



Cisco Network Convergence System 4000 Fabric Card Chassis Hardware Installation Guide

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Preface

This document describes how to install a Cisco Network Convergence System (NCS) 4000 Fabric Card Chassis and its components. The Cisco NCS 4000 Fabric Card Chassis (FCC) is a product in the Cisco Network Convergence System 4000 Series family.

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Audience

This guide is intended for chassis installers and Cisco installation partners who are responsible for installing the Cisco NCS 4000 Series chassis 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.

Conventions

This document uses the following conventions:

Convention	Indication
bold font	Commands and keywords and user-entered text appear in bold font .
<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.
[x y z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
courier font	Terminal sessions and information the system displays appear in courier font.

Convention	Indication
< >	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.



Timesaver Means *the described action saves time* . You can save time by performing the action described in the paragraph.



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.

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. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelyyn liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung WICHTIGE SICHERHEITSHINWEISE

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning! VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение	<p>ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ</p> <p>Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.</p> <p>СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ</p>
警告	<p>重要的安全性说明</p> <p>此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。</p> <p>请保存这些安全性说明</p>
警告	<p>安全上の重要な注意事項</p> <p>「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。</p> <p>これらの注意事項を保管しておいてください。</p>
주의	<p>중요 안전 지침</p> <p>이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.</p> <p>이 지시 사항을 보관하십시오.</p>
Aviso	<p>INSTRUÇÕES IMPORTANTES DE SEGURANÇA</p> <p>Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.</p> <p>GUARDE ESTAS INSTRUÇÕES</p>
Advarsel	<p>VIGTIGE SIKKERHEDSANVISNINGER</p> <p>Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.</p> <p>GEM DISSE ANVISNINGER</p>
تحذير	<p>إرشادات الأمان الهامة</p> <p>يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمة الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات</p>

Upozorenje	<p>VAŽNE SIGURNOSNE NAPOMENE</p> <p>Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.</p> <p>SAČUVAJTE OVE UPUTE</p>
Upozornění	<p>DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY</p> <p>Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.</p> <p>USCHOVEJTE TYTO POKYNY</p>
Προειδοποίηση	<p>ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ</p> <p>Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.</p> <p>ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ</p>
אזהרה	<p>הוראות בטיחות חשובות</p> <p>סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.</p> <p>שמור הוראות אלה</p>
Opomena	<p>ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА</p> <p>Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.</p> <p>ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА</p>
Ostrzeżenie	<p>WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA</p> <p>Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.</p> <p>NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ</p>
Upozornenie	<p>DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY</p> <p>Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.</p> <p>USCHOVAJTE SI TENTO NÁVOD</p>

Related Documentation

For complete planning and installation information, see the following documents:

- *Regulatory Compliance and Safety Information for Cisco NCS 4000 Series*
- *Hardware Installation Guide for the Cisco NCS 4000 Series*
- *Configuration Guide for Cisco NCS 4000 Series*
- *Command Reference for Cisco NCS 4000 Series*

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.



CHAPTER 1

Overview

This chapter provides an overview of the Cisco NCS 4000 Fabric Card Chassis.

- [About the Cisco NCS 4000 Fabric Card Chassis, on page 1](#)
- [Fabric Card Chassis Components, on page 2](#)
- [Slot Numbers, on page 4](#)
- [Chassis Specifications, on page 4](#)
- [Safety Guidelines, on page 5](#)

About the Cisco NCS 4000 Fabric Card Chassis

The Cisco NCS 4000 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 4000 FCC.

The Cisco NCS 4000 FCC is part of the Cisco NCS 4000 Multi-Chassis system that also includes the Cisco NCS 4016 16-slot line card chassis (LCC). The system can expand from a single chassis to various multi-chassis configurations for increased routing capacity.

The Cisco NCS 4000 Multi-Chassis system scales by interconnecting LCCs to FCCs. These connections are made from the LCC switch fabric cards to the FCC fabric cards through CXP optical interconnects. The NCS 4000 has a three-stage switch fabric architecture. In a multi-chassis configuration, the first and third stages are implemented by the fabric cards (NCS4016-FC2-M) on the LCC, and the second stage is performed by the fabric cards (NCS4KF-FC2-C) on the FCC.

In the multi-chassis system, the system uptime displayed on the craft panel of each chassis in the multi-chassis system varies based on the when the chassis was booted or rebooted.

Fabric Card Chassis Components

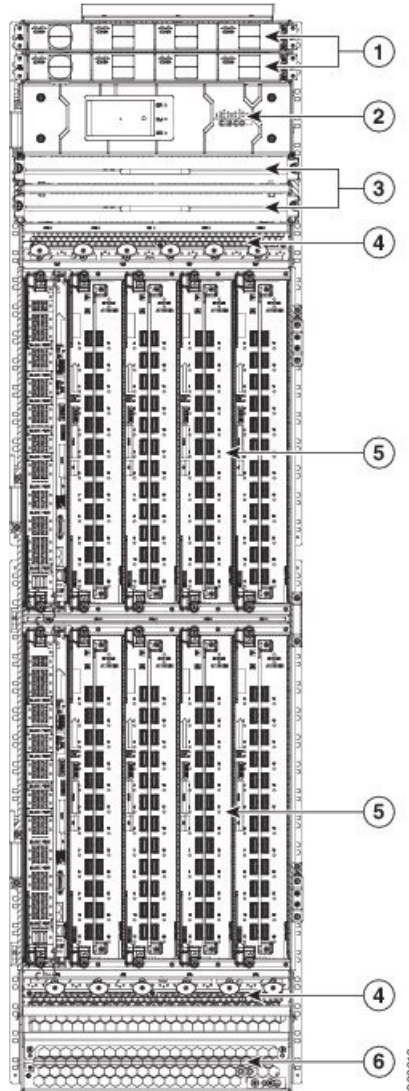
Table 1: Main Components of the Cisco NCS 4000 FCC

Component	Description
Chassis backplane	The chassis backplane distributes power and provides interconnections for other components in the system. The backplane supports the RPMC and fabric cards. The power trays, craft panel, fan trays, and temperature sensor are connected to the backplane through cabled connectors.
S2 Fabric Cards (FCs)	The FCC has eight FC slots: four slots on the upper cage and four slots on the lower cage.
CXP optical modules and connectors	The connections between the LCC and the FCC are implemented through a number of bi-directional optical links. Pluggable CXP2 form-factor optics are used for these interconnects. CXP2 optical modules are used on the NCS4KF-FC2-C and NCS4016-FC2-M cards to connect the two fabric cards together. The CXP2 module uses a 24-fiber MPO connector that supports 12 bi-directional optical links up to 100 meters of OM-4 multi-mode fiber cable.
RPMC Cards	There are two RPMC cards. The cards are inserted into two dedicated slots on the front of the FCC. One RPMC card installs into slot RPMC0 SC0/SW0 on the upper card cage and the other RPMC card installs into slot RPMC1 SC1/SW1 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 RPMC card must be operational for the FCC to function.
Power trays	There are two DC power trays. Each DC power tray has four power modules.
Fan trays	Two fan trays are inserted into the front of the FCC . Each fan tray contains six axial fans. The fans pull cooling air through the FCC from the front to the rear of the FCC. Both the fan trays must be present always for the proper functioning of the chassis.
Air filter	A removable air filter is located below the lower cable management bracket and inside the front air inlet on the front of the FCC .
Cable management brackets	The FCC has cable management features on the front side 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. Two horizontal cable management assemblies are preinstalled on the FCC: one cable management assembly above the upper card cage and one cable management assembly below the lower card cage. The cable management bracket can be rotated to three different positions. To change the position of the cable management bracket, loosen the captive screw, align it to the required aperture, and then tighten the captive screw.
Temperature sensor assembly	A temperature sensor is used for monitoring the temperature of the air entering the chassis. This sensor is placed near the base of the chassis where the fresh air enters inside the chassis.

Component	Description
Craft panel display	A craft panel display, located on the front of the FCC and 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 4000 FCC.

Figure 1: Front View of the Cisco NCS 4000 FCC



1	Power trays	4	Cable management brackets
2	Craft panel display	5	Card cages
3	Two fan trays	6	Removable air filter

Slot Numbers

This section identifies the location and slot numbers for system components that plug into the Cisco NCS 4000 FCC.

The FCC has the following slots: Two RPMC card slots for redundancy and eight FC slots

- Upper card cage: (left to right: RPMC0 SC0/SW0, FC0, FC1, FC2, FC3)
- Lower card cage: (left to right: RPMC1 SC1/SW1, FC4, FC5, FC6, FC7)

Chassis Specifications

The following table lists the physical specifications of the Cisco NCS 4000 FCC.

Table 2: Cisco NCS 4000 FCC Specifications

Supported Cards and Modules	<ul style="list-style-type: none"> • Two RPMC cards • Eight fabric cards • Eight DC power modules • Two fan trays
Fabric Chassis Dimensions	
Height	70.7 in. (179.6 cm) as shipped
Width	17.54 in. (44.55 cm) Chassis side to side 19.5 in. (49.54 cm) with door assembled
Depth	17.77 in. (45.14 cm) with door
Aisle Spacing	To install chassis (front): 48 in. (122 cm) To service FRUs (front): 31.7 in. (80.5 cm) To service FRUs (rear): 14.0 in. (35.6 cm)
Weights	
Chassis as shipped	227.3 lb (103.1 kg)
Chassis, fully loaded with power trays, cards, and cosmetics	440.9 lb (200 kg)
Fabric Chassis Cooling	Two fan trays
Chassis airflow	Up to 1250 cubic feet per minute
DC power system airflow	240 cubic feet per minute

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 4000 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

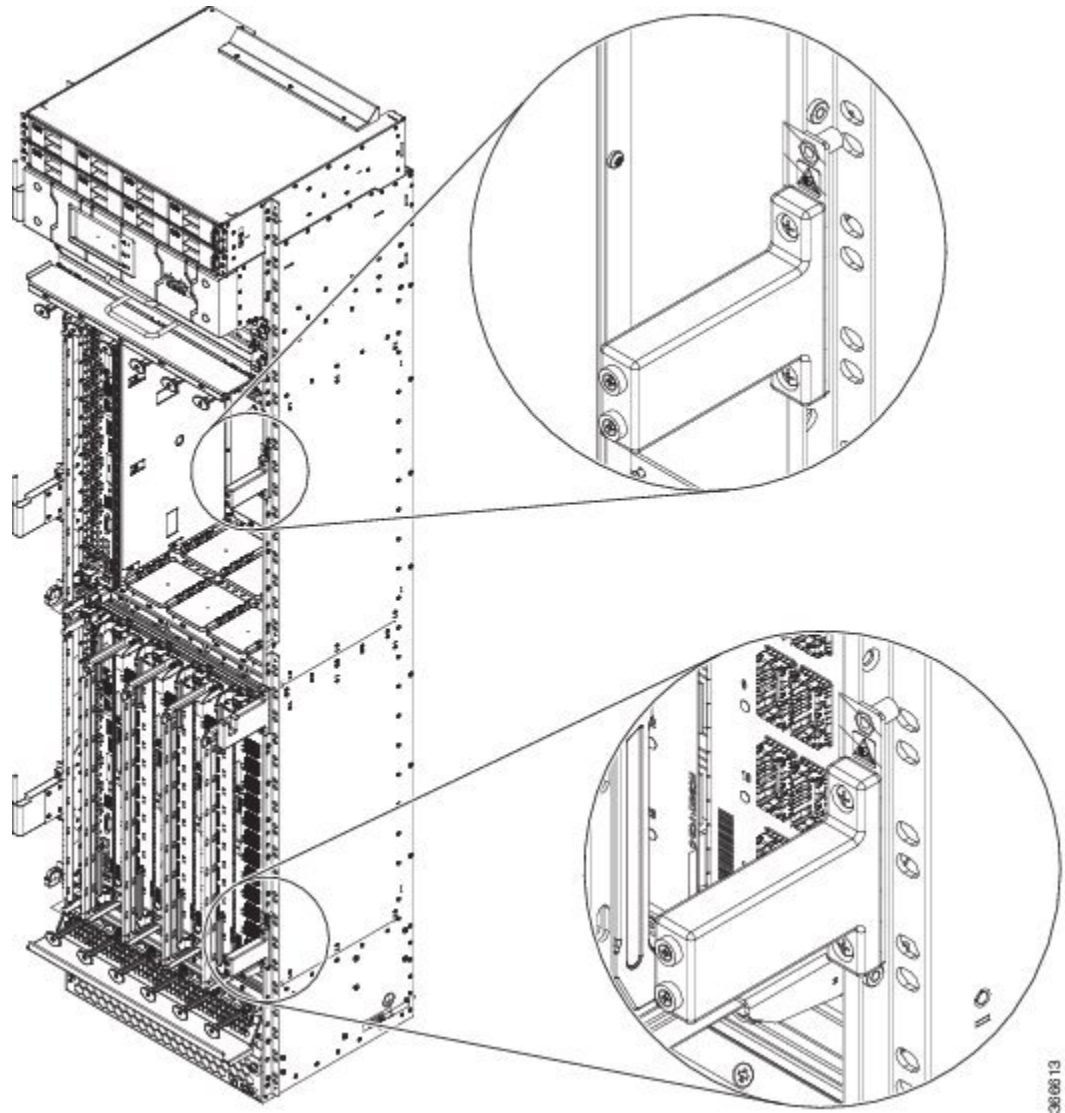
Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend use of an ESD-preventive wrist strap whenever you handle network equipment or one of its components.

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

The following figure shows the locations of the ESD jacks on the FCC.

Figure 2: ESD Jacks on the NCS 4000 FCC



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CHAPTER 2

Mounting the Cisco NCS 4000 Fabric Card Chassis

This chapter describes how to secure the Cisco NCS 4000 fabric card chassis in the rack.

- [Preparing to Mount the Chassis in a Rack, on page 9](#)
- [Mounting the Chassis into a Rack, on page 17](#)

Preparing to Mount the Chassis in a Rack

Before you mount the Cisco NCS 4000 FCC into a rack, it is critical that the installation site be prepared properly to handle the chassis weight, power requirements, cooling needs, and other requirements.

Because a fully-configured chassis weight can be up to 440.92 lb (200 kg), you should review the rack specifications from the manufacturer to determine whether the racks you have are appropriate to handle the weight of the chassis.



Caution To avoid tipping the chassis and possible injury when installing it, take care to properly position the chassis in the rack when you are mounting it.

Unpacking the Chassis

This section describes how to unpack the chassis from its shipping crate.



Caution The crated Cisco NCS 4000 FCC is tall and heavy. Handle it carefully to reduce the risk of tipping the chassis over too far so that it falls to the floor and causes injury. We recommend that at least two people move the chassis together to better support its size and weight.

The following table lists the physical characteristics of the Cisco NCS 4000 FCC shipping crate.

Weight (estimated maximum)	<ul style="list-style-type: none">• 227 lb (103 kg) chassis as shipped.• 375 lb (170 kg) shipping crate with pallet• 441 lb (200 kg) chassis fully loaded with power modules, fan trays, cards, and door
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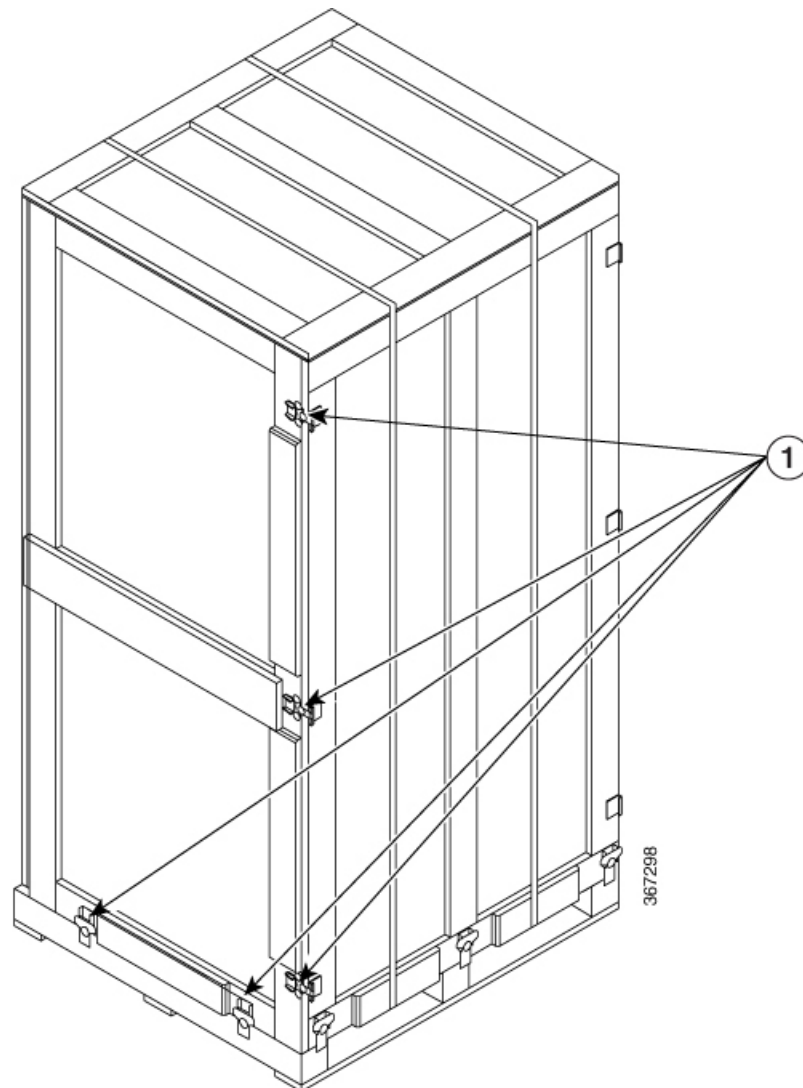
Dimensions	Height: 84 in. (213.4 cm)
	Width: 41 in. (104.1 cm)
	Length: 38 in. (96.52 cm)

To unpack the chassis, follow these steps:

Procedure

- Step 1** Locate a large area to accommodate and remove the chassis crate.
- Step 2** Carefully move the pallet containing the chassis to the staging area where you plan on unpacking it.
- Caution** The chassis with pallet should be handled carefully to eliminate the risk of tipping over the chassis.
- Step 3** Disengage the metal link-lock latches that are securing the crate to pallet, and the crate door to the rest of the crate as seen in the figure below.

Figure 3: Cisco NCS 4000 Series Chassis Crate



1	Metal link-lock latches
---	-------------------------

Step 4 Using two people open and remove the crate carefully from the shipping pallet.

Tip Be sure to save the packaging in case you need to return any of the components.

Step 5 Remove the packaging cushion from the top of the chassis.

Leave the chassis in place until you are ready to move and install the chassis in the rack.

Removing the Chassis from the Pallet



Note Do not remove the chassis support brackets until you are ready to move and install the chassis.

Required Tools and Equipment

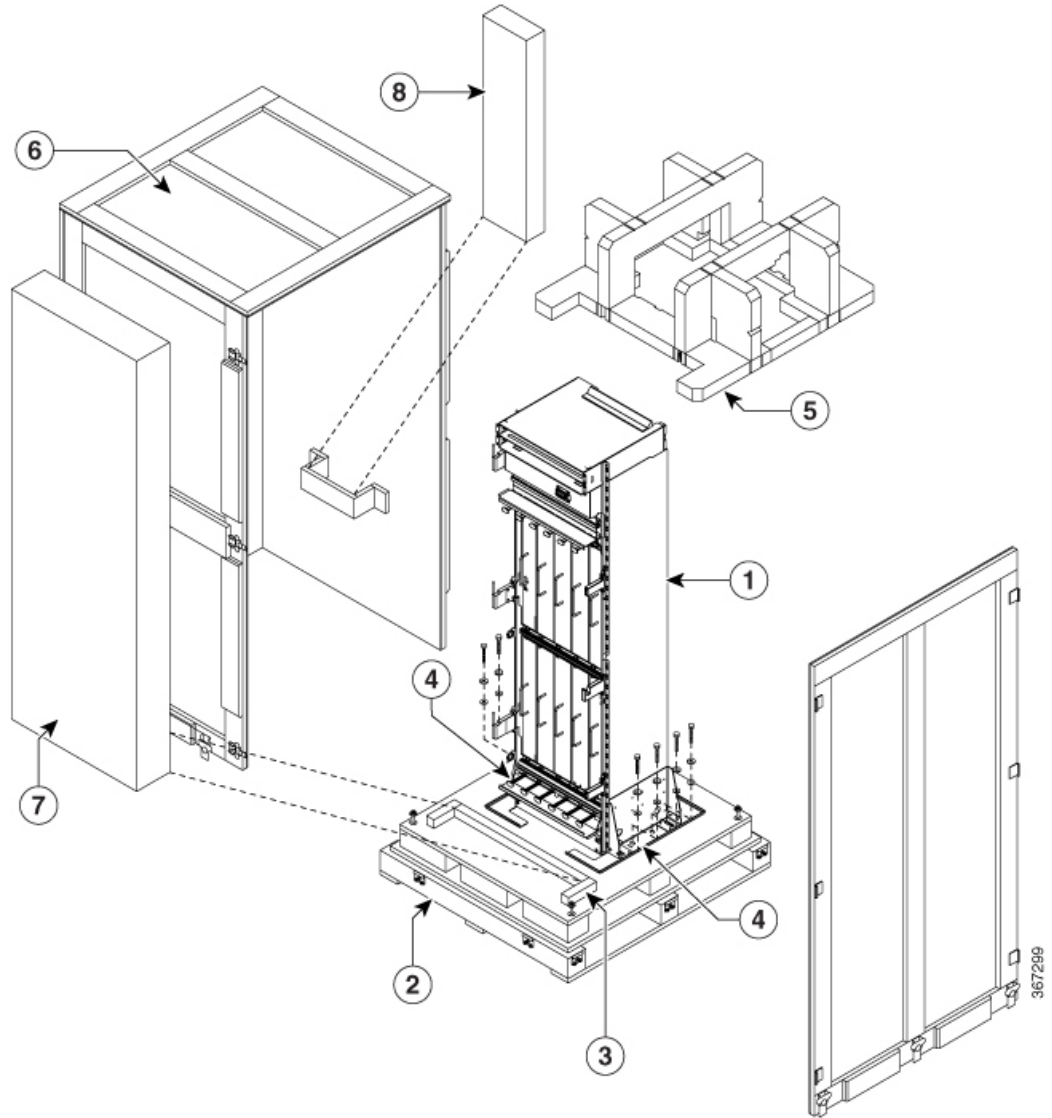
- Pry bar or claw hammer
- Number-2 Phillips screwdriver
- 9/16-inch or M14 wrench or socket
- Forklift

To remove the chassis from the pallet, follow these steps:

Procedure

Step 1 Remove the wooden cleat using a pry bar or claws of hammer.

Figure 4: Unpacking the NCS 4000 Fabric Chassis



1	NCS 4000 fabric chassis	5	Packaging cushion
2	Pallet	6	Crate
3	Wooden cleat	7	Chassis door
4	Bolts	8	Accessory kit

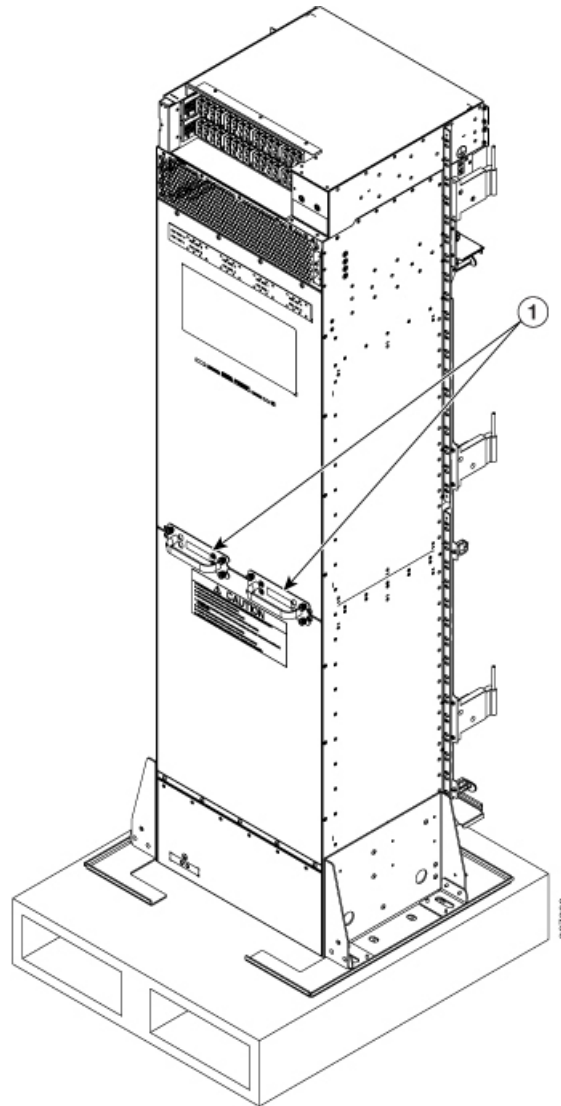
Step 2 Using a 9/16-inch or M14 wrench or socket, remove the eight bolts that are securing the brackets to the pallet. Do not remove the brackets from the chassis until the chassis is ready to be installed in the rack.

Step 3 Align the forklift to the surface of the pallet. Using at least two people, slide the chassis onto the forklift.


Note

Use the handles on the rear side of the chassis to help move the chassis onto the forklift. See figure below.

Figure 5: Chassis Handles



1	Chassis handles
---	-----------------

	CAUTION
<p>1. USE HANDLES TO MOVE THE CHASSIS FROM PACKAGING TO FORK/SCISSOR LIFT</p> <p>2. DO NOT USE HANDLES TO LIFT THE CHASSIS</p> <p>3. USE HANDLES TO GUIDE THE CHASSIS ONTO RACK</p> <p>4. REMOVE HANDLES ONCE THE CHASSIS ASSEMBLED ON A RACK</p> <p>1. UTILISER LES POIGNÉES UNIQUEMENT POUR GLISSER LE CHÂSSIS HORS DE LA BOÎTE SUR L'ÉLÉVATEUR</p> <p>2. NE PAS SOULEVER LE CHÂSSIS PAR LES POIGNÉES</p> <p>3. UTILISER LES POIGNÉES POUR GUIDER LE CHÂSSIS SUR LE RACK</p> <p>4. UNE FOIS LE CHÂSSIS INSTALLÉ SUR LE RACK, RETIRER LES POIGNÉES</p>	

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Note Make sure that the L-shaped extensions of the brackets rest completely on the fork lift blades before you transport the chassis. This ensures chassis stability.

Step 4 Transport the chassis to the installation location.

Note Make sure that you have at least two people to transport the chassis.

Installing the Mounting Brackets

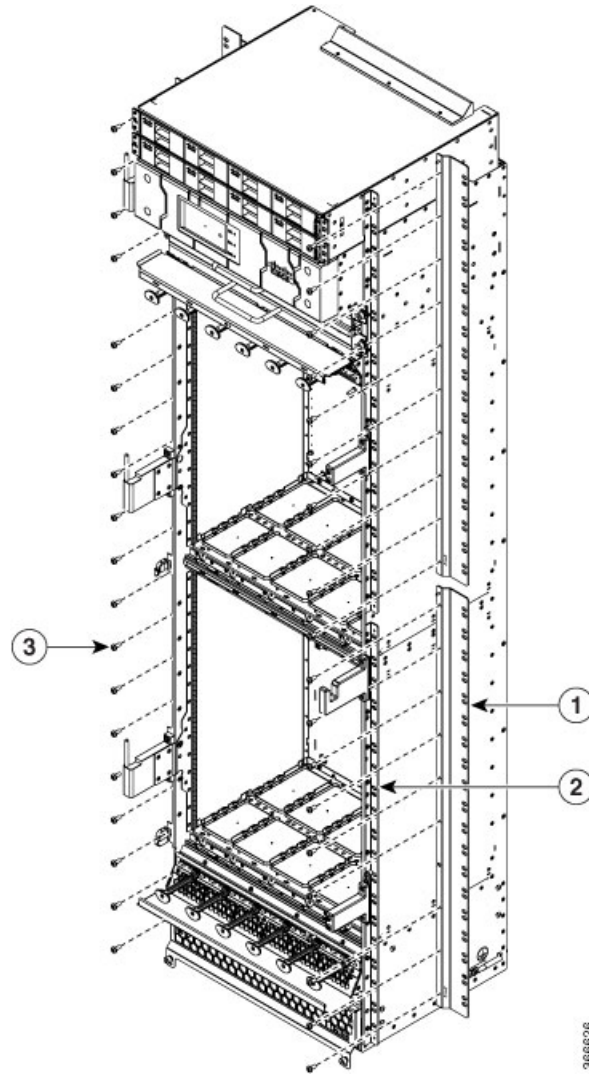
This section explains how to install the top and bottom 23-inch mounting brackets on the chassis.

Required Tools and Equipment

- Number-2 Phillips screwdriver
- Cisco installation kit (NCS4KF-INST-KIT=)

To attach the mounting brackets, simply fix each adaptor bracket onto the 10-inch bracket that is already preinstalled on the chassis using at least 14 screws on each side as shown in the figure below.

Figure 6: Attaching Chassis Mounting Brackets



1	23-inch bracket adaptor
2	19-inch pre-installed bracket
3	Screws

Mounting the Chassis into a Rack

This section describes how to mount the Cisco NCS 4000 FCC into a rack.



Caution The crated Cisco NCS 4000 FCC is tall and heavy. Handle it carefully to reduce the risk of tipping the chassis over too far so that it falls to the floor and causes injury. We recommend that at least two people move the chassis together to better support its size and weight.

Prerequisites

- Make sure that the rack is level and bolted to the floor.
- Make sure that the mounting brackets are installed on the chassis.

Required Tools and Equipment

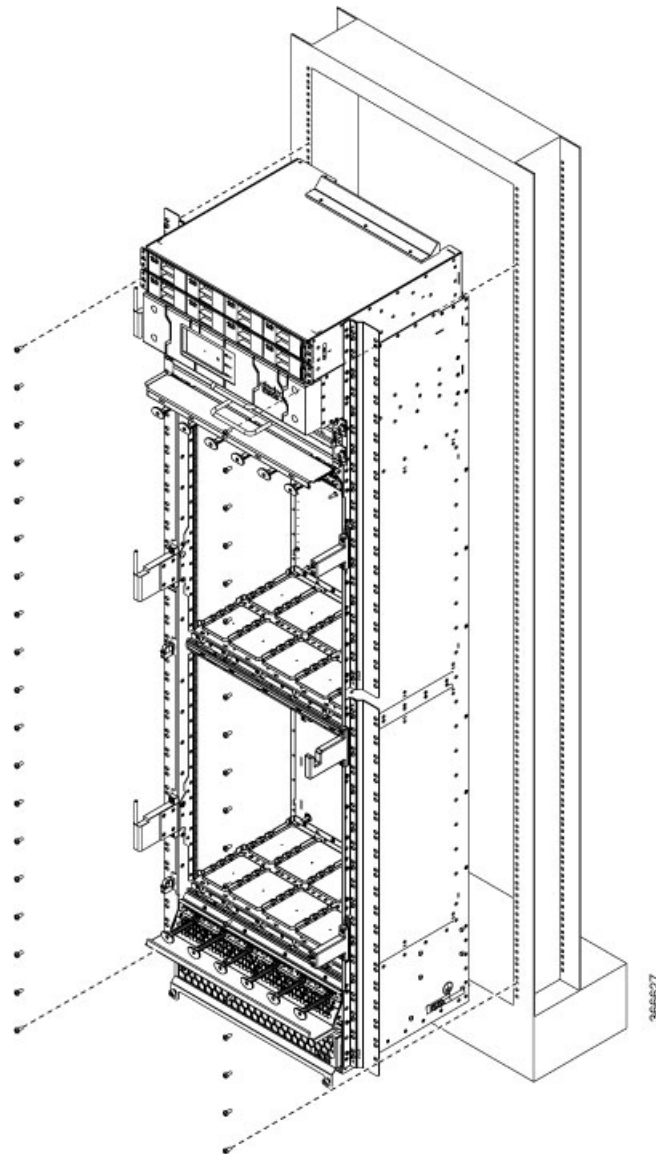
- Number 2 Phillips screwdriver
- Cisco installation kit (NCS4KF-INST-KIT=)

To mount the chassis in the rack, follow these steps:

Procedure

- Step 1** With the chassis on the forklift, align the chassis with the rack.
Ensure there is sufficient room to maneuver the forklift into the installation location.
- Step 2** Using a number-2 Phillips screwdriver, remove the eighteen screws that are securing the brackets to the chassis.
The eighteen screws are present on the shipping bracket.
- Step 3** Using the forklift, raise the chassis to the required height of the chassis installation position.
- Step 4** Move the chassis with at least two people. With one person standing in front of the chassis, carefully push the chassis into the rack. With one person standing behind the chassis, use the rear pull handles to carefully pull the chassis from the forklift to the rack until the chassis mounting brackets make contact with the rack vertical posts.
- Caution** Ensure that the chassis is supported when it is moved from the forklift to the rack if the forklift blades do not fully go into the rack space.
- Step 5** Insert and partially tighten the 28 mounting screws to attach the chassis vertical mounting brackets to the rack vertical mounting rails.

Figure 7: Chassis Mounting Holes



Note To accommodate equipment racks with different mounting-hole patterns, the chassis mounting brackets have groups of screw holes on either side. The mounting holes in these rails are spaced so that one hole in each hole group aligns with a hole in the equipment rack or the optional center-mount bracket. Use the corresponding mounting hole (in the same hole group) on the opposite side of the chassis to level the chassis in the rack.

- Step 6** Use the screwdriver to fully tighten the screws after all the screws have been installed using a torque of 22 in-lb.
- Step 7** Remove the forklift.
- Step 8** Remove the two rear handles after the chassis has been installed.



CHAPTER 3

Installing the Power Components

This chapter provides an overview of the DC power system and how to install the power modules and input power cables into the Cisco NCS 4000 Fabric Card Chassis (FCC).

- [Installing Power Components, on page 21](#)

Installing Power Components

Power Connection Guidelines

Ensure all power connection wiring conforms to the rules and regulations in the National Electrical Code (NEC) as well as local codes.

The chassis has two power trays. Each power tray includes four power modules. The power tray provides electrical connections to the chassis backplane. Each power module can be individually plugged in or out from the tray.



Caution Proper grounding is necessary to avoid damage from lightning and power surges. See the [NEBS Supplemental Unit Bonding and Grounding Guidelines, on page 24](#) for grounding requirements.

DC-Powered Chassis

Use a 6 AWG wire rated 75°C minimum, for DC power modules connection. The system accepts a nominal input voltage of -48 VDC or -60VDC, with an operational tolerance range of -40.5 to -72 VDC. One dedicated, commensurately rated DC power source is required for each power module connection. Each power feed shall be provided with a double pole breaker, rated not more than 60A, with medium delay.



Note Follow the power and sizing requirements for your site.



Note The Short Circuit protection Breaker shall not be rated more than 60A.

Power redundancy requirements vary based on the system configuration (number of cards present in the chassis and traffic load). DC-powered systems are N+1 protected.

Power connections to the power tray for each DC power module requires four cables: two source cables and two return cables.

For DC power cables, we recommend 6 AWG high-strand-count copper wire cables, rated 75°C minimum. The size of the cables depends on your chassis location from the source power. Follow your local practices for determining cable size. DC power cables are not available from Cisco, but they are available from any commercial cable vendor.

You must terminate DC power cables using cable lugs at the power tray end. The lugs required for the input power are provided with the power modules.



Warning Hazardous voltage or energy may be present on power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place. Statement 1086



Warning Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030



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



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



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



Warning To avoid shock hazard, be sure to apply shrink wrap tubing around the wire entry area of the lug.

The color coding of source DC power cable leads depends on the color coding of the site DC power source. Because there is no color code standard for source DC wiring, be sure that power source cables are connected to the power modules using the proper positive (+) and negative (–) polarity:

- In some cases, the source DC cable leads might have a positive (+) or a negative (–) label. This is a relatively safe indication of the polarity, *but you must verify the polarity by measuring the voltage between the DC cable leads*. Be sure that the positive (+) and negative (–) cable leads match the positive (+) and negative (–) labels on the power module when making the measurement.
- A green (or green and yellow) cable typically indicates that it is a ground cable.



Caution DC power modules contain reverse voltage protection circuitry to prevent damage to the power module if it detects a reverse polarity condition. No damage should occur from reverse polarity, but you should correct a reverse polarity condition immediately.

The rating label is shown in the figure below.

Figure 8: Rating Label for NCS 4000 FCC DC Chassis



General Power and Grounding Requirements

This section describes the power and grounding requirements you must consider when planning the site facilities for the routing system. In addition, see the [DC Power Requirements, on page 24](#) for additional information about the power requirements for your chassis type.



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

General power and grounding requirements are:

- Installation of the routing system must follow national and local electrical codes:
 - In the United States: United States National Fire Protection Association (NFPA) 70 and United States National Electrical Code (NEC).
 - In Canada: Canadian Electrical Code, part I, CSA C22.1.
 - In other countries: International Electrotechnical Commission (IEC) 60364, parts 1 through 7.
- Two separate and independent DC power sources are needed to provide 2N redundancy for system power. Each power source requires its own circuit breaker.
- Each power source must provide clean power to the site. If necessary, install a power conditioner.
- The site must provide short-circuit (over-current) protection for devices.
- Proper grounding is required at the site to ensure that equipment is not damaged by lightning and power surges. In addition:
 - Chassis grounding is required for DC-powered systems.
- Site power planning must include the power requirements for any external terminals and test equipment you will use with your system.



Note Be sure to review the safety warnings in the *Regulatory Compliance and Safety Information for Cisco NCS 4000 Series* before attempting to install the routing system.

DC Power Requirements

Observe the following guidelines for DC-powered shelves. In addition, be sure to review the requirements described in the [General Power and Grounding Requirements, on page 23](#).

- A DC-powered chassis requires up to a maximum of 12,250 watts of DC input power when the chassis is fully loaded.
- All power connection wiring must conform to the rules and regulations in the National Electrical Code (NEC) and any local codes. In addition, make sure that the wiring conforms to any internal requirements at the installation site.
- Each DC power source must comply with the safety extra-low voltage (SELV) requirements in UL 60950-1, CSA-C22.2 No. 60950-1, EN60950-1, AS/NZS 60950, and IEC60950-1.
- A DC-powered system should be installed in a restricted access area in accordance with the National Electric Code, ANSI/NFPA 70.
- All components in the area where DC input power is accessible must be properly insulated.

If it is not possible to rely on the identification of the earthed conductor in the DC mains supply, whereby the equipment is not provided with a two-pole disconnect device, then a two-pole disconnect device is to be provided external to the equipment.

NEBS Supplemental Unit Bonding and Grounding Guidelines

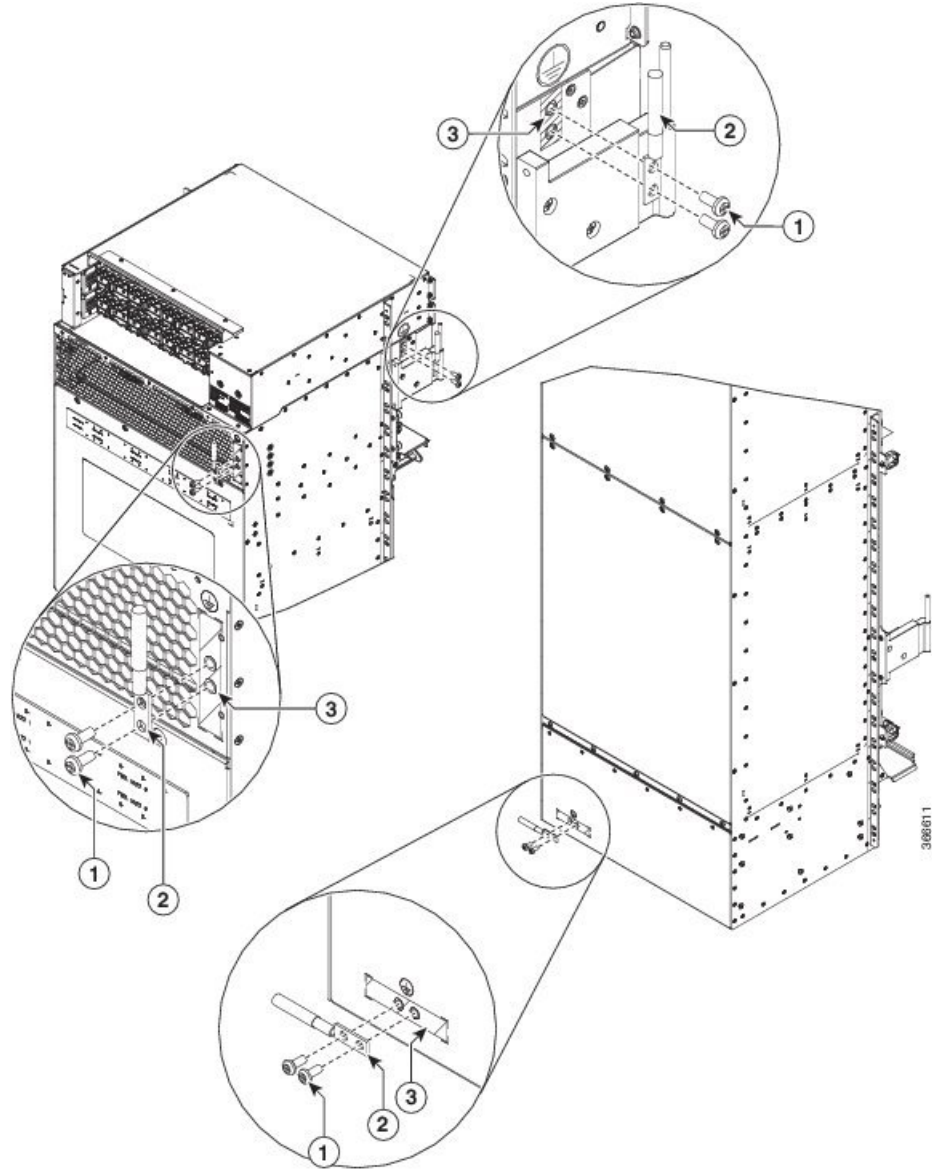
You must connect the central office ground system or interior equipment grounding system permanently to one of the two supplemental bonding and grounding connections on the back or side of the chassis to meet Network Equipment Building System (NEBS) requirements as well as safety compliance requirements. These grounding points are referred to as the NEBS bonding and grounding points.

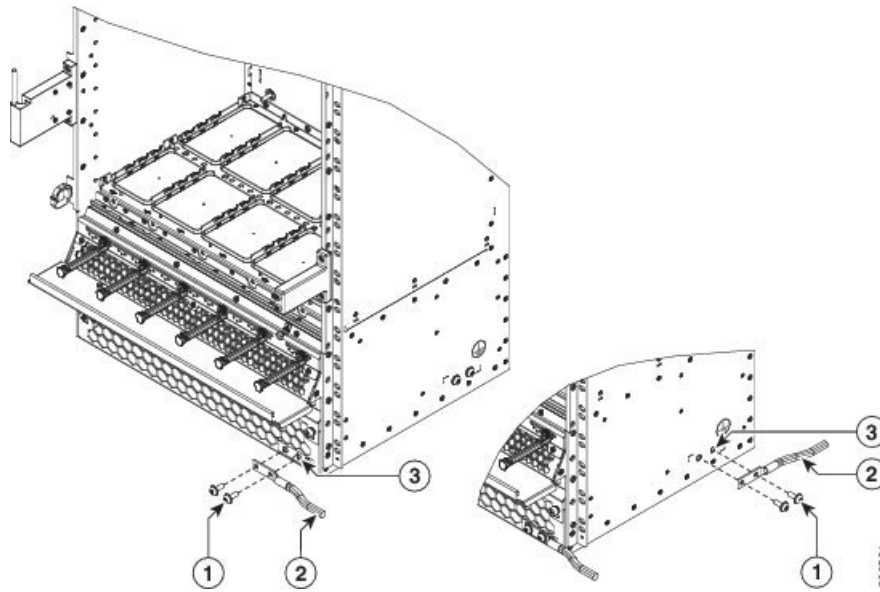


Note These bonding and grounding connections satisfy the Telcordia NEBS requirements for supplemental bonding and grounding connections. If you are not installing the chassis in a NEBS environment, you can choose to bypass these guidelines and rely on the safety earth ground connections to the DC power modules.

There are five grounding points on the Cisco NCS 4000 FCC as seen in the figure below.

Figure 9: NEBS Bonding and Grounding Points on the Cisco NCS 4000 FCC





1	Screws and washers
2	Grounding lug with cable
3	Grounding point

To ensure a satisfactory supplemental ground connection to the chassis, use the following parts:

- One grounding lug, which has #10 stud holes with 5/8 spacing between them, and a wire receptacle able to accept a 4-AWG or larger, multistrand copper wire. This lug is similar to those used for the DC input power supply leads.
- Two M6 round-head screws and two locking washers.
- One grounding wire. Although we recommend at least 4-AWG multistrand copper wire, the wire diameter and length depend on your chassis location and site environment.

Installing the Chassis Ground Cable

This section describes how to install a ground cable to either NEBS bonding and grounding point on the front or side of the Cisco NCS 4000 FCC.

Required Tools and Equipment

- Ground lug and screws (provided in chassis accessory kit)
- Ground cable
- Crimping tool and lug specific die
- Number-2 Phillips screwdriver

To ensure a satisfactory ground connection, we recommend 4-AWG multistrand copper ground cable. The cable should be sized according to local and national installation requirements.

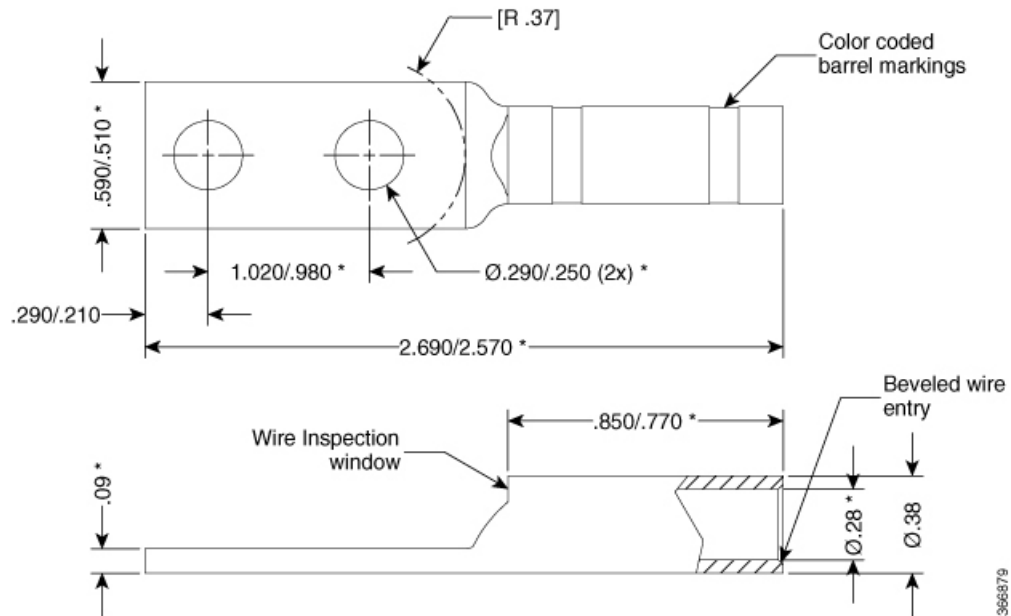


Note The chassis ground cable must be connected first to the chassis before any other connections are made. During removal of the chassis, the ground cable must be disconnected last.



Note The DC return of this system should remain isolated from the system frame and chassis (DC-I: Isolated DC Return). The DC return must be connected to the ground at source.

Figure 10: Straight Barrel Grounding Lug

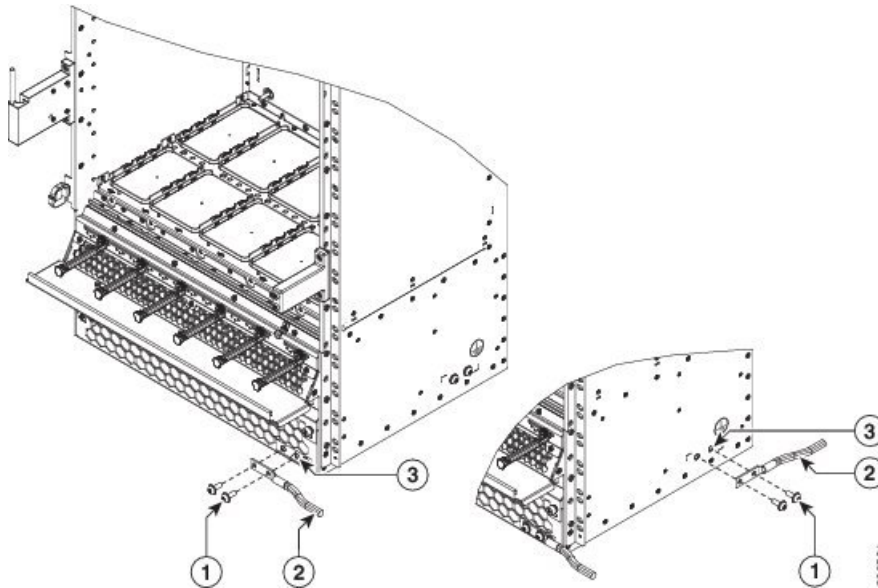


To attach the ground cable to the chassis, follow these steps:

Procedure

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

Figure 11: Installing the Chassis Ground Cable



1	Screws and washers
2	Grounding lug with cable
3	Grounding point

Step 2 Use the Phillips screwdriver to tighten the screws to a torque of 22-25 in-lb.

Step 3 Connect the other end of the ground cable to a grounding point at your site, according to site requirements.

Installing DC Power Tray

This section describes how to install a DC power tray in the chassis.

Required Tools and Equipment

- 6-inch, number-1 Phillips screwdriver
- Cisco NCS 4000 FCC power trays (Cisco PIDNCS4K-DC-PEM)

To install a DC power tray, follow these steps:

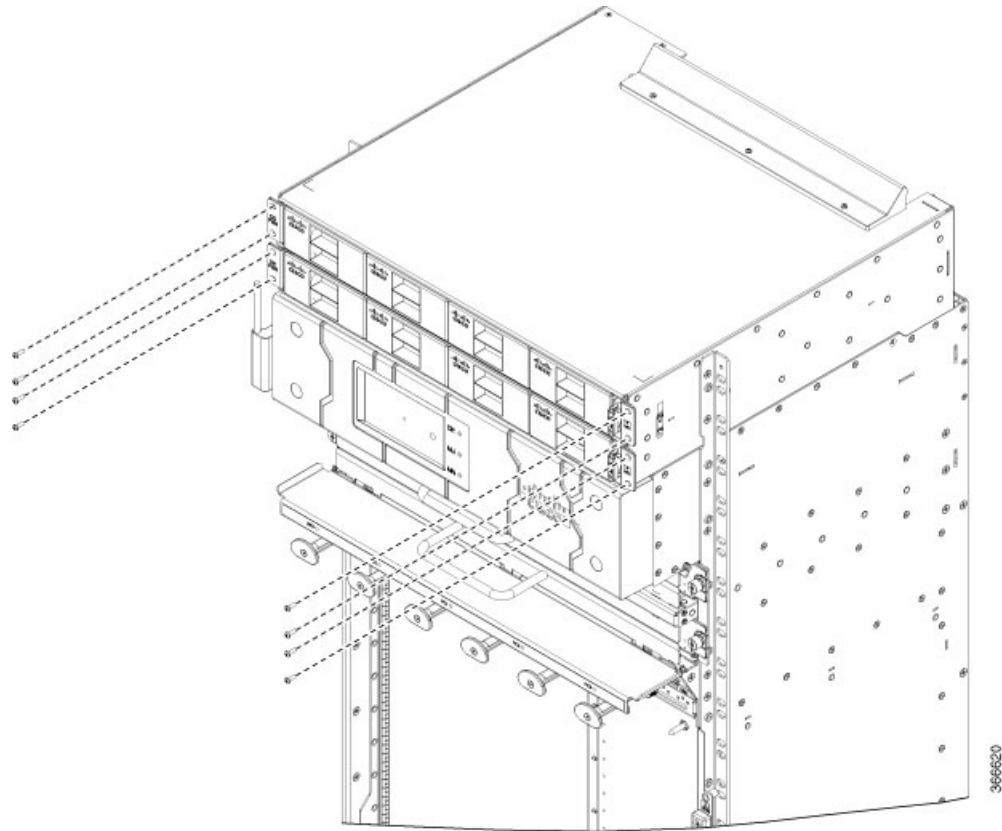
Procedure

Step 1 Slide the power tray into the bay until it engages its mating connector on the chassis.

Step 2 Fully seat the power tray into its mating connector and seat the power tray mounting ears against the chassis mounting ears.

Step 3 Install and tighten the screws (for each power tray) through the power tray mounting ears on each side into the screw holes in the chassis mounting ears to secure the tray to the chassis using a torque of 6 in-lb.

Figure 12: Screws on Power Tray Mounting Ears



Installing Power Modules

This section describes how to install power modules into the chassis.



Caution Never force a power module into the power tray if you feel any resistance! Forcing a module into the incorrect tray can cause damage to the module and the tray.

Each power module has three status LEDs located on the front left side of its faceplate.

Table 3: Power Module LED Status Indicator Lights

LED Name	Color	Meaning
Input OK	Green	<ul style="list-style-type: none"> 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.

LED Name	Color	Meaning
Output OK	Green	<ul style="list-style-type: none"> • On: The output voltage is on. • Blinking: The power module is in a power limit or over current condition. • Off: The output voltage is off.
Fault	Red	<ul style="list-style-type: none"> • On: An internal fault is detected within the power module. • Off: No internal faults detected on the power module.

Installing DC Power Modules

This section describes how to install DC power modules.

Required Tools and Equipment

- Cisco NCS 4000 FCC power modules (NCS4K-DC-PSU-V1)



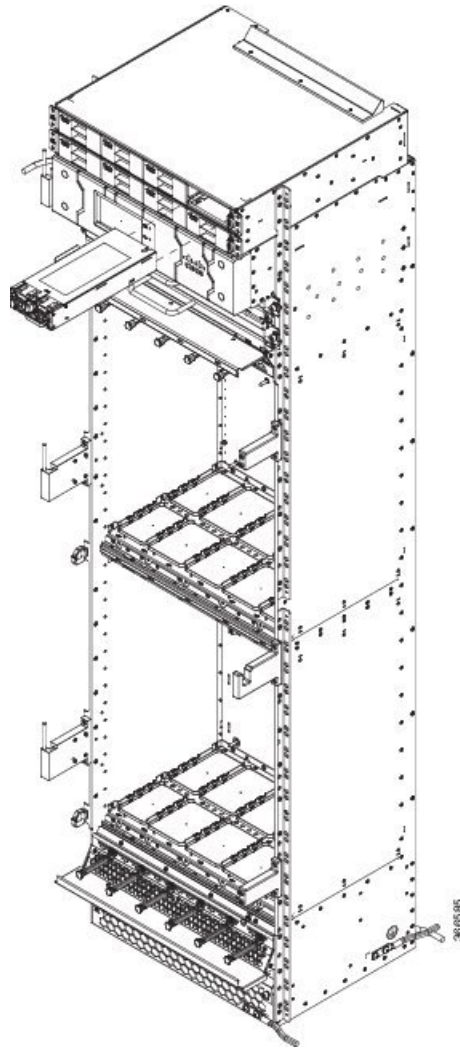
Caution To prevent damage to the power tray backplane connector, do not use excessive force when inserting the power module into the power tray.

To install the DC power modules into the chassis, follow these steps:

Procedure

- Step 1** Remove the filler caps from the slots where you want to install the power modules.
- Step 2** Using two hands to support the power module, slide it into the power tray.

Figure 13: Inserting the DC Power Module



Step 3 Secure the power module into the power tray using the snap hook.

Step 4 Repeat these steps for the other DC power modules.

Connecting Power to a DC-Powered Chassis

This section explains how to connect the DC source power cables to a DC-powered chassis.

The color coding of source DC power cable leads depends on the color coding of the site DC power source. Because there is no color code standard for source DC wiring, you must be sure that power source cables are connected to the power module with the proper positive (+) and negative (–) polarity:

- In some cases, the source DC cable leads might have a positive (+) or a negative (–) label. This is a relatively safe indication of the polarity, *but you must verify the polarity by measuring the voltage between the DC cable leads*. Be sure that the positive (+) and negative (–) cable leads match the positive (+) and negative (–) labels on the power module when making the measurement.

- Green (or green and yellow) cable typically indicates that it is a ground cable.



Caution DC power modules contain circuitry to trip the breaker on the power module if the power module detects a reverse polarity condition. No damage should occur from reverse polarity, but you should correct a reverse-polarity condition immediately.



Warning To ensure that power remains off while you are performing this procedure, lock-out/tag-out the DC circuit breaker switch in the OFF (0) position until you are ready to turn it on.

To connect the DC source power cables to a DC power tray, follow these steps :

Procedure

Step 1 Verify that the power switch is set to the OFF (0) position. The power switch is on the right of the power tray.

Step 2 Remove the clear plastic safety covers that fit over the DC power connection terminal studs.

Step 3 Verify the following resistance values on both power shelves:

- The resistance between the positive and negative power terminal studs of each input must be greater than 90 KOhm.
- The resistance between each positive terminal stud and bare metal surface on the power shelf must be greater than 10 MOhms.
- The resistance between each negative terminal stud and bare metal surface on the power shelf must be greater than 10 MOhms.

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

Step 4 Connect the DC power cables in the following order:

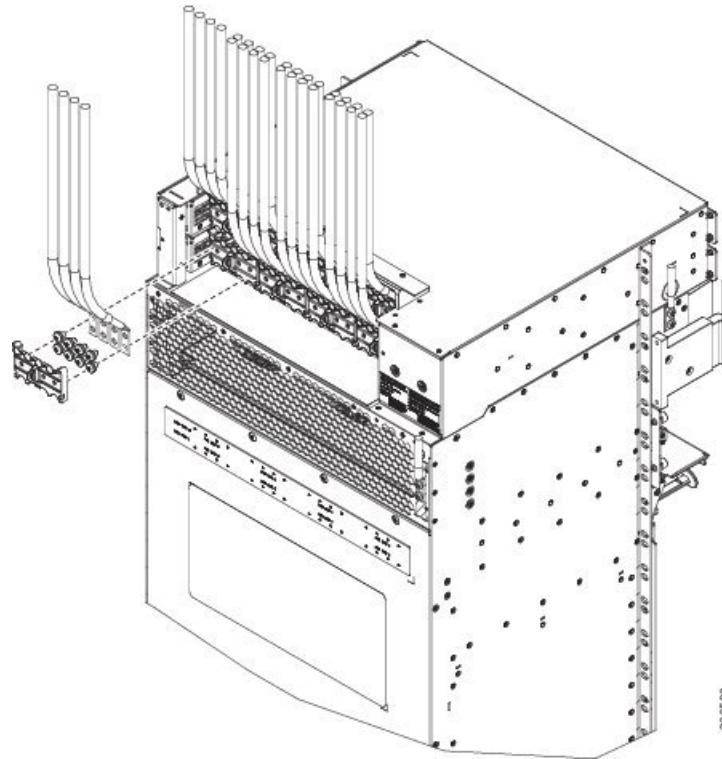
- a) Positive cable first.
- b) Negative cable last.

Step 5 Repeat Step-4 for the other power modules installed in the tray.

Warning To prevent injury and damage to the equipment, always attach the ground and source DC power cable lugs to power tray terminals in the following order: (1) positive (+) to positive (+), (2) negative (-) to negative (-).

Caution Do not over tighten the nuts that secure the DC power cables to the power tray terminals. The nuts should be tightened using the 7/16 hex socket and torque wrench to a torque of 35 in-lb.

Figure 14: Typical Power Connections to a Power Tray for a Single DC Power Module—Power System



Step 6 Replace the clear plastic safety covers over the connection terminal studs.

Step 7 Proceed to the [Powering On the Chassis](#), on page 35.

Disconnecting DC Power

The following sections explain how to disconnect DC power to the FCC.

Disconnecting DC Power From a Single Power Module



Caution It is not necessary to disconnect all power from the chassis to replace components, including power modules.

To disconnect an individual DC power source from a power tray, follow these steps:

Procedure

Step 1 Power off the circuit breaker assigned to the DC power source you are disconnecting.

Warning To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the OFF (0) position until you are ready to turn it on.

- Step 2** Remove the clear plastic safety covers that fit over the DC power connection terminal studs.
- Warning** To prevent injury and damage to the equipment, always remove the source DC power cables from the power tray terminals in the following order : (1) negative (-), (2) positive (+).
- Step 3** Disconnect the DC power cables from their terminals in the following order and note the color of each cable:
- Negative (PWR) cables first.
 - Positive (RTN) cables last.
- Step 4** Repeat Step-1 through Step-3 for the other power module distribution that needs to be removed.

Disconnecting DC Power From All Power Modules In a Power Tray

To disconnect power from all power modules in a single power tray, follow these steps:



Note The procedure is the same for each DC power tray, if more than one is installed.



Caution If only one power tray is installed, performing the following procedure turns off all power to the chassis.

Procedure

- Step 1** Set the power tray switch to the OFF (0) position.
- Step 2** Power off (0) the circuit breaker assigned to the DC power source you are disconnecting.
- Warning** To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the OFF (0) position until you are ready to turn it on.
- Step 3** Remove the clear plastic safety covers that fit over the DC power connection terminal studs.
- Warning** To prevent injury and damage to the equipment, always remove the source DC power cables from the power tray terminals *in the following order* : (1) negative (-), (2) positive (+).
- Step 4** Disconnect the DC power cables from their terminals in the following order and note the color of each cable:
- Negative (PWR) cables first.
 - Positive (RTN) cables last.
- Step 5** Repeat Step 1 through Step 4 for the other power tray, if installed.
- Note** Perform this step only if you want to power down the whole chassis.

Reconnecting DC Power

To reconnect DC power to a DC power tray, see [Connecting Power to a DC-Powered Chassis](#), on page 31.

Powering On the Chassis

To turn on power to a DC-powered chassis, follow these steps:

Procedure

- Step 1** Power on the circuit breaker to your power sources one at a time.
- Step 2** Verify that the correct Power Input LED on each power module in the tray is lit. Continue with steps 1 and 2 until all inputs have been verified.
- Note** The power tray has two power LEDs on the rear side for each power module, one for Feed A and the other for Feed B. Each LED is solid green if the respective feed is present.
- Step 3** Set the power tray switch to the ON (1) position. This powers on slots PWR MOD 0 through PWR MOD 3.
- Step 4** Verify that the Power Output LED on each power module in the tray is lit.
- Step 5** Repeat Step 3 and Step 4 for the other power tray.
-



CHAPTER 4

Installing the RPMC and the Fabric Cards

This chapter provides details about RPMC and fabric cards for the NCS 4000 FCC.

- [Route Processor Multi Chassis Card, on page 37](#)
- [Fabric Card, on page 38](#)
- [Guidelines for Installing a Card, on page 40](#)
- [Installing a Fabric Card or a Route Processor Multi Chassis Card , on page 41](#)
- [Online Insertion and Removal of a Fabric Card or Route Processor Multi Chassis Card, on page 44](#)
- [Verifying the Installation of a Card, on page 46](#)

Route Processor Multi Chassis Card

The Route Processor Multi Chassis (RPMC) card (PID: NCS4KF-RPMC) is a 56-port combination card. The RPMC card integrates a Shelf Controller and the Switch for the NCS 4000 Control Ethernet into one physical card. The RPMC card controls the route processing, the fabric cards, and the management functions for the FCC and its components. The alarm LEDs on the RPMC card indicate active alarm conditions.

The RPMC cards are inserted into two dedicated slots on the front of the FCC. One RPMC card installs into slot RPMC0 SC0/SW0 on the upper card cage, and the other installs into slot RPMC1 SC1/SW1 on the lower card cage. Both the upper and lower cardslots 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 RPMC card must be operational for the FCC to function.

The cable management brackets are preinstalled on the RPMC card.



Caution All SFP+ and QSFP+ optical ports on the RPMC card are required to be populated with either SFP+/QSFP+ optics or SFP+/QSFP+ dust plugs. This requirement is to adhere to the system EMC and safety compliance guidelines.

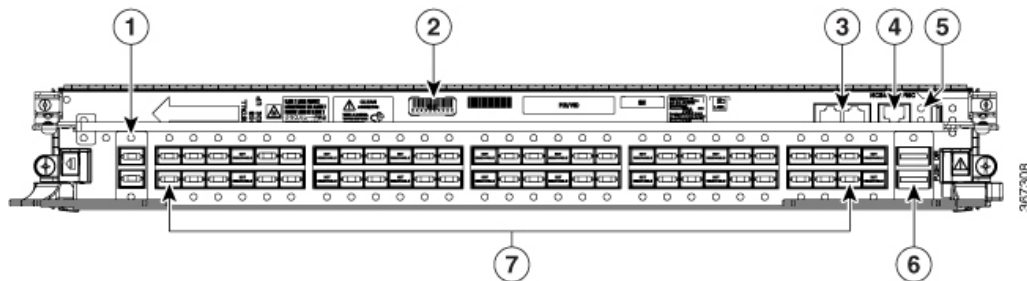


Note Only two RPMC cards, with their switch portions operational (that is, participating in Ethernet control plane traffic), are supported in an entire multichassis system.

Table 4: RPMC Card Physical Characteristics

Card Type	Height	Depth	Width	Weight
RPMC	22.37 in. (56.8 cm) including ejector projection at sides.	2.75 in. (7.0 cm) 3.45 in. (8.76 cm) without exterior cosmetics.	11.19 in. (28.4 cm) without ejector projection from faceplate.	14.96 lb (5.89 kg)

Figure 15: RPMC Card Front Panel Ports



1	Two 10GE expansion ports (EXP 0 and EXP 1)	5	USB 2.0 port
2	Serial number label	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 (0–28–55 at top)
4	RJ-45 Ethernet management port		

The RPMC card's 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 can handle 10GE operations through the SFP+ modules. The supported SFP+ modules are: ONS-SC+-10G-LR and ONS-SC+-10G-SR.
- 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 a 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 that are used for communication between two RPMC cards. The supported QSFP+ module is, QSFP-40G-SR4.
- SFP+ 10GE optical ports: control plane connectivity between the FCC and the LCC.

Fabric Card

The Cisco NCS 4000 switch fabric (PID: NCS4KF-FC2-C) has a 3-stage, cell-based architecture with four fabric planes. The fabric card (FC) implements the second stage of the switch fabric. The FCs provide the

switching functionality for the routing system and perform the cross-connect function, enabling the line cards (LC) to interact with each other.

The NCS4KF-SA-DC chassis can accommodate eight FCs. The chassis remains always populated with all eight fabric cards, except during replacement.

Table 5: NCS4KF-FC2-C Card Physical Characteristics

Card Type	Height	Depth	Width	Weight
Fabric Card	22.37 inches (56.8 cm) including the ejector projection on the sides.	11.19 inches (28.4 cm) without ejector projection from faceplate. 12.9 inches (32.79 cm) with ejectors.	3.49 inches (8.87 cm)	18 lb (8.2 kg), when shipped.

The cable management brackets are preinstalled on the FC.

The connections between the LCC and the FCC are implemented through several bidirectional optical links. Pluggable CXP2 form-factor optics are used for these interconnects. CXP2 optical modules are used on the NCS4KF-FC2-C fabric card in the FCC and on the NCS4016-FC2-M fabric card in the LCC. CXP2 connects the fabric cards that are a part of the LCC and FCC. The CXP2 module uses a 24-fiber MPO connector that supports 12 bidirectional optical links up to 100 meters of OM4 multimode fiber. The NCS4KF-FC2-C fabric card supports up to 24 CXP2 modules.



Caution All CXP2 optical ports on the NCS4KF-FC2-C fabric card are required to be populated with either CXP2 optics (ONS-CXP2-SR25) or with CXP2 dust plugs. It is mandatory to use CXP2 dust plugs in the unused CXP2 optical ports to adhere to EMC and safety compliance guidelines.

The metal surfaces of the CXP2 optical module, when used in the NCS4KF-FC2-C card, may reach high temperatures. The *Hot Optical Module* label is indicated on the fabric card, as shown in the following figure.



Caution The optical transceiver module (CXP2) may be hot; avoid direct contact with the metal surface.

Follow the procedure to remove the optical modules from the system:

- Shut down the plane on which the pluggable is installed (X is the fabric plane number- its range is from 0 to 3).

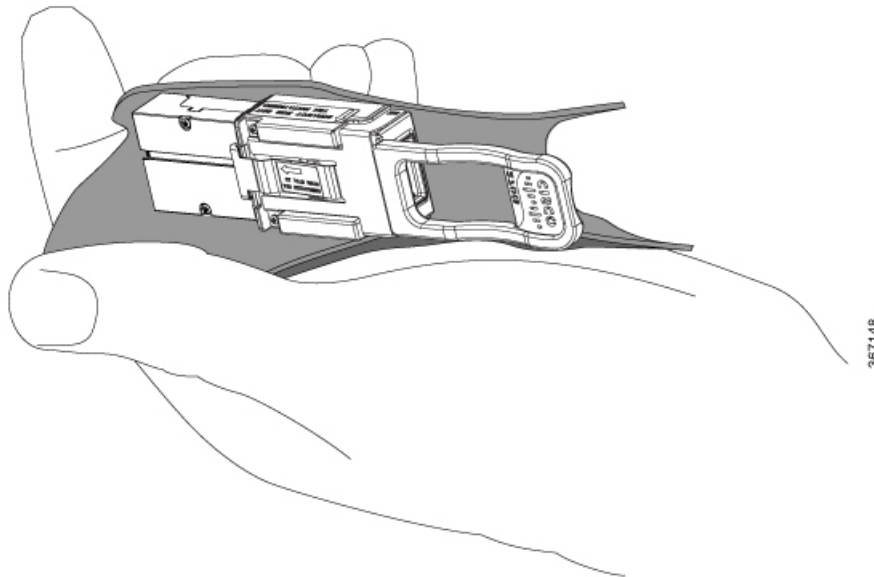
```
config
controller fabric plane X
shutdown
commit
```

- Remove the fiber optical cable from the optical module.
- Remove the optical module from the FC with the help of the pull tab. Do not touch the metal surface.
- Unshut the plane.

```
config
no controller fabric plane 0 shutdown
commit
```

- Hold the optical module only by the pull tab. You can place the optical module on an insulation pad, as shown in the following figure. The insulation pad is a part of the FC packaging.

Figure 16: Optical Module on an Insulation Pad



Guidelines for Installing a Card

- Every card has a label (with an arrow) on its faceplate indicating the side that is up for installation.
- Every card has a key, which matches a corresponding slot on the chassis side (top of each cardslot). This key-slot mechanism prevents a card from being inserted into the wrong, nonmatching cardslot. It also prevents a card from being inserted upside down. If you insert a card into the wrong cardslot or upside down, the key gets blocked against the chassis card guide. The key will not slide through the slot. If the key is blocked, remove the card and insert it in the correct cardslot.
- Online insertion and removal (OIR) is supported, enabling you to install a card while the FCC is in operation. During OIR, routing information is maintained, and ensures session preservation. We recommend that you perform a graceful shutdown, to shut down a fabric card before removing it from the FCC. See [Online Insertion and Removal of a Fabric Card or Route Processor Multi Chassis Card](#), on page 44.
- When installing a fabric card, you must first push the OIR button, which is 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 backplane connector. The exact locations of the ejector

levers and captive screws may vary from card to card, but generally they are in the same locations: on the upper and bottom ends of the faceplate.

- The FCC is shipped with the cardslots containing impedance carriers to help maintain chassis stiffness and prevent any damage to the chassis during shipment.



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 30 seconds for the FCC to complete its tasks before installing another card.



Caution The FCC slots should not be empty at any given time. The fabric cardslots are always populated with FCs, except during replacement of an FC. If necessary, the RPMC cardslot can be populated with an impedance carrier. The impedance carriers are different for fabric cards and RPMC cards.

Installing a Fabric Card or a Route Processor Multi Chassis Card

To install a fabric card or an RPMC card, follow these steps.



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



Caution To prevent electromagnetic interference, the RPMC card ships with two QSFP plugs installed on the two QSFP ports. A QSFP plug must be installed on any empty QSFP ports always.



Caution To prevent electromagnetic interference, the RPMC card ships with SFP+ plugs installed in all 56 ports. The plugs in a few SFP+ ports are nonremovable to avoid their use in cable routing. An SFP+ plug must be installed on empty SFP+ ports.



Warning **Class I and Class 1M laser products.** Statement 291



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

Prerequisites

- Open the front door, if installed.
- For installing an FC or RPMC card, remove the impedance carrier from the slot as the chassis is shipped with impedance carriers. For the detailed procedure, see the [Removing an Impedance Carrier, on page 52](#) section in the Removing and Replacing Chassis Components chapter.

Required Tools and Equipment

- ESD-preventive wrist strap
- Number-2 Phillips screwdriver or number-2 common (flat-head) screwdriver
- RPMC card (Cisco PID NCS4KF-RPMC) or FC (Cisco PID NCS4KF-FC2-C)

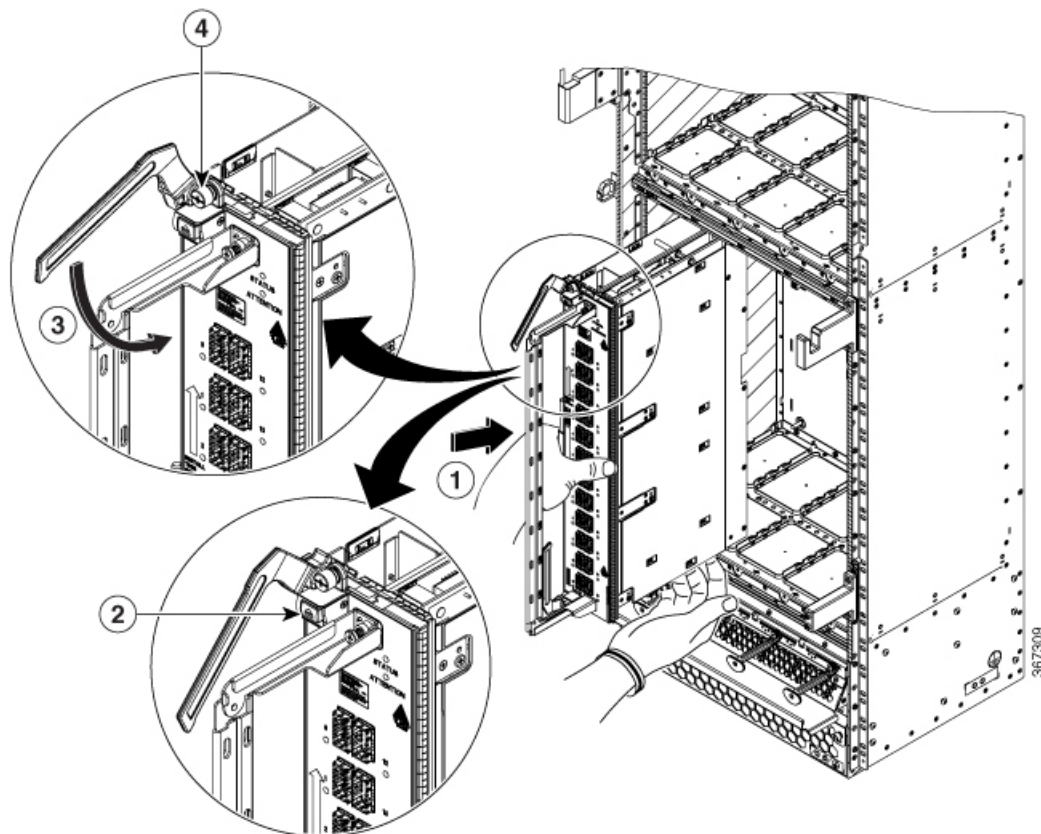
Procedure

Step 1

Attach the ESD-preventive wrist strap to your wrist. Connect its leash to one of the two ESD jacks on the front side of the FCC. (See the [Safety Guidelines, on page 5](#) section in the Overview chapter.) You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the FCC.

Caution Always wear the ESD band while installing or removing a card.

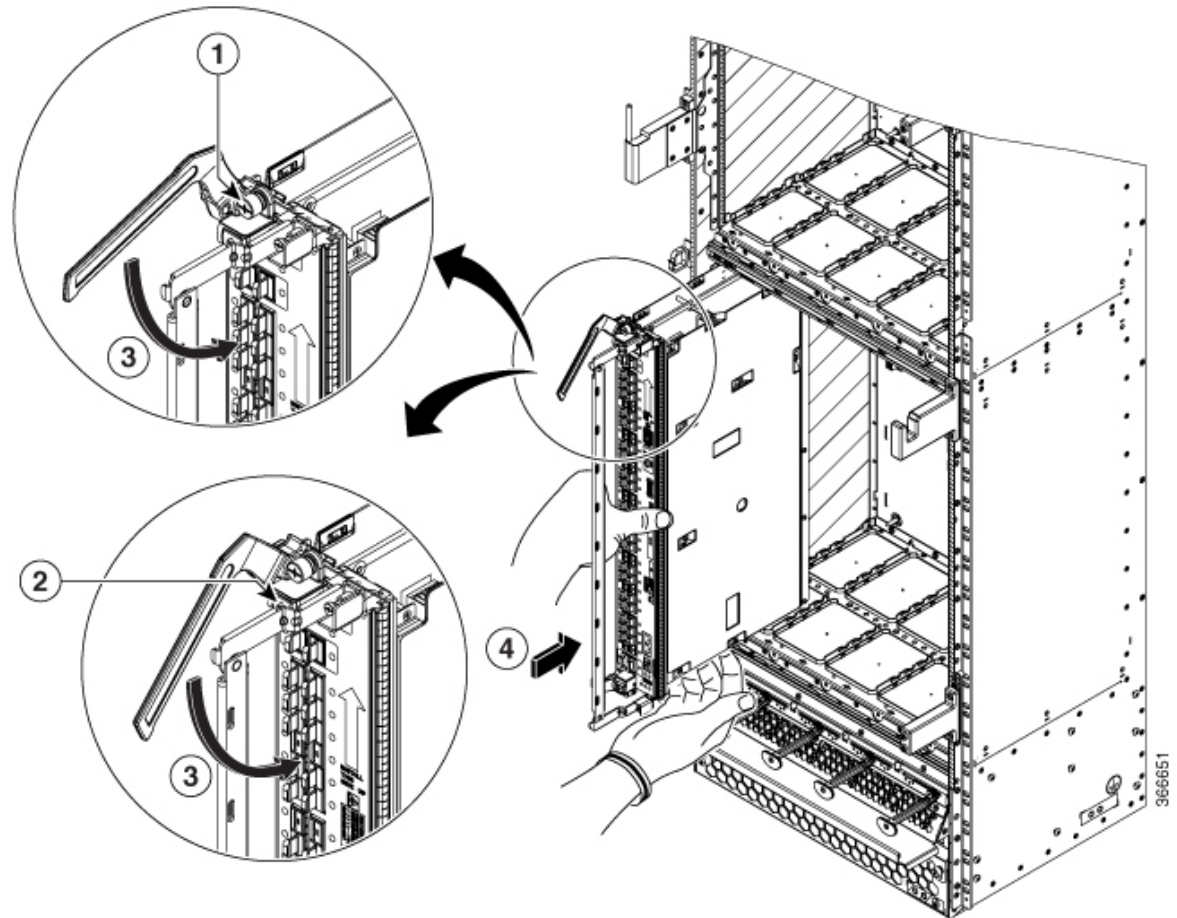
Figure 17: Installing a Fabric Card



1	Direction of insertion	3	Ejector lever
---	------------------------	---	---------------

2	Ejector button	4	Captive screw
---	----------------	---	---------------

Figure 18: Installing an RPMC Card



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

Step 2 Remove the card from its antistatic packaging.

Step 3 Orient the card according to the *up* arrow, as indicated on the faceplate.

Note If the card does not slide easily into the slot during installation, the slot or the orientation may be wrong.

Step 4 Use both hands while inserting the card. Use one hand on the faceplate and the other hand along the base of the card to guide it into a slot.

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 button (at the bottom) and the ejector button (at the top) to release the ejector levers.

Step 6 Carefully slide the card completely into the slot until the ejector levers meet the edges of the card cage. 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.

Note FCs and RPMC cards have guide pins that contact the backplane connector as you slide a card into its slot.

Step 7 Pivot the ejector levers toward the faceplate of the card. Do not force the card; the ejector levers properly seat the card against the backplane. If the captive screws are difficult to tighten, ensure that the ejector lever is properly secured to the catch. Also, check that the card is properly seated in the slot.

Step 8 Use a number-2 Phillips screwdriver to tighten the captive screw or screws next to each card ejector lever to ensure proper EMI shielding. This action prevents the card from becoming partially dislodged from the backplane. Tighten the captive screws using 10.60 in-lb (1.20 Nm).

Note For a new installation, do not tighten any fabric cards until all cards have been inserted and seated. For maintenance or replacement of a failed fabric card, loosen the fabric card on both sides of the failed FC and the FC to be replaced. Remove only the FC that needs replacement.

Online Insertion and Removal of a Fabric Card or Route Processor Multi Chassis Card

To perform a graceful OIR of a fabric card (FC) or Route Processor Multi Chassis (RPMC) card, follow these steps:



Caution Perform OIR of a card at a temperature of 30°C or lower.



Note The RPMC card is hot-swappable. Perform these tasks when you are certain that the secondary RPMC card in the FCC is operational. The secondary card automatically assumes control. Failure to follow these guidelines can result in interruptions in data communications and network connectivity.



Note 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.

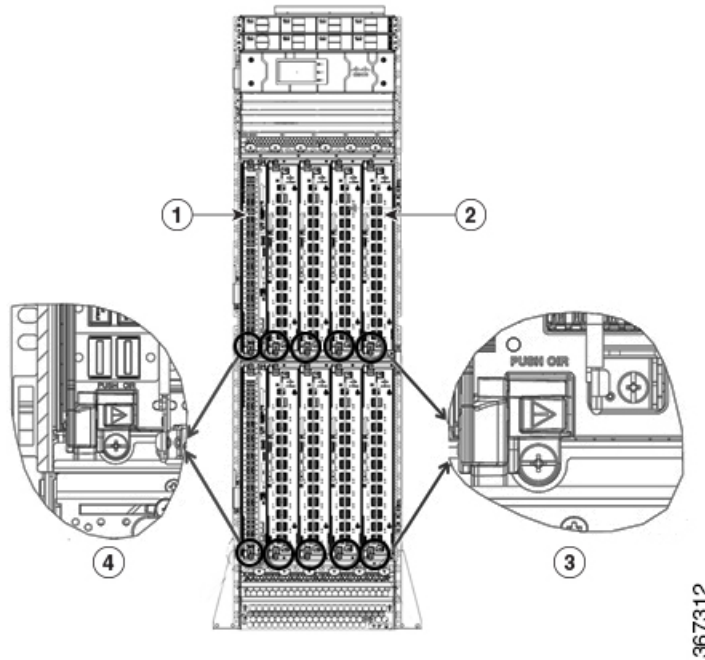


Warning Class I and Class 1M laser products. Statement 291



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

Figure 19: OIR Procedure for FC and RPMC Card



1	Fiber guide (RPMC card)	3	OIR button (FC)
2	Fiber guide (FC)	4	OIR button (RPMC card)

Before you begin

Open the chassis door.

Procedure

Step 1

Shut down the plane and the FC.

X is the plane on which the FC is installed.

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

This step is not applicable for the RPMC card.

Step 2 Press the OIR button (red-colored) which is at the bottom. The OIR button is clearly indicated with the words *Push OIR* shown on the faceplate.

The Card Status LED starts blinking (yellow color). The blinking continues for 120 seconds. After 120 seconds, the LED displays a steady yellow. Use the **show led** command to get the current status of an LED.

Caution Do not remove the card until the blinking completely stops.

If the active RPMC card is reloaded or the active LED manager process is restarted, the LED starts blinking again. (The LED restarts blinking even if it has stopped blinking after the specified 120 seconds.)

Step 3 Press the ejector button (gray-colored) which is at the top.

Step 4 Remove the cables from the card.

Step 5 Remove the fiber guide by loosening the screws at the top and bottom.

Step 6 Remove the optical modules.

Step 7 Loosen the two captive screws that are located at the top and bottom of the card.

Step 8 Pivot the ejector levers away from the faceplate.

Step 9 Remove the card from the chassis.

Step 10 Install the new card in the empty slot within five minutes of removal time. For a detailed installation procedure, see the [Installing a Fabric Card or a Route Processor Multi Chassis Card](#), on page 41 section of this chapter.

Warning The FC or RPMC card in the upper shelf must be replaced within the time limit of five minutes. If not, the corresponding card in the bottom shelf and the cards that are next to the card that is to be replaced, is shut down. The main chassis remains operational.

We also recommend that an FC or RPMC card in the lower shelf is replaced within the time limit of five minutes. This replacement within that time limit ensures that the other cards and the chassis continue to function normally.

Step 11 Use the number-2 Phillips screwdriver to tighten the captive screws on the card using 10 in-lb (1.12 Nm).

Step 12 Plug in the optical modules and the fiber connections.

Use dust plugs in the empty optical module slots.

Step 13 Unshut the plane. Wait for ten minutes for the FC to be operational.

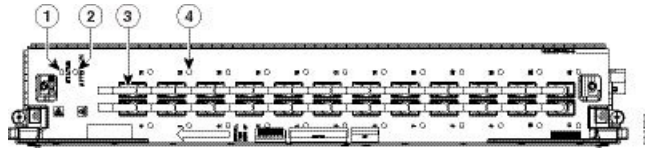
```
config
no controller fabric plane X shutdown
commit
end
```

This step is not applicable for the RPMC card.

Verifying the Installation of a Card

This section describes how to verify that an FC or RPMC card is properly installed and is working correctly in the Cisco NCS 4000 FCC. Use the Status LED, located on the faceplate of the card to verify the correct installation of the card.

Figure 20: Fabric Card Front Panel



1	Status LED	3	24 CXP2 ports (0–11 and 12–23)
2	Attention LED	4	24 CXP2 port LEDs (one per port)

On the fabric card, the 24 CXP2 LEDs indicate the status of the CXP2 links. Each FC slot must be configured as a fabric instance for the CXP2 port LED to light up. For example:

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

Figure 21: RPMC Front Panel



1	Status LED	5	Two QSF LEDs (Q1 port 56 and Q0 port 56)
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 (0 to 27 on the left, 28 to 55 on the right)		

Table 6: LED Indicators on the FC and RPMC Card

LED	LED Color	Description
STATUS	Green	The card is properly installed and powered-up with no faults.
	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. Note The flashing (blinking) yellow LED is also used during the OIR procedure.
	Off	No power is applied to the card.

LED	LED Color	Description
ATTENTION	Blue	On: The card needs attention. Off: The card does not require attention.
CXP2 (0-23) (available only on the FC)	Green	The port is correctly connected.
	Red	One or more links are down.
	Off	The CXP2 module is not present or is not fully inserted in the card.
QSFP SFP MGMT EXPANSION PORT (available only on the RPMC card)	Green	The port is working correctly.
	Blinking green	When the port is sending (Tx) and receiving (Rx) data, the LED flashes green.
ALARM (available only on the RPMC card)	Orange	Active alarm on the card or in the system.
	Off	No Alarm on card or in the system.

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

- Ensure that the card is seated firmly in the FCC slot. To verify the installation, check if the faceplate of the card is even with the faceplates of the other installed cards.
- Ensure that the ejector levers are latched and that the captive screws are fastened properly. Reseat the card if necessary.



Note To confirm the location of the card that needs attention, use the **hw-module attention-led location** command. The Attention LED of the faulty card is lit up.



CHAPTER 5

Removing and Replacing Chassis Components

This chapter provides instructions on how to remove and replace components from the Cisco NCS 4000 FCC.

- [Removing the Power Components, on page 49](#)
- [Removing an Impedance Carrier, on page 52](#)
- [Removing the Chassis Door, on page 53](#)
- [Attaching the Front Door, on page 53](#)
- [Replacing the Fan Trays and Air Filter, on page 57](#)

Removing the Power Components

This section describes how to remove power components from the Cisco NCS 4000 FCC.

While it is possible to remove power components from the Cisco NCS 4000 FCC separately, some parts (such as the power tray) require that other parts be removed first.

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

Removing DC Input Power Cables

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

Prerequisites

Power off the DC power modules in the tray you want to disconnect.



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

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-inch, number-1 Phillips screwdriver
- 3/8-inch ratchet wrench with 7/16-pt. socket
- Voltmeter

To disconnect DC input power cables, follow these steps:

Procedure

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the two ESD jacks on the chassis. You can also connect the ESD-preventive wrist strap leash to any bare metal surface on the chassis.
 - Step 2** Using the voltmeter, verify that there is no voltage on the cables that are about to be removed.
 - Step 3** Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.
 - Step 4** Slide the terminal block cover downward.
 - Step 5** Remove the terminal block cover.
 - Step 6** Disconnect the DC power cables from their terminals in the following order and note the color of each cable:
 - a) Negative (PWR) cables first.
 - b) Positive (RTN) cables last.
 - Step 7** Replace the terminal block cover.
-

Removing a Power Module Slot Cover

This section describes how to remove a power module slot cover from a power module slot in a DC power tray.

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

Procedure

- Step 1** Gently pinch the tabs on the top of the power module slot cover to partially detach the slot cover from the slot.
 - Step 2** Slide the power module slot cover out by removing the tabs on the bottom of the power module slot cover from the two holes on the bottom of the slot.
-

Removing DC Power Module

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



- 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.
-

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

Procedure

- Step 1** Release the snap hook on the power module.

- Step 2** Slide the power module out of its bay in the power tray while supporting it with your other hand. Use the handle available on the front plate of the power module.
-

Replacing a Power Module

The following section describes how to replace a power module in a NCS 4000 FCC.

Following are the limitations when a Delta power module (DC power) is replaced with an ACBEL power module (DC power).

- Release 6.5.25 and 6.5.26 software packages come with ACBEL PEM FPD image with version 4.02. Post upgrade, the state of ACBEL PSU FPD is shown as NOT READY but the power module will function normally.

Follow these steps to replace DC power modules for a chassis:

Procedure

- Step 1** Using two hands to support the power module, slide it into the power tray.
- Step 2** Secure the power module into the power tray using the snap hook.
-

Removing the Chassis Ground Cable

This section describes how to remove the chassis ground cable on the Cisco NCS 4000 FCC.

Prerequisites

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



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

Required Tools and Equipment

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

Procedure

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

Removing an Impedance Carrier

This section describes how to remove a fabric card or RPMC card impedance carrier from the Cisco NCS 4000 FCC.



Caution The FCC ships with impedance carriers preinstalled in all the slots.

The eight fabric card slots are populated with a fabric card at all times, except when a replacement is required.

Figure 22: FC Impedance Carrier

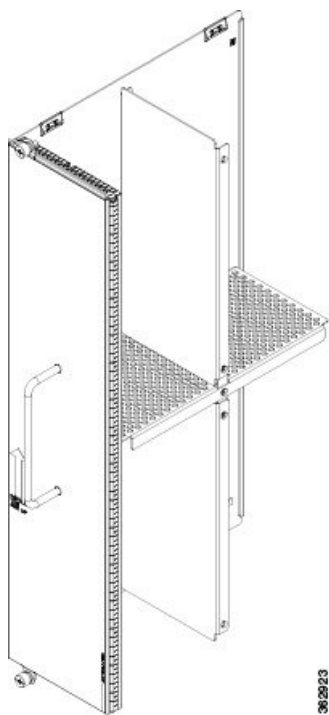
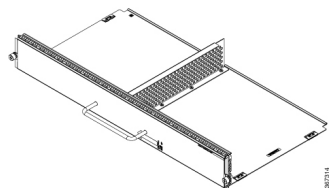


Figure 23: RPMC Card Impedance Carrier



Prerequisites

Before performing this task, open the door, if installed.

Required Tools and Equipment

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

To remove an impedance carrier from the FCC, follow these steps:

Procedure

- 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.
-

Removing the Chassis Door

This section describes how to remove the chassis door.

Required Tools and Equipment

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver, medium and small slot-head screwdrivers

To remove the front door of the chassis, follow these steps.

Procedure

- Step 1** Turn the knob to unlock the door.
 - Step 2** Open the door.
 - Step 3** Loosen the screw to disconnect the ground cable.
 - Step 4** Move the door up to release from the hinge pins.
-

Attaching the Front Door

This section describes how to attach the front door.

Required Tools and Equipment

- ESD-preventive wrist strap
- Number 2 Phillips screwdriver, medium and small slot-head screwdrivers
- Front door (Cisco PID NCS4KF-DOOR(=))



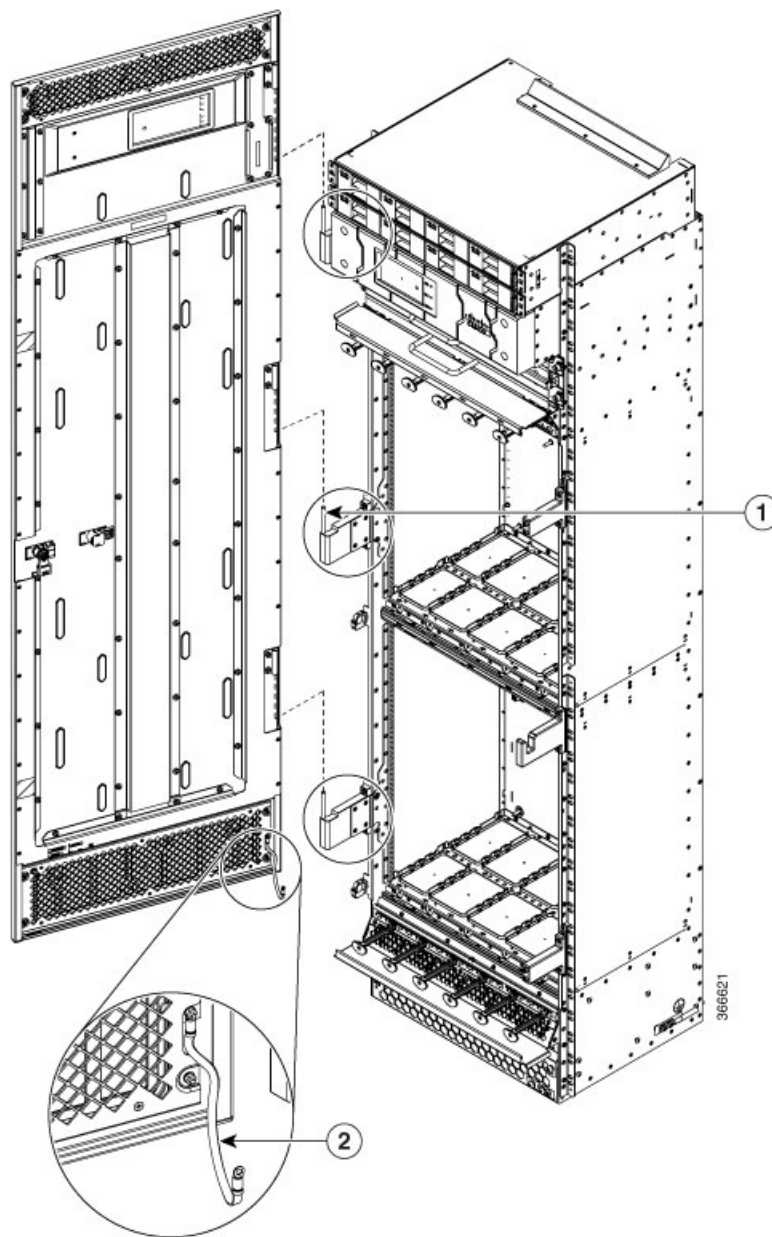
Note For ease of installation, it is recommended to stand in front of the chassis while assembling the door.

To attach the front door of the chassis, follow these steps.

Procedure

Step 1 Lift the door up and align the three door hinges to the hinge pins available on the chassis.

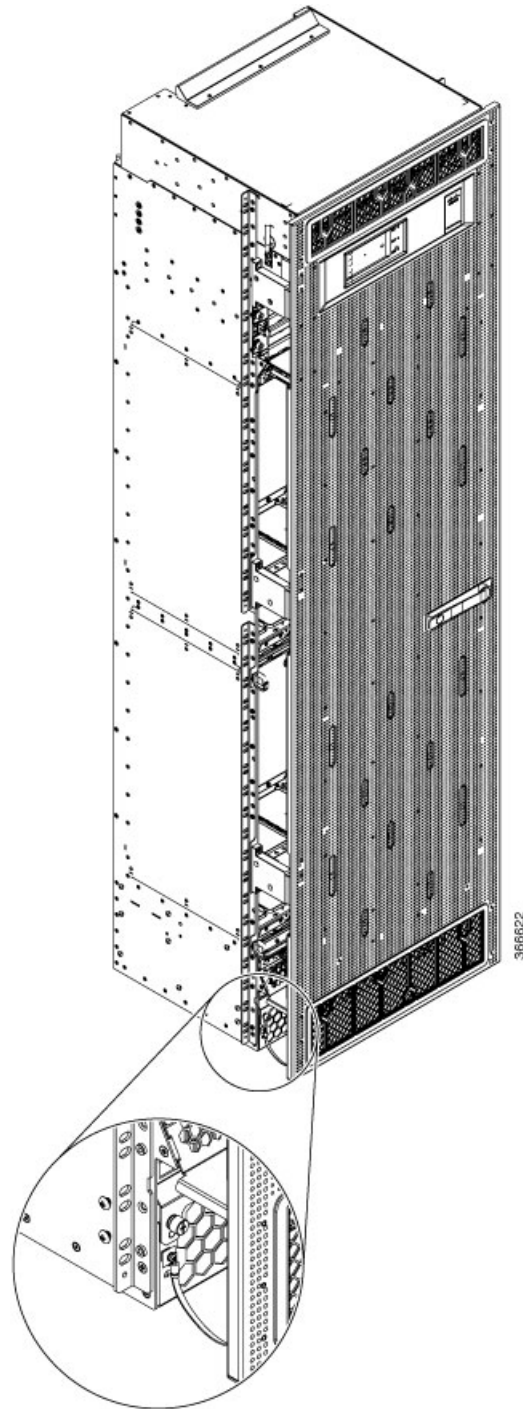
Figure 24: Aligning the Door Hinges



1	Hinge pins	2	Ground strap cable
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- Step 2** Lower the door.
- Step 3** To attach the ground cable, loosen the screw from the chassis fixing point.
- Step 4** Feed the screw through the ground cable ring lug, through the washer, and then into the machined block.
- Step 5** Using a Phillips screwdriver, insert and tighten the screw using a torque of 6 in-lb.
- The following figure shows the shelf assembly with the front door and ground strap installed.

Figure 25: FCC with Door Ground Strap Installed



Replacing the Fan Trays and Air Filter

This section describes how to replace a fan tray and air filter from the Cisco NCS 4000 FCC and includes the following topics:



Note The NCS 4000 FCC 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 4000 FCC. These components help circulate and filter the airflow throughout the FCC.

The airflow volumes for a fully loaded Cisco NCS 4000 FCC are as follows:

- Chassis airflow: Up to 1250 cubic feet per minute
- DC power system airflow: 240 cubic feet per minute

About the Fan Trays

The Cisco NCS 4000 FCC has two fan trays that are adjacent to each other and located directly above the upper cable management bracket on the front of the FCC. Each fan tray has six axial fans. The fans pull the heated air from the system and throw it out through the rear of the chassis. Both the fan trays must be present in the chassis at all times.

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 speed 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 7: 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.
Off	No power is applied to the fan tray.

About the Air Filter

The Cisco NCS 4000 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. 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.



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

This section describes how to replace a fan tray.

Required Tools and Equipment

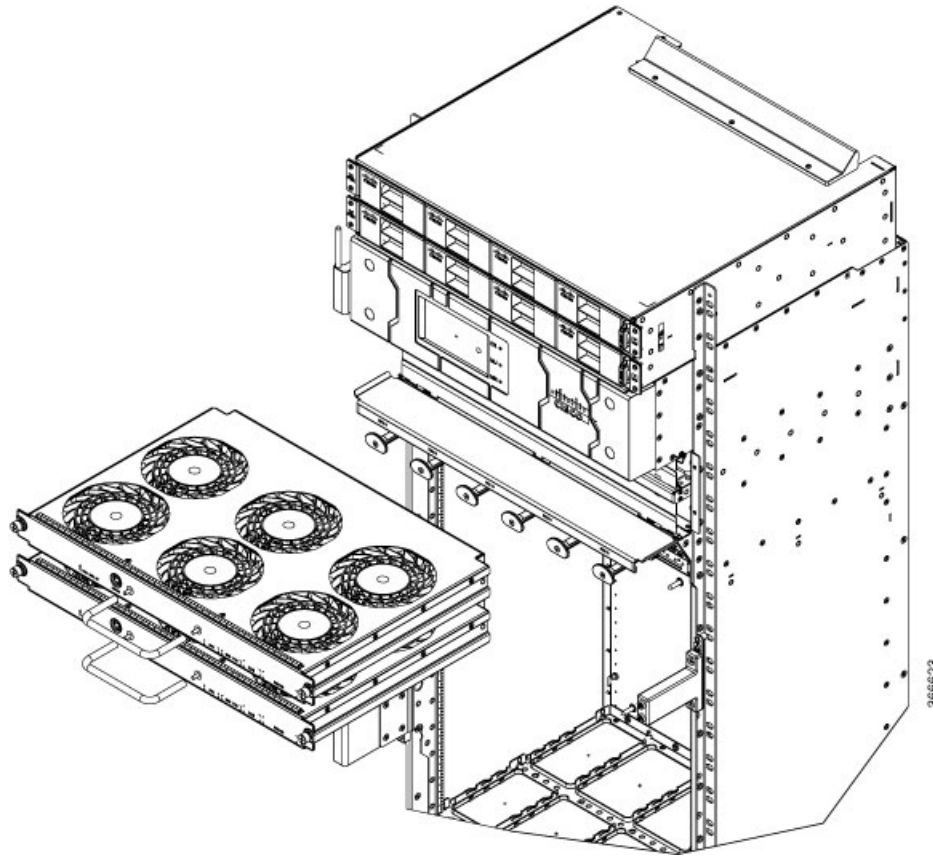
- ESD-preventive wrist strap
- 6-inch, Number-1 Phillips screwdriver
- Fan tray (Cisco PID NCS4KF-FTA=)

To replace a fan tray, follow these steps:

Procedure

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to the ESD jack on the FCC. 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.
- Step 3** Pull firmly on the fan tray handle to pull it free.
- 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 26: 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 using a torque of 10 in-lb.

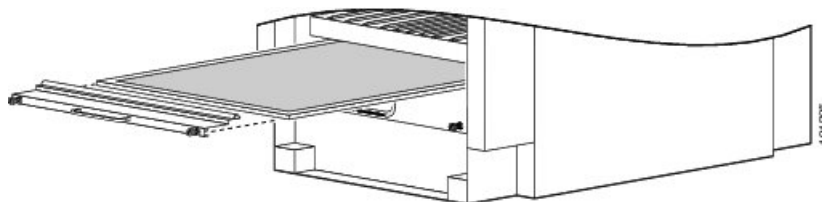
Replacing the Air Filter

This section describes how to install an air filter in the Cisco NCS 4000 FC. The following figure shows the FCC air filter. The air filter is located on the front of the FCC.



Note We recommend that you change the air filter every three months.

Figure 27: 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.



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.

Required Tools and Equipment

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

To replace the air filter, follow these steps:

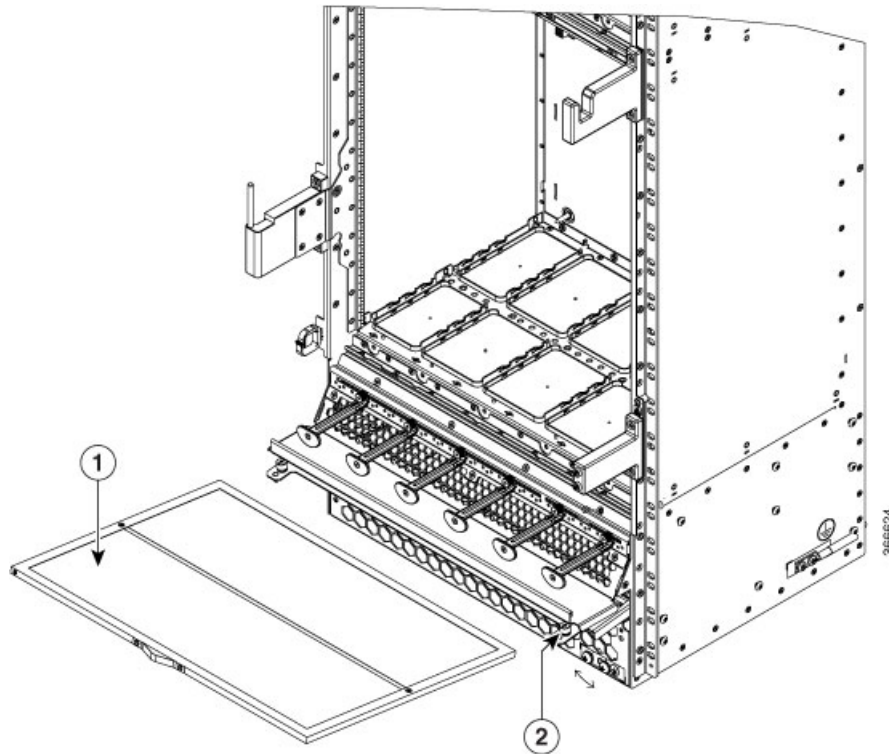
Procedure

Step 1

Remove the filter you are replacing.

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

Figure 28: Replacing the Air Filter—Front Side of the FCC



1	Air Filter	2	Captive screw
---	------------	---	---------------

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 using a torque of 10in-lb.



CHAPTER 6

System Product IDs

This appendix provides information about the product IDs for the Cisco NCS 4000 FCC and its components.

- [Component Product IDs, on page 63](#)

Component Product IDs

Table 8: Component Product IDs

Component	Product ID	Description
Fabric card chassis	NCS4KF-SA-DC	Cisco NCS 4000 DC Fabric Card Chassis (chassis only)
Craft panel display	NCS4KF-CRAFT=	Cisco NCS 4000 Fabric Card Chassis craft panel display kit
Fan tray assembly	NCS4KF-FTA=	Cisco NCS 4000 Fabric Card Chassis fan tray assembly
Door	NCS4KF-DOOR=	Cisco NCS 4000 Fabric Card Chassis door
DC power tray	NCS4K-DC-PEM=	Cisco NCS 4000 DC power tray
DC power module	NCS4K-DC-PSU-V1	Cisco NCS 4000 DC power module
Route processor card	NCS4KF-RPMC=	Cisco NCS 4000 Fabric Card Chassis route processor with ethernet switch for multi-chassis connect
Fabric card	NCS4KF-FC2-C=	Cisco NCS 4000 Fabric Card Chassis fabric card



CHAPTER 7

Cabling a Multi-chassis Configuration

This chapter describes how to physically cable the fabric planes between each LCC and FCC in the system. The Cisco NCS 4000 Multi-Chassis system currently supports these multi-chassis configurations:

- 2+2—Two LCCs + one FCC
- 4+2—Four LCCs + two FCC
- 8+3—Eight LCCs + three FCCs

Table 9: Feature History

Feature Name	Release Information	Feature Description
8+3 Multi-chassis configuration	Cisco IOS XR Release 6.5.31	Eight NCS 4016 chassis are connected to three NCS 4000 fabric chassis to form a multi-chassis system. This multi-chassis system enables scalability by supporting 128-line cards using a single admin and control plane. This ensures seamless switching across the racks.

- [About the Cisco NCS 4000 Multi-Chassis System, on page 65](#)
- [Cabling Requirements, on page 66](#)
- [Required Tools and Equipment, on page 69](#)
- [Cabling Overview , on page 69](#)
- [Cabling the Ethernet Control Plane Network , on page 71](#)
- [Cabling the Fabric, on page 75](#)

About the Cisco NCS 4000 Multi-Chassis System

This section provides an overview of the Cisco NCS 4000 Multi-Chassis system and describes what is required to interconnect the system components. The Cisco NCS 4000 Multi-Chassis system is also referred to as the “multi-chassis system” throughout this chapter.

The Cisco NCS 4000 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 line card (LC) slots, four fabric card slots, and two RP slots. The FCC eight fabric card slots and two slots for the RPMC cards.

The timing connections between multiple LCCs is a must in a multi-chassis configuration. For information on the ECU2 and timing, see the *Hardware Installation Guide for the Cisco NCS 4000 Series*.

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.

The maximum distance between an FCC and LCC or a LCC and LCC is 100 meters.

Cabling Requirements

The following cables and optics are required to interconnect the LCC and FCC in a Cisco NCS 4000 Multi-Chassis system.



Note Cisco provides the optical modules but does not provide the cables specified below. To obtain the optics, please contact your Cisco sales representative for further information.

For connections from each RP (in the LCC) and RPMC (in the FCC):

- 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 transceiver module SSF single mode fiber.

For connections between RPMC cards in the FCC:



Note For one FCC based configurations, the connections are between the RPMC0 and RPMC1 cards within the same FCC.

For configurations with two or more FCCs, the RPMC0 card in one FCC is connected to the RPMC0 card in another chassis. For example, the RPMC0 cards in FCC0 is connected to the RPMC0 card in FCC1.

Similarly, the RPMC1 card in one FCC is connected to the RPMC1 card in another chassis.

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

For connecting the fabric:

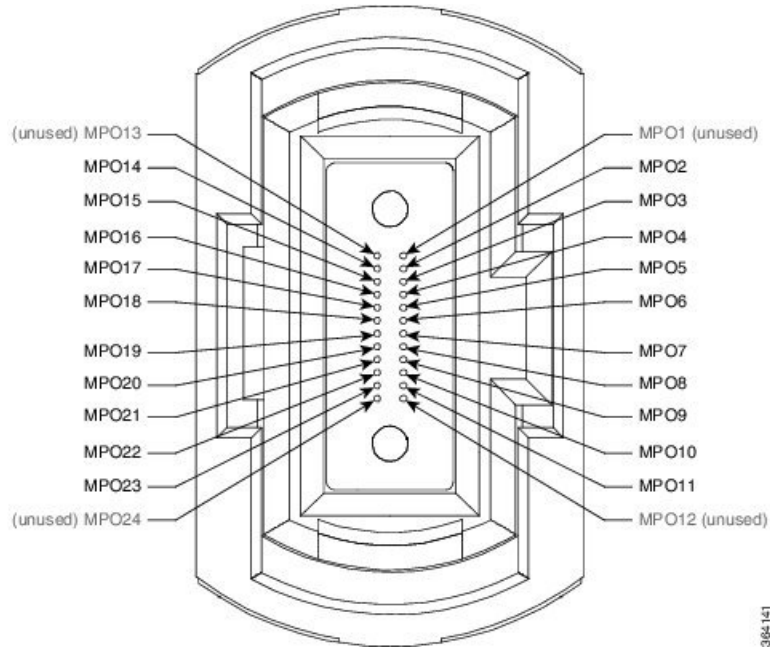
- 48 MPO-24, OM4, key-up key down, female-female, 3.8 mm, multimode, optical fiber cables for each LCC

- CXP2 modules (Cisco PID ONS-CXP2-SR25): 48 modules per LCC and 48 modules for the FCC (for peer connections)

MPO-24 Cable Specifications

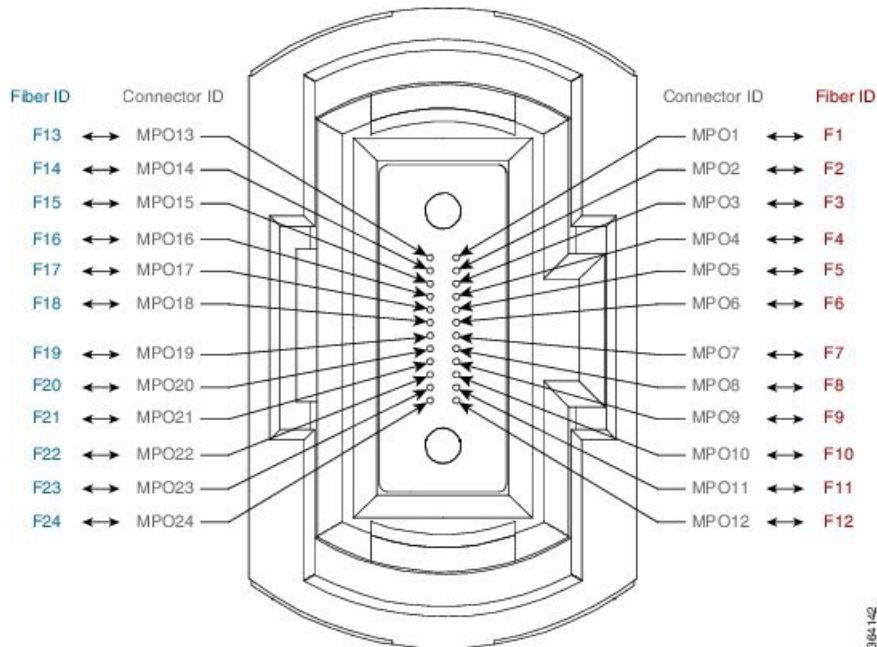
The following figure shows the MPO-24 connector pinouts.

Figure 29: MPO-24 Connector Pinouts



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

Figure 30: MPO-24 Connector Fiber Assignments



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

Table 10: 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
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

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)
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
- Supply of Velcro tie wraps (to bundle cables)
- Ladder

Cabling Overview

General Cabling Procedures

Observe these procedures as you attach every cable:

- Strap the bundles to the horizontal cable management brackets on the chassis.

Two horizontal cable management brackets are preinstalled on both the LCC and FCC.

- 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 4000 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 4000 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 4000. The control network must be cabled before the NCS 4000 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 RPMC cards in the FCCs. The RPMC cards provide the control plane network between all chassis.

Each RPMC card has 56 10GE connections and two 40GE connections. Two RPMC cards are used for redundancy purposes. For the multi-chassis system setup, the expansion ports on each RP in the LCCs and each RPMC (SC) in FCCs need to be connected to the SFP+ ports on the RPMC faceplate. SFP+ ports are ports 0 through 55. A few ports on the RPMC faceplate are blocked with dust caps without handles.

Cabling the Control Plane for a 2+2, 4+2, and 8+3 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. To connect the QSFP 40GE optical modules between the RPMC cards, we recommend that you use QSFP supported cables.

Figure 31: Control Plane Cabling for a 2+2 Multi-Chassis System

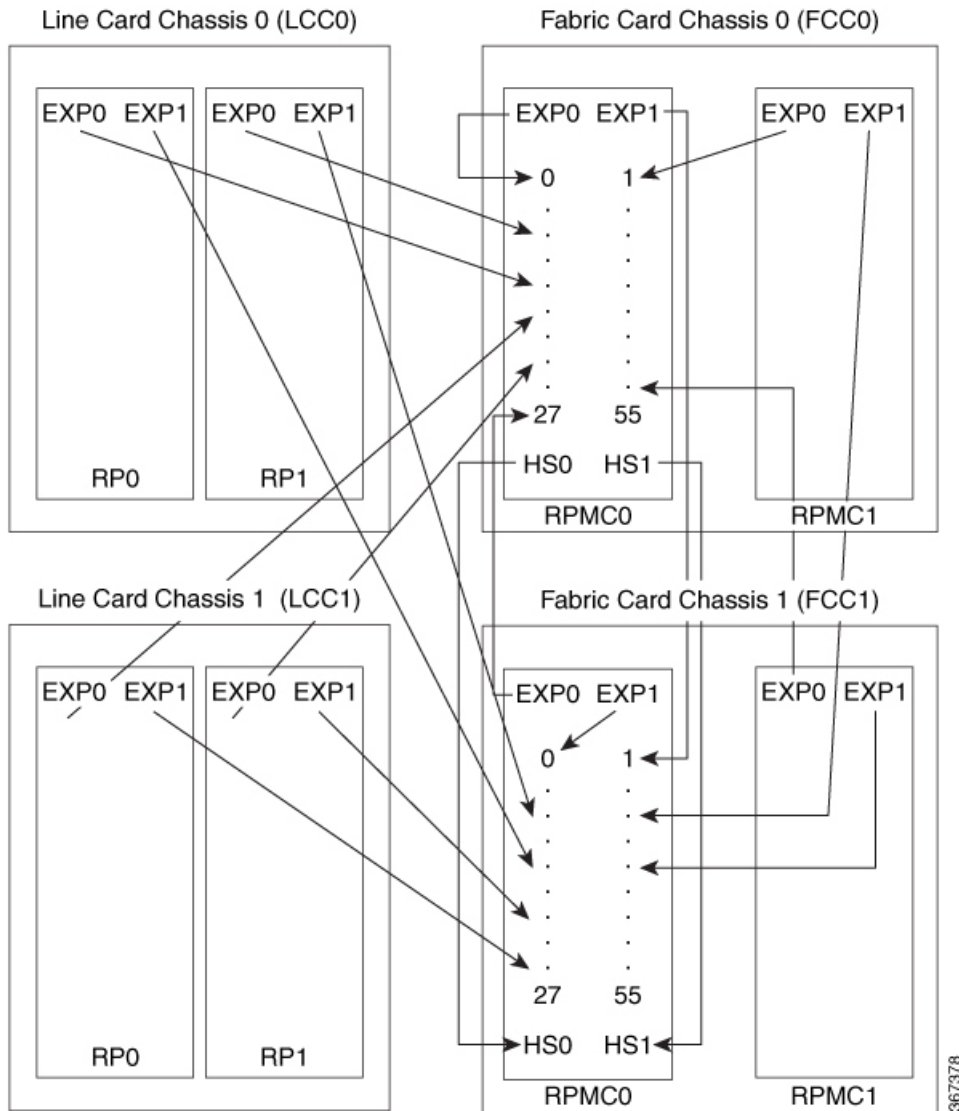


Table 11: RP Cards to RPMC Card Connections (2+2 Configuration)

From Line Card Chassis	LCC RP Port	To RPMC Cards in Fabric Card Chassis
LCC0	RP0, EXP0	FCC0, RPMC0/port 4
	RP1, EXP0	FCC0, RPMC0/port 5
	RP0, EXP1	FCC1, RPMC0/port 4
	RP1, EXP1	FCC1, RPMC0/port 5

From Line Card Chassis	LCC RP Port	To RPMC Cards in Fabric Card Chassis
LCC1	RP0, EXP0	FCC0, RPMC0/port 35
	RP1, EXP0	FCC0, RPMC0/port 36
	RP0, EXP1	FCC1, RPMC0/port 35
	RP1, EXP1	FCC1, RPMC0/port 36

Table 12: RP Cards to RPMC Card Connections (8+3 Configuration)

From Line Card Chassis	LCC RP Port	To RPMC Cards in Fabric Card Chassis
LCC0	RP0, EXP0	FCC0, RPMC0/port 4
	RP1, EXP0	FCC0, RPMC0/port 5
	RP0, EXP1	FCC1, RPMC0/port 4
	RP1, EXP1	FCC1, RPMC0/port 5
LCC1	RP0, EXP0	FCC0, RPMC0/port 35
	RP1, EXP0	FCC0, RPMC0/port 36
	RP0, EXP1	FCC1, RPMC0/port 35
	RP1, EXP1	FCC1, RPMC0/port 36
LCC2	RP0, EXP0	FCC0, RPMC0/port 10
	RP1, EXP0	FCC0, RPMC0/port 11
	RP0, EXP1	FCC1, RPMC0/port 10
	RP1, EXP1	FCC1, RPMC0/port 11
LCC3	RP0, EXP0	FCC0, RPMC0/port 41
	RP1, EXP0	FCC0, RPMC0/port 42
	RP0, EXP1	FCC1, RPMC0/port 41
	RP1, EXP1	FCC1, RPMC0/port 42
LCC4	RP0, EXP0	FCC0, RPMC0/port 16
	RP1, EXP0	FCC0, RPMC0/port 17
	RP0, EXP1	FCC1, RPMC0/port 16
	RP1, EXP1	FCC1, RPMC0/port 17

From Line Card Chassis	LCC RP Port	To RPMC Cards in Fabric Card Chassis
LCC5	RP0, EXP0	FCC0, RPMC0/port 47
	RP1, EXP0	FCC0, RPMC0/port 48
	RP0, EXP1	FCC1, RPMC0/port 47
	RP1, EXP1	FCC1, RPMC0/port 48
LCC6	RP0, EXP0	FCC0, RPMC0/port 22
	RP1, EXP0	FCC0, RPMC0/port 23
	RP0, EXP1	FCC1, RPMC0/port 22
	RP1, EXP1	FCC1, RPMC0/port 23
LCC7	RP0, EXP0	FCC0, RPMC0/port 52
	RP1, EXP0	FCC0, RPMC0/port 53
	RP0, EXP1	FCC1, RPMC0/port 52
	RP1, EXP1	FCC1, RPMC0/port 53

Table 13: Connections Between Expansion Ports of the RPMC0 and RPMC1 Card (2+2 or 4+ 2 Configuration)

From RPMC Card	To RPMC Card
FCC0, RPMC0 EXP0	FCC0, RPMC0 port 0
FCC0, RPMC0 EXP1	FCC1, RPMC0 port 28
FCC0, RPMC1 EXP0	FCC0, RPMC0 port 28
FCC0, RPMC1 EXP1	FCC1, RPMC0 port 29
FCC1, RPMC0 EXP0	FCC0, RPMC0 port 26
FCC1, RPMC0 EXP1	FCC1, RPMC0 port 0
FCC1, RPMC1 EXP0	FCC0, RPMC0 port 54
FCC1, RPMC1 EXP1	FCC1, RPMC0 port 30

Table 14: Connections Between Expansion Ports of the RPMC0 and RPMC1 Card (8+3 Configuration)

From RPMC Card	To RPMC Card
FCC0, RPMC0 EXP0	FCC0, RPMC0 port 0
FCC0, RPMC0 EXP1	FCC1, RPMC0 port 28

FCC0, RPMC1 EXP0	FCC0, RPMC0 port 28
FCC0, RPMC1 EXP1	FCC1, RPMC0 port 29
FCC1, RPMC0 EXP0	FCC0, RPMC0 port 26
FCC1, RPMC0 EXP1	FCC1, RPMC0 port 0
FCC1, RPMC1 EXP0	FCC0, RPMC0 port 54
FCC1, RPMC1 EXP1	FCC1, RPMC0 port 30
FCC2, RPMC0 EXP0	FCC0, RPMC0 port 1
FCC2, RPMC0 EXP1	FCC1, RPMC0 port 1
FCC2, RPMC1 EXP0	FCC0, RPMC0 port 2
FCC2, RPMC1 EXP1	FCC1, RPMC0 port 2

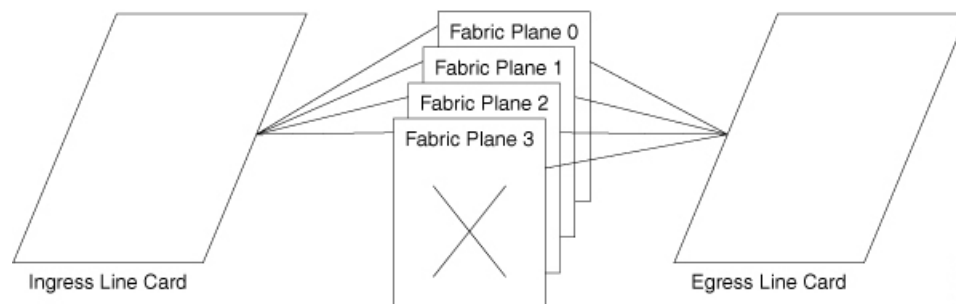
Cabling the Fabric

This section describes how to connect 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 4000 multi-chassis system.

Fabric Overview

The Cisco NCS 4000 switch fabric is a three-stage cell based architecture with four fabric planes. The fabric planes are numbered 0 through 3. Stage 1 and Stage 3 of the fabric are implemented in the Cisco NCS 4000 Line Card Chassis (LCC). Stage 2 of the fabric is implemented in the Cisco NCS 4000 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.

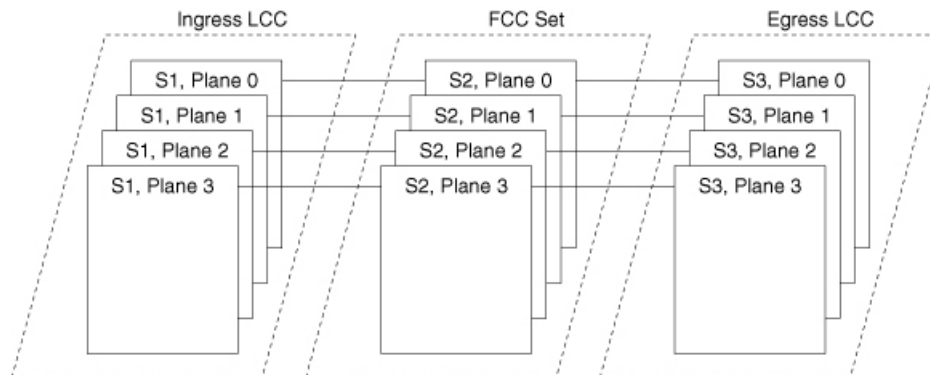
Figure 32: Relationship of Line Cards and Fabric Cards



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 optical cables to the S2 stage in the

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

Figure 33: Fabric Plane Stages



The Line Card Chassis (LCC) has 16 line cards (LCs), four S13 MC fabric cards (FCs). Each S13 FC can connect to S2 fabric cards on the FCC through 12 CXP2 modules. In each LCC the S13 FCs provide Stage 1 and stage-3 for each of the four fabric planes. The planes do not interconnect with each other but operate independently. Because there are a total of four S13 FCs in the LCC. Each FC is referred as a fabric plane. For example: FC0 in LCC0, LCC1, and so forth are all part of plane 0.

The Fabric Card Chassis (FCC) supports eight S2 fabric cards. 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 24 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. It is mandatory to have all the eight S2 cards in the FCC at all times.

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

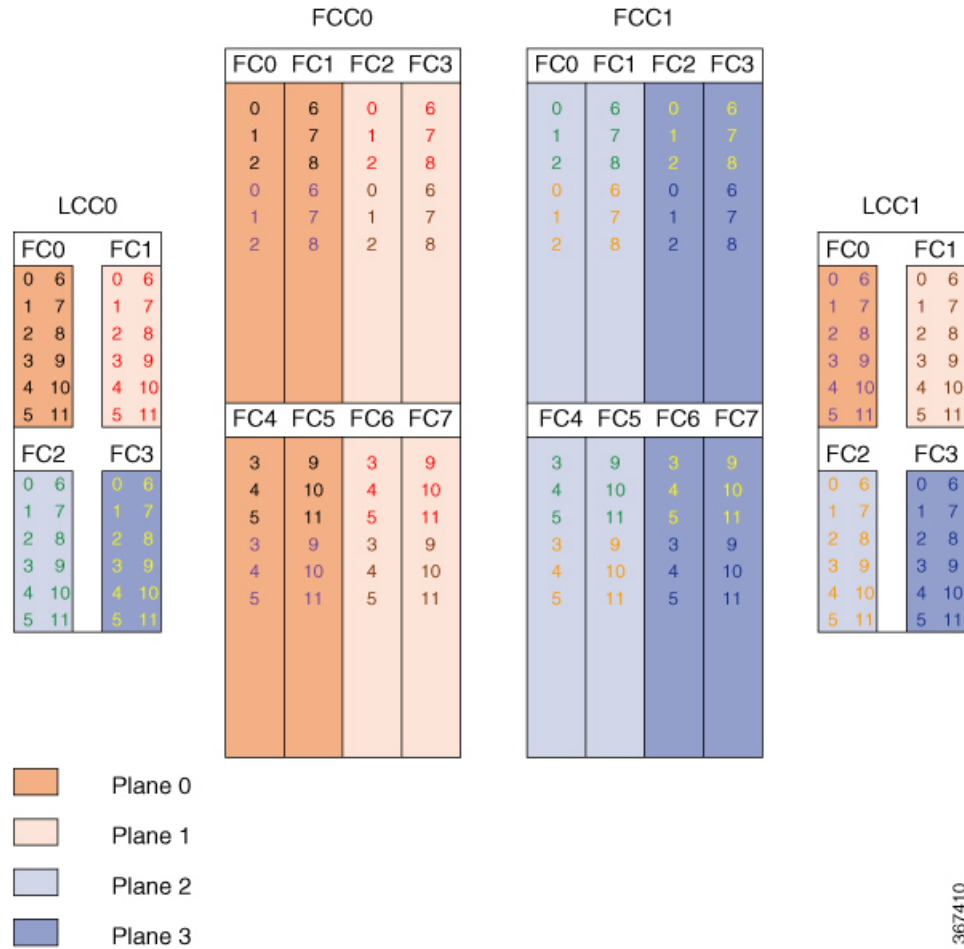
For connecting the fabric, you need the following:

- 96 MPO-24 fiber cables (48 per LCC).
- 192 CXP2 modules (Cisco PID ONS-CXP2-SR25).

Configuring a 2+2 Configuration with 16 S2 Fabric Cards

The following figure shows two line card chassis (LCC0 and LCC1) connected to two fabric card chassis (FCC0 and FCC1). In this configuration, there are eight FCs in each fabric card chassis; in total 16 S2 FCs are installed. The figure shows the multi-chassis 2+2 configuration.

Figure 34: Cisco NCS 4000 Multi-Chassis 2+2 Configuration



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The following table shows the cabling plan for a 2+2 multi-chassis configuration. The FCC0 has the fabric instances 0 through 3 for planes 0 and 1. The FCC1 has the fabric instances 0 through 3 for planes 2 and 3.

Table 15: Cabling Plan for LCC0 in a 2+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis
FC0/0 to FC0/0 (FCC0)		FC1/0 to FC2/0 (FCC0)		FC2/0 to FC0/0 (FCC1)		FC3/0 to FC2/0 (FCC1)	
FC0/1 to FC0/1 (FCC0)		FC1/1 to FC2/1 (FCC0)		FC2/1 to FC0/1 (FCC1)		FC3/1 to FC2/1 (FCC1)	
FC0/2 to FC0/2 (FCC0)		FC1/2 to FC2/2 (FCC0)		FC2/2 to FC0/2 (FCC1)		FC3/2 to FC2/2 (FCC1)	
FC0/3 to FC4/0 (FCC0)		FC1/3 to FC6/0 (FCC0)		FC2/3 to FC4/0 (FCC1)		FC3/3 to FC6/0 (FCC1)	
FC0/4 to FC4/1 (FCC0)		FC1/4 to FC6/1 (FCC0)		FC2/4 to FC4/1 (FCC1)		FC3/4 to FC6/1 (FCC1)	
FC0/5 to FC4/2 (FCC0)		FC1/5 to FC6/2 (FCC0)		FC2/5 to FC4/2 (FCC1)		FC3/5 to FC6/2 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3	
LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis
FC0/6 to FC1/0 (FCC0)		FC1/6 to FC3/0 (FCC0)		FC2/6 to FC1/0 (FCC1)		FC3/6 to FC3/0 (FCC1)	
FC0/7 to FC1/1 (FCC0)		FC1/7 to FC3/1 (FCC0)		FC2/7 to FC1/1 (FCC1)		FC3/7 to FC3/1 (FCC1)	
FC0/8 to FC1/2 (FCC0)		FC1/8 to FC3/2 (FCC0)		FC2/8 to FC1/2 (FCC1)		FC3/8 to FC3/2 (FCC1)	
FC0/9 to FC5/0 (FCC0)		FC1/9 to FC7/0 (FCC0)		FC2/9 to FC5/0 (FCC1)		FC3/9 to FC7/0 (FCC1)	
FC0/10 to FC5/1 (FCC0)		FC1/10 to FC7/1 (FCC0)		FC2/10 to FC5/1 (FCC1)		FC3/10 to FC7/1 (FCC1)	
FC0/11 to FC5/2 (FCC0)		FC1/11 to FC7/2 (FCC0)		FC2/11 to FC5/2 (FCC1)		FC3/11 to FC7/2 (FCC1)	

Table 16: Cabling Plan for LCC1 in a 2+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC1 slot/port	FCC slot/port/chassis	LCC1 slot/port	FCC slot/port/chassis	LCC1 slot/port	FCC slot/port/chassis	LCC1 slot/port	FCC slot/port/chassis
FC0/0 to FC0/3 (FCC0)		FC1/0 to FC2/3 (FCC0)		FC2/0 to FC0/3 (FCC1)		FC3/0 to FC2/3 (FCC1)	
FC0/1 to FC0/4 (FCC0)		FC1/1 to FC2/4 (FCC0)		FC2/1 to FC0/4 (FCC1)		FC3/1 to FC2/4 (FCC1)	
FC0/2 to FC0/5 (FCC0)		FC1/2 to FC2/5 (FCC0)		FC2/2 to FC0/5 (FCC1)		FC3/2 to FC2/5 (FCC1)	
FC0/3 to FC4/3 (FCC0)		FC1/3 to FC6/3 (FCC0)		FC2/3 to FC4/3 (FCC1)		FC3/3 to FC6/3 (FCC1)	
FC0/4 to FC4/4 (FCC0)		FC1/4 to FC6/4 (FCC0)		FC2/4 to FC4/4 (FCC1)		FC3/4 to FC6/4 (FCC1)	
FC0/5 to FC4/5 (FCC0)		FC1/5 to FC6/5 (FCC0)		FC2/5 to FC4/5 (FCC1)		FC3/5 to FC6/5 (FCC1)	
FC0/6 to FC1/3 (FCC0)		FC1/6 to FC3/3 (FCC0)		FC2/6 to FC1/3 (FCC1)		FC3/6 to FC3/3 (FCC1)	
FC0/7 to FC1/4 (FCC0)		FC1/7 to FC3/4 (FCC0)		FC2/7 to FC1/4 (FCC1)		FC3/7 to FC3/4 (FCC1)	
FC0/8 to FC1/5 (FCC0)		FC1/8 to FC3/5 (FCC0)		FC2/8 to FC1/5 (FCC1)		FC3/8 to FC3/5 (FCC1)	
FC0/9 to FC5/3 (FCC0)		FC1/9 to FC7/3 (FCC0)		FC2/9 to FC5/3 (FCC1)		FC3/9 to FC7/3 (FCC1)	
FC0/10 to FC5/4 (FCC0)		FC1/10 to FC7/4 (FCC0)		FC2/10 to FC5/4 (FCC1)		FC3/10 to FC7/4 (FCC1)	
FC0/11 to FC5/5 (FCC0)		FC1/11 to FC7/5 (FCC0)		FC2/11 to FC5/5 (FCC1)		FC3/11 to FC7/5 (FCC1)	

2+2 Software Configuration (16 S2 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/FC4
instance 3
location F0/FC5

controller fabric plane 1
instance 0
location F0/FC2
instance 1
location F0/FC3
instance 2
location F0/FC6
instance 3
location F0/FC7

controller fabric plane 2
instance 0
location F1/FC0
instance 1
location F1/FC1
instance 2
location F1/FC4
instance 3
location F1/FC5

controller fabric plane 3
instance 0
location F1/FC2
instance 1
location F1/FC3
instance 2
location F1/FC6
instance 3
location F1/FC7
```

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

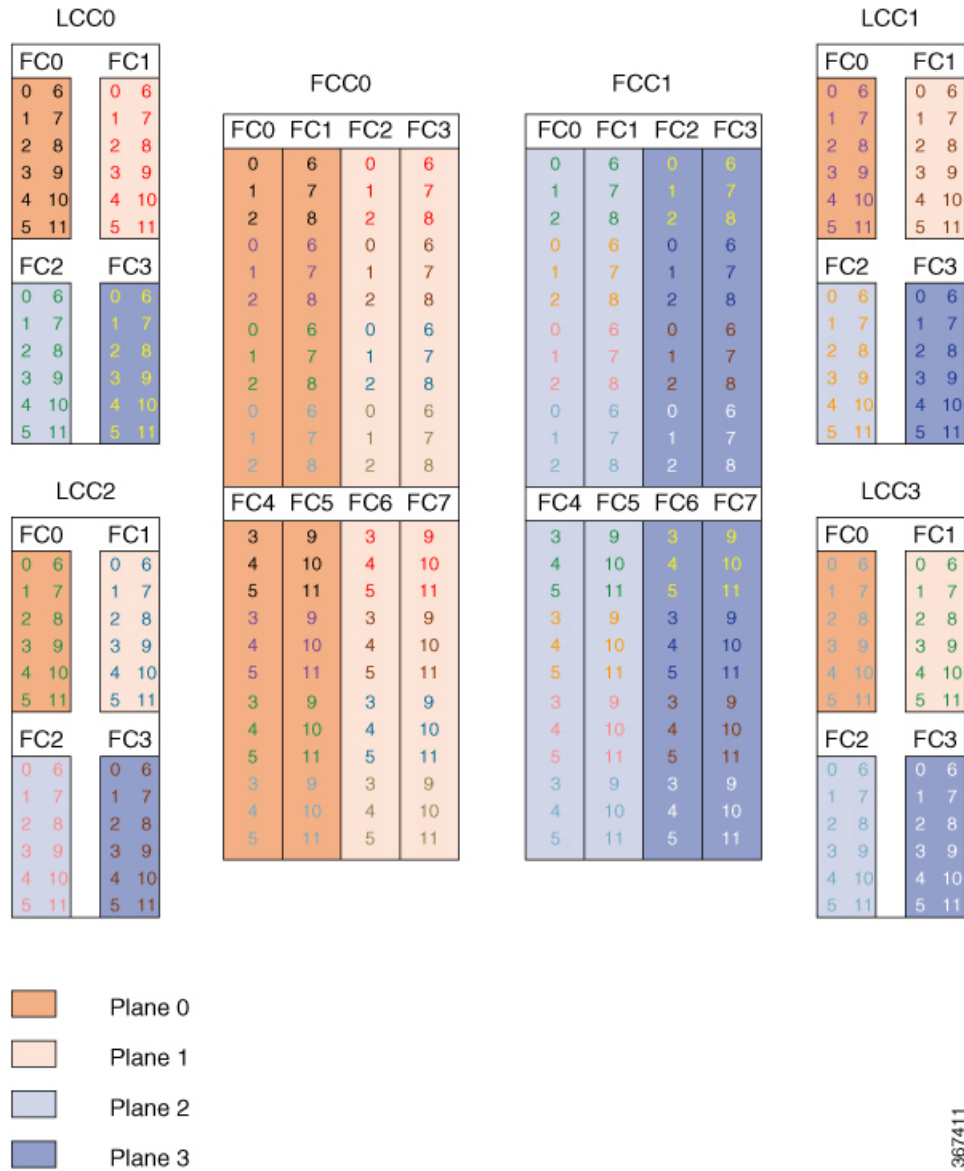
For connecting the fabric, you need the following:

- 192 MPO-24 fiber cables (48 per LCC)
- 384 CXP2 modules (Cisco PID ONS-CXP2-SR25).

Configuring a 4+2 Configuration with 16 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 eight FCs in each fabric card chassis; in total 16 S2 FCs are installed. The figure shows the multi-chassis 4+2 configuration,

Figure 35: Cisco NCS 4000 Multi-Chassis 4+2 Configuration



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

Table 17: Cabling Plan for LCC0 in a 4+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis	LCC0 slot/port	FCC slot/port/chassis
FC0/0 to FC0/0 (FCC0)		FC1/0 to FC2/0 (FCC0)		FC2/0 to FC0/0 (FCC1)		FC3/0 to FC2/0 (FCC1)	
FC0/1 to FC0/1 (FCC0)		FC1/1 to FC2/1 (FCC0)		FC2/1 to FC0/1 (FCC1)		FC3/1 to FC2/1 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3	
LCC0 slot/port	FCC slot/port/ chassis	LCC0 slot/port	FCC slot/port/ chassis	LCC0 slot/port	FCC slot/port/ chassis	LCC0 slot/port	FCC slot/port/ chassis
FC0/2 to FC0/2 (FCC0)		FC1/2 to FC2/2 (FCC0)		FC2/2 to FC0/2 (FCC1)		FC3/2 to FC2/2 (FCC1)	
FC0/3 to FC4/0 (FCC0)		FC1/3 to FC6/0 (FCC0)		FC2/3 to FC4/0 (FCC1)		FC3/3 to FC6/0 (FCC1)	
FC0/4 to FC4/1 (FCC0)		FC1/4 to FC6/1 (FCC0)		FC2/4 to FC4/1 (FCC1)		FC3/4 to FC6/1 (FCC1)	
FC0/5 to FC4/2 (FCC0)		FC1/5 to FC6/2 (FCC0)		FC2/5 to FC4/2 (FCC1)		FC3/5 to FC6/2 (FCC1)	
FC0/6 to FC1/0 (FCC0)		FC1/6 to FC3/0 (FCC0)		FC2/6 to FC1/0 (FCC1)		FC3/6 to FC3/0 (FCC1)	
FC0/7 to FC1/1 (FCC0)		FC1/7 to FC3/1 (FCC0)		FC2/7 to FC1/1 (FCC1)		FC3/7 to FC3/1 (FCC1)	
FC0/8 to FC1/2 (FCC0)		FC1/8 to FC3/2 (FCC0)		FC2/8 to FC1/2 (FCC1)		FC3/8 to FC3/2 (FCC1)	
FC0/9 to FC5/0 (FCC0)		FC1/9 to FC7/0 (FCC0)		FC2/9 to FC5/0 (FCC1)		FC3/9 to FC7/0 (FCC1)	
FC0/10 to FC5/1 (FCC0)		FC1/10 to FC7/1 (FCC0)		FC2/10 to FC5/1 (FCC1)		FC3/10 to FC7/1 (FCC1)	
FC0/11 to FC5/2 (FCC0)		FC1/11 to FC7/2 (FCC0)		FC2/11 to FC5/2 (FCC1)		FC3/11 to FC7/2 (FCC1)	

Table 18: Cabling Plan for LCC1 in a 4+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC1 slot/port	FCC slot/port/ chassis	LCC1 slot/port	FCC slot/port/ chassis	LCC1 slot/port	FCC slot/port/ chassis	LCC1 slot/port	FCC slot/port/ chassis
FC0/0 to FC0/3 (FCC0)		FC1/0 to FC2/3 (FCC0)		FC2/0 to FC0/3 (FCC1)		FC3/0 to FC2/3 (FCC1)	
FC0/1 to FC0/4 (FCC0)		FC1/1 to FC2/4 (FCC0)		FC2/1 to FC0/4 (FCC1)		FC3/1 to FC2/4 (FCC1)	
FC0/2 to FC05 (FCC0)		FC1/2 to FC2/5 (FCC0)		FC2/2 to FC0/5 (FCC1)		FC3/2 to FC2/5 (FCC1)	
FC0/3 to FC4/3 (FCC0)		FC1/3 to FC6/3 (FCC0)		FC2/3 to FC4/3 (FCC1)		FC3/3 to FC6/3 (FCC1)	
FC0/4 to FC4/4 (FCC0)		FC1/4 to FC6/4 (FCC0)		FC2/4 to FC4/4 (FCC1)		FC3/4 to FC6/4 (FCC1)	
FC0/5 to FC4/5 (FCC0)		FC1/5 to FC6/5 (FCC0)		FC2/5 to FC4/5 (FCC1)		FC3/5 to FC6/5 (FCC1)	
FC0/6 to FC1/3 (FCC0)		FC1/6 to FC3/3 (FCC0)		FC2/6 to FC1/3 (FCC1)		FC3/6 to FC3/3 (FCC1)	
FC0/7 to FC1/4 (FCC0)		FC1/7 to FC3/4 (FCC0)		FC2/7 to FC1/4 (FCC1)		FC3/7 to FC3/4 (FCC1)	
FC0/8 to FC1/5 (FCC0)		FC1/8 to FC3/5 (FCC0)		FC2/8 to FC1/5 (FCC1)		FC3/8 to FC3/5 (FCC1)	
FC0/9 to FC5/3 (FCC0)		FC1/9 to FC7/3 (FCC0)		FC2/9 to FC5/3 (FCC1)		FC3/9 to FC7/3 (FCC1)	
FC0/10 to FC5/4 (FCC0)		FC1/10 to FC7/4 (FCC0)		FC2/10 to FC5/4 (FCC1)		FC3/10 to FC7/4 (FCC1)	
FC0/11 to FC5/5 (FCC0)		FC1/11 to FC7/5 (FCC0)		FC2/11 to FC5/5 (FCC1)		FC3/11 to FC7/5 (FCC1)	

Table 19: Cabling Plan for LCC2 in a 4+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC2 slot/port	FCC slot/port/ chassis	LCC2 slot/port	FCC slot/port/ chassis	LCC2 slot/port	FCC slot/port/ chassis	LCC2 slot/port	FCC slot/port/ chassis
FC0/0 to FC0/6 (FCC0)		FC1/0 to FC2/6 (FCC0)		FC2/0 to FC0/6 (FCC1)		FC3/0 to FC2/6 (FCC1)	
FC0/1 to FC0/7 (FCC0)		FC1/1 to FC2/7 (FCC0)		FC2/1 to FC0/7 (FCC1)		FC3/1 to FC2/7 (FCC1)	
FC0/2 to FC0/8 (FCC0)		FC1/2 to FC2/8 (FCC0)		FC2/2 to FC0/8 (FCC1)		FC3/2 to FC2/8 (FCC1)	
FC0/3 to FC4/6 (FCC0)		FC1/3 to FC6/6 (FCC0)		FC2/3 to FC4/6 (FCC1)		FC3/3 to FC6/6 (FCC1)	
FC0/4 to FC4/7 (FCC0)		FC1/4 to FC6/7 (FCC0)		FC2/4 to FC4/7 (FCC1)		FC3/4 to FC6/7 (FCC1)	
FC0/5 to FC4/8 (FCC0)		FC1/5 to FC6/8 (FCC0)		FC2/5 to FC4/8 (FCC1)		FC3/5 to FC6/8 (FCC1)	
FC0/6 to FC1/6 (FCC0)		FC1/6 to FC3/6 (FCC0)		FC2/6 to FC1/6 (FCC1)		FC3/6 to FC3/6 (FCC1)	
FC0/7 to FC1/7 (FCC0)		FC1/7 to FC3/7 (FCC0)		FC2/7 to FC1/7 (FCC1)		FC3/7 to FC3/7 (FCC1)	
FC0/8 to FC1/8 (FCC0)		FC1/8 to FC3/8 (FCC0)		FC2/8 to FC1/8 (FCC1)		FC3/8 to FC3/8 (FCC1)	
FC0/9 to FC5/6 (FCC0)		FC1/9 to FC7/6 (FCC0)		FC2/9 to FC5/6 (FCC1)		FC3/9 to FC7/6 (FCC1)	
FC0/10 to FC5/7 (FCC0)		FC1/10 to FC7/7 (FCC0)		FC2/10 to FC5/7 (FCC1)		FC3/10 to FC7/7 (FCC1)	
FC0/11 to FC5/8 (FCC0)		FC1/11 to FC7/8 (FCC0)		FC2/11 to FC5/8 (FCC1)		FC3/11 to FC7/8 (FCC1)	

Table 20: Cabling Plan for LCC3 in a 4+2 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis
FC0/0 to FC0/9 (FCC0)		FC1/0 to FC2/9 (FCC0)		FC2/0 to FC0/9 (FCC1)		FC3/0 to FC2/9 (FCC1)	
FC0/1 to FC0/10 (FCC0)		FC1/1 to FC2/10 (FCC0)		FC2/1 to FC0/10 (FCC1)		FC3/1 to FC2/10 (FCC1)	
FC0/2 to FC0/11 (FCC0)		FC1/2 to FC2/11 (FCC0)		FC2/2 to FC0/11 (FCC1)		FC3/2 to FC2/11 (FCC1)	
FC0/3 to FC4/9 (FCC0)		FC1/3 to FC6/9 (FCC0)		FC2/3 to FC4/9 (FCC1)		FC3/3 to FC6/9 (FCC1)	
FC0/4 to FC4/10 (FCC0)		FC1/4 to FC6/10 (FCC0)		FC2/4 to FC4/10 (FCC1)		FC3/4 to FC6/10 (FCC1)	
FC0/5 to FC4/11 (FCC0)		FC1/5 to FC6/11 (FCC0)		FC2/5 to FC4/11 (FCC1)		FC3/5 to FC6/11 (FCC1)	
FC0/6 to FC1/9 (FCC0)		FC1/6 to FC3/9 (FCC0)		FC2/6 to FC1/9 (FCC1)		FC3/6 to FC3/9 (FCC1)	
FC0/7 to FC1/10 (FCC0)		FC1/7 to FC3/10 (FCC0)		FC2/7 to FC1/10 (FCC1)		FC3/7 to FC3/10 (FCC1)	
FC0/8 to FC1/11 (FCC0)		FC1/8 to FC3/11 (FCC0)		FC2/8 to FC1/11 (FCC1)		FC3/8 to FC3/11 (FCC1)	

Plane 0		Plane 1		Plane 2		Plane 3	
LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis	LCC3 slot/port	FCC slot/port/ chassis
FC0/9 to FC5/9 (FCC0)		FC1/9 to FC7/9 (FCC0)		FC2/9 to FC5/9 (FCC1)		FC3/9 to FC7/9 (FCC1)	
FC0/10 to FC5/10 (FCC0)		FC1/10 to FC7/10 (FCC0)		FC2/10 to FC5/10 (FCC1)		FC3/10 to FC7/10 (FCC1)	
FC0/11 to FC5/11 (FCC0)		FC1/11 to FC7/11 (FCC0)		FC2/11 to FC5/11 (FCC1)		FC3/11 to FC7/11 (FCC1)	

4+2 Software Configuration (16 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/FC4
instance 3
location F0/FC5

controller fabric plane 1
instance 0
location F0/FC2
instance 1
location F0/FC3
instance 2
location F0/FC6
instance 3
location F0/FC7

controller fabric plane 2
instance 0
location F1/FC0
instance 1
location F1/FC1
instance 2
location F1/FC4
instance 3
location F1/FC5

controller fabric plane 3
instance 0
location F1/FC2
instance 1
location F1/FC3
instance 2
location F1/FC6
instance 3
location F1/FC7

```

Multi-Chassis 8+3 Configuration

This section describes how to configure a multi-chassis 8+3 configuration. In this configuration, eight line card chassis (LCC0, LCC1, LCC2, LCC3, LCC4, LCC5, LCC6, and LCC7) are connected to three fabric card chassis (FCC0, FCC1, and FCC2).

Prerequisites

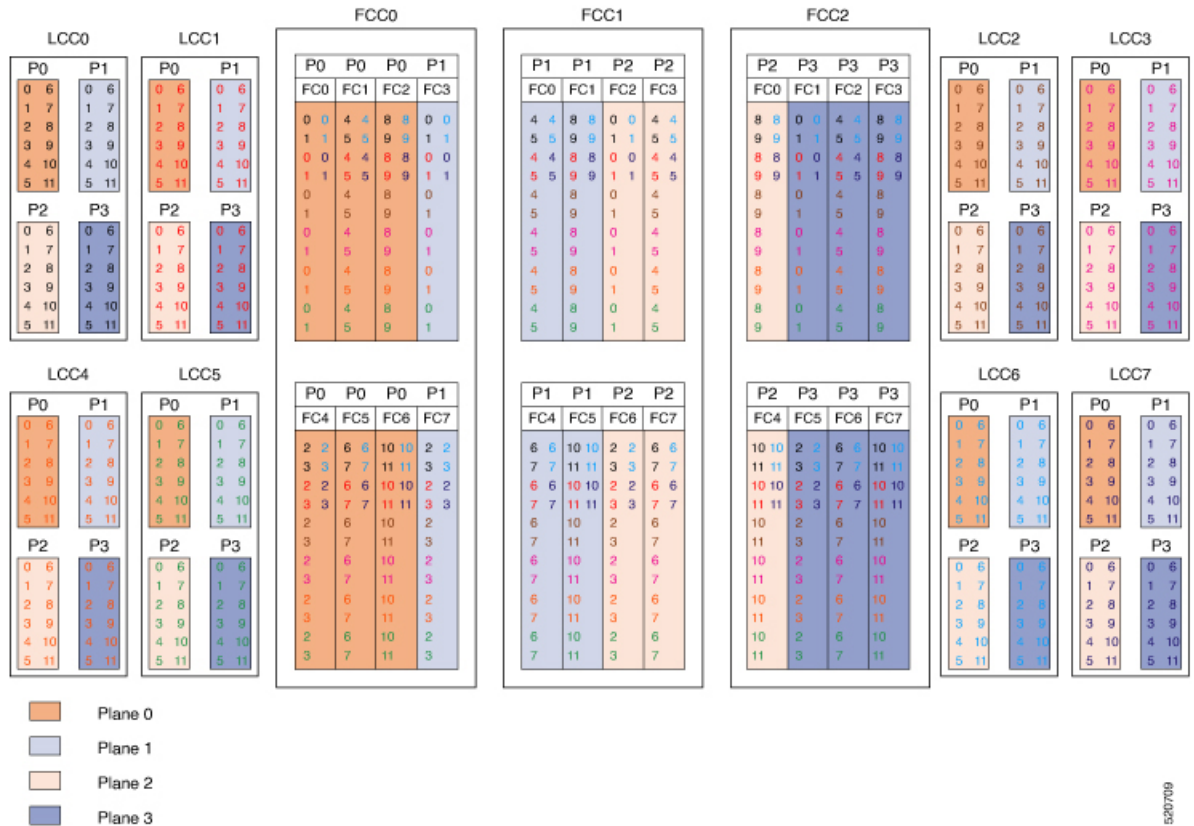
For connecting the fabric, you need the following:

- 384 MPO-24 fiber cables (48 per LCC).
- 768 CXP2 modules (Cisco PID ONS-CXP2-SR25).

Configuring a 8+3 Configuration with 24 S2 Fabric Cards

The following figure shows eight line card chassis (LCC0, LCC1, LCC2, LCC3, LCC4, LCC5, LCC6, and LCC7) connected to three fabric card chassis (FCC0, FCC1, and FCC2). In this configuration, there are eight FCs in each fabric card chassis; in total 24 FCs are installed. The figure shows the multi-chassis 8+3 configuration.

Figure 36: Cisco NCS 4000 Multi Chassis 8+3 Configuration



The following tables show the datapath cabling plan for a 8+3 multi-chassis configuration.

Table 21: Cabling Plan for LCC0 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis
0/FC0/0	F0/FC0/0	0/FC1/0	F0/FC3/0	0/FC2/0	F1/FC2/0	0/FC3/0	F2/FC1/0
0/FC0/1	F0/FC0/1	0/FC1/1	F0/FC3/1	0/FC2/1	F1/FC2/1	0/FC3/1	F2/FC1/1
0/FC0/2	F0/FC4/0	0/FC1/2	F0/FC7/0	0/FC2/2	F1/FC6/0	0/FC3/2	F2/FC5/0
0/FC0/3	F0/FC4/1	0/FC1/3	F0/FC7/1	0/FC2/3	F1/FC6/1	0/FC3/3	F2/FC5/1
0/FC0/4	F0/FC1/0	0/FC1/4	F1/FC0/0	0/FC2/4	F1/FC3/0	0/FC3/4	F2/FC2/0
0/FC0/5	F0/FC1/1	0/FC1/5	F1/FC0/1	0/FC2/5	F1/FC3/1	0/FC3/5	F2/FC2/1
0/FC0/6	F0/FC5/0	0/FC1/6	F1/FC4/0	0/FC2/6	F1/FC7/0	0/FC3/6	F2/FC6/0
0/FC0/7	F0/FC5/1	0/FC1/7	F1/FC4/1	0/FC2/7	F1/FC7/1	0/FC3/7	F2/FC6/1
0/FC0/8	F0/FC2/0	0/FC1/8	F1/FC1/0	0/FC2/8	F2/FC0/0	0/FC3/8	F2/FC3/0
0/FC0/9	F0/FC2/1	0/FC1/9	F1/FC1/1	0/FC2/9	F2/FC0/1	0/FC3/9	F2/FC3/1
0/FC0/10	F0/FC6/0	0/FC1/10	F1/FC5/0	0/FC2/10	F2/FC4/0	0/FC3/10	F2/FC7/0
0/FC0/11	F0/FC6/1	0/FC1/11	F1/FC5/1	0/FC2/11	F2/FC4/1	0/FC3/11	F2/FC7/1

Table 22: Cabling Plan for LCC1 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis
1/FC0/0	F0/FC0/2	1/FC1/0	F0/FC3/2	1/FC2/0	F1/FC2/2	1/FC3/0	F2/FC1/2
1/FC0/1	F0/FC0/3	1/FC1/1	F0/FC3/3	1/FC2/1	F1/FC2/3	1/FC3/1	F2/FC1/3
1/FC0/2	F0/FC4/2	1/FC1/2	F0/FC7/2	1/FC2/2	F1/FC6/2	1/FC3/2	F2/FC5/2
1/FC0/3	F0/FC4/3	1/FC1/3	F0/FC7/3	1/FC2/3	F1/FC6/3	1/FC3/3	F2/FC5/3
1/FC0/4	F0/FC1/2	1/FC1/4	F1/FC0/2	1/FC2/4	F1/FC3/2	1/FC3/4	F2/FC2/2
1/FC0/5	F0/FC1/3	1/FC1/5	F1/FC0/3	1/FC2/5	F1/FC3/3	1/FC3/5	F2/FC2/3
1/FC0/6	F0/FC5/2	1/FC1/6	F1/FC4/2	1/FC2/6	F1/FC7/2	1/FC3/6	F2/FC6/2
1/FC0/7	F0/FC5/3	1/FC1/7	F1/FC4/3	1/FC2/7	F1/FC7/3	1/FC3/7	F2/FC6/3
1/FC0/8	F0/FC2/2	1/FC1/8	F1/FC1/2	1/FC2/8	F2/FC0/2	1/FC3/8	F2/FC3/2
1/FC0/9	F0/FC2/3	1/FC1/9	F1/FC1/3	1/FC2/9	F2/FC0/3	1/FC3/9	F2/FC3/3
1/FC0/10	F0/FC6/2	1/FC1/10	F1/FC5/2	1/FC2/10	F2/FC4/2	1/FC3/10	F2/FC7/2
1/FC0/11	F0/FC6/3	1/FC1/11	F1/FC5/3	1/FC2/11	F2/FC4/3	1/FC3/11	F2/FC7/3

Table 23: Cabling Plan for LCC2 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis
2/FC0/0	F0/FC0/4	2/FC1/0	F0/FC3/4	2/FC2/0	F1/FC2/4	2/FC3/0	F2/FC1/4
2/FC0/1	F0/FC0/5	2/FC1/1	F0/FC3/5	2/FC2/1	F1/FC2/5	2/FC3/1	F2/FC1/5
2/FC0/2	F0/FC4/4	2/FC1/2	F0/FC7/4	2/FC2/2	F1/FC6/4	2/FC3/2	F2/FC5/4
2/FC0/3	F0/FC4/5	2/FC1/3	F0/FC7/5	2/FC2/3	F1/FC6/5	2/FC3/3	F2/FC5/5
2/FC0/4	F0/FC1/4	2/FC1/4	F1/FC0/4	2/FC2/4	F1/FC3/4	2/FC3/4	F2/FC2/4
2/FC0/5	F0/FC1/5	2/FC1/5	F1/FC0/5	2/FC2/5	F1/FC3/5	2/FC3/5	F2/FC2/5
2/FC0/6	F0/FC5/4	2/FC1/6	F1/FC4/4	2/FC2/6	F1/FC7/4	2/FC3/6	F2/FC6/4
2/FC0/7	F0/FC5/5	2/FC1/7	F1/FC4/5	2/FC2/7	F1/FC7/5	2/FC3/7	F2/FC6/5
2/FC0/8	F0/FC2/4	2/FC1/8	F1/FC1/4	2/FC2/8	F2/FC0/4	2/FC3/8	F2/FC3/4
2/FC0/9	F0/FC2/5	2/FC1/9	F1/FC1/5	2/FC2/9	F2/FC0/5	2/FC3/9	F2/FC3/5
2/FC0/10	F0/FC6/4	2/FC1/10	F1/FC5/4	2/FC2/10	F2/FC4/4	2/FC3/10	F2/FC7/4
2/FC0/11	F0/FC6/5	2/FC1/11	F1/FC5/5	2/FC2/11	F2/FC4/5	2/FC3/11	F2/FC7/5

Table 24: Cabling Plan for LCC3 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis
3/FC0/0	F0/FC0/6	3/FC1/0	F0/FC3/6	3/FC2/0	F1/FC2/6	3/FC3/0	F2/FC1/6
3/FC0/1	F0/FC0/7	3/FC1/1	F0/FC3/7	3/FC2/1	F1/FC2/7	3/FC3/1	F2/FC1/7
3/FC0/2	F0/FC4/6	3/FC1/2	F0/FC7/6	3/FC2/2	F1/FC6/6	3/FC3/2	F2/FC5/6
3/FC0/3	F0/FC4/7	3/FC1/3	F0/FC7/7	3/FC2/3	F1/FC6/7	3/FC3/3	F2/FC5/7
3/FC0/4	F0/FC1/6	3/FC1/4	F1/FC0/6	3/FC2/4	F1/FC3/6	3/FC3/4	F2/FC2/6
3/FC0/5	F0/FC1/7	3/FC1/5	F1/FC0/7	3/FC2/5	F1/FC3/7	3/FC3/5	F2/FC2/7
3/FC0/6	F0/FC5/6	3/FC1/6	F1/FC4/6	3/FC2/6	F1/FC7/6	3/FC3/6	F2/FC6/6
3/FC0/7	F0/FC5/7	3/FC1/7	F1/FC4/7	3/FC2/7	F1/FC7/7	3/FC3/7	F2/FC6/7
3/FC0/8	F0/FC2/6	3/FC1/8	F1/FC1/6	3/FC2/8	F2/FC0/6	3/FC3/8	F2/FC3/6
3/FC0/9	F0/FC2/7	3/FC1/9	F1/FC1/7	3/FC2/9	F2/FC0/7	3/FC3/9	F2/FC3/7
3/FC0/10	F0/FC6/6	3/FC1/10	F1/FC5/6	3/FC2/10	F2/FC4/6	3/FC3/10	F2/FC7/6
3/FC0/11	F0/FC6/7	3/FC1/11	F1/FC5/7	3/FC2/11	F2/FC4/7	3/FC3/11	F2/FC7/7

Table 25: Cabling Plan for LCC4 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis
4/FC0/0	F0/FC0/8	4/FC1/0	F0/FC3/8	4/FC2/0	F1/FC2/8	4/FC3/0	F2/FC1/8
4/FC0/1	F0/FC0/9	4/FC1/1	F0/FC3/9	4/FC2/1	F1/FC2/9	4/FC3/1	F2/FC1/9
4/FC0/2	F0/FC4/8	4/FC1/2	F0/FC7/8	4/FC2/2	F1/FC6/8	4/FC3/2	F2/FC5/8
4/FC0/3	F0/FC4/9	4/FC1/3	F0/FC7/9	4/FC2/3	F1/FC6/9	4/FC3/3	F2/FC5/9
4/FC0/4	F0/FC1/8	4/FC1/4	F1/FC0/8	4/FC2/4	F1/FC3/8	4/FC3/4	F2/FC2/8
4/FC0/5	F0/FC1/9	4/FC1/5	F1/FC0/9	4/FC2/5	F1/FC3/9	4/FC3/5	F2/FC2/9
4/FC0/6	F0/FC5/8	4/FC1/6	F1/FC4/8	4/FC2/6	F1/FC7/8	4/FC3/6	F2/FC6/8
4/FC0/7	F0/FC5/9	4/FC1/7	F1/FC4/9	4/FC2/7	F1/FC7/9	4/FC3/7	F2/FC6/9
4/FC0/8	F0/FC2/8	4/FC1/8	F1/FC1/8	4/FC2/8	F2/FC0/8	4/FC3/8	F2/FC3/8
4/FC0/9	F0/FC2/9	4/FC1/9	F1/FC1/9	4/FC2/9	F2/FC0/9	4/FC3/9	F2/FC3/9
4/FC0/10	F0/FC6/8	4/FC1/10	F1/FC5/8	4/FC2/10	F2/FC4/8	4/FC3/10	F2/FC7/8
4/FC0/11	F0/FC6/9	4/FC1/11	F1/FC5/9	4/FC2/11	F2/FC4/9	4/FC3/11	F2/FC7/9

Table 26: Cabling Plan for LCC5 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis	LCC slot/port	FCC slot/port/chassis
5/FC0/0	F0/FC0/10	5/FC1/0	F0/FC3/10	5/FC2/0	F1/FC2/10	5/FC3/0	F2/FC1/10
5/FC0/1	F0/FC0/11	5/FC1/1	F0/FC3/11	5/FC2/1	F1/FC2/11	5/FC3/1	F2/FC1/11
5/FC0/2	F0/FC4/10	5/FC1/2	F0/FC7/10	5/FC2/2	F1/FC6/10	5/FC3/2	F2/FC5/10
5/FC0/3	F0/FC4/11	5/FC1/3	F0/FC7/11	5/FC2/3	F1/FC6/11	5/FC3/3	F2/FC5/11
5/FC0/4	F0/FC1/10	5/FC1/4	F1/FC0/10	5/FC2/4	F1/FC3/10	5/FC3/4	F2/FC2/10
5/FC0/5	F0/FC1/11	5/FC1/5	F1/FC0/11	5/FC2/5	F1/FC3/11	5/FC3/5	F2/FC2/11
5/FC0/6	F0/FC5/10	5/FC1/6	F1/FC4/10	5/FC2/6	F1/FC7/10	5/FC3/6	F2/FC6/10
5/FC0/7	F0/FC5/11	5/FC1/7	F1/FC4/11	5/FC2/7	F1/FC7/11	5/FC3/7	F2/FC6/11
5/FC0/8	F0/FC2/10	5/FC1/8	F1/FC1/10	5/FC2/8	F2/FC0/10	5/FC3/8	F2/FC3/10
5/FC0/9	F0/FC2/11	5/FC1/9	F1/FC1/11	5/FC2/9	F2/FC0/11	5/FC3/9	F2/FC3/11
5/FC0/10	F0/FC6/10	5/FC1/10	F1/FC5/10	5/FC2/10	F2/FC4/10	5/FC3/10	F2/FC7/10
5/FC0/11	F0/FC6/11	5/FC1/11	F1/FC5/11	5/FC2/11	F2/FC4/11	5/FC3/11	F2/FC7/11

Table 27: Cabling Plan for LCC6 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis
6/FC0/0	F0/FC0/12	6/FC1/0	F0/FC3/12	6/FC2/0	F1/FC2/12	6/FC3/0	F2/FC1/12
6/FC0/1	F0/FC0/13	6/FC1/1	F0/FC3/13	6/FC2/1	F1/FC2/13	6/FC3/1	F2/FC1/13
6/FC0/2	F0/FC4/12	6/FC1/2	F0/FC7/12	6/FC2/2	F1/FC6/12	6/FC3/2	F2/FC5/12
6/FC0/3	F0/FC4/13	6/FC1/3	F0/FC7/13	6/FC2/3	F1/FC6/13	6/FC3/3	F2/FC5/13
6/FC0/4	F0/FC1/12	6/FC1/4	F1/FC0/12	6/FC2/4	F1/FC3/12	6/FC3/4	F2/FC2/12
6/FC0/5	F0/FC1/13	6/FC1/5	F1/FC0/13	6/FC2/5	F1/FC3/13	6/FC3/5	F2/FC2/13
6/FC0/6	F0/FC5/12	6/FC1/6	F1/FC4/12	6/FC2/6	F1/FC7/12	6/FC3/6	F2/FC6/12
6/FC0/7	F0/FC5/13	6/FC1/7	F1/FC4/13	6/FC2/7	F1/FC7/13	6/FC3/7	F2/FC6/13
6/FC0/8	F0/FC2/12	6/FC1/8	F1/FC1/12	6/FC2/8	F2/FC0/12	6/FC3/8	F2/FC3/12
6/FC0/9	F0/FC2/13	6/FC1/9	F1/FC1/13	6/FC2/9	F2/FC0/13	6/FC3/9	F2/FC3/13
6/FC0/10	F0/FC6/12	6/FC1/10	F1/FC5/12	6/FC2/10	F2/FC4/12	6/FC3/10	F2/FC7/12
6/FC0/11	F0/FC6/13	6/FC1/11	F1/FC5/13	6/FC2/11	F2/FC4/13	6/FC3/11	F2/FC7/13

Table 28: Cabling Plan for LCC7 in a 8+3 Multi-Chassis Configuration

Plane 0		Plane 1		Plane 2		Plane 3	
LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis	LCC slot/port	FCC slot/port/ chassis
7/FC0/0	F0/FC0/14	7/FC1/0	F0/FC3/14	7/FC2/0	F1/FC2/14	7/FC3/0	F2/FC1/14
7/FC0/1	F0/FC0/15	7/FC1/1	F0/FC3/15	7/FC2/1	F1/FC2/15	7/FC3/1	F2/FC1/15
7/FC0/2	F0/FC4/14	7/FC1/2	F0/FC7/14	7/FC2/2	F1/FC6/14	7/FC3/2	F2/FC5/14
7/FC0/3	F0/FC4/15	7/FC1/3	F0/FC7/15	7/FC2/3	F1/FC6/15	7/FC3/3	F2/FC5/15
7/FC0/4	F0/FC1/14	7/FC1/4	F1/FC0/14	7/FC2/4	F1/FC3/14	7/FC3/4	F2/FC2/14
7/FC0/5	F0/FC1/15	7/FC1/5	F1/FC0/15	7/FC2/5	F1/FC3/15	7/FC3/5	F2/FC2/15
7/FC0/6	F0/FC5/14	7/FC1/6	F1/FC4/14	7/FC2/6	F1/FC7/14	7/FC3/6	F2/FC6/14
7/FC0/7	F0/FC5/15	7/FC1/7	F1/FC4/15	7/FC2/7	F1/FC7/15	7/FC3/7	F2/FC6/15
7/FC0/8	F0/FC2/14	7/FC1/8	F1/FC1/14	7/FC2/8	F2/FC0/14	7/FC3/8	F2/FC3/14
7/FC0/9	F0/FC2/15	7/FC1/9	F1/FC1/15	7/FC2/9	F2/FC0/15	7/FC3/9	F2/FC3/15
7/FC0/10	F0/FC6/14	7/FC1/10	F1/FC5/14	7/FC2/10	F2/FC4/14	7/FC3/10	F2/FC7/14
7/FC0/11	F0/FC6/15	7/FC1/11	F1/FC5/15	7/FC2/11	F2/FC4/15	7/FC3/11	F2/FC7/15



Note The cable plan for the 8+3 configuration is not flexible.

8+3 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.

The following configurations are for a 8+3 MC system with six FCC fabric cards per plane with FCC rack level redundancy.

```
controller fabric plane 0
instance 0
location F0/FC0
instance 1
location F0/FC4
instance 2
location F0/FC1
instance 3
location F0/FC5
instance 4
location F0/FC2
instance 5
location F0/FC6
```

```
controller fabric plane 1
instance 0
location F0/FC3
instance 1
location F0/FC7
instance 2
location F1/FC0
instance 3
location F1/FC4
instance 4
location F1/FC1
instance 5
location F1/FC5
```

```
controller fabric plane 2
instance 0
location F1/FC2
instance 1
location F1/FC6
instance 2
location F1/FC3
instance 3
location F1/FC7
instance 4
location F2/FC0
instance 5
location F2/FC4
```

```
controller fabric plane 3
instance 0
location F2/FC1
Instance 1
location F2/FC5
instance 2
location F2/FC2
Instance 3
```

```
location F2/FC6
instance 4
location F2/FC3
Instance 5
location F2/FC7
```