table 26: Cabling Plan for LCC0 in a 2+1 Multi-Chassis Configuration with Six S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0		S1/0 to FC1/0		S2/0 to FC2/0		S3/0 to FC3/0		S4/0 to FC4/0		S5/0 to FC5/0	
S0/1 to FC0/1		S1/1 to FC1/1		S2/1 to FC2/1		S3/1 to FC3/1		S4/1 to FC4/1		S5/1 to FC5/1	
S0/2 to FC0/2		S1/2 to FC1/2		S2/2 to FC2/2		S3/2 to FC3/2		S4/2 to FC4/2		S5/2 to FC5/2	
S0/3 to FC0/3		S1/3 to FC1/3		S2/3 to FC2/3		S3/3 to FC3/3		S4/3 to FC4/3		S5/3 to FC5/3	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/4 to FC0/4		S1/4 to FC1/4		S2/4 to FC2/4		S3/4 to FC3/4		S4/4 to FC4/4		S5/4 to FC5/4	
S0/5 to FC0/5		S1/5 to FC1/5		S2/5 to FC2/5		S3/5 to FC3/5		S4/5 to FC4/5		S5/5 to FC5/5	
S0/6 to FC0/6		S1/6 to FC1/6		S2/6 to FC2/6		S3/6 to FC3/6		S4/6 to FC4/6		S5/6 to FC5/6	
S0/7 to FC0/7		S1/7 to FC1/7		S2/7 to FC2/7		S3/7 to FC3/7		S4/7 to FC4/7		S5/7 to FC5/7	
S0/8 to FC0/8		S1/8 to FC1/8		S2/8 to FC1/8		S3/8 to FC3/8		S4/8 to FC4/8		S5/8 to FC5/8	
S0/9 to FC0/9		S1/9 to FC1/9		S2/9 to FC2/9		S3/9 to FC3/9		S4/9 to FC4/9		S5/9 to FC5/9	
S0/10 to FC0/10		S1/10 to FC1/10		S2/10 to FC2/10		S3/10 to FC3/10		S4/10 to FC4/10		S5/10 to FC5/10	
S0/11 to FC0/11		S1/11 to FC1/11		S2/11 to FC2/11		S3/11 to FC3/11		S4/11 to FC4/11		S5/11 to FC5/11	
S0/12 to FC0/12		S1/12 to FC1/12		S2/12 to FC2/12		S3/12 to FC3/12		S4/12 to FC4/12		S5/12 to FC5/12	
S0/13 to FC0/13		S1/13 to FC1/13		S2/13 to FC2/13		S3/13 to FC3/13		S4/13 to FC4/13		S5/13 to FC5/13	
S0/14 to FC0/14		S1/14 to FC1/14		S2/14 to FC2/14		S3/14 to FC3/14		S4/14 to FC4/14		S5/14 to FC5/14	
S0/15 to FC0/15		S1/15 to FC1/15		S2/15 to FC2/15		S3/15 to FC3/15		S4/15 to FC4/15		S5/15 to FC5/15	

**Table 27: Cabling Plan for LCC1 in a 2+1 Multi-Chassis Configuration with Six S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/16		S1/0 to FC1/16		S2/0 to FC2/16		S3/0 to FC3/16		S4/0 to FC4/16		S5/0 to FC5/16	
S0/1 to FC0/17		S1/1 to FC1/17		S2/1 to FC2/17		S3/1 to FC3/17		S4/1 to FC4/17		S5/1 to FC5/17	
S0/2 to FC0/18		S1/2 to FC1/18		S2/2 to FC2/18		S3/2 to FC3/18		S4/2 to FC4/18		S5/2 to FC5/18	
S0/3 to FC0/19		S1/3 to FC1/19		S2/3 to FC2/19		S3/3 to FC3/19		S4/3 to FC4/19		S5/3 to FC5/19	
S0/4 to FC0/20		S1/4 to FC1/20		S2/4 to FC2/20		S3/4 to FC3/20		S4/4 to FC4/20		S5/4 to FC5/20	
S0/5 to FC0/21		S1/5 to FC1/21		S2/5 to FC2/21		S3/5 to FC3/21		S4/5 to FC4/21		S5/5 to FC5/21	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/6 to FC0/22		S1/6 to FC1/22		S2/6 to FC2/22		S3/6 to FC3/22		S4/6 to FC4/22		S5/6 to FC5/22	
S0/7 to FC0/23		S1/7 to FC1/23		S2/7 to FC2/23		S3/7 to FC3/23		S4/7 to FC4/23		S5/7 to FC5/23	
S0/8 to FC0/24		S1/8 to FC1/24		S2/8 to FC2/24		S3/8 to FC3/24		S4/8 to FC4/24		S5/8 to FC5/24	
S0/9 to FC0/25		S1/9 to FC1/25		S2/9 to FC2/25		S3/9 to FC3/25		S4/9 to FC4/25		S5/9 to FC5/25	
S0/10 to FC0/26		S1/10 to FC1/26		S2/10 to FC2/26		S3/10 to FC3/26		S4/10 to FC4/26		S5/10 to FC5/26	
S0/11 to FC0/27		S1/11 to FC1/27		S2/11 to FC2/27		S3/11 to FC3/27		S4/11 to FC4/27		S5/11 to FC5/27	
S0/12 to FC0/28		S1/12 to FC1/28		S2/12 to FC2/28		S3/12 to FC3/28		S4/12 to FC4/28		S5/12 to FC5/28	
S0/13 to FC0/29		S1/13 to FC1/29		S2/13 to FC2/29		S3/13 to FC3/29		S4/13 to FC4/29		S5/13 to FC5/29	
S0/14 to FC0/30		S1/14 to FC1/30		S2/14 to FC2/30		S3/14 to FC3/30		S4/14 to FC4/30		S5/14 to FC5/30	
S0/15 to FC0/31		S1/15 to FC1/31		S2/15 to FC2/31		S3/15 to FC3/31		S4/15 to FC4/31		S5/15 to FC5/31	

## 2+1 Software Configuration (Six S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```
controller fabric plane 0
instance 0
location F0/FC0
```

```
controller fabric plane 1
instance 0
location F0/FC1
```

```
controller fabric plane 2
instance 0
location F0/FC2
```

```
controller fabric plane 3
instance 0
location F0/FC3
```

```
controller fabric plane 4
instance 0
location F0/FC4
```

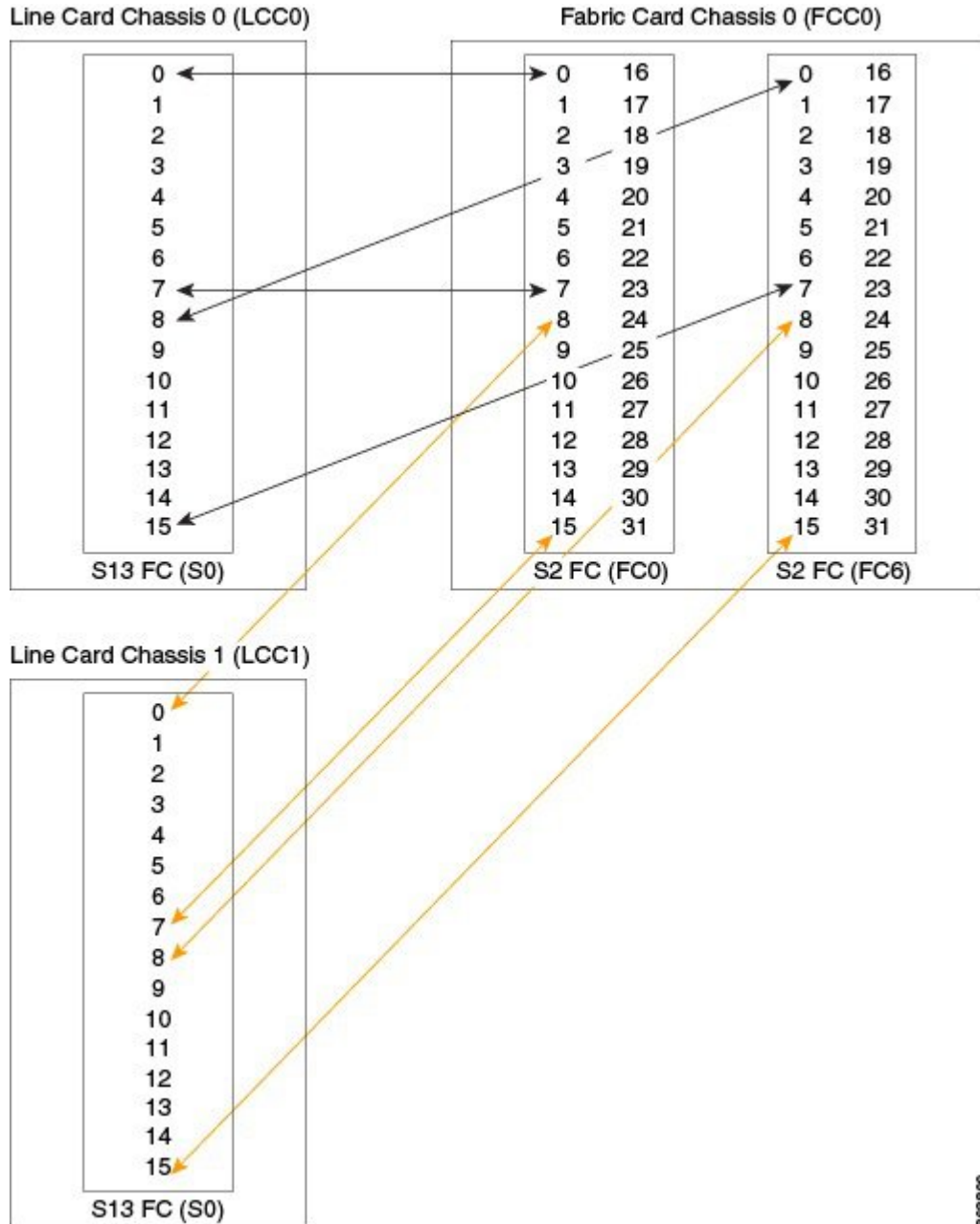
```
controller fabric plane 5
instance 0
location F0/FC5
```

## Configuring a 2+1 Configuration with 12 S2 FCs

The following figure shows two line card chassis (LCC0 and LCC1) connected to one fabric card chassis (FCC0) that has 12 S2 FCs installed. The advantage of installing 12 S2 FCs cards instead of 6 S2 FCs cards is that only half of the available S2 ports are used. This allows up to two additional LCCs to be added later without having to re-cable the initial 2 LCCs.

The figure below shows the connections for one fabric plane. To complete the configuration, you must repeat the cabling for the remaining five fabric planes until all 12 S2 FCs cards are connected.

**Figure 81: Cisco NCS 6000 Multi-Chassis 2+1 Configuration (12 S2 FCs)**



363800

**Table 28: Cabling Plan for LCC0 in a 2+1 Multi-Chassis Configuration with 12 S2 Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0		S1/0 to FC1/0		S2/0 to FC2/0		S3/0 to FC3/0		S4/0 to FC4/0		S5/0 to FC5/0	
S0/1 to FC0/1		S1/1 to FC1/1		S2/1 to FC2/1		S3/1 to FC3/1		S4/1 to FC4/1		S5/1 to FC5/1	
S0/2 to FC0/2		S1/2 to FC1/2		S2/2 to FC2/2		S3/2 to FC3/2		S4/2 to FC4/2		S5/2 to FC5/2	
S0/3 to FC0/3		S1/3 to FC1/3		S2/3 to FC2/3		S3/3 to FC3/3		S4/3 to FC4/3		S5/3 to FC5/3	
S0/4 to FC0/4		S1/4 to FC1/4		S2/4 to FC2/4		S3/4 to FC3/4		S4/4 to FC4/4		S5/4 to FC5/4	
S0/5 to FC0/5		S1/5 to FC1/5		S2/5 to FC2/5		S3/5 to FC3/5		S4/5 to FC4/5		S5/5 to FC5/5	
S0/6 to FC0/6		S1/6 to FC1/6		S2/6 to FC2/6		S3/6 to FC3/6		S4/6 to FC4/6		S5/6 to FC5/6	
S0/7 to FC0/7		S1/7 to FC1/7		S2/7 to FC2/7		S3/7 to FC3/7		S4/7 to FC4/7		S5/7 to FC5/7	
S0/8 to FC6/0		S1/8 to FC7/0		S2/8 to FC8/0		S3/8 to FC9/0		S4/8 to FC10/0		S5/8 to FC11/0	
S0/9 to FC6/1		S1/9 to FC7/1		S2/9 to FC8/1		S3/9 to FC9/1		S4/9 to FC10/1		S5/9 to FC11/1	
S0/10 to FC6/2		S1/10 to FC7/2		S2/10 to FC8/2		S3/10 to FC9/2		S4/10 to FC10/2		S5/10 to FC11/2	
S0/11 to FC6/3		S1/11 to FC7/3		S2/11 to FC8/3		S3/11 to FC9/3		S4/11 to FC10/3		S5/11 to FC11/3	
S0/12 to FC6/4		S1/12 to FC7/4		S2/12 to FC8/4		S3/12 to FC9/4		S4/12 to FC10/4		S5/12 to FC11/4	
S0/13 to FC6/5		S1/13 to FC7/5		S2/13 to FC8/5		S3/13 to FC9/5		S4/13 to FC10/5		S5/13 to FC11/5	
S0/14 to FC6/6		S1/14 to FC7/6		S2/14 to FC8/6		S3/14 to FC9/6		S4/14 to FC10/6		S5/14 to FC11/6	
S0/15 to FC6/7		S1/15 to FC7/7		S2/15 to FC8/7		S3/15 to FC9/7		S4/15 to FC10/7		S5/15 to FC11/7	

**Table 29: Cabling Plan for LCC1 in a 2+1 Multi-Chassis Configuration with 12 S2 Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/8		S1/0 to FC1/8		S2/0 to FC2/8		S3/0 to FC3/8		S4/0 to FC4/8		S5/0 to FC5/8	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/1 to FC0/9		S1/1 to FC1/9		S2/1 to FC2/9		S3/1 to FC3/9		S4/1 to FC4/9		S5/1 to FC5/9	
S0/2 to FC0/10		S1/2 to FC1/10		S2/2 to FC2/10		S3/2 to FC3/10		S4/2 to FC4/10		S5/2 to FC5/10	
S0/3 to FC0/11		S1/3 to FC1/11		S2/3 to FC2/11		S3/3 to FC3/11		S4/3 to FC4/11		S5/3 to FC5/11	
S0/4 to FC0/12		S1/4 to FC1/12		S2/4 to FC2/12		S3/4 to FC3/12		S4/4 to FC4/12		S5/4 to FC5/12	
S0/5 to FC0/13		S1/5 to FC1/13		S2/5 to FC2/13		S3/5 to FC3/13		S4/5 to FC4/13		S5/5 to FC5/13	
S0/6 to FC0/14		S1/6 to FC1/14		S2/6 to FC2/14		S3/6 to FC3/14		S4/6 to FC4/14		S5/6 to FC5/14	
S0/7 to FC0/15		S1/7 to FC1/15		S2/7 to FC2/15		S3/7 to FC3/15		S4/7 to FC4/15		S5/7 to FC5/15	
S0/8 to FC6/8		S1/8 to FC7/8		S2/8 to FC8/8		S3/8 to FC9/8		S4/8 to FC10/8		S5/8 to FC11/8	
S0/9 to FC6/9		S1/9 to FC7/9		S2/9 to FC8/9		S3/9 to FC9/9		S4/9 to FC10/9		S5/9 to FC11/9	
S0/10 to FC6/10		S1/10 to FC7/10		S2/10 to FC8/10		S3/10 to FC9/10		S4/10 to FC10/10		S5/10 to FC11/10	
S0/11 to FC6/11		S1/11 to FC7/11		S2/11 to FC8/11		S3/11 to FC9/11		S4/11 to FC10/11		S5/11 to FC11/11	
S0/12 to FC6/12		S1/12 to FC7/12		S2/12 to FC8/12		S3/12 to FC9/12		S4/12 to FC10/12		S5/12 to FC11/12	
S0/13 to FC6/13		S1/13 to FC7/13		S2/13 to FC8/13		S3/13 to FC9/13		S4/13 to FC10/13		S5/13 to FC11/13	
S0/14 to FC6/14		S1/14 to FC7/14		S2/14 to FC8/14		S3/14 to FC9/14		S4/14 to FC10/14		S5/14 to FC11/14	
S0/15 to FC6/15		S1/15 to FC7/15		S2/15 to FC8/15		S3/15 to FC9/15		S4/15 to FC10/15		S5/15 to FC11/15	

## 2+1 Software Configuration (12 S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```

controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F0/FC6

controller fabric plane 1
instance 0
location F0/FC1
instance 1
location F0/FC7

```



```
controller fabric plane 2
instance 0
location F0/FC2
instance 1
location F0/FC8

controller fabric plane 3
instance 0
location F0/FC3
instance 1
location F0/FC9

controller fabric plane 4
instance 0
location F0/FC4
instance 1
location F0/FC10

controller fabric plane 5
instance 0
location F0/FC5
instance 1
location F0/FC11
```

## Multi-Chassis 2+2 Configuration

This section describes how to configure a multi-chassis 2+2 configuration. In this configuration, two line card chassis (LCC0 and LCC1) are connected to two fabric card chassis (FCC0 and FCC1).

### Prerequisites

For connecting the fabric, you need the following:

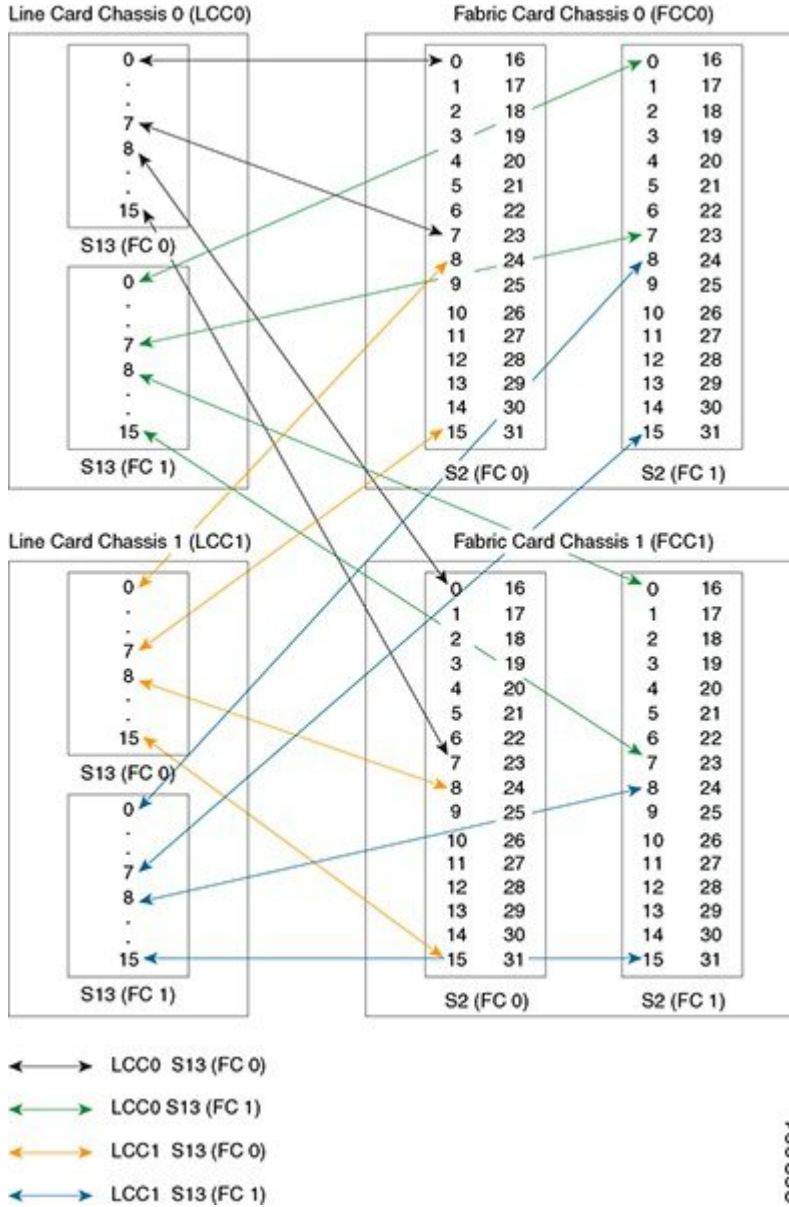
- 192 MPO-24 fiber cables (96 per LCC)
- Optical module sets:
  - **In 1T multi-chassis 2+2 mode:** Four CXP optical module sets (Cisco PID NCS-FAB-OPT). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 CXP-100G-SR12 modules for a total of 384 modules.
  - **In 2T multi-chassis 2+2 mode:** Four CXP2 optical module sets (Cisco PID NCS-FAB-OPT2). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 ONS-CXP2-SR25 modules for a total of 384 modules.

### Configuring a 2+2 Configuration with 12 S2 Fabric Cards

The following shows two line card chassis (LCC0 and LCC1) connected to two fabric card chassis (FCC0 and FCC1). In this configuration, there are 6 FCs in each fabric card chassis; in total 12 FCs are installed.

The figure shows the 2+2 connections for two fabric planes. To complete the configuration, you must repeat the cabling for the remaining four fabric planes until all 12 S2 cards are connected.

**Figure 82: Cisco NCS 6000 Multi-Chassis 2+2 Configuration with 12 S2 FC s**



The following table shows the cabling plan for a 2+2 multi-chassis configuration with 12 SC FCs installed. FCC0 has a fabric instance 0 for planes 0 through 5 in FCC0 (6 SC FCs in slots 0 through 5), and fabric instance 1 in FCC1 (also in slots 0 through 5). Other mappings are possible (for example, you can put both instances of planes 0 through 2 in FCC0, and planes 3 through 5 in FCC1 but the following table and software configuration assume that instance 0 is in FCC0 and instance 1 is in FCC1).

Table 30: Cabling Plan for LCC0 in a 2+2 Multi-Chassis Configuration with 12 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0 (FCC0)		S1/0 to FC1/0 (FCC0)		S2/0 to FC2/0 (FCC0)		S3/0 to FC3/0 (FCC0)		S4/0 to FC4/0 (FCC0)		S5/0 to FC5/0 (FCC0)	
S0/1 to FC0/1 (FCC0)		S1/1 to FC1/1 (FCC0)		S2/1 to FC2/1 (FCC0)		S3/1 to FC3/1 (FCC0)		S4/1 to FC4/1 (FCC0)		S5/1 to FC5/1 (FCC0)	
S0/2 to FC0/2 (FCC0)		S1/2 to FC1/2 (FCC0)		S2/2 to FC2/2 (FCC0)		S3/2 to FC3/2 (FCC0)		S4/2 to FC4/2 (FCC0)		S5/2 to FC5/2 (FCC0)	
S0/3 to FC0/3 (FCC0)		S1/3 to FC1/3 (FCC0)		S2/3 to FC2/3 (FCC0)		S3/3 to FC3/3 (FCC0)		S4/3 to FC4/3 (FCC0)		S5/3 to FC5/3 (FCC0)	
S0/4 to FC0/4 (FCC0)		S1/4 to FC1/4 (FCC0)		S2/4 to FC2/4 (FCC0)		S3/4 to FC3/4 (FCC0)		S4/4 to FC4/4 (FCC0)		S5/4 to FC5/4 (FCC0)	
S0/5 to FC0/5 (FCC0)		S1/5 to FC1/5 (FCC0)		S2/5 to FC2/5 (FCC0)		S3/5 to FC3/5 (FCC0)		S4/5 to FC4/5 (FCC0)		S5/5 to FC5/5 (FCC0)	
S0/6 to FC0/6 (FCC0)		S1/6 to FC1/6 (FCC0)		S2/6 to FC2/6 (FCC0)		S3/6 to FC3/6 (FCC0)		S4/6 to FC4/6 (FCC0)		S5/6 to FC5/6 (FCC0)	
S0/7 to FC0/7 (FCC0)		S1/7 to FC1/7 (FCC0)		S2/7 to FC2/7 (FCC0)		S3/7 to FC3/7 (FCC0)		S4/7 to FC4/7 (FCC0)		S5/7 to FC5/7 (FCC0)	
S0/8 to FC0/0 (FCC1)		S1/8 to FC1/0 (FCC1)		S2/8 to FC2/0 (FCC1)		S3/8 to FC3/0 (FCC1)		S4/8 to FC4/0 (FCC1)		S5/8 to FC5/0 (FCC1)	
S0/9 to FC0/2 (FCC1)		S1/9 to FC1/1 (FCC1)		S2/9 to FC2/1 (FCC1)		S3/9 to FC3/1 (FCC1)		S4/9 to FC4/1 (FCC1)		S5/9 to FC5/1 (FCC1)	
S0/10 to FC0/2 (FCC1)		S1/10 to FC1/2 (FCC1)		S2/10 to FC2/2 (FCC1)		S3/10 to FC3/2 (FCC1)		S4/10 to FC4/2 (FCC1)		S5/10 to FC5/2 (FCC1)	
S0/11 to FC0/3 (FCC1)		S1/11 to FC1/3 (FCC1)		S2/11 to FC2/3 (FCC1)		S3/11 to FC3/3 (FCC1)		S4/11 to FC4/3 (FCC1)		S5/11 to FC5/3 (FCC1)	
S0/12 to FC0/4 (FCC1)		S1/12 to FC1/4 (FCC1)		S2/12 to FC2/4 (FCC1)		S3/12 to FC3/4 (FCC1)		S4/12 to FC4/4 (FCC1)		S5/12 to FC5/4 (FCC1)	
S0/13 to FC0/5 (FCC1)		S1/13 to FC1/5 (FCC1)		S2/13 to FC2/5 (FCC1)		S3/13 to FC3/5 (FCC1)		S4/13 to FC4/5 (FCC1)		S5/13 to FC5/5 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/14 to FC0/5 (FCC1)		S1/14 to FC1/6 (FCC1)		S2/14 to FC2/6 (FCC1)		S3/14 to FC3/6 (FCC1)		S4/14 to FC4/6 (FCC1)		S5/14 to FC5/6 (FCC1)	
S0/15 to FC0/7 (FCC1)		S1/15 to FC1/7 (FCC1)		S2/15 to FC2/7 (FCC1)		S3/15 to FC3/7 (FCC1)		S4/15 to FC4/7 (FCC1)		S5/15 to FC5/7 (FCC1)	

Table 31: Cabling Plan for LCC1 in a 2+2 Multi-Chassis Configuration with 12 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/8 (FCC0)		S1/0 to FC1/8 (FCC0)		S2/0 to FC2/8 (FCC0)		S3/0 to FC3/8 (FCC0)		S4/0 to FC4/8 (FCC0)		S5/0 to FC5/8 (FCC0)	
S0/1 to FC0/9 (FCC0)		S1/1 to FC1/9 (FCC0)		S2/1 to FC2/9 (FCC0)		S3/1 to FC3/9 (FCC0)		S4/1 to FC4/9 (FCC0)		S5/1 to FC5/9 (FCC0)	
S0/2 to FC0/10 (FCC0)		S1/2 to FC1/10 (FCC0)		S2/2 to FC2/10 (FCC0)		S3/2 to FC3/10 (FCC0)		S4/2 to FC4/10 (FCC0)		S5/2 to FC5/10 (FCC0)	
S0/3 to FC0/11 (FCC0)		S1/3 to FC1/11 (FCC0)		S2/3 to FC2/11 (FCC0)		S3/3 to FC3/11 (FCC0)		S4/3 to FC4/11 (FCC0)		S5/3 to FC5/11 (FCC0)	
S0/4 to FC0/12 (FCC0)		S1/4 to FC1/12 (FCC0)		S2/4 to FC2/12 (FCC0)		S3/4 to FC3/12 (FCC0)		S4/4 to FC4/12 (FCC0)		S5/4 to FC5/12 (FCC0)	
S0/5 to FC0/13 (FCC0)		S1/5 to FC1/13 (FCC0)		S2/5 to FC2/13 (FCC0)		S3/5 to FC3/13 (FCC0)		S4/5 to FC4/13 (FCC0)		S5/5 to FC5/13 (FCC0)	
S0/6 to FC0/14 (FCC0)		S1/6 to FC1/14 (FCC0)		S2/6 to FC2/14 (FCC0)		S3/6 to FC3/14 (FCC0)		S4/6 to FC4/14 (FCC0)		S5/6 to FC5/14 (FCC0)	
S0/7 to FC0/15 (FCC0)		S1/7 to FC1/15 (FCC0)		S2/7 to FC2/15 (FCC0)		S3/7 to FC3/15 (FCC0)		S4/7 to FC4/15 (FCC0)		S5/7 to FC5/15 (FCC0)	
S0/8 to FC0/8 (FCC1)		S1/8 to FC1/8 (FCC1)		S2/8 to FC2/8 (FCC1)		S3/8 to FC3/8 (FCC1)		S4/8 to FC4/8 (FCC1)		S5/8 to FC5/8 (FCC1)	
S0/9 to FC0/9 (FCC1)		S1/9 to FC1/9 (FCC1)		S2/9 to FC2/9 (FCC1)		S3/9 to FC3/9 (FCC1)		S4/9 to FC4/9 (FCC1)		S5/9 to FC5/9 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/10 to FC0/10 (FCC1)		S1/10 to FC1/10 (FCC1)		S2/10 to FC2/10 (FCC1)		S3/10 to FC3/10 (FCC1)		S4/10 to FC4/10 (FCC1)		S5/10 to FC5/10 (FCC1)	
S0/11 to FC0/11 (FCC1)		S1/11 to FC1/11 (FCC1)		S2/11 to FC2/11 (FCC1)		S3/11 to FC3/11 (FCC1)		S4/11 to FC4/11 (FCC1)		S5/11 to FC5/11 (FCC1)	
S0/12 to FC0/12 (FCC1)		S1/12 to FC1/12(FCC1)		S2/12 to FC2/12 (FCC1)		S3/12 to FC3/12 (FCC1)		S4/12 to FC4/12 (FCC1)		S5/12 to FC5/12 (FCC1)	
S0/13 to FC0/13 (FCC1)		S1/13 to FC1/13 (FCC1)		S2/13 to FC2/13 (FCC1)		S3/13 to FC3/13 (FCC1)		S4/13 to FC4/13 (FCC1)		S5/13 to FC5/13 (FCC1)	
S0/14 to FC0/14 (FCC1)		S1/14 to FC1/14 (FCC1)		S2/14 to FC2/14 (FCC1)		S3/14 to FC3/14 (FCC1)		S4/14 to FC4/14 (FCC1)		S5/14 to FC5/14 (FCC1)	
S0/15 to FC0/15 (FCC1)		S1/15 to FC1/15 (FCC1)		S2/15 to FC2/15 (FCC1)		S3/15 to FC3/15 (FCC1)		S4/15 to FC4/15 (FCC1)		S5/15 to FC5/15 (FCC1)	

## 2+2 Software Configuration (12 S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```

controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F1/FC0

controller fabric plane 1
instance 0
location F0/FC1
instance 1
location F1/FC1

controller fabric plane 2
instance 0
location F0/FC2
instance 1
location F1/FC2

controller fabric plane 3
instance 0
location F0/FC3
instance 1
location F1/FC3

controller fabric plane 4
instance 0
location F0/FC4
instance 1
location F1/FC4

```

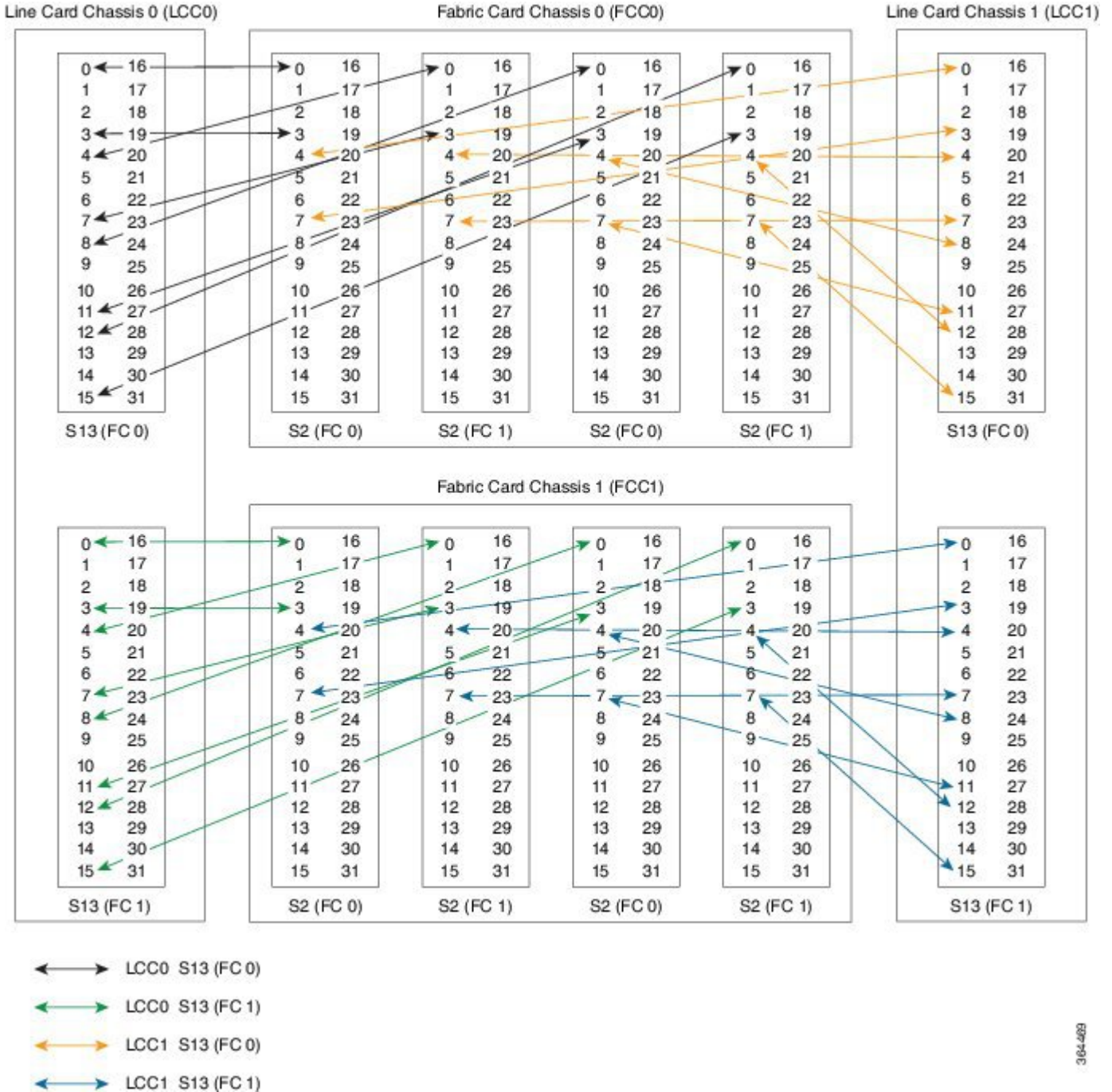
```
controller fabric plane 5
instance 0
location F0/FC5
instance 1
location F1/FC5
```

## Configuring a 2+2 Configuration with 24 S2 Fabric Cards

The following figure shows four line card chassis (LCC0 and LCC1) connected to two fabric card chassis (FCC0 and FCC1). In this configuration, there are 12 FCs in each fabric card chassis; in total 24 FCs are

installed. The figure shows the 2+2 connections for two fabric planes. To complete the configuration, you must repeat the cabling for the remaining four fabric planes until all 24 S2 cards are connected.

Figure 83: Cisco NCS 6000 Multi-Chassis 2+2 Configuration with 24 S2 FC s



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The following table shows the cabling plan for a 2+2 multi-chassis configuration with 24 SC FCs installed. The FCC0 has the fabric instances 0 through 5 for planes 0, 2, and 4. The FCC1 has the fabric instances 0 through 5 for planes 1, 3, and 5.

**Table 32: Cabling Plan for LCC0 in a 2+2 Multi-Chassis Configuration with 24 S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0 (FCC0)		S1/0 to FC0/0 (FCC1)		S2/0 to FC4/0 (FCC0)		S3/0 to FC4/0 (FCC1)		S4/0 to FC8/0 (FCC0)		S5/0 to FC8/0 (FCC1)	
S0/1 to FC0/1 (FCC0)		S1/1 to FC0/1 (FCC1)		S2/1 to FC4/1 (FCC0)		S3/1 to FC4/1 (FCC1)		S4/1 to FC8/1 (FCC0)		S5/1 to FC8/1 (FCC1)	
S0/2 to FC0/2 (FCC0)		S1/2 to FC0/2 (FCC1)		S2/2 to FC4/2 (FCC0)		S3/2 to FC4/2 (FCC1)		S4/2 to FC8/2 (FCC0)		S5/2 to FC8/2 (FCC1)	
S0/3 to FC0/3 (FCC0)		S1/3 to FC0/3 (FCC1)		S2/3 to FC4/3 (FCC0)		S3/3 to FC4/3 (FCC1)		S4/3 to FC8/3 (FCC0)		S5/3 to FC8/3 (FCC1)	
S0/4 to FC1/0 (FCC0)		S1/4 to FC1/0 (FCC1)		S2/4 to FC5/0 (FCC0)		S3/4 to FC5/0 (FCC1)		S4/4 to FC9/0 (FCC0)		S5/4 to FC9/0 (FCC1)	
S0/5 to FC1/1 (FCC0)		S1/5 to FC1/1 (FCC1)		S2/5 to FC5/1 (FCC0)		S3/5 to FC5/1 (FCC1)		S4/5 to FC9/1 (FCC0)		S5/5 to FC9/1 (FCC1)	
S0/6 to FC1/2 (FCC0)		S1/6 to FC1/2 (FCC1)		S2/6 to FC5/2 (FCC0)		S3/6 to FC5/2 (FCC1)		S4/6 to FC9/2 (FCC0)		S5/6 to FC9/2 (FCC1)	
S0/7 to FC1/3 (FCC0)		S1/7 to FC1/3 (FCC1)		S2/7 to FC5/3 (FCC0)		S3/7 to FC5/3 (FCC1)		S4/7 to FC9/3 (FCC0)		S5/7 to FC9/3 (FCC1)	
S0/8 to FC2/0 (FCC0)		S1/8 to FC2/0 (FCC1)		S2/8 to FC6/0 (FCC0)		S3/8 to FC6/0 (FCC1)		S4/8 to FC10/0 (FCC0)		S5/8 to FC10/0 (FCC1)	
S0/9 to FC2/1 (FCC0)		S1/9 to FC2/1 (FCC1)		S2/9 to FC6/1 (FCC0)		S3/9 to FC6/1 (FCC1)		S4/9 to FC10/1 (FCC0)		S5/9 to FC10/1 (FCC1)	
S0/10 to FC2/2 (FCC0)		S1/10 to FC2/2 (FCC1)		S2/10 to FC6/2 (FCC0)		S3/10 to FC6/2 (FCC1)		S4/10 to FC10/2 (FCC0)		S5/10 to FC10/2 (FCC1)	
S0/11 to FC2/3 (FCC0)		S1/11 to FC2/3 (FCC1)		S2/11 to FC6/3 (FCC0)		S3/11 to FC6/3 (FCC1)		S4/11 to FC10/3 (FCC0)		S5/11 to FC10/3 (FCC1)	
S0/12 to FC3/0 (FCC0)		S1/12 to FC3/0 (FCC1)		S2/12 to FC7/0 (FCC0)		S3/12 to FC7/0 (FCC1)		S4/12 to FC11/0 (FCC0)		S5/12 to FC11/0 (FCC1)	



Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/13 to FC3/1 (FCC0)		S1/13 to FC3/1 (FCC1)		S2/13 to FC7/1 (FCC0)		S3/13 to FC7/1 (FCC1)		S4/13 to FC11/1 (FCC0)		S5/13 to FC11/1 (FCC1)	
S0/14 to FC3/2 (FCC0)		S1/14 to FC3/2 (FCC1)		S2/14 to FC7/2 (FCC0)		S3/14 to FC7/2 (FCC1)		S4/14 to FC11/2 (FCC0)		S5/14 to FC11/2 (FCC1)	
S0/15 to FC3/3 (FCC0)		S1/15 to FC3/3 (FCC1)		S2/15 to FC7/3 (FCC0)		S3/15 to FC7/3 (FCC1)		S4/15 to FC11/3 (FCC0)		S5/15 to FC11/3 (FCC1)	

**Table 33: Cabling Plan for LCC1 in a 2+2 Multi-Chassis Configuration with 24 S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/4 (FCC0)		S1/0 to FC0/4 (FCC1)		S2/0 to FC4/4 (FCC0)		S3/0 to FC4/4 (FCC1)		S4/0 to FC8/4 (FCC0)		S5/0 to FC8/4 (FCC1)	
S0/1 to FC0/5 (FCC0)		S1/1 to FC0/5 (FCC1)		S2/1 to FC4/5 (FCC0)		S3/1 to FC4/5 (FCC1)		S4/1 to FC8/5 (FCC0)		S5/1 to FC8/5 (FCC1)	
S0/2 to FC0/6 (FCC0)		S1/2 to FC0/6 (FCC1)		S2/2 to FC4/6 (FCC0)		S3/2 to FC4/6 (FCC1)		S4/2 to FC8/6 (FCC0)		S5/2 to FC8/6 (FCC1)	
S0/3 to FC0/7 (FCC0)		S1/3 to FC0/7 (FCC1)		S2/3 to FC4/7 (FCC0)		S3/3 to FC4/7 (FCC1)		S4/3 to FC8/7 (FCC0)		S5/3 to FC8/7 (FCC1)	
S0/4 to FC1/4 (FCC0)		S1/4 to FC1/4 (FCC1)		S2/4 to FC5/4 (FCC0)		S3/4 to FC5/4 (FCC1)		S4/4 to FC9/4 (FCC0)		S5/4 to FC9/4 (FCC1)	
S0/5 to FC1/5 (FCC0)		S1/5 to FC1/5 (FCC1)		S2/5 to FC5/5 (FCC0)		S3/5 to FC5/5 (FCC1)		S4/5 to FC9/5 (FCC0)		S5/5 to FC9/5 (FCC1)	
S0/6 to FC1/6 (FCC0)		S1/6 to FC1/6 (FCC1)		S2/6 to FC5/6 (FCC0)		S3/6 to FC5/6 (FCC1)		S4/6 to FC9/6 (FCC0)		S5/6 to FC9/6 (FCC1)	
S0/7 to FC1/7 (FCC0)		S1/7 to FC1/7 (FCC1)		S2/7 to FC5/7 (FCC0)		S3/7 to FC5/7 (FCC1)		S4/7 to FC9/7 (FCC0)		S5/7 to FC9/7 (FCC1)	
S0/8 to FC2/4 (FCC0)		S1/8 to FC2/4 (FCC1)		S2/8 to FC6/4 (FCC0)		S3/8 to FC6/4 (FCC1)		S4/8 to FC10/4 (FCC0)		S5/8 to FC10/4 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/9 to FC2/5 (FCC0)		S1/9 to FC2/5 (FCC1)		S2/9 to FC6/5 (FCC0)		S3/9 to FC6/5 (FCC1)		S4/9 to FC10/5 (FCC0)		S5/9 to FC10/5 (FCC1)	
S0/10 to FC2/6 (FCC0)		S1/10 to FC2/6 (FCC1)		S2/10 to FC6/6 (FCC0)		S3/10 to FC6/6 (FCC1)		S4/10 to FC10/6 (FCC0)		S5/10 to FC10/6 (FCC1)	
S0/11 to FC2/7 (FCC0)		S1/11 to FC2/7 (FCC1)		S2/11 to FC6/7 (FCC0)		S3/11 to FC6/7 (FCC1)		S4/11 to FC10/7 (FCC0)		S5/11 to FC10/7 (FCC1)	
S0/12 to FC3/4 (FCC0)		S1/12 to FC3/4 (FCC1)		S2/12 to FC7/4 (FCC0)		S3/12 to FC7/4 (FCC1)		S4/12 to FC11/4 (FCC0)		S5/12 to FC11/4 (FCC1)	
S0/13 to FC3/5 (FCC0)		S1/13 to FC3/5 (FCC1)		S2/13 to FC7/5 (FCC0)		S3/13 to FC7/5 (FCC1)		S4/13 to FC11/5 (FCC0)		S5/13 to FC11/5 (FCC1)	
S0/14 to FC3/6 (FCC0)		S1/14 to FC3/6 (FCC1)		S2/14 to FC7/6 (FCC0)		S3/14 to FC7/6 (FCC1)		S4/14 to FC11/6 (FCC0)		S5/14 to FC11/6 (FCC1)	
S0/15 to FC3/7 (FCC0)		S1/15 to FC3/7 (FCC1)		S2/15 to FC7/7 (FCC0)		S3/15 to FC7/7 (FCC1)		S4/15 to FC11/7 (FCC0)		S5/15 to FC11/7 (FCC1)	

## 2+2 Software Configuration (24 S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```
controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F0/FC1
instance 2
location F0/FC2
instance 3
location F0/FC3
```

```
controller fabric plane 1
instance 0
location F1/FC0
instance 1
location F1/FC1
instance 2
location F1/FC2
instance 3
location F1/FC3
```

```
controller fabric plane 2
instance 0
location F0/FC4
instance 1
```

```
location F0/FC5
instance 2
location F0/FC6
instance 3
location F0/FC7

controller fabric plane 3
instance 0
location F1/FC4
instance 1
location F1/FC5
instance 2
location F1/FC6
instance 3
location F1/FC7

controller fabric plane 4
instance 0
location F0/FC8
instance 1
location F0/FC9
instance 2
location F0/FC10
instance 3
location F0/FC11

controller fabric plane 5
instance 0
location F1/FC8
instance 1
location F1/FC9
instance 2
location F1/FC10
instance 3
location F1/FC11
```

## Multi-Chassis 4+2 Configuration

This section describes how to configure a multi-chassis 4+2 configuration. In this configuration, four line card chassis (LCC0, LCC1, LCC2, and LCC3) are connected to two fabric card chassis (FCC0 and FCC1).

### Prerequisites

For connecting the fabric, you need the following:

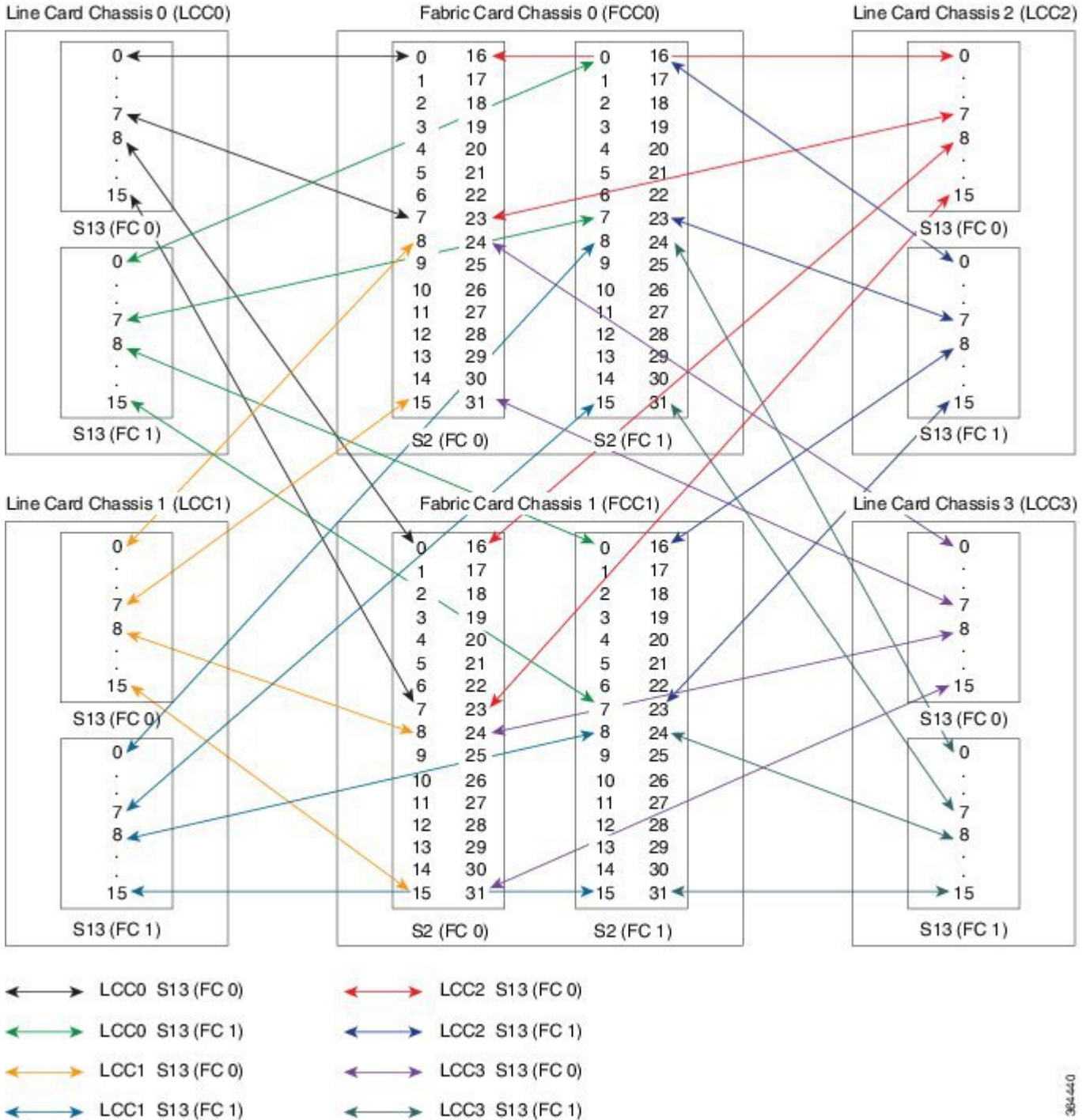
- 384 MPO-24 fiber cables (96 per LCC)
- Optical module sets:
  - **In 1T multi-chassis 4+2 mode:** Eight CXP optical module sets (Cisco PID NCS-FAB-OPT). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 CXP-100G-SR12 modules for a total of 768 modules.
  - **In 2T multi-chassis 4+2 mode:** Eight CXP2 optical module sets (Cisco PID NCS-FAB-OPT2). Two sets are required per LCC: one set plugs into the LCC and the other set plugs into the FCC. Each set includes 96 ONS-CXP2-SR25 modules for a total of 768 modules.

## Configuring a 4+2 Configuration with 12 S2 Fabric Cards

The following figure shows four line card chassis (LCC0, LCC1, LCC2, and LCC3) connected to two fabric card chassis (FCC0 and FCC1). In this configuration, there are 6 FCs in each fabric card chassis; in total 12

FCs are installed. The figure shows the 4+2 connections for two fabric plane. To complete the configuration, you must repeat the cabling for the remaining four fabric planes until all 12 S2 cards are connected.

Figure 84: Cisco NCS 6000 Multi-Chassis 4+2 Configuration with 12 S2 FC's



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The following tables show the cabling plan for a 4+2 multi-chassis configuration with 12 SC FCs installed. FCC0 has a fabric instance 0 for planes 0 through 5 in FCC0 (6 SC FCs in slots 0 through 5), and fabric instance 1 in FCC1 (also in slots 0 through 5). Other mappings are possible (for example, you can put both instances of planes 0 through 2 in FCC0, and planes 3 through 5 in FCC1 but the following table and software configuration assume that instance 0 is in FCC0 and instance 1 is in FCC1).

**Table 34: Cabling Plan for LCC0 in a 4+2 Multi-Chassis Configuration with 12 S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0 (FCC0)		S1/0 to FC1/0 (FCC0)		S2/0 to FC2/0 (FCC0)		S3/0 to FC3/0 (FCC0)		S4/0 to FC4/0 (FCC0)		S5/0 to FC5/0 (FCC0)	
S0/1 to FC0/1 (FCC0)		S1/1 to FC1/1 (FCC0)		S2/1 to FC2/1 (FCC0)		S3/1 to FC3/1 (FCC0)		S4/1 to FC4/1 (FCC0)		S5/1 to FC5/1 (FCC0)	
S0/2 to FC0/2 (FCC0)		S1/2 to FC1/2 (FCC0)		S2/2 to FC2/2 (FCC0)		S3/2 to FC3/2 (FCC0)		S4/2 to FC4/2 (FCC0)		S5/2 to FC5/2 (FCC0)	
S0/3 to FC0/3 (FCC0)		S1/3 to FC1/3 (FCC0)		S2/3 to FC2/3 (FCC0)		S3/3 to FC3/3 (FCC0)		S4/3 to FC4/3 (FCC0)		S5/3 to FC5/3 (FCC0)	
S0/4 to FC0/4 (FCC0)		S1/4 to FC1/4 (FCC0)		S2/4 to FC2/4 (FCC0)		S3/4 to FC3/4 (FCC0)		S4/4 to FC4/4 (FCC0)		S5/4 to FC5/4 (FCC0)	
S0/5 to FC0/5 (FCC0)		S1/5 to FC1/5 (FCC0)		S2/5 to FC2/5 (FCC0)		S3/5 to FC3/5 (FCC0)		S4/5 to FC4/5 (FCC0)		S5/5 to FC5/5 (FCC0)	
S0/6 to FC0/6 (FCC0)		S1/6 to FC1/6 (FCC0)		S2/6 to FC2/6 (FCC0)		S3/6 to FC3/6 (FCC0)		S4/6 to FC4/6 (FCC0)		S5/6 to FC5/6 (FCC0)	
S0/7 to FC0/7 (FCC0)		S1/7 to FC1/7 (FCC0)		S2/7 to FC2/7 (FCC0)		S3/7 to FC3/7 (FCC0)		S4/7 to FC4/7 (FCC0)		S5/7 to FC5/7 (FCC0)	
S0/8 to FC0/0 (FCC1)		S1/8 to FC1/0 (FCC1)		S2/8 to FC2/0 (FCC1)		S3/8 to FC3/0 (FCC1)		S4/8 to FC4/0 (FCC1)		S5/8 to FC5/0 (FCC1)	
S0/9 to FC0/2 (FCC1)		S1/9 to FC1/1 (FCC1)		S2/9 to FC2/1 (FCC1)		S3/9 to FC3/1 (FCC1)		S4/9 to FC4/1 (FCC1)		S5/9 to FC5/1 (FCC1)	
S0/10 to FC0/2 (FCC1)		S1/10 to FC1/2 (FCC1)		S2/10 to FC2/2 (FCC1)		S3/10 to FC3/2 (FCC1)		S4/10 to FC4/2 (FCC1)		S5/10 to FC5/2 (FCC1)	
S0/11 to FC0/3 (FCC1)		S1/11 to FC1/3 (FCC1)		S2/11 to FC2/3 (FCC1)		S3/11 to FC3/3 (FCC1)		S4/11 to FC4/3 (FCC1)		S5/11 to FC5/3 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/12 to FC0/4 (FCC1)		S1/12 to FC1/4 (FCC1)		S2/12 to FC2/4 (FCC1)		S3/12 to FC3/4 (FCC1)		S4/12 to FC4/4 (FCC1)		S5/12 to FC5/4 (FCC1)	
S0/13 to FC0/5 (FCC1)		S1/13 to FC1/5 (FCC1)		S2/13 to FC2/5 (FCC1)		S3/13 to FC3/5 (FCC1)		S4/13 to FC4/5 (FCC1)		S5/13 to FC5/5 (FCC1)	
S0/14 to FC0/5 (FCC1)		S1/14 to FC1/6 (FCC1)		S2/14 to FC2/6 (FCC1)		S3/14 to FC3/6 (FCC1)		S4/14 to FC4/6 (FCC1)		S5/14 to FC5/6 (FCC1)	
S0/15 to FC0/7 (FCC1)		S1/15 to FC1/7 (FCC1)		S2/15 to FC2/7 (FCC1)		S3/15 to FC3/7 (FCC1)		S4/15 to FC4/7 (FCC1)		S5/15 to FC5/7 (FCC1)	

**Table 35: Cabling Plan for LCC1 in a 4+2 Multi-Chassis Configuration with 12 S2 Fabric Cards**

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/8 (FCC0)		S1/0 to FC1/8 (FCC0)		S2/0 to FC2/8 (FCC0)		S3/0 to FC3/8 (FCC0)		S4/0 to FC4/8 (FCC0)		S5/0 to FC5/8 (FCC0)	
S0/1 to FC0/9 (FCC0)		S1/1 to FC1/9 (FCC0)		S2/1 to FC2/9 (FCC0)		S3/1 to FC3/9 (FCC0)		S4/1 to FC4/9 (FCC0)		S5/1 to FC5/9 (FCC0)	
S0/2 to FC0/10 (FCC0)		S1/2 to FC1/10 (FCC0)		S2/2 to FC2/10 (FCC0)		S3/2 to FC3/10 (FCC0)		S4/2 to FC4/10 (FCC0)		S5/2 to FC5/10 (FCC0)	
S0/3 to FC0/11 (FCC0)		S1/3 to FC1/11 (FCC0)		S2/3 to FC2/11 (FCC0)		S3/3 to FC3/11 (FCC0)		S4/3 to FC4/11 (FCC0)		S5/3 to FC5/11 (FCC0)	
S0/4 to FC0/12 (FCC0)		S1/4 to FC1/12 (FCC0)		S2/4 to FC2/12 (FCC0)		S3/4 to FC3/12 (FCC0)		S4/4 to FC4/12 (FCC0)		S5/4 to FC5/12 (FCC0)	
S0/5 to FC0/13 (FCC0)		S1/5 to FC1/13 (FCC0)		S2/5 to FC2/13 (FCC0)		S3/5 to FC3/13 (FCC0)		S4/5 to FC4/13 (FCC0)		S5/5 to FC5/13 (FCC0)	
S0/6 to FC0/14 (FCC0)		S1/6 to FC1/14 (FCC0)		S2/6 to FC2/14 (FCC0)		S3/6 to FC3/14 (FCC0)		S4/6 to FC4/14 (FCC0)		S5/6 to FC5/14 (FCC0)	
S0/7 to FC0/15 (FCC0)		S1/7 to FC1/15 (FCC0)		S2/7 to FC2/15 (FCC0)		S3/7 to FC3/15 (FCC0)		S4/7 to FC4/15 (FCC0)		S5/7 to FC5/15 (FCC0)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/8 to FC0/8 (FCC1)		S1/8 to FC1/8 (FCC1)		S2/8 to FC2/8 (FCC1)		S3/8 to FC3/8 (FCC1)		S4/8 to FC4/8 (FCC1)		S5/8 to FC5/8 (FCC1)	
S0/9 to FC0/9 (FCC1)		S1/9 to FC1/9 (FCC1)		S2/9 to FC2/9(FCC1)		S3/9 to FC3/9 (FCC1)		S4/9 to FC4/9 (FCC1)		S5/9 to FC5/9 (FCC1)	
S0/10 to FC0/10 (FCC1)		S1/10 to FC1/10 (FCC1)		S2/10 to FC2/10 (FCC1)		S3/10 to FC3/10 (FCC1)		S4/10 to FC4/10 (FCC1)		S5/10 to FC5/10 (FCC1)	
S0/11 to FC0/11 (FCC1)		S1/11 to FC1/11 (FCC1)		S2/11 to FC2/11 (FCC1)		S3/11 to FC3/11 (FCC1)		S4/11 to FC4/11 (FCC1)		S5/11 to FC5/11 (FCC1)	
S0/12 to FC0/12 (FCC1)		S1/12 to FC1/12(FCC1)		S2/12 to FC2/12 (FCC1)		S3/12 to FC3/12 (FCC1)		S4/12 to FC4/12 (FCC1)		S5/12 to FC5/12 (FCC1)	
S0/13 to FC0/13 (FCC1)		S1/13 to FC1/13 (FCC1)		S2/13 to FC2/13 (FCC1)		S3/13 to FC3/13 (FCC1)		S4/13 to FC4/13 (FCC1)		S5/13 to FC5/13 (FCC1)	
S0/14 to FC0/14 (FCC1)		S1/14 to FC1/14 (FCC1)		S2/14 to FC2/14 (FCC1)		S3/14 to FC3/14 (FCC1)		S4/14 to FC4/14 (FCC1)		S5/14 to FC5/14 (FCC1)	
S0/15 to FC0/15 (FCC1)		S1/15 to FC1/15 (FCC1)		S2/15 to FC2/15 (FCC1)		S3/15 to FC3/15 (FCC1)		S4/15 to FC4/15 (FCC1)		S5/15 to FC5/15 (FCC1)	

Table 36: Cabling Plan for LCC2 in a 4+2 Multi-Chassis Configuration with 12 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/16 (FCC0)		S1/0 to FC1/16 (FCC0)		S2/0 to FC2/16 (FCC0)		S3/0 to FC3/16 (FCC0)		S4/0 to FC4/16 (FCC0)		S5/0 to FC5/16 (FCC0)	
S0/1 to FC0/17 (FCC0)		S1/1 to FC1/17 (FCC0)		S2/1 to FC2/17 (FCC0)		S3/1 to FC3/17 (FCC0)		S4/1 to FC4/17 (FCC0)		S5/1 to FC5/17 (FCC0)	
S0/2 to FC0/18 (FCC0)		S1/2 to FC1/18 (FCC0)		S2/2 to FC2/18 (FCC0)		S3/2 to FC3/18 (FCC0)		S4/2 to FC4/18 (FCC0)		S5/2 to FC5/18 (FCC0)	
S0/3 to FC0/19 (FCC0)		S1/3 to FC1/19 (FCC0)		S2/3 to FC2/19 (FCC0)		S3/3 to FC3/19 (FCC0)		S4/3 to FC4/19 (FCC0)		S5/3 to FC5/19 (FCC0)	



Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis
S0/4 to FC0/20 (FCC0)		S1/4 to FC1/20 (FCC0)		S2/4 to FC2/20 (FCC0)		S3/4 to FC3/20 (FCC0)		S4/4 to FC4/20 (FCC0)		S5/4 to FC5/20 (FCC0)	
S0/5 to FC0/21 (FCC0)		S1/5 to FC1/21 (FCC0)		S2/5 to FC2/21 (FCC0)		S3/5 to FC3/21 (FCC0)		S4/5 to FC4/21 (FCC0)		S5/5 to FC5/21 (FCC0)	
S0/6 to FC0/22 (FCC0)		S1/6 to FC1/22 (FCC0)		S2/6 to FC2/22 (FCC0)		S3/6 to FC3/22 (FCC0)		S4/6 to FC4/22 (FCC0)		S5/6 to FC5/22 (FCC0)	
S0/7 to FC0/23 (FCC0)		S1/7 to FC1/23 (FCC0)		S2/7 to FC2/23 (FCC0)		S3/7 to FC3/23 (FCC0)		S4/7 to FC4/23 (FCC0)		S5/7 to FC5/23 (FCC0)	
S0/8 to FC0/16 (FCC1)		S1/8 to FC1/16 (FCC1)		S2/8 to FC2/16 (FCC1)		S3/8 to FC3/16 (FCC1)		S4/8 to FC4/16 (FCC1)		S5/8 to FC5/16 (FCC1)	
S0/9 to FC0/17 (FCC1)		S1/9 to FC1/17 (FCC1)		S2/9 to FC2/17 (FCC1)		S3/9 to FC3/17 (FCC1)		S4/9 to FC4/17 (FCC1)		S5/9 to FC5/17 (FCC1)	
S0/10 to FC0/18 (FCC1)		S1/10 to FC1/18 (FCC1)		S2/10 to FC2/18 (FCC1)		S3/10 to FC3/18 (FCC1)		S4/10 to FC4/18 (FCC1)		S5/10 to FC5/18 (FCC1)	
S0/11 to FC0/19 (FCC1)		S1/11 to FC1/19 (FCC1)		S2/11 to FC2/19 (FCC1)		S3/11 to FC3/19 (FCC1)		S4/11 to FC4/19 (FCC1)		S5/11 to FC5/19 (FCC1)	
S0/12 to FC0/20 (FCC1)		S1/12 to FC1/20 (FCC1)		S2/12 to FC2/20 (FCC1)		S3/12 to FC3/20 (FCC1)		S4/12 to FC4/20 (FCC1)		S5/12 to FC5/20 (FCC1)	
S0/13 to FC0/21 (FCC1)		S1/13 to FC1/21 (FCC1)		S2/13 to FC2/21 (FCC1)		S3/13 to FC3/21 (FCC1)		S4/13 to FC4/21 (FCC1)		S5/13 to FC5/21 (FCC1)	
S0/14 to FC0/22 (FCC1)		S1/14 to FC1/22 (FCC1)		S2/14 to FC2/22 (FCC1)		S3/14 to FC3/22 (FCC1)		S4/14 to FC4/22 (FCC1)		S5/14 to FC5/22 (FCC1)	
S0/15 to FC0/23 (FCC1)		S1/15 to FC1/23 (FCC1)		S2/15 to FC2/23 (FCC1)		S3/15 to FC3/23 (FCC1)		S4/15 to FC4/23 (FCC1)		S5/15 to FC5/23 (FCC1)	

Table 37: Cabling Plan for LCC3 in a 4+2 Multi-Chassis Configuration with 12 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3(S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/24 (FCC0)		S1/0 to FC1/24 (FCC0)		S2/0 to FC2/24 (FCC0)		S3/0 to FC3/24 (FCC0)		S4/0 to FC4/24 (FCC0)		S5/0 to FC5/24 (FCC0)	
S0/1 to FC0/25 (FCC0)		S1/1 to FC1/25 (FCC0)		S2/1 to FC2/25 (FCC0)		S3/1 to FC3/25 (FCC0)		S4/1 to FC4/25 (FCC0)		S5/1 to FC5/25 (FCC0)	
S0/2 to FC0/26 (FCC0)		S1/2 to FC1/26 (FCC0)		S2/2 to FC2/26 (FCC0)		S3/2 to FC3/26 (FCC0)		S4/2 to FC4/26 (FCC0)		S5/2 to FC5/26 (FCC0)	
S0/3 to FC0/27 (FCC0)		S1/3 to FC1/27 (FCC0)		S2/3 to FC2/27 (FCC0)		S3/3 to FC3/27 (FCC0)		S4/3 to FC4/27 (FCC0)		S5/3 to FC5/27 (FCC0)	
S0/4 to FC0/28 (FCC0)		S1/4 to FC1/28 (FCC0)		S2/4 to FC2/28 (FCC0)		S3/4 to FC3/28 (FCC0)		S4/4 to FC4/28 (FCC0)		S5/4 to FC5/28 (FCC0)	
S0/5 to FC0/29 (FCC0)		S1/5 to FC1/29 (FCC0)		S2/5 to FC2/29 (FCC0)		S3/5 to FC3/29 (FCC0)		S4/5 to FC4/29 (FCC0)		S5/5 to FC5/29 (FCC0)	
S0/6 to FC0/30 (FCC0)		S1/6 to FC1/30 (FCC0)		S2/6 to FC2/30 (FCC0)		S3/6 to FC3/30 (FCC0)		S4/6 to FC4/30 (FCC0)		S5/6 to FC5/30 (FCC0)	
S0/7 to FC0/31 (FCC0)		S1/7 to FC1/31 (FCC0)		S2/7 to FC2/31 (FCC0)		S3/7 to FC3/31 (FCC0)		S4/7 to FC4/31 (FCC0)		S5/7 to FC5/31 (FCC0)	
S0/8 to FC0/24 (FCC1)		S1/8 to FC1/24 (FCC1)		S2/8 to FC2/24 (FCC1)		S3/8 to FC3/24 (FCC1)		S4/8 to FC4/24 (FCC1)		S5/8 to FC5/24 (FCC1)	
S0/9 to FC0/25 (FCC1)		S1/9 to FC1/25 (FCC1)		S2/9 to FC2/25 (FCC1)		S3/9 to FC3/25 (FCC1)		S4/9 to FC4/25 (FCC1)		S5/9 to FC5/25 (FCC1)	
S0/10 to FC0/26 (FCC1)		S1/10 to FC1/26 (FCC1)		S2/10 to FC2/26 (FCC1)		S3/10 to FC3/26 (FCC1)		S4/10 to FC4/26 (FCC1)		S5/10 to FC5/26 (FCC1)	
S0/11 to FC0/27 (FCC1)		S1/11 to FC1/27 (FCC1)		S2/11 to FC2/27 (FCC1)		S3/11 to FC3/27 (FCC1)		S4/11 to FC4/27 (FCC1)		S5/11 to FC5/27 (FCC1)	
S0/12 to FC0/28 (FCC1)		S1/12 to FC1/28 (FCC1)		S2/12 to FC2/28 (FCC1)		S3/12 to FC3/28 (FCC1)		S4/12 to FC4/28 (FCC1)		S5/12 to FC5/28 (FCC1)	
S0/13 to FC0/29 (FCC1)		S1/13 to FC1/29 (FCC1)		S2/13 to FC2/29 (FCC1)		S3/13 to FC3/29 (FCC1)		S4/13 to FC4/29 (FCC1)		S5/13 to FC5/29 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3(S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis
S0/14 to FC0/30 (FCC1)		S1/14 to FC1/30 (FCC1)		S2/14 to FC2/30 (FCC1)		S3/14 to FC3/30 (FCC1)		S4/14 to FC4/30 (FCC1)		S5/14 to FC5/30 (FCC1)	
S0/15 to FC0/31 (FCC1)		S1/15 to FC1/31 (FCC1)		S2/15 to FC2/31 (FCC1)		S3/15 to FC3/31 (FCC1)		S4/15 to FC4/31 (FCC1)		S5/15 to FC5/31 (FCC1)	

## 4+2 Software Configuration (12 S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```

controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F1/FC0

controller fabric plane 1
instance 0
location F0/FC1
instance 1
location F1/FC1

controller fabric plane 2
instance 0
location F0/FC2
instance 1
location F1/FC2

controller fabric plane 3
instance 0
location F0/FC3
instance 1
location F1/FC3

controller fabric plane 4
instance 0
location F0/FC4
instance 1
location F1/FC4

controller fabric plane 5
instance 0
location F0/FC5
instance 1
location F1/FC5

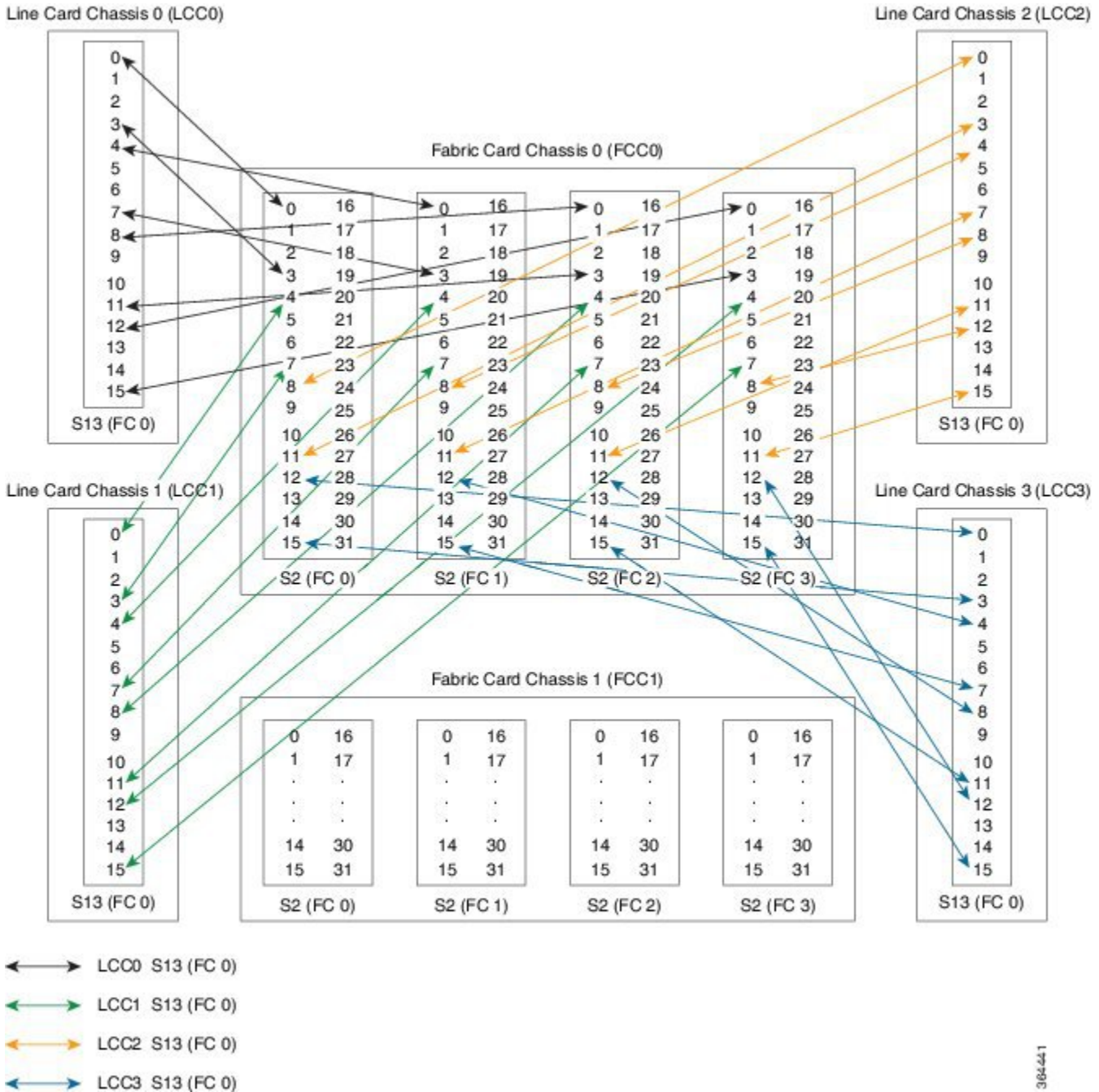
```

## Configuring a 4+2 Configuration with 24 S2 Fabric Cards

The following figure shows four line card chassis (LCC0, LCC1, LCC2, and LCC3) connected to two fabric card chassis (FCC0 and FCC1). In this configuration, there are 12 FCs in each fabric card chassis; in total 24

FCs are installed. The figure shows the 4+2 connections for one fabric plane. To complete the configuration, you must repeat the cabling for the remaining five fabric planes until all 24 S2 cards are connected.

Figure 85: Cisco NCS 6000 Multi-Chassis 4+2 Configuration with 24 S2 FC s



The following tables show the cabling plan for a 4+2 multi-chassis configuration with 24 SC FCs installed. The FCC0 has the fabric instances 0 through 5 for planes 0, 2, and 4. The FCC1 has the fabric instances 0 through 5 for planes 1, 3, and 5.

Table 38: Cabling Plan for LCC0 in a 4+2 Multi-Chassis Configuration with 24 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/0 (FCC0)		S1/0 to FC0/0 (FCC1)		S2/0 to FC4/0 (FCC0)		S3/0 to FC4/0 (FCC1)		S4/0 to FC8/0 (FCC0)		S5/0 to FC8/0 (FCC1)	
S0/1 to FC0/1 (FCC0)		S1/1 to FC0/1 (FCC1)		S2/1 to FC4/1 (FCC0)		S3/1 to FC4/1 (FCC1)		S4/1 to FC8/1 (FCC0)		S5/1 to FC8/1 (FCC1)	
S0/2 to FC0/2 (FCC0)		S1/2 to FC0/2 (FCC1)		S2/2 to FC4/2 (FCC0)		S3/2 to FC4/2 (FCC1)		S4/2 to FC8/2 (FCC0)		S5/2 to FC8/2 (FCC1)	
S0/3 to FC0/3 (FCC0)		S1/3 to FC0/3 (FCC1)		S2/3 to FC4/3 (FCC0)		S3/3 to FC4/3 (FCC1)		S4/3 to FC8/3 (FCC0)		S5/3 to FC8/3 (FCC1)	
S0/4 to FC1/0 (FCC0)		S1/4 to FC1/0 (FCC1)		S2/4 to FC5/0 (FCC0)		S3/4 to FC5/0 (FCC1)		S4/4 to FC9/0 (FCC0)		S5/4 to FC9/0 (FCC1)	
S0/5 to FC1/1 (FCC0)		S1/5 to FC1/1 (FCC1)		S2/5 to FC5/1 (FCC0)		S3/5 to FC5/1 (FCC1)		S4/5 to FC9/1 (FCC0)		S5/5 to FC9/1 (FCC1)	
S0/6 to FC1/2 (FCC0)		S1/6 to FC1/2 (FCC1)		S2/6 to FC5/2 (FCC0)		S3/6 to FC5/2 (FCC1)		S4/6 to FC9/2 (FCC0)		S5/6 to FC9/2 (FCC1)	
S0/7 to FC1/3(FCC0)		S1/7 to FC1/3 (FCC1)		S2/7 to FC5/3(FCC0)		S3/7 to FC5/3(FCC1)		S4/7 to FC9/3(FCC0)		S5/7 to FC9/3(FCC1)	
S0/8 to FC2/0 (FCC0)		S1/8 to FC2/0 (FCC1)		S2/8 to FC6/0 (FCC0)		S3/8 to FC6/0 (FCC1)		S4/8 to FC10/0 (FCC0)		S5/8 to FC10/0 (FCC1)	
S0/9 to FC2/1 (FCC0)		S1/9 to FC2/1 (FCC1)		S2/9 to FC6/1 (FCC0)		S3/9 to FC6/1 (FCC1)		S4/9 to FC10/1 (FCC0)		S5/9 to FC10/1 (FCC1)	
S0/10 to FC2/2 (FCC0)		S1/10 to FC2/2 (FCC1)		S2/10 to FC6/2 (FCC0)		S3/10 to FC6/2 (FCC1)		S4/10 to FC10/2 (FCC0)		S5/10 to FC10/2 (FCC1)	
S0/11 to FC2/3 (FCC0)		S1/11 to FC2/3 (FCC1)		S2/11 to FC6/3 (FCC0)		S3/11 to FC6/3 (FCC1)		S4/11 to FC10/3 (FCC0)		S5/11 to FC10/3 (FCC1)	
S0/12 to FC3/0 (FCC0)		S1/12 to FC3/0 (FCC1)		S2/12 to FC7/0 (FCC0)		S3/12 to FC7/0 (FCC1)		S4/12 to FC11/0 (FCC0)		S5/12 to FC11/0 (FCC1)	
S0/13 to FC3/1 (FCC0)		S1/13 to FC3/1 (FCC1)		S2/13 to FC7/1 (FCC0)		S3/13 to FC7/1 (FCC1)		S4/13 to FC11/1 (FCC0)		S5/13 to FC11/1 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis	LCC0 (S13) slot/port	FCC (S2) slot/port/chassis
S0/14 to FC3/2 (FCC0)		S1/14 to FC3/2 (FCC1)		S2/14 to FC7/2 (FCC0)		S3/14 to FC7/2 (FCC1)		S4/14 to FC11/2 (FCC0)		S5/14 to FC11/2 (FCC1)	
S0/15 to FC3/3 (FCC0)		S1/15 to FC3/3 (FCC1)		S2/15 to FC7/3 (FCC0)		S3/15 to FC7/3 (FCC1)		S4/15 to FC11/3 (FCC0)		S5/15 to FC11/3 (FCC1)	

Table 39: Cabling Plan for LCC1 in a 4+2 Multi-Chassis Configuration with 24 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/4 (FCC0)		S1/0 to FC0/4 (FCC1)		S2/0 to FC4/4 (FCC0)		S3/0 to FC4/4 (FCC1)		S4/0 to FC8/4 (FCC0)		S5/0 to FC8/4 (FCC1)	
S0/1 to FC0/5 (FCC0)		S1/1 to FC0/5 (FCC1)		S2/1 to FC4/5 (FCC0)		S3/1 to FC4/5 (FCC1)		S4/1 to FC8/5 (FCC0)		S5/1 to FC8/5 (FCC1)	
S0/2 to FC0/6 (FCC0)		S1/2 to FC0/6 (FCC1)		S2/2 to FC4/6 (FCC0)		S3/2 to FC4/6 (FCC1)		S4/2 to FC8/6 (FCC0)		S5/2 to FC8/6 (FCC1)	
S0/3 to FC0/7 (FCC0)		S1/3 to FC0/7 (FCC1)		S2/3 to FC4/7 (FCC0)		S3/3 to FC4/7 (FCC1)		S4/3 to FC8/7 (FCC0)		S5/3 to FC8/7 (FCC1)	
S0/4 to FC1/4 (FCC0)		S1/4 to FC1/4 (FCC1)		S2/4 to FC5/4 (FCC0)		S3/4 to FC5/4 (FCC1)		S4/4 to FC9/4 (FCC0)		S5/4 to FC9/4 (FCC1)	
S0/5 to FC1/5 (FCC0)		S1/5 to FC1/5 (FCC1)		S2/5 to FC5/5 (FCC0)		S3/5 to FC5/5 (FCC1)		S4/5 to FC9/5 (FCC0)		S5/5 to FC9/5 (FCC1)	
S0/6 to FC1/6 (FCC0)		S1/6 to FC1/6 (FCC1)		S2/6 to FC5/6 (FCC0)		S3/6 to FC5/6 (FCC1)		S4/6 to FC9/6 (FCC0)		S5/6 to FC9/6 (FCC1)	
S0/7 to FC1/7 (FCC0)		S1/7 to FC1/7 (FCC1)		S2/7 to FC5/7 (FCC0)		S3/7 to FC5/7 (FCC1)		S4/7 to FC9/7 (FCC0)		S5/7 to FC9/7 (FCC1)	
S0/8 to FC2/4 (FCC0)		S1/8 to FC2/4 (FCC1)		S2/8 to FC6/4 (FCC0)		S3/8 to FC6/4 (FCC1)		S4/8 to FC10/4 (FCC0)		S5/8 to FC10/4 (FCC1)	
S0/9 to FC2/5 (FCC0)		S1/9 to FC2/5 (FCC1)		S2/9 to FC6/5 (FCC0)		S3/9 to FC6/5 (FCC1)		S4/9 to FC10/5 (FCC0)		S5/9 to FC10/5 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1(S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis	LCC1 (S13) slot/port	FCC (S2) slot/port/chassis
S0/10 to FC2/6 (FCC0)		S1/10 to FC2/6 (FCC1)		S2/10 to FC6/6 (FCC0)		S3/10 to FC6/6 (FCC1)		S4/10 to FC10/6 (FCC0)		S5/10 to FC10/6 (FCC1)	
S0/11 to FC2/7 (FCC0)		S1/11 to FC2/7 (FCC1)		S2/11 to FC6/7 (FCC0)		S3/11 to FC6/7 (FCC1)		S4/11 to FC10/7 (FCC0)		S5/11 to FC10/7 (FCC1)	
S0/12 to FC3/4 (FCC0)		S1/12 to FC3/4 (FCC1)		S2/12 to FC7/4 (FCC0)		S3/12 to FC7/4 (FCC1)		S4/12 to FC11/4 (FCC0)		S5/12 to FC11/4 (FCC1)	
S0/13 to FC3/5 (FCC0)		S1/13 to FC3/5 (FCC1)		S2/13 to FC7/5 (FCC0)		S3/13 to FC7/5 (FCC1)		S4/13 to FC11/5 (FCC0)		S5/13 to FC11/5 (FCC1)	
S0/14 to FC3/6 (FCC0)		S1/14 to FC3/6 (FCC1)		S2/14 to FC7/6 (FCC0)		S3/14 to FC7/6 (FCC1)		S4/14 to FC11/6 (FCC0)		S5/14 to FC11/6 (FCC1)	
S0/15 to FC3/7 (FCC0)		S1/15 to FC3/7 (FCC1)		S2/15 to FC7/7 (FCC0)		S3/15 to FC7/7 (FCC1)		S4/15 to FC11/7 (FCC0)		S5/15 to FC11/7 (FCC1)	

Table 40: Cabling Plan for LCC2 in a 4+2 Multi-Chassis Configuration with 24 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/8 (FCC0)		S1/0 to FC0/8 (FCC1)		S2/0 to FC4/8 (FCC0)		S3/0 to FC4/8 (FCC1)		S4/0 to FC8/8 (FCC0)		S5/0 to FC8/8 (FCC1)	
S0/1 to FC0/9 (FCC0)		S1/1 to FC0/9 (FCC1)		S2/1 to FC4/9 (FCC0)		S3/1 to FC4/9 (FCC1)		S4/1 to FC8/9 (FCC0)		S5/1 to FC8/9 (FCC1)	
S0/2 to FC0/10 (FCC0)		S1/2 to FC0/10 (FCC1)		S2/2 to FC4/10 (FCC0)		S3/2 to FC4/10 (FCC1)		S4/2 to FC8/10 (FCC0)		S5/2 to FC8/10 (FCC1)	
S0/3 to FC0/11 (FCC0)		S1/3 to FC0/11 (FCC1)		S2/3 to FC4/11 (FCC0)		S3/3 to FC4/11 (FCC1)		S4/3 to FC8/11 (FCC0)		S5/3 to FC8/11 (FCC1)	
S0/4 to FC1/8 (FCC0)		S1/4 to FC1/8 (FCC1)		S2/4 to FC5/8 (FCC0)		S3/4 to FC5/8 (FCC1)		S4/4 to FC9/8 (FCC0)		S5/4 to FC9/8 (FCC1)	
S0/5 to FC1/9 (FCC0)		S1/5 to FC1/9 (FCC1)		S2/5 to FC5/9 (FCC0)		S3/5 to FC5/9 (FCC1)		S4/5 to FC9/9 (FCC0)		S5/5 to FC9/9 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis	LCC2 (S13) slot/port	FCC (S2) slot/port/chassis
S0/6 to FC1/10 (FCC0)		S1/6 to FC1/10 (FCC1)		S2/6 to FC5/10 (FCC0)		S3/6 to FC5/10 (FCC1)		S4/6 to FC9/10 (FCC0)		S5/6 to FC9/10 (FCC1)	
S0/7 to FC1/11 (FCC0)		S1/7 to FC1/11 (FCC1)		S2/7 to FC5/11 (FCC0)		S3/7 to FC5/11 (FCC1)		S4/7 to FC9/11 (FCC0)		S5/7 to FC9/11 (FCC1)	
S0/8 to FC2/8 (FCC0)		S1/8 to FC2/8 (FCC1)		S2/8 to FC6/8 (FCC0)		S3/8 to FC6/8 (FCC1)		S4/8 to FC10/8 (FCC0)		S5/8 to FC10/8 (FCC1)	
S0/9 to FC2/9 (FCC0)		S1/9 to FC2/9 (FCC1)		S2/9 to FC6/9 (FCC0)		S3/9 to FC6/9 (FCC1)		S4/9 to FC10/9 (FCC0)		S5/9 to FC10/9 (FCC1)	
S0/10 to FC2/10 (FCC0)		S1/10 to FC2/10 (FCC1)		S2/10 to FC6/10 (FCC0)		S3/10 to FC6/10 (FCC1)		S4/10 to FC10/10 (FCC0)		S5/10 to FC10/10 (FCC1)	
S0/11 to FC2/11 (FCC0)		S1/11 to FC2/11 (FCC1)		S2/11 to FC6/11 (FCC0)		S3/11 to FC6/11 (FCC1)		S4/11 to FC10/11 (FCC0)		S5/11 to FC10/11 (FCC1)	
S0/12 to FC3/8 (FCC0)		S1/12 to FC3/8 (FCC1)		S2/12 to FC7/8 (FCC0)		S3/12 to FC7/8 (FCC1)		S4/12 to FC11/8 (FCC0)		S5/12 to FC11/8 (FCC1)	
S0/13 to FC3/9 (FCC0)		S1/13 to FC3/9 (FCC1)		S2/13 to FC7/9 (FCC0)		S3/13 to FC7/9 (FCC1)		S4/13 to FC11/9 (FCC0)		S5/13 to FC11/9 (FCC1)	
S0/14 to FC3/10 (FCC0)		S1/14 to FC3/10 (FCC1)		S2/14 to FC7/10 (FCC0)		S3/14 to FC7/10 (FCC1)		S4/14 to FC11/10 (FCC0)		S5/14 to FC11/10 (FCC1)	
S0/15 to FC3/11 (FCC0)		S1/15 to FC3/11 (FCC1)		S2/15 to FC7/11 (FCC0)		S3/15 to FC7/11 (FCC1)		S4/15 to FC11/11 (FCC0)		S5/15 to FC11/11 (FCC1)	

Table 41: Cabling Plan for LCC3 in a 4+2 Multi-Chassis Configuration with 24 S2 Fabric Cards

Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3(S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis
S0/0 to FC0/12 (FCC0)		S1/0 to FC0/12 (FCC1)		S2/0 to FC4/12 (FCC0)		S3/0 to FC4/12 (FCC1)		S4/0 to FC8/12 (FCC0)		S5/0 to FC8/12 (FCC1)	
S0/1 to FC0/13 (FCC0)		S1/1 to FC0/13 (FCC1)		S2/1 to FC4/13 (FCC0)		S3/1 to FC4/13 (FCC1)		S4/1 to FC8/13 (FCC0)		S5/1 to FC8/13 (FCC1)	



Plane 0		Plane 1		Plane 2		Plane 3		Plane 4		Plane 5	
LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3(S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis	LCC3 (S13) slot/port	FCC (S2) slot/port/chassis
S0/2 to FC0/14 (FCC0)		S1/2 to FC0/14 (FCC1)		S2/2 to FC4/14 (FCC0)		S3/2 to FC4/14 (FCC1)		S4/2 to FC8/14 (FCC0)		S5/2 to FC8/14 (FCC1)	
S0/3 to FC0/15 (FCC0)		S1/3 to FC0/15 (FCC1)		S2/3 to FC4/15 (FCC0)		S3/3 to FC4/15 (FCC1)		S4/3 to FC8/15 (FCC0)		S5/3 to FC8/15 (FCC1)	
S0/4 to FC1/12 (FCC0)		S1/4 to FC1/12 (FCC1)		S2/4 to FC5/12 (FCC0)		S3/4 to FC5/12 (FCC1)		S4/4 to FC9/12 (FCC0)		S5/4 to FC9/12 (FCC1)	
S0/5 to FC1/13 (FCC0)		S1/5 to FC1/13 (FCC1)		S2/5 to FC5/13 (FCC0)		S3/5 to FC5/13 (FCC1)		S4/5 to FC9/13 (FCC0)		S5/5 to FC9/13 (FCC1)	
S0/6 to FC1/14 (FCC0)		S1/6 to FC1/14 (FCC1)		S2/6 to FC5/14 (FCC0)		S3/6 to FC5/14 (FCC1)		S4/6 to FC9/14 (FCC0)		S5/6 to FC9/14 (FCC1)	
S0/7 to FC1/15 (FCC0)		S1/7 to FC1/15 (FCC1)		S2/7 to FC5/15 (FCC0)		S3/7 to FC5/15 (FCC1)		S4/7 to FC9/15 (FCC0)		S5/7 to FC9/15 (FCC1)	
S0/8 to FC2/12 (FCC0)		S1/8 to FC2/12 (FCC1)		S2/8 to FC6/12 (FCC0)		S3/8 to FC6/12 (FCC1)		S4/8 to FC10/12 (FCC0)		S5/8 to FC10/12 (FCC1)	
S0/9 to FC2/13 (FCC0)		S1/9 to FC2/13 (FCC1)		S2/9 to FC6/13 (FCC0)		S3/9 to FC6/13 (FCC1)		S4/9 to FC10/13 (FCC0)		S5/9 to FC10/13 (FCC1)	
S0/10 to FC2/14 (FCC0)		S1/10 to FC2/14 (FCC1)		S2/10 to FC6/14 (FCC0)		S3/10 to FC6/14 (FCC1)		S4/10 to FC10/14 (FCC0)		S5/10 to FC10/14 (FCC1)	
S0/11 to FC2/15 (FCC0)		S1/11 to FC2/15 (FCC1)		S2/11 to FC6/15 (FCC0)		S3/11 to FC6/15 (FCC1)		S4/11 to FC10/15 (FCC0)		S5/11 to FC10/15 (FCC1)	
S0/12 to FC3/12 (FCC0)		S1/12 to FC3/12 (FCC1)		S2/12 to FC7/12 (FCC0)		S3/12 to FC7/12 (FCC1)		S4/12 to FC11/12 (FCC0)		S5/12 to FC11/12 (FCC1)	
S0/13 to FC3/13 (FCC0)		S1/13 to FC3/13 (FCC1)		S2/13 to FC7/13 (FCC0)		S3/13 to FC7/13 (FCC1)		S4/13 to FC11/13 (FCC0)		S5/13 to FC11/13 (FCC1)	
S0/14 to FC3/14 (FCC0)		S1/14 to FC3/14 (FCC1)		S2/14 to FC7/14 (FCC0)		S3/14 to FC7/14 (FCC1)		S4/14 to FC11/14 (FCC0)		S5/14 to FC11/14 (FCC1)	
S0/15 to FC3/15 (FCC0)		S1/15 to FC3/15 (FCC1)		S2/15 to FC7/15 (FCC0)		S3/15 to FC7/15 (FCC1)		S4/15 to FC11/15 (FCC0)		S5/15 to FC11/15 (FCC1)	

## 4+2 Software Configuration (24 S2 Fabric Cards)

An explicit admin configuration is required to specify an ordered list of S2 connections assigned for a plane. Each S2 connection is specified as an instance. The instances are contiguous, starting from 0.

```
controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F0/FC1
instance 2
location F0/FC2
instance 3
location F0/FC3
```

```
controller fabric plane 1
instance 0
location F1/FC0
instance 1
location F1/FC1
instance 2
location F1/FC2
instance 3
location F1/FC3
```

```
controller fabric plane 2
instance 0
location F0/FC4
instance 1
location F0/FC5
instance 2
location F0/FC6
instance 3
location F0/FC7
```

```
controller fabric plane 3
instance 0
location F1/FC4
instance 1
location F1/FC5
instance 2
location F1/FC6
instance 3
location F1/FC7
```

```
controller fabric plane 4
instance 0
location F0/FC8
instance 1
location F0/FC9
instance 2
location F0/FC10
instance 3
location F0/FC11
```

```
controller fabric plane 5
instance 0
location F1/FC8
instance 1
location F1/FC9
instance 2
location F1/FC10
instance 3
location F1/FC11
```