Cisco CRS Carrier Routing System Multishelf System Interconnection and Cabling Guide

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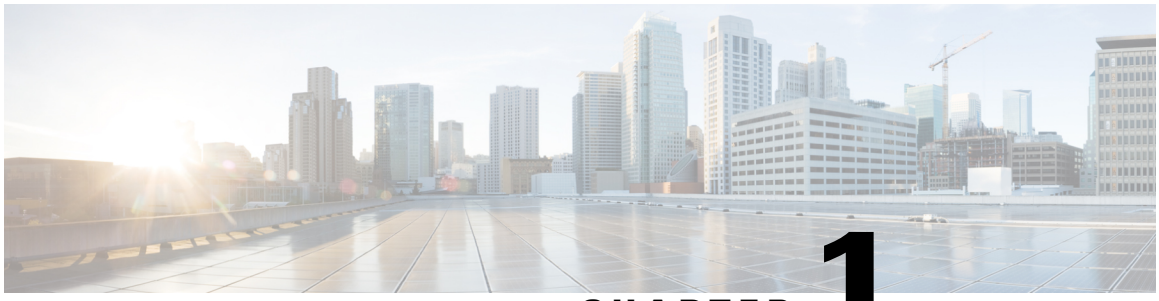


CHAPTER 1

Preface

This preface explains the objectives and intended audience for this *Cisco CRS Carrier Routing System 4-Slot Line Card Chassis Site Planning Guide* (referred to in this document as the site planning guide). This preface also decribes the document organization and the conventions used in the document.

Objectives

This guide describes the basic facilities requirements, such as floor space, power requirements, environmental requirements, and so on, for the Cisco CRS 16-Slot Line Card Chassis (LCC). This guide is intended to help you in planning the site where the chassis will be installed. It should be used with Cisco Systems, Inc. site planning coordinators and site inspectors, well in advance of the delivery of the chassis.

Audience

This guide is intended for anyone who plans the facilities, including space, rack-mounting, power, cooling, cabling, delivery, and storage, for the delivery and installation of a Cisco CRS 16-Slot LCC.

Organization

This document contains the following chapters and appendices:

Title	Description
Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Overview	Describes the Cisco CRS routing system and presents an overview of the steps required to prepare the site for the installation of a LCC.
Space Planning	Provides information about chassis space requirements and other site preparation details (for example, floor loading and securing the chassis to the floor).
Power and Cooling Requirements	Describes the power and cooling requirements for the chassis.
Shipping and Receiving	Describes the things to consider as you plan for the shipment of the chassis and transport to the installation site.
System Planning Considerations	Provides information about system planning considerations, such as high availability.
Product IDs	Provides the product identifiers (IDs) for orderable chassis components.
Preliminary Site Survey	Contains a sample preliminary site survey in which to enter information about the installation site and site-preparation process.
Cisco CRS Series Carrier Routing System 16-Slot Line Card Chassis Specifications	Lists the chassis specifications and provides information about wire gauges and resistances for DC power cabling.

Documentation Conventions

This document uses the following conventions:

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

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

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

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

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

Warning IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS

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

Related Documentation

This section refers you to other documentation that contains complete planning, installation, and configuration information.

The documentation listed below is available online.

- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Site Planning Guide
- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Installation Guide
- Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Unpacking, Moving, and Securing Guide
- Cisco CRS Carrier Routing System Ethernet Physical Layer Interface Module (PLIM) Installation Note
- Cisco CRS Carrier Routing System Packet-over-SONET/SDH Physical Layer Interface Module Installation Note
- Cisco CRS Carrier Routing System SIP and SPA Hardware Installation Guide
- Cisco CRS-1 Carrier Routing System 16-Slot Line Card Chassis Hardware Operations and Troubleshooting Guide
- Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information

Changes to This Document

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

Table 1: Changes to This Document

Date	Summary
July 2014	Added support for new 2x100GE-FLEX-40 PLIM. Added updates to support the Cisco CRS-X back-to-back and multishelf systems, which include new CRS-16-FC400/M switch fabric card.
January 2014	Added updates to support the Cisco CRS-X, which includes new line cards, switch fabric cards, and PLIMs.
September 2011	Updated Appendix A, *Product IDs* and Appendix C, *Cisco CRS Series Carrier Routing System 16-Slot Line Card Chassis Specifications*.
May 2011	Updated the *Shipping and Receiving* with information about moving the chassis using the dolly supplied by Cisco.

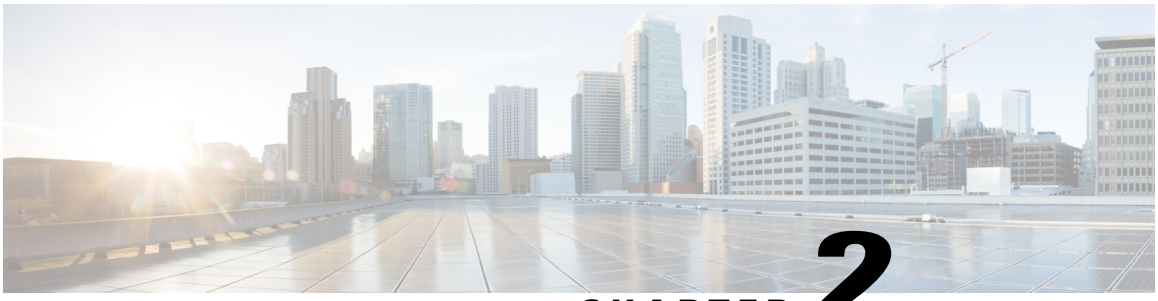
Date	Summary
April 2011	Added information about new CRS-16-PRP-6G and CRS-16-PRP-12G Performance Route Processor (PRP) cards. Technical updates and minor editorial changes were also made.
March 2011	Added information about new modular configuration AC and DC power systems. Added product IDs for the modular configuration power components.
October 2010	Added information about new MSC140 and FP140 line cards; 4-port, 8-port, 14-port, and 20-port 10-GE XFP PLIMS; and 1-port 100-GE CFP PLIM. Technical updates and minor editorial changes were also made.
January 2010	Updated weight and floor loading values.
February 2008	Updated the document with technical corrections.
August 2007	Revision includes technical corrections and other updates throughout the document.
June 2007	Updated the two-pole DC power requirements.
September 2006	Revision includes general technical corrections.
April 2006	Changed document title.
December 2005	Reorganized the document to more closely align with the steps in the site preparation process. Updated the *Space Planning*, and *Shipping and Receiving* chapters, with information about chassis dimensions and weight, required aisle clearances, and floor loading. Updated the *Power and Cooling Requirements* chapter, with new information on general power and grounding requirements and DC power requirements, and a few clarifications were made in the AC power section. Updated the *System Planning Considerations* chapter, with information about high availability. Added several new product IDs to Appendix A *Product IDs*. Updated chassis specifications in Appendix C *Cisco CRS Series Carrier Routing System 16-Slot Line Card Chassis Specifications*. Added the *DC Wire Gauge and Resistance* section.

Date	Summary
July 2004 December 2004	The document was released in July and updated with technical corrections in December.

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 2

Introduction to Multishelf System Cabling

Introduction to Multishelf System Cabling

This chapter provides an overview of the Cisco CRS Carrier Routing System Multishelf System and describes what is required to interconnect system components. The Cisco CRS Carrier Routing System Multishelf System is also called the Cisco CRS Multishelf system or *multishelf system* .

The multishelf 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 multishelf system consists of two major components: 16-slot line card chassis (commonly referred to as LCC) and fabric card chassis (commonly referred to as FCC). The current Cisco IOS XR software release supports up to eight LCCs and one, two, or four FCCs.

Note This cabling guide is for a new multishelf system installation. If you are upgrading a Cisco CRS 16-Slot Line Card Chassis to become part of a Cisco CRS Multishelf System, see the Cisco CRS Carrier Routing System Multishelf System Upgrade and Conversion Guide. Also see the Cisco CRS Carrier Routing System Multishelf System Upgrade and Conversion Guide if you are converting a multishelf system from a Cisco Catalyst-based system to a 22-port shelf controller Gigabit Ethernet (22-port SCGE) system.

The chapter covers the following topics:

Multishelf System Overview

Multishelf system configurations are available with one, two, or four fabric card chassis (FCCs). The single-FCC multishelf system requires a smaller investment, while the two- or four-FCC systems provide additional fault tolerance because the failure of a single FCC does not shut down the system.

These systems are introduced in the following sections:

Tip For a complete introduction to multishelf systems, see *Cisco CRS Carrier Routing System Multishelf System Description* .

Single-FCC Multishelf System

The Cisco CRS Carrier Routing System is the first carrier routing system in the industry to offer continuous system operation, unprecedented service flexibility, and system longevity. The system is powered by Cisco IOS XR software, a unique self-healing and self-defending operating system designed for continual operation while scaling system capacity from 4.88 Terabits per second (Tbps) for each line card chassis (LCC) up to 322 terabits per second (Tbps) for a fully-loaded multishelf system (MSS). The multishelf system design supports from 2 to 8 LCCs and from 1 to 4 FCCs, for a total switching capacity of up to 322 Tbps.

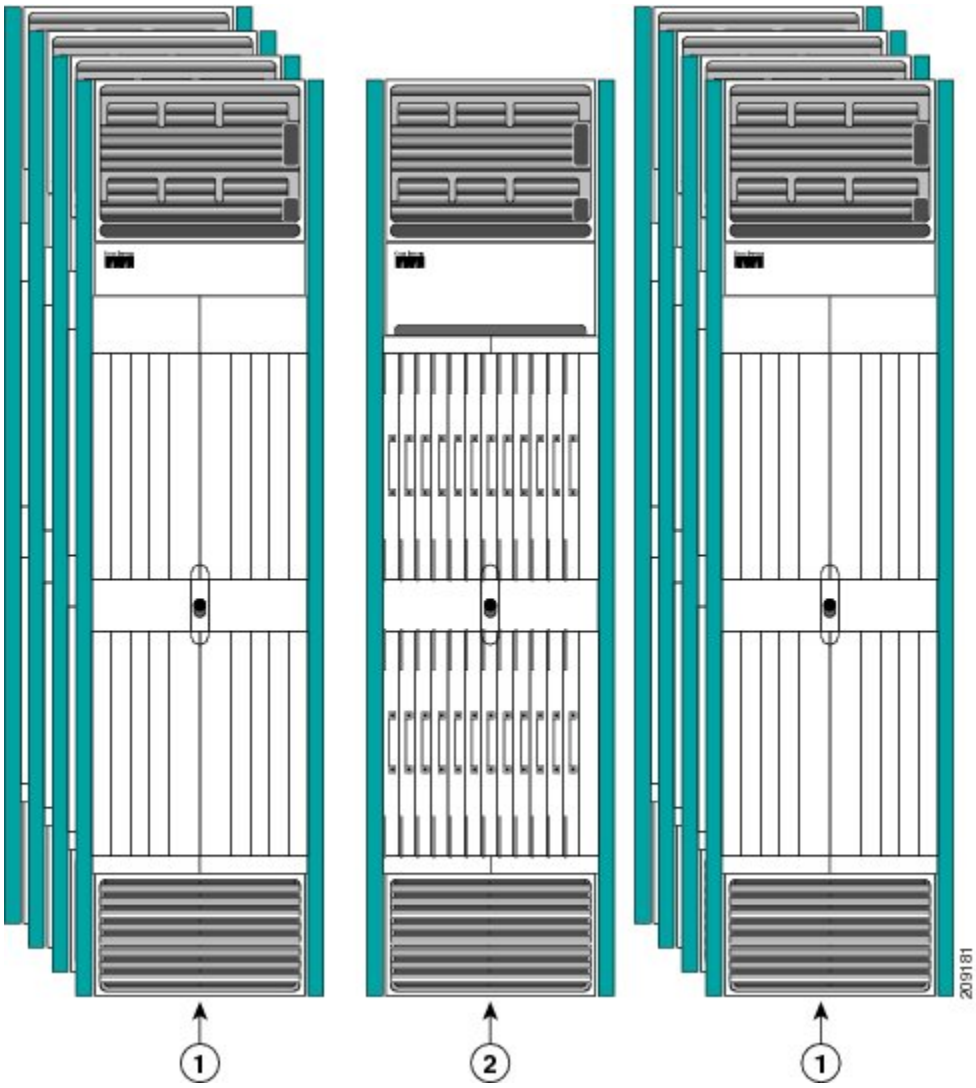
Note Refer to the appropriate Cisco IOS XR software release notes online to confirm the multishelf system capacity supported by the Cisco IOS XR software release you have loaded. Currently the upper range of multishelf system capacity supported by Cisco IOS XR software is eight LCCs and four FCCs.

The figure below shows the single-FCC multishelf system, which contains the following major components:

- Eight Cisco CRS 16-Slot Line Card Chassis
- One Cisco CRS Fabric Card Chassis

Note The single-FCC multishelf system also supports up to two 22-port shelf controller Gigabit Ethernet (22-port SCGE) cards per fabric card chassis.

Figure 1: Front View of the Single-FCC Multishelf System



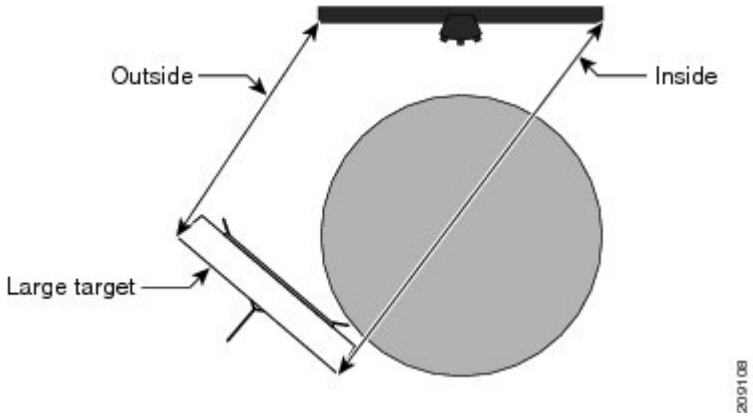
1	Cisco CRS 16-Slot Line Card Chassis *(* eight shown*)*	2	Cisco CRS-Fabric Card Chassis (one shown)

Two-FCC Multishelf System

The figure below shows the two-FCC multishelf system, which contains the following major components:

- Eight Cisco CRS 16-Slot Line Card Chassis
- Two Cisco CRS Fabric Card Chassis

Figure 2: Front View of the Two-FCC Multishelf System



1	Cisco CRS 16-Slot Line Card Chassis *(* eight shown*)*	2	Cisco CRS Fabric Card Chassis *(* two shown)

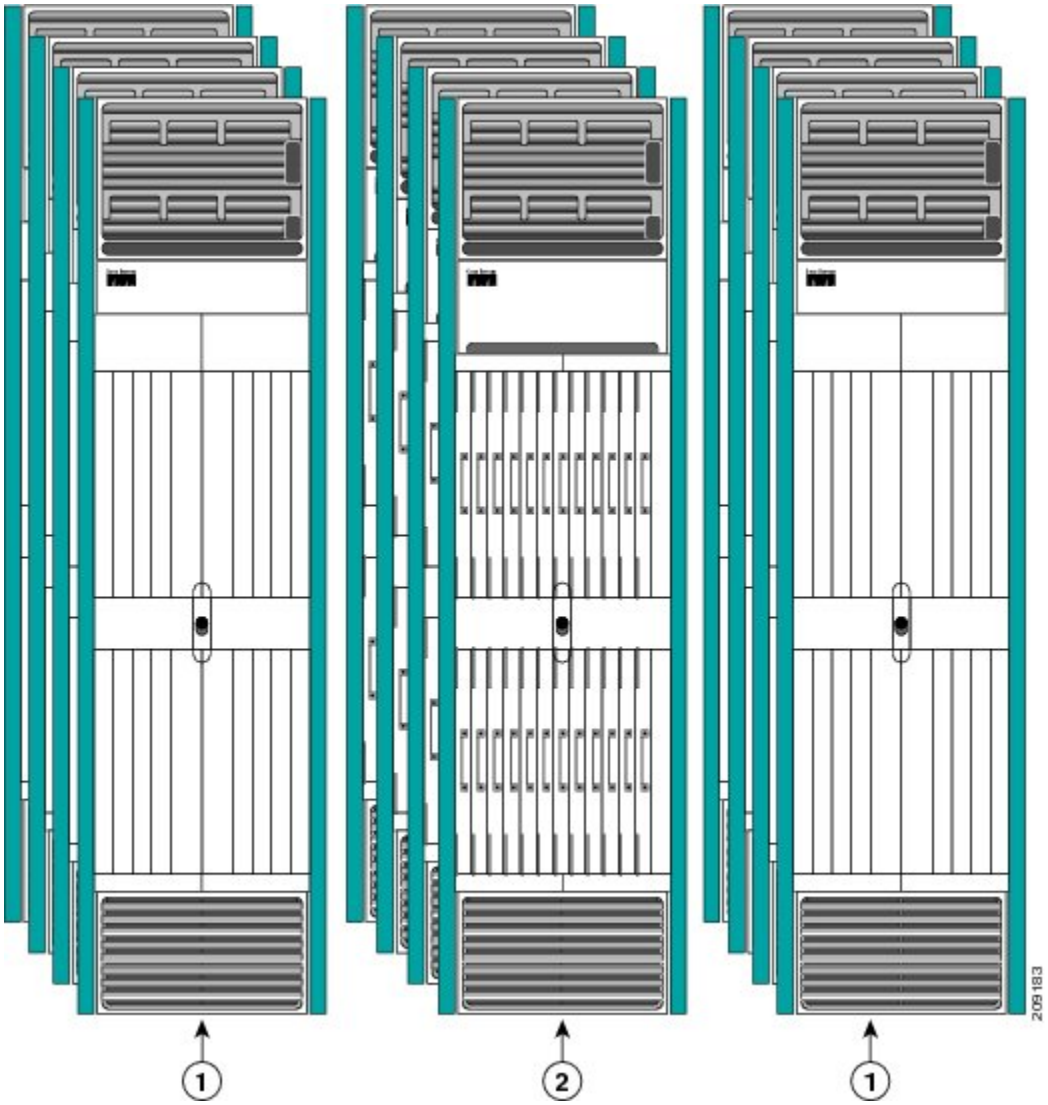
Four-FCC Multishelf System

The figure below shows the four-FCC multishelf system, which contains the following major components:

- Eight Cisco CRS 16-Slot Line Card Chassis

- Four Cisco CRS Fabric Card Chassis

Figure 3: Front View of the Four-FCC Multishelf System



1	Cisco CRS 16-Slot Line Card Chassis *(* eight shown*)*	2	Cisco CRS Fabric Card Chassis *(* four shown)

Cabling Overview

Multishelf system cabling can be divided into the following groups, and a multishelf system should be cabled in this approximate order:

System Management, Alarm, and Network Clock Cabling

The Cabling for System Management, Alarms, and Network Clocking chapter describes the cabling for system management connections, the optional network clock feature, and the optional external alarm feature. At least one form of system management connection must be cabled before system configuration can start.

Control Network Cabling Using 22-Port SCGE Cards

The chapter *Cabling the Control Network Using 22-Port Shelf Controller Gigabit Ethernet Cards* describes the cabling for the control network, which links all racks together and enables the designated shelf controller (DSC) rack to control the other racks in the system. The DSC also uses the control network to download software to the other racks in the system and receive messages on rack status. The control network must be cabled before the system can become operational.

Fabric Cabling

The chapter *Cabling the Fabric* describes the cabling between the fabric components in the LCCs and the fabric components in the FCCs. The fabric provides the data connection for router traffic between all the modular services card (MSC) ports in the LCCs. The fabric cabling must be completed to enable data communications through the multishelf system.There are two types of fabric cable, Trimese and Riser.

PLIM Port Cabling

All router data traffic enters the multishelf system through lines connected to the physical layer interface modules (PLIMs). For information about PLIM cards and connectors, see the PLIM notes and installation guides on http://cisco.com

General Cabling Prerequisites

The prerequisites for installing a multishelf system include having adequate floor space to cable the system, an environment that meets specifications, the minimum system components needed to create a multishelf system, the tools required to perform the installation, and the proper cables needed to interconnect the chassis to each other, the 22-port SCGE cards, and their power sources. These prerequisites are explained in the following sections:

Space and Environmental Considerations

Space, power, and environmental specifications are cited in the following online guides:

- *Cisco CRS Carrier Routing System Multishelf System Site Planning Guide*
- *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Site Planning Guide*

Tools and Supplies Required

The following tools and supplies are required to cable the multishelf system:

- ESD (ElectroStatic Discharge) wrist strap (for inserting an SFP module)
- 2.5-mm Allen wrench (to screw or unscrew the hex screws on the unistrut)
- Torx T6 wrench (to screw or unscrew the bolt on the fabric cable connector to the OIM or S13 fabric card)
- Medium (number 2) Phillips screwdriver
- Medium flat-blade screwdriver (1/4 inch [60 to 70 mm]). This screwdriver is optional; it's used for opening the bale latches on small form-factor pluggable [SFP] or Gigabit Interface Converter [GBIC] transceivers.
- Turn collars (to provide support and strain relief for fabric cable connections). The turn collars are supplied with the cable.
- Supply of Velcro tie wraps (to bundle cables)
- Ladder

Cables Required

The cables listed in the below table are required for each LCC in a multishelf system installation.

Table 2: Cables Required to Install a Cisco CRS Multishelf System

Cable Product ID	Description	Purpose
Trimese: LCC/M-FC-FBR-*xx* = (where *xx* is the length in meters) Riser: LCC/M-FC-FBR-*xx* R= (where *xx* is the length in meters)	Line Card Chassis/Multishelf - Fabric Chassis - Fiber	To interconnect fabric cards between the LCCs and one or more FCCs. **Note** Twenty-four (24) cables are required for each LCC.
72-1258-01	Gigabit Ethernet cables (green)	To connect the route processor (RP) cards and shelf controller Gigabit Ethernet (SCGE) cards To connect console cables to the router
—	22-port SCGE card LC to LC Ethernet cable (single mode)	To connect the DSC RP cards RP0 and RP1 MGMT ETH ports to the 22-port SCGE cards.[1]

1 These cables are required in configurations using 22-port SCGE cards.

For more information on the range of lengths available for the Cisco CRS fabric cables, refer to Cisco Systems Fabric Cables, on page 39 in *Cabling the Fabric* chapter. Table 9: Fabric Cables for the Cisco CRS Multishelf System, on page 39the product ID numbers for Cisco CRS fabric cables. Evaluate your installation for the appropriate length of fabric cable needed before ordering.

Cable Routing Considerations

The elements of the multishelf system that need to be cabled together include:

- Two 22-port SCGE cards per fabric card chassis.
- One, two, or four fabric card chassis
- Two or more line card chassis

Whether the cables will be run overhead or under the floor, consider the airflow and cable characteristics of the combined cable sets to ensure that your cable management structures match or exceed the total capacity of cables for the multishelf system installation.

The following sections provide some cable routing guidelines:

Tip See the Cisco CRS Carrier Routing System Multishelf System Site Planning Guide for information on planning component locations and cable runs.

Raised Floor Installations

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

Cable Characteristics

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

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

Note Trimese fabric cables carry a dual flame rating: *general purpose* and *LSZH* (low smoke zero halogen). These cables are designed to connect between an LCC and FCC in the free air of the room. Fabric cables must be routed within a room. Fabric cables are not rated for installation above ceilings, below floors, or through walls.

Note Riser fabric cables (LCC-M-C-FBR-xxR) meet the OFNR riser cable flame rating. These cables are designed to connect between an LCC and an FCC, either in the free air within a room, or, through a riser access between building floors. Riser cables are not rated for installation in air plenum passages, nor are they designed for use in LSZH (low smoke zero halogen) applications.

Cable Length

The limit of the cables is 100 meters (328 feet). Consider this distance when planning the physical locations of the LCCs and FCCs. For more information on the range of lengths available for the Cisco CRS fabric cables, refer to Cisco Systems Fabric Cables in the *cabling the Fabirc* chapter . The Table 9: Fabric Cables for the Cisco CRS Multishelf System, on page 39 lists the product ID numbers for Cisco CRS fabric cables. Evaluate your installation for the appropriate length of fabric cable needed before ordering.

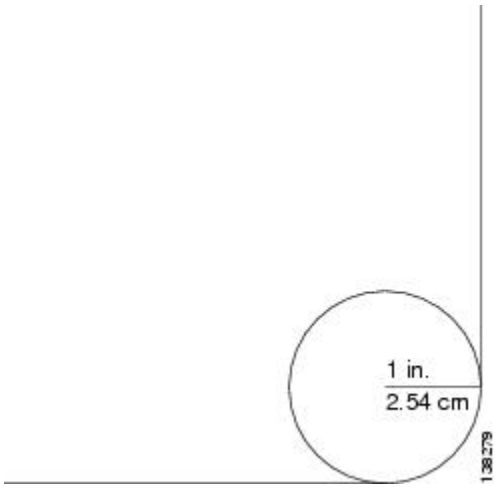
Cable Bend Radius

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

The figure below shows an example of how a bend radius is measured for Trimese cables. In this figure, the cable has a 1-inch (2.54-cm) radius. If the cable is specified to wrap around the arc formed by the circle with the 1-inch radius, the cable is said to have a *1-inch bend radius* .

At any time, the bend radius should not be less than 1.25" and less than 2" bend radius for Trimese cables and should not be less than 2” bend radius for Riser cables or should not exceed the bend established by the strain relief collars.

Figure 4: How a Bend Radius Is Specified



General Cabling Procedures

Observe these procedures as you attach every cable:

- Before you start, determine whether you will route the interconnection cables upward or downward from the fabric card. The direction determines whether you will install the fabric cable turn collar (see) pointing up or down.
- For horizontal cable management, the rear of the line card chassis has a single horizontal cable manager located between the two shelves. The rear of the fabric card chassis has a horizontal cable manager above the top shelf and above and below the bottom shelf. Strap cable bundles to these brackets.

Handle all cables carefully. Fiber-optic cables require special care as follows:

- 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. See *Cisco CRS Carrier Routing System Optical Cleaning Guide* for details.
- 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. Refer to the *Multimodule Horizontal Cabling Plans*chapter for examples of multimodule cabling plans.

Safety Guidelines

The following sections describe safety guidelines:

General Safety Guidelines

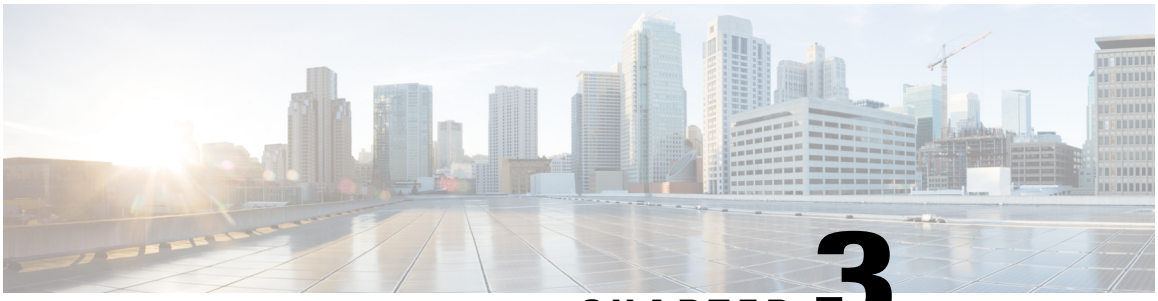
Before you perform any procedure in this document, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.

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

Note Review the *Document Conventions section* and the *Understanding Warning Statement Numbers* sections. In addition, review the safety warnings listed in *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System* before installing, configuring, or troubleshooting any installed card. That booklet shipped with your system.

- 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.



CHAPTER 3

Cabling for System Management, Alarms, and Network Clocking

Cabling for System Management, Alarms, and Network Clocking

The multishelf system supports several options for system management connections, and it provides connections for triggering external alarms and controlling optical cable clocking. A console port connection must be established before the system can be configured and become operational. The optional external alarm and network clocking features can be cabled at any time.

This chapter describes the following cabling options:

Note Although some of the cabling described in this chapter is used to control the router, the control network is a separate cabling component and is described in *Cabling the Control Network Using 22-Port Shelf Controller Gigabit Ethernet Cards* chapter.

Console Port Cabling

The initial configuration of an RP coupled with a 22-port SCGE card takes place through the console port. Although these devices have Ethernet ports, the Ethernet ports cannot be used until they are configured. The 22-port SCGE card in the FCC has a console port, but because the multishelf system is configured on an RP, the console port on the 22-port SCGE card is generally used only for troubleshooting.

To connect to any of the console ports in the multishelf system, use a rollover cable with an RJ-45 connector on the end that connects to the multishelf system component. Typically, the other end of the rollover cable also uses an RJ-45 connector. The other end of the rollover cable may connect to a terminal, computer running terminal emulation software, or terminal server. Adapters are available to connect the RJ-45 connector on the rollover cable to a variety of serial ports. For more information on rollover cables and connectors, see the following web page:

http://www.cisco.com/c/en/us/td/docs/switches/wan/mgx/mgx_8850/software/mgx_r3/rpm/rpm_r1-5/configuration/guide/rpm150/rpmappb.html

For information on connecting to the console port on an RP, see *Cisco IOS XR Getting Started Guide* .

Auxiliary Port Cabling

Auxiliary ports are provided on the RP and SCGE (2-port or 22-port) cards for remote connections through modems. RP auxiliary ports can be used to configure the multishelf system. As with the console port, the SCGE auxiliary port is typically used for troubleshooting.

The typical connection to the auxiliary ports uses a serial cable with RJ-45 connectors at each end. As with the rollover cable, adapters are available to connect the RJ-45 connector at the other end to a variety of serial port types. *Cisco IOS XR Getting Started Guide* provides illustrations that show how RP auxiliary ports are connected through modems to a remote terminal.

Management Ethernet Port Cabling

Each RP provides a Management Ethernet port that can be used to manage the RP through an Ethernet network. This port can also be used to download software to RPs in the multishelf system or transfer files to remote servers for analysis or backup storage.

The typical connection to the Management Ethernet port uses an Ethernet cable with RJ-45 connectors at each end. The other end of the cable typically connects to an Ethernet switch, hub, or router that provides connectivity between the multishelf system and networks from which system management is desired.

For information on connecting to the Management Ethernet port on an RP, see *Cisco IOS XR Getting Started Guide* .

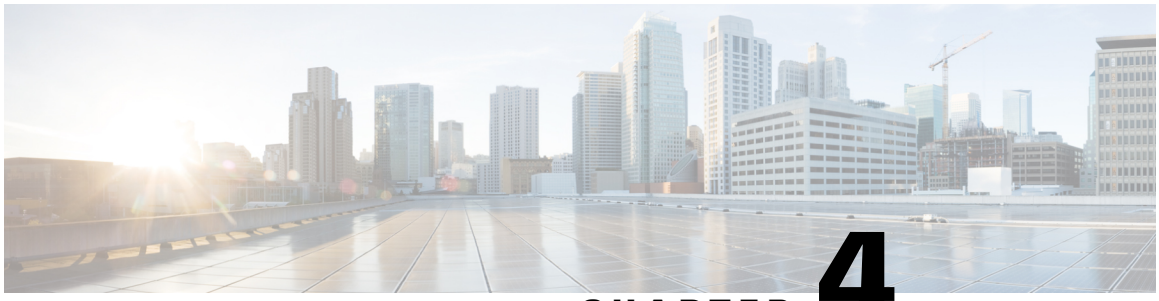
Alarm Module Alarm-Out Cabling

Each AC or DC power shelf in LCCs and FCCs contains an alarm module that monitors the status of the power shelf and provides an external interface for system alarms. The same alarm module is used in all power shelves. For more information on alarm module connections, see the following documents:

- *Cisco CRS Carrier Routing System Multishelf System Description*
- *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description*

What to Do Next

When you have completed the cabling connections described in this chapter, document these connections and forward them to the people who will configure the system. For example, if you have cabled the console port to a terminal server so that people can access the console port from a network, they need the IP address of the terminal server and corresponding port number before they can use the console port.



CHAPTER 4

Cabling the Control Network Using 22-Port Shelf Controller Gigabit Ethernet Cards

Cabling the Control Network Using 22-Port Shelf Controller Gigabit Ethernet Cards

This chapter describes how to connect cables between two 22-port SCGE cards and the other components of a multishelf system. These connections establish control network connectivity for the multishelf system.

Note These procedures are for a new multishelf system installation. If you are converting a Cisco Catalyst-based control network over to a 22-port SCGE card control network, see the Cisco CRS Carrier Routing System Multishelf System Upgrade and Conversion Guide.

Control Network Cabling

This section describes cabling assignments for various multishelf system configurations. The following sub-sections are included:

The multishelf system is connected between LCC and FCC with four paths per LCC (two per each RP connection). Each of the two paths have Gigabit Ethernet (GE) connections (on each RP) that are connected to two connections on each GE (on the 22-port SCGE cards) in the FCCs. The 22-port SCGE card provides the GE path, or control Ethernet network, between all chassis.

Caution A multishelf system will operate with only one 22-port SCGE card installed, but Cisco strongly suggests using two cards for redundancy. If you operate the multishelf system with a single card and that card fails, the multishelf system has no control network connectivity and the router fails.

Note the following connection tips:

- Any GE ports can be used, in any sequence, but we suggest using ports in sequence as a convention to enable easier maintenance.
- SCGE0 is the 22-port SCGE card in the FCC upper card cage. SCGE1 is the 22-port SCGE card in the FCC lower card cage.

Caution Do not remove the plugs from the GE optical bores or the fiber-optic cable until you are ready to connect the cable. The plugs protect the bores and cable from contamination.

Prerequisites

- Before cabling the system, install each line card chassis (LCC) and fabric card chassis (FCC) in the planned location.

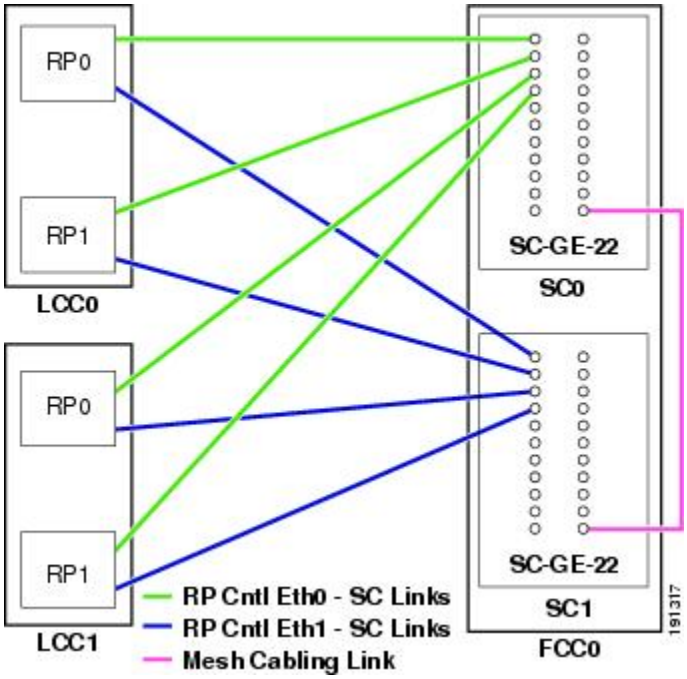
For information on installing the LCCs and FCCs, see the following documents:

- ◦ *Cisco CRS Carrier Routing System Fabric Card Chassis Installation Guide*
  ◦ *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Installation Guide*
- All connections are made using single-mode LC to LC fiber cables.
- Determine the required amount of cabling based on the configuration in use:
  ◦ Single-FCC system requires 9 cables—8 RP to SCGE cables and 1 mesh cable
  ◦ Two-FCC system requires 14 cables—8 RP to SCGE cables and 6 mesh cables
  ◦ Four-FCC system requires 36 cables—8 RP to SCGE cables and 28 mesh cables

Connections for a Single-FCC System

The figure below shows the cabling scheme for a single-FCC system. The table below lists the cabling connections that must be completed between the RPs and the 22-port SCGE cards and Table 4: Mesh Connections (Single-FCC System), on page 25 lists the mesh connection in a single-FCC system.

Figure 5: Connections Within a Single-FCC Multishelf System



Note that, while Figure 3-1 describes a two-LCC multishelf system, up to eight LCCs can be added to a single FCC multishelf system. The same level of expansion is possible in a two- or four-FCC multishelf system even though Figure 3-3 and Figure 3-5 show two LCCs. Table 3-1 and Table 3-3 map out eight LCCs.

Table 3: RP to 22-Port SCGE Card Connections (Single-FCC System)

From Chassis	From RP Port	To 22-Port SCGE Card Number	To 22-Port SCGE Card Port Number
LCC0	RP0, Cntl Eth 0	SC0	GE0
	RP0, Cntl Eth 1	SC1	GE0
	RP1, Cntl Eth 0	SC0	GE1
	RP1, Cntl Eth 1	SC1	GE1

LCC1	RP0, Cntl Eth 0	SC0	GE2
	RP0, Cntl Eth 1	SC1	GE2
	RP1, Cntl Eth 0	SC0	GE3
	RP1, Cntl Eth 1	SC1	GE3
LCC2	RP0, Cntl Eth 0	SC0	GE4
	RP0, Cntl Eth 1	SC1	GE4
	RP1, Cntl Eth 0	SC0	GE5
	RP1, Cntl Eth 1	SC1	GE5
LCC3	RP0, Cntl Eth 0	SC0	GE6
	RP0, Cntl Eth 1	SC1	GE6
	RP1, Cntl Eth 0	SC0	GE7
	RP1, Cntl Eth 1	SC1	GE7
LCC4	RP0, Cntl Eth 0	SC0	GE8
	RP0, Cntl Eth 1	SC1	GE8
	RP1, Cntl Eth 0	SC0	GE9
	RP1, Cntl Eth 1	SC1	GE9
LCC5	RP0, Cntl Eth 0	SC0	GE10
	RP0, Cntl Eth 1	SC1	GE10
	RP1, Cntl Eth 0	SC0	GE11
	RP1, Cntl Eth 1	SC1	GE11
LCC6	RP0, Cntl Eth 0	SC0	GE12
	RP0, Cntl Eth 1	SC1	GE12
	RP1, Cntl Eth 0	SC0	GE13
	RP1, Cntl Eth 1	SC1	GE13

LCC7	RP0, Cntl Eth 0	SC0	GE14
	RP0, Cntl Eth 1	SC1	GE14
	RP1, Cntl Eth 0	SC0	GE15
	RP1, Cntl Eth 1	SC1	GE15

Table 4: Mesh Connections (Single-FCC System)

Originating Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number	Destination Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number
FCC0	SC0	GE21	FCC1	SC1	GE21

Connections for a Two-FCC System

The figure below shows the cabling scheme for a two-FCC system. The below table lists the cabling connections that must be completed between the RPs and the 22-port SCGE cards and Table 6: Mesh Connections (two-FCC System), on page 27 lists the mesh cabling connections in a two-FCC system.

Figure 6: Connections Within a Two-FCC Multishelf System

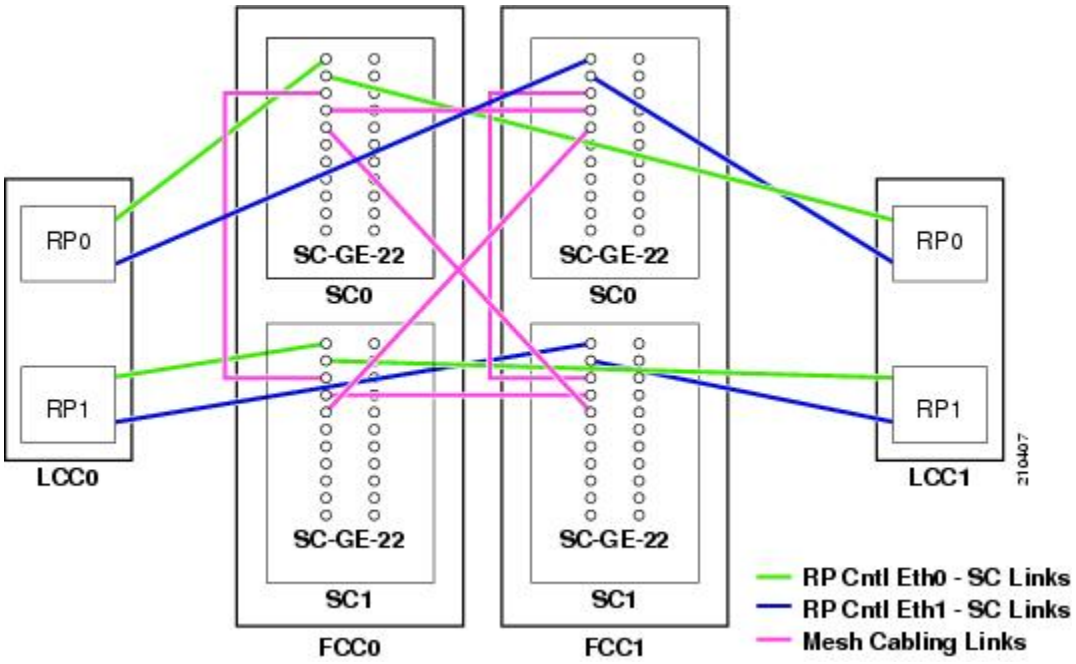


Table 5: RP to 22-Port SCGE Card Connections (Two-FCC System)

From Chassis	From RP Port	FCC	To 22-Port SCGE Card Number	To 22-Port SCGE Card Port Number
LCC0	RP0, Cntl Eth 0	FCC0	SC0	GE0
	RP0, Cntl Eth 1	FCC1	SC0	GE0
	RP1, Cntl Eth 0	FCC0	SC1	GE0
	RP1, Cntl Eth 1	FCC1	SC1	GE0
LCC1	RP0, Cntl Eth 0	FCC0	SC0	GE1
	RP0, Cntl Eth 1	FCC1	SC0	GE1
	RP1, Cntl Eth 0	FCC0	SC1	GE1
	RP1, Cntl Eth 1	FCC1	SC1	GE1
LCC2	RP0, Cntl Eth 0	FCC0	SC0	GE2
	RP0, Cntl Eth 1	FCC1	SC0	GE2
	RP1, Cntl Eth 0	FCC0	SC1	GE2
	RP1, Cntl Eth 1	FCC1	SC1	GE2
LCC3	RP0, Cntl Eth 0	FCC0	SC0	GE3
	RP0, Cntl Eth 1	FCC1	SC0	GE3
	RP1, Cntl Eth 0	FCC0	SC1	GE3
	RP1, Cntl Eth 1	FCC1	SC1	GE3
LCC4	RP0, Cntl Eth 0	FCC0	SC0	GE4
	RP0, Cntl Eth 1	FCC1	SC0	GE4
	RP1, Cntl Eth 0	FCC0	SC1	GE4
	RP1, Cntl Eth 1	FCC1	SC1	GE4

LCC5	RP0, Cntl Eth 0	FCC0	SC0	GE5
	RP0, Cntl Eth 1	FCC1	SC0	GE5
	RP1, Cntl Eth 0	FCC0	SC1	GE5
	RP1, Cntl Eth 1	FCC1	SC1	GE5
LCC6	RP0, Cntl Eth 0	FCC0	SC0	GE6
	RP0, Cntl Eth 1	FCC1	SC0	GE6
	RP1, Cntl Eth 0	FCC0	SC1	GE6
	RP1, Cntl Eth 1	FCC1	SC1	GE6
LCC7	RP0, Cntl Eth 0	FCC0	SC0	GE7
	RP0, Cntl Eth 1	FCC1	SC0	GE7
	RP1, Cntl Eth 0	FCC0	SC1	GE7
	RP1, Cntl Eth 1	FCC1	SC1	GE7

Table 6: Mesh Connections (two-FCC System)

Originating Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number	Destination Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number
FCC0	SC0	GE19	FCC0	SC1	GE19
FCC1	SC0	GE19	FCC1	SC1	GE19
FCC0	SC0	GE20	FCC1	SC0	GE20
FCC0	SC1	GE20	FCC1	SC1	GE20
FCC0	SC0	GE21	FCC1	SC1	GE21
FCC0	SC1	GE21	FCC1	SC0	GE21

Connections for a Four-FCC System

The figure below shows the cabling scheme for a four-FCC system, but unlike Table 3: RP to 22-Port SCGE Card Connections (Single-FCC System) , on page 23 and Table 4: Mesh Connections (Single-FCC System), on page 25, does not show the mesh cabling connections in a four-FCC system. Refer to Mesh Cabling (Four-FCC System), on page 30, cabling connections in a four-FCC system. The table below lists the cabling

connections that must be completed between the RPs and the 22-port SCGE cards. Table 8: Mesh Connections (Four-FCC System) , on page 30 lists the mesh cabling connections in a four-FCC system.

Figure 7: Connections Within a Four-FCC Multishelf System

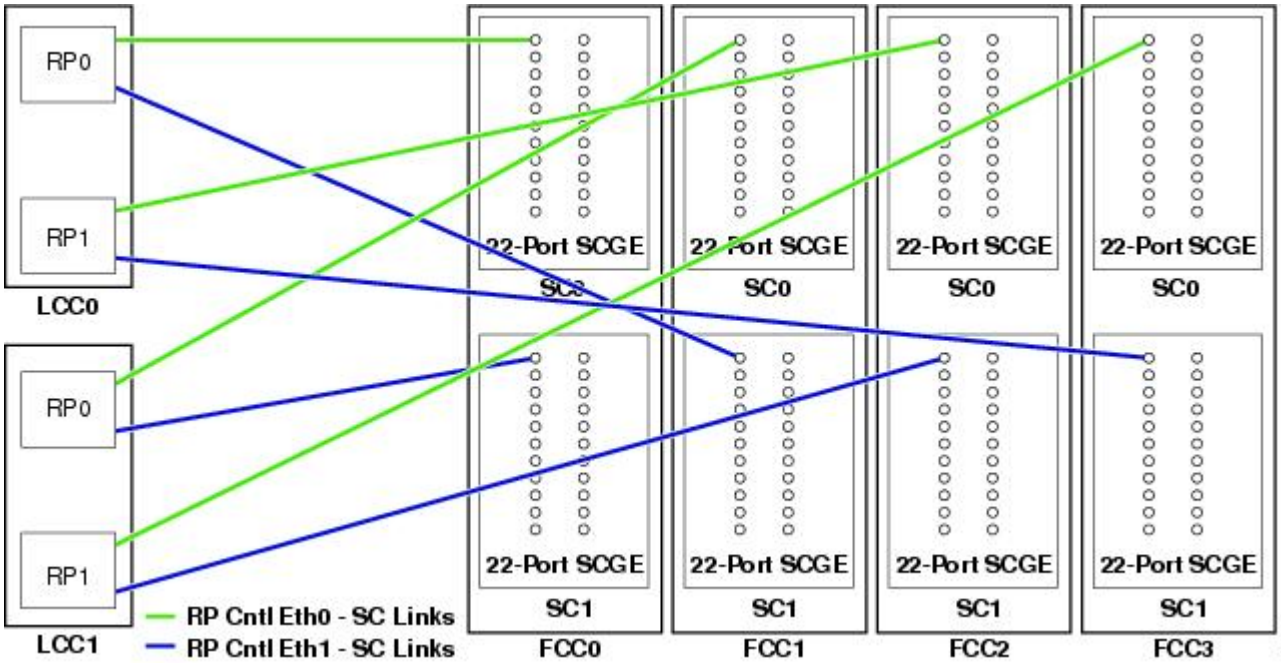


Table 7: RP to 22-Port SCGE Card Connections (Four-FCC System)

From Chassis	From RP Port	FCC	To 22-Port SCGE Card Number	To 22-Port SCGE Card Port Number
LCC0	RP0, Cntl Eth 0	FCC0	SC0	GE0
	RP0, Cntl Eth 1	FCC1	SC1	GE0
	RP1, Cntl Eth 0	FCC2	SC0	GE0
	RP1, Cntl Eth 1	FCC3	SC1	GE0
LCC1	RP0, Cntl Eth 0	FCC1	SC0	GE0
	RP0, Cntl Eth 1	FCC0	SC1	GE0
	RP1, Cntl Eth 0	FCC3	SC0	GE0
	RP1, Cntl Eth 1	FCC2	SC1	GE0

LCC2	RP0, Cntl Eth 0	FCC0	SC0	GE1
	RP0, Cntl Eth 1	FCC1	SC1	GE1
	RP1, Cntl Eth 0	FCC2	SC0	GE1
	RP1, Cntl Eth 1	FCC3	SC1	GE1
LCC3	RP0, Cntl Eth 0	FCC1	SC0	GE1
	RP0, Cntl Eth 1	FCC0	SC1	GE1
	RP1, Cntl Eth 0	FCC3	SC0	GE1
	RP1, Cntl Eth 1	FCC2	SC1	GE1
LCC4	RP0, Cntl Eth 0	FCC0	SC0	GE2
	RP0, Cntl Eth 1	FCC1	SC1	GE2
	RP1, Cntl Eth 0	FCC2	SC0	GE2
	RP1, Cntl Eth 1	FCC3	SC1	GE2
LCC5	RP0, Cntl Eth 0	FCC1	SC0	GE2
	RP0, Cntl Eth 1	FCC0	SC1	GE2
	RP1, Cntl Eth 0	FCC3	SC0	GE2
	RP1, Cntl Eth 1	FCC2	SC1	GE2
LCC6	RP0, Cntl Eth 0	FCC0	SC0	GE3
	RP0, Cntl Eth 1	FCC1	SC1	GE3
	RP1, Cntl Eth 0	FCC2	SC0	GE3
	RP1, Cntl Eth 1	FCC3	SC1	GE3
LCC7	RP0, Cntl Eth 0	FCC1	SC0	GE3
	RP0, Cntl Eth 1	FCC0	SC1	GE3
	RP1, Cntl Eth 0	FCC3	SC0	GE3
	RP1, Cntl Eth 1	FCC2	SC1	GE3

Mesh Cabling (Four-FCC System)

To complete the cabling of a four-FCC system, all of the 22-port SCGE cards in the FCCs must be connected to each other in a full mesh configuration. This provides a great amount of redundancy, so in the event that one of the nodes fails, network traffic is directed to any of the other nodes. The figure below shows a graphical view of the full mesh configuration.

Figure 8: Mesh Cabling Diagram (Four-FCC System)

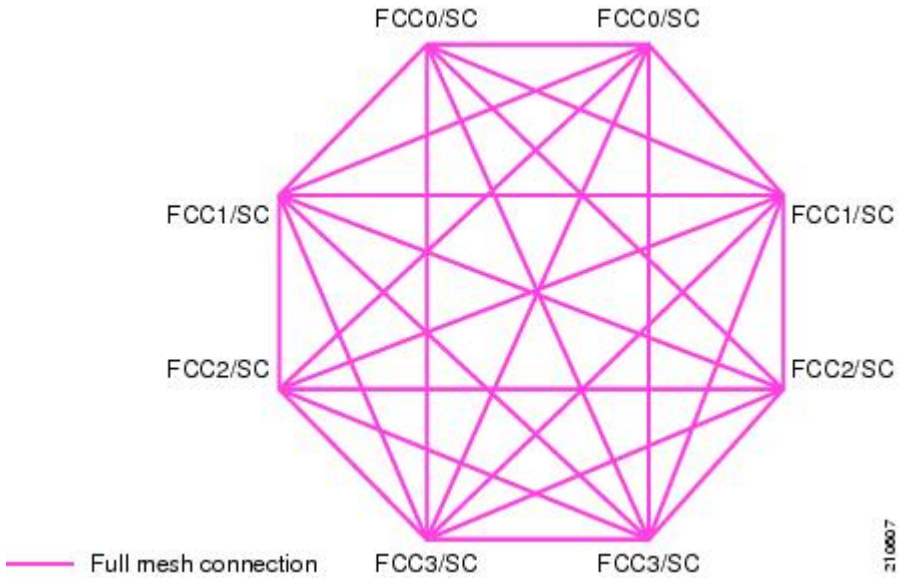


Table 8: Mesh Connections (Four-FCC System)

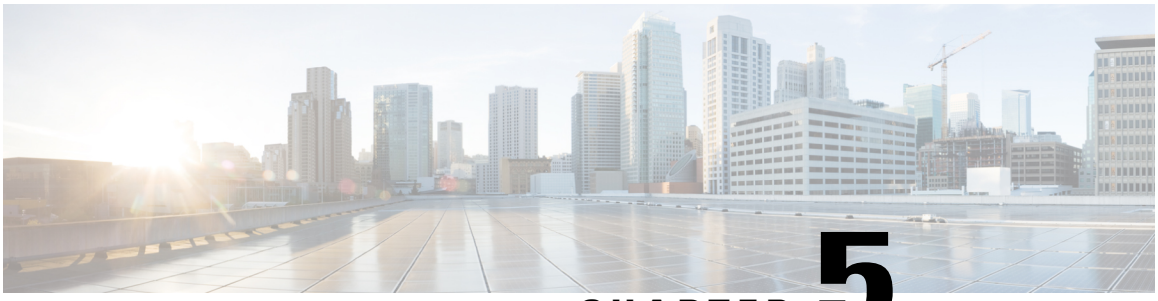
Originating Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number	Destination Chassis	22-Port SCGE Card Number	22-Port SCGE Card Port Number
FCC0	SC0	GE21	FCC0	SC1	GE21
	SC0	GE15	FCC1	SC0	GE15
	SC0	GE16	FCC1	SC1	GE15
	SC0	GE17	FCC2	SC0	GE15
	SC0	GE18	FCC2	SC1	GE15
	SC0	GE19	FCC3	SC0	GE15
	SC0	GE20	FCC3	SC1	GE15

FCC0	SC1	GE15	FCC1	SC0	GE16
	SC1	GE16	FCC1	SC1	GE16
	SC1	GE17	FCC2	SC0	GE16
	SC1	GE18	FCC2	SC1	GE16
	SC1	GE19	FCC3	SC0	GE16
	SC1	GE20	FCC3	SC1	GE16
FCC1	SC0	GE21	FCC1	SC1	GE21
	SC0	GE17	FCC2	SC0	GE17
	SC0	GE18	FCC2	SC1	GE17
	SC0	GE19	FCC3	SC0	GE17
	SC0	GE20	FCC3	SC1	GE17
FCC1	SC1	GE17	FCC2	SC0	GE18
	SC1	GE18	FCC2	SC1	GE18
	SC1	GE19	FCC3	SC0	GE18
	SC1	GE20	FCC3	SC1	GE18
FCC2	SC0	GE21	FCC2	SC1	GE21
	SC0	GE19	FCC3	SC0	GE19
	SC0	GE20	FCC3	SC1	GE19
FCC2	SC1	GE19	FCC3	SC0	GE20
	SC1	GE20	FCC3	SC1	GE20
FCC3	SC0	GE21	FCC3	SC1	GE21

What to Do Next

After you cable the control network, configure the 22-port SCGE cards, as described in *Cisco IOS XR Getting Started Guide* . The control network must be brought up to enable communications between the racks and to support software downloads from the DSC rack to the other racks.

The final step in cabling the multishelf system is to cable the system fabric, as described in *Cabling the Fabric* chapter.



CHAPTER 5

Cabling the Fabric

Cabling the Fabric

The cables used to interconnect the multishelf system chassis are optical array cables called fabric cables. This chapter describes how to physically cable the fabric planes between each line card chassis (LCC) and fabric card chassis (FCC) in a multishelf system and card placement for high availability. This chapter is organized into the following sections:

Note This procedure is for a *first-time* installation of the multishelf system. If you are upgrading a Cisco CRS 16-Slot Line Card Chassis that is carrying live traffic, see Cisco CRS Carrier Routing System Multishelf System Upgrade and Conversion Guide for details.

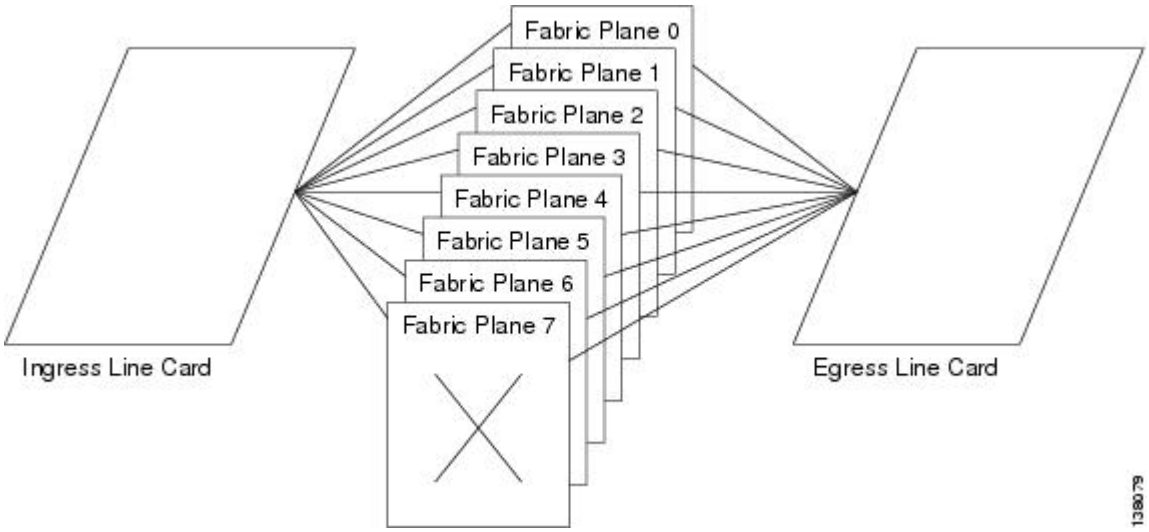
About Fabric Cabling

The multishelf fabric cabling requires 24 fiber fabric cables per LCC. This cabling enables interchassis communication, which is accomplished using fiber-optic bundles. This section describes the following topics:

About Fabric Planes in the Multishelf System

The multishelf system has eight fabric planes that support data traffic between the lines connected to the LCCs. The figure below shows a simplified view of the relationship between the line cards and the fabric.

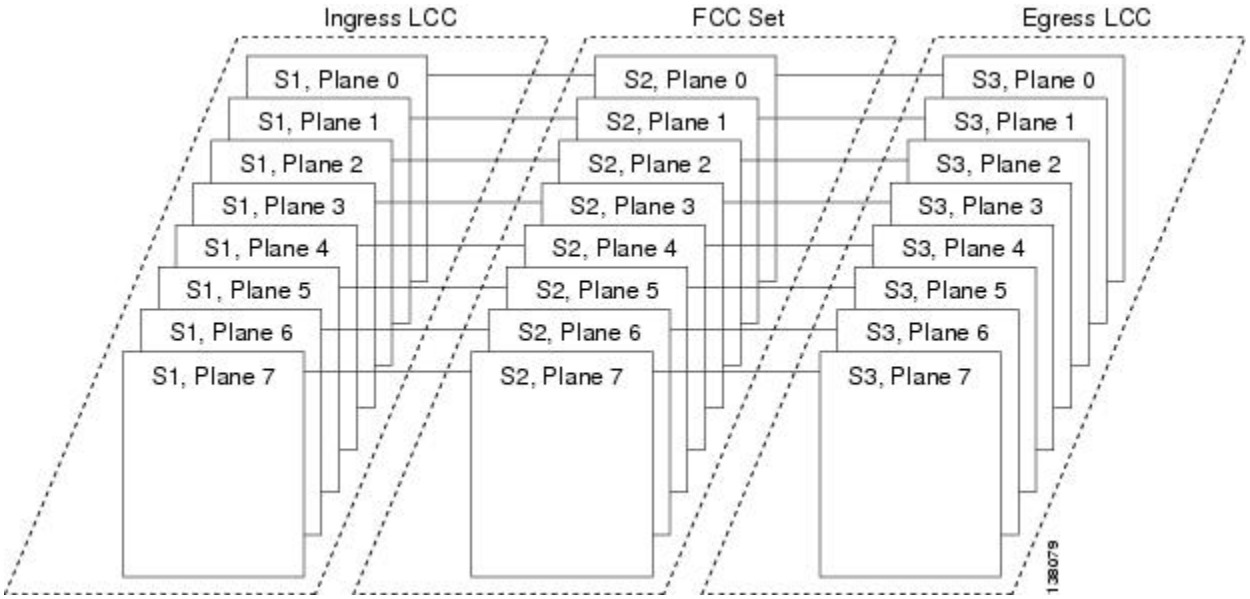
Figure 9: Relationship of Line Cards and Fabric Cards



Each fabric plane is divided into three components or stages, which are numbered S1, S2, and S3. Data arrives at the S1 stage in an LCC, passes over the fabric cables to the S2 stage in an FCC, and then passes over the fabric cables again to the S3 stage in the destination LCC. The figure below shows a simplified view of the relationship between the line cards and the fabric. Refer to Figure 14: Cisco CRS Multishelf System with Vertical Fabric Plane Interconnections (Trimese Cable only), on page 43 and Figure 15: Cisco CRS Multishelf

System with Horizontal Fabric Plane Interconnections, on page 45 for physical vertical and horizontal cabling examples.

Figure 10: Fabric Plane Stages



In each LCC, eight S13 fabric cards provide stages S1 and S3 for each of the eight fabric planes. All ingress traffic enters through the S1 component of the ingress S13 card, travels over the fabric cables and S2 fabric component, and exits through the S3 component on an S13 fabric card. Data traffic can enter through the S1 component of one card, pass through the S2 component, and then exit the S3 component of the same card.

The S2 cards are distributed between one, two, or four FCCs. The S2 cards for all fabric planes can be installed in a single FCC, but distributing the planes between FCCs prevents a failure in one FCC from disrupting traffic in all eight planes.

Figure 12: How Adapters Are Numbered on OIMs (J0 Through J8) for Vertical Cabling, on page 36 the location of the S13 fabric cards in the LCC and how the connectors are labeled on those cards. The fabric planes are numbered 0 through 7 and are installed in slot numbers SM 0 through SM 7, respectively. Each fabric card has three connectors, which are labeled A0, A1, and A2. Each fabric cable connects to all three S13 card connectors and to one or more S2 cards in an FCC.

The figure below shows eight S2 cards installed in an FCC and how the connectors are labeled on those cards. Unlike the fabric planes in an LCC, the FCC slots are not preconfigured for specific plane numbers. The plane

number served by a slot is defined during system configuration. This approach provides the flexibility to distribute the fabric planes between FCCs and distribute the planes in different power zones within an FCC.

Figure 11: How Adapters Are Numbered on S13 Cards (A0 Through A2)

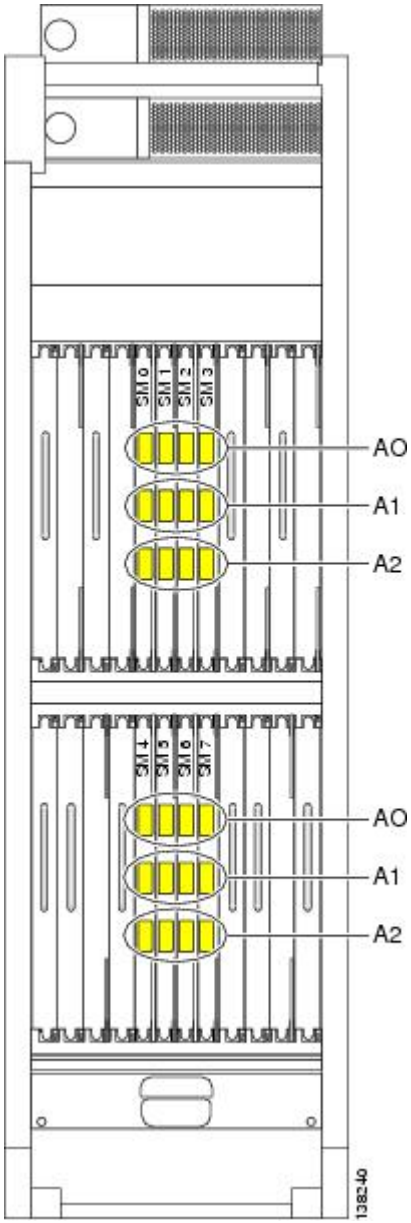
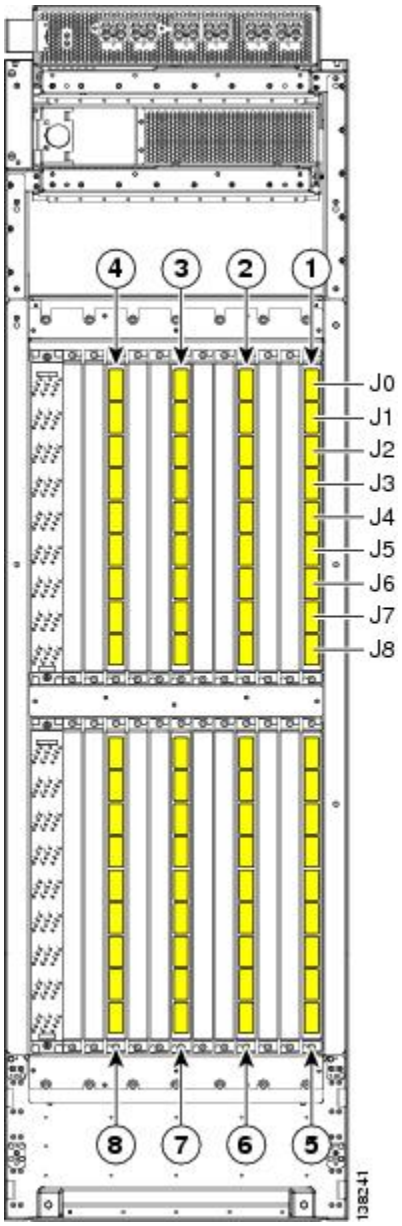
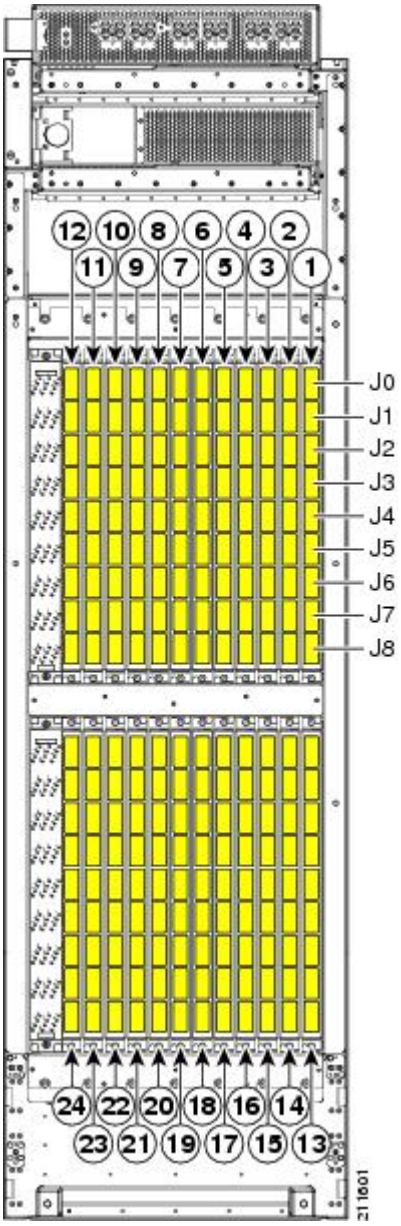


Figure 12: How Adapters Are Numbered on OIMs (J0 Through J8) for Vertical Cabling



1	OIM in slot FM 0	5	OIM in slot FM 12
2	OIM in slot FM 3	6	OIM in slot FM 15
3	OIM in slot FM 6	7	OIM in slot FM 18
4	OIM in slot FM 9	8	OIM in slot FM 21

Figure 13: How Adapters Are Numbered on OIMs (J0 Through J8) for Horizontal Cabling



1	OIM in slot FM 0	9	OIM in slot FM 8	17	OIM in slot FM 16
2	OIM in slot FM 1	10	OIM in slot FM 9	18	OIM in slot FM 17

3	OIM in slot FM 2	11	OIM in slot FM 10	19	OIM in slot FM 18
4	OIM in slot FM 3	12	OIM in slot FM 11	20	OIM in slot FM 19
5	OIM in slot FM 4	13	OIM in slot FM 12	21	OIM in slot FM 20
6	OIM in slot FM 5	14	OIM in slot FM 13	22	OIM in slot FM 21
7	OIM in slot FM 6	15	OIM in slot FM 14	23	OIM in slot FM 22
8	OIM in slot FM 7	16	OIM in slot FM 15	24	OIM in slot FM 23

Cisco Systems Fabric Cables

The table below lists the product ID numbers for Cisco CRS fabric cables. The cables listed in the below table can be ordered. The interconnection cables listed are shipped as a set of 24 in the meter length specified. Evaluate your installation for the appropriate length of fabric cable needed before ordering. You should try to avoid long runs of coiled cables.

In the table below, the cable name *LCC/M-FC-FBR-XX* means the following:

- *LCC/M* is “Line Card Chassis/Multishelf System.”
- *FC* is Fabric (Card) Chassis.
- *FBR* is Fiber.
- *xx* is the length of the cable in meters.

Note The = symbol at the end of a product ID number indicates that the part is a *spare* , which means the part can be ordered.

Note The R symbol at the end of a product ID number indicates that the part is a riser rated fiber cable.

Table 9: Fabric Cables for the Cisco CRS Multishelf System

Fabric Cable Product ID	Description and Length
LCC/M-FC-FBR-10=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 10 meters (32.8 feet)

LCC/M-FC-FBR-15=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 15 meters (49.2 feet)
LCC/M-FC-FBR-20=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 20 meters (65.6 feet)
LCC/M-FC-FBR-25=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 25 meters (82 feet)
LCC/M-FC-FBR-30=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 30 meters (98.43)
LCC/M-FC-FBR-40=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 40 meters (131.2 feet)
LCC/M-FC-FBR-50=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 50 meters (164 feet)
LCC/M-FC-FBR-60=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 60 meters (197 feet)
LCC/M-FC-FBR-70=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 70 meters (229.7)
LCC/M-FC-FBR-80=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 80 meters (262.5 feet)
LCC/M-FC-FBR-90=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 90 meters (295.3feet)
LCC/M-FC-FBR-100=	Cisco CRS Line Card Chassis-Fabric Chassis Fiber 100 meters (328 feet)
LCC/M-FC-FBR-10R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 10 meters (32.8 feet)
LCC/M-FC-FBR-15R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 15 meters (49.2 feet)
LCC/M-FC-FBR-20R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 20 meters (65.6)
LCC/M-FC-FBR-25R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 25 meters (82 feet)
LCC/M-FC-FBR-30R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 30 meters (98.43 feet)
LCC/M-FC-FBR-40R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 40 meters (131.2 feet)

LCC/M-FC-FBR-50R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 50 meters (164 feet)
LCC/M-FC-FBR-60R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 60 meters (197 feet)
LCC/M-FC-FBR-70R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 70 meters (229.7)
LCC/M-FC-FBR-80R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 80 meters (262.5 feet)
LCC/M-FC-FBR-90R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 90 meters (295.3 feet)
LCC/M-FC-FBR-100R=	Cisco CRS Line Card Chassis-Fabric Chassis Riser 100 meters (328 feet)

Planning Fabric Cabling

There are several components to planning the fabric cabling:

Planning S2 Fabric Card Placement and Cable Connections

The following sections describe and illustrate what you need to know to plan the S2 fabric card placement and fabric cable connections:

Rules for Fabric Connectivity

The following rules and characteristics define the requirements for positioning S2 optical interface modules (OIMs) in the multishelf system and connecting them to the S13 cards in the LCCs.

- Each S2 fabric card can support only one plane. For vertical cabling, eight S2 fabric cards are required. For horizontal cabling, 24 S2 fabric cards are required.
- If a multishelf system uses more than one FCC, the S2 fabric cards should be equally distributed among the FCCs.
- The FCC power distribution system divides the 24 S2 fabric card slots into several power zones. In certain multiple-failure scenarios, all the cards in one zone could lose power. For a multishelf system to operate, one odd-numbered plane and one even-numbered plane must be active. For maximum fault tolerance, S2 fabric cards should be distributed among power zones so that the loss of one zone does not disable all odd-numbered or all even-numbered fabric planes. The power zones are described in the following documents:
  - *Cisco CRS Carrier Routing System Multishelf System Description*
  - *Cisco CRS Carrier Routing System 16-Slot Line Card Chassis System Description*

- At the LCC end of a fabric cable, the plane number is determined by the slot to which the cable is connected. The other end of each fabric cable must connect to an FCC S2 fabric card designated for the same plane number.
- For vertical cabling, when connecting fabric cables for an LCC to an S2 fabric card, the three cable connectors for each plane should connect to the same ports on every S2 card. For example, the connectors for Rack 0 connect to connectors J0 through J2 on the S2 cards for all planes.
- For horizontal cabling, when connecting fabric cables for an LCC to a series of S2 fabric cards, the three cable connectors for each plane should connect to the same port on each S2 card. For example, the connectors for Rack 0 connect to connector J0 on each S2 card for all planes.
- The connector sequence on the S13 cards must match the connector sequence on the S2 cards. Rack 1 connectors connect to S2 connectors J3 through J5, S13 card connector A0 must connect to S2 connector J3, S13 card connector A1 must connect to S2 connector J4, and S13 card connector A2 must connect to S2 connector J5. [refer to vertical and horizontal cabling plans]
- A single-FCC system stops if the FCC fails, but a two- or four-FCC system can operate as long as one of the FCCs is operational. [not redundant - degraded operation - refer to *Cisco CRS Carrier Routing System Multishelf System Description*]

The fabric cabling plans in the chapter *Vertical Cabling Plans* conform to these rules.

Chassis Cable Routing

After you have determined the placement of the S2 cards and the cable connections, it is time to plan the cable routing.

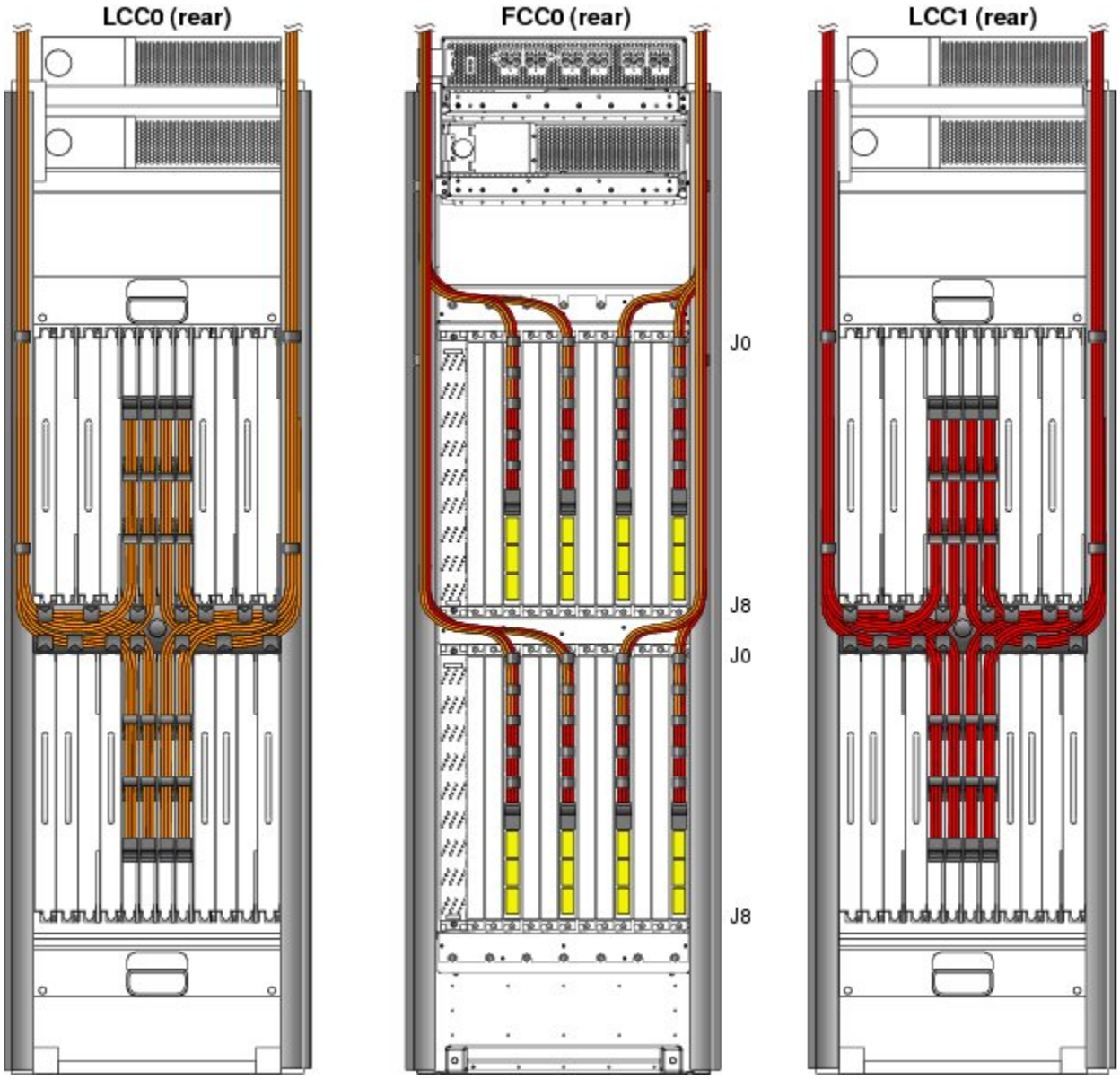
Plan your cabling runs as suggested in Cisco CRS Carrier Routing System Multishelf System Site Planning Guide. For example, it is convenient when cables are planned, labeled, and hung from overhead cable troughs so that the end of the cable is almost touching the floor. Allow more or less slack as cables are connected. Allow about 0.9 meters (3 feet) of additional cable length for fabric card chassis cable routing.

The figure below shows a vertical cabling routing plan for a single-FCC multishelf system. Before you begin cabling, develop a cabling plan for your multishelf system. The example in the figure below routes cables upward to a monorail system and conforms to the following guidelines:

- In the top shelf of the line card chassis, cables are routed downward, toward the side of the chassis, then up and out of the vertical troughs.
- In the bottom shelf of the line card chassis, cables are routed upward, toward the side of the chassis, then up and out of the vertical troughs.
- In the top shelf of the fabric card chassis, cables are routed upward, toward the sides, then up and out the vertical troughs.
- In the bottom shelf of the fabric card chassis, for Vertical Cabling, cables are routed upward, towards the side, then up and out the vertical troughs. Note that for Horizontal Cabling the upper half of the bottom shelf routes upward and the bottom half routes downward.
- When routing riser cables or horizontal cabling, cables need to route outside of the vertical troughs. Figure *Cables passing through Cut-Out Slots* shows the openings in the side of the vertical troughs

where riser cables can pass through. Remove the blank plates and replace with the cable pass through accessory plates.

Figure 14: Cisco CRS Multishelf System with Vertical Fabric Plane Interconnections (Trimese Cable only)



When preparing to cable the multishelf system, consider the following information:

- For the recommended plan for a single-FCC system, cable planes in this order: 1, 0, 3, 2, 5, 4, 7, 6. This sequence simplifies turn collar installation and cable maintenance because space is tight on the S13 fabric cards (SM slots).
- You can connect the planes in any order. For example, you can start connecting plane 7 to plane 7 first.
- The bend radius of each fabric cable should be no smaller than the arc of the turn collar support.

- Adding new connections later will be easier if the open slots are on the outside of the shelf, so we recommend cabling from the interior out.
- Always put the turn collar on the fabric cable *before* inserting the cable connector into the OIM connector, as described in the *Installing Turning Collars* section .
- When you install a fabric cable connector into a OIM card connector, hand-tighten the screws. After you have installed all the fabric cable connectors that go on a OIM card, bundle the cables gently, in sequence, using the Velcro tie wrap on each turn collar. Use additional Velcro tie wraps as needed to route the cables around the support brackets and up the vertical troughs, as shown in the above figure.
- Fabric cables have dust covers, held on by two screws. Fabric card connectors have yellow dust covers that snap on and off. When you take dust covers off, do not put them where they can collect dust. Store unused dust covers in a clean, dust-free area.
- Velcro tie wraps arrive installed in the vertical troughs. Support brackets have slots that allow Velcro tie wraps to attach the cables to the bracket. The figure *Closeup of Riser Cables Attached to Ports A0, A1, and A2 on an S13 Card in a Line Card Chassis* shows the Velcro straps on an S13 card.

- The figure below shows horizontal cabling routing for a single-FCC two LCC multishelf system. Refer to the *Multimodule Horizontal Cabling Plans* chapter.

Figure 15: Cisco CRS Multishelf System with Horizontal Fabric Plane Interconnections

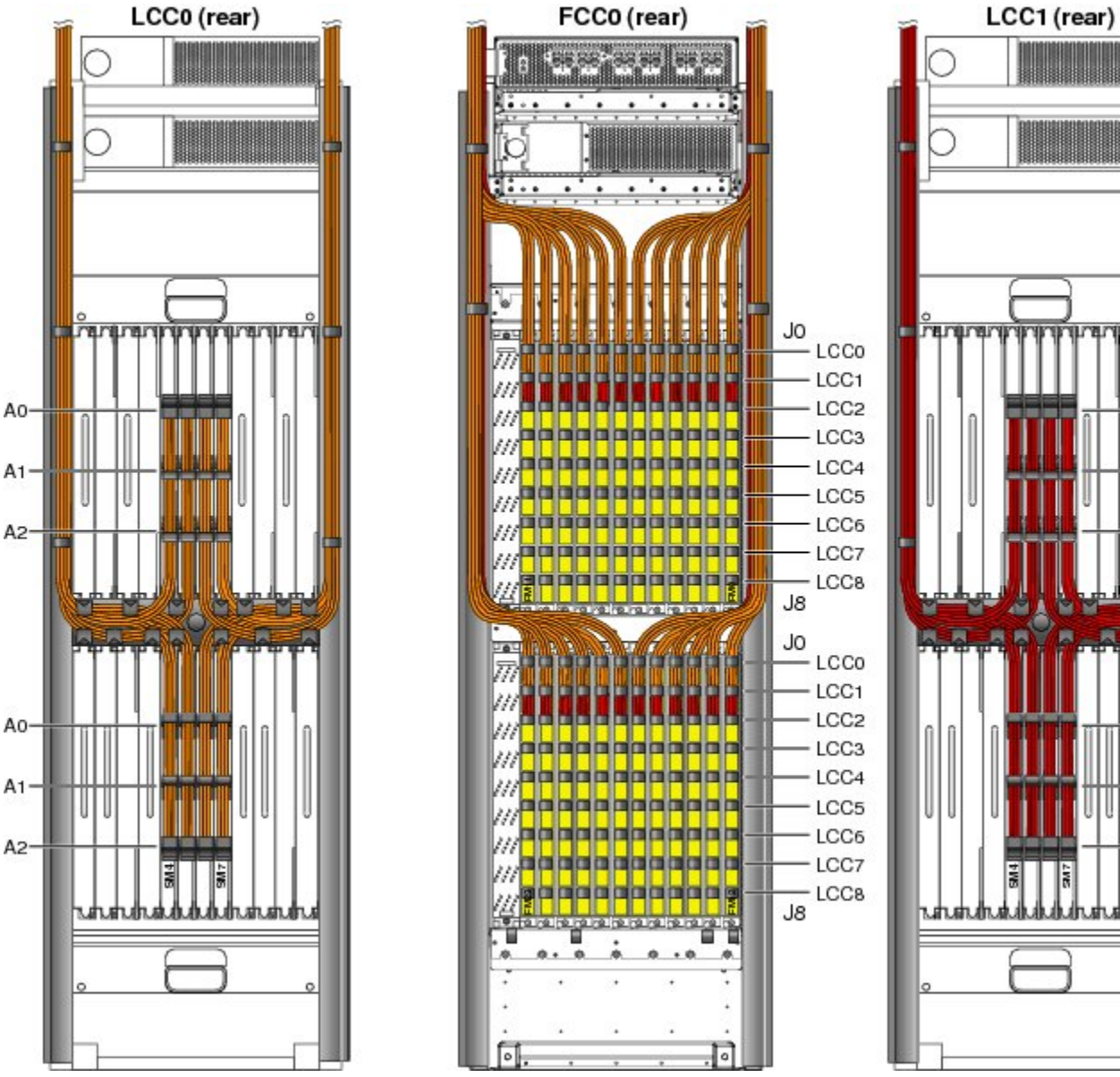


Figure 16: Cables passing through Cut-Out Slots

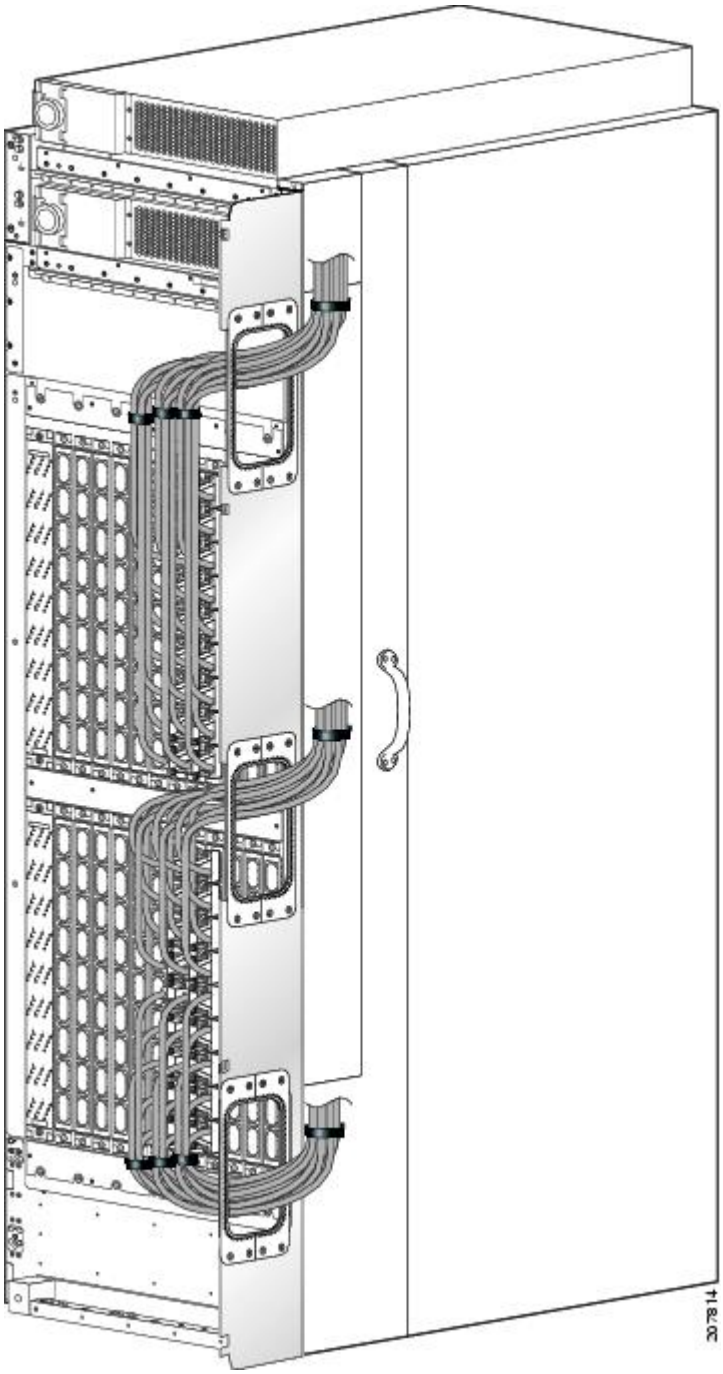


Figure 17: Closeup of Fabric Cables Attached to Ports A0, A1, and A2 on an S13 Card in a Line Card Chassis

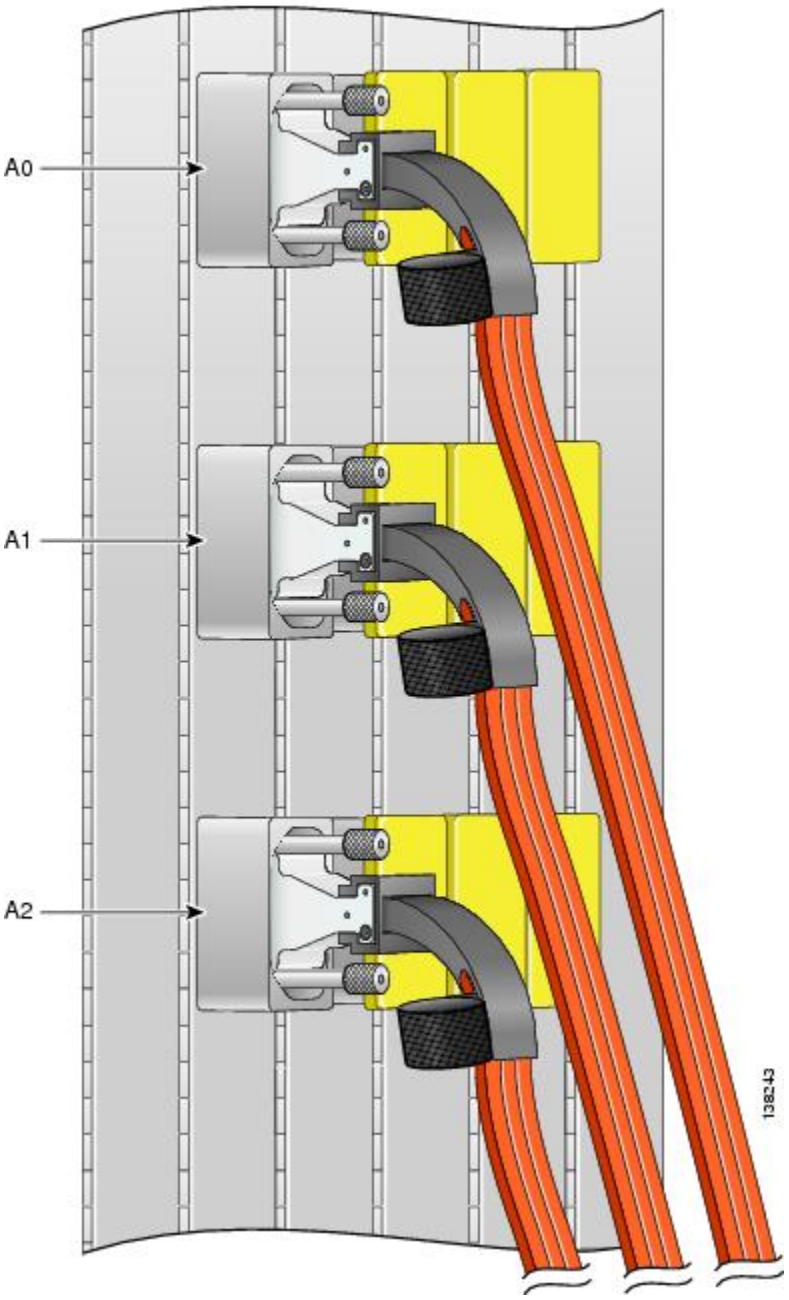
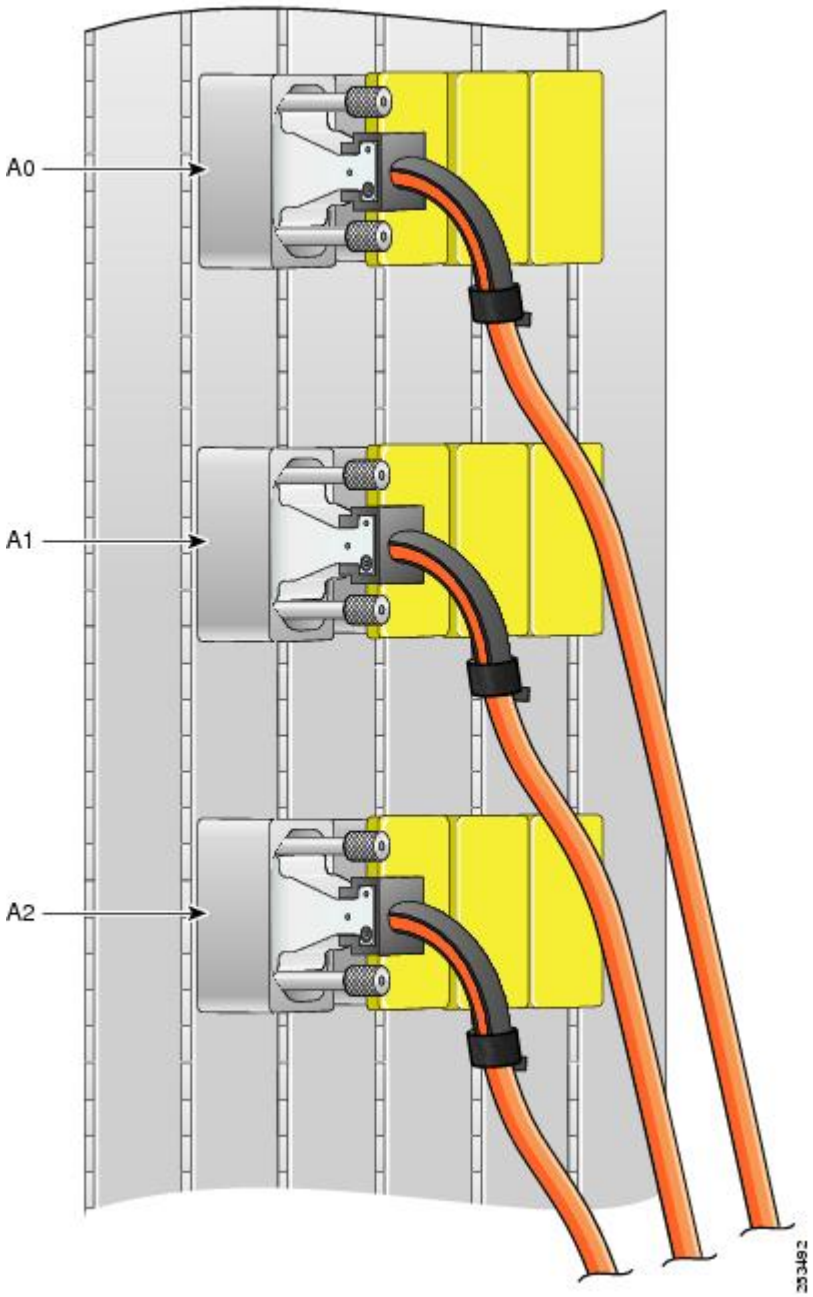


Figure 18: Closeup of Riser Cables Attached to Ports A0, A1, and A2 on an S13 Card in a Line Card Chassis



Planning Cable Labels

Label cables as you unpack them. With a felt-tip pen, mark cables as *1, 2, 3* , and so on. Create a consistent labeling scheme. This section suggests a labeling scheme.

Use a label size that works best at your installation. Each label should contain the *from* and *to* port location at which either end of the cable is attached. For example, a label could contain the following information:

From:

Bay [row number (for example, a FIC code)]

Rack #

Slot #/Port #

To:

Bay [row number (for example, a FIC code)]

Rack #

Slot #/Port #

where:

- *Bay* is a row number (for example, a FIC code) or whatever term is appropriate for your site layout.
- *Rack #* is the rack number for the LCC or FCC.
- *Slot #/Port #* are slot and port numbers (for example, FM3/A0, which means slot FM3, connector A0). To further explain:
  - FM0 through FM23 are slot numbers because there are 24 slots that are numbered 0 through 23
  - A0 through A2 match fabric card port numbers on the S13 card in the line card chassis
  - J0 through J7 match fabric card port numbers on the OIM in the fabric card chassis

Thus, a label on the Figure 17: Closeup of Fabric Cables Attached to Ports A0, A1, and A2 on an S13 Card in a Line Card Chassis, on page 46 might be as shown:

From:

FIC 060184.03 (this means 6th floor, line up 184, bay number 3)

FCC 0

FM14/J5 (this means slot FM 14, port J5)

To:

FIC 060184.05 (this means 6th floor, line up 184, bay number 5)

LCC 5

SM4/A2 (this means slot SM 4, port A2)

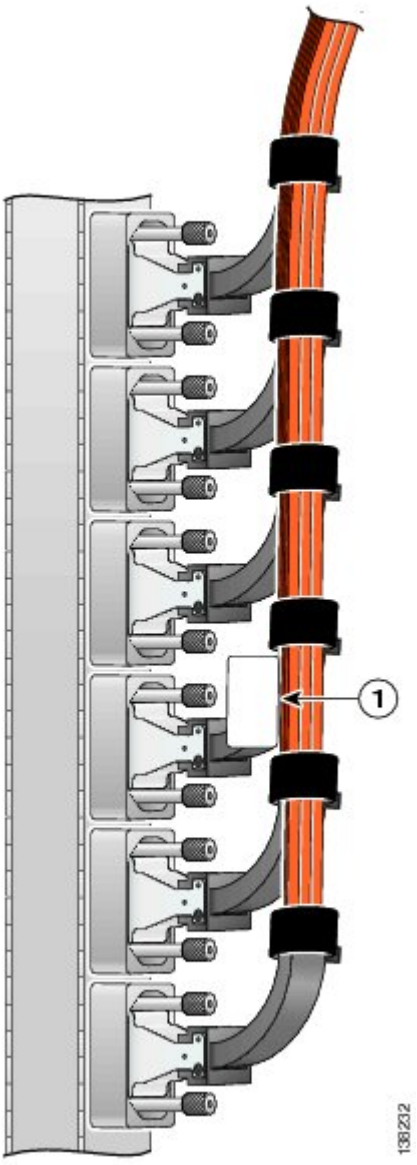
Label Schema Example

We suggest that you use a labeling schema, for example, with an Excel spreadsheet. The sample label schema shown in the table below uses the following conventions:

- Each cable should have a minimum of two labels, one label for each end.
- The upper part of the label describes the end at which the label is attached; the lower part describes the other end of the cable.
- Left side or right side refers to the side of the chassis the cable enters the chassis.
- The port number is *rack_name* /*slot_name* /*port_name* .
- The directions in italics are to assist proper placement of the label; they are not part of the label.

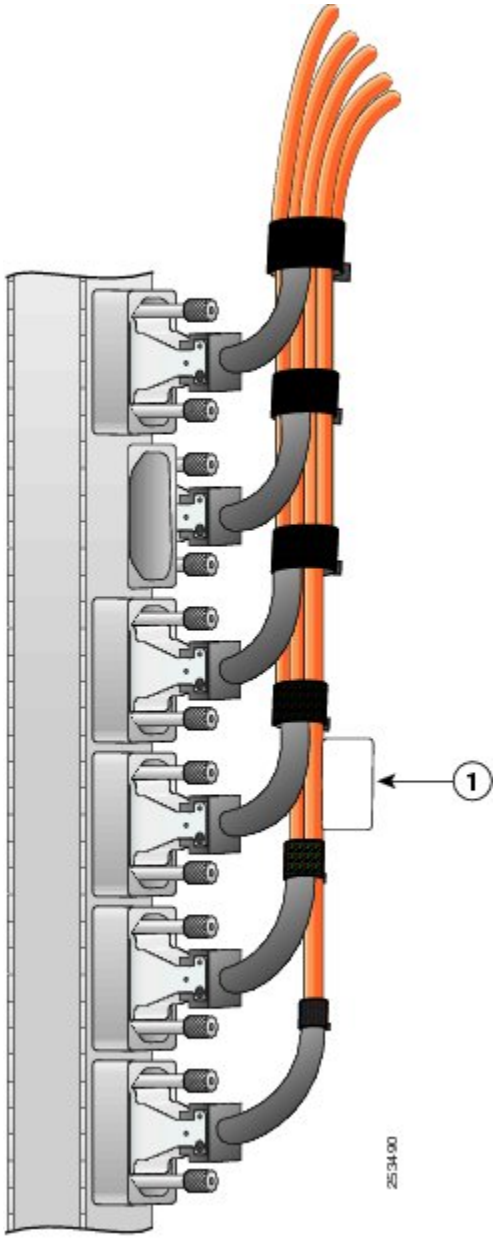
- Do not apply the label within 2.5 inches (6.4 cm) from the point at which the cable meets the connector, or the label will be covered by the turn collar. In addition, if the label is farther than 3.5 inches (8.9 cm) from the point at which the cable meets the connector, it might be obscured by the collar of an adjacent cable when installed. Sample label placement is shown in the figure below and Figure 19: Example of Where to Label a Fabric Cable, on page 50. A turn collar is shown in Figure 23: Turn Collar - Fabric Cable, on page 61.

Figure 19: Example of Where to Label a Fabric Cable



1	Sample label placement

Figure 20: Example of Where to Label a Riser Cable



1	Sample label placement

Table 10: Sample Labeling Schema for Fabric Cables

Plane / Label	**Label**	**Label**	**Label**	**Label**	**Label**	**Plane and LCC or FCC End**
Plane number 0						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 0–LC end
Left side	Left side	Left side	Left side	Left side	Left side	
0/SM0/A0	0/SM0/A1	0/SM0/A2	1/SM0/A0	1/SM0/A1	1/SM0/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM10/J0	F0/OIM10/J1	F0/OIM10/J2	F0/OIM10/J3	F0/OIM10/J4	F0/OIM10/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns down	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 0–FC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
F0/OIM10/J0	F0/OIM10/J1	F0/OIM10/J2	F0/OIM10/J3	F0/OIM10/J4	F0/OIM10/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM0/A0	0/SM0/A1	0/SM0/A2	1/SM0/A0	1/SM0/A1	1/SM0/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 1						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 1–LC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
0/SM1/A0	0/SM1/A1	0/SM1/A2	1/SM1/A0	1/SM1/A1	1/SM1/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM7/J0	F0/OIM7/J1	F0/OIM7/J2	F0/OIM7/J3	F0/OIM7/J4	F0/OIM7/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	

Cable turns down	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 1–FC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
F0/OIM7/J0	F0/OIM7/J1	F0/OIM7/J2	F0/OIM7/J3	F0/OIM7/J4	F0/OIM7/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM1/A0	0/SM1/A1	0/SM1/A2	1/SM1/A0	1/SM1/A1	1/SM1/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 2						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 2–LC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
0/SM2/A0	0/SM2/A1	0/SM2/A2	1/SM2/A0	1/SM2/A1	1/SM2/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM4/J0	F0/OIM4/J1	F0/OIM4/J2	F0/OIM4/J3	F0/OIM4/J4	F0/OIM4/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns down	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 2–FC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
F0/OIM4/J0	F0/OIM4/J1	F0/OIM4/J2	F0/OIM4/J3	F0/OIM4/J4	F0/OIM4/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM2/A0	0/SM2/A1	0/SM2/A2	1/SM2/A0	1/SM2/A1	1/SM2/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 3						

Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 3–LC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
0/SM3/A0	0/SM3/A1	0/SM3/A2	1/SM3/A0	1/SM3/A1	1/SM3/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM1/J0	F0/OIM1/J1	F0/OIM1/J2	F0/OIM1/J3	F0/OIM1/J4	F0/OIM1/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns down	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	*Cable turns down*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 3–FC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
F0/OIM1/J0	F0/OIM1/J1	F0/OIM1/J2	F0/OIM1/J3	F0/OIM1/J4	F0/OIM1/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM3/A0	0/SM3/A1	0/SM3/A2	1/SM3/A0	1/SM3/A1	1/SM3/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 4						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 4–LC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
0/SM4/A0	0/SM4/A1	0/SM4/A2	1/SM4/A0	1/SM4/A1	1/SM4/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM22/J0	F0/OIM22/J1	F0/OIM22/J2	F0/OIM22/J3	F0/OIM22/J4	F0/OIM22/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 4–FC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	

F0/OIM22/J0	F0/OIM22/J1	F0/OIM22/J2	F0/OIM22/J3	F0/OIM22/J4	F0/OIM22/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM4/A0	0/SM4/A1	0/SM4/A2	1/SM4/A0	1/SM4/A1	1/SM4/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 5						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 5–LC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
0/SM5/A0	0/SM5/A1	0/SM5/A2	1/SM5/A0	1/SM5/A1	1/SM5/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM19/J0	F0/OIM19/J1	F0/OIM19/J2	F0/OIM19/J3	F0/OIM19/J4	F0/OIM19/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 5–FC end
Left side	*Left side*	*Left side*	*Left side*	*Left side*	*Left side*	
F0/OIM19/J0	F0/OIM19/J1	F0/OIM19/J2	F0/OIM19/J3	F0/OIM19/J4	F0/OIM19/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM5/A0	0/SM5/A1	0/SM5/A2	1/SM5/A0	1/SM5/A1	1/SM5/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Plane number 6						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 6–LC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
0/SM6/A0	0/SM6/A1	0/SM6/A2	1/SM6/A0	1/SM6/A1	1/SM6/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	

F0/OIM16/J0	F0/OIM16/J1	F0/OIM16/J2	F0/OIM16/J3	F0/OIM16/J4	F0/OIM16/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 6–FC end
Right side	Right side	Right side	Right side	Right side	Right side	
F0/OIM16/J0	F0/OIM16/J1	F0/OIM16/J2	F0/OIM16/J3	F0/OIM16/J4	F0/OIM16/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM6/A0	0/SM6/A1	0/SM6/A2	1/SM6/A0	1/SM6/A1	1/SM6/A2	
Flat side to left	Flat side to left	Flat side to left	Flat side to left	Flat side to left	Flat side to left	
Cable turns up	Cable turns up	Cable turns up	Cable turns up	Cable turns up	Cable turns up	
Plane number 7						
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	Plane 7–LC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
0/SM7/A0	0/SM7/A1	0/SM7/A2	1/SM7/A0	1/SM7/A1	1/SM7/A2	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	
F0/OIM13/J0	F0/OIM13/J1	F0/OIM13/J2	F0/OIM13/J3	F0/OIM13/J4	F0/OIM13/J5	
Flat side to right	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	*Flat side to right*	
Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	
Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Bay 542	Plane 7–FC end
Right side	*Right side*	*Right side*	*Right side*	*Right side*	*Right side*	
F0/OIM13/J0	F0/OIM13/J1	F0/OIM13/J2	F0/OIM13/J3	F0/OIM13/J4	F0/OIM13/J5	
Bay 541	Bay 541	Bay 541	Bay 543	Bay 543	Bay 543	
0/SM7/A0	0/SM7/A1	0/SM7/A2	1/SM7/A0	1/SM7/A1	1/SM7/A2	
Flat side to left	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	*Flat side to left*	

Cable turns up	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	*Cable turns up*	

Cabling the Fabric

Precautions

Please observe all precautions listed in the General Safety Guidelines, on page 16 when you perform any procedure in this chapter. The following precautions are additional reminders before you begin cabling the multishelf system.

Danger 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

Danger During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself. Statement 94

Danger Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. Statement 43

If a chassis power is on, assume lasers are turned on.

Never look at the ends of the fiber cables unless you are certain the laser is powered off.

The S2 and S13 cards are Class 1M. Other optical cards are Class 1.

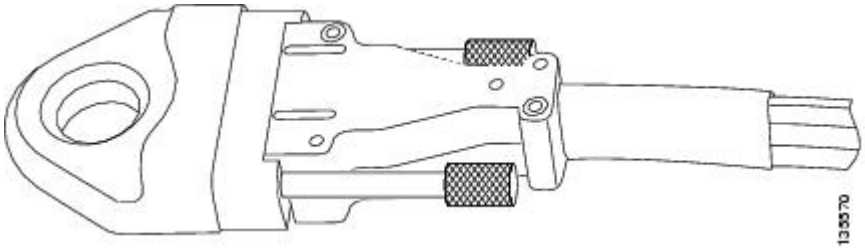
Danger For diverging beams, viewing the laser output with certain optical instruments within a distance of 100 MM. may pose an eye hazard. For collimated beams, viewing the laser output with certain optical instruments designed for use at a distance may pose an eye hazard. Statement 282

Danger Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Statement 283

Caution Handle cables carefully, as described in the chapter *Introduction to Multishelf System Cabling*

Caution Cleanliness is critical to proper switch operation. To keep connections clean, do not remove the yellow dust cover from a port until you are ready to attach a cable. Do not remove the silver dust cover from a fabric cable until you are ready to attach the cable to the fabric card connector. Silver dust covers should be screwed on for security. Loosen the screws to remove the dust cover (see the figure below). Store dust covers in a dust-free location.

Figure 21: Silver Dust Cover Protecting the Fabric Cable Connector



Prerequisites

Cable connection procedures assume that all FCCs, LCCs, and their cards are installed in accordance with site planning guidelines and that appropriate interconnection cable lengths are ordered and ready to be connected.

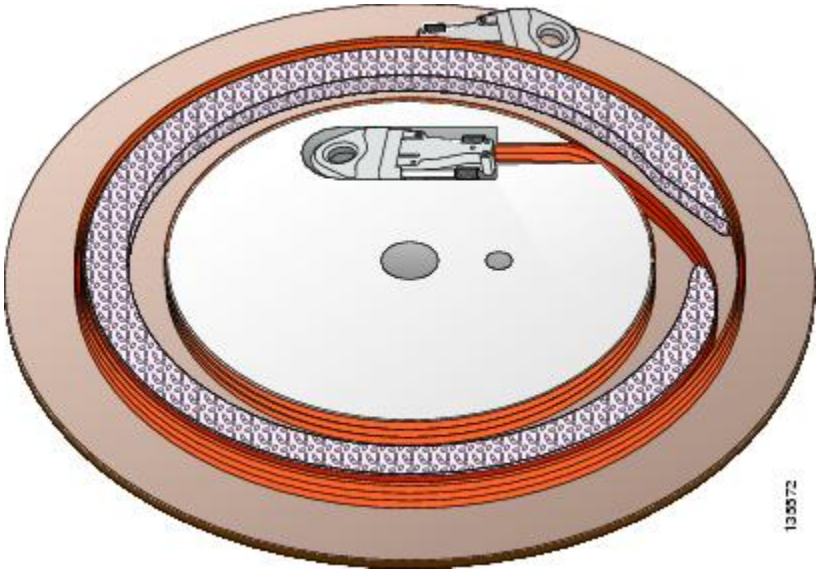
Caution All ports should have yellow dust covers on them as you begin this procedure, as shown in About Fabric Planes in the Multishelf System, on page 34.

How to Connect the Fabric Cables

The fabric cables are shipped separately from the fabric card chassis. These cables are shipped on a reel, similar to as shown in the figure below. This procedure begins with the assumption that the fabric cables have

been unpacked and positioned or hung near the chassis to which they will be connected. Packaging for riser rated cables may differ from he figure below.

Figure 22: Fabric Cable—as Shipped on a Reel



You will be attaching 24 fabric cables for each LCC. Ensure that each cable is labeled at both ends and then run each cable between the LCC(s) and the FCC. Use of the FCC vertical cable troughs or the side ports is determined by the cabling scheme (vertical or horizontal) and cable type (Trimese or Riser). Refer to Cabling scheme section.

Attach LCC(s)

The steps to take while attaching each cable to the LCC follow:

Procedure

Step 1 Slide the turn collar support on in the direction shown below:Upper shelf - all turn collars go down. Lower shelf - all turn collars go up.

Step 2 Gently position the connector in the correct orientation (fabric card connectors and fabric cable connectors are keyed).

Step 3 Hand-tighten the thumbscrews on the connector.

Step 4 Repeat Steps 1 through 3 to each cable.

Step 5 Fully tighten every connection.

Step 6 Gently drape and group cables behind the fabric card. Use Velcro straps to tie the growing bundles together.

Step 7 Bundle the cables together and velcro them to the horizontal cable manager and the vertical trough.

Attach FCC

The steps to take while attaching each cable to the FCC follow:

Procedure

Step 1 Slide the turn collar support on in the direction shown below:Vertical Cabling: Upper or lower shelf - all turn collars go up. Horizontal Cabling: Upper shelf - all turn collars go up.Horizontal Cabling: Lower shelf - J0, J1, J2 and J3 turn collars go up. Horizontal Cabling: Lower shelf - J4, J5, J6, J7 and J8 turn collars go down.

Step 2 Gently position the connector in the correct orientation (fabric card connectors and fabric cable connectors are keyed).

Step 3 Hand-tighten the thumbscrews on the connector.

Step 4 Repeat Steps 1 through 3 to each cable.

Step 5 Fully tighten every connection.

Step 6 Gently drape and group cables behind the fabric card. Use Velcro straps to tie the growing bundles together.

Step 7 Bundle the cables together and velcro them to the horizontal cable manager. For vertical cabling with Trimese cables, bundle the cables together and velcro them to the vertical troughs.

What to Do Next

General Fabric Cabling Procedures

The following are general fabric cabling procedures you might want to use when installing or maintaining the fabric cabling:

Installing Turn Collars

The turn collar protects the fabric cable bend radius and functions as a strain-relief support. It also has a Velcro strap attached to it to bundle the cables as the cables are installed.

Here are notes to help you install a turn collar:

- The connector is keyed. One side is flat, and the other side has a diagonal cut from the corners.
- Connectors in S13 cards have the flat side on the right; connectors on OIMs have the flat side on the left.
- Turn collars can be slipped onto either side of the connector, depending on whether the cable should turn up or down for proper routing through the chassis.

To install a turn collar:

Procedure

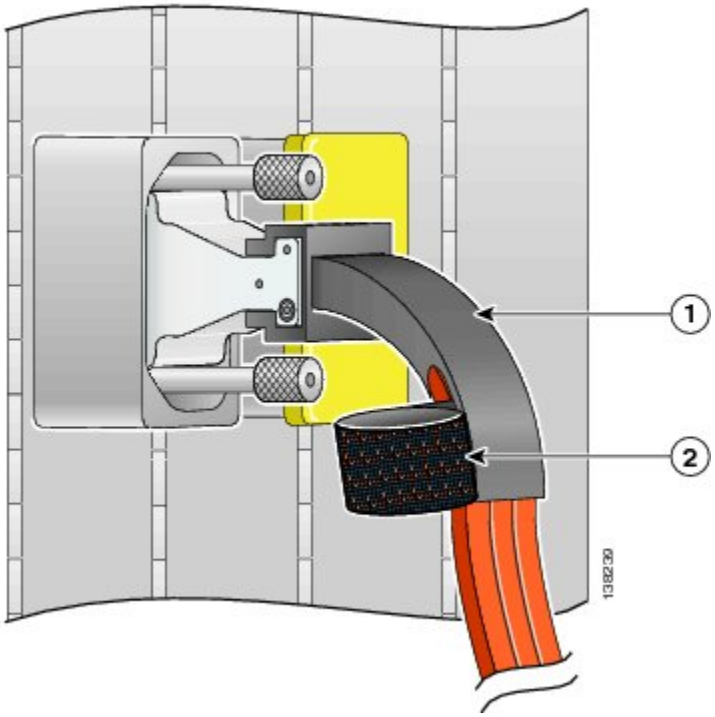
Step 1 Undo the Velcro strap (Trimese cable shown) (see the figure below).

Step 2 Slide the cable into the turn collar until the cable is seated and snaps into place.

Add the collar while the cable is hanging. Since the cable is not connected, consider the direction the cable connector will go when it is connected because all fabric card and fabric cable connectors are keyed.

Step 3 Attach the Velcro strap around the cable (Riser cable shown) to hold the cable in place. (see the figure below)

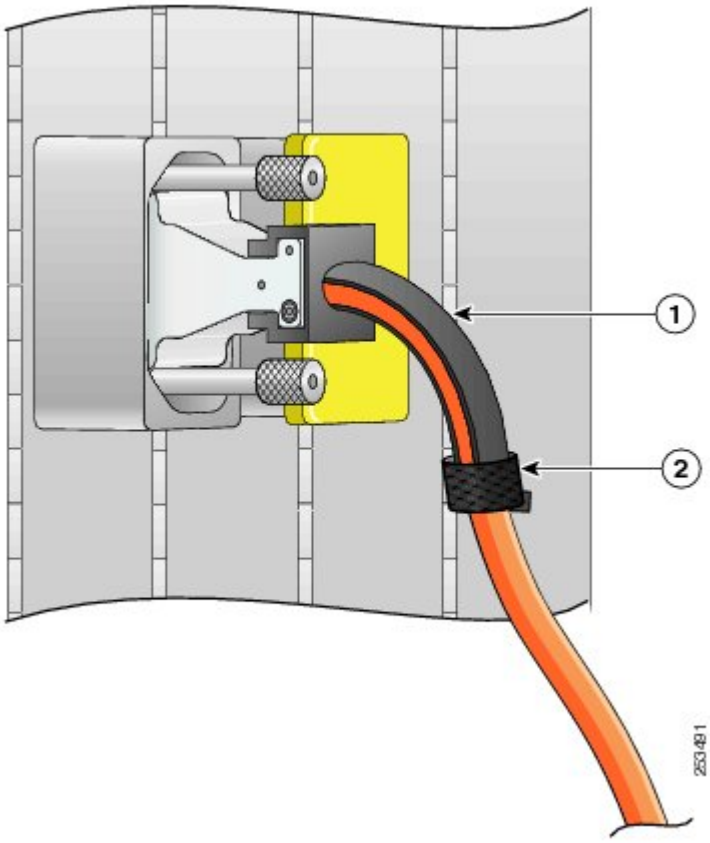
Figure 23: Turn Collar - Fabric Cable



1	Turn collar	2	Velcro strap to keep the fabric cable inside the turn collar and bundle fabric cables)

What to Do Next

Figure 24: Turn Collar - Riser Cable



1	Turn collar	2	Velcro strap (to keep the fabric cable inside the turn collar and bundle fabric cables)

Cleaning Cables

For information about cleaning fiber-optic cables, see Cisco CRS-1 Optical Cleaning Guide.

Verifying the Fabric1

This section describes, in table form, the processes for executing the commands required to verify the fabric. All commands in this mode will be run from admin mode.

Procedure

Step 1 Execute the command: show platform. The command will have output similar to below. Specifically, note that there are 24 SM cards (SM0-23) and all are in IOS XR RUN state. Also note the 8 LCC SM cards.

Example:

```
Node Type PLIM State Config State
------------------------------------------------------------------------------
0/RP0/CPU0 RP(Active) N/A IOS XR RUN PWR,NSHUT,MON
0/RP1/CPU0 RP(Standby) N/A IOS XR RUN PWR,NSHUT,MON
0/FC0/SP LCC-FAN-CT(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/FC1/SP LCC-FAN-CT(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/AM0/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/AM1/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM0/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM1/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM2/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM3/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM4/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM5/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM6/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
0/SM7/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/RP0/CPU0 RP(Active) N/A IOS XR RUN PWR,NSHUT,MON
1/RP1/CPU0 RP(Standby) N/A IOS XR RUN PWR,NSHUT,MON
1/FC0/SP LCC-FAN-CT(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/FC1/SP LCC-FAN-CT(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/AM0/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/AM1/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM0/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM1/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM2/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM3/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM4/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM5/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM6/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
1/SM7/SP FC/M(SP) N/A IOS XR RUN PWR,NSHUT,MON
F0/SM0/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM1/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM2/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM3/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM4/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM5/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM6/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM7/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM8/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM9/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM10/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM11/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM12/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM13/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM14/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM15/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM16/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM17/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM18/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM19/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM20/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM21/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM22/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SM23/SP FCC-SFC(SP) FCC-FM-1S IOS XR RUN PWR,NSHUT,MON
F0/SC0/CPU0 FCC-SC(Active) N/A IOS XR RUN PWR,NSHUT,MON1
F0/SC1/CPU0 FCC-SC(Standby) N/A IOS XR RUN PWR,NSHUT,MON
F0/AM0/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
F0/AM1/SP ALARM(SP) N/A IOS XR RUN PWR,NSHUT,MON
```

```
F0/LM0/SP FCC-LED(SP) N/A IOS XR RUN PWR,NSHUT,MON
F0/LM1/SP FCC-LED(SP) N/A IOS XR RUN PWR,NSHUT,MON
```

Step 2 Execute the command: show controllers fabric plane all detail. All planes should be UP/UP and the amount of downed bundles should be 21 on each plane. If there are more than 21 downed bundles, it means that at least one of the array cables is loose or not connected properly.

Example:

```
Flags: P - plane admin down, p - plane oper down
C - card admin down, c - card oper down
L - link port admin down, l - linkport oper down
A - asic admin down, a - asic oper down
B - bundle port admin Down, b - bundle port oper down
I - bundle admin down, i - bundle oper down
N - node admin down, n - node down
o - other end of link down d - data down
f - failed component downstream
m - plane multicast down
Plane Admin Oper Down Total Down
Id State State Flags Bundles Bundles
------------------------------------------------------
0 UP UP 27 21
1 UP UP 27 21
2 UP UP 27 21
3 UP UP 27 21
4 UP UP 27 21
5 UP UP 27 21
6 UP UP 27 21
7 UP UP 27 21
```

Step 3 Execute the command: show controllers fabric connectivity all detail. Each one of your line cards will be represented in the output. Verify that there is connectivity to all 8 planes. This will be represented by 8 1's, like below.

Example:

```
Flags: P - plane admin down, p - plane oper down
C - card admin down, c - card oper down
L - link port admin down, l - linkport oper down
A - asic admin down, a - asic oper down
B - bundle port admin Down, b - bundle port oper down
I - bundle admin down, i - bundle oper down
N - node admin down, n - node down
o - other end of link down d - data down
f - failed component downstream
m - plane multicast down
Card In Tx Planes Rx Planes Monitored Total Percent
R/S/M Use 01234567 01234567 For (s) Uptime (s) Uptime
-------------------------------------------------------------------------------
0/RP0/CPU0 1 11111111 11111111 12702 12702 100.0000
0/RP1/CPU0 1 11111111 11111111 12702 12702 100.0000
1/RP0/CPU0 1 11111111 11111111 50137 50137 100.0000
1/RP1/CPU0 1 11111111 11111111 50137 50137 100.0000
```

Step 4 Execute the command: show controllers fabric bundle all detail | include FM/0. This command will show you output like below. Verify that each line shows 72 and 0. This shows that for Line Card Chassis 0, each of the fiber bundles has 72 active links and 0 downed links. If the output does not look like below, try cleaning the cable that is showing the problem.

Example:

```
F0/SM0/FM/0 UP 3 72 0 F0/SM0/FM/0 0/SM3/SP/2
F0/SM1/FM/0 UP 3 72 0 F0/SM1/FM/0 0/SM3/SP/1
F0/SM2/FM/0 UP 3 72 0 F0/SM2/FM/0 0/SM3/SP/0
F0/SM3/FM/0 UP 2 72 0 F0/SM3/FM/0 0/SM2/SP/2
F0/SM4/FM/0 UP 2 72 0 F0/SM4/FM/0 0/SM2/SP/1 19-24
```

```
F0/SM5/FM/0 UP 2 72 0 F0/SM5/FM/0 0/SM2/SP/0
F0/SM6/FM/0 UP 1 72 0 F0/SM6/FM/0 0/SM1/SP/2
F0/SM7/FM/0 UP 1 72 0 F0/SM7/FM/0 0/SM1/SP/1
F0/SM8/FM/0 UP 1 72 0 F0/SM8/FM/0 0/SM1/SP/0
F0/SM9/FM/0 UP 0 72 0 F0/SM9/FM/0 0/SM0/SP/2
F0/SM10/FM/0 UP 0 72 0 F0/SM10/FM/0 0/SM0/SP/1
F0/SM11/FM/0 UP 0 72 0 F0/SM11/FM/0 0/SM0/SP/0
F0/SM13/FM/0 UP 4 72 0 F0/SM13/FM/0 0/SM4/SP/1
F0/SM14/FM/0 UP 4 72 0 F0/SM14/FM/0 0/SM4/SP/2
F0/SM16/FM/0 UP 5 72 0 F0/SM16/FM/0 0/SM5/SP/1
F0/SM17/FM/0 UP 5 72 0 F0/SM17/FM/0 0/SM5/SP/2
F0/SM19/FM/0 UP 6 72 0 F0/SM19/FM/0 0/SM6/SP/1
F0/SM20/FM/0 UP 6 72 0 F0/SM20/FM/0 0/SM6/SP/2
F0/SM22/FM/0 UP 7 72 0 F0/SM22/FM/0 0/SM7/SP/1
F0/SM23/FM/0 UP 7 72 0 F0/SM23/FM/0 0/SM7/SP/2
```

Step 5 Also execute the command: show controllers fabric bundle all detail | include FM/1. Verify the output as above. This will check Line Card Chassis 1.

Step 6 Execute the command: show controllers fabric plane all statistics. Verify that the output looks similar to below. The actual number of packets does not matter, as long as all fabric planes are showing some packets passed and no increasing errors. It is normal to have a few UCEs across the planes and many CEs on Plane 4.

What to Do Next

When the multishelf system cabling is complete, see *Cisco IOS XR Getting Started Guide* for directions on bringing up the system.

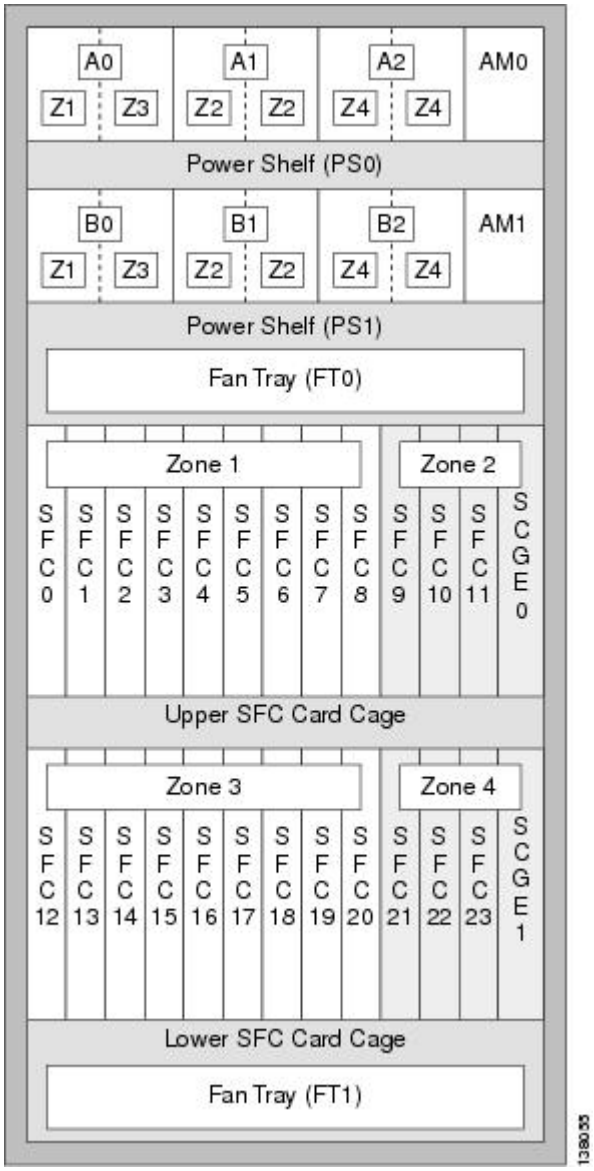
Fabric Chassis Power Zones and Card Placement for High Availability

This section describes the power zones in the FCC and provides information about how to install cards in the chassis so that a double-fault power failure does not disrupt service when a fixed configuration power system is installed. A double-fault power failure *cannot* occur in the modular configuration power system because all power modules power all chassis power zones.

Note The concept of power zones only applies to the older power supplies and power shelf. With the newer power supplies and power shelf, power distribution changes to a bus system so concept of power zones no longer applies.

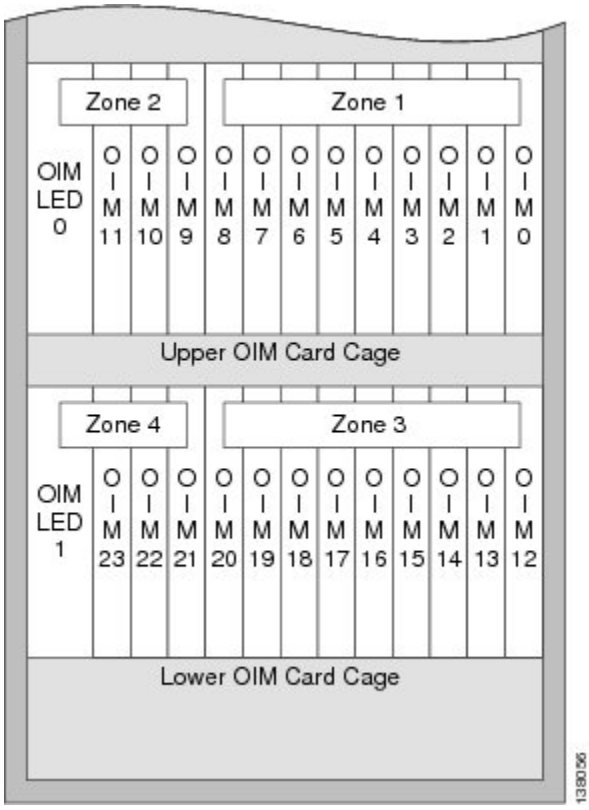
The figure below shows the power zones on the front (SFC) side of a fixed configuration AC-powered FCC.

Figure 25: FCC Power Zones, Fixed Configuration AC-Powered Chassis Front (SFC) Side



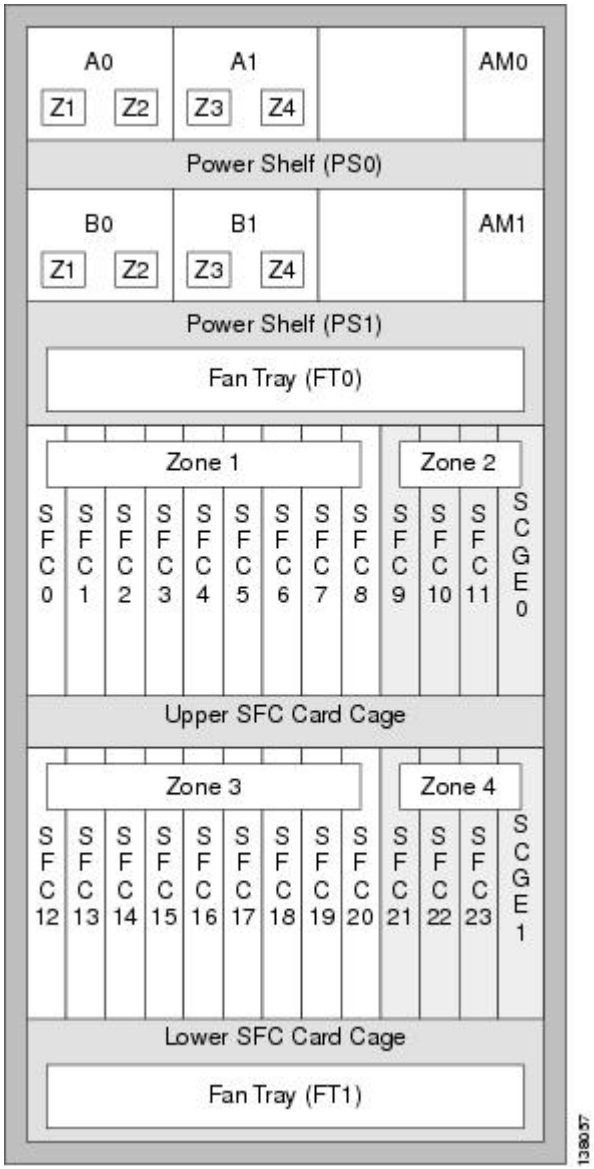
The figure below shows the power zones on the rear (OIM) side of a fixed configuration AC-powered FCC.

Figure 26: FCC Power Zones, Fixed Configuration AC-Powered Chassis (OIM Side)



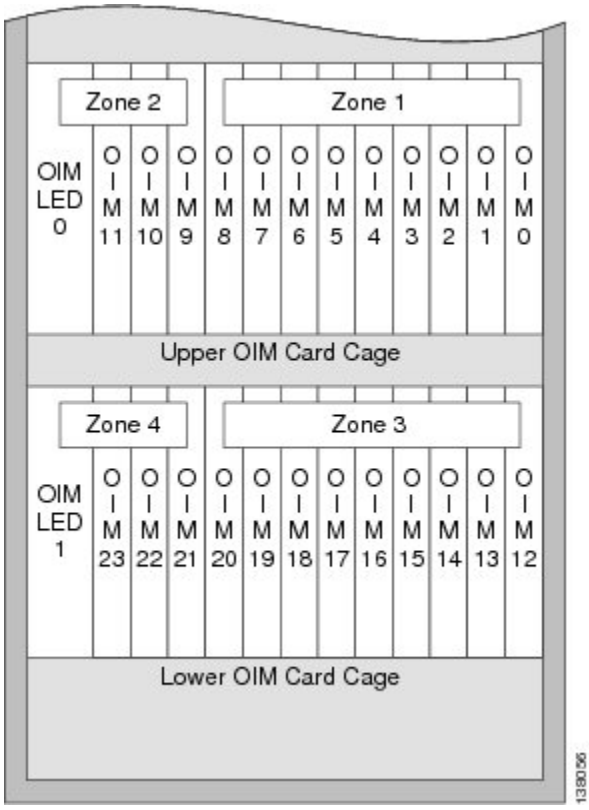
The figure below shows the power zones on the front (SFC) side of a fixed configuration DC-powered FCC.

Figure 27: FCC Power Zones, Fixed Configuration DC-Powered Chassis (SFC) Side



The figure below shows the power zones on the rear (OIM) side of a fixed configuration DC-powered FCC.

Figure 28: FCC Power Zones, Fixed Configuration DC-Powered Chassis Rear (OIM) Side



In a configuration with two FCCs, each switch fabric card implements a single plane of the eight-plane switch fabric. If a chassis slot loses power, that plane of the switch fabric stops operating. Although the Cisco CRS router can continue to operate with fewer than eight planes of the switch fabric, you can reduce the amount of performance degradation that occurs by carefully planning how to install fabric cards in the FCC.

For example, in a fixed configuration AC-powered system, if both power modules A0 and B0 fail, chassis slots 0 through 8 and 12 through 20 would lose power, and all switch fabric cards installed in those slots stop operating. If you had installed all of the fabric cards in slots 0 to 8 or in slots 12 to 20, the loss of A0 **and** B0 results in a complete system failure because none of the switch fabric planes would be active and operational.

We recommend that you distribute the switch fabric planes across chassis power zones to avoid a single point of failure that can result in the loss of switch fabric connectivity during a double-fault power failure. In two- and four-FCC multishelf systems, we recommend that you distribute the fabric planes across all FCCs.

Note At least two planes of the switch fabric (an even plane and an odd plane) must be active at all times for the Cisco CRS router to operate. Otherwise, the switch fabric fails, causing a system failure. For example, if power is lost to all switch fabric card slots except the slots holding planes 1 and 4, the system continues to operate, although forwarding capacity is degraded. However, if power is lost to all but planes 2 and 4, the system fails because there is no active odd plane.

To avoid service disruption due to a double-fault power failure, consider the following to determine how to install switch fabric cards in the FCC:

- Do not install all switch fabric cards in chassis slots powered by a single power zone (for example, zone 1 or zone 3 in an AC-powered chassis). Instead, distribute fabric cards across the power zones so a double-fault failure does not bring down all planes in the switch fabric.
- Distribute switch fabric cards across chassis power zones so that an odd plane and an even plane of the switch fabric remain operational if a double-fault failure occurs.

For single-FCC systems, use the information in the below table as a guide to determine where to install switch fabric cards. Table 12: Two-FCC System, S2 Fabric Card Placement for High Availability, on page 71 shows the recommended slots for two-FCC multishelf systems, and the Table 13: Four-FCC System, S2 Fabric Card Placement for High Availability, on page 72 shows the recommended slots for four-FCC systems.

Table 11: Single-FCC System, S2 Fabric Card Placement for High Availability

Power Zone	Slot	1 to 3 LCCs	4 to 9 LCCs
1	0	S2 card, plane 3	S2 card, plane 3
	1		S2 card, plane 3
	2		S2 card, plane 3
	3	S2 card, plane 2	S2 card, plane 2
	4		S2 card, plane 2
	5		S2 card, plane 2
	6	S2 card, plane 1	S2 card, plane 1
	7		S2 card, plane 1
	8		S2 card, plane 1
2	9	S2 card, plane 0	S2 card, plane 0
	10		S2 card, plane 0
	11		S2 card, plane 0
	SC 0		

3	12	S2 card, plane 4	S2 card, plane 4
	13		S2 card, plane 4
	14		S2 card, plane 4
	15	S2 card, plane 5	S2 card, plane 5
	16		S2 card, plane 5
	17		S2 card, plane 5
	18	S2 card, plane 6	S2 card, plane 6
	19		S2 card, plane 6
	20		S2 card, plane 6
4	21	S2 card, plane 7	S2 card, plane 7
	22		S2 card, plane 7
	23		S2 card, plane 7
	SC 1		

Table 12: Two-FCC System, S2 Fabric Card Placement for High Availability

Rack	Power Zone	Slot	1 to 3 LCCs	4 to 9 LCCs
F0	1	0	S2 card, plane 0	S2 card, plane 0
1			S2 card, plane 0	
2			S2 card, plane 0	
2	9	S2 card, plane 1	S2 card, plane 1	
	10		S2 card, plane 1	
	11		S2 card, plane 1	
3	12	S2 card, plane 2	S2 card, plane 2	
	13		S2 card, plane 2	
	14		S2 card, plane 2	

4	21	S2 card, plane 3	S2 card, plane 3	
	22		S2 card, plane 3	
	23		S2 card, plane 3	
F1	1	0	S2 card, plane 4	S2 card, plane 4
1			S2 card, plane 4	
2			S2 card, plane 4	
2	9	S2 card, plane 5	S2 card, plane 5	
	10		S2 card, plane 5	
	11		S2 card, plane 5	
3	12	S2 card, plane 6	S2 card, plane 6	
	13		S2 card, plane 6	
	14		S2 card, plane 6	
4	21	S2 card, plane 7	S2 card, plane 7	
	22		S2 card, plane 7	
	23		S2 card, plane 7	

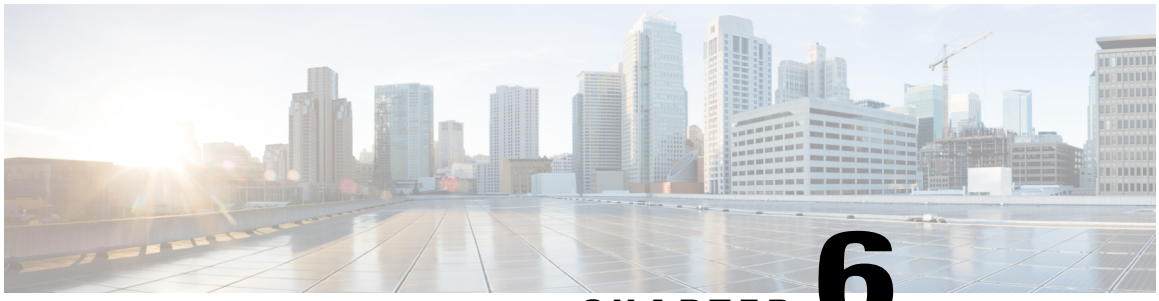
Table 13: Four-FCC System, S2 Fabric Card Placement for High Availability

Rack	Power Zone	Slot	1 to 3 LCCs	4 to 9 LCCs
F0	1	0	S2 card, plane 0	S2 card, plane 0
		1		S2 card, plane 0
		2		S2 card, plane 0
	2	9	S2 card, plane 1	S2 card, plane 1
		10		S2 card, plane 1
		11		S2 card, plane 1

F1	1	0	S2 card, plane 2	S2 card, plane 2
		1		S2 card, plane 2
		2		S2 card, plane 2
	2	9	S2 card, plane 3	S2 card, plane 3
		10		S2 card, plane 3
		11		S2 card, plane 3
F2	1	0	S2 card, plane 4	S2 card, plane 4
		1		S2 card, plane 4
		2		S2 card, plane 4
	2	9	S2 card, plane 5	S2 card, plane 5
		10		S2 card, plane 5
		11		S2 card, plane 5
F3	1	0	S2 card, plane 6	S2 card, plane 6
		1		S2 card, plane 6
		2		S2 card, plane 6
	2	9	S2 card, plane 7	S2 card, plane 7
		10		S2 card, plane 7
		11		S2 card, plane 7

What to Do Next

When the multishelf system cabling is complete, see *Cisco IOS XR Getting Started Guide* for directions on bringing up the system.



CHAPTER 6

Multimodule Horizontal Cabling Plans

Multimodule Horizontal Cabling Plans

This appendix provides you with information about multimodule horizontal cabling plans for the following expanded Cisco CRS Multishelf installations:

- 8+1 Multimodule Installations—For eight LCCs and one FCC.
- 8+2 Multimodule Installations—For eight LCCs and two FCCs.
- 8+4 Multimodule Installations—For eight LCCs and four FCCs.

Cabling 8+1 Multimodule Installations

This section describes how to physically cable the fabric planes between each line card chassis (LCC) and fabric card chassis (FCC) in an 8+1, 8+2, or 8+4 Cisco CRS Multishelf installation using a horizontal multimodule cabling scheme.

Cabling the Control Network

For information about how to cable the control network for a single FCC, see the section *Connections for a Single-FCC System* in chapter *Cabling the Fabric*.

S2 Fabric Card Distribution

Because there is only one FCC in an 8+1 installation, and multimodule installations support horizontal expansion, the FCC is fully loaded with 24, S2 fabric cards.

Rules for Multimodule Fabric Connectivity

The following rules and characteristics define the requirements for positioning S2 optical interface modules (OIMs) in the multishelf system and connecting them to the S13 cards in the LCCs.

- Each plane is supported by a set of three S2 fabric cards for a total of 24 S2 fabric cards.
- At the LCC end of a fabric cable, the plane number is determined by the slot to which the cable is connected. The other end of each fabric cable must connect to a set of three FCC S2 fabric cards designated for the same plane number. See Table 14: Horizontal Cabling Plan for 8+1, 8+2 and 8+4 Where N Equals LCC0 through LCC7 , on page 76 for the entire fabric cabling plan for an 8+1, an 8+2, or an 8+4 Cisco CRS multishelf installation.
- When connecting fabric cables from an LCC to a set of three FCC S2/OIM fabric cards in an 8+1 installation, connect LCC-Rack 0 cables to J0 on all three OIM cards for the same plane. Connect LCC-Rack 1 cables to J1 on all three OIM cards for the same plane.

Horizontal Cabling Cable Plan For Eight Line Card Chassis and One to Four Fabric Card Chassis

See Table 14: Horizontal Cabling Plan for 8+1, 8+2 and 8+4 Where N Equals LCC0 through LCC7 , on page 76 below for the cabling plan for each line card chassis LCC 0 through LCC 7 and a single fabric card chassis (FCC 0), two fabric card chassis (FCC0 and FCC1), and four fabric card chassis (FCC0, FCC1, FCC2, and FCC3), each connected with horizontal cabling: In Table 14: Horizontal Cabling Plan for 8+1, 8+2 and 8+4 Where N Equals LCC0 through LCC7 , on page 76 below, N equals 0 through 7, corresponding to LCC0 through LCC7

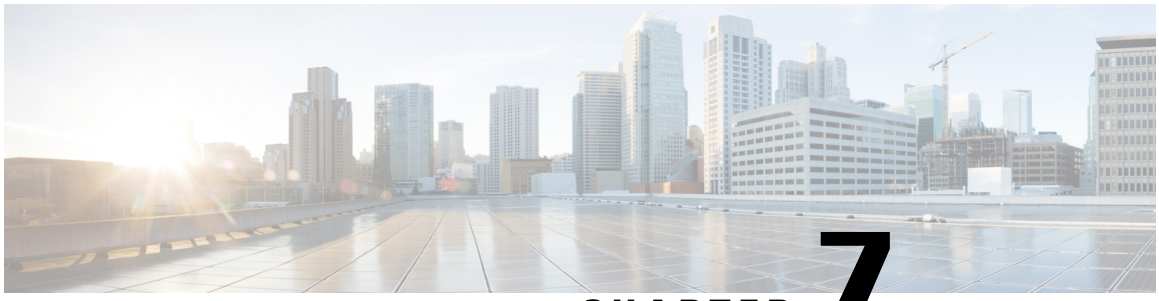
Horizontal Cabling Plan 8+1, 8+2 and 8+4

LCCN (N = 0 through 7)

Table 14: Horizontal Cabling Plan for 8+1, 8+2 and 8+4 Where N Equals LCC0 through LCC7

8+1 Cabling SM0 #	**FCC #**	**OIM & J #**	**8+2 Cabling SM0 #**	**FCC #**	**OIM & J #**	**8+4 Cabling SM0 #**	**FCC #**	**OIM & J #**	**SM 0 A 0,1,2**	**0**	**11-9 J N**	**SM 0 A 0,1,2**	**0**	**11-9 J N**	SM 0 A 0,1,2	0	11-9 J N
SM 1 A 0,1,2	0	8-6 J N	SM 1 A 0,1,2	1	11-9 J N	SM 1 A 0,1,2	1	11-9 J N									
SM 2 A 0,1,2	0	5-3 J N	SM 2 A 0,1,2	1	2-0 J N	SM 2 A 0,1,2	0	2-0 J N									

SM 3 A 0,1,2	0	2-0 J N	SM 3 A 0,1,2	0	2-0 J N	SM 3 A 0,1,2	1	2-0 J N
SM 4 A 0,1,2	0	12-14 J N	SM 4 A 0,1,2	0	12-14 J N	SM 4 A 0,1,2	2	11-9 J N
SM 5 A 0,1,2	0	15-17 J N	SM 5 A 0,1,2	1	12-14 J N	SM 5 A 0,1,2	3	11-9 J N
SM 6 A 0,1,2	0	18-20 J N	SM 6 A 0,1,2	1	21-23 J N	SM 6 A 0,1,2	2	2-0 J N
SM 7 A 0,1,2	0	21-23 J N	SM 7 A 0,1,2	0	21-23 J N	SM 7 A 0,1,2	3	2-0 J N



CHAPTER 7

Vertical Cabling Plans

Vertical Cabling Plans

This appendix contains the following sample vertical cabling plans:

- Vertical Cabling Cable Plans For Three Line Card Chassis and One, Two, or Four Fabric Card Chassis, on page 79
- Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0, on page 79
- Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1, on page 80
- Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2, on page 81

Vertical Cabling Cable Plans For Three Line Card Chassis and One, Two, or Four Fabric Card Chassis

Table 15: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0 , on page 80, Table 16: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1 , on page 80. and Table 17: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2 , on page 81 show the vertical cabling configurations Cisco recommends for single-FCC, two-FCC, and four-FCC multishelf installations. Table 15: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0 , on page 80 shows the cabling configurations Cisco recommends for the first Line Card Chassis (LCC0). Table 16: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1 , on page 80 and Table 17: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2 , on page 81 show the cabling configurations Cisco recommends for the second Line Card Chassis (LCC1) and the third Line Card Chassis (LCC2), respectively. All three tables show the cabling configurations Cisco recommends for single-FCC, two-FCC, and four-FCC multishelf installations.

Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0

Table 15: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0 , on page 80, Table 16: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1 , on page 80. and Table 17: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2 , on page 81 show the vertical cabling configuration Cisco recommends for single-FCC multishelf installations, two-FCC

multishelf installations, and four-FCC multishelf installations, respectively. Table 15: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0 , on page 80 shows the vertical cabling configurations Cisco recommends for the first Line Card Chassis (LCC0).

Table 15: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC0

3+1 Cabling SM0 #	**FCC #**	**OIM & J #**	**3+2 Cabling SM0 #**	**FCC #**	**OIM & J #**	**3+4 Cabling SM0 #**	**FCC #**	**OIM & J #**
SM 0 A 0,1,2	0	0 J 0,1,2	SM 0 A 0,1,2	0	0 J 0,1,2	SM 0 A 0,1,2	**0**	0 J 0,1,2
SM 1 A 0,1,2	0	9 J 0,1,2	SM 1 A 0,1,2	0	9 J 0,1,2	SM 1 A 0,1,2	**0**	9 J 0,1,2
SM 2 A 0,1,2	0	12 J 0,1,2	SM 2 A 0,1,2	0	12 J 0,1,2	SM 2 A 0,1,2	**2**	0 J 0,1,2
SM 3 A 0,1,2	0	21 J 0,1,2	SM 3 A 0,1,2	0	21 J 0,1,2	SM 3 A 0,1,2	**2**	9 J 0,1,2
SM 4 A 0,1,2	0	3 J 0,1,2	SM 4 A 0,1,2	1	0 J 0,1,2	SM 4 A 0,1,2	**1**	0 J 0,1,2
SM 5 A 0,1,2	0	6 J 0,1,2	SM 5 A 0,1,2	1	9 J 0,1,2	SM 5 A 0,1,2	**1**	9 J 0,1,2
SM 6 A 0,1,2	0	15 J 0,1,2	SM 6 A 0,1,2	1	12 J 0,1,2	SM 6 A 0,1,2	**3**	0 J 0,1,2
SM 7 A 0,1,2	0	18 J 0,1,2	SM 7 A 0,1,2	1	21 J 0,1,2	SM 7 A 0,1,2	**3**	9 J 0,1,2

Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1

The table below shows the vertical cabling configuration Cisco recommends for single-FCC multishelf installations, two-FCC multishelf installations, and four-FCC multishelf installations, respectively. The table below shows the vertical cabling configurations Cisco recommends for the second Line Card Chassis (LCC1).

Table 16: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC1

3+1 Cabling SM0 #	**FCC #**	**OIM & J #**	**3+2 Cabling SM0 #**	**FCC #**	**OIM & J #**	**3+4 Cabling SM0 #**	**FCC #**	**OIM & J #**
SM 0 A 0,1,2	0	0 J 3,4,5	SM 0 A 0,1,2	0	0 J 3,4,5	SM 0 A 0,1,2	**0**	0 J 3,4,5

SM 1 A 0,1,2	0	9 J 3,4,5	SM 1 A 0,1,2	0	9 J 3,4,5	SM 1 A 0,1,2	**0**	9 J 3,4,5
SM 2 A 0,1,2	0	12 J 3,4,5	SM 2 A 0,1,2	0	12 J 3,4,5	SM 2 A 0,1,2	**2**	0 J 3,4,5
SM 3 A 0,1,2	0	21 J 3,4,5	SM 3 A 0,1,2	0	21 J 3,4,5	SM 3 A 0,1,2	**2**	9 J 3,4,5
SM 4 A 0,1,2	0	3 J 3,4,5	SM 4 A 0,1,2	1	0 J 3,4,5	SM 4 A 0,1,2	**1**	0 J 3,4,5
SM 5 A 0,1,2	0	6 J 3,4,5	SM 5 A 0,1,2	1	9 J 3,4,5	SM 5 A 0,1,2	**1**	9 J 3,4,5
SM 6 A 0,1,2	0	15 J 3,4,5	SM 6 A 0,1,2	1	12 J 3,4,5	SM 6 A 0,1,2	**3**	0 J 3,4,5
SM 7 A 0,1,2	0	18 J 3,4,5	SM 7 A 0,1,2	1	21 J 3,4,5	SM 7 A 0,1,2	**3**	9 J 3,4,5

Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2

The table below shows the vertical cabling configuration Cisco recommends for single-FCC multishelf installations, two-FCC multishelf installations, and four-FCC multishelf installations, respectively. The table below shows the vertical cabling configurations Cisco recommends for the third Line Card Chassis (LCC2).

Table 17: Vertical Cabling Plan 3+1, 3+2 and 3+4, LCC2

3+1 Cabling SM0 #	**FCC #**	**OIM & J #**	**3+2 Cabling SM0 #**	**FCC #**	**OIM & J #**	**3+4 Cabling SM0 #**	**FCC #**	**OIM & J #**
SM 0 A 0,1,2	0	0 J 6,7,8	SM 0 A 0,1,2	0	0 J 6,7,8	SM 0 A 0,1,2	**0**	0 J 6,7,8
SM 1 A 0,1,2	0	9 J 6,7,8	SM 1 A 0,1,2	0	9 J 6,7,8	SM 1 A 0,1,2	**0**	9 J 6,7,8
SM 2 A 0,1,2	0	12 J 6,7,8	SM 2 A 0,1,2	0	12 J 6,7,8	SM 2 A 0,1,2	**2**	0 J 6,7,8
SM 3 A 0,1,2	0	21 J 6,7,8	SM 3 A 0,1,2	0	21 J 6,7,8	SM 3 A 0,1,2	**2**	9 J 6,7,8
SM 4 A 0,1,2	0	3 J 6,7,8	SM 4 A 0,1,2	1	0 J 6,7,8	SM 4 A 0,1,2	**1**	0 J 6,7,8

SM 5 A 0,1,2	0	6 J 6,7,8	SM 5 A 0,1,2	1	9 J 6,7,8	SM 5 A 0,1,2	**1**	9 J 6,7,8
SM 6 A 0,1,2	0	15 J 6,7,8	SM 6 A 0,1,2	1	12 J 6,7,8	SM 6 A 0,1,2	**3**	0 J 6,7,8
SM 7 A 0,1,2	0	18 J 6,7,8	SM 7 A 0,1,2	1	21 J 6,7,8	SM 7 A 0,1,2	**3**	9 J 6,7,8