Cisco Converged Broadband Routers Hardware Installation Guide

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

CONTENTS

CHAPTER 1 **What is a Cisco cBR Series Converged Broadband Router** 1

- Introduction 1
- Functional Overview 2
  - Upstream Data Path 2
  - Downstream Data Path 3
- Cisco cBR-8 Converged Broadband Router 4
  - Physical Description 7
  - Slot Numbering—Physical and Logical 10
  - Field Replaceable Units 15
- Supervisor 19
- Interface Cards 24
- Power System 32
- Fan Module 40
  - Cooling System of the Cisco cBR Chassis 41
- Air Filter 42
- Cisco IOS-XE Software 43
- NEBS Level 3 Compliance 43
- How and What to Order 43

CHAPTER 2 **Prepare to Install** 47

- General Safety Guidelines 47
- Safety Instructions 48
- Warning Definition 48
- Preventing Electrostatic Discharge Damage 49
- Plant Wiring Guidelines 49
- Electrical Equipment Guidelines 50
- Unpacking and Verifying Shipping Contents 50
- Chassis-Lifting Guidelines 51

General Rack Installation Guidelines 51
Cabling Guidelines 54

CHAPTER 3 Installing the Cisco cBR Chassis 55
Installation Methods 55
Verifying Rack Dimensions 56
Installing Chassis Installation Brackets 57
Attaching the Chassis Rack-Mount Brackets 59
Installing the Chassis Installation Handle (Optional) 61
Installing the Cisco cBR-8 In a Rack 63
Installing the Cisco cBR in a Four-Post Rack 63
Installing the Cisco cBR in a Two-Post Rack 66
Attaching the Cable-Management Brackets 68
Attaching the Fiber/Cable Routing Guide on the Chassis 69
Attaching a Chassis Ground Connection 75

CHAPTER 4 Installing the Fan Module in Cisco cBR 79
Installing the Fan Module in the cBR Chassis 79

CHAPTER 5 Installing the Power System in the Cisco cBR Chassis 83
Installing the Power Cassette Module in the Cisco cBR Chassis 83
Installing the FPEM in the Cisco cBR Chassis 86
Installing the Power Module in the Cisco cBR Chassis 88
Connecting Power to the AC-Powered Cisco cBR Chassis 91
Connecting Power to the DC-Powered Cisco cBR Chassis 93

CHAPTER 6 Installing the Supervisor in the Cisco cBR Chassis 97
Installing the Supervisor PIC in the Cisco cBR Chassis 97
Installing the Supervisor PIC Cable Management Bracket 100
Installing the SFP+ Modules in the Supervisor PIC 102
Installing the Supervisor Card in the Cisco cBR Chassis 104
Using the SFP+ Ports on the Supervisor PIC 108
Using the DTI Ports on the Supervisor PIC 109
Using the NME Ports on the Supervisor PIC 109
Using the Console Port on the Supervisor PIC 110

Using the Auxiliary Port on the Supervisor PIC 112
Cable Management for the Supervisor PIC in the Cisco cBR Chassis 113
Using the USB Port on the Supervisor Card 119
Using the Console Port on the Supervisor Card 121

CHAPTER 7 **Installing the Interface Line and PIC Cards** 123
Installing RF PICs in the Cisco cBR Chassis 123
Using UCH.8 Connectors on the Ports on the RF PIC 127
Installing the Interface Line Card in the Cisco cBR Chassis 129

CHAPTER 8 **Powering Up the Cisco cBR Chassis** 135
Powering Up the Cisco cBR 135

CHAPTER 9 **Monitoring the Cisco cBR Chassis** 137
Monitoring the Cisco cBR Chassis Using CLI 137

CHAPTER 10 **Monitoring the Fan Module in Cisco cBR** 145
Monitoring the Fan Module on the Cisco cBR using LEDs 145
Monitoring the Fan Module using CLI in the Cisco cBR Chassis 146

CHAPTER 11 **Monitoring the Power System in the Cisco cBR Chassis** 147
Monitoring the Power System in the Cisco cBR Chassis Using LEDs 147
Monitoring the Power System in the Cisco cBR Chassis Using CLI 149

CHAPTER 12 **Monitoring the Supervisor in the Cisco cBR Chassis** 151
Monitoring the Supervisor in the Cisco cBR Chassis Using LEDs 152

CHAPTER 13 **Monitoring the Interface Card in the Cisco cBR Chassis** 155
Monitoring the Interface Cards in the Cisco cBR Chassis using LEDs 155

CHAPTER 14 **Maintaining the Cisco cBR Chassis** 157
Powering Down the Cisco cBR Chassis 157
Unmounting the Cisco cBR Chassis 157

CHAPTER 15 **Maintaining the Fan Module for Cisco cBR** 159

Removing the Fan Module from the Cisco cBR Chassis 159

CHAPTER 16 **Maintaining the Power System in the Cisco cBR Chassis 161**

Removing the AC Power Connections from the Cisco cBR Chassis 161

Removing the DC Power Connections from the Cisco cBR Chassis 162

Removing the Power Module from the Cisco cBR Chassis 164

Removing the FPEM from the Cisco cBR Chassis 167

Removing the Power Cassette Module from the Cisco cBR Chassis 169

CHAPTER 17 **Maintaining the Supervisor in the Cisco cBR Chassis 173**

Removing the Supervisor Card from the Cisco cBR Chassis 173

Removing the SFP+ Module from the Supervisor PIC 177

Removing the Supervisor PIC Cable Management Bracket 179

Removing the Supervisor PIC from the Cisco cBR Chassis 180

CHAPTER 18 **Maintaining the Interface Cards in the Cisco cBR Chassis 183**

Removing the Interface Line Card from the Cisco cBR Chassis 183

Removing the UCH.8 Connectors from the RF PICs 185

Removing the RF PIC from the Cisco cBR Chassis 186

Removing the cLGA Connector from an Interface Line Card 188

Installing the cLGA Connector on the Line Card PCB 191

CHAPTER 19 **Maintaining the PHY Modules in the Cisco cBR Chassis 195**

Removing the Downstream PHY Module in the Interface Line Card 195

Installing the Downstream PHY Module in the Interface Line Card 197

Removing the Upstream PHY Module in the Interface Line Card 199

Installing the Upstream PHY Module in the Interface Line Card 200

CHAPTER 20 **Maintaining the Air Filter in the Cisco cBR Chassis 203**

Removing the Air Filter on a Card 203

Installing the Air Filter on a Card 205

CHAPTER 21 **Online Insertion and Removal of Cards on the Cisco cBR 217**

About OIR 217

What Does an OIR Do? 218

Guidelines for Performing an OIR 218
OIR on Cisco cBR 218
How Do I Perform an OIR? 219
Verifying Status after an OIR 219

CHAPTER 22 Upgrading the Programmable Hardware Devices in the Cisco cBR 223
Overview of Firmware Images and Packages 223
Displaying Current and Minimum Required FPD Image Versions 223
Displaying Information About the Default FPD Image Package 224
Displaying All Firmware on the Router 225
Programmable Hardware Devices in the Cisco cBR 228
Bundled FPGA Images 228
Upgrading Your Cisco IOS-XE Release and FPD Image 229
Upgrading Only Your Cisco IOS-XE Release and Retaining Your Current FPD Image 229
Field-Programmable Devices 230
Upgrading FPD Images in a Production System 230
Verifying System Compatibility First 230
Using a Nonproduction System to Upgrade the Cisco cBR Series Converged Broadband Routers FPD Image 231
Optional FPD Procedures 231
Manually Upgrading FRU FPD Images 231
Upgrading Multiple FPD Images 232
Verifying the FPD Image Upgrade Progress 232
Troubleshooting Problems with FPD Image Upgrades 232
Power Failure or Removal of a FRU During an FPD Image Upgrade 232
Performing an FPD Recovery Upgrade 233
HW-Programmable Upgrades 233
Upgrading ROMMON 234
Upgrading Uboot 235
Upgrading the Line Card Daggit Firmware 236
Upgrading Both the Line Card Daggit Firmware and the UBoot Image 237
Upgrading the Line Card PSoC Image in the Cisco cBR (Cisco IOS-XE Release 3.16.1S) 239
Upgrading the Line Card PSoC Image in the Cisco cBR (Cisco IOS-XE Release 3.16.0S) 240
Upgrading the Fan PSoC Image in the Cisco cBR 242
Upgrading Supervisor Viper Firmware in the Cisco cBR 244

Upgrading Docsis 3.0 downstream module and Docsis 3.1 downstream module 247
Upgrading DSPHY CPLD Firmware 252
Upgrading DSPHY PSoC Firmware 253
Verifying the Firmware Versions after the Upgrade 254

CHAPTER 23 Troubleshooting the Cisco cBR 255
Troubleshooting the Fan Module in the Cisco cBR 255
Troubleshooting the Power System in the Cisco cBR 257
Troubleshooting the Interface Cards in Cisco cBR Chassis 257

CHAPTER 1

What is a Cisco cBR Series Converged Broadband Router

- Introduction, page 1
- Functional Overview, page 2
- Cisco cBR-8 Converged Broadband Router, page 4
- Supervisor, page 19
- Interface Cards, page 24
- Power System, page 32
- Fan Module, page 40
- Air Filter, page 42
- Cisco IOS-XE Software, page 43
- NEBS Level 3 Compliance, page 43
- How and What to Order, page 43

Introduction

The Cisco cBR Series Converged Broadband Router (Cisco cBR) is an Edge Services platform designed for cable MSOs. It supports the RF and Data-over-Cable Service Interface Specifications (DOCSIS) interfaces of a Cable Modem Termination System (CMTS) and digital optical interfaces such as Passive Optical Networks (PON) and point-to-point Ten Gigabit Ethernet.

The Cisco cBR supports video including both traditional MPEG video and Video over IP over DOCSIS (VDOC). The advantage of Cisco cBR is the ability to support MPEG video and VDOC in the same platform allowing transition from MPEG to VDOC. The Cisco cBR is a single device that manages the entire RF spectrum of the cable plant.

The Cisco cBR provides high-speed data, broadband, and IP telephony services to residential and commercial subscribers using cable modems or digital set-top boxes (STBs). It supports data and digitized voice connectivity over a bidirectional cable television and IP backbone network. And uses advanced quality of service (QoS)

techniques to ensure that real-time traffic such as voice can be reliably delivered, while still transmitting other traffic on a best-effort basis.

The Cisco cBR concentrates traffic from two-way DOCSIS-based cable modems and STBs that is transmitted over the coaxial cable television (CATV) network, and presents that traffic to local and remote Internet Protocol (IP) hosts over its high-speed network uplink interfaces.

The Cisco cBR runs on the Cisco IOS-XE networking software and supports the most advanced networking and routing options.

Functional Overview

The Cisco cBR provides the following network solutions:

- High speed data access over DOCSIS
- Video over DOCSIS
- Voice services over DOCSIS
- Business services over DOCSIS
- MPEG transport-based video distribution
- Videoscape management system integration
- Data plane optimization to carry ABR traffic including monitoring of quality of service
- Assistance with the support of legacy devices in a Videoscape environment
- Video cache integration

The path from the Cisco CMTS to the cable modem or STB is the downstream, which carries the majority of traffic over the cable interface.

The path from the cable modem or STB to the Cisco CMTS is the upstream, and it carries approximately 10 percent of the traffic that is sent over the downstream.

A large number of users can be assigned to the same downstream, and for efficient use of bandwidth, those users can be split among several different upstream.

The following sections contain information about:

Upstream Data Path

The following example describes the upstream data path.

1. A request for service is generated by a subscriber. The modem transmits the request as a series of packets to the Cisco CMTS on the upstream.
2. The cable line card receives the packets on its upstream interface and forwards them to its onboard processor.
3. The line card processor verifies the header check sequence (HCS), frame check sequence (FCS), and system identification number (SID), processes all fields in the DOCSIS MAC header, and then removes the header.

   a. The line card examines and processes the extended headers (Request, Acknowledgment, Privacy, PHSs and Unsolicited Grand Synchronization header elements). If Baseline Privacy Interface (BPI) is used, the processor also decrypts the Privacy EH frames using the appropriate key.
   b. Bandwidth requests, acknowledgment (ACK) requests, and unsolicited grant syncs are reformatted and passed to the request ring of the Cisco cable line card.
   c. The DOCSIS MAC header is removed and another header is added, which includes the SID, the upstream port information, and status bits that indicate whether any errors were detected.

4. The packet is sent across the backplane to the forwarding processor (FP) or the routing processor (RP) on the route processor.
5. The route processor performs packet operations such as access list processing, classification, switching, and QoS. It is also where major routing and IOS management functions (filtering) are run.
6. The packet is moved to the correct output queue and transmitted over the backplane to the network uplink card (Ten Gigabit Ethernet) or another cable interface line card.
7. The output card forwards the packet to the next interface point.

Downstream Data Path

The following example describes the downstream data path.

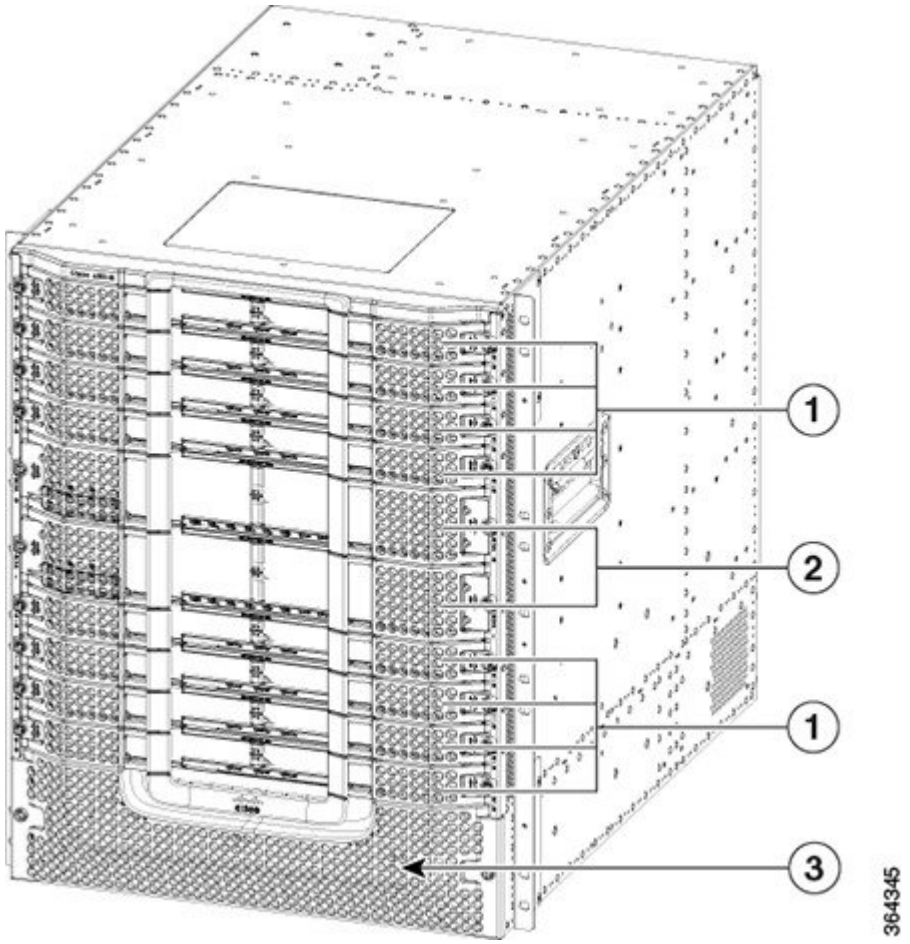
1. Data packets from the Internet are received by the network uplink cards (Ten Gigabit Ethernet).
2. The packets are forwarded to the forwarding processor (FP) on the Supervisor module.
3. The FP performs MAC classification to determine the type of frame or packet to be processed.
4. The route processor performs access list filtering, policing, and marking.
5. The route processor performs a forwarding information base (FIB) lookup and rewrite.
   a. The rewrite consists of a downstream header and 802.3 MAC header.
   b. The downstream header contains destination primary SID, physical DS port number, PHS rule index, and some control bits and other fields.
   c. The packet is policed, shaped, and prepared for queueing. Queueing is based on the priority of the queue and the state of the flow bits from the card. The destination card address (port) is pre-appended on the header of the packet being transmitted.
6. The packet is transmitted over the backplane to the appropriate cable interface line card.
7. The cable interface line card receives the packet and forwards it to all the ASICs on the line card.
   a. Each ASIC decodes the header to determine if the packet is destined for one of the downstream ports on that card. If so, the downstream header is removed and the 802.3 MAC header is saved.
   b. The MAC header is processed to determine how to build the DOCSIS MAC header and what operations to perform on the packet. These might include pre-appending the DOCSIS MAC header, computing the HCS and FCS, performing Packet Header Suppression, and BPI encryption.
8. After the packet is ready, it is immediately transmitted on the downstream.

Cisco cBR-8 Converged Broadband Router

The Cisco cBR-8 Converged Broadband Router (Cisco cBR-8) is a 13 rack unit (RU) chassis. It supports multiple card modules and is designed with back-to-back midplanes; a front facing Digital Midplane and a rear facing RF Midplane.

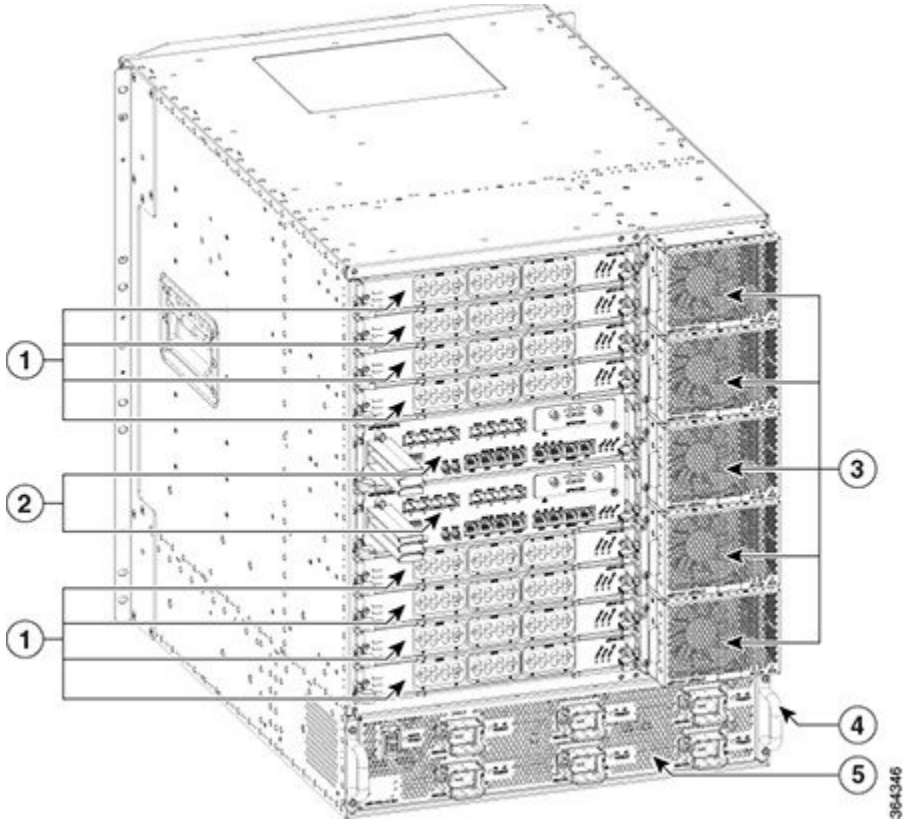
The front card modules plug into the Digital Midplane and the associated Physical Interface Card (PIC) plugs into the rear of the chassis. All permanent connections to the Cisco cBR-8 chassis are made at the rear.

Figure 1: Chassis Front View



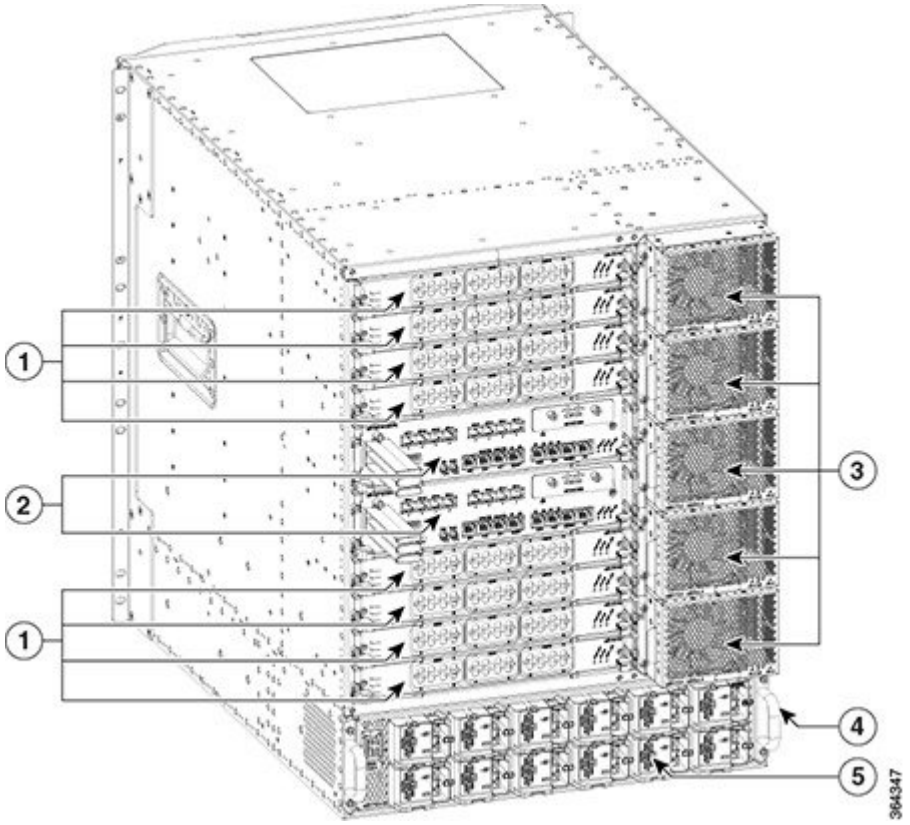
1	RF Line Cards	3	Front Power Entry Bezel
2	Supervisor Cards		

Figure 2: Chassis Rear View with AC FPEM



1	RF Line Card PIC	4	Lifting Handle
2	Supervisor PIC	5	AC FPEM
3	Fan Module		

Figure 3: Chassis Rear View with DC FPEM



1	RF Line Card PIC	4	Lifting Handle
2	Supervisor PIC	5	DC FPEM
3	Fan Module		

The Cisco cBR-8 chassis supports:

- Two Supervisor Cards
- Two Supervisor PICs
- Eight Cisco cBR line cards
- Eight Cisco cBR RF PIC cards (seven when the chassis is configured in protect mode)
- One or more Cisco cBR RF PROT PIC cards (when the chassis is configured in protect mode)
- Six DC Power Modules with redundant input feeds or six AC Power Modules
- One Cisco cBR DC FPEM or one Cisco cBR AC FPEM

- Five Fan Modules

Physical Description

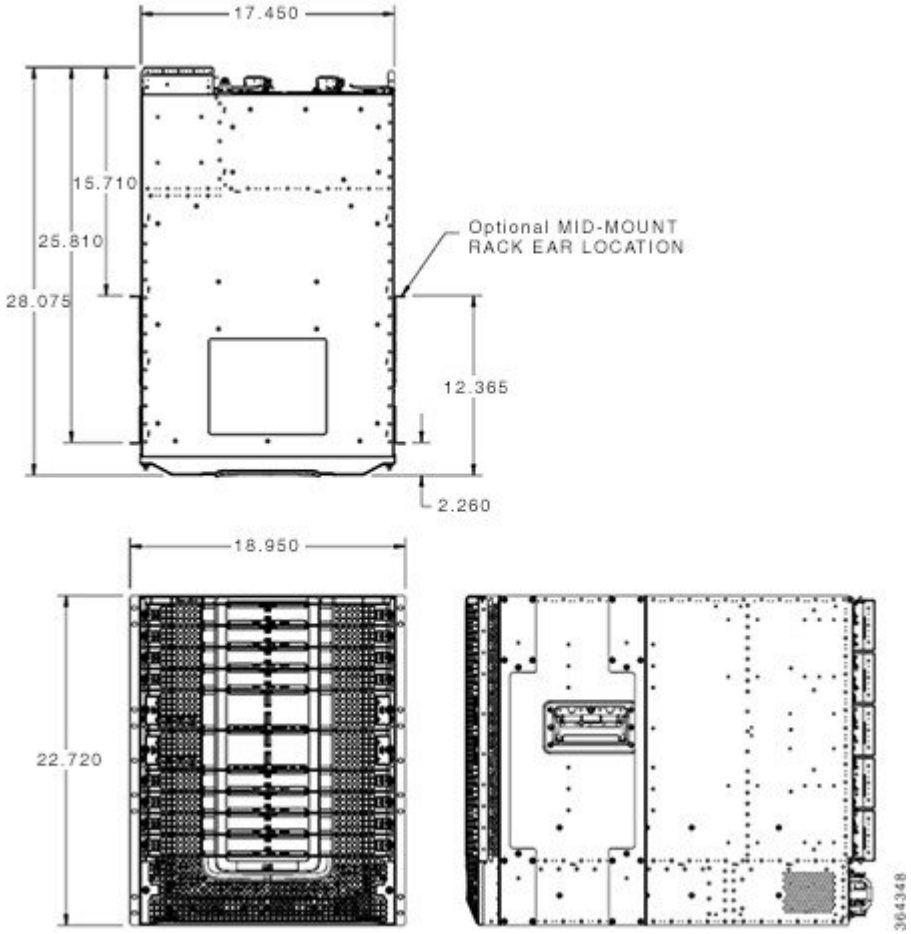
Table 1: Cisco cBR-8 Chassis Physical Description Summary

Parameter	Description
Height	13RU (22.75 in./57.78 cm)
Width	17.45 in. (44.32 cm) without rack mounts 17.65 in. (44.83 cm) with rack mounts
Overall Depth	28.075 in. (71.3 cm)
Weight	429 lb (195 kg) maximum fully loaded
Airflow	Front-to-back

Cisco cBR-8 Chassis Dimensions

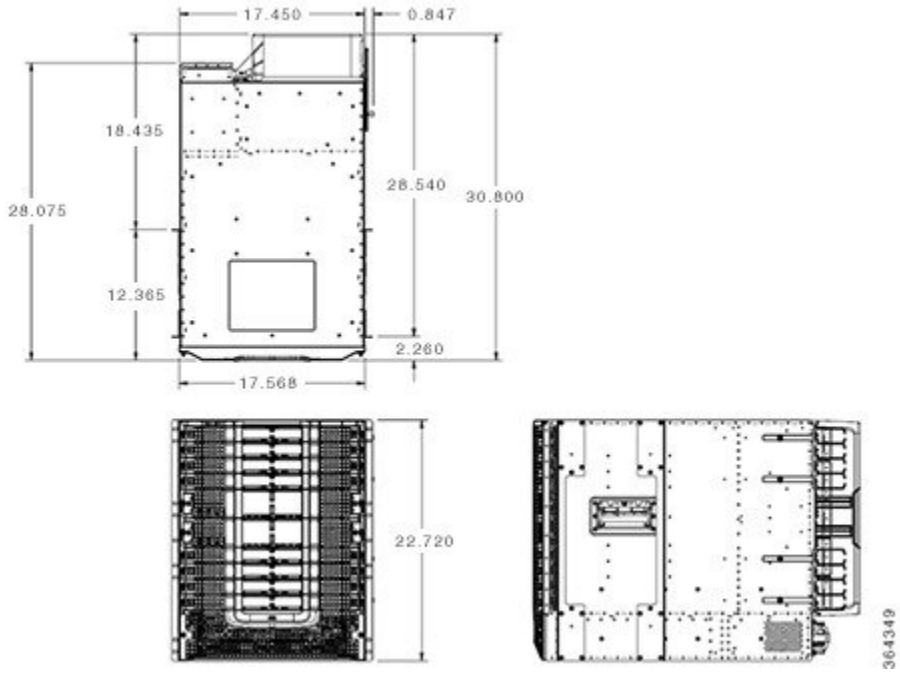
The below image shows the basic dimensions of the Cisco cBR-8 chassis.

Figure 4: Basic Dimension



The below image shows the overall dimensions of the Cisco cBR-8 chassis with optional cable management and rear door cable protection.

Figure 5: Overall Dimension



Cisco cBR-8 Chassis Features

Digital Midplane

The Digital Midplane provides connectivity between various components in the chassis. It provides the interconnect between the supervisors and all the interface slots. This interconnect includes differential pairs used for ESI data plan links, Gigabit Ethernet/Ten Gigabit Ethernet control plane links, timing and single-ended signals used for status and control functions. It also has connections for status and control of PICs, the power shelf, and the fan modules.

RF Midplane

The RF midplane interconnects all RF-capable slots to allow backup RF line cards to send and receive RF signals to and from an active RF line card PIC. It is designed to support a maximum of 24 RF ports on a PIC with all ports carrying signals with frequency content up to 1.2 GHz. It supports downstream, upstream, and a mixture of both.

Rear Door (Optional)

The rear door provides protection to the PIC cables.

Lifting Handles

The Cisco cBR-8 chassis has four handles available for lifting. It is recommended to remove all circuit cards before attempting to install the chassis in a rack, but at a minimum, the front Supervisors and line cards should be removed before lifting the chassis with the available handles.

The accessory kit that ships with the chassis includes rack mount rails. These can be pre-assembled in the rack to help slide the chassis into place. An optional front mounted lifting handle is also available to help with chassis installation.

Rear Cable Connectivity

All permanent facility cabling is on the rear of the chassis. Connectors on the PICs provide connectivity to the front mounted Supervisors and line cards.

Front Side LED and Temporary I/O Locations

The LEDs are situated at the lower middle area on all the front mounted cards. Temporary I/O connectivity ports are available on the left side of the Supervisor Card behind a removable door in the ejector handle.

Slot Numbering—Physical and Logical

Table 2: Physical Slot Numbering on the Cisco cBR-8 Router

Component	Slot Numbering
Front and Rear Circuit Cards	Identified by a two number system. The numbers are separated by a forward slash. • The first number indicates the slot number (starting with 0 for the first slot at the top). • The second number indicates the side of the chassis. That is, 0 is for front-mounted cards and 1 is for rear-mounted cards.
Supervisor Cards	Identified as SUP0 and SUP1.
Power Supply Modules	Numbered from P0 to P5 and these map to the facility power outlet markings on the rear of the chassis.
Fan Modules	Numbered from P10 (the top fan module slot) to P14 (the bottom fan module slot).

Figure 6: Slot Numbering—Front of the Chassis With AC Power Module

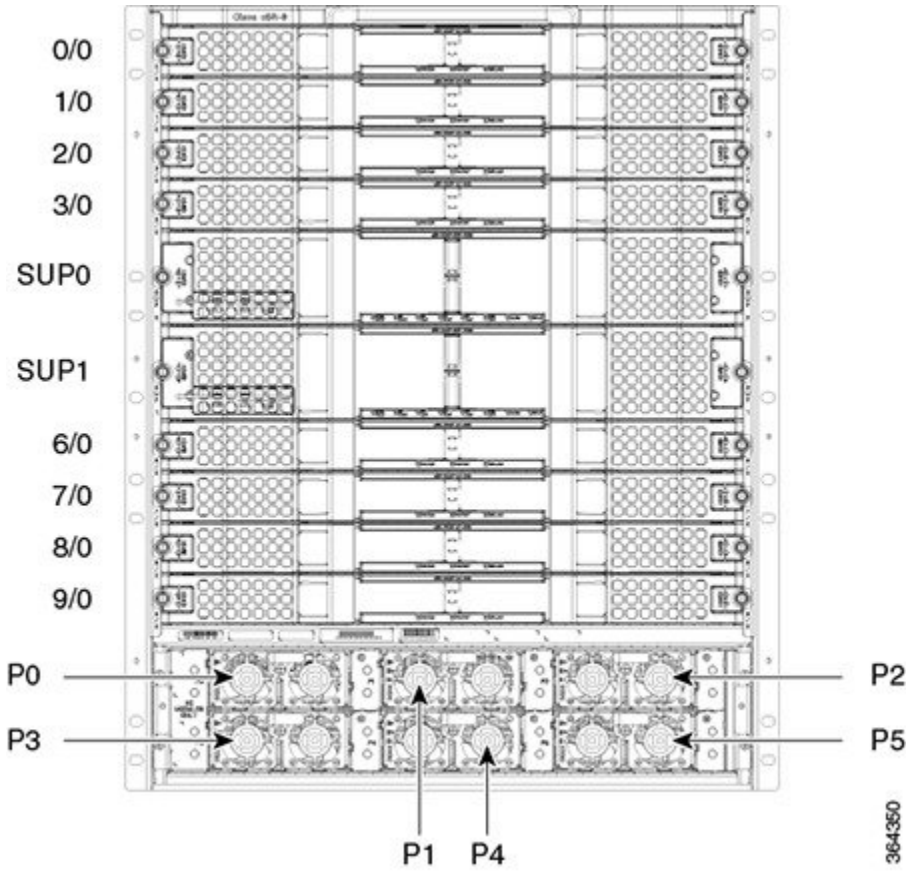


Figure 7: Slot Numbering—Front of the Chassis With DC Power Module

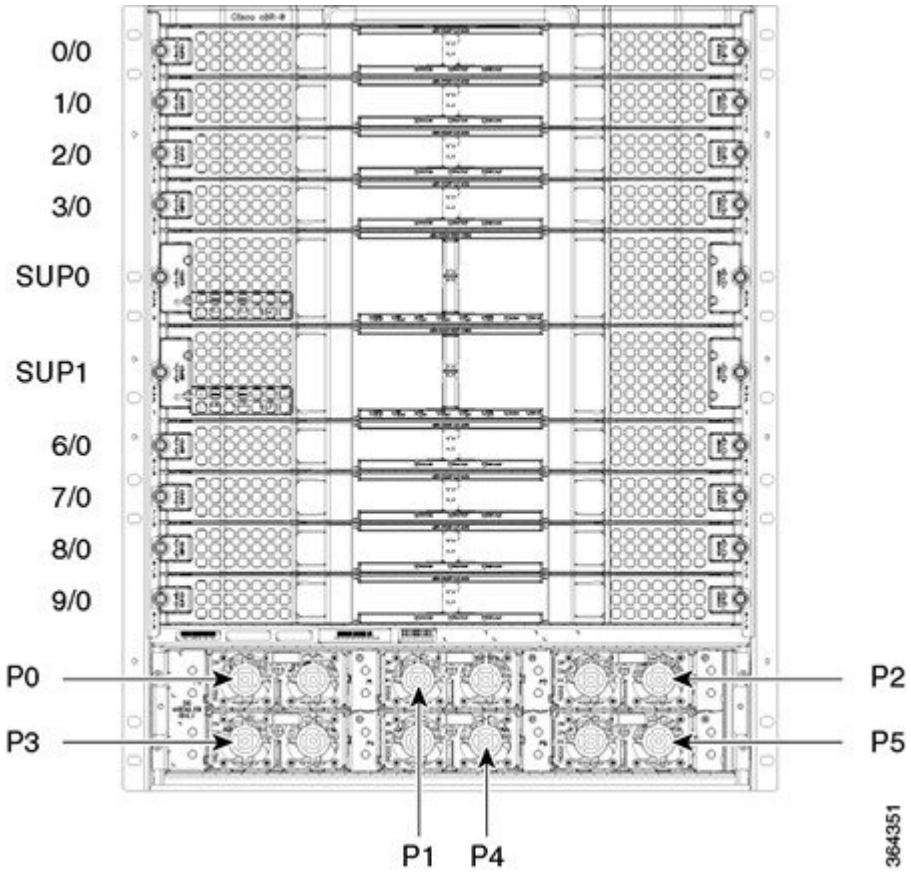


Figure 8: Slot Numbering—Rear of the Chassis With AC Power Module

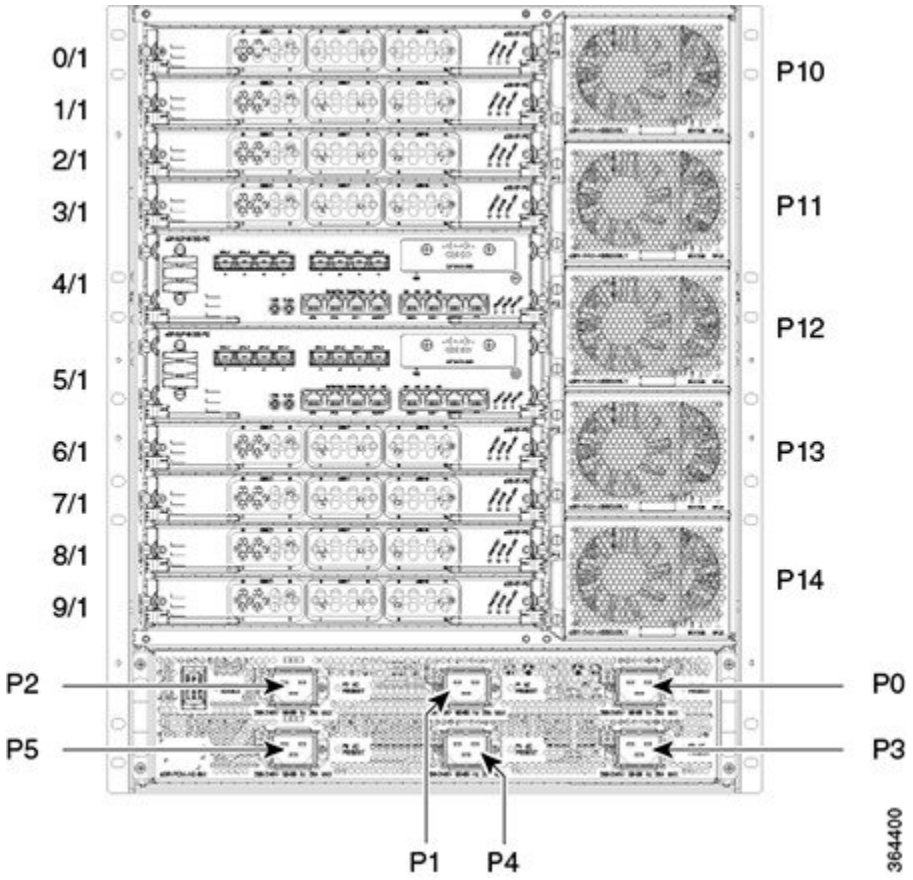


Figure 9: Slot Numbering—Rear of the Chassis With DC Power Module

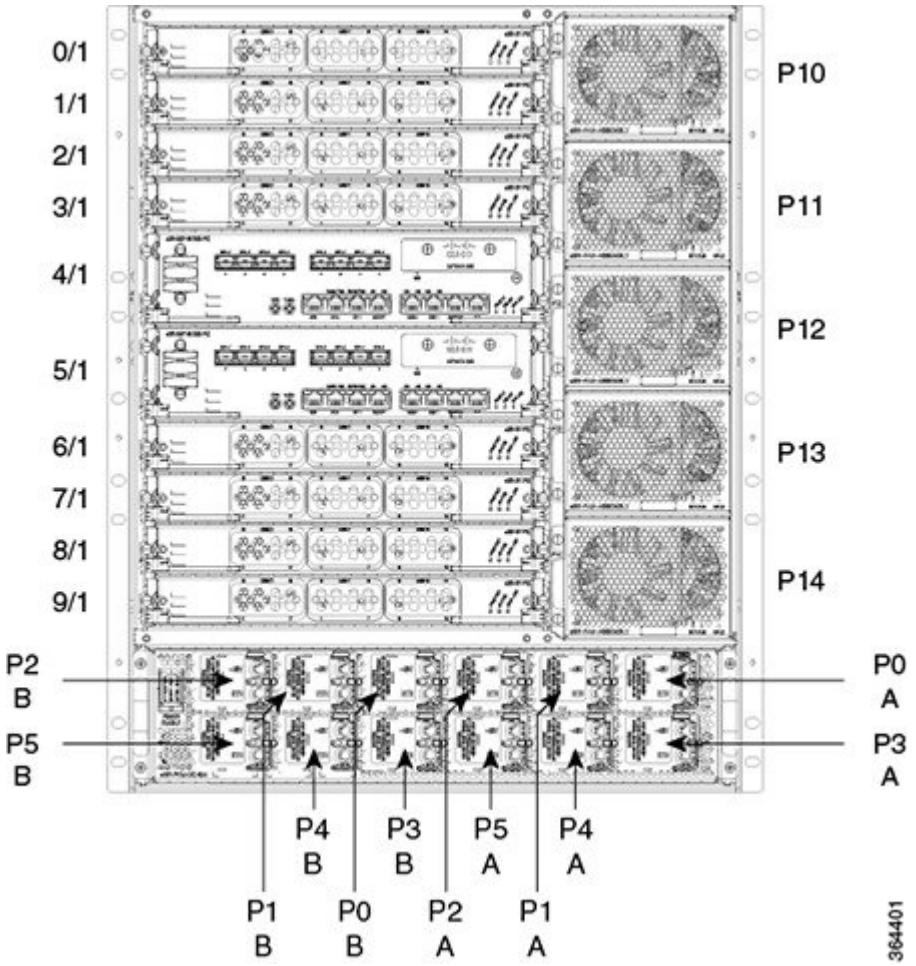


Table 3: Logical Slot Numbering on the Cisco cBR-8 Router

Variable	Component	Description	Valid Range/Values
Release—Cisco IOS-XE Release 3.15.0S			
Slot	Interface card	Slot where the interface card resides.	0 to 3 and 6 to 9
	Supervisor card	Slot where the Supervisor card resides.	4 or 5
Subslot	Interface card	Secondary slot where the interface card resides.	0
	Supervisor card	Secondary slot where the Supervisor card resides.	1

Variable	Component	Description	Valid Range/Values
Port	Interface card (downstream)	Downstream controller port on the interface card.	0 to 7
	Interface card (upstream)	Upstream controller port on the interface card.	0 to 15
	Supervisor card	Controller port on the Supervisor card.	0 to 7 (For Ten Gigabit Ethernet ports)
cable-interface-index	Interface card	MAC domain index of the interface card.	0 to 15
logical-channel-index	NA	NA	NA
rf-channel	Interface card (downstream)	RF channel number on the interface card.	0 to 127
	Interface card (upstream)	RF channel number on the interface card.	0 to 7
	Supervisor card	RF channel number on the Supervisor card.	NA
wideband-channel	Interface card	Wideband channel number on the interface card.	0 to 63
	Supervisor card	Wideband channel number on the Supervisor card.	NA

Field Replaceable Units

Table 4: Cisco cBR-8 Chassis Modules and their Function

Hardware Module	Function Description
Supervisor (SUP)	The route and forwarding processor of the system and includes integrated backhaul capability.
Supervisor PIC Slot	Provides the supervisor physical interface to the facility located on these cards.
Subscriber Side Interface Card (SSI Card)	Provides the service side functionality such as DOCSIS, Edge QAM, EPON, or other service blades.

Hardware Module	Function Description
SSI PIC	Provides the physical interface to the facility for the SSI Cards.
Downstream PHY module	DOCSIS Downstream module. There are two modules available: Downstream D3.0 module that conforms to DOCSIS 3.0 and Downstream D3.1 module that conforms to DOCSIS 3.1.
Upstream PHY module	DOCSIS Upstream module. There are two modules available: Upstream D3.0 module that conforms to DOCSIS 3.0.
Power Modules (AC or DC)	Provide power conversion, filtering, and conditioning from facility input power to the required -52V midplane power that is used within the chassis. There are specific AC and DC modules depending on the facility input voltage. The power modules provide their own cooling using internal fans.
Facility Power Entry Module (FPEM) (AC/DC)	Provides the physical hookup interface and interconnection to the power modules for either the AC or DC input voltage. The digital communication from the power modules to the digital midplane; and the power interconnect from the power modules to the midplane Bus Bar. This module is field replaceable to allow the facility to change from AC to DC or DC to AC in the future without having to replace the chassis.
Power Cassette Module	Provides the physical support and keying for the power supply modules. It is keyed with a corresponding FPEM to determine AC or DC support.
Fan Module	Provides forced air cooling for the front and rear card slots.

Table 5: Card Slot Pitch Definitions

Slot Type	Quantity and Pitch
Supervisor Slots	2 in the front of chassis on a 2.75” pitch
Supervisor PIC Slots	2 in the rear of chassis on a 2.75” pitch
SSI Card Slots	6 in the front of chassis on a 1.48” pitch

Slot Type	Quantity and Pitch
NSI/SSI Slots	2 in the front of chassis on a 1.48” pitch
SSI PIC Slots	6 in the rear of chassis on a 1.48” pitch
NSI/SSI PIC Slots	2 in the rear of chassis on a 1.48” pitch
Power Cassette Module	6 power supply bays in the front of the chassis
Facility Power Entry Module (FPEM) (AC/DC)	1 in the bottom, rear of the chassis
Fan Module	5 in the rear of the chassis on a 3.5” pitch

Table 6: Maximum Weight for Cards and Modules

Module	Maximum Weight
Supervisor Slots	26 lbs.
Supervisor PIC Slots	6 lbs.
SSI Card Slots	19 lbs.
NSI/SSI Slots	19 lbs.
SSI PIC Slots	5 lbs.
NSI/SSI PIC Slots	5 lbs.
Power Cassette Module	6 lbs.
Power Cassette (AC/DC)	17 lbs.
Facility Power Entry Module (FPEM) (AC/DC)	15 lbs.
Fan Module	4 lbs.
13RU Chassis Estimated Weight (with midplanes and Bus Bar)	85 lbs.[1]
13RU Loaded Chassis Estimated Weight (maximum)	429 lbs.

1 117 lbs. with Power Cassette Module and FPEM (recommended configuration during installation)

Table 7: Card Slot Power Allocation

Module	Maximum Power Allocated (Watts)
Supervisor Slots	930
Supervisor PIC Slots	120
SSI Card Slots	530
NSI/SSI Slots	530
SSI PIC Slots	60
NSI/SSI PIC Slots	60
Fan Module	170
Bus Bar + Midplane Loss	150
cBR-8 Total Power Allocation (power to Bus Bar from FPEM)	7820
cBR-8 Facility Power Requirement	9000

Table 8: Chassis System Module Overall Dimensional Envelopes

Module	Envelope Size (width x height x depth)
Supervisor Card	17.24” x 2.75” x 19.99”
Supervisor PIC	11.80” x 2.75” x 7.82”
SSI Card	17.24” x 1.48” x 19.99”
SSI PIC	11.80” x 1.48” x 7.82”
Fan Module	5.16” x 3.50” x 8.39”
AC FPEM	17.45” x 3.85” x 10.08”
DC FPEM	17.45” x 3.85” x 10.08”
AC Power Supply Module	4.00” x 1.60 x 16.94”
DC Power Supply Module	4.00” x 1.60 x 16.94”
Power Cassette Module	17.3" x 3.7" X 16.9"

Supervisor

The Supervisor is the processor of the Cisco cBR. It consists of a forward processor (FP) complex and route processor (RP) complex.

The FP complex performs data forwarding, baseline router packet operations including MAC classification, Layer 2 and the various Layer 3 forwarding, QoS classification, security ACLs, VPNs, policing, shaping, load balancing, and Netflow, egress packet buffering, queueing, and egress packet scheduling functions. The FP complex supports firewall, intrusion prevention, Network-Based Application Recognition (NBAR), Network Address Translation (NAT), flexible pattern matching, tunneling protocols, and header and payload compression.

The RP complex performs route processing, Cisco cBR chassis management, and runs the network operating system and its controls.

The Supervisor supports:

- Eight Ten Gigabit Ethernet backhaul interfaces.
- 1+1 active/standby redundancy.
- Chassis management of the Cisco cBR including activation and initialization of the other cards, selection and switch over of the active and standby cards, image management and distribution, logging facilities, distribution of user configuration information .
- DOCSIS Timing Interface (DTI) client and server ports.
- Online insertion and removal (OIR).

The Supervisor consists of the following field replaceable units (FRUs):

- Supervisor Card
- Supervisor physical interface card (PIC)

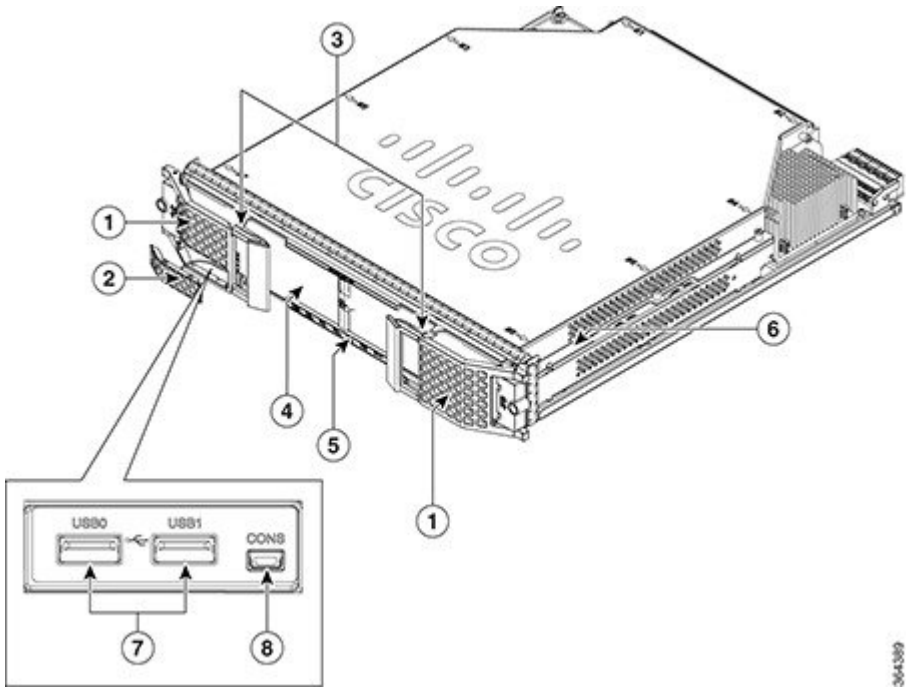
The Cisco cBR-8 supports:

- Two Supervisor Cards
- Two Supervisor PICs

Supervisor Card

The Supervisor Card is the route processor of the Cisco cBR and includes integrated backhaul capability. It is installed in the front of the Cisco cBR chassis. The plastic latch maintains the alignment of the spring-loaded ejector with the faceplate. The Supervisor Card has a tethered door to allow access to the ports on its faceplate.

Figure 10: Supervisor Card



1	Spring-loaded ejector	5	LEDs
2	Tethered I/O door	6	Support rails
3	Plastic latch	7	USB ports
4	Removable air filter	8	Console port

Table 9: Physical Specifications of the Supervisor Card

Unit	Value
Depth	20 in (50.8 cm)
Width	17.2 in (43.68 cm)
Height	2.8 in (7.11 cm)
Maximum weight	26 lb (11.79 kg)

Table 10: Ports on the Supervisor Card

Port	Description
USB ports	The Supervisor Card has two type-A USB ports. These ports are used for connecting external memory sticks or flash drives to load configurations.
Console port	The Supervisor Card has one mini type-B USB console port. This port is an asynchronous EIA/TIA-232 serial port used to connect a terminal to the Supervisor Card for local administrative access.

Note The ports on the Supervisor Card are used for temporary connections. For all permanent connections, including the console connection, you must use the ports on the Supervisor PIC installed in the rear of the chassis.

The Supervisor Card has the following LEDs:

LED	Description
PWR STAT	Power status LED
RP STAT	RP status LED
RP ACT	RP active LED
FP STAT	FP status LED
FP ACT	FP active LED
INSI ACT	iNSI active LED
ALRM	Alarm LED
RPLC	Replace LED

The router supports the following Supervisor Cards:

- CBR-CCAP-SUP-60G—Supervisor Card with 60 Gbps forwarding capacity. It supports a maximum of four interface cards, working in 3+1 protection mode, on the Cisco cBR-8 router. It supports a maximum of 72268 unicast flows or 88268 modular quality of service (MQoS) flows. The maximum number of unicast and MQoS flows supported is 88268.

Note If you are using the CBR-CCAP-SUP-60G Supervisor Card in Cisco IOS-XE Release 3.15.0S, the output of the **show inventory** command displays the CBR-CCAP-SUP-160G PID instead of the CBR-CCAP-SUP-60G PID.

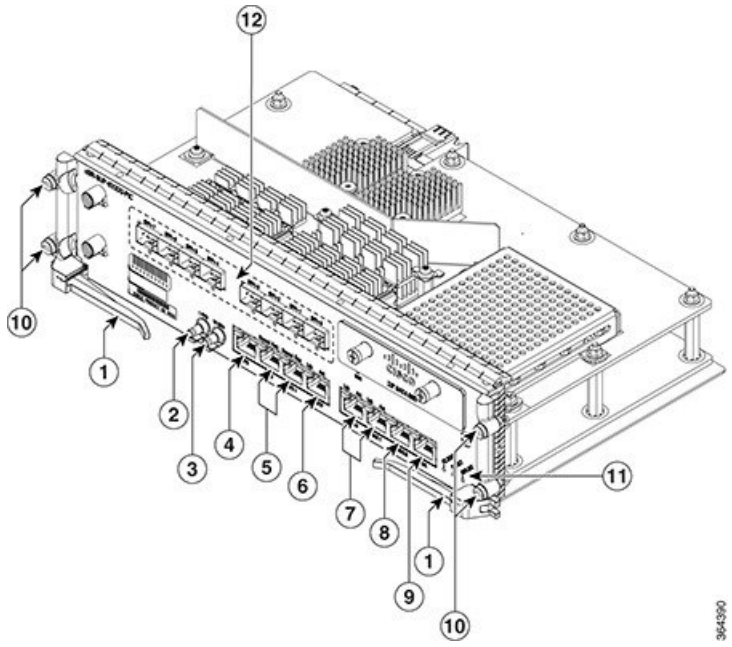
- CBR-CCAP-SUP-160G—Supervisor Card with 160 Gbps forwarding capacity. It supports a maximum of eight interface cards, working in N+1 protection mode, on the Cisco cBR-8 router.

Important Different Supervisor Cards cannot coexist on a Cisco cBR-8 router. We recommend that you install the Supervisor Cards with the same capacity in the chassis to ensure proper redundancy support.

Supervisor PIC

The Supervisor PIC provides the physical interface to the Supervisor Card. It is installed in the rear of the Cisco cBR chassis.

Figure 11: Supervisor PIC



1	Ejector lever	7	NME ports
2	Timing port (1 PPS)	8	Console port
3	Timing port (10 MHz)	9	Auxiliary port
4	GPS port	10	Captive screws

5	DTI ports	11	LEDs
6	CM/DTP port	12	SFP+ ports

Table 11: Physical Specifications of the Supervisor PIC

Unit	Value
Depth	7.82 in (19.86 cm)
Width	11.8 in (29.97 cm)
Height	2.8 in (7.11 cm)
Maximum weight	6 lb (2.72 kg)

Table 12: Ports on the Supervisor PIC

Port	Description
SFP+ ports	The Supervisor PIC has eight Ten Gigabit Ethernet SFP (SFP+) ports. These ports are used to connect it to the switch or router. These ports provide backhaul connection to the WAN network.
Timing ports	The Supervisor PIC has two timing ports, 1 PPS and 10 MHz ports, which are reserved for future use.
GPS port	The Supervisor PIC has a GPS port, which is reserved for future use.
DTI ports	The Supervisor PIC has two DTI ports. These ports are used for connecting to DTI server as a reference clock source.
CM/DTP port	The Supervisor PIC has a CM/DTP port, which is reserved for future use.
NME ports	The Supervisor PIC has two NME ports. These ports are the Gigabit Ethernet management ports. One port is used for network management and is used to connect to a switch and the other port is reserved for future use.
Console port	The Supervisor PIC has one RJ-45 console port. This port is an asynchronous EIA/TIA-232 serial port used to connect a terminal to the Supervisor PIC for local administrative access.

Port	Description
Auxiliary port	The Supervisor PIC has one auxiliary port. This port is used to connect a terminal server to the Supervisor PIC for verifying the system status.

The Supervisor PIC has the following LEDs:

LED	Description
PIC_STAT	Supervisor PIC status LED
INSI_ACT	iNSI active LED
REPLACE	Replace LED
SFP+	SFP+ module and link status LED
DTI Normal	DTI normal mode status LED
DTI Fast	DTI fast mode status LED
NME Lnk	NME module link status LED
NME Act	NME module link active LED
SSD	SSD access status LED
CM/DTP Lnk	Reserved for future use
CM/DTP Act	Reserved for future use

Interface Cards

The Cisco cBR uses two types of interface line cards - the Subscriber Side Interface (SSI) card, and the Network Side Interface (NSI) card. The SSI Card is the RF line card in the Cisco cBR router. The NSI Card provides high speed back haul capabilities in addition to the Supervisor Card. The Cisco cBR chassis has separate slots for SSI Cards and NSI Cards. The SSI Card can be inserted in an NSI Card slot. However, an NSI Card cannot be inserted into the SSI Card slot.

The front of the RF line card has spring-loaded ejectors with plastic latches, on both sides of the interface line card. The plastic latch maintains the spring-loaded ejector's alignment with the faceplate.

The line cards have perforated grill faceplate that allow air flow into the card. There is a removable filter in the front panel of the line card. This filter filters the air flowing into the chassis through the perforated grill faceplate.

All interface cards in the Cisco cBR-8 chassis are designed for High Availability (HA) with a N+1 redundancy scheme. The Cisco cBR-8 supports the following interface cards:

- Interface Line Card (SSI Card or RF line card)—The RF line card provides the service side functionality such as DOCSIS, Edge QAM, EPON, or other service blades.
- RF Through PIC—Connects to the RF line card. This PIC provides the physical interface to the facility for the RF line card.
- RF Protect PIC—Provides connection of the redundant RF line card to the appropriate RF Through PIC.

The RF line card (SSI Card) supports the following:

- 768 downstream QAM channels
- 96 upstream channels.

The Interface Line Card

The number of interface or RF line cards supported on the Cisco cBR-8 chassis is described as follows:

- The CBR-CCAP-SUP-60G—Supervisor Card supports a maximum of four interface cards, working in 3+1 protection mode.
- The CBR-CCAP-SUP-160G—Supervisor Card supports a maximum of eight interface cards, working in N+1 protection mode.

For more details on the supported Supervisor cards and the corresponding number of RF line cards, see the overview of the Supervisor.

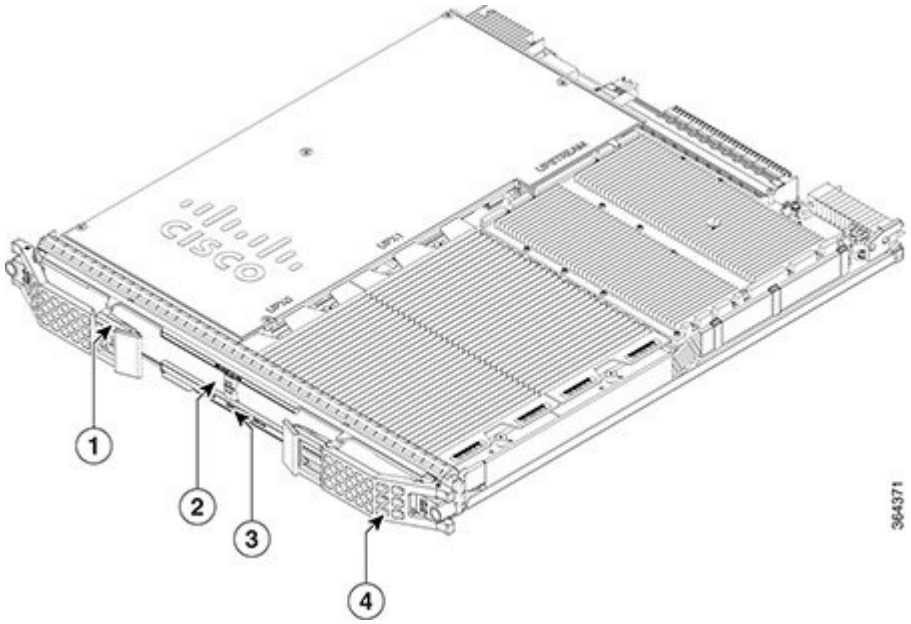
The interface or RF line card is paired with an RF Physical Interface Card (RF Through PIC or RF Protect PIC). The SSI Card supports up to two downstream upconverter PHY modules and one upstream PHY module. SSI Card can be installed in an SSI Card slot or an NSI Card slot.

The Cisco cBR chassis supports the following SSI Cards or RF line cards:

- SSI Card with two downstream D3.0 modules and one upstream D3.0 module installed. [PID: CBR-LC-8D30-16U30]

- SSI Card with two downstream D3.1 modules and one upstream D3.0 module installed. [PID: CBR-LC-8D31-16U30]

Figure 12: Interface Line Card



1	Plastic latch	3	LEDs
2	Removable Filter	4	Spring-loaded ejector

Table 13: Physical Specifications of Interface Line Card

Unit	Value
Depth	20 in (50.8 cm)
Width	17.2 in (43.7 cm)
Height	1.5 in (3.8 cm)
Maximum Weight	19 lbs (8.61 kg)

Table 14: Ports in the Interface Line Card

Ports	Description
Downstream ports	The SSI Card has 8 downstream ports. These ports support downstream DOCSIS and MPEG traffic on the downstream upconverter (UPX) modules.
Upstream DOCSIS ports	The SSI Card has 16 upstream DOCSIS ports. These ports support upstream DOCSIS traffic on the upstream PHY module.

The line card has the following LEDs:

LED	Description
STATUS	Status of the card.
PROTECT	Protect configuration status of the card.
REPLACE	Indicates if the card must be replaced.

NSI Card

The NSI Card is the backhaul interface card that provides high speed backhaul capability. It is paired with a NSI PIC.

Note NSI Card is not currently supported in the Cisco cBR router.

Interface Line Card Blank

Apart from the operational interface line cards, an interface line card blank (line card blank) is installed in any empty unused line card slot, to ensure proper airflow within the operational chassis.

Line Card Bandwidth

Release	Line Card	Bandwidth on SUP-160G
Cisco IOS-XE Release 3.15.0S	SSI (RF line card)	
	NSI (Backhaul card)	
Cisco IOS-XE Release 3.16.0S	SSI (RF line card)	
	NSI (Backhaul card)	

Release	Line Card	Bandwidth on SUP-160G
Cisco IOS-XE Release 3.17.0S	SSI (RF line card)	
	NSI (Backhaul card)	

Protect Zone

To configure N+1 redundancy, the interface line card installed in the uppermost slot is configured as the Protect line card with the RF Protect PIC installed in the corresponding PIC slot. The working line cards and the RF Through PIC cards installed successively below the Protect line card and PIC card form a Protect Zone. The following are the restrictions for the Protect Zone:

- Each protect zone has one RF Protect PIC card at the top with a set of RF Through PIC cards installed successively below the protect line card.
- A PIC card blank should not be installed within a protect zone. It is not necessary to have a line card in every slot of a protect zone.
- If another line card is configured as a Protect line card, then it forms a separate Protect Zone with the successive working line cards below it.
- Every Protect line card must have an RF Protect PIC installed in the corresponding PIC slot in the rear of the chassis.

Downstream PHY Module

Each interface line card supports two downstream PHY modules. The Cisco cBR chassis supports the following downstream PHY module versions:

- Downstream D3.0 (supporting DOCSIS 3.0). [PID: CBR-D30-DS-MOD]
- Downstream D3.1 (supporting DOCSIS 3.1). [PID: CBR-D31-DS-MOD]

Note The Downstream D3.1 module has a green label on it.

The following limitations are applicable to the downstream PHY modules:

- All interface line cards in the chassis must have the same downstream PHY module version; that is all D3.0 or D3.1 modules.
- In an interface line card, both the downstream PHY modules must be the same version; that is both D3.0 or both D3.1 modules.
- The downstream D3.1 modules are supported only with the Cisco IOS-XE Release 3.16.0S and later releases.
- If the downstream D3.1 modules are installed with the Cisco IOS-XE Release 3.15.0S, the downstream D3.1 modules will boot up, but not function properly.
- With the Cisco IOS-XE Release 3.16.0S, the downstream D3.1 module provides operational readiness for the implementation of DOCSIS 3.1 functions and features.

Upstream PHY Module

Each interface line card supports one upstream PHY module. The Cisco cBR chassis supports the following upstream PHY module versions:

- Upstream D3.0 (supporting DOCSIS 3.0). [PID: CBR-D30-US-MOD]
- Upstream D3.1 (supporting DOCSIS 3.1). [PID: CBR-D31-US-MOD]

Note The Upstream D3.1 module has a green label on it.

The following limitations are applicable to the upstream PHY modules:

- All interface line cards in the chassis must have the same upstream PHY module version; that is all D3.0 or D3.1 modules.
- The upstream D3.1 module is supported only with the Cisco IOS-XE Release 3.18.0S and later releases.
- If the upstream D3.1 modules are installed with the Cisco IOS-XE Release 3.17.0S, the upstream D3.1 modules will boot up, but not function properly.
- With the Cisco IOS-XE Release 3.18.0S, the upstream D3.1 module provides operational readiness for the implementation of DOCSIS 3.1 functions and features.

RF PICs

The RF PICs are installed into the rear of the Cisco cBR chassis. The Cisco cBR-8 chassis uses only PICs that support the SSI Cards.

Note NSI PIC is not currently used in Cisco IOS-XE 3.15.0S Release.

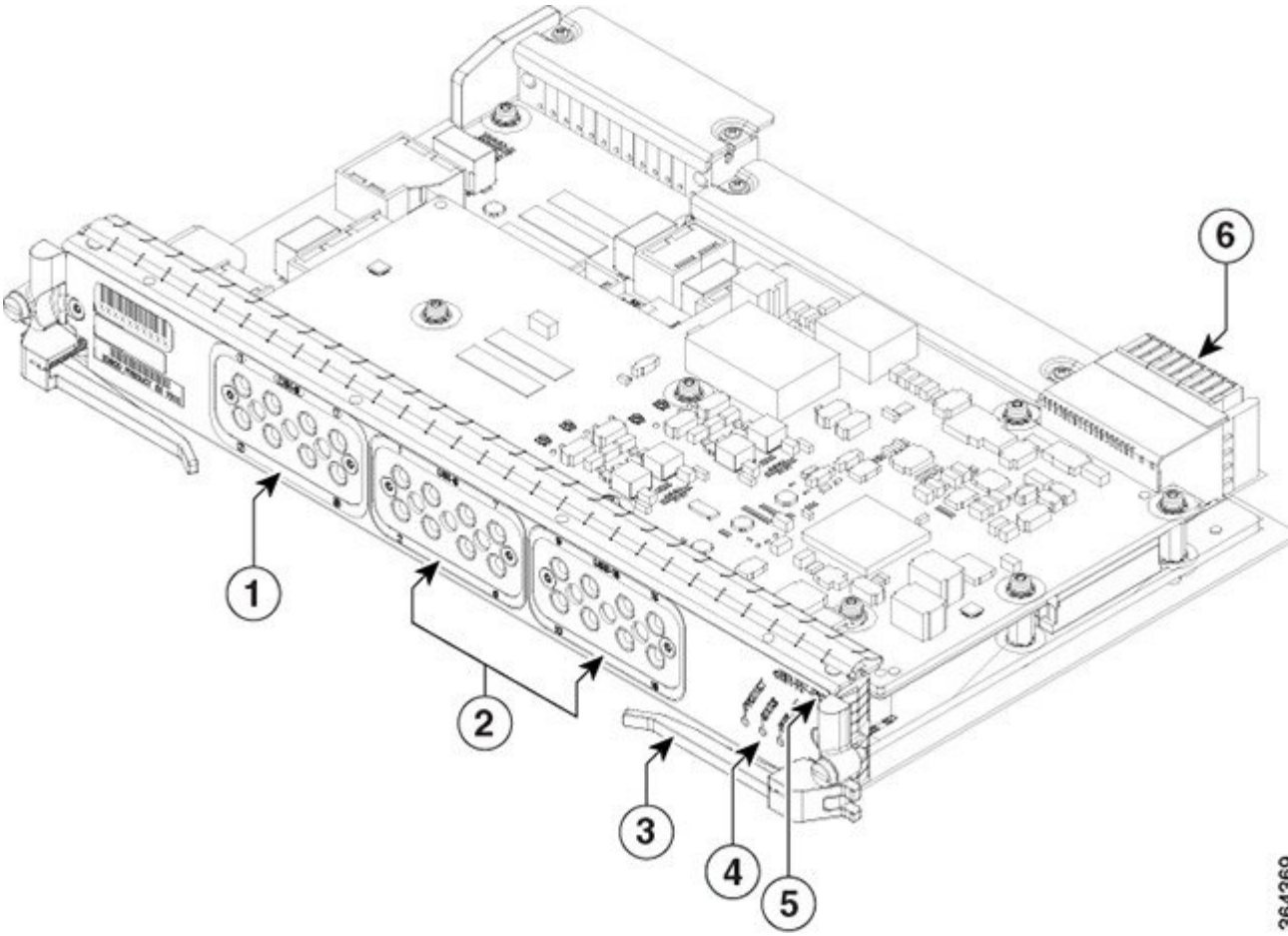
The RF PICs support only the PHY and interface connections for the interface line cards. The following are the two types of RF PICs used in the Cisco cBR chassis:

- RF Through PIC
- RF Protect PIC

RF Through PIC

The RF Through PIC connects to the line cards on the digital and RF midplanes, and provides downstream and upstream physical connectivity. It connects to the line card.

Figure 13: RF Through PIC



1	Downstream ports DS0 to DS7	4	LEDs
2	Upstream ports US0 to US7 and US8 to US15	5	Product Identifier (PID)
3	Ejector Lever		

Table 15: Physical Specifications of the RF PICs

Unit	Value
Depth	7.8 in (19.8 cm)
Width	11.8 in (30 cm)

Unit	Value
Height	1.5 inch (3.8 cm)
Maximum Weight	5 lbs (2.26 kg)

The RF Through PIC has the following ports:

Ports	Description
DS0 to DS7	The RF Through PIC has eight 1.2 GHz RF connector ports that provide downstream channel connectivity.
US0 to US7 and US8 to US15	The RF Through PIC has sixteen 200 MHz RF connector ports that provide upstream channel connectivity.

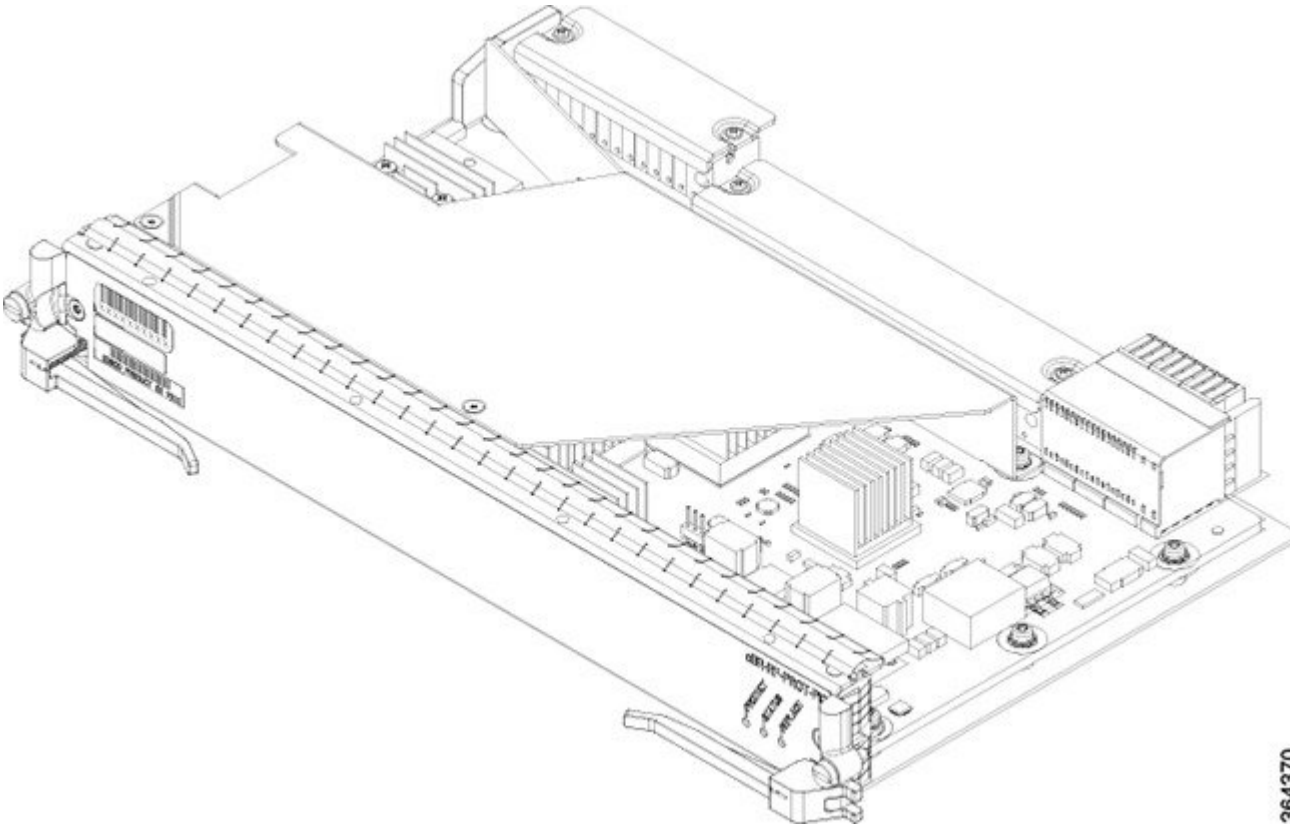
The RF PICs have the following LEDs:

LED	Description
STATUS	Status of the card.
PROTECT	Protect configuration status of the card.
REPLACE	Indicates if the card must be replaced.

RF Protect PIC

The RF Protect PIC provides redundancy support for the N+1 high availability features, to the RF Through PICs in the chassis. It has only the LEDs on its faceplate. It does not have the downstream and upstream ports.

Figure 14: RF Protect PIC



PIC Blank

Apart from the operational RF PICs, a PIC blank is installed in any empty unused PIC slot, to ensure proper airflow within the operational chassis.

Refer to the FRU list and the ordering information for more information.

Power System

The Cisco cBR chassis is powered using AC or DC power inputs. The power system consists of the following modules:

- Power Cassette Module
- AC or DC Facility Power Entry Modules (FPEM)
- AC or DC Power Modules

The Cisco cBR power system supports:

- Load sharing between the Power Modules

- N+1 redundancy for the DC power systems, and N+1 or 1+1 redundancy for the AC power systems
- Online Insertion and Removal (OIR)

The Cisco cBR-8 Converged Broadband Router (cBR-8) supports:

- One Power Cassette Module
- One FPEM
- Six Power Modules

Redundancy

- For the DC-powered Cisco cBR with N+1 redundancy, the chassis must have at least five operational DC Power Modules to be functional.

Note The DC-powered Cisco cBR allows A and B inputs to each DC Power Module to support separate A and B facility feeds. However, only one feed is necessary to support full power operation.

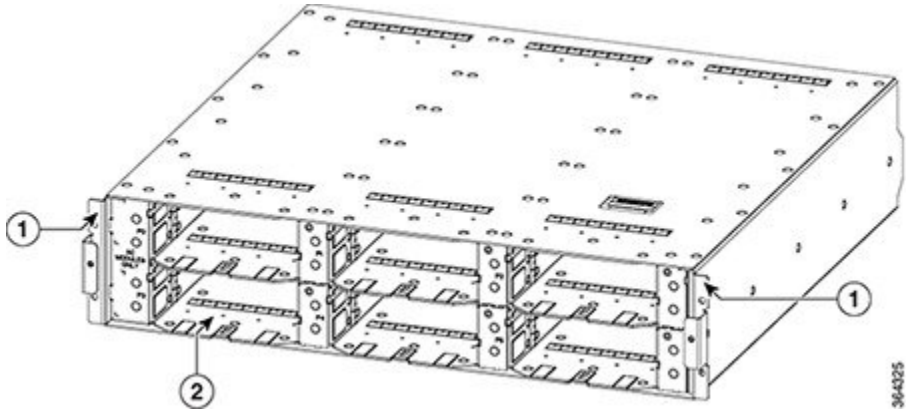
- For the AC-powered Cisco cBR with N+1 redundancy, the chassis must have at least four operational AC Power Modules to be functional.
- For the AC-powered Cisco cBR with 1+1 redundancy, the chassis must have six operational AC Power Modules to be functional.

Power Cassette Module

The Power Cassette Module provides the physical support and keying for the Power Modules. It is keyed with a corresponding FPEM to determine AC or DC support.

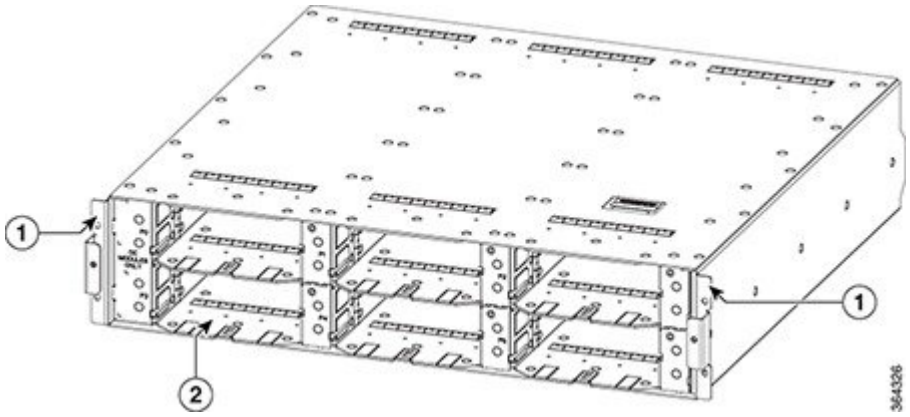
This module is installed in the front of the Cisco cBR chassis.

Figure 15: AC Power Cassette Module



1	Mounting flange	2	AC Power Module bay

Figure 16: DC Power Cassette Module



1	Mounting flange	2	DC Power Module bay

Table 16: Physical Specifications of the Power Cassette Module

Unit	Value
AC Power Cassette Module	
Depth	16.9 in (42.92 cm)
Width	17.3 in (43.94 cm)
Height	3.7 in (9.4 cm)
Maximum weight	17 lb (7.7 kg)
DC Power Cassette Module	
Depth	16.9 in (42.92 cm)
Width	17.3 in (43.94 cm)
Height	3.7 in (9.4 cm)
Maximum weight	17 lb (7.7 kg)

The Power Cassette Module supports six Power Modules. The front Power Module slots are numbered from P0 to P5 on the Power Cassette Module and these designations map to the facility power outlet markings on the rear of the chassis.

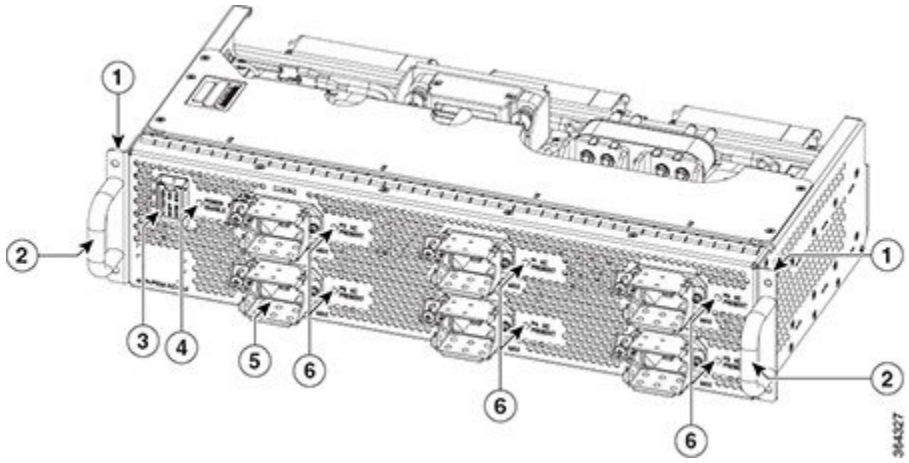
FPEM

The FPEM provides the following:

- Physical interface and interconnection to the Power Modules for either AC or DC input voltage.
- Digital communication from the Power Modules to the digital midplane.
- Power interconnection from the Power Modules to the midplane bus bar.

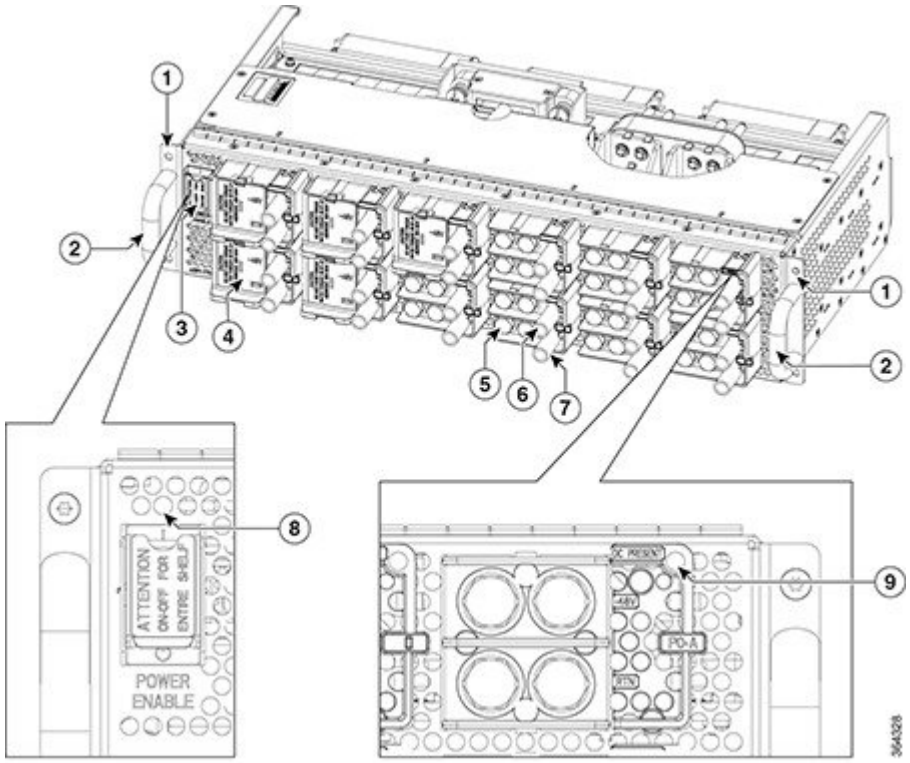
The FPEM is installed in the rear of the Cisco cBR chassis. It is field replaceable to allow the facility to change from AC to DC power, or vice versa, without replacing the chassis.

Figure 17: AC FPEM



1	Mounting flange	4	Power Enable LED
2	Handle	5	AC power input connector
3	Power switch	6	P0 through P5 AC PRESENT LEDs

Figure 18: DC FPEM



1	Mounting flange	6	Negative lead
2	Handle	7	Positive lead
3	Power switch	8	Power Enable LED
4	Terminal block cover	9	DC Present LED
5	Terminal bolt		—

Table 17: Physical Specifications of the FPEM

Unit	Value
AC FPEM	
Depth	10.08 in (25.6 cm)
Width	17.45 in (44.32 cm)

Unit	Value
Height	3.85 in (9.78 cm)
Maximum weight	15 lb (6.8 kg)
DC FPEM	
Depth	10.08 in (25.6 cm)
Width	17.45 in (44.32 cm)
Height	3.85 in (9.78 cm)
Maximum weight	15 lb (6.8 kg)

Both AC and DC FPEMs have a power switch to enable power to the entire Cisco cBR chassis.

The AC FPEM has the following LEDs:

- POWER ENABLE—Power status LED
- P0 AC PRESENT through P5 AC PRESENT—Input AC power status LED for the corresponding AC Power Module

The DC FPEM has the following LEDs:

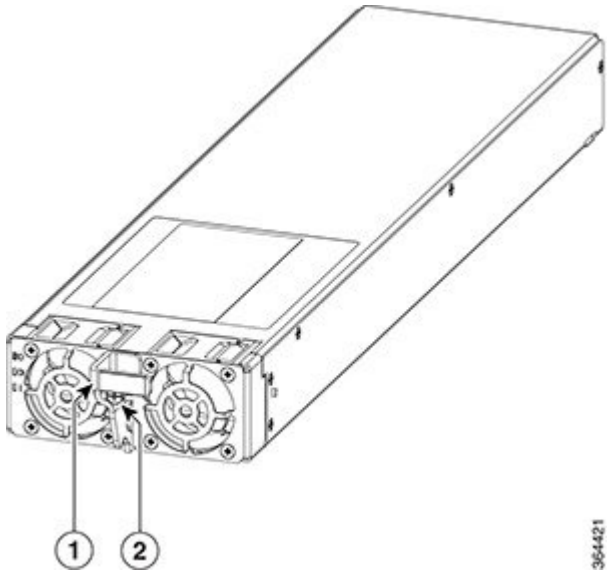
- POWER ENABLE—Power status LED
- DC PRESENT—Input DC power status LED for each terminal block

Power Module

The Power Modules provide the power conversion, filtering, and conditioning from facility input power to the required -52 V midplane power that is used within the chassis. Both AC and DC Power Modules are available depending on the facility input voltage. These modules have internal fans for cooling.

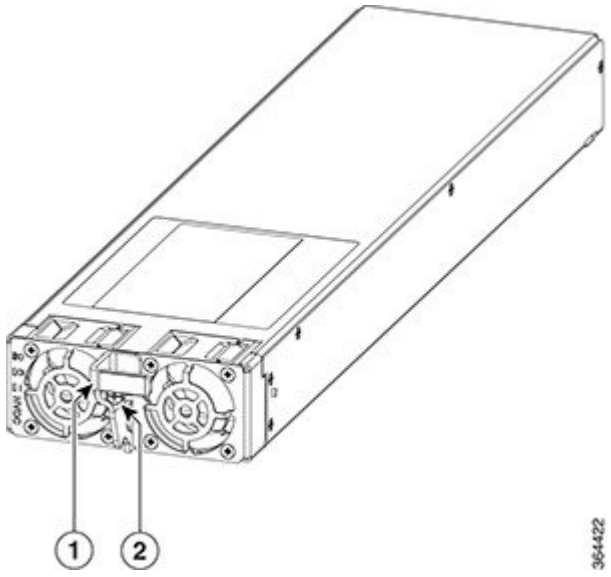
The Power Modules are installed in the front of the Cisco cBR chassis.

Figure 19: AC Power Module



1	Handle	2	Screw

Figure 20: DC Power Module



1	Handle	2	Screw

Table 18: Physical Specifications of the Power Module

Unit	Value
AC Power Module	
Depth	16.94 in (43.02 cm)
Width	4 in (10.16 cm)
Height	1.6 in (4.06 cm)
Maximum weight	6 lb (2.72 kg)
DC Power Module	
Depth	16.94 in (43.02 cm)
Width	4 in (10.16 cm)
Height	1.6 in (4.06 cm)
Maximum weight	6 lb (2.72 kg)

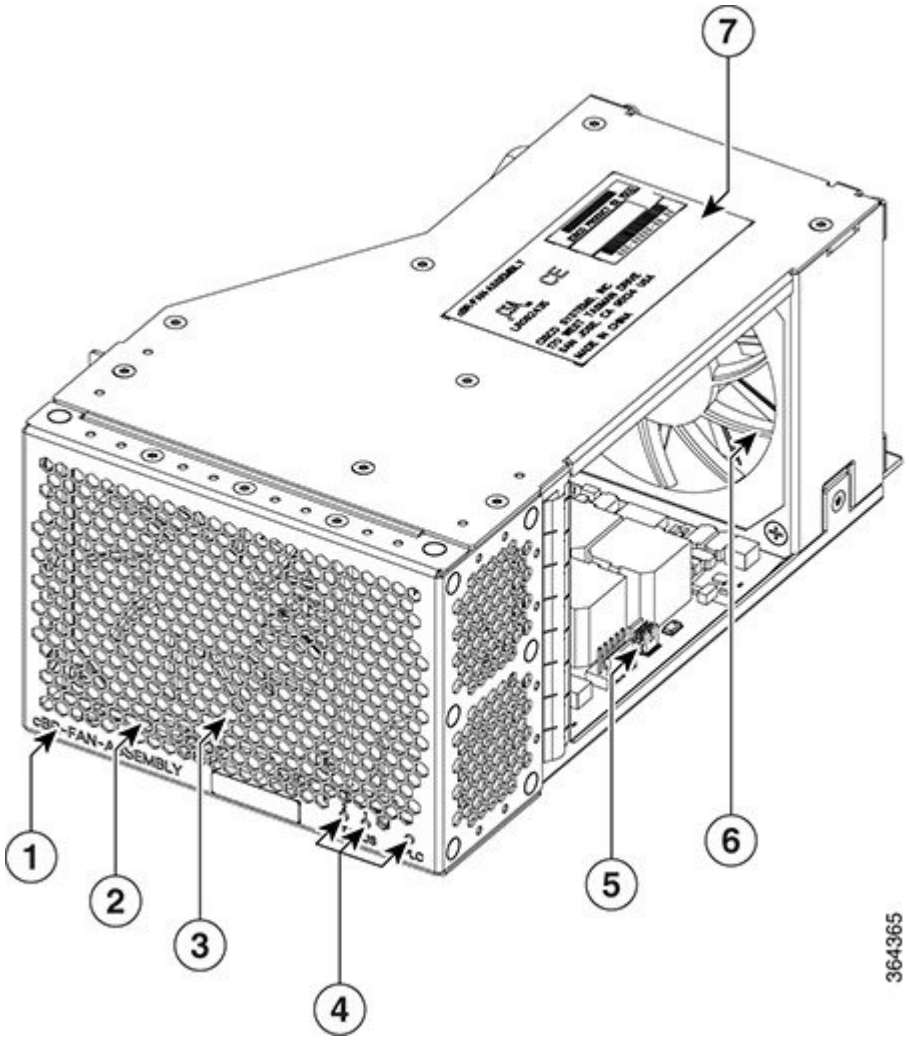
Both AC and DC Power Modules have the following LEDs:

- Input power LED—Power input status LED
- Output power LED—Power output status LED
- Fault LED—Fault status LED

Fan Module

The Cisco cBR-8 router has multiple modular Fan Modules installed in the rear to supply cooling air and have five Fan Module bays in the rear of the chassis. The bays are numbered from P10 to P14.

Figure 21: Fan Module



1	Product Identifier (PID)	5	Control Panel
2	Front Grille Panel	6	Rear Fan
3	Front Fan	7	PID label
4	LEDs		—

Each Fan Module has two fans and a control board. The fans in each Fan Module are synchronized and operate at variable speeds as set by the Supervisor. Fan speeds are determined based on ambient temperature and pressure. When the chassis boots up, the operating speed of the fans is set to the default number of revolutions per minute (RPM) in unsupervised mode. The multi Fan Module cooling architecture permits only one fan failure at any time in any given Fan Module during normal operational conditions. All the remaining fans are capable of changing to full speed operation to compensate for the failed fan or module.

Each fan bay has one hinged rear door and one sliding side door which close when a Fan Module is removed for replacement. This prevents re-circulation of air which could lead to the system overheating. The multi cooling architecture permits only one fan failure at any time in any given during normal operational conditions. All the remaining fans are capable of changing to full speed operation to compensate for the failed fan or module.

Ensure that all Fan Module bays have functioning Fan Modules. If a Fan Module is removed, replace it with a functioning Fan Module within one minute of the removal in order to avoid critical thermal alarms relating to overheating of individual components.

Table 19: Physical Specifications of the Fan Module

Unit	Value
Depth	8.40 in (21.34 cm)
Width	5.20 in (13.20 cm)
Height	3.50 in (8.89 cm)
Weight	4 lbs (1.81 kg)

The faceplate of the Fan Module has the following LEDs:

LED	Description
STATUS 1	Status of the rear fan that faces inside the chassis.
STATUS 2	Status of the front fan that faces outside the chassis.
RPLC	Failure and replacement status of the Fan Module.

Cooling System of the Cisco cBR Chassis

The Fan Modules in the Cisco cBR chassis are controlled by the Supervisor Card. Until the Supervisor Card boots up, the fans spin at default speed of 11000 RPM. After Supervisor Card boot-up, the Supervisor Card controls the fan speeds, based on the temperature of the air entering the chassis and the barometric pressure reported by the sensors in the Fan Modules.

Failure Responses and Fan Speed Variations

The fan module will change speed based on the following conditions:

- When communication with the Supervisor Card is lost, both the fans in the Fan Module are set the 11,000 RPM default speed mode until communication is established. If the fans were running above 11,000 RPM default when communication was lost, the fans continue to operate at the elevated speeds until they are power cycled.
- If a fan is considered to have failed if it operates at +/- 1000rpm from the set point. All fans are elevated in speed based on facility air inlet temperature to the Supervisor Card as safety measure, by a temperature sensor on the Supervisor Card. The front panel LED of the Fan Module indicates an amber color LED. If there is an indication of a fan failure the Supervisor Card sets all the fan modules to a higher RPM value based on the inlet temperature on the Supervisor Card. The Supervisor Card sets the following values:

  1. 13,000RPM (194CFM) for T≤30C
  2. 14,500RPM (218 CFM) for 30<T≤ 40C
  3. 16,000RPM (239 CFM) for T>40C

  If there are more than 2 fan failures, the speed of the remaining fans automatically default to 16,000 RPM.
- A fan operating at speeds between 301 and 999 RPM from the set point, is considered a minor fan alarm. The fan speeds are not elevated in case of a minor alarm. The Fan Module amber LED is illuminated.
- When the chassis is booted and a fan is missing or removed the Supervisor Card sets all the other operational fans to 16,000 RPM. The chassis will not boot with a missing Fan Module. When a working Fan Module is replaced and all the other Fan Modules are working correctly the Supervisor Card will return all the fans to their normal operational speed. When a Fan Module is initially removed the Supervisor Card sets all the remaining fans to run at 13,000 RPM for 10 seconds, 14,500 RPM for 30 seconds, ramping to 15,000RPM for the next 30 seconds and then ramping to 16,000RPM until all the Fan Modules are again shown present.

Note Variations in speeds occur to regulate the internal component temperatures. Such speed variations are normal, in the absence of any alarms. For more details, see Monitoring the Fan Modules.

Air Filter

The air filter is a field replaceable unit on the Supervisor and RF line cards that remove dust from the room air drawn into the chassis by the cooling fans. It is recommended that you examine the air filter once a month or more. Do not clean and re-use the air filters. They must be replaced either when they are clogged or worn out.

Note You can remove and install an air filter when the Cisco cBR router is powered on and working

Cisco IOS-XE Software

The Cisco cBR Series Converged Broadband Router (Cisco cBR) runs the Cisco IOS-XE software, which is stored on the Type II PCMCIA flash memory disks stored in the two PCMCIA slots in the primary route processor module. A PCMCIA flash memory disk in either slot can store a Cisco software image or configuration file. In addition to the flash memory disks, each route processor module contains onboard flash memory that is used to store a boot loader. The loader executes following a system reset to reload and execute the Cisco IOS-XE software on the flash memory disks.

The route processor module also stores the system configuration in the onboard flash memory. The configuration information read from the flash memory is buffered in operational memory following initialization, and is written to the flash memory device when the configuration is saved. Each line card also contains onboard flash memory that is used to store a boot loader, similar in function to that used on the route processor module. However, the line card loader executes following a system reset, line card reset, or line card insertion to reload and execute any code that must run on the line card. Software images may also be stored on an external TFTP server. If the Cisco cBR is so configured, it then downloads the proper image from the TFTP server and executes it.

NEBS Level 3 Compliance

The Cisco cBR is designed to meet Network Equipment Building System (NEBS) Level 3 compliance.

How and What to Order

Ordering Information

Table 20: Ordering Information for Cisco cBR-8 Router

Product Description	Part Number
Cisco cBR-8 Converged Cable Access Chassis	
cBR-8 CCAP Chassis	CBR-8-CCAP-CHASS
AC Power Module	CBR-AC-PS
AC FPEM	CBR-PEM-AC-6M
AC Power Cassette Module	CBR-AC-PWR-TRAY
DC Power Module	CBR-DC-PS
DC FPEM	CBR-PEM-DC-6M
DC Power Cassette Module	CBR-DC-PWR-TRAY

Product Description	Part Number
Power Module Blanks (for empty Power Module bays)	CBR-PS-BLANK
Fan Module	CBR-FAN-ASSEMBLY
Chassis Installation Handle (optional)	CBR-CHASSI-HANDLE=

Table 21: Ordering Information for Cisco cBR-8 Router Supervisor

Product Description	Part Number
Cisco cBR-8 Supervisor Modules	
Supervisor with 200G forwarding capability as well as a robust and powerful control plane complex. It ships with 48 GB of memory.	CBR-CCAP-SUP-160G
Supervisor with 60G forwarding capability. It does not have the DC board. It ships with 48 GB of memory.	CBR-CCAP-SUP-60G
The Supervisor PIC includes WAN backhaul connectivity options.	CBR-SUP-8X10G-PIC
Bundle PID for the 8x10G Supervisor PIC.	CBR-8X10G-PIC-BUN
SFP+	SFP-10G-SR SFP-10G-LR SFP-10G-ER SFP-10G-ZR SFP-10G-LRM
Blank for an empty Supervisor slot	CBR-SUP-BLANK
Blank for an empty Supervisor PIC slot	CBR-SUP-PIC-BLANK
Air filter for the Supervisor	CBR-SUP-FILTER=

Table 22: Ordering Information for Cisco cBR-8 Router Interface and Modules

Product Description	Part Number
Cisco cBR-8 CCAP line cards	

Product Description	Part Number
The cBR CCAP line card includes two downstream DOCSIS 3.0 modules as well as one upstream DOCSIS 3.0 Module. The line card can be upgraded to DOCSIS 3.1 on both downstream and upstream.	CBR-LC-8D30-16U30
The cBR CCAP line card with one Downstream D3.1 module and one Upstream D3.0 module.	CBR-LC-4D31-16U30
The cBR CCAP line card with two Downstream D3.1 modules and one Upstream D3.0 module	CBR-LC-8D31-16U30
The cBR CCAP line card with one Downstream D3.1 module and one Upstream D3.1 module.	CBR-LC-4D31-16U31
The cBR CCAP line card with two Downstream D3.1 modules and one Upstream D3.1 module.	CBR-LC-8D31-16U31
cBR CCAP RF Through PIC (Connectivity to the RF Plant)	CBR-RF-PIC
cBR CCAP Protect PIC (for N+1 redundancy)	CBR-RF-PROT-PIC
cBR RF cable bundle (3 meters)	CBR-CABLE-8X16
Blank for an empty line card slot	CBR-LC-BLANK
Blank for an empty line card PIC slot	CBR-LC-PIC-BLANK
Downstream D3.0 module Downstream D3.1 module	CBR-D30-DS-MOD CBR-D31-DS-MOD
Upstream D3.0 module Upstream D3.1 module	CBR-D30-US-MOD CBR-D31-US-MOD
Air filter for the cBR CCAP line card	CBR-LC-FILTER=

License Information

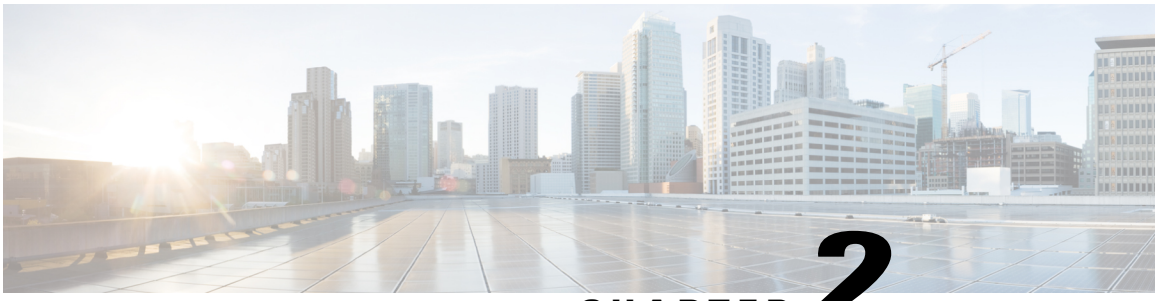
Table 23: License Information

Product Description	Part Number
Software Licenses For Cisco cBR-8 Supervisor Modules	
10G WAN license	CBR-SUP-10G-LIC

Product Description	Part Number
Software Licenses For Cisco cBR-8 RF Line Cards	
DOCSIS 3.0 Downstream License	CBR-D30-DS-LIC
DOCSIS 3.0 Upstream License	CBR-D30-US-LIC
Line Card Redundancy Feature License	CBR-LCRED-LIC
Software Licenses for Cisco cBR-8 Video	
VOD/SDV Downstream Video QAM License	CBR-VIDEO-LIC
VOD/SDV Replicated QAM License	CBR-VIDEO-RPL-LIC
VOD PowerKEY QAM Encryption License	CBR-VODPKY-LIC
VOD PME QAM Encryption License	CBR-VODPME-LIC

How to Order

To place an order, visit the Cisco Ordering Home Page.



CHAPTER 2

Prepare to Install

- General Safety Guidelines, page 47
- Safety Instructions, page 48
- Warning Definition, page 48
- Preventing Electrostatic Discharge Damage, page 49
- Plant Wiring Guidelines, page 49
- Electrical Equipment Guidelines, page 50
- Unpacking and Verifying Shipping Contents, page 50
- Chassis-Lifting Guidelines, page 51
- General Rack Installation Guidelines, page 51
- Cabling Guidelines, page 54

General Safety Guidelines

When you install any component in a chassis, observe all caution and warning statements mentioned in this chapter. For warning translations, see the regulatory compliance and safety documentation that came with this product.

The following guidelines will help ensure your safety and protect the equipment. However, these guidelines may not cover all potentially hazardous situations you may encounter during system installation, *so be alert*.

- Install your product in compliance with the national and local electrical codes. In the United States, this means the National Fire Protection Association (NFPA) 70, United States National Electrical Code. In Canada, Canadian Electrical Code, part I, CC22.1. In other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.
- Review the safety warnings listed in the regulatory compliance and safety documentation before installing, configuring, or performing maintenance on the product.
- Disconnect power at the source before you install or remove a chassis.
- Do not attempt to lift an object you might find too heavy to lift safely.

- Keep the chassis area clear and as dust free as possible during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis.
- Use the product in accordance with its marked electrical ratings and product usage instructions.

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

Safety Instructions

Note Do not unpack the module until you are ready to install it. Keep the module in the shipping container to prevent accidental damage until you determine an installation site. Use the appropriate unpacking documentation included with the module.

Warning Read the installation instructions before connecting the system to the power source. Statement 1004

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

Warning Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

Warning Definition

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. Statement 1071

SAVE THESE INSTRUCTIONS

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage occurs when electronic cards or components are improperly handled, and can result in complete or intermittent failures. All line cards consist of a printed circuit card that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the cards from ESD, use an antistatic strap each time you handle the modules. Handle the carriers by the edges only; never touch the cards or connector pins.

Caution Always tighten the captive installation screws on all system components when you are installing them. These screws prevent accidental removal of the module, provide proper grounding for the system, and help to ensure that the line card connectors are properly seated in the backplane. To ensure proper grounding and mechanical support, the captive screws on the front cards should be tightened to 10-12 in-lbs and the rear PIC cards should be tightened to 6-8 in-lbs. Never use cordless or corded drills to tighten screws; power screwdrivers and hand tools are acceptable.

Static electricity can harm delicate components inside your system. To prevent static damage, discharge static electricity from your body before you touch any of your system components. As you continue to work on your system, periodically touch an unpainted metal surface on the computer chassis.

The following guidelines can prevent ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Before removing a card from the chassis, ensure that the chassis is grounded to the rack.
- Handle line cards by the faceplate and carrier edges only; avoid touching the card components or any connector pins.
- When removing a card, place the removed module component-side-up on an antistatic surface or in a static-shielding bag. If the module will be returned to the factory, immediately place it in a static-shielding bag.
- Avoid contact between the modules and clothing. The wrist-strap protects the card from ESD voltages on the body only; ESD voltages on clothing can still cause damage.
- When transporting a sensitive component, first place it an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

Plant Wiring Guidelines

When planning the location of the new system, consider the distance limitations for signaling, EMI, and connector compatibility, as described in the following sections.

Warning **This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.**Statement 1045.

Interference Considerations

When wires are run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires. This fact has two implications for the construction of plant wiring:

- Bad wiring practice can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy the signal drivers and receivers in this equipment, and can even create an electrical hazard by conducting power surges through lines and into equipment. (Review the safety warnings.)

Note To predict and remedy strong EMI, you may also need to consult experts in radio frequency interference (RFI).

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Electrical Equipment Guidelines

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone in potentially hazardous conditions.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Unpacking and Verifying Shipping Contents

Note Save the original Cisco box and packaging in which your equipment was sent and received in.

Before You Begin

Read the safety guidelines and review the electrical safety and ESD-preventive guidelines.

Caution Ensure that you are properly grounded with an ESD-preventive wrist strap.

Note We recommend that you have at least two people available to help with the installation and ensure safe lifting.

Required Tools and Equipment

- #2 Phillips screwdriver
- 3/16" flat-blade screwdriver
- Wire cutters
- ESD-preventive wrist strap
- Antistatic mat or bag

Step 1 Inspect the box for any shipping damage. (If there is damage contact your service representative).

Step 2 Carefully cut the packaging straps that secure the shipping container to the pallet and open the top of the outer shipping container.

Step 3 Locate and remove the accessory kit. Set the accessory kit aside.

Step 4 Remove the top foam cap.

Step 5 Remove the screws that fasten the brackets used for attaching the chassis to the pallet using #2 Phillips screwdriver.

Step 6 Slide the ESD plastic bag off the chassis.

Step 7 Verify that you have received all of the required and ordered components.

Chassis-Lifting Guidelines

A fully loaded configured system can weigh up to 430 lbs. The chassis is not intended to be moved frequently. Before you install the system, ensure that your site is properly prepared so you can avoid having to move the chassis later to accommodate power sources and network connections.

You must use a hydraulic lift or forklift to move a fully populated chassis.

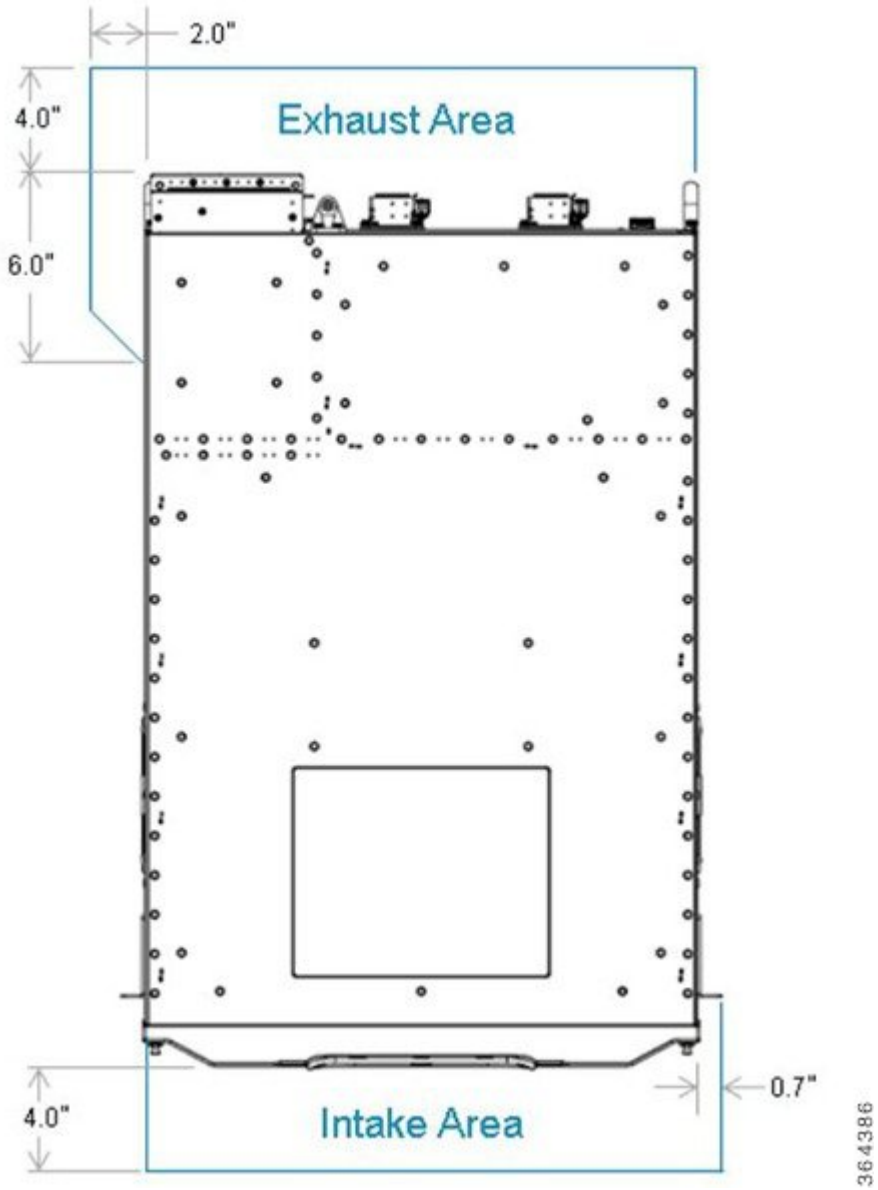
General Rack Installation Guidelines

When planning your rack installation, consider the following guidelines:

- The Cisco cBR-8 router requires a minimum of 13 rack units (22.75 inches or 57.785 cm) of vertical rack space. Measure the proposed rack location before mounting the chassis in the rack.
- Before using a rack, check for obstructions (such as a power strip) that could impair the rack-mount installation. If a power strip impairs the rack-mount installation, remove the power strip before installing the chassis, and then replace it after the chassis is installed.
- Allow sufficient clearance around the rack for maintenance. If the rack is mobile, you can push it back near a wall or cabinet for normal operation and pull it out for maintenance (installing or moving cards, connecting cables, or replacing or upgrading components). Otherwise, allow 36 inches (91.44 cm) of access to remove field-replaceable units.

- Maintain a minimum clearance of 4 inches (10.16 cm) on the front, and rear of the chassis for the cooling air inlet and exhaust ports, respectively. In addition, there is a small air inlet area on the front right side of the chassis in front of the mounting ear and a small exhaust area on the rear left hand side.

Figure 22: Minimum Clearance Area



- Avoid placing the chassis in an overly congested rack or directly next to another equipment rack; otherwise, the heated exhaust air from the other equipment can enter the inlet air vents and cause a high temperature condition inside the router.

Caution To prevent chassis overheating, never install a Cisco cBR-8 router in an enclosed room that is not properly ventilated or air conditioned.

- Always install heavier equipment in the lower half of a rack to maintain a low center of gravity to prevent the rack from falling over.
- Install and use the cable-management accessories included with the Cisco cBR-8 router to keep cables organized and out of the way of the cards and processors. Ensure that cables from other equipment already installed in the rack do not impair access to the cards or require you to disconnect cables unnecessarily to perform equipment maintenance or upgrades.
- Install rack stabilizers (if available) before you mount the chassis.
- Provide an adequate chassis ground (earth) connection for your Cisco cBR-8 chassis.

Cabling Guidelines

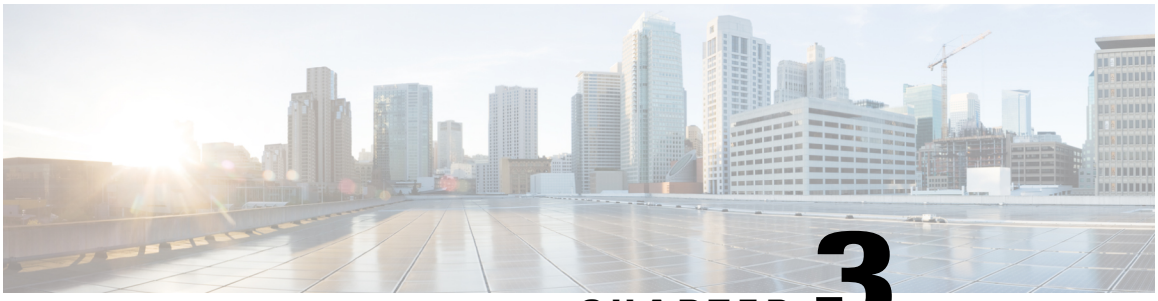
The size of your networks and the distances between connections depend on the type of signal, the signal speed, and the transmission media (the type of cabling used to transmit the signals). For example, standard coaxial cable has a greater channel capacity than twisted-pair cabling. The distance and rate limits in the following descriptions are the IEEE recommended maximum speeds and distances for signaling; however, you can usually get good results at speeds and distances far greater than these. For example, the recommended maximum rate for V.35 is 2 Mbps, but it is commonly used at 4 Mbps without any problems. If you understand the electrical problems that might arise and can compensate for them, you should get good results with rates and distances greater than those shown here; however, do so at your own risk.

When preparing your site for network connections to the chassis, you must consider a number of factors related to each type of interface:

- Type of cabling required for each type (fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling)
- Distance limitations for each signal type
- Specific cables you need to connect each interface

The extent of your network and the distances between network interface connections depend in part on the following factors:

- Signal type
- Signal speed
- Transmission medium



CHAPTER 3

Installing the Cisco cBR Chassis

- Installation Methods, page 55
- Verifying Rack Dimensions, page 56
- Installing Chassis Installation Brackets, page 57
- Attaching the Chassis Rack-Mount Brackets, page 59
- Installing the Chassis Installation Handle (Optional), page 61
- Installing the Cisco cBR-8 In a Rack, page 63
- Attaching the Cable-Management Brackets, page 68
- Attaching the Fiber/Cable Routing Guide on the Chassis, page 69
- Attaching a Chassis Ground Connection, page 75

Installation Methods

The Cisco cBR-8 router can be either mounted on the rack at the front or in the middle. Also, the router can be either mounted on a standard 19-inch wide four-post equipment rack unit or a two-post rack unit.

Note The Cisco cBR-8 router usually ships fully loaded. Due to a fully configured system weighing approximately 430 lbs, components must be removed from the chassis to make the chassis lighter for rack installation. Remove all power supplies, supervisor cards, line cards, rear PIC cards and fan modules before rack-mounting to reduce the weight to approximately 117 lbs. For instructions on how to remove the components, see the monitoring sections.

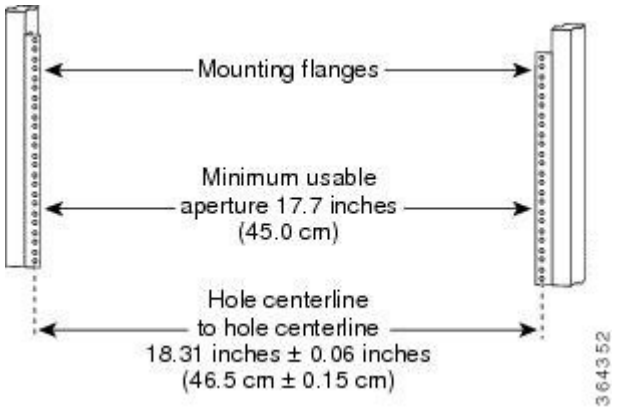
Note Make sure you place the cards and modules in an anti-static bag until you install the chassis in the rack.

Verifying Rack Dimensions

Before You Begin

Before you install the chassis, measure the space between the vertical mounting flanges (rails) on your equipment rack to verify that the rack conforms to the measurements shown in the figure below.

Figure 23: Equipment Rack Dimensions



Step 1 Mark and measure the distance between two holes on the left and right mounting rails.
The distance should measure 18.31 inches ± 0.06 inches (46.5 cm ± 0.15 cm).

Note Measure the pairs of holes near the bottom, middle and top of the equipment rack to ensure that the rack posts are parallel.

Step 2 Measure the space between the inner edges of the left front and right front mounting flanges on the equipment rack. The space must be at least 17.7 inches (45 cm) to accommodate the chassis which is 17.45 inches (44.3 cm) wide and fits between the mounting posts on the rack.

What to Do Next

Install chassis installation brackets.

Installing Chassis Installation Brackets

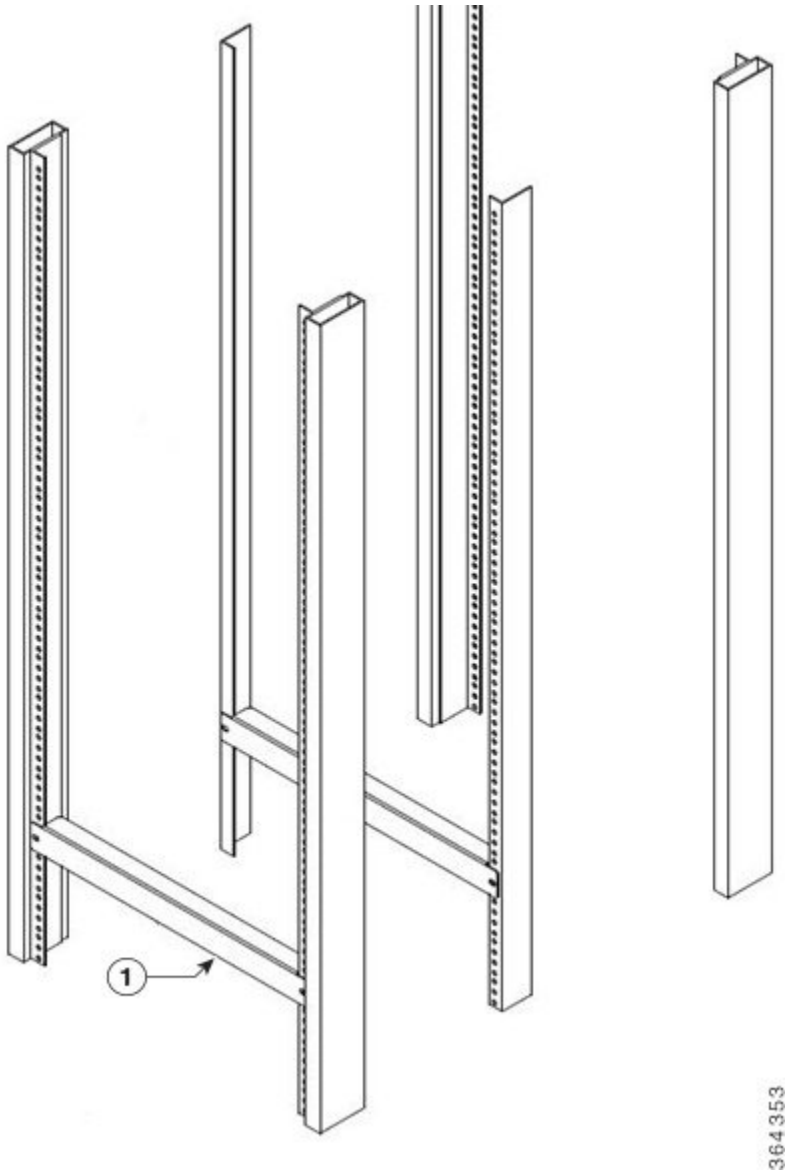
Each chassis is shipped with two chassis installation brackets in the accessory kit. These brackets aid in installing a chassis into a 19-inch rack and are used as a support base to vertically position and set the chassis before the rack mount screws are installed.

Step 1 Determine the position in the rack where you want the chassis to be mounted. If you are mounting more than one chassis in the rack, then start from the bottom or the center of the rack. Hold the chassis installation bracket where the chassis bottom will be positioned vertically in the rack.

Step 2 Secure the chassis installation bracket to the front rails with rack mount screws.

If there is a second internal rack rail that is no more than 23 inches from the front rail, position the second installation bracket to create a rear support for the chassis during installation.

Figure 24: Chassis Installation Bracket



1	Chassis Installation Bracket

Note After the chassis is installed and secured to the rack the chassis installation brackets can be removed from the rack. These brackets are not needed for supporting the weight of the chassis after all rack mount screws are secured.

Attaching the Chassis Rack-Mount Brackets

Before installing the chassis in the rack, you must install the rack-mount brackets on each side of the chassis.

Note The rear RF cable-management brackets are installed on the chassis after you install the chassis rack-mount brackets and mount the chassis in the rack.

Rack-mounting brackets can be attached either in front or middle of the chassis.

- Front Rack-Mount Bracket Installation—The chassis is shipped with the rack-mount brackets installed at the front. Proceed to installation of the chassis in the rack.
- Middle Rack-Mount Bracket Installation—Install the mounting bracket in the middle of the chassis to allow the chassis to be recessed in the rack or to be installed in a two-post rack unit.

Note The chassis installation handle cannot be installed if the chassis is mid-mounted.

To install the rack-mount brackets in the middle of the chassis, complete the following steps:

Before You Begin

Required Tools and Equipment

- #2 Phillips torque screwdriver

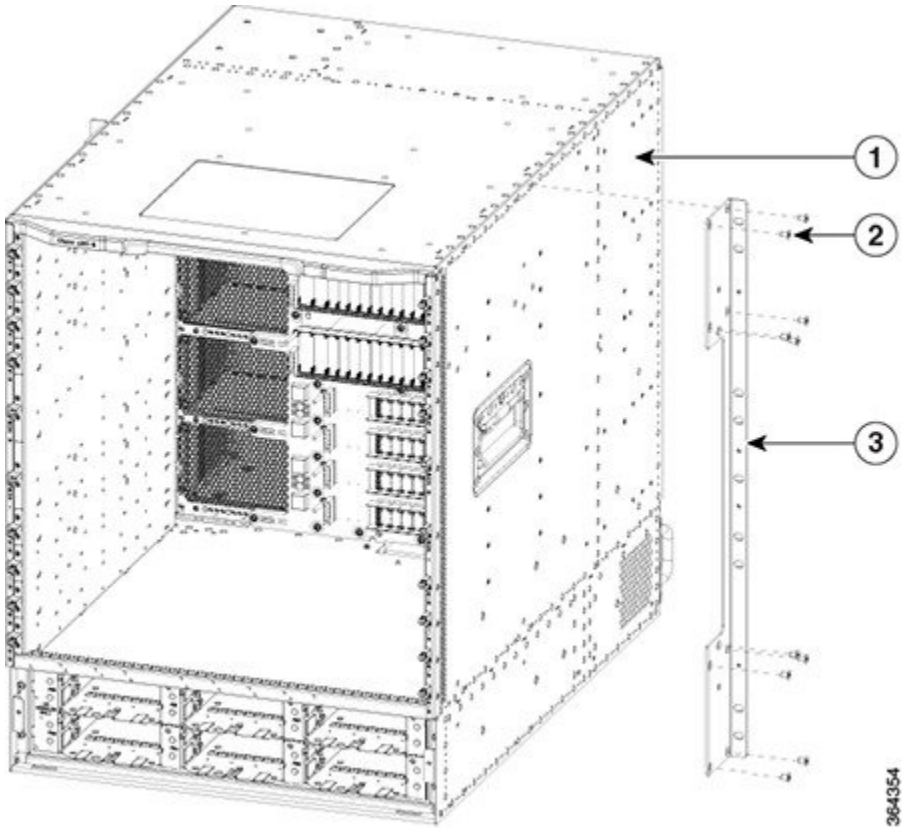
Step 1 Remove the rack-mount brackets installed at the front of the chassis by unscrewing the M5 undercut flat-head screws using a #2 Phillips torque screwdriver.

Step 2 Locate the threaded holes at the middle on the side of the chassis that align with the holes in the rack-mount bracket.

Step 3 Install the 10 M5 undercut flat-head screws to secure each rack-mounting bracket to the chassis. Five screws must be installed on each end of the rack-mounting bracket.

Step 4 Repeat the above steps on the other side of the chassis.

Figure 25: Installing Rack-Mount Bracket



1	Chassis	3	Rack-Mount Bracket
2	M5 undercut flat-head screws		

What to Do Next

Install the chassis installation handle.

Installing the Chassis Installation Handle (Optional)

Before You Begin

Required Tools and Equipment

- #2 Phillips screwdriver

Restrictions

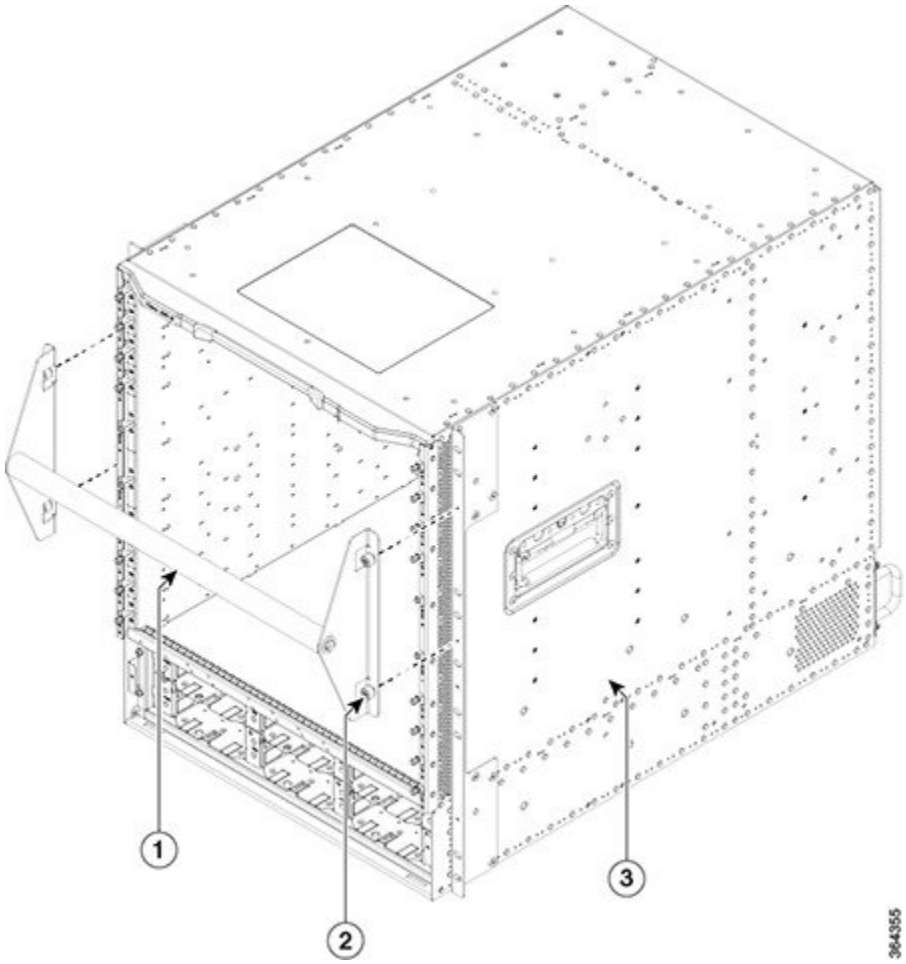
Do not install the chassis installation handle if the chassis is to be mid-mounted in the rack.

Step 1 Locate two M5 threaded holes on each chassis rack mount bracket that align with the chassis lifting handle captive screw holes.

Step 2 Align and hold the chassis lifting handle screw holes with the M5 threaded holes. Insert the captive screws and tighten them using a #2 Phillips screwdriver.

Caution Ensure that the captive screws are tightly secured before loading the handles to prevent injury or damage to the chassis.

Figure 26: Attaching the Chassis Installation Handles to the Cisco CBR-8 Converged Broadband Router



1	Chassis Installation Handle	3	Chassis
2	Captive Screw		—

The rack mount brackets support both low and high installation of the handles. This is to facilitate low or high chassis installation in the rack.

What to Do Next

Install the Cisco cBR-8 router in the rack.

Installing the Cisco cBR-8 In a Rack

Rack mount the chassis by securing the rack-mount brackets to two posts or mounting strips in the rack. Use at least four rack-mount screws on each side to fasten the two rack-mount brackets to the rack posts because the rack-mount brackets support the weight of the entire chassis.

You can install the chassis in either a four-post rack unit or a two-post rack unit.

Before You Begin

1. Verify rack dimensions.
2. Install chassis installation brackets.
3. Attach the chassis rack-mount brackets.
4. Install the chassis installation handle (optional).

Warning To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Installing the Cisco cBR in a Four-Post Rack

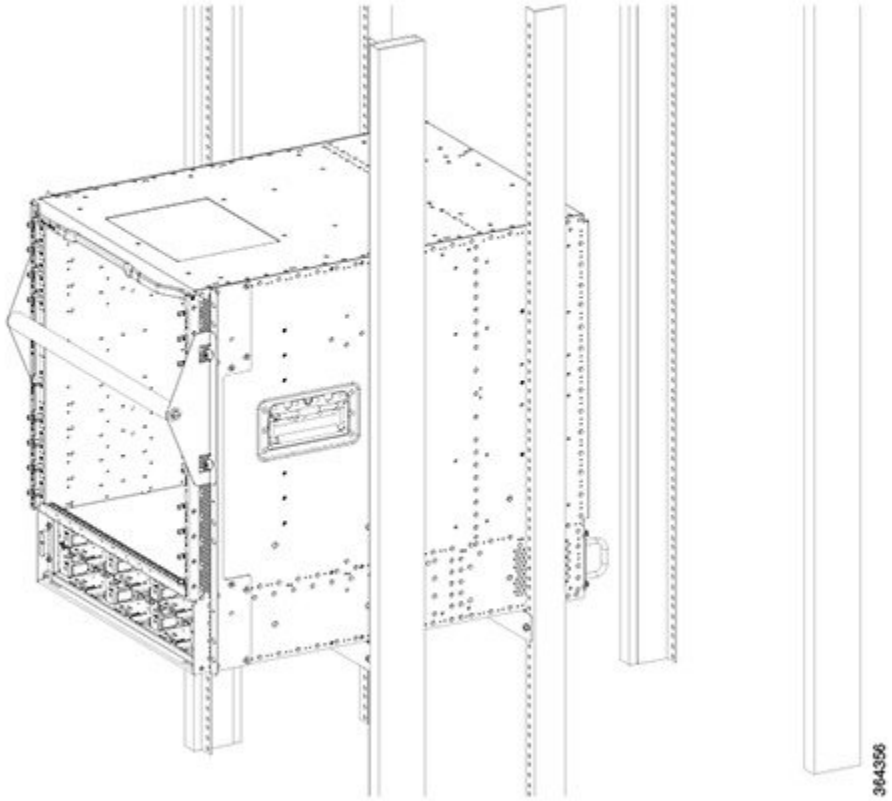
Step 1 Ensure that all screw fasteners on the installed components are securely tightened on the chassis.

Step 2 Ensure that your path to the rack is unobstructed. If the rack is on wheels, ensure that the brakes are engaged or the rack is stabilized.

Step 3 With two or more people, lift the chassis (partially unloaded) into position between the rack posts and rest it on the chassis installation bracket. The chassis can be lifted using the installation handle, the two large side handles, the rear

Power entry area handles or by placing your hands underneath the bottom of the chassis. With the installation handle installed, you can tilt the chassis up in the front in order to get your hands underneath the bottom of the chassis.

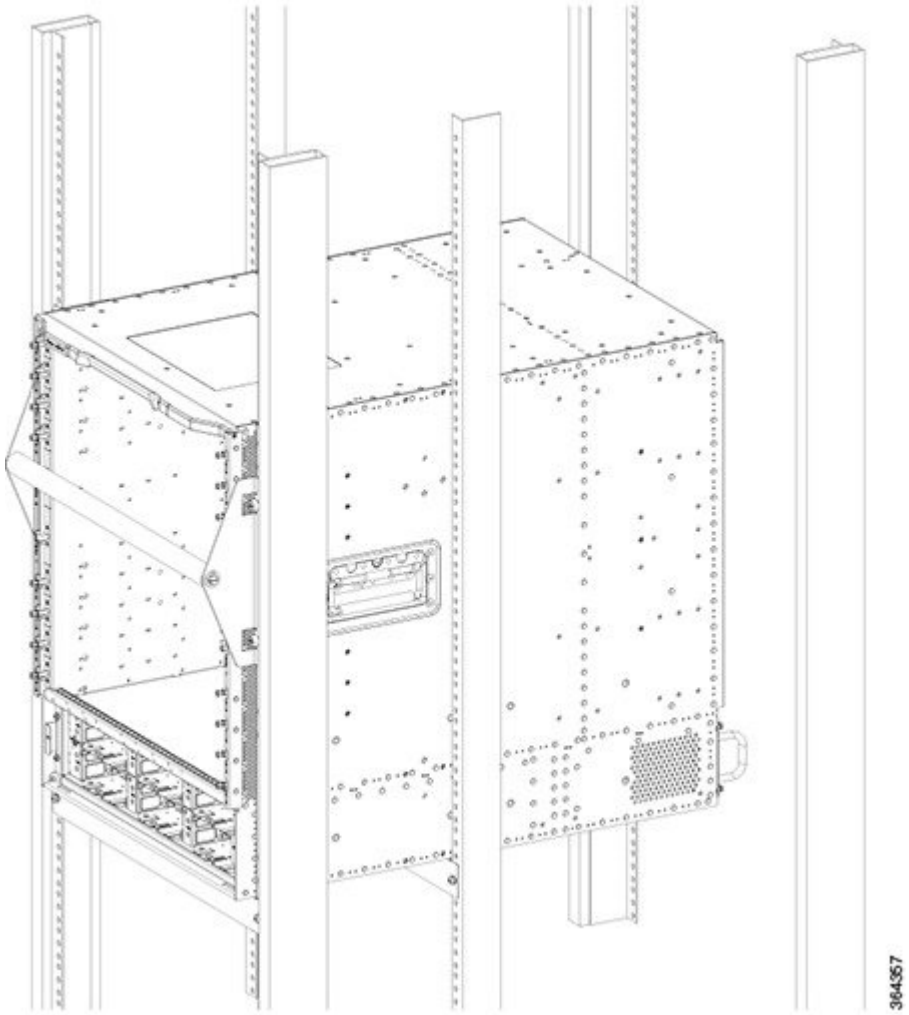
Figure 27: Lifting the Chassis into Position



Step 4 After the rear weight of the chassis is resting on the installation bracket, one person can hold it in place while the second person moves to the rear of the rack to help slide it into place and hold the weight while the rack mount screws are tightened.

Step 5 Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

Figure 28: Flushing Against Mounting Rails



Step 6 Hold the chassis in position against the mounting rails and do the following:

a) Insert a bottom screw into the rack mount ear on each side and use a hand-held screwdriver to tighten the screw to the rack rail.

b) Insert a top screw into each side rack mount bracket and tighten the screw to the rack rail. Insert a minimum of 4 screws per bracket on both sides of the chassis.

Note Remove the chassis installation handle before installing the fourth screw.

What to Do Next

- If required, remove the chassis installation brackets after ensuring that all screws are tightly secured to the rack unit.
- Attach the cable management bracket.

Installing the Cisco cBR in a Two-Post Rack

The Cisco cBR chassis can be installed in a two-post 19-inch rack either as a front mount or a mid-mount.

The procedure for the front mount option in a two-post rack is identical to the procedure for front mounting in a four-post rack except you cannot use the second chassis installation bracket.

Caution If you are using a two-post rack, secure the rack to the floor surface to prevent tipping and avoid bodily injury and component damage.

To mid-mount the chassis, follow these steps:

Step 1 Ensure that all screw fasteners on the installed components are securely tightened on the chassis.

Step 2 Ensure that your path to the rack is unobstructed. If the rack is on wheels, ensure that the brakes are engaged or the rack is otherwise stabilized.

Step 3 (Optional) Install the chassis installation bracket into the rack to support the chassis during installation while you secure it to the rack.

Step 4 With two or more people, lift the chassis (partially unloaded) into position between the rack posts and rest it on the chassis installation bracket. The chassis can be lifted using the two large side handles, the rear Power entry area handles or by placing your hands underneath the bottom of the chassis.

Step 5 After the rear weight of the chassis is resting on the installation bracket, one person can hold it in place while the second person moves to the rear of the rack to help slide it into place and hold the weight while the rack mount screws are tightened.

Step 6 Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

Step 7 Hold the chassis in position against the mounting rails and do the following:

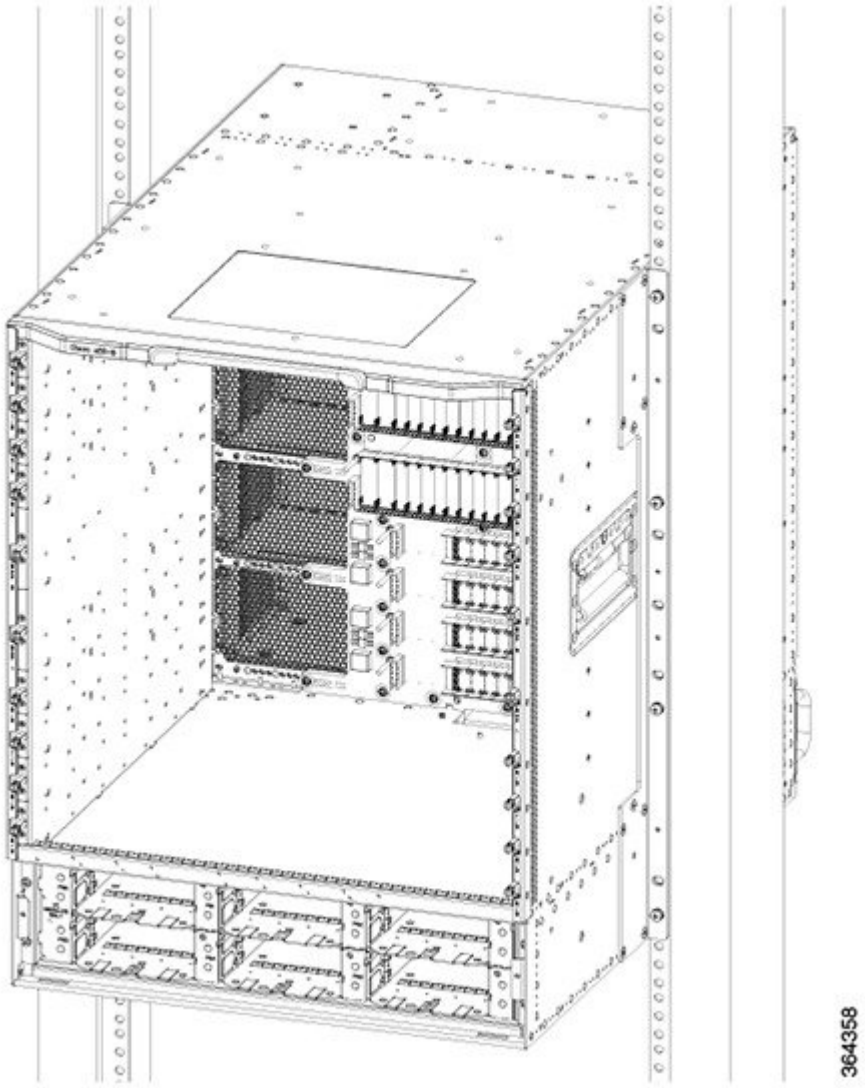
a) Insert a bottom screw into the rack mount ear on each side and use a hand-held screwdriver to tighten the screw to the rack rail.

b) Insert a top screw into each side rack mount bracket and tighten the screw to the rack rail.

c) Insert a minimum of four screws per bracket on both sides of the chassis.

Step 8 Ensure that all the screws on each of the side rack-mount brackets are tightened to the equipment rack before the chassis installation bracket is removed from the rack.

Figure 29: Two-Post Rack Mounting



What to Do Next

Attach the cable management bracket.

Attaching the Cable-Management Brackets

The rear RF cable-management brackets mount to the right rear side of the chassis to provide cable-management to coaxial cables exiting the RF PIC modules. These brackets provide a reference configuration that allows installation and removal of cables and modules in the rear of the chassis.

Each RF cable-management bracket for the Cisco cBR chassis contains four independent "U" type cable-management provisions, with two captive screws for attaching to the chassis, and provides cable dressing of each RF PIC card slot.

Before You Begin

Required Tools and Equipment

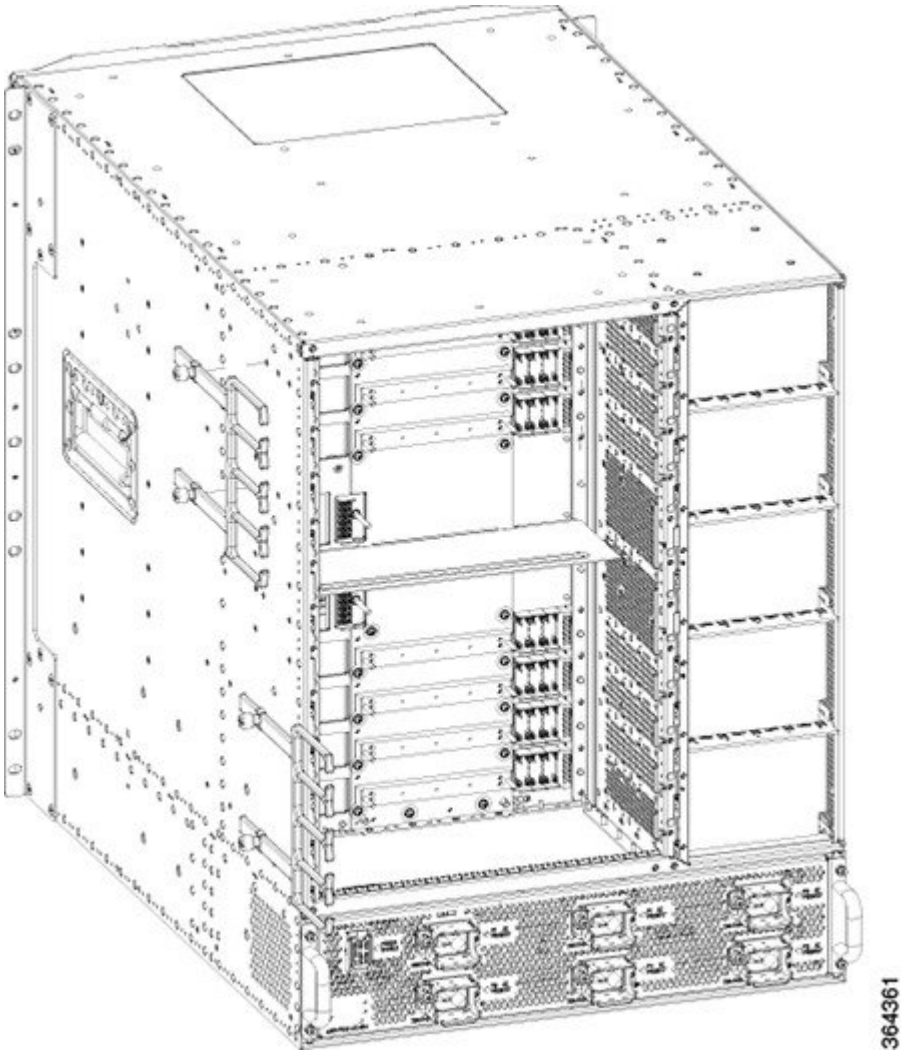
- #2 Phillips torque screwdriver

Step 1 Align the cable-management bracket captive screws to the right rear side panel captive nuts of the chassis. There are multiple positions that allow you to determine the position of the bracket that best suits your installation.

Step 2 If the captive screws are accessible, use a #2 Phillips torque screwdriver to secure them to the chassis. Else, tighten the knurled captive screws using your fingers.

Note Do not over tighten the cable-management captive screws when using a #2 Phillips torque screwdriver. Torque must not exceed 7 in-lbs.

Figure 30: Installing the Cable-Management Brackets



Attaching the Fiber/Cable Routing Guide on the Chassis

The fiber/cable routing accessories are made up of:

- 2 strap-down clips
- 4 snap-on plastic fiber/cable routing guides—with upper slot for fiber and lower slot for copper cables

The strap-down clips have multiple uses. They can be used:

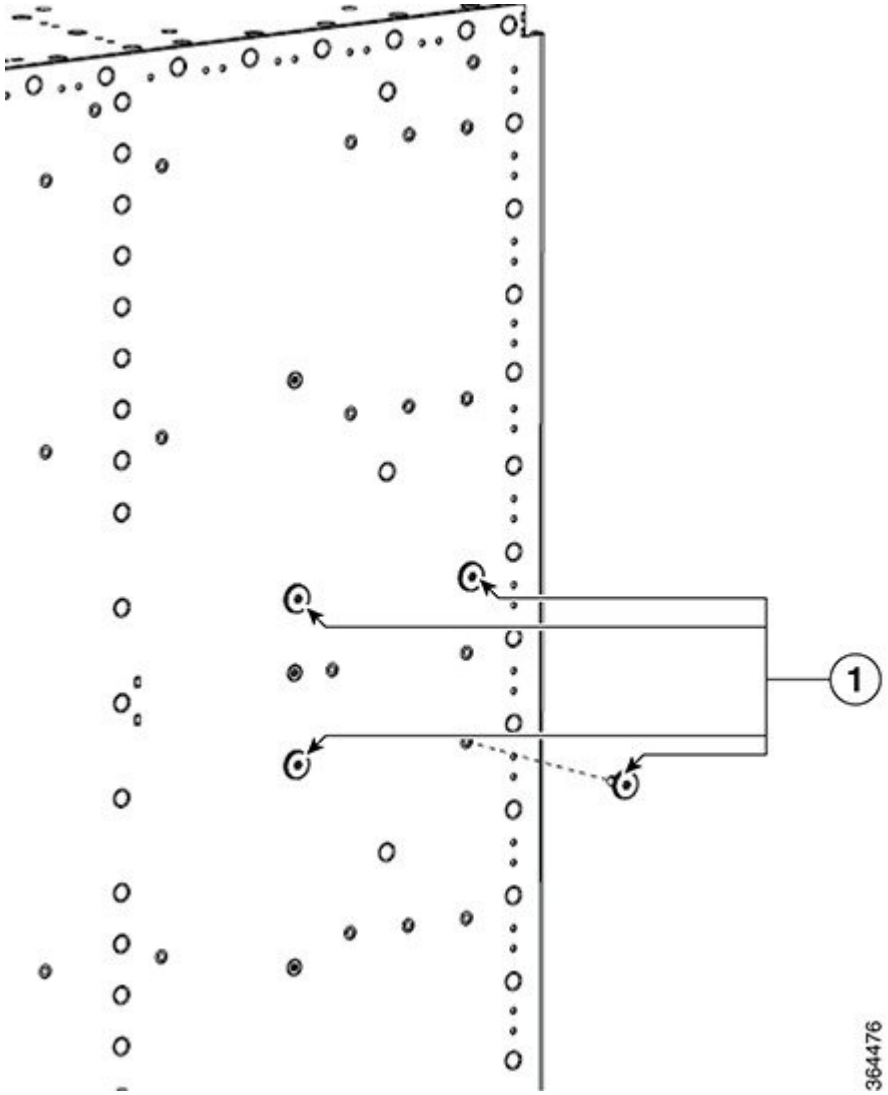
- to strap down cable bundles or conduit (there are multiple tie down points on each strap-down clip)
- as a base for two snap-on plastic fiber/cable routing guides

Before You Begin

Required Tools and Equipment

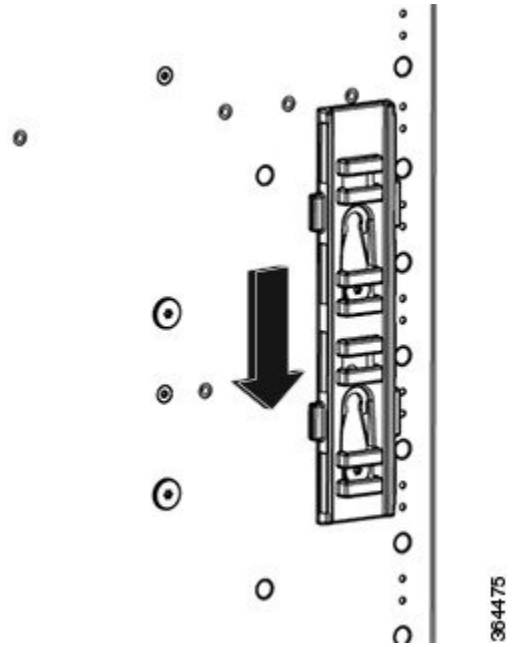
- 4 knurled retaining screws
- T15 Torx driver (optional)
- 2 strap-down clips
- 4 snap-on plastic cable routing guides

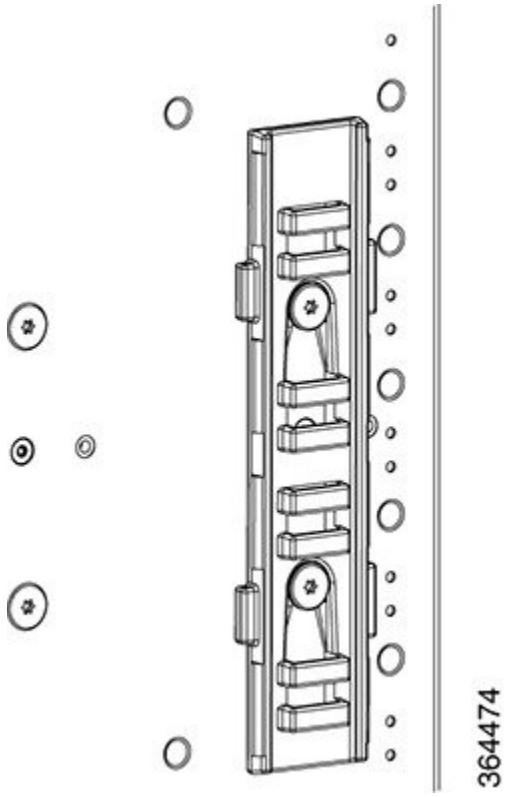
Step 1 Insert the four knurled retaining screws on the side of the chassis and tighten them using a T15 Torx driver (up to a torque of 6-8 in-lbs). If the screw location is not accessible for a driver, you can tighten the knurled screws by hand.



1	Knurled Retaining Screws		—

Step 2 Align the slots on the strap-down clip with the knurled screws installed on the chassis and push down until it snaps in place.

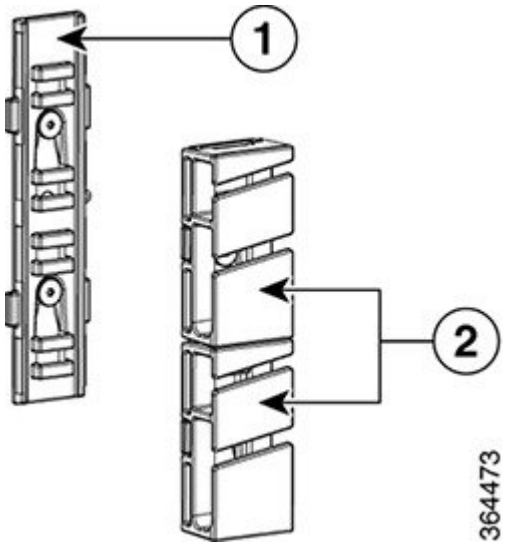




Step 3 Repeat Step 2, on page 71 for the other strap-down clip.

Step 4 Attach the snap-on plastic guides on the strap-down clip, as necessary.

Note Ensure that the orientation of the fiber/cable routing guide is proper by placing the smaller slot used for fiber on the top.



1	Strap-Down Clip	2	Snap-on Plastic Fiber/Cable Routing Guide

Figure 31: Chassis with Strap-Down Clips

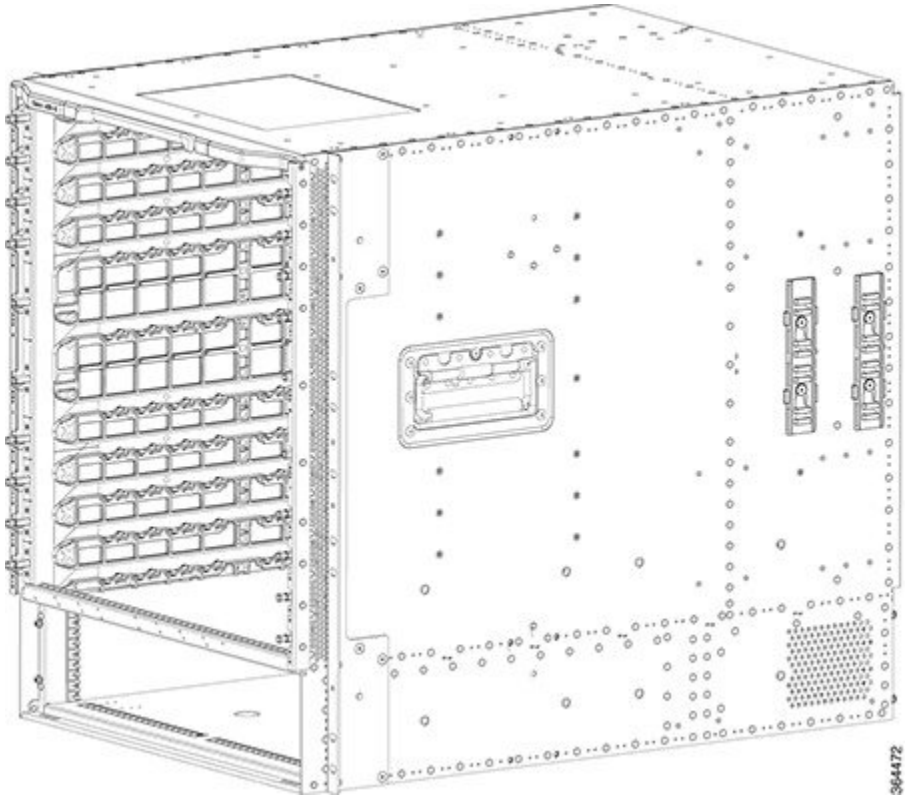
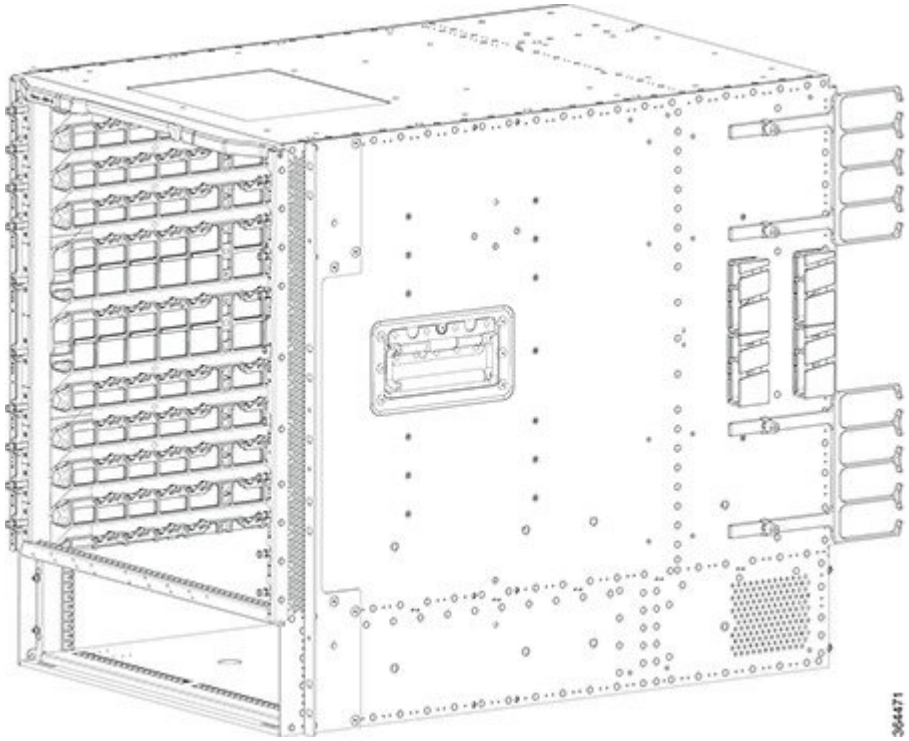


Figure 32: Chassis with Fiber/Cable Routing Guides and RF Cable Management Brackets



Attaching a Chassis Ground Connection

Before You Begin

Warning This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. **Statement 1024**

Before you connect power or turn on power to your chassis, you must provide an adequate chassis ground (earth) connection for the chassis. A chassis ground connector is provided on each Cisco CBR-8 chassis.

Caution The grounding wire is always the first to be installed or connected and the last to be removed or disconnected.

Required Tools and Equipment

- Phillips Screwdriver
- ¼-20 Phillips pan head with square cone lock washer (provided in accessory kit)

- 2 hole 4 AWG dual crimp compression lug (provided in accessory kit)
- 4 or 2 AWG grounding wire—The ground wire and lug should always be as big as the input gauge. For example, to use 2 AWG for the DC inputs, the ground lug and wire should be 2 AWG or bigger.
- Crimping tool for ground lug

Step 1 Use the wire stripper to strip one end of the AWG #4 wire approximately 1.12 inches (28.4 mm).

Step 2 Insert the AWG #4 wire into the wire receptacle on the grounding lug.

Step 3 Use the crimping tool to carefully crimp the wire receptacle around the wire; this step is required to ensure a proper mechanical connection.

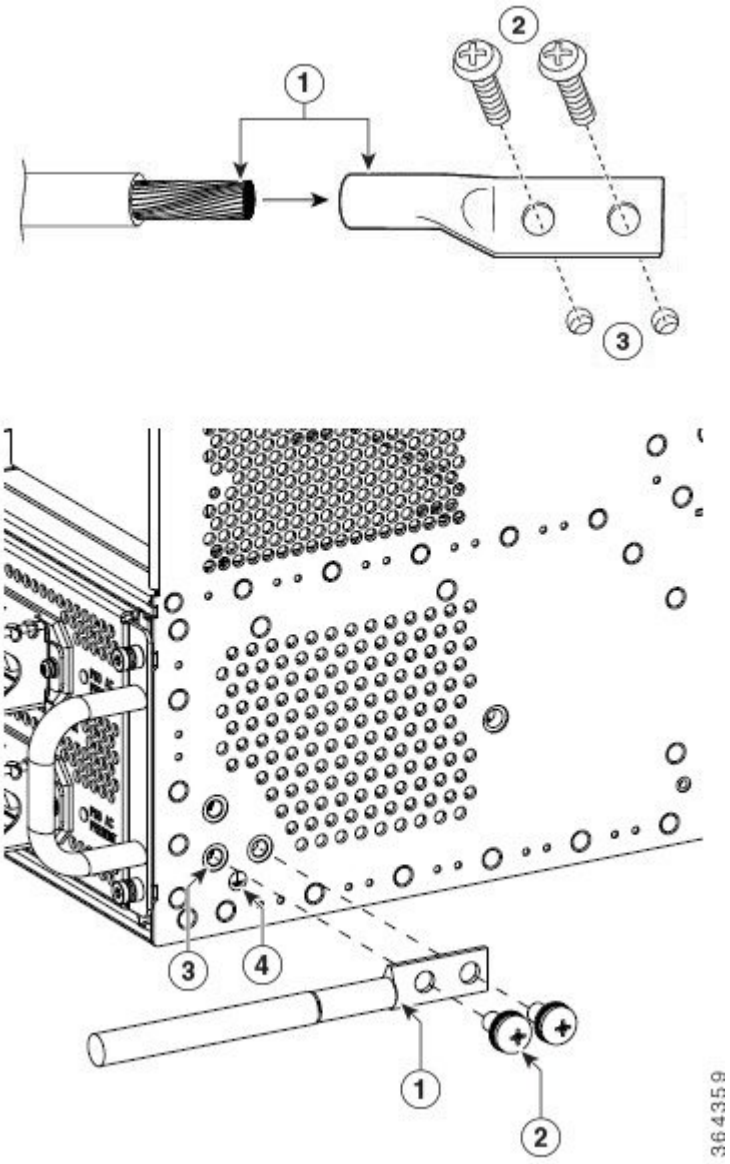
Step 4 Locate the chassis ground area on the rear lower left side panel of your chassis.

Step 5 Insert the two ¼-20 screws (provided in the accessory kit) through the holes in the grounding lug and tighten until the grounding lug is held firmly to the chassis.

Note There are captive nuts provided on the rear lower left side of the chassis for attaching a two-hole ground lug. Three nuts are provided for the attachment so the lug can be mounted horizontally or vertically depending on wire routing preferences.

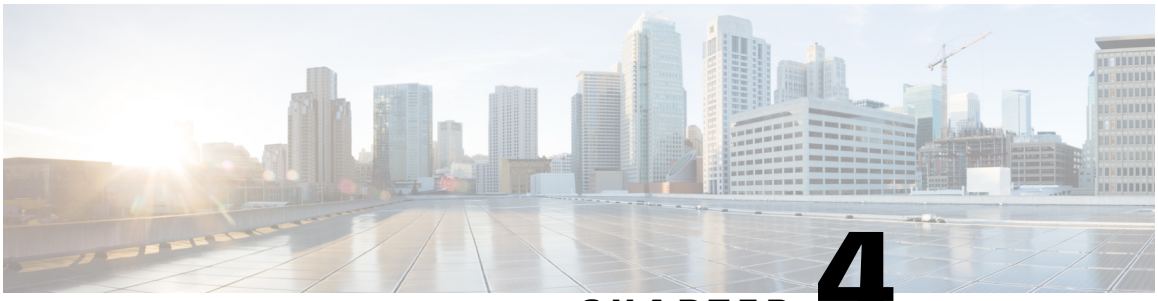
Step 6 Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

Figure 33: Chassis Ground Connection



1	Chassis earth ground lug and lead wire	3	Earth ground lug holes on the chassis
2	¼-20 Grounding screws	4	Earth ground symbol

The grounding lug can be mounted horizontally (as shown) or vertically depending on site preference.



CHAPTER 4

Installing the Fan Module in Cisco cBR

- Installing the Fan Module in the cBR Chassis, page 79

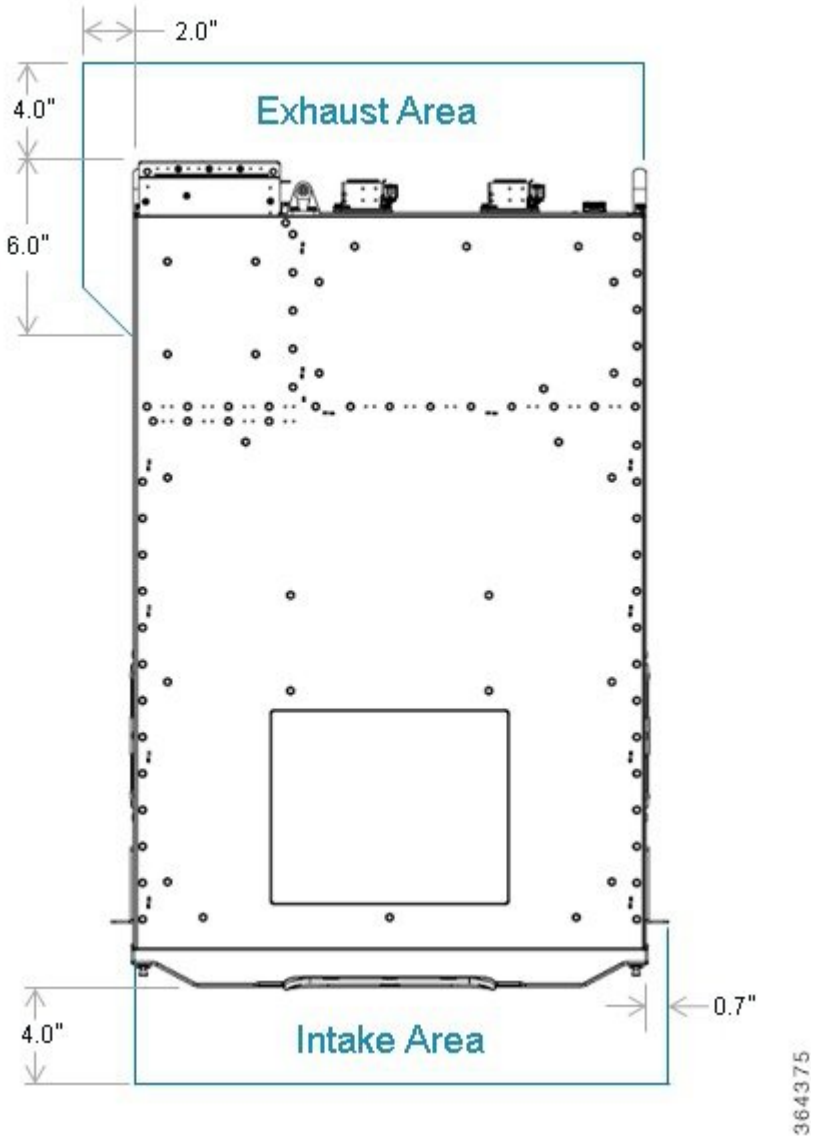
Installing the Fan Module in the cBR Chassis

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- **Minimum Keep Out Areas for Proper Cooling**
  Air flows from the front to the rear of the chassis. Air enters through the chassis front panel. Additionally, a small air inlet area is on the front right side in front of the mounting ear. Air is expelled from the rear of the chassis and a small exhaust area on the rear left side.

The keep-out areas are defined to ensure adequate space around the Cisco cBR-8 chassis. The space is necessary to ensure adequate air intake and exhaust. The figure shows the keep-out areas for the Cisco cBR-8 chassis.

Figure 34: Keep-Out Areas for the Cisco cBR-8 Chassis



Restrictions

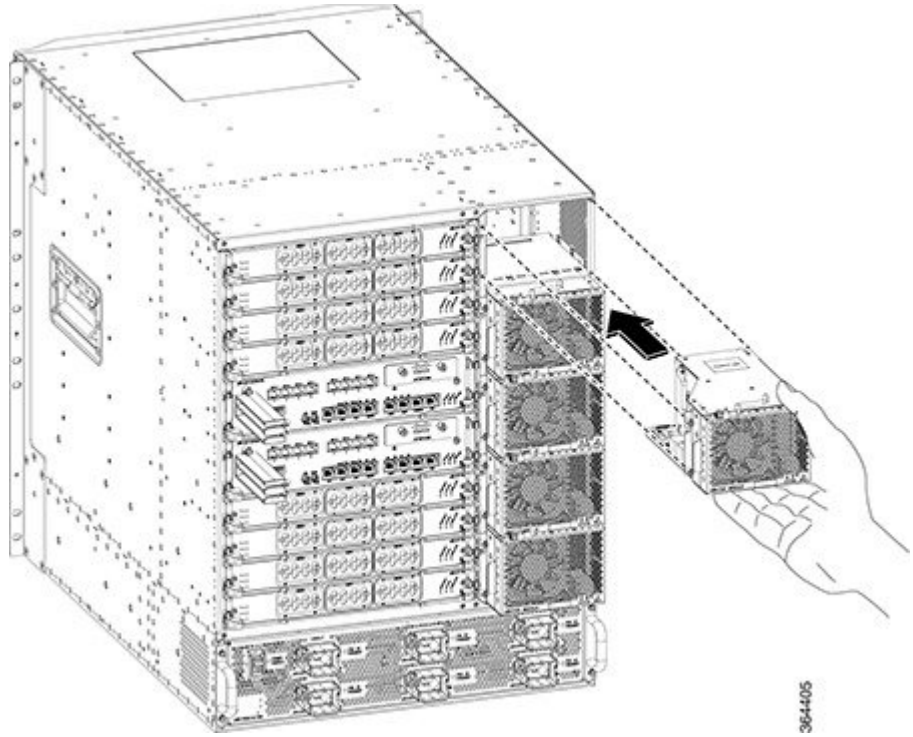
- Do not boot the chassis unless all the Fan Modules are installed.
- Only one fan module should be removed at a time for servicing or replacement.
- Do not operate the chassis with an empty fan bay even if the Supervisor Card allows it.

Required Tools and Equipment

- Flat-blade torque screwdriver
- Fan Module (cBR-FAN-ASSEMBLY)

Step 1 Using both hands, grip the top and the bottom of the front of the Fan Module. Align the fan module in the chassis slot and push firmly to open hinged door. Continue sliding until the Fan module flanges reach the chassis flange.

Figure 35: Aligning the Fan Module

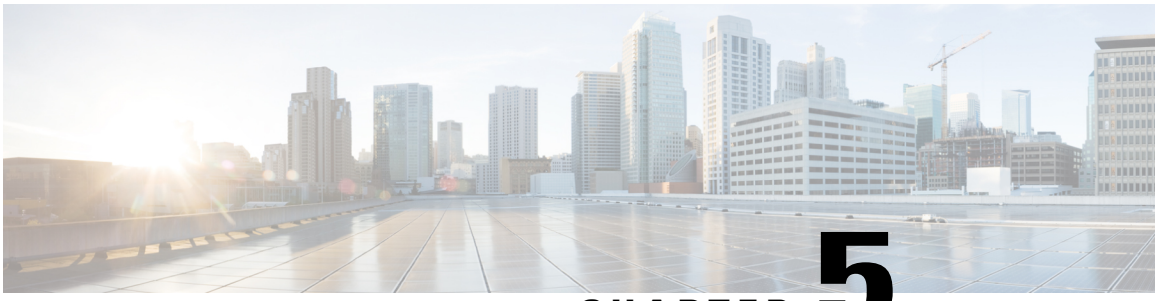


Step 2 Tighten the captive screws on front left flange of the Fan Module.

Note To tighten the captive screws on the Fan Modules, apply 6-8 in-lb (0.67-0.90 Nm) torque.

What to Do Next

- Visually check if the fans are working.
- If the RPLC LED on the Fan Module faceplate is illuminated, see Troubleshooting the Fan Assembly section for corrective action.



CHAPTER 5

Installing the Power System in the Cisco cBR Chassis

- Installing the Power Cassette Module in the Cisco cBR Chassis, page 83
- Installing the FPEM in the Cisco cBR Chassis, page 86
- Installing the Power Module in the Cisco cBR Chassis, page 88
- Connecting Power to the AC-Powered Cisco cBR Chassis, page 91
- Connecting Power to the DC-Powered Cisco cBR Chassis, page 93

Installing the Power Cassette Module in the Cisco cBR Chassis

The chassis ships with the Power Cassette Module installed. You may need to install the Power Cassette Module to swap the power system of the chassis.

Before You Begin

Warning When you install the module, the chassis ground connection must always be made first and disconnected last. **Statement 1046**

- Be aware of the weight and size of the equipment. Handle it with care.

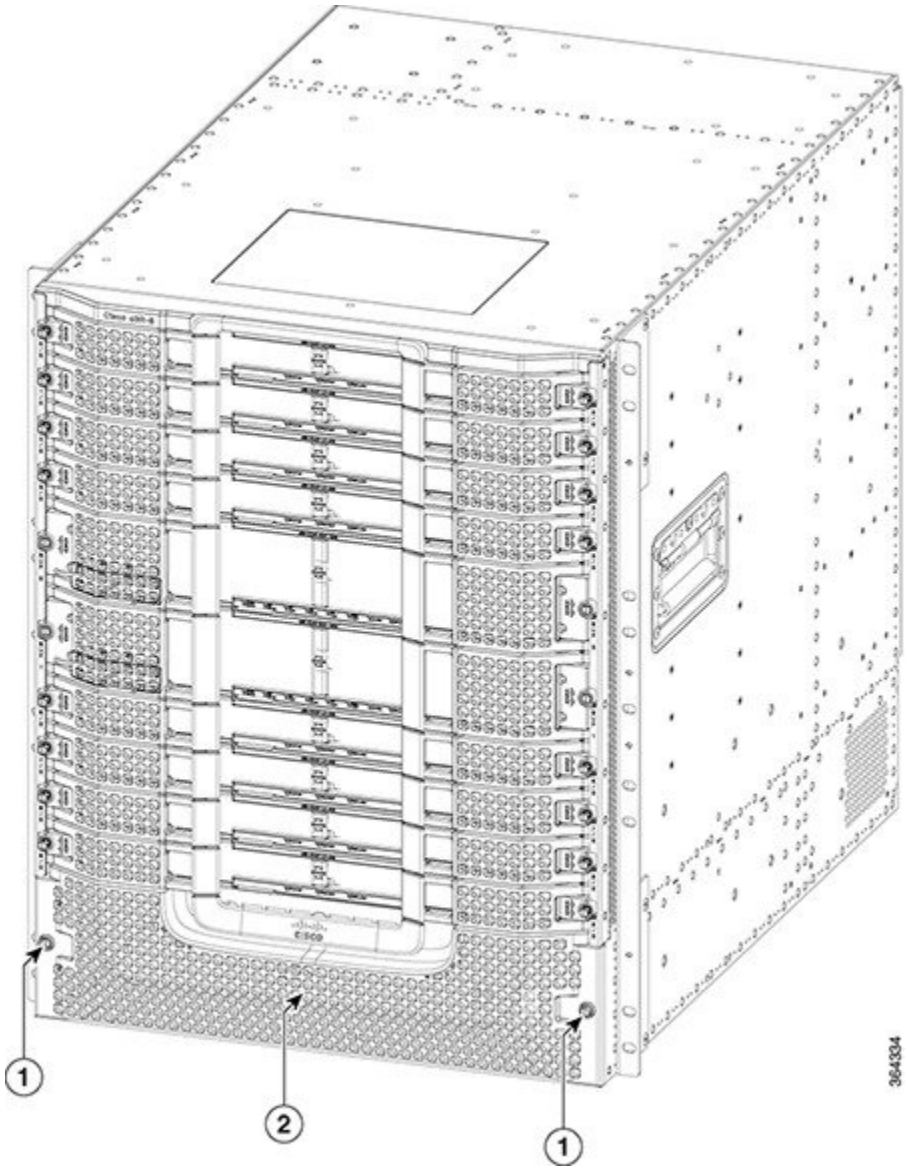
Required Tools and Equipment

- 3/16" flat-blade torque screwdriver
- AC or DC Power Cassette Module

- T10 Torx torque screwdriver

Step 1 Loosen the two screws on the front power entry bezel using a 3/16" flat-blade torque screwdriver. Remove the front power entry bezel from the chassis.

Figure 36: Removing the Front Power Entry Bezel from the Chassis

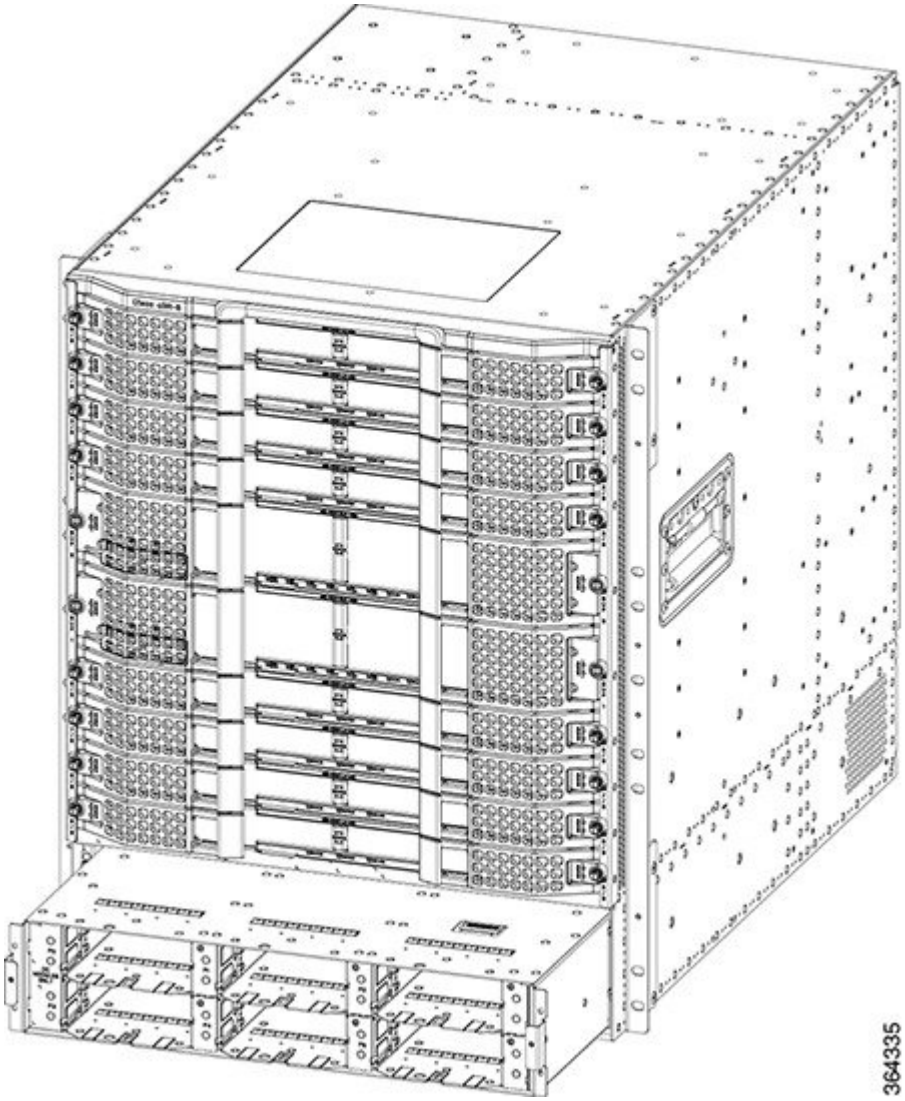


1	Screw	2	Front power entry bezel

Step 2 Remove the four #6-32 Torx-head screws located on the chassis mounting flanges using a T10 Torx torque screwdriver.

Step 3 Slide the Power Cassette Module into the slot in the chassis until the mounting flanges are fully seated.

Figure 37: Installing the Power Cassette Module in the Chassis



Step 4 Insert the four #6-32 Torx-head screws into the mounting flanges. Tighten the screws using a T10 Torx torque screwdriver with a torque of 8-10 in-lb (0.90-1.13Nm) to secure the module.

Step 5 Position the front power entry bezel on the chassis. Insert and tighten the two screws using a 3/16" flat-blade torque screwdriver with a torque of 5-7 in-lb (0.56-0.79 Nm) to secure the bezel.

What to Do Next

- Install the FPIM.

- Install the Power Modules.

Installing the FPEM in the Cisco cBR Chassis

The chassis ships with the FPEM installed. You may need to install the FPEM to swap the power system of the chassis. Use this procedure to install the following modules in the chassis:

- AC FPEM
- DC FPEM

Before You Begin

- Install the Power Cassette Module.
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.

Required Tools and Equipment

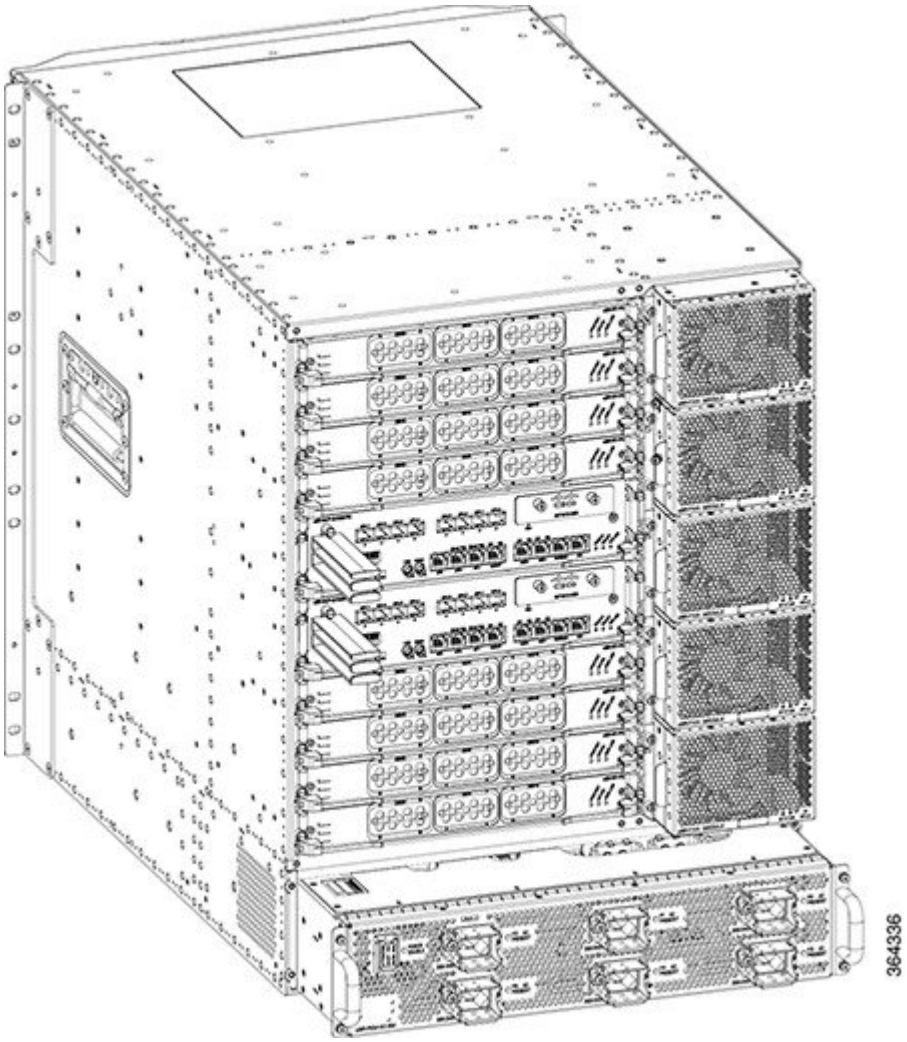
- ESD-preventive wrist strap
- AC or DC FPEM
- T10 Torx torque screwdriver

Step 1 Remove the four #6-32 Torx-head screws located on the chassis mounting flanges using a T10 Torx torque screwdriver.

Step 2 Carefully slide the FPEM into the slot using the two handles applying even pressure to both the handles until the FPEM is fully seated in the chassis.

Caution To prevent damage to the midplane connectors, do not use excessive force when inserting the FPEM into the slot.

Figure 38: Installing the FPEM in the Chassis



Step 3 Insert the four #6-32 Torx-head screws into the mounting flanges. Tighten the screws using a T10 Torx torque screwdriver with a torque of 8-10 in-lb (0.90-1.13Nm) to secure the module.

What to Do Next

- For an AC-powered Cisco cBR chassis, connect the AC power.

  For a DC-powered Cisco cBR chassis, connect the DC power.
- Install the Power Modules.

Installing the Power Module in the Cisco cBR Chassis

The chassis ships with the Power Module already installed.

Use this procedure to install the following modules in the chassis:

- AC Power Module
- DC Power Module

Before You Begin

Important We recommend that you wire the chassis for 9 KW of power. If you wire it for less than 9 KW power, you may need to add more power modules while adding new hardware or upgrading the existing hardware.

Warning If you are adding new hardware or upgrading the existing hardware, ensure that the power modules installed in the chassis are adequate to support the hardware.

- Install the Power Cassette Module.
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the FPIM.
- Be aware of the weight and size of the equipment. Handle it with care.

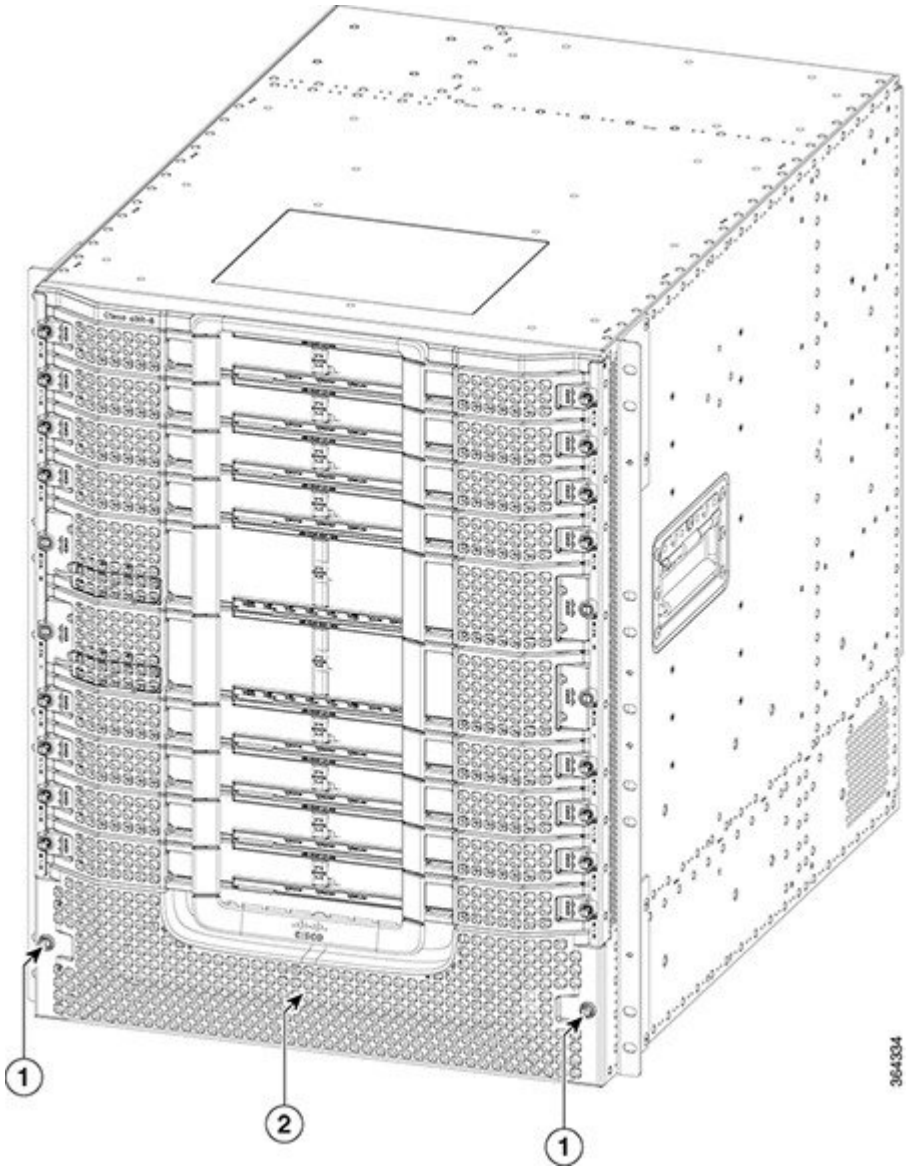
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver

- AC or DC Power Module

Step 1 Loosen the two screws on the front power entry bezel using a 3/16" flat-blade torque screwdriver. Remove the front power entry bezel from the chassis.

Figure 39: Removing the Front Power Entry Bezel from the Chassis

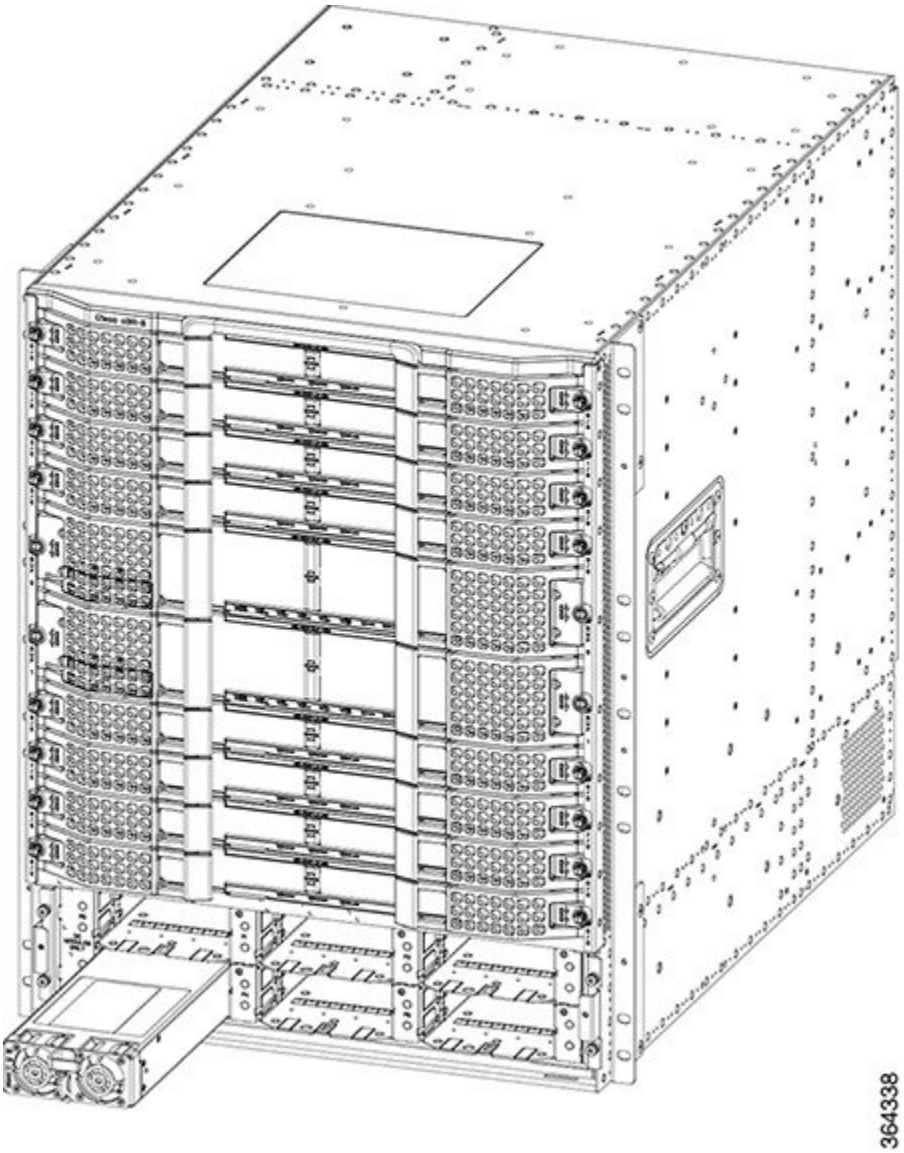


1	Screw	2	Front power entry bezel

Step 2 Carefully slide Power Module into the bay until it mates with the FPEM connectors.

Caution To prevent damage to the FPEM connectors, do not use excessive force when inserting the Power Module into the bay.

Figure 40: Installing the Power Module in the Chassis



Step 3 Move the handle up to lock the Power Module in the chassis.

Step 4 Tighten the screw using a 3/16" flat-blade screwdriver with a torque of 5-7 in-lb (0.56-0.79 Nm) to secure the Power Module.

Step 5 Repeat Step 2, on page 90 to Step 4, on page 91 for each Power Module.

Step 6 Position the front power entry bezel on the chassis. Insert and tighten the two screws using a 3/16" flat-blade torque screwdriver with a torque of 5-7 in-lb (0.56-0.79 Nm) to secure the bezel.

What to Do Next

- For an AC-powered Cisco cBR chassis, connect the AC power.

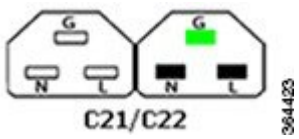
  For an DC-powered Cisco cBR chassis, connect the DC power.
- If all the interfaces and other cables are connected, power up the Cisco cBR chassis.
- Verify that the input power LED on the Power Module illuminates green.

Connecting Power to the AC-Powered Cisco cBR Chassis

Warning Before connecting AC Power to the AC FPEM, the chassis ground connection must always be made first and disconnected last.

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

The AC FPEM has six input connectors. Each input connector corresponds to the AC Power Module installed in the front of the chassis. They are IEC60320, C22 inlet connectors, which require facility power cords with a C21 style connector. These are similar to a standard C19/C20 combination, but they have chamfers in the upper corners, which are used to distinguish them as rated for 155C instead of the typical 70C used on the C19/C20.

Configuration Female/Male	Rated Current International	Rated Current North America	Wires	Poles	Inlet	Connector
	250 V 16 A	125/250 V 16 A	3	2	C22	C21

Description	Value
AC Power Modules per system	Up to six
Total AC input power per AC Power Module	3400 VA facility input
Rated input voltage per AC Power Module	200-240 VAC nominal (range: 180 to 264 VAC) 220-240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Source AC service requirement	20 A North America; 16 A international; 13 A UK (IEC60320 C22 connector on the chassis input side)

Before You Begin

- Attach the Chassis Ground Connection.
- Install the AC Power Cassette Module.
- Install the AC FPIM.
- Install the AC Power Modules.

Required Tools and Equipment

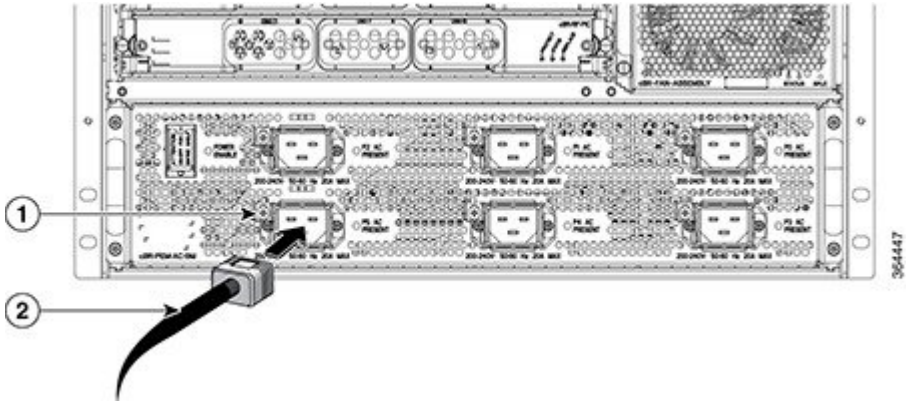
- AC power cord

- #2 Phillips torque screwdriver

Step 1 Ensure that the power switch on the AC FPEM is in off (down) position.

Step 2 Connect the AC power cord to the receptacle on the AC FPEM.

Figure 41: Connecting AC Power Cord to the AC FPEM



1	Screw on the cable retaining bracket	2	AC power cord

Step 3 Tighten the Phillips-head screw on the cable retaining bracket using a #2 Phillips torque screwdriver with a torque of 8-10 in-lb (0.90-1.13Nm).

Step 4 Connect the other end of the AC power cord to the AC source receptacle.

Step 5 Repeat Step 2, on page 93 to Step 4, on page 93 for all power connections.

What to Do Next

If all the interfaces and other cables are connected, power up the Cisco cBR chassis.

Connecting Power to the DC-Powered Cisco cBR Chassis

Warning The terminal block covers are an integral part of the safety design of the product. Do not operate the unit without the covers installed. **Statement 1077**

Warning Before connecting DC Power to the DC FPEM, the ground connection must always be made first and disconnected last.

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. **Statement 1003**

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

The DC FPEM provides terminal blocks for facility input connectivity. It has 12 sets of input terminal blocks to provide each power module with the option of both A and B facility connections.

The table below provides the common input range and circuit breaker requirements:

Table 24: Common DC Input Range and Circuit Breaker Requirements

DC Power	System Input Rating (in A)	Circuit Breaker (in A)		AWG # Wire	
		Minimum	Maximum	Minimum	Maximum
DC FPEM	2 feeds of 60 A per DC Power Module	Always 60		AWG # 4	AWG # 2[2]

2 If AWG #2 wire is used for DC power module connections, the chassis ground wire must also be upgraded to an AWG #2 wire and connector .

Before You Begin

- Attach the Chassis Ground Connection.
- Install the DC Power Cassette Module.
- Install the DC FPIM.
- Install the DC Power Modules.
- The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green/yellow is used for ground (GND), black is used for -48V on negative (-) terminal and red is used for RTN on the positive (+) terminal. Ensure that the lead color coding you choose for the DC-input power supply matches lead color coding used at the DC power source.
- For DC input power cables, select the appropriate wire gauge based on the National Electrical Code (NEC) and local codes for 60-amp service at nominal DC input voltage (-48 VDC). Two pairs of cable leads, source DC (-) and source DC return (+) on P-A and P-B, can be used for each DC Power Module. These cables are available from any commercial cable vendor. All input power cables for the chassis must have the same wire gauge.

Note You do not need to connect power to both P-A and P-B feeds for each DC Power Module. The DC Power Modules can operate even with one power input connected.

- Each DC input power cable is terminated at the FPEM by a cable lug (included in the accessory kit). The cable lugs must be dual-hole, and have a 90 degree tongue (reference Panduit LCD4-14AF-L). They must be able to fit over 1/4-20 terminal studs on 0.625 in (15.88 mm) centers and have a maximum tongue width of 0.6 inches.

Note DC input power cables must be connected to the FPEM terminal studs in the proper positive (+) and negative (-) polarity. Some DC cable leads are labeled, which is a relatively safe indication of the polarity. However, you must verify the polarity by measuring the voltage between the DC cable leads. When measuring the voltage, the positive (+) lead and the negative (-) lead must always match the (+) and (-) labels on the power distribution unit.

- To avoid hazardous conditions, all components in the area where DC input power is accessible must be properly insulated. Therefore, before installing the DC cable lugs, ensure to insulate the lugs according to the manufacturer's instructions.

Caution Before installing the DC cable lugs, insulate the entire 90 degree portion of the lugs where the wire is crimped to avoid hazardous conditions where DC input power is accessible through the terminal block cover of the DC FPEM.

Required Tools and Equipment

- Insulating sleeving
- Torque wrench
- 7/16" hex socket
- Lugs for the cables
- Cables for positive and negative leads

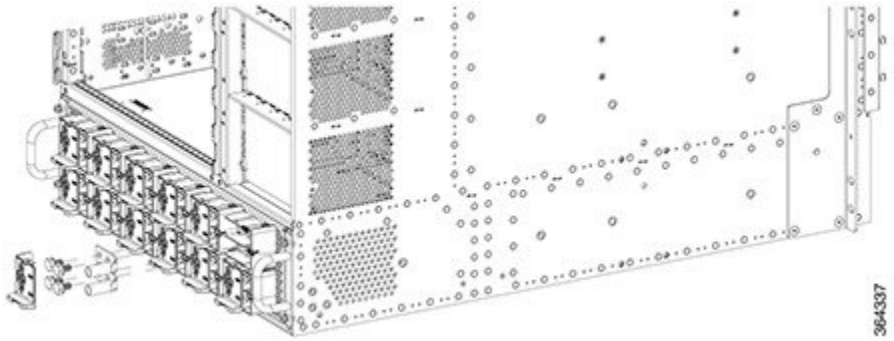
- Crimping tool

Step 1 Ensure that the power switch on the DC FPEM is in off (down) position.

Step 2 Attach the lug to the lead cable. Carefully crimp the receptacle around the cable using the crimping tool. Insulate the entire 90 degree portion of the lug with shrink sleeving for each lead wire.

Step 3 Remove the terminal block cover on each terminal block by pushing down on the bottom tab then pivoting the bottom out.

Figure 42: Connecting DC Power to the DC FPEM



Step 4 Loosen the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket and remove them.

Step 5 Connect the negative lead cable and secure it in place with the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket with a torque of 45-50 in-lb (5.08-5.65 Nm).

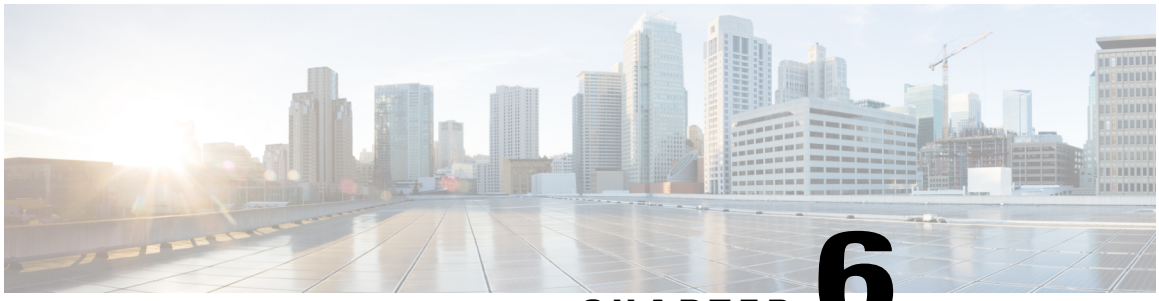
Step 6 Connect the positive lead cable and secure it in place with the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket with a torque of 45-50 in-lb (5.08-5.65 Nm).

Step 7 Repeat Step 5, on page 96 and Step 6, on page 96 for each terminal block connection.

Step 8 Reinstall the terminal block covers by clipping them on the top edge of the terminal block housing and then rotating them down until they snap into place.

What to Do Next

If all the interfaces and other cables are connected, power up the Cisco cBR chassis.



CHAPTER 6

Installing the Supervisor in the Cisco cBR Chassis

- Installing the Supervisor PIC in the Cisco cBR Chassis, page 97
- Installing the Supervisor PIC Cable Management Bracket, page 100
- Installing the SFP+ Modules in the Supervisor PIC, page 102
- Installing the Supervisor Card in the Cisco cBR Chassis, page 104
- Using the SFP+ Ports on the Supervisor PIC, page 108
- Using the DTI Ports on the Supervisor PIC, page 109
- Using the NME Ports on the Supervisor PIC, page 109
- Using the Console Port on the Supervisor PIC, page 110
- Using the Auxiliary Port on the Supervisor PIC, page 112
- Cable Management for the Supervisor PIC in the Cisco cBR Chassis, page 113
- Using the USB Port on the Supervisor Card, page 119
- Using the Console Port on the Supervisor Card, page 121

Installing the Supervisor PIC in the Cisco cBR Chassis

Perform this procedure to install the following PICs:

- Supervisor PIC
- Blank PIC for the Supervisor

Before You Begin

Warning If you are adding a new Supervisor PIC or upgrading the existing Supervisor PICs, ensure that the power modules installed in the chassis are adequate to support the Supervisor PICs.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.

Restrictions

- If you are using a single Supervisor, you must install the Supervisor PIC in the slot corresponding to the Supervisor Card.

Note In the Cisco cBR-8 router,

- Slot 4/1 for the Supervisor PIC corresponds to slot SUP0 for the Supervisor Card.
- Slot 5/1 for the Supervisor PIC corresponds to slot SUP1 for the Supervisor Card.

Required Tools and Equipment

- ESD-preventive wrist strap
- Supervisor PIC or blank PIC for the Supervisor
- 3/16" flat-blade torque screwdriver

Step 1 Grasp the faceplate of the PIC with one hand and place your other hand under the PIC to support its weight.

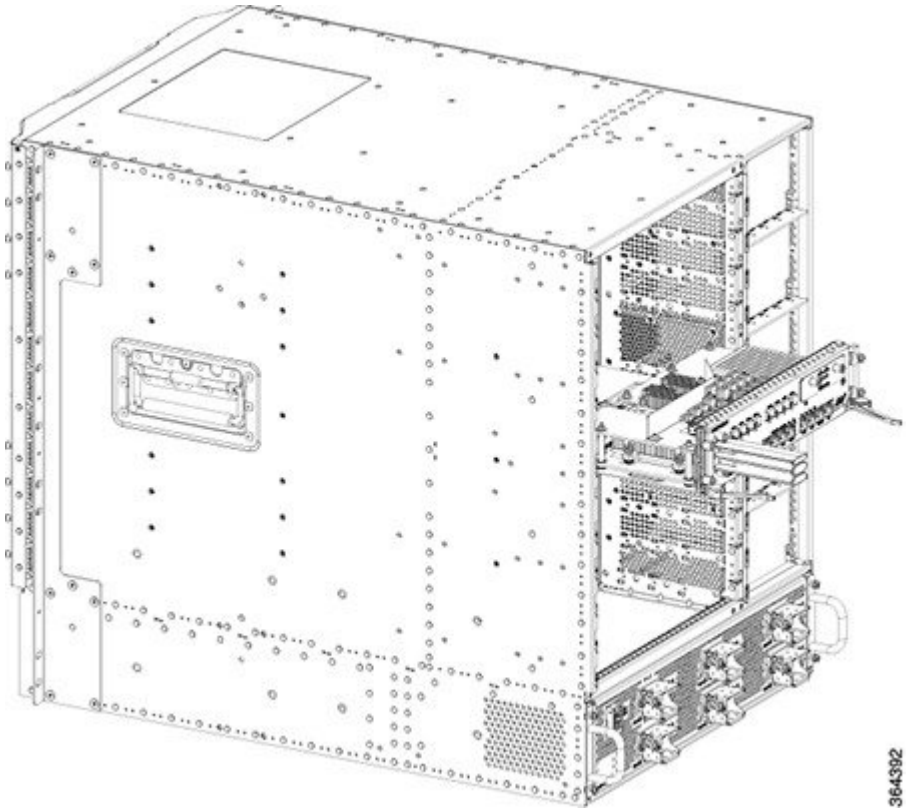
Step 2 Carefully align the PIC with the plastic guides in the slot.

Step 3 Slide the PIC into the slot applying even pressure using both your hands until it is within an inch of full insertion.

Step 4 Open the ejector levers and fully insert the PIC into the slot applying even pressure on both sides until it mates with the midplane connectors.

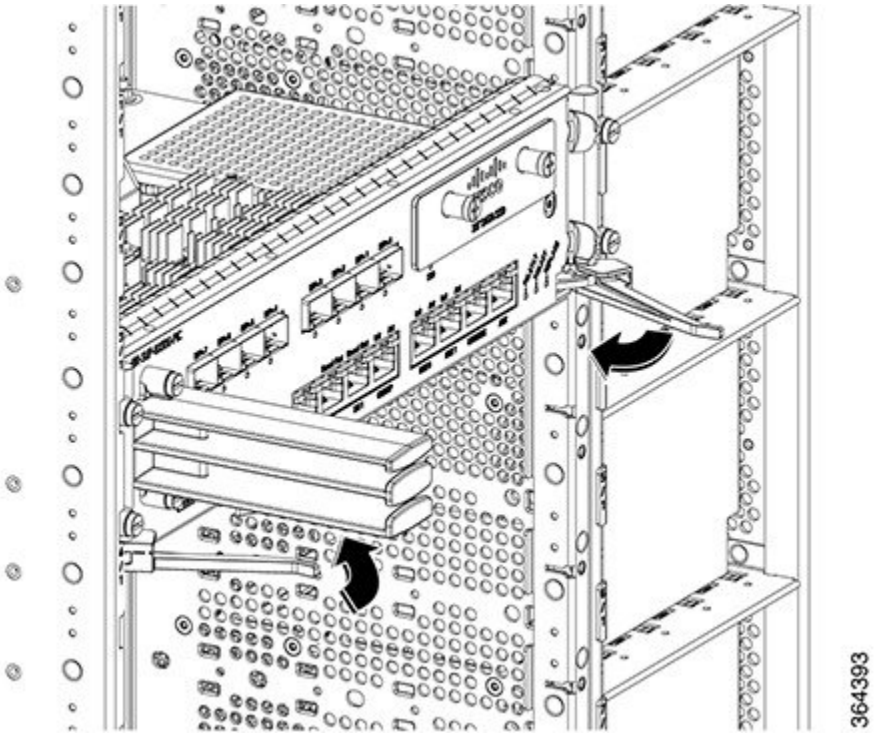
Caution To prevent damage to the midplane connectors, do not use excessive force when inserting the PIC into the slot.

Figure 43: Inserting the Supervisor PIC into the Chassis



Step 5 Simultaneously pivot both the ejector levers towards each other until they cannot be pivoted any further.

Figure 44: Closing the Ejector Levers on the Supervisor PIC



Step 6 Tighten the four captive screws using a 3/16" flat-blade torque screwdriver with a torque of 6-8 in-lb (0.68-0.90 Nm) to secure the PIC.

What to Do Next

- If you are using a single Supervisor PIC, install a blank PIC for the Supervisor in the empty slot.
- Install the Supervisor PIC cable management bracket (recommended).
- Install the Supervisor Card (if not already installed).

Installing the Supervisor PIC Cable Management Bracket

The Supervisor PIC cable management bracket is shipped separately in the chassis accessory kit. It has a smaller slot for fiber-optic cables and a larger slot for the RJ-45 cables.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.

- Install the Supervisor PIC (recommended).

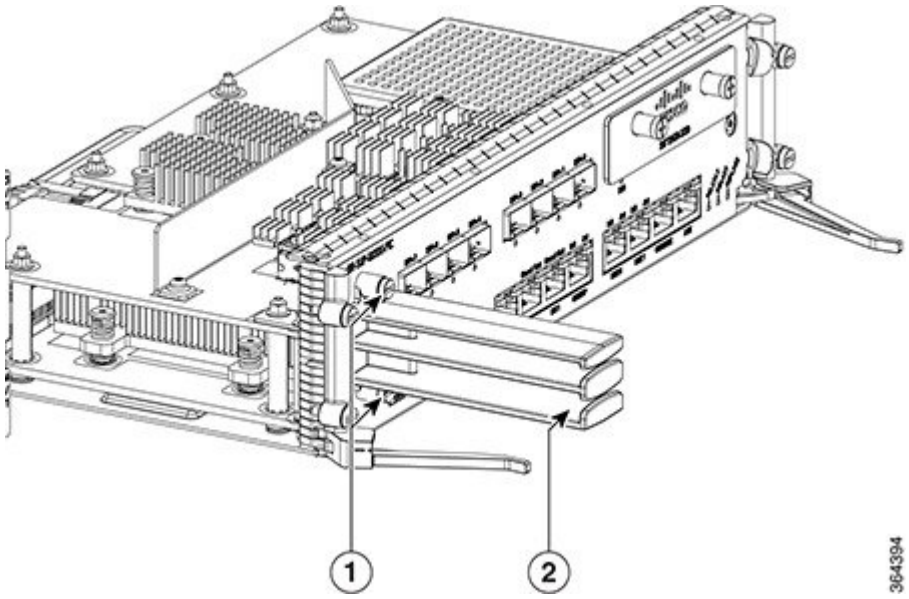
Required Tools and Equipment

- ESD-preventive wrist strap
- Supervisor PIC
- Supervisor PIC cable management bracket
- 3/16" flat-blade torque screwdriver

Step 1 Align the captive screws on the Supervisor PIC cable management bracket with the mounting holes on the Supervisor PIC.

Important Ensure that the upper slot in the cable management bracket is the smaller slot for fiber-optic cables and the lower slot is the larger slot for RJ-45 cables.

Figure 45: Installing the Supervisor PIC Cable Management Bracket



1	Captive screws	2	Supervisor PIC cable management bracket

Step 2 Tighten the captive screws using a 3/16" flat-blade torque screwdriver with a torque of 6-8 in-lb (0.68-0.90 Nm) to secure the Supervisor PIC cable management bracket.

What to Do Next

- Install the chassis-mounted fiber/cable routing guide (if not already installed).

- Route the Supervisor PIC cables through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Installing the SFP+ Modules in the Supervisor PIC

Before You Begin

Caution Do not install or remove the SFP+ module with fiber-optic cables still attached to it. Doing so may damage cables, cable connectors, or the optical interfaces and may interfere with the SFP+ module latching properly into its socket connector. Disconnect all cables before removing or installing an SFP transceiver module.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- You must use the supported SFP+ modules. The following SFP+ modules are supported on the Supervisor PIC:
  - SFP-10G-SR
  - SFP-10G-LR
  - SFP-10G-ER
  - SFP-10G-ZR
  - SFP-10G-LRM

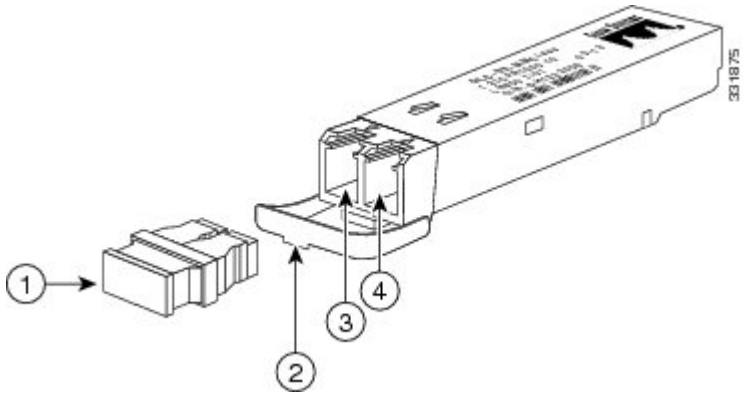
Required Tools and Equipment

- ESD-preventive wrist strap
- SFP+ module

Step 1 Remove the SFP+ module from its protective packaging.

Note Do not remove the optical bore dust plugs.

Figure 46: SFP+ Module with Dust Plugs



1	Dust plug	3	Transmit bore
2	Bail clasp with clasp tab	4	Receive bore

Step 2 Check the label on the SFP+ module to verify that you have the correct model for your network.

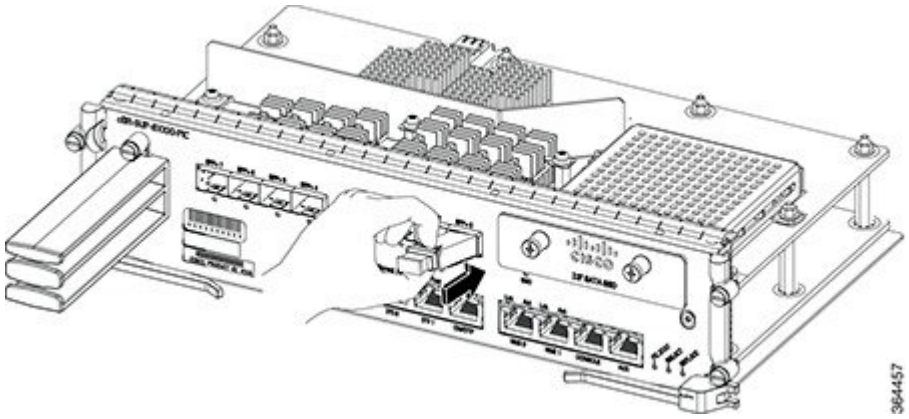
Step 3 Find the send (TX) and receive (RX) markings that identify the top side of the SFP+ module.

Note On some SFP modules, the TX and RX marking might be replaced by arrowheads pointing from the SFP+ module connector (transmit direction or TX) and towards the connector (receive direction or RX).

Step 4 Align the SFP+ module in front of the socket opening.

Step 5 Carefully insert the SFP+ module into the socket until you feel the connector latch into place.

Figure 47: Installing the SFP+ Module in the Supervisor PIC



Step 6 Press the SFP+ module into the slot firmly with your thumb until it is latched securely into the socket.

Step 7 Repeat Step 1, on page 102 to Step 6, on page 104 for each SFP+ module.

What to Do Next

- Verify if the SFP+ module is seated and latched properly. Grasp the SFP+ module and try to remove it without releasing the latch. If the SFP+ module cannot be removed, it is installed and seated properly. If the SFP+ module can be removed, reinstall it.
- Connect fiber-optic cable to the SFP+ port.

Installing the Supervisor Card in the Cisco cBR Chassis

Perform this procedure to install the following cards:

- Supervisor Card
- Blank card for the Supervisor

Before You Begin

Warning If you are adding a new Supervisor Card or upgrading the existing Supervisor Cards, ensure that the power modules installed in the chassis are adequate to support the Supervisor Cards.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the Supervisor PIC (recommended).
- Be aware of the weight and size of the equipment. Handle it with care.

Restrictions

- If you are using a single Supervisor, you must install the Supervisor Card in the slot corresponding to the Supervisor PIC.

Note In the Cisco cBR-8 router,

- Slot 4/1 for the Supervisor PIC corresponds to slot SUP0 for the Supervisor Card.
- Slot 5/1 for the Supervisor PIC corresponds to slot SUP1 for the Supervisor Card.

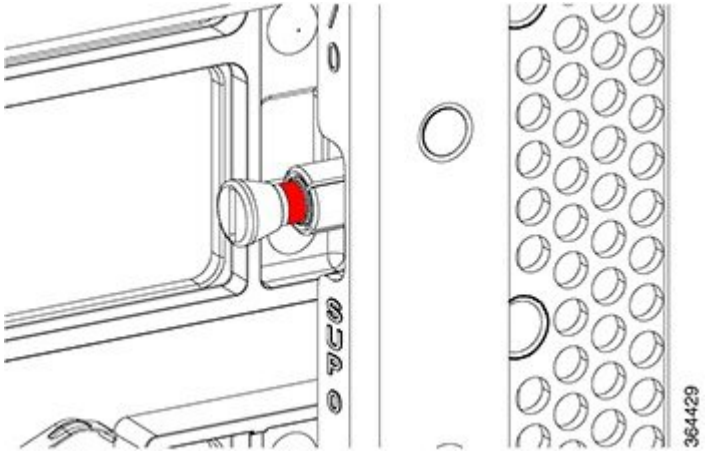
Required Tools and Equipment

- ESD-preventive wrist strap

- Supervisor Card or blank card for the Supervisor
- 3/16" flat-blade torque screwdriver

Step 1 Loosen the captive screws on the appropriate slot using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

Figure 48: Loosening the Captive Screws on the Supervisor Card



Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate.

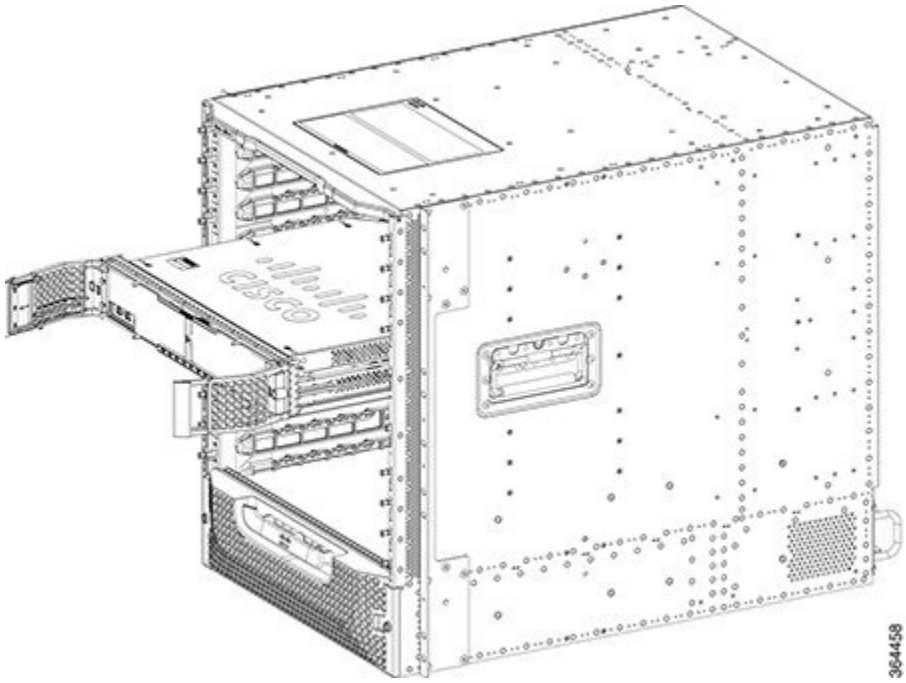
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

Step 4 Carefully align the support rails on the card with the rails in the appropriate slot.

Step 5 Slide and push the card into the slot applying even pressure using both your hands until it mates with its midplane connectors.

Caution To prevent damage to the midplane connector, do not use excessive force when inserting the card into the slot.

Figure 49: Inserting the Supervisor Card into the Chassis



Step 6 Simultaneously pivot both the spring-loaded ejectors towards the faceplate until they make contact with the faceplate.

Figure 50: Closing the Spring-Loaded Ejectors on the Supervisor Card

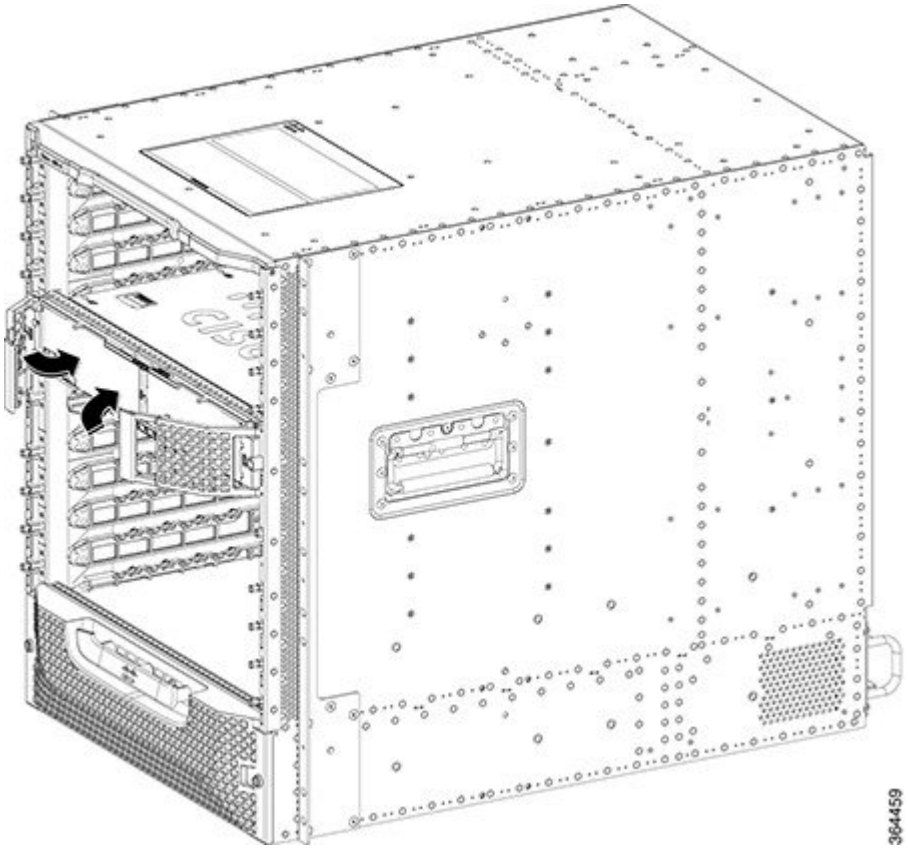
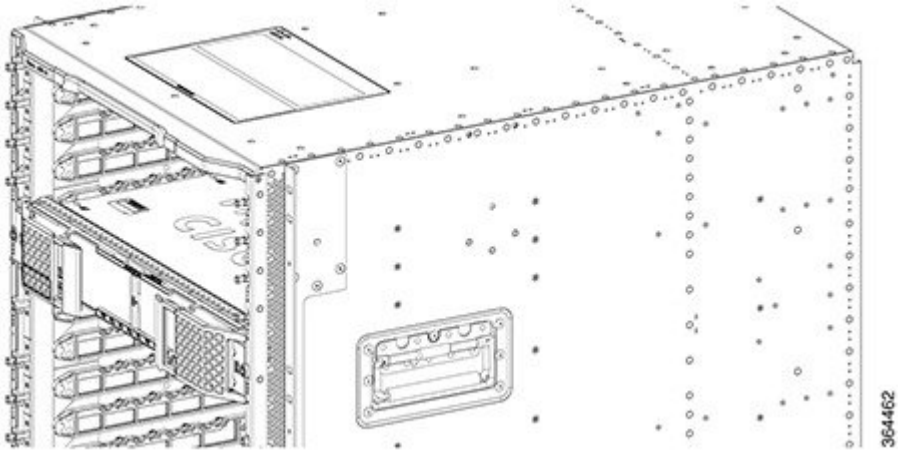


Figure 51: Closed and Secured Spring-Loaded Ejectors on the Supervisor Card



Step 7 Tighten the two captive screws using a 3/16" flat-blade torque screwdriver with a torque of 10-12 lb-in (1.12-1.36 Nm) to secure the card.

What to Do Next

- If you are using a single Supervisor Card, install a blank card for the Supervisor in the empty slot.
- Connect memory stick or flash drive to use the USB port (if required).
- Connect cable to use the console port (if required).

Using the SFP+ Ports on the Supervisor PIC

Before You Begin

- Install the Supervisor PIC.
- Install the SFP+ module in the Supervisor PIC
- Install the Supervisor Card.
- Do not remove the protective dust plugs on the unplugged fiber-optic cable connectors and the SFP+ optical bores until you are ready to make a connection.

Required Tools and Equipment

- Fiber-optic cable with the LC connector

Step 1 Remove the dust plugs from the network interface cable LC connectors. Save the dust plugs for future use.

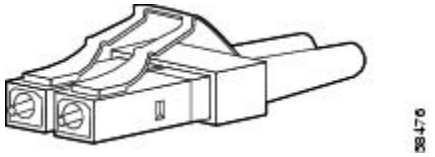
Step 2 Inspect and clean the LC connector end-faces.

Step 3 Remove the dust plug from the SFP+ module optical bores on the Supervisor PIC.

Step 4 Immediately connect the fiber-optic cable with cable LC connector to the SFP+ port.

Important Grasp the LC connector housing to connect the fiber-optic cable to the SFP+ ports.

Figure 52: LC fiber-optic connector



What to Do Next

Route the fiber-optic cables through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Using the DTI Ports on the Supervisor PIC

Before You Begin

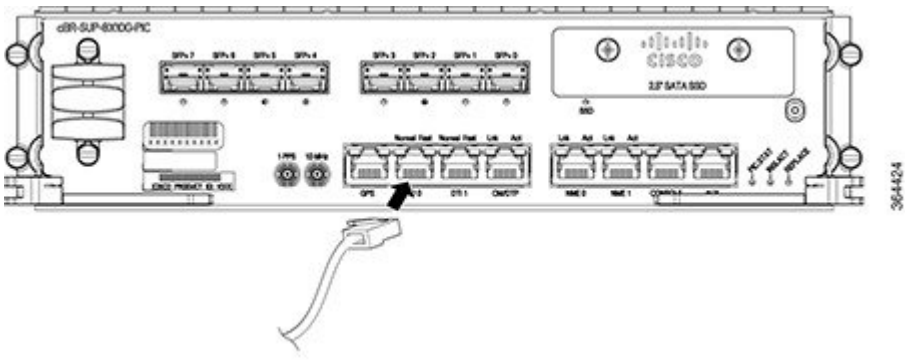
- Install the Supervisor PIC.
- Install the Supervisor Card.

Required Tools and Equipment

- RJ-45 cable
- Clock source (DTI server)

Step 1 Connect one end of the RJ-45 cable to the DTI port on the Supervisor PIC.

Figure 53: DTI Port Connection on the Supervisor PIC



Step 2 Connect the other end of the RJ-45 cable to the to the DTI server as a reference clock source.

What to Do Next

Route the RJ-45 cable through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Using the NME Ports on the Supervisor PIC

Before You Begin

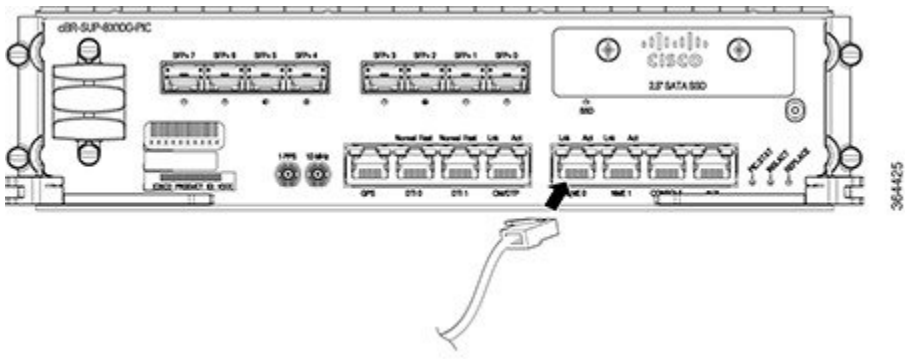
- Install the Supervisor PIC.
- Install the Supervisor Card.

Required Tools and Equipment

- RJ-45 cable
- Switch

Step 1 Connect one end of the RJ-45 cable to the NME port on the Supervisor PIC.

Figure 54: NME Port Connection on the Supervisor PIC



Step 2 Connect the other end of the RJ-45 cable to a switch.

What to Do Next

Route the RJ-45 cable through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Using the Console Port on the Supervisor PIC

The console port provides local administrative access to the router and its command-line interface (CLI).

Before You Begin

- Install the Supervisor PIC.
- Install the Supervisor Card.

Restrictions

- Each Supervisor PIC must have a console port connection when running a redundant configuration in the chassis.

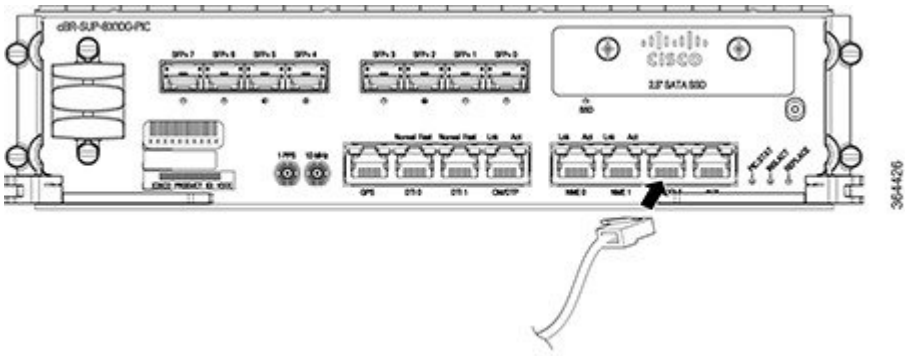
Required Tools and Equipment

- RJ-45 cable
- RJ-45-to-DB-9 adapter

- PC or terminal

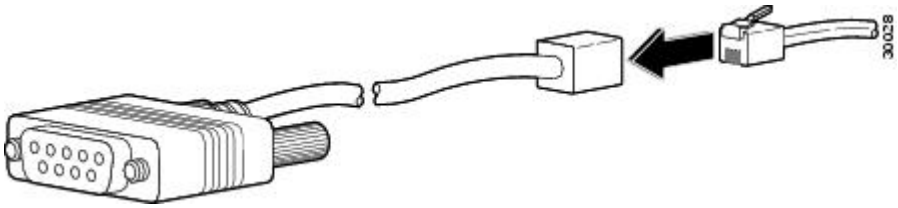
Step 1 Connect one end of the RJ-45 cable to the console port on the Supervisor PIC.

Figure 55: Console Port Connection on the Supervisor PIC



Step 2 Connect the other end of the RJ-45 cable to the RJ-45-to-DB-9 adapter.

Figure 56: Connecting an RJ-45-to-DB-9 Adapter



Step 3 Connect the RJ-45-to-DB-9 adapter to the appropriate serial port on the PC or terminal.

Step 4 Power up the PC or terminal.

Step 5 Configure the PC terminal emulation software or the terminal with the following settings:

- 9600 baud
- 8 data bits
- No parity generation or checking
- 1 stop bit
- No flow control

What to Do Next

- Route the cable through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

- Connect a terminal server to the auxiliary port (if required).

Using the Auxiliary Port on the Supervisor PIC

The auxiliary port provides a connection for a terminal server to allow remote access to the router and its command-line interface (CLI).

Before You Begin

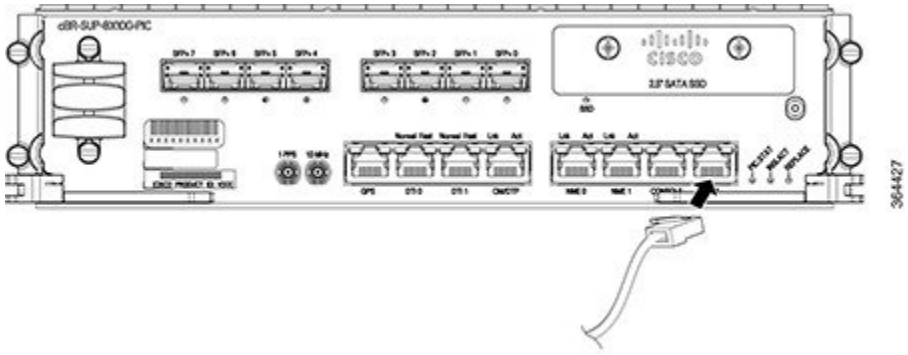
- Install the Supervisor PIC.
- Install the Supervisor Card.

Required Tools and Equipment

- RJ-45 cable
- RJ-45-to-DB-9 adapter
- Terminal server

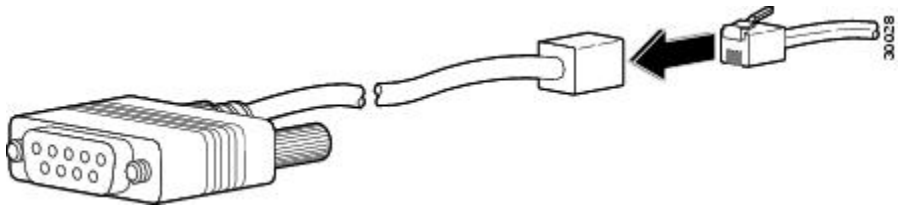
Step 1 Connect one end of the RJ-45 cable to the auxiliary port on the Supervisor PIC.

Figure 57: Auxiliary Port Connection on the Supervisor PIC



Step 2 Connect the other end of the RJ-45 cable to the RJ-45-to-DB-9 adapter.

Figure 58: Connecting an RJ-45-to-DB-9 Adapter



Step 3 Connect the RJ-45-to-DB-9 adapter to the appropriate serial port on the terminal server.

What to Do Next

Route the cable through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Cable Management for the Supervisor PIC in the Cisco cBR Chassis

The following accessories are used for routing the cables connected to the Supervisor PIC:

- Supervisor PIC cable management bracket
- Chassis-mounted cable strap-down clips
- Chassis-mounted snap-on plastic fiber/cable routing guides

Use the upper cable management bracket and fiber/cable routing guides for routing the cables connected to the upper Supervisor PIC and the lower cable management bracket and fiber/cable routing guide for routing the cables connected to the lower Supervisor PIC.

The strap-down clips have multiple uses. They can be used:

- to strap down cable bundles or conduit (there are multiple tie down points on each strap-down clip)
- as a base for two snap-on plastic fiber/cable routing guides

Before You Begin

- Install the Supervisor PIC.
- Install the Supervisor PIC cable management bracket.
- Install the chassis-mounted cable strap-down clips and attach the snap-on plastic fiber/cable routing guides, as necessary based on the cable routing preference.
- Connect the cables to the appropriate ports on the Supervisor PIC.

Required Tools and Equipment

- Cable ties

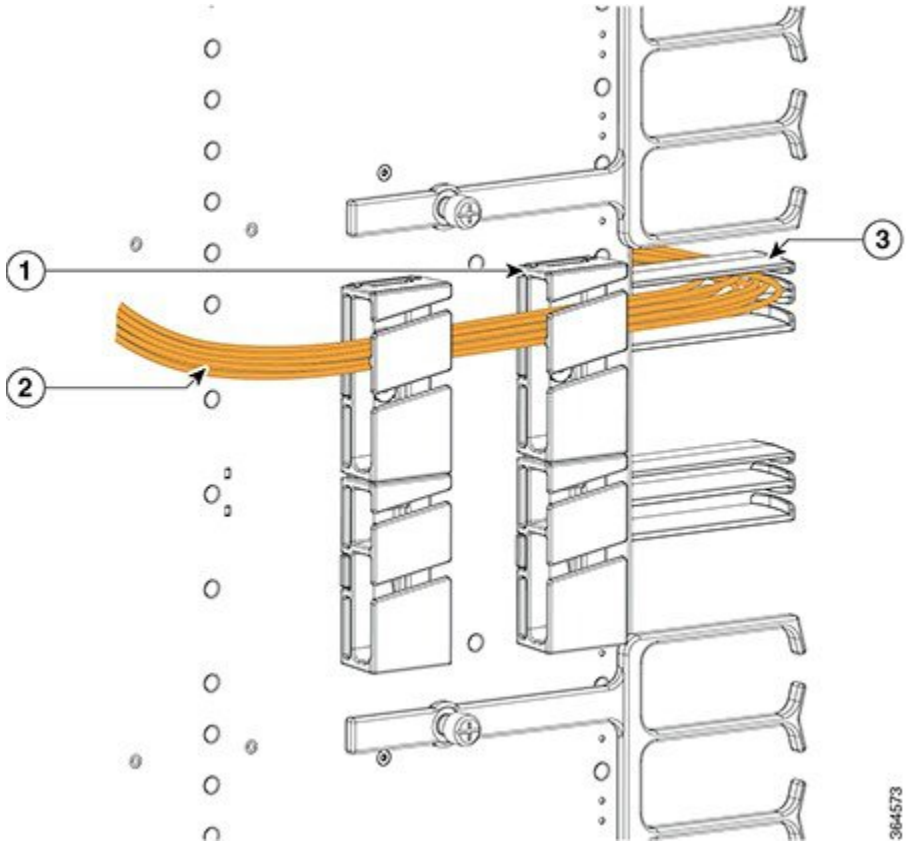
Step 1 Perform the following for the fiber-optic cables connected to the Supervisor PIC:

- If you are using a chassis-mounted snap-on plastic fiber/cable routing guide, route the fiber-optic cables through the upper slot of the snap-on plastic fiber/cable routing guide and then through the upper slot of the Supervisor PIC cable management bracket. Secure the cable bundle using cable ties.

- If you are using a chassis-mounted cable strap-down clip without the snap-on plastic fiber/cable routing guide, route the fiber-optic cables through the upper slot of the Supervisor PIC cable management bracket. Secure the cable bundle to the upper tie down point on the strap-down clip using a cable tie.

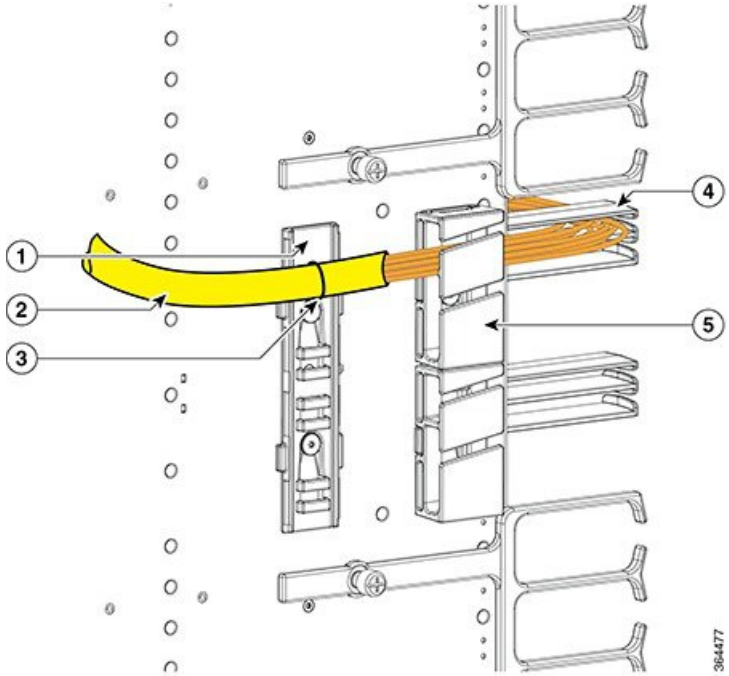
The following figures illustrate the possible cable routing options for the fiber-optic cables connected to the Supervisor PIC:

Figure 59: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 1



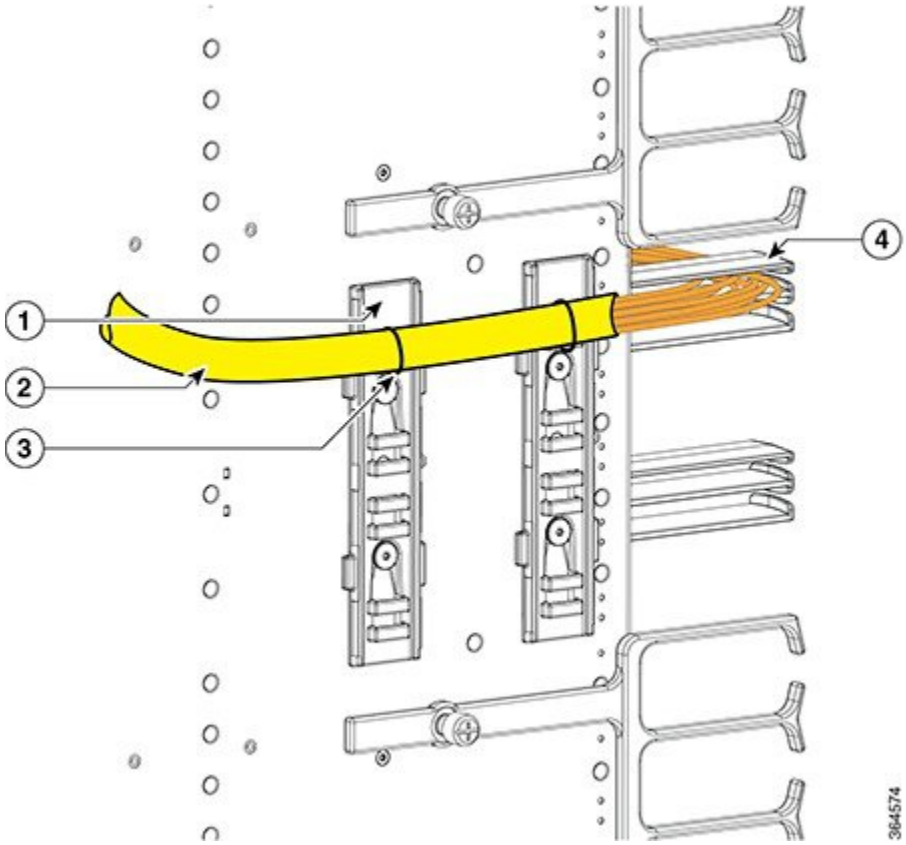
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	Fiber-optic cable bundle		—

Figure 60: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 2



1	Strap-down clips	4	Supervisor PIC cable management bracket
2	Fiber-optic cable bundle in flexible conduit	5	Snap-on plastic fiber/cable routing guides
3	Cable tie		—

Figure 61: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 3



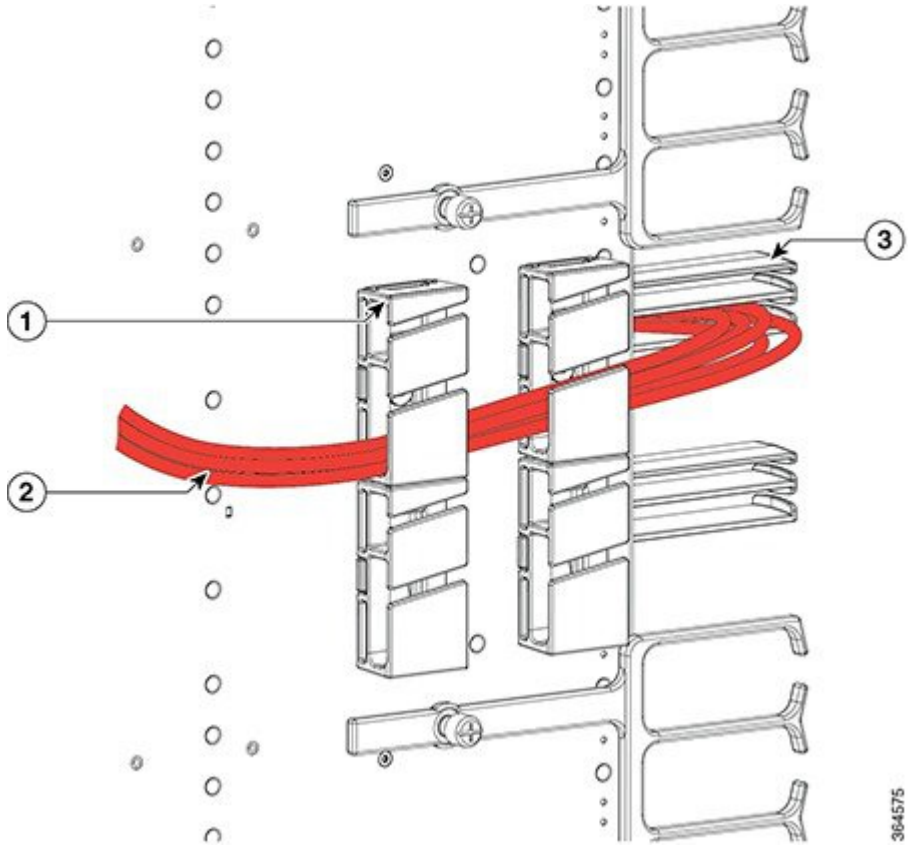
1	Strap-down clip	3	Cable tie
2	Fiber-optic cable bundle in flexible conduit	4	Supervisor PIC cable management bracket

Step 2 Perform the following for the RJ-45 cables connected to the Supervisor PIC:

- If you are using a chassis-mounted snap-on plastic fiber/cable routing guide, route the RJ-45 cables through the lower slot of the snap-on plastic fiber/cable routing guide and then through the lower slot of the Supervisor PIC cable management bracket. Secure the cable bundle using cable ties.
- If you are using a chassis-mounted cable strap-down clip without the snap-on plastic fiber/cable routing guide, route the RJ-45 cables through the lower slot of the Supervisor PIC cable management bracket. Secure the cable bundle to the lower tie down point on the strap-down clip using a cable tie.

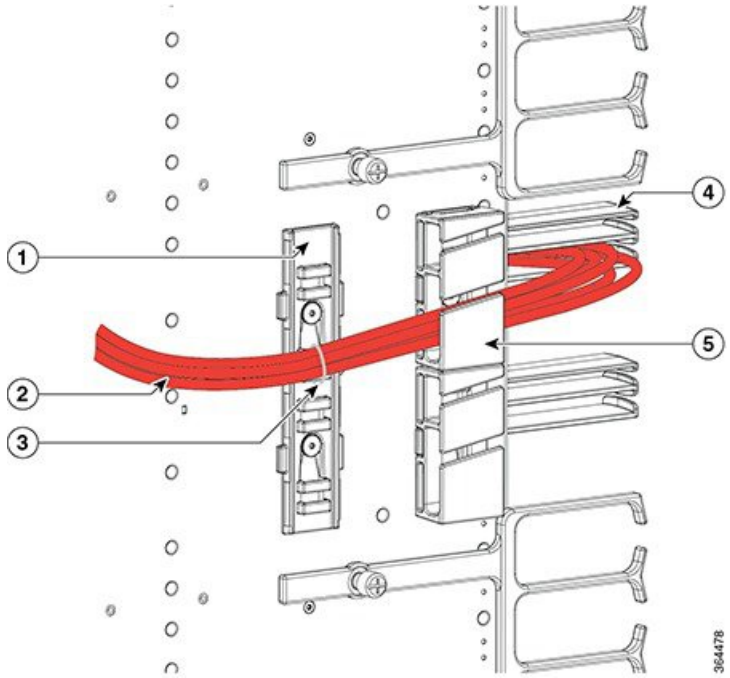
The following figures illustrate the possible cable routing options for the RJ-45 cables connected to the Supervisor PIC:

Figure 62: Routing the RJ-45 Cables Connected to the Supervisor PIC—Option 1



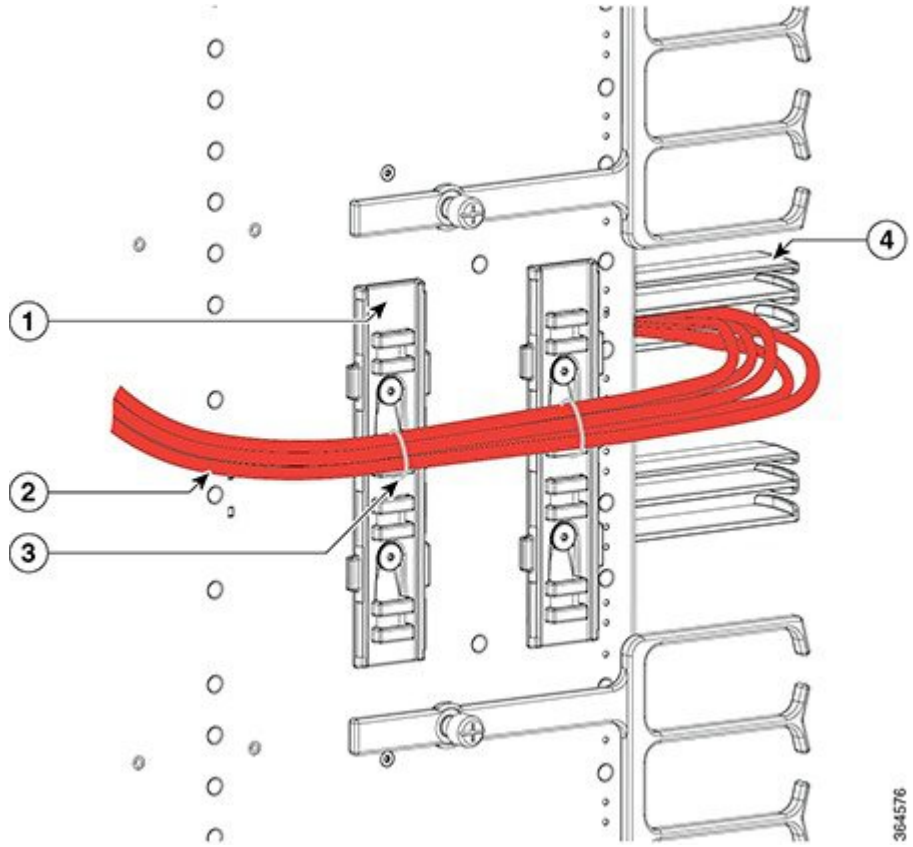
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	RJ-45 cable bundle		—

Figure 63: Routing the RJ-45 Cables Connected to the Supervisor PIC—Option 2



1	Strap-down clip	4	Supervisor PIC cable management bracket
2	RJ-45 cable bundle	5	Snap-on plastic fiber/cable routing guides
3	Cable tie		—

Figure 64: Routing the RJ-45 Cables Connected to the Supervisor PIC—Option 3



1	Strap-down clips	3	Cable ties
2	RJ-45 cable bundle	4	Supervisor PIC cable management bracket

Step 3 Repeat Step 1, on page 113 and Step 2, on page 116 for the cables connected to the each Supervisor PIC.

Using the USB Port on the Supervisor Card

Before You Begin

- Install the Supervisor PIC.
- Install the Supervisor Card.

Restrictions

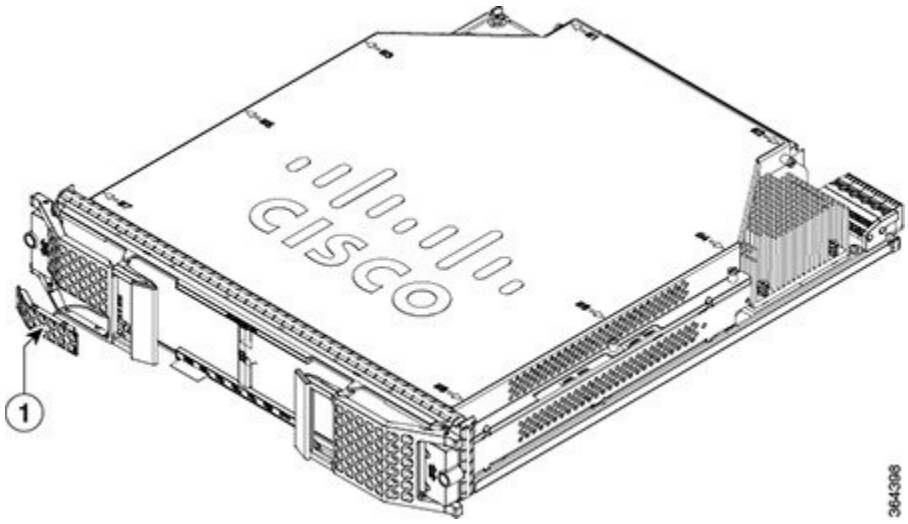
The USB ports on the Supervisor Card are used for temporary connections. For all permanent connections, you must use the ports on the Supervisor PIC.

Required Tools and Equipment

- Memory stick or flash drive

Step 1 Open the tethered I/O door on the Supervisor Card by pulling on the left edge of the door until the door is released from the spring-loaded ejector.

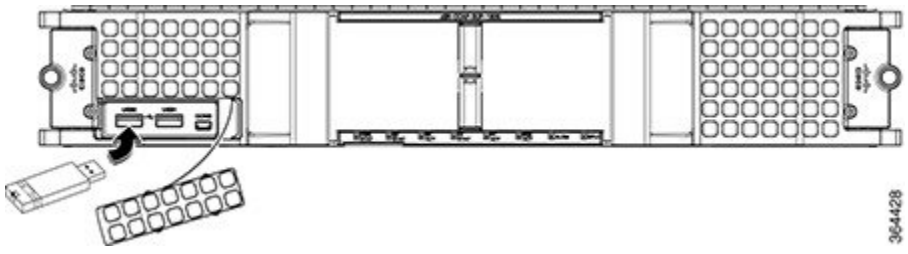
Figure 65: Opening the Tethered I/O Door on the Supervisor Card



1	Tethered I/O door		—

Step 2 Connect the memory stick or flash drive to the USB port on the Supervisor Card.

Figure 66: Connecting the USB Drive to the USB Port



Using the Console Port on the Supervisor Card

Before You Begin

- Install the Supervisor PIC.
- Install the Supervisor Card.

Restrictions

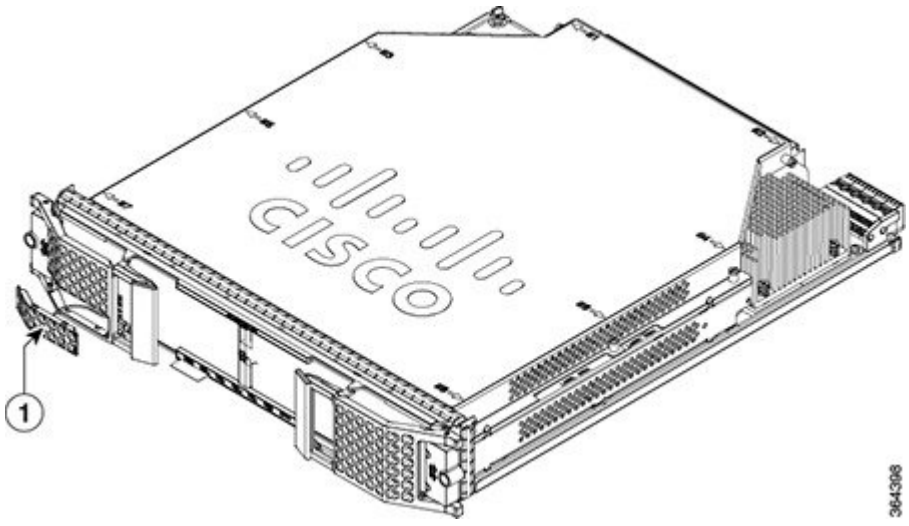
- When running a redundant configuration in the chassis, each Supervisor Card or Supervisor PIC must have a console port connection.
- The console port on the Supervisor Card is for temporary connections. For permanent console connection, you must use the port on the Supervisor PIC.

Required Tools and Equipment

- Console cable (with mini type-B USB connector on one end, and a type-A USB connector on the other end)
- Exar XR21V1410 UART with USB interface
- Cable with type-A USB connector on one end and DB-9 connector on the other end
- PC or terminal

Step 1 Open the tethered I/O door on the Supervisor Card by pulling on the left edge of the door until the door is released from the spring-loaded ejector.

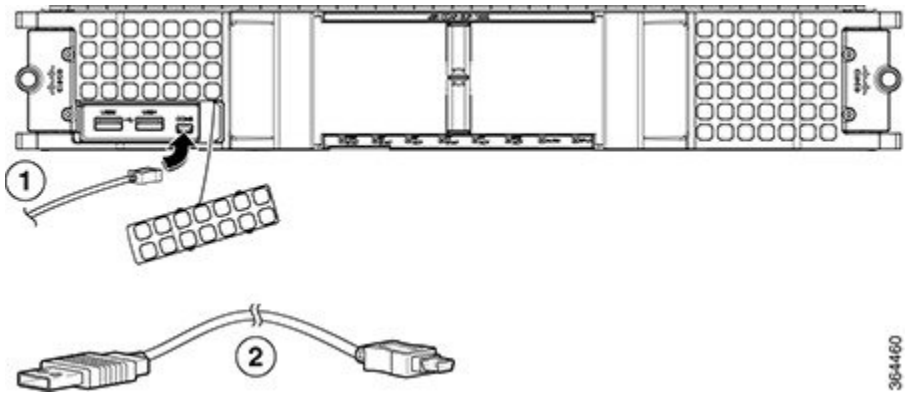
Figure 67: Opening the Tethered I/O Door on the Supervisor Card



1	Tethered I/O door		—

Step 2 Connect the mini type-B USB connector of the console cable to the console port on the Supervisor Card.

Figure 68: Console Port Connection on the Supervisor Card



1	Mini type-B USB connector	2	Console cable (with mini type-B USB connector on one end, and a type-A USB connector on the other end)

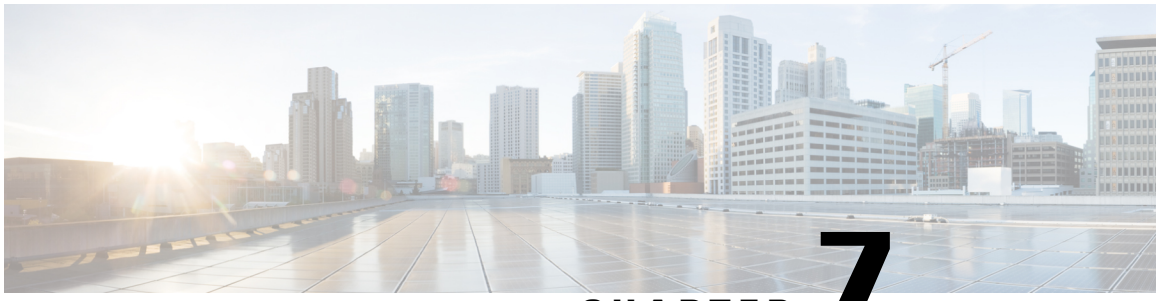
Step 3 Connect the type-A USB connector of the console cable to the Exar XR21V1410 UART with USB interface.

Step 4 Connect the Exar XR21V1410 UART to the appropriate serial port on the PC or terminal using a cable with type-A USB connector on one end and DB-9 connector on the other end.

Step 5 Power up the PC or terminal.

Step 6 Configure the PC terminal emulation software or the terminal with the following settings:

- 9600 baud
- 8 data bits
- No parity generation or checking
- 1 stop bit
- No flow control



CHAPTER 7

Installing the Interface Line and PIC Cards

- Installing RF PICs in the Cisco cBR Chassis, page 123
- Using UCH.8 Connectors on the Ports on the RF PIC, page 127
- Installing the Interface Line Card in the Cisco cBR Chassis, page 129

Installing RF PICs in the Cisco cBR Chassis

If you are adding more interface line cards or upgrading the existing line cards, ensure that the power modules installed in the chassis are adequate to support the line cards.

Perform this procedure to install the following PICs:

- RF Through PIC
- RF Protect PIC
- RF PIC Blank card

To use the HA features, install the RF Protect PIC.

When HA must be configured, ensure that the RF Protect or Through PICs are installed in consecutive slots, with the RF Protect PIC being installed in the uppermost PIC slot.

Caution Do not leave a PIC slot empty in order to avoid critical thermal alarms relating to overheating of individual components.

Do not install any Blank PICs between any two RF Through PICs or between an RF Protect PIC and RF Through PIC.

Before You Begin

- If high availability (HA) configuration is required, install an RF Protect PIC in the uppermost PIC slot.
- Be aware of the weight and size of the equipment. Handle it with care.
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.

Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver
- RF Through PIC or RF Protect PIC or RF PIC Blank card

Step 1 Grasp the faceplate of the PIC with one hand and place your other hand under the PIC to support its weight.

Step 2 Carefully align the PIC with the plastic guides in the slot.

Step 3 Slide the PIC into the slot applying even pressure using both your hands until it is within an inch of full insertion.

Step 4 Open the ejector levers on the PIC and fully insert the PIC into the slot applying even pressure on both sides until it mates with the midplane connectors.

Caution To prevent damage to the midplane connector, do not use excessive force when inserting the card into the slot.

Note While installing a RF PIC Blank card, open the ejector levers and fully insert the PIC blank into the slot until the ejectors touch the chassis flanges.

Figure 69: Opening the Ejector Levers on the RF PIC

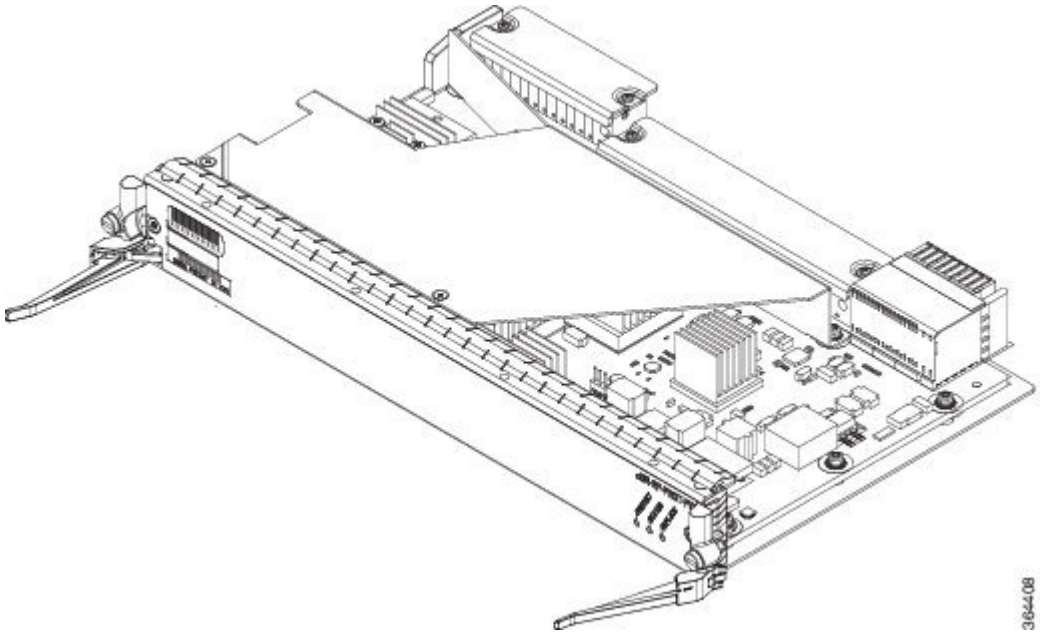
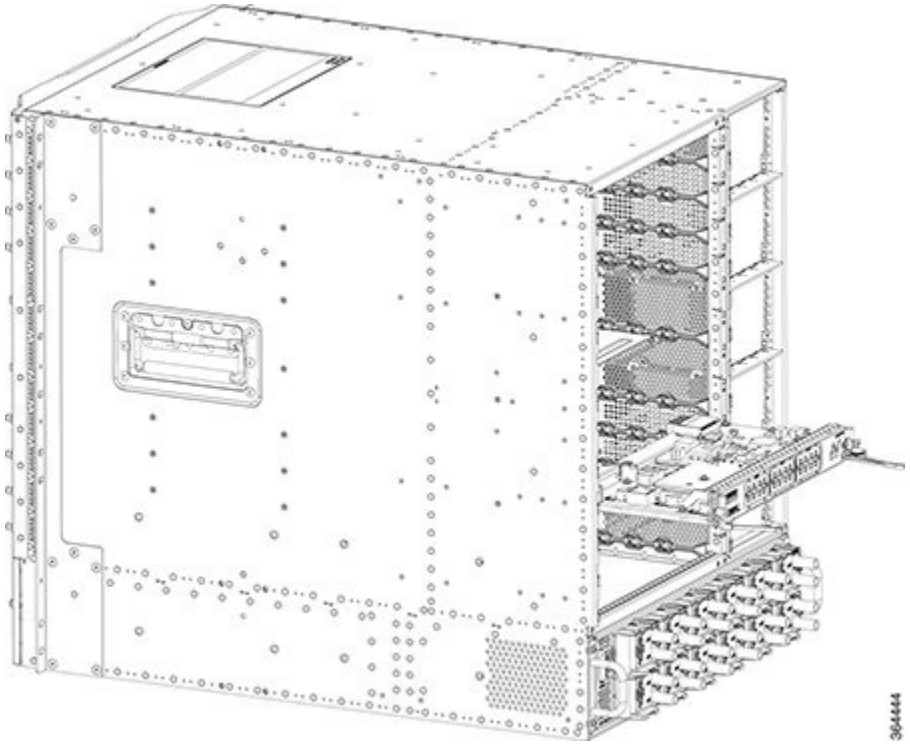
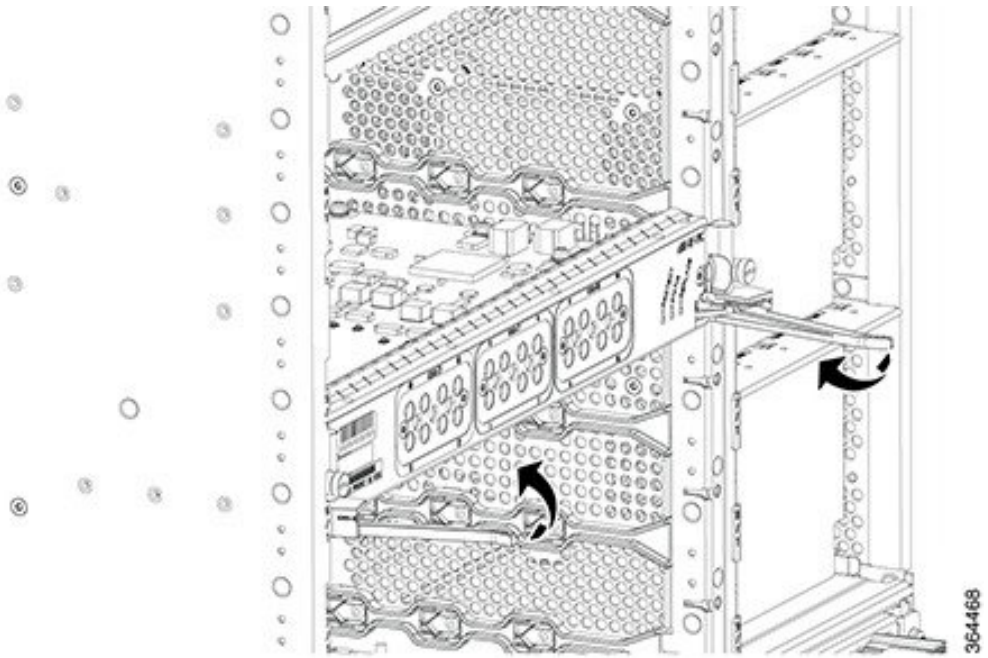


Figure 70: Inserting the RF PIC



Step 5 Simultaneously pivot both the ejector levers towards each other until they cannot be pivoted any further.

Figure 71: Closing the Ejector Levers on the RF PIC



Step 6 Tighten the two captive screws using a 3/16" flat-blade torque screwdriver with a torque of 6-8 lb-in (0.68 Nm to 0.90 Nm) to secure the PIC.

What to Do Next

- Install additional RF PIC.
- Install the Interface line card.
- If a card is not installed in the slot, install a blank filler card.
- Connect the PIC ports using the UCH.8 connectors.

Using UCH.8 Connectors on the Ports on the RF PIC

The faceplate of the RF Through PIC card has one downstream port cluster and two upstream port clusters. Three cable assemblies with UCH.8 connectors are used, one for each cluster, to connect the RF Through PIC.

Connect the cable assemblies in the following order:

1. Red cable assembly to the downstream port cluster.
2. One blue cable assembly to upstream port cluster with the ports US0 to US7.
3. Other blue cable assembly to upstream port cluster with the ports US8 to US15.

The following steps describe how to connect one UCH.8 connector. Repeat the procedure to connect all the three UCH.8 connectors.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the corresponding PIC.
- Install the chassis-mounted cable management bracket (if not already installed).

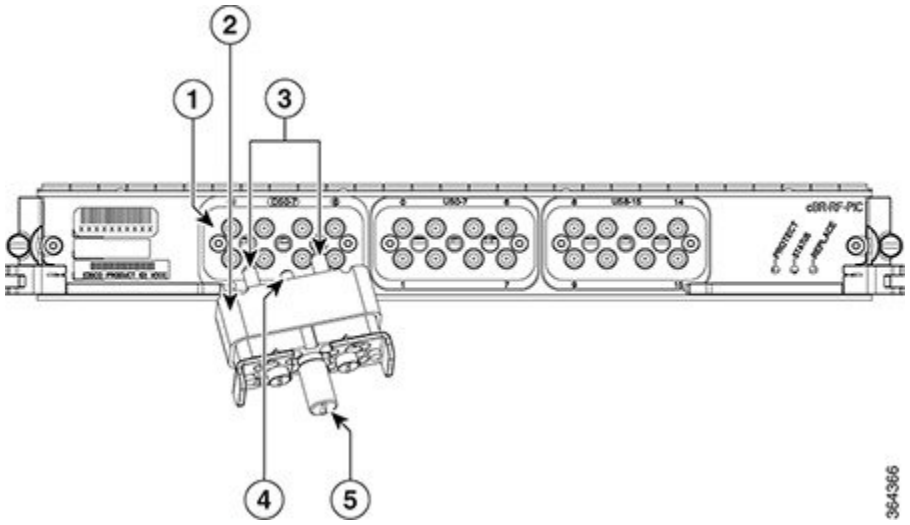
Required Tools and Equipment

- ESD-preventive wrist strap.
- 3/16" flat-blade torque screwdriver.
- Cable Bundle containing the following cable assemblies:
  - One cable assembly with red colored cables connected to one UCH.8 connector.

- Two cable assemblies with blue colored cables connected to one UCH.8 connector each.

Step 1 Align the small and large guide pins in the UCH.8 connector with the small and large guide pin holes on the PIC.

Figure 72: UCH.8 Connector



1	Downstream port cluster with ports DS0 to DS7	4	Small guide pin
2	UCH.8 connector	5	Lead screw
3	Large guide pins		—

Step 2 Insert the guide pins of the UCH.8 connector into the guide pin holes in the PIC.

Step 3 Hold the UCH.8 connector in place and tighten the lead screw using the 3/16" flat-head torque screwdriver, with a torque of 10-12 in-lbs.

What to Do Next

Route the cable bundle through the corresponding slot in the RF cable management brackets attached to the side of the chassis.

After each UCH.8 connector has been installed on the RF Through PIC port, push the cable assembly into the corresponding cable management bracket attached to the side of the chassis.

Installing the Interface Line Card in the Cisco cBR Chassis

Repeat this procedure for all the interface line cards and the line card blanks that you must install in the unused line card slots.

If you are adding more interface line cards or upgrading the existing line cards, ensure that the power modules installed in the chassis are adequate to support the line cards.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the corresponding PIC.
- Be aware of the weight and size of the equipment. Handle it with care.

Restrictions

- Install the interface line card in the slot corresponding to the RF Protect or RF Through PIC installed.

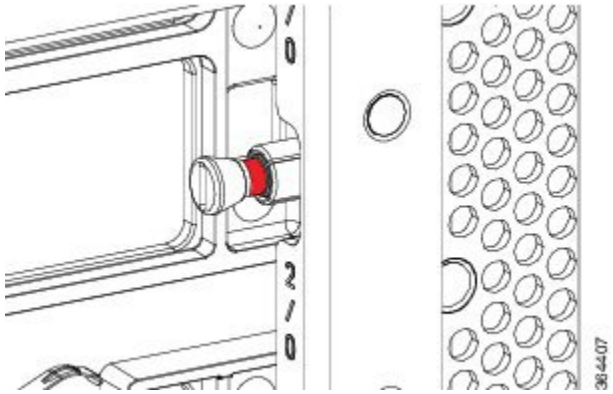
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver
- One of the following SSI Cards (RF line cards):
  - SSI Card with two downstream D3.0 modules and one upstream D3.0 module installed. [PID: CBR-LC-8D30-16U30]
  - SSI Card with two downstream D3.1 modules and one upstream D3.0 module installed. [PID: CBR-LC-8D31-16U30]
  - Line card blank. [PID: CBR-LC-BLANK]

Step 1 Loosen the captive screws on the appropriate slot using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

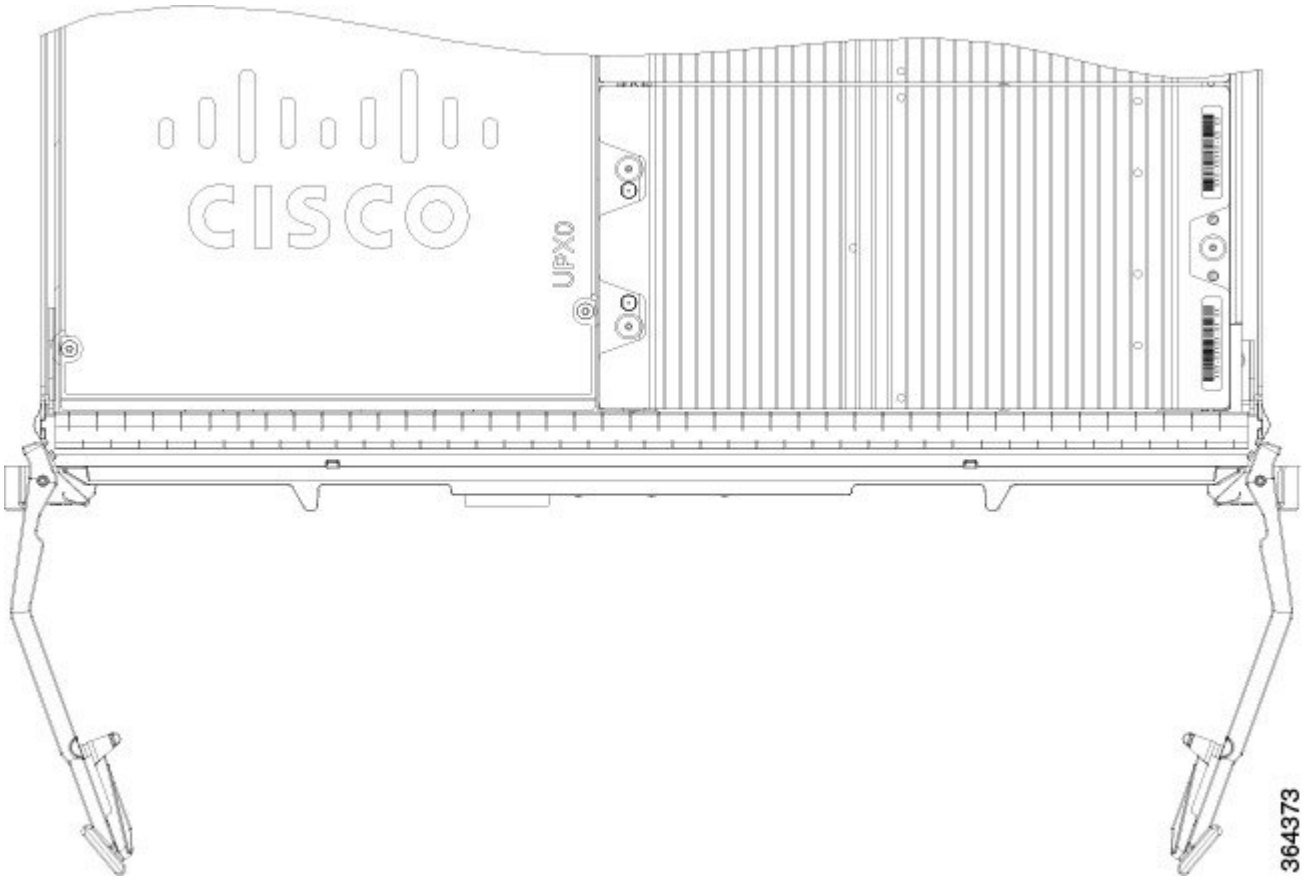
Note Ensure that the red band on the screws are visible.

Figure 73: Red Band on the Screw



Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate.

Figure 74: Opening the Spring-Loaded Ejectors on the Interface Line Card



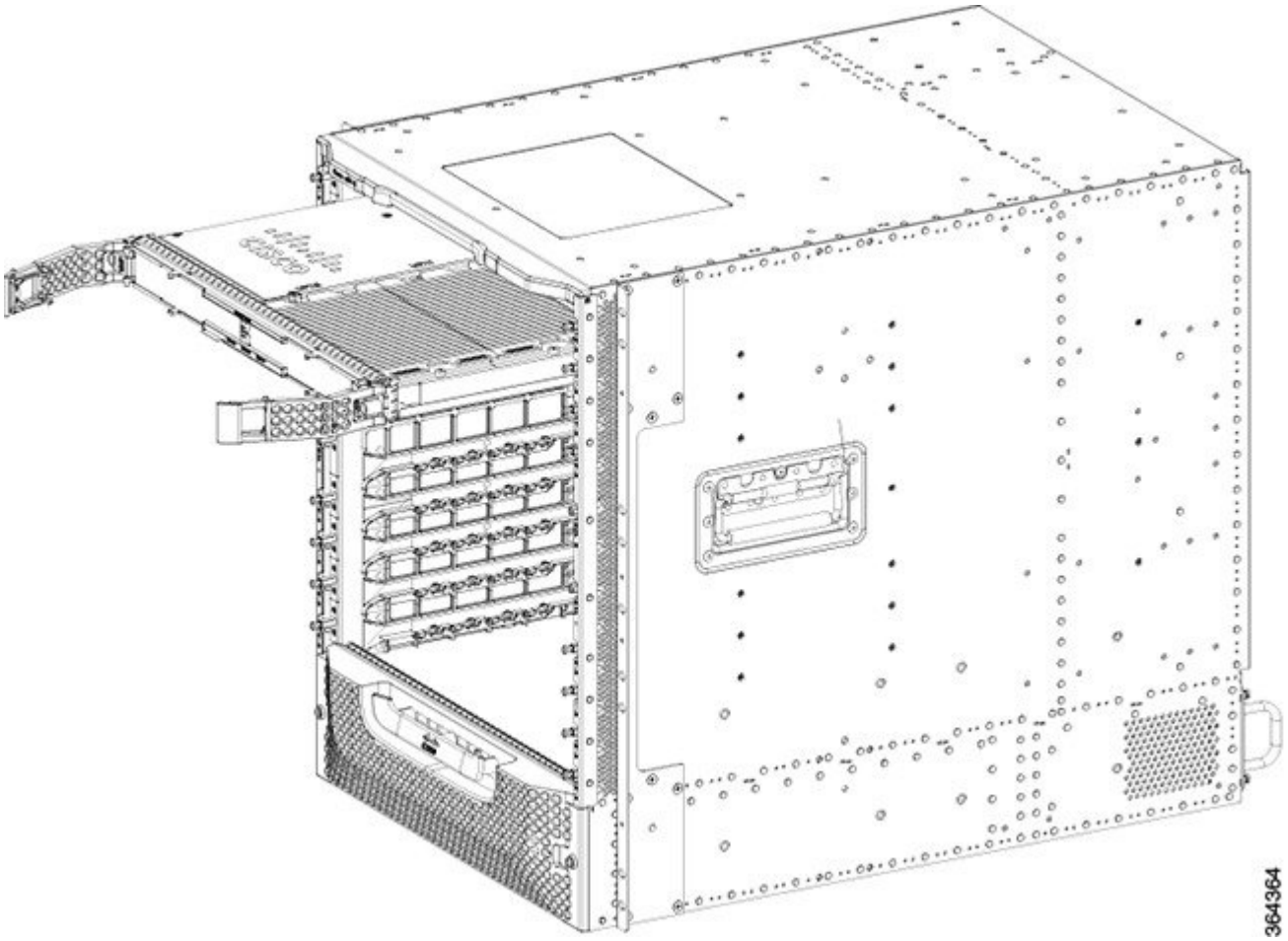
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

Step 4 Carefully align the support rails on the card with the rails in the appropriate slot.

Step 5 Slide and push the card into the slot applying even pressure using both your hands until it mates with its midplane connectors.

Caution To prevent damage to the midplane connector, do not use excessive force when inserting the card into the slot.

Figure 75: Inserting the Interface Line Card into the Chassis



Step 6 Simultaneously pivot both the spring-loaded ejectors towards the faceplate until they make contact with the faceplate.

Figure 76: Closing the Spring-Loaded Ejectors on the Interface Line Card

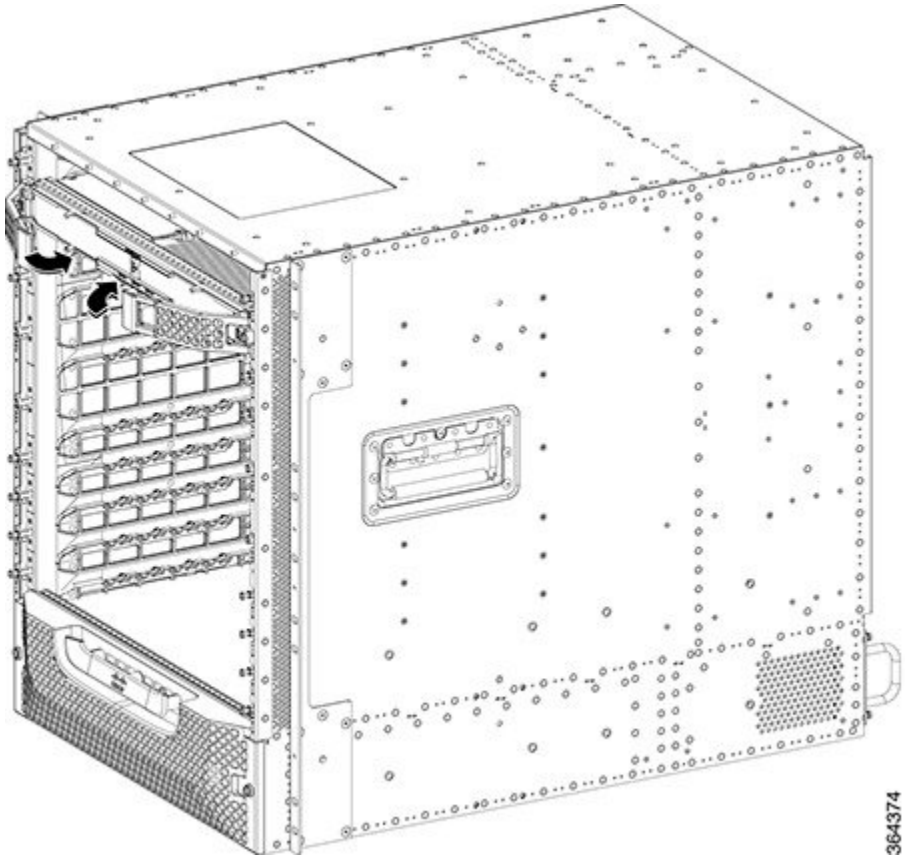
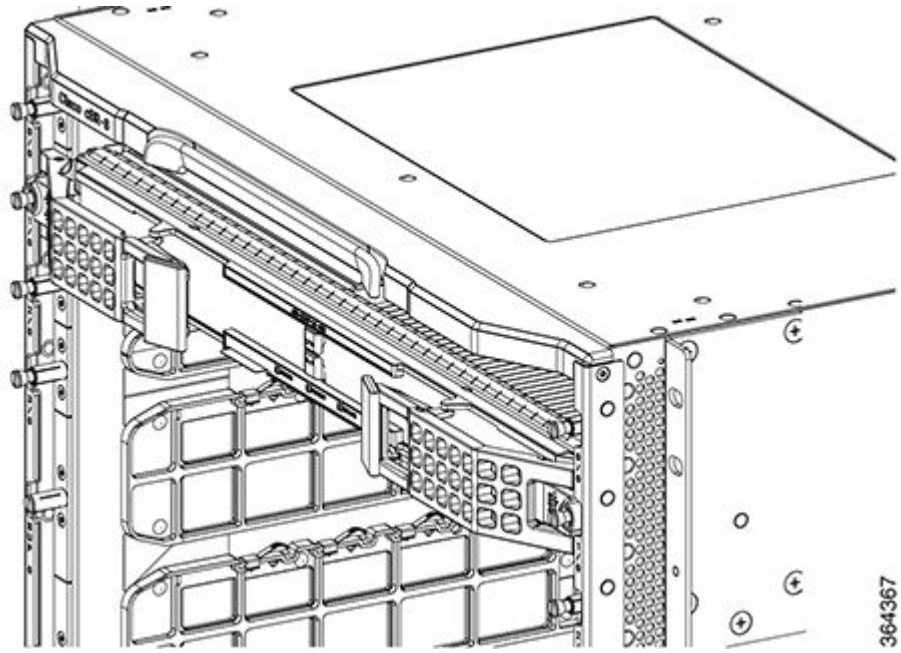


Figure 77: Closed and Secured Spring-Loaded Ejectors on the Interface Line Card



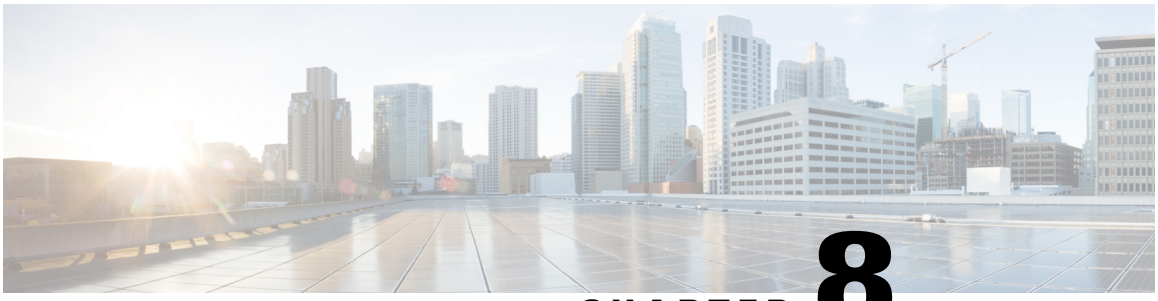
Step 7 Tighten the two captive screws using a 3/16" flat-blade torque screwdriver with a torque of 10-12 lb-in (1.12-1.36 Nm) to secure the card.

What to Do Next

An RF line card may be installed in the chassis during the OIR process for the following reasons:

- As a replacement.
- As an upgrade.
- After the downstream PHY module was replaced or upgraded.

When an RF line card was installed in the chassis for any of the above-stated reasons, use the **hw-module slot reload** command to reload the RF line card.



CHAPTER 8

Powering Up the Cisco cBR Chassis

- Powering Up the Cisco cBR, page 135

Powering Up the Cisco cBR

Before You Begin

After all the interfaces and other cables are connected, perform a visual check of all connections and check that:

- The ejector levers on each line card are in the locked position.
- All the top and bottom line card captive screws are tight.
- All network interface cables are connected.
- The console terminal is turned on.

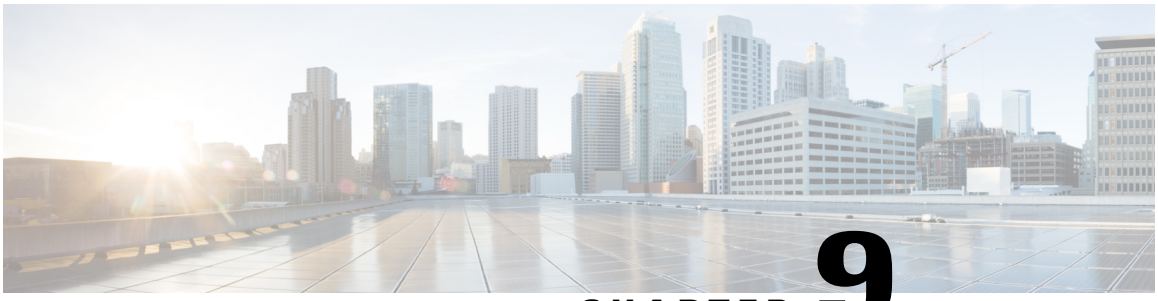
Step 1 Make sure the chassis ground connection is attached.

Step 2 Push the toggle switch on the FPIM (AC or DC) on the rear of the chassis to ON position.

What to Do Next

Ensure the POWER ENABLE LED on the FPIM illuminates green.

Verify if the LEDs on the Power Module indicate input voltage presence within correct range.



CHAPTER 9

Monitoring the Cisco cBR Chassis

- Monitoring the Cisco cBR Chassis Using CLI, page 137

Monitoring the Cisco cBR Chassis Using CLI

- **show platform—**Verify if the installed cards are in **Ok** or **Inserted** state.

```
Router# show platform

Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
1         CBR-CCAP-LC-40G     ok                    03:22:58
1/1       CBR-RF-PIC          ok                    03:19:40
SUP0      CBR-CCAP-SUP-160G   inserted              03:22:58
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    03:20:30
P0        PWR-2KW-DC-V2       ok                    03:21:20
P1        PWR-2KW-DC-V2       ok                    03:21:20
P2        PWR-2KW-DC-V2       ok                    03:21:20
P3        PWR-2KW-DC-V2       ok                    03:21:20
P4        PWR-2KW-DC-V2       ok                    03:21:20
P5        PWR-2KW-DC-V2       ok                    03:21:20
P10       CBR-FAN-ASSEMBLY    ok                    03:21:10
P11       CBR-FAN-ASSEMBLY    ok                    03:21:10
P12       CBR-FAN-ASSEMBLY    ok                    03:21:10
P13       CBR-FAN-ASSEMBLY    ok                    03:21:10
P14       CBR-FAN-ASSEMBLY    ok                    03:21:10
```

- **show platform hardware slot** *slot* **serdes status—**Verify if all the links are in **locked** state.

```
Router# show platform hardware slot F1 serdes status

Slot R1-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 3-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes
```

```
Slot 5-Link A
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link B
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link C
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link D
  RX link locked
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link E
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link F
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link G
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes

Slot 5-Link H
  RX link Init
  58-bit scrambler, 20 Gbps
  0 Overruns, 0 Underruns
  0 Reframe, 0 Disparity
  0 Out of band, 0 Illegal control codes
```

- **show environment all—**Verify the environmental status of each FRU after installation.

  This command displays the system temperature, voltage, fan, and power supply conditions.

```
Router# show environment all

Sensor List:  Environmental Monitoring
 Sensor           Location          State             Reading
 AVCC&1P2: Sens   4/1               Normal            81 mV
 AVCC&1P2: Vin    4/1               Normal            12600 mV
 AVCC&1P2: ADin   4/1               Normal            0 mV
 VP1P35: Sens     4/1               Normal            8 mV
 VP1P35: Vin      4/1               Normal            12650 mV
 VP1P35: ADin     4/1               Normal            112 mV
 VP1P0: Sens      4/1               Normal            15 mV
```

```
VP1P0: Vin       4/1              Normal           12625 mV
VP1P0: ADin      4/1              Normal           0 mV
MGTAVTT: Sens    4/1              Normal           21 mV
MGTAVTT: Vin     4/1              Normal           12625 mV
MGTAVTT: ADin    4/1              Normal           0 mV
VP1P8: Sens      4/1              Normal           41 mV
VP1P8: Vin       4/1              Normal           12600 mV
VP1P8: ADin      4/1              Normal           0 mV
VP3P3: Sens      4/1              Normal           39 mV
VP3P3: Vin       4/1              Normal           12625 mV
VP3P3: ADin      4/1              Normal           0 mV
Temp: RTMAC      4/1              Normal           34 Celsius
Temp: INLET      4/1              Normal           29 Celsius
Temp: OUTLET     4/1              Normal           27 Celsius
Temp: MAX6697    4/1              Normal           50 Celsius
Temp: TCXO       4/1              Normal           37 Celsius
Temp: SUP_OUT    4/1              Normal           49 Celsius
Temp: 3882_1 P   4/1              Normal           44 Celsius
Temp: 3882_2 P   4/1              Normal           39 Celsius
Temp: 3882_3 P   4/1              Normal           39 Celsius
VP5P0: Sens      4/1              Normal           6 mV
VP5P0: Vin       4/1              Normal           12650 mV
VP5P0: ADin      4/1              Normal           0 mV
VP1P8: Sens      4/1              Normal           33 mV
VP1P8: Vin       4/1              Normal           12625 mV
VP1P8: ADin      4/1              Normal           0 mV
3P3&1P0: Sens    4/1              Normal           24 mV
3P3&1P0: Vin     4/1              Normal           12625 mV
3P3&1P0: ADin    4/1              Normal           0 mV
Temp: INLET PD   4/1              Normal           27 Celsius
Temp: OUTLETPD   4/1              Normal           36 Celsius
Temp: 6697-DC    4/1              Normal           38 Celsius
Temp: PHYOUT     4/1              Normal           49 Celsius
Temp: PHYIN      4/1              Normal           38 Celsius
Temp: SSD        4/1              Normal           40 Celsius
Temp: SFP+       4/1              Normal           36 Celsius
Temp: 3882_1PD   4/1              Normal           42 Celsius
3882_PC1_0: VO   4/1              Normal           1198 mV
3882_PC1_1: VO   4/1              Normal           999 mV
3882_PC2_0: VO   4/1              Normal           998 mV
3882_PC3_0: VO   4/1              Normal           1349 mV
PSOC-PC1_0: VO   4/1              Normal           3300 mV
PSOC-PC1_1: VO   4/1              Normal           12590 mV
PSOC-PC1_2: VO   4/1              Normal           6997 mV
PSOC-PC1_3: VO   4/1              Normal           5000 mV
PSOC-PC1_4: VO   4/1              Normal           3299 mV
PSOC-PC1_5: VO   4/1              Normal           1000 mV
PSOC-PC1_6: VO   4/1              Normal           1010 mV
PSOC-PC1_7: VO   4/1              Normal           1801 mV
PSOC-PC1_8: VO   4/1              Normal           2000 mV
PSOC-PC1_9: VO   4/1              Normal           1198 mV
PSOC-PC1_10: V   4/1              Normal           1798 mV
PSOC-PC1_11: V   4/1              Normal           2500 mV
PSOC-PC1_12: V   4/1              Normal           1353 mV
PSOC-PC1_13: V   4/1              Normal           1223 mV
PSOC-PC1_14: V   4/1              Normal           592 mV
PSOC-PC1_15: V   4/1              Normal           596 mV
3882_PDC_0: VO   4/1              Normal           1000 mV
3882_PDC_1: VO   4/1              Normal           3300 mV
PSOC-DC1_0: VO   4/1              Normal           4998 mV
PSOC-DC1_1: VO   4/1              Normal           3280 mV
PSOC-DC1_2: VO   4/1              Normal           1005 mV
PSOC-DC1_3: VO   4/1              Normal           1801 mV
PSOC-DC1_4: VO   4/1              Normal           2500 mV
12_CUR: Sens     9                Normal           14 mV
12_CUR: Vin      9                Normal           12650 mV
12_CUR: ADin     9                Normal           267 mV
G0_CUR: Sens     9                Normal           69 mV
G0_CUR: Vin      9                Normal           12550 mV
G0_CUR: ADin     9                Normal           0 mV
G1_CUR: Sens     9                Normal           69 mV
G1_CUR: Vin      9                Normal           12575 mV
G1_CUR: ADin     9                Normal           0 mV
```

```
LB_CUR: Sens     9                Normal           11 mV
LB_CUR: Vin      9                Normal           12525 mV
LB_CUR: ADin     9                Normal           0 mV
Temp: CAPRICA    9                Normal           40 Celsius
Temp: BASESTAR   9                Normal           47 Celsius
Temp: RAIDER     9                Normal           45 Celsius
Temp: CPU        9                Normal           31 Celsius
Temp: INLET      9                Normal           25 Celsius
Temp: OUTLET     9                Normal           35 Celsius
Temp: DIGITAL    9                Normal           31 Celsius
Temp: UPX        9                Normal           29 Celsius
Temp: LEOBEN1    9                Normal           31 Celsius
Temp: LEOBEN2    9                Normal           35 Celsius
Temp: 3.3-18     9                Normal           43 Celsius
Temp: BS_1V      9                Normal           45 Celsius
Freq: 5338-49    9                Normal           0 MHz
Freq: 5338-52    9                Normal           0 MHz
Freq: 5338-89    9                Normal           0 MHz
3882_1_0: VOUT   9                Normal           3299 mV
3882_1_1: VOUT   9                Normal           1800 mV
3882_2_0: VOUT   9                Normal           2500 mV
3882_2_1: VOUT   9                Normal           1199 mV
3882_3_0: VOUT   9                Normal           1419 mV
3882_4_0: VOUT   9                Normal           1350 mV
3882_5_0: VOUT   9                Normal           1000 mV
3882_6_0: VOUT   9                Normal           1021 mV
3882_7_0: VOUT   9                Normal           1199 mV
3882_7_1: VOUT   9                Normal           1000 mV
3882_8_0: VOUT   9                Normal           1000 mV
3882_9_0: VOUT   9                Normal           999 mV
V2978: VSENSE0   9                Normal           0 mV
V2978: VSENSE1   9                Normal           0 mV
V2978: VSENSE2   9                Normal           0 mV
V2978: VSENSE3   9                Normal           6000 mV
V2978: VSENSE4   9                Normal           2400 mV
V2978: VSENSE5   9                Normal           0 mV
V2978: VSENSE6   9                Normal           6598 mV
V2978: VSENSE7   9                Normal           4998 mV
V2978: VIN       9                Normal           25218 mV
PSOC_2_0: VOUT   9                Normal           12582 mV
PSOC_2_1: VOUT   9                Normal           4985 mV
PSOC_2_2: VOUT   9                Normal           3256 mV
PSOC_2_3: VOUT   9                Normal           1982 mV
PSOC_2_4: VOUT   9                Normal           1990 mV
PSOC_2_5: VOUT   9                Normal           1782 mV
PSOC_2_6: VOUT   9                Normal           1793 mV
PSOC_2_7: VOUT   9                Normal           1786 mV
PSOC_2_8: VOUT   9                Normal           1483 mV
PSOC_2_9: VOUT   9                Normal           1193 mV
PSOC_2_10: VOU   9                Normal           995 mV
PSOC_2_11: VOU   9                Normal           987 mV
PSOC_2_12: VOU   9                Normal           994 mV
PSOC_2_13: VOU   9                Normal           707 mV
PSOC_2_14: VOU   9                Normal           592 mV
PSOC_2_15: VOU   9                Normal           593 mV
LTC4261: Power   9                Normal           340 Watts
PEM Iout         P0               Normal           5 A
PEM Vout         P0               Normal           55 V DC
PEM Vin          P0               Normal           202 V AC
Temp: INLET      P0               Normal           26 Celsius
Temp: OUTLET     P0               Normal           48 Celsius
PEM Iout         P1               Normal           6 A
PEM Vout         P1               Normal           55 V DC
PEM Vin          P1               Normal           204 V AC
Temp: INLET      P1               Normal           30 Celsius
Temp: OUTLET     P1               Normal           53 Celsius
PEM Iout         P2               Normal           3 A
PEM Vout         P2               Normal           55 V DC
PEM Vin          P2               Normal           204 V AC
Temp: INLET      P2               Normal           25 Celsius
Temp: OUTLET     P2               Normal           51 Celsius
PSOC-MB2_0: VO   R0               Normal           12758 mV
PSOC-MB2_1: VO   R0               Normal           4998 mV
```

```
PSOC-MB2_2: VO    R0                Normal            7082 mV
PSOC-MB2_3: VO    R0                Normal            3287 mV
PSOC-MB2_4: VO    R0                Normal            989 mV
PSOC-MB2_5: VO    R0                Normal            1047 mV
PSOC-MB2_6: VO    R0                Normal            1500 mV
PSOC-MB2_7: VO    R0                Normal            1800 mV
PSOC-MB2_8: VO    R0                Normal            914 mV
PSOC-MB2_9: VO    R0                Normal            885 mV
PSOC-MB2_10: V    R0                Normal            994 mV
PSOC-MB2_11: V    R0                Normal            989 mV
PSOC-MB2_12: V    R0                Normal            1479 mV
PSOC-MB2_13: V    R0                Normal            989 mV
PSOC-MB2_14: V    R0                Normal            984 mV
PSOC-MB2_15: V    R0                Normal            890 mV
PSOC-MB2_16: V    R0                Normal            2485 mV
PSOC-MB2_17: V    R0                Normal            1346 mV
PSOC-MB2_18: V    R0                Normal            1458 mV
PSOC-MB2_19: V    R0                Normal            1208 mV
PSOC-MB2_20: V    R0                Normal            1791 mV
PSOC-MB2_21: V    R0                Normal            3293 mV
PSOC-MB2_22: V    R0                Normal            3250 mV
PSOC-MB2_23: V    R0                Normal            3284 mV
PSOC-MB2_24: V    R0                Normal            4970 mV
PSOC-MB2_25: V    R0                Normal            4451 mV
PSOC-MB3_0: VO    R0                Normal            4983 mV
PSOC-MB3_1: VO    R0                Normal            4979 mV
PSOC-MB3_2: VO    R0                Normal            1500 mV
PSOC-MB3_3: VO    R0                Normal            1192 mV
PSOC-MB3_4: VO    R0                Normal            705 mV
PSOC-MB3_5: VO    R0                Normal            752 mV
PSOC-MB3_6: VO    R0                Normal            579 mV
PSOC-MB3_7: VO    R0                Normal            1500 mV
PSOC-MB3_8: VO    R0                Normal            1501 mV
PSOC-MB3_9: VO    R0                Normal            1250 mV
PSOC-MB3_10: V    R0                Normal            1247 mV
PSOC-MB3_11: V    R0                Normal            1260 mV
PSOC-MB3_12: V    R0                Normal            1038 mV
PSOC-MB3_13: V    R0                Normal            1343 mV
PSOC-MB3_14: V    R0                Normal            670 mV
PSOC-MB3_15: V    R0                Normal            1800 mV
PSOC-MB3_16: V    R0                Normal            908 mV
PSOC-MB3_17: V    R0                Normal            823 mV
PSOC-MB3_18: V    R0                Normal            992 mV
PSOC-MB3_19: V    R0                Normal            984 mV
PSOC-MB3_20: V    R0                Normal            1046 mV
PSOC-MB3_21: V    R0                Normal            1192 mV
PSOC-MB3_22: V    R0                Normal            1169 mV
PSOC-MB3_23: V    R0                Normal            1187 mV
PSOC-MB3_24: V    R0                Normal            1796 mV
PSOC-MB3_25: V    R0                Normal            1792 mV
PSOC-MB3_26: V    R0                Normal            1787 mV
PSOC-MB3_27: V    R0                Normal            1034 mV
3882_MB1_0: VO    R0                Normal            1001 mV
3882_MB1_1: VO    R0                Normal            1022 mV
3882_MB2_0: VO    R0                Normal            1197 mV
3882_MB3_0: VO    R0                Normal            1045 mV
3882_MB3_1: VO    R0                Normal            996 mV
3882_MB4_0: VO    R0                Normal            898 mV
3882_MB5_0: VO    R0                Normal            1348 mV
3882_MB6_0: VO    R0                Normal            1350 mV
3882_MB6_1: VO    R0                Normal            3297 mV
3882_MB7_0: VO    R0                Normal            998 mV
3882_MB8_0: VO    R0                Normal            1501 mV
3882_MB8_1: VO    R0                Normal            1551 mV
3882_MB9_0: VO    R0                Normal            999 mV
3882_MB9_1: VO    R0                Normal            3296 mV
15301_1: VOUT     R0                Normal            2500 mV
15301_2: VOUT     R0                Normal            1200 mV
15301_3: VOUT     R0                Normal            1200 mV
AS_VRM: Sens      R0                Normal            40 mV
AS_VRM: Vin       R0                Normal            12725 mV
AS_VRM: ADin      R0                Normal            0 mV
Y0_VRM: Sens      R0                Normal            23 mV
```

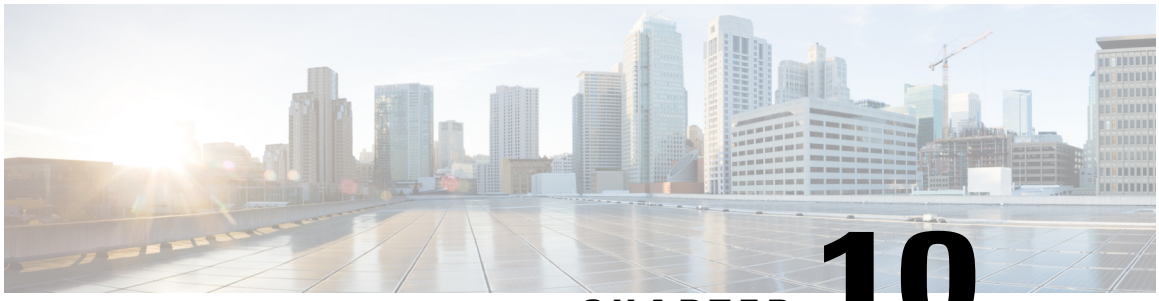
```
Y0_VRM: Vin      R0                Normal            12675 mV
Y0_VRM: ADin     R0                Normal            380 mV
CPU_VCC: Sens    R0                Normal            6 mV
CPU_VCC: Vin     R0                Normal            12725 mV
CPU_VCC: ADin    R0                Normal            0 mV
5P0_BIAS: Sens   R0                Normal            19 mV
5P0_BIAS: Vin    R0                Normal            12700 mV
5P0_BIAS: ADin   R0                Normal            0 mV
7P0_BIAS: Sens   R0                Normal            45 mV
7P0_BIAS: Vin    R0                Normal            12725 mV
7P0_BIAS: ADin   R0                Normal            0 mV
1P0_AA: Sens     R0                Normal            37 mV
1P0_AA: Vin      R0                Normal            12700 mV
1P0_AA: ADin     R0                Normal            0 mV
1P0_RT: Sens     R0                Normal            16 mV
1P0_RT: Vin      R0                Normal            12725 mV
1P0_RT: ADin     R0                Normal            0 mV
1P2: Sens        R0                Normal            37 mV
1P2: Vin         R0                Normal            12675 mV
1P2: ADin        R0                Normal            0 mV
0P9_T0: Sens     R0                Normal            7 mV
0P9_T0: Vin      R0                Normal            12750 mV
0P9_T0: ADin     R0                Normal            0 mV
1P05_CPU: Sens   R0                Normal            11 mV
1P05_CPU: Vin    R0                Normal            12700 mV
1P05_CPU: ADin   R0                Normal            0 mV
1P0_CC: Sens     R0                Normal            16 mV
1P0_CC: Vin      R0                Normal            12700 mV
1P0_CC: ADin     R0                Normal            0 mV
1P35_DDR: Sens   R0                Normal            6 mV
1P35_DDR: Vin    R0                Normal            12725 mV
1P35_DDR: ADin   R0                Normal            0 mV
1P35_RLD: Sens   R0                Normal            0 mV
1P35_RLD: Vin    R0                Normal            12675 mV
1P35_RLD: ADin   R0                Normal            2047 mV
3P3_CCC: Sens    R0                Normal            16 mV
3P3_CCC: Vin     R0                Normal            12700 mV
3P3_CCC: ADin    R0                Normal            1375 mV
1P0_R: Sens      R0                Normal            29 mV
1P0_R: Vin       R0                Normal            12700 mV
1P0_R: ADin      R0                Normal            0 mV
1P5_A0: Sens     R0                Normal            41 mV
1P5_A0: Vin      R0                Normal            12700 mV
1P5_A0: ADin     R0                Normal            0 mV
1P5: Sens        R0                Normal            34 mV
1P5: Vin         R0                Normal            12675 mV
1P5: ADin        R0                Normal            0 mV
2P5: Sens        R0                Normal            5 mV
2P5: Vin         R0                Normal            12700 mV
2P5: ADin        R0                Normal            0 mV
1P8_A: Sens      R0                Normal            10 mV
1P8_A: Vin       R0                Normal            12675 mV
1P8_A: ADin      R0                Normal            947 mV
1P0_BV: Sens     R0                Normal            24 mV
1P0_BV: Vin      R0                Normal            12700 mV
1P0_BV: ADin     R0                Normal            0 mV
3P3: Sens        R0                Normal            16 mV
3P3: Vin         R0                Normal            12725 mV
3P3: ADin        R0                Normal            0 mV
1P2_B: Sens      R0                Normal            41 mV
1P2_B: Vin       R0                Normal            12725 mV
1P2_B: ADin      R0                Normal            0 mV
ADM1075: Power   R0                Normal            329 Watts
Temp: Y0_DIE     R0                Normal            33 Celsius
Temp: BB_DIE     R0                Normal            29 Celsius
Temp: VP_DIE     R0                Normal            26 Celsius
Temp: RT-E_DIE   R0                Normal            31 Celsius
Temp: INLET_1    R0                Normal            23 Celsius
Temp: INLET_2    R0                Normal            22 Celsius
Temp: OUTLET_1   R0                Normal            25 Celsius
Temp: 3882_1     R0                Normal            46 Celsius
Temp: 3882_1A    R0                Normal            43 Celsius
Temp: 3882_1B    R0                Normal            43 Celsius
```

```
 Temp: 3882_2     R0                Normal            41 Celsius
 Temp: 3882_2A    R0                Normal            40 Celsius
 Temp: 3882_2B    R0                Normal            41 Celsius
 Temp: 3882_3     R0                Normal            37 Celsius
 Temp: 3882_3A    R0                Normal            34 Celsius
 Temp: 3882_3B    R0                Normal            33 Celsius
 Temp: 3882_4     R0                Normal            46 Celsius
 Temp: 3882_4A    R0                Normal            38 Celsius
 Temp: 3882_4B    R0                Normal            35 Celsius
 Temp: 3882_5     R0                Normal            32 Celsius
 Temp: 3882_5A    R0                Normal            23 Celsius
 Temp: 3882_5B    R0                Normal            23 Celsius
 Temp: 3882_6     R0                Normal            37 Celsius
 Temp: 3882_6A    R0                Normal            30 Celsius
 Temp: 3882_6B    R0                Normal            32 Celsius
 Temp: 3882_7     R0                Normal            38 Celsius
 Temp: 3882_7A    R0                Normal            35 Celsius
 Temp: 3882_7B    R0                Normal            35 Celsius
 Temp: 3882_8     R0                Normal            47 Celsius
 Temp: 3882_8A    R0                Normal            45 Celsius
 Temp: 3882_8B    R0                Normal            41 Celsius
 Temp: 3882_9     R0                Normal            37 Celsius
 Temp: 3882_9A    R0                Normal            33 Celsius
 Temp: 3882_9B    R0                Normal            32 Celsius
 Temp: 8314_1     R0                Normal            40 Celsius
 Temp: 8314_2     R0                Normal            36 Celsius
 Temp: 3536_1A    R0                Normal            26 Celsius
 Temp: 3536_1B    R0                Normal            26 Celsius
 Temp: 15301_1A   R0                Normal            31 Celsius
 Temp: 15301_1B   R0                Normal            32 Celsius
 Temp: 15301_2A   R0                Normal            28 Celsius
 Temp: 15301_2B   R0                Normal            34 Celsius
 Temp: 15301_3A   R0                Normal            38 Celsius
 Temp: 15301_3B   R0                Normal            45 Celsius
 Temp: AS_DIE     R0                Normal            70 Celsius
 Temp: XPT1_DTL   R0                Normal            42 Celsius
 Temp: XPT1_DTR   R0                Normal            42 Celsius
 Temp: XPT1_DBL   R0                Normal            42 Celsius
 Temp: XPT1_DBR   R0                Normal            42 Celsius
 Temp: XPT2_DTL   R0                Normal            42 Celsius
 Temp: XPT2_DTR   R0                Normal            42 Celsius
 Temp: XPT2_DBL   R0                Normal            42 Celsius
 Temp: XPT2_DBR   R0                Normal            42 Celsius
 Temp: XPT3_DTL   R0                Normal            42 Celsius
 Temp: XPT3_DTR   R0                Normal            42 Celsius
 Temp: XPT3_DBL   R0                Normal            42 Celsius
 Temp: XPT3_DBR   R0                Normal            42 Celsius
 Freq: MAX3674    R0                Normal            500 MHz
 Freq: SQ420D     R0                Normal            24 MHz
```

- **show facility-alarm status —**Verify the chassis status.

```
Router# show facility-alarm status

System Totals  Critical: 4  Major: 1  Minor: 8

Source                    Time                   Severity      Description [Index]
------                    ------                 --------      -------------------
slot 3/0                  Apr 13 2015 16:25:58   CRITICAL      Active Card Removed
OIR Alarm [0]
Power Supply Bay 3        Apr 13 2015 13:41:56   CRITICAL      Power Supply/FAN
Module Missing [0]
Power Supply Bay 4        Apr 13 2015 13:41:56   CRITICAL      Power Supply/FAN
Module Missing [0]
Power Supply Bay 5        Apr 13 2015 13:41:56   CRITICAL      Power Supply/FAN
Module Missing [0]
Cable3/0/15-US0           Apr 13 2015 17:32:53   MINOR         Physical Port Link
Down [0]
Cable3/0/15-US1           Apr 13 2015 17:32:53   MINOR         Physical Port Link
Down [0]
Cable3/0/15-US2           Apr 13 2015 17:32:53   MINOR         Physical Port Link
Down [0]
```

```
Cable3/0/15-US3            Apr 13 2015 17:32:53   MINOR         Physical Port Link
Down [0]
Cable3/0/15-US4            Apr 13 2015 17:32:53   MINOR         Physical Port Link
Down [0]
```



CHAPTER 10

Monitoring the Fan Module in Cisco cBR

- Monitoring the Fan Module on the Cisco cBR using LEDs, page 145
- Monitoring the Fan Module using CLI in the Cisco cBR Chassis, page 146

Monitoring the Fan Module on the Cisco cBR using LEDs

Table 25: Verifying the LEDs on the Fan Module

LED	Status	Description
STATUS1 [3] STATUS2 [4]	OFF	If the chassis was powered on for more than 10 seconds, it indicates fan module failure.
	Green	Fan module is operational.
	Amber	Fan module failure or minor fan alarm.
	White	Fan module has failed and must be replaced.

LED	Status	Description
RPLC	OFF	Fan is operational.
	Amber	Fan failure or minor fan alarm.
	White	**1** A fan is outside set RPM limit setpoints by greater than +/-300RPM≤RPM. **2** Any fan is outside set RPM limit setpoints by greater than +/-1000RPM. **3** Temperature or barometric sensor failure sensed by the Supervisor. The Supervisor sets the RPLC LED to White color. **4** The Supervisor sets the RPLC LED to White color.

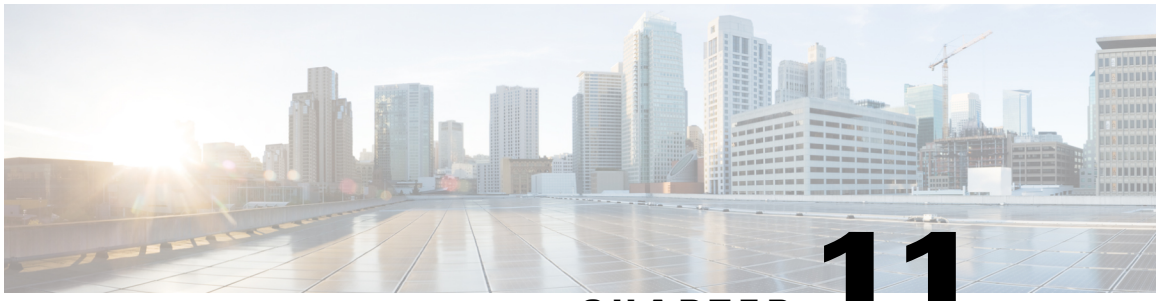
3 Indicates the status of the back fan.
4 Indicates the status of the front fan.

Monitoring the Fan Module using CLI in the Cisco cBR Chassis

To monitor the Fan Module use the **show platform hardware slot** command.

This example shows the status of the fans installed in the chassis:

```
Router#show platform hardware slot P10 fan status
Fan 0: Normal
Fan 1: Normal
```



CHAPTER 11

Monitoring the Power System in the Cisco cBR Chassis

- Monitoring the Power System in the Cisco cBR Chassis Using LEDs, page 147
- Monitoring the Power System in the Cisco cBR Chassis Using CLI, page 149

Monitoring the Power System in the Cisco cBR Chassis Using LEDs

Table 26: Verifying the LEDs on the AC FPEM

LED	Status	Description
POWER ENABLE LED	Green	The chassis power is on.
	Off	The chassis power is off.
P0 through P5 AC PRESENT LED	Green	The Power Module AC power input is present. **Note** This LED does not indicate that the power input is within the correct range.
	Off	The Power Module AC power input is not present.

Table 27: Verifying the LEDs on the DC FPEM

LED	Status	Description
POWER ENABLE LED	Green	The chassis power is on.
	Off	The chassis power is off.

LED	Status	Description
DC PRESENT LED	Green	The DC power input is present. **Note** This LED does not indicate that the power input is within the correct range.
	Yellow	The DC power input is reversed.
	Off	The DC power input is not present.

Table 28: Verifying the LEDs on the AC Power Module

LED	Status	Description
Input power LED	Green	AC input voltage is present and within the correct range.
	Blinking	AC input voltage is present and out of the acceptable range.
	Off	AC input voltage is not present.
Output power LED	Green	The Power Module output voltage is on.
	Blinking	The AC Power Module is in a power limit or overcurrent condition.
	Off	The AC Power Module output voltage is off.
Fault LED	Red	Internal fault in the AC Power Module.
	Off	The AC Power Module is operating normally.

Table 29: Verifying the LEDs on the DC Power Module

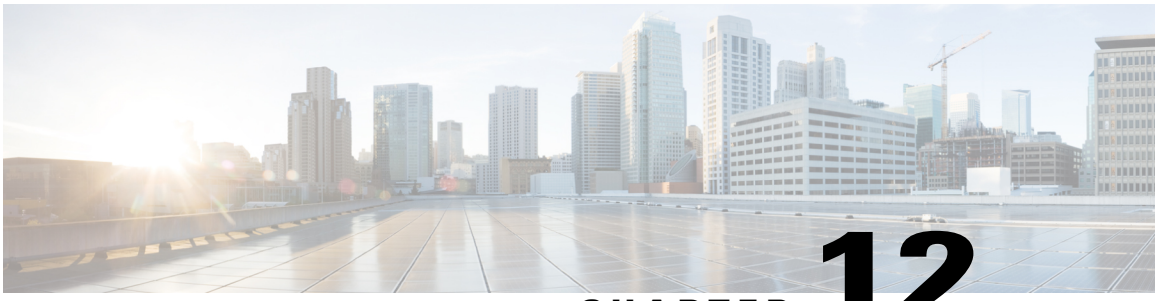
LED	Status	Description
Input power LED	Green	Dual DC input voltages are present and within the correct range (-40 V to -72 V).
	Blinking	The DC Power Module is in single input operation mode and at least one DC input voltage is out of the acceptable range.
	Off	Dual DC input voltages are less than -26 V (or is less than -26 V for a single input operation mode).
Output power LED	Green	The DC Power Module output voltage is on.
	Blinking	The DC Power Module is in a power limit or overcurrent condition.
	Off	The DC Power Module output voltage is off.

LED	Status	Description
Fault LED	Red	Internal fault in the DC Power Module.
	Off	The DC Power Module is operating normally.

Monitoring the Power System in the Cisco cBR Chassis Using CLI

show environment power—Displays the power consumption for each card and the power output for each Power Module. Following is a sample output:

```
Router# show environment power

------------------------------
Slot    Controller       Value
------------------------------
3         FRU Power        340 W
P0        PEM Power        275 W
P1        PEM Power        220 W
P2        PEM Power        220 W
R0        FRU Power        410 W
```



CHAPTER 12

Monitoring the Supervisor in the Cisco cBR Chassis

- Monitoring the Supervisor in the Cisco cBR Chassis Using LEDs, page 152

Monitoring the Supervisor in the Cisco cBR Chassis Using LEDs

Table 30: Verifying the LEDs on the Supervisor Card

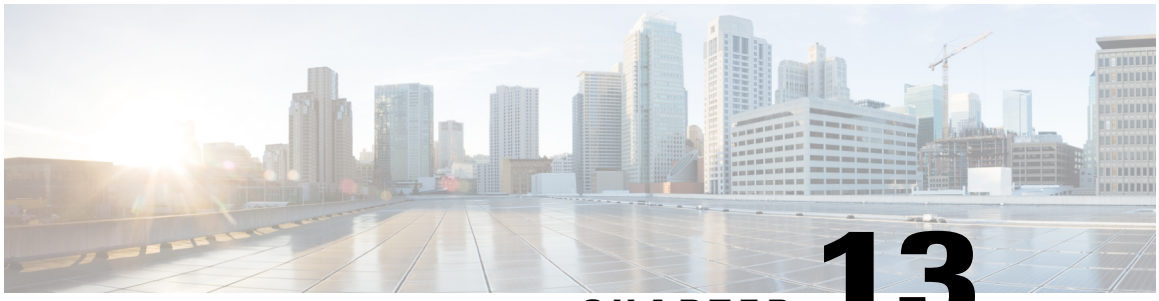
LED	Status	Description
PWR STAT	Off	Supervisor Card is not powered up.
	Green	Supervisor Card is powered up.
	Yellow	Supervisor Card has a power fault - at least one voltage rail exceeded its voltage threshold limit.
	Blinking green at a 2 seconds rate	Supervisor Card has a power fault - less than the minimum number of fan modules with no fault condition detected at power-on.
	Blinking yellow at a 2 seconds rate	Supervisor Card has a power fault - less than the minimum number of power modules with no fault condition detected at power-on.
	Blinking between green and yellow at a 2 seconds rate	Supervisor Card has a power fault - the Supervisor PIC is not detected at power-on.
	Blinking yellow at a 1/4 second rate	Supervisor Card has a power fault - either the Supervisor PIC, SUP-DC, or SUP-MB did not respond with a PGOOD signal within 3 seconds after power-on.
	Blinking green at a 1/4 second rate	Software on the other Supervisor Card has turned off power on this Supervisor Card.
	Blinking between green and yellow at a 1/4 seconds rate	Secure Boot authentication has failed and Supervisor Card is powered down.
RP STAT	Off	RP has not booted.
	Blinking green	Software is loading.
	Green	RP is operational.
	Yellow	RP has detected a fault.

LED	Status	Description
RP ACT	Off	RP is not active.
	Green	RP is active.
FP STAT	Off	FP has not booted.
	Green	FP is operational.
	Yellow	FP has detected a fault.
FP ACT	Off	FP is not active.
	Green	FP is active.
INSI ACT	Off	iNSI is not enabled.
	Green	iNSI is enabled.
ALRM	Off	No alarm condition is detected.
	Yellow	Alarm condition is detected.
RPLC	Off	Supervisor Card does not need to be replaced.
	White	Supervisor Card needs to be replaced.

Table 31: Verifying the LEDs on the Supervisor PIC

LED	Status	Description
PIC_STAT	Off	The Supervisor PIC is not powered up.
	Green	The Supervisor PIC is functioning normally.
	Yellow	The Supervisor PIC has a fault.
INSI_ACT	Off	iNSI module is not enabled.
	Green	iNSI module is enabled.

LED	Status	Description
REPLACE	Off	The Supervisor PIC does not need to be replaced.
	Green	The Supervisor PIC needs to be replaced.
SFP+	Off	The SFP+ module is not powered up.
	Yellow	The SFP+ module is powered up and the link is down.
	Green	The link is up with no active traffic.
	Blinking green	The link is up with active traffic.
DTI Normal	Off	DTI is not in normal mode.
	Green	DTI is in normal mode.
	Blinking green	DTI is in normal mode as standby.
DTI Fast	Off	DTI is not in fast mode.
	Yellow	DTI is in fast mode.
NME Lnk	Off	The Gigabit Ethernet link is down.
	Green	The Gigabit Ethernet link is up.
NME Act	Off	The Gigabit Ethernet link is down.
	Blinking yellow	The Gigabit Ethernet link is up with active traffic.
SSD	Off	There is no SSD access.
	Green	SSD read/write is in progress.
CM/DTP Lnk	—	Reserved for future use.
CM/DTP Act	—	Reserved for future use.



CHAPTER 13

Monitoring the Interface Card in the Cisco cBR Chassis

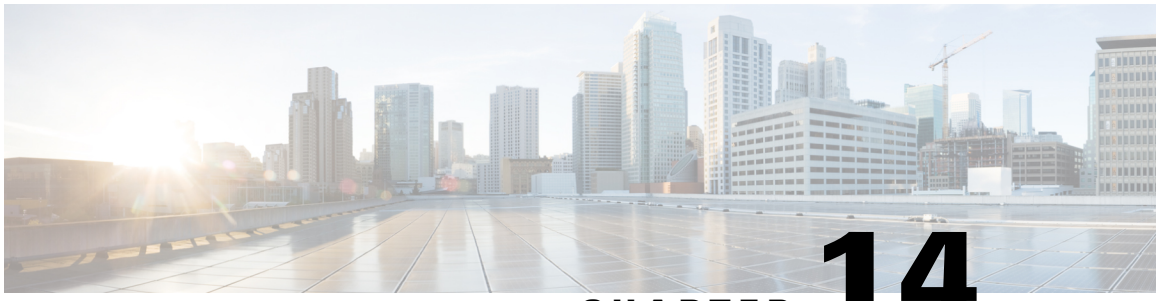
- Monitoring the Interface Cards in the Cisco cBR Chassis using LEDs, page 155

Monitoring the Interface Cards in the Cisco cBR Chassis using LEDs

The LEDs on the interface cards (that is, interface line cards, the RF Through PIC and the RF Protect PIC) are the same.

Table 32: Verifying the LEDs on the Interface Cards

LED	Status	Description
STATUS	Off	The line card has not initialized correctly.
	Yellow	The line card has initialized, but HA fault is detected.
	Green	The line card is operational.
PROTECT	Off	The Interface line card is not a Protect card.
	Blue	The Interface line card is configured as a Protect card.
	Green	The Protect card is operational and traffic is flowing.
REPLACE	Off	The Interface line card is operational and does not require replacement.
	White	The Interface line card requires replacement.



CHAPTER 14

Maintaining the Cisco cBR Chassis

- Powering Down the Cisco cBR Chassis, page 157
- Unmounting the Cisco cBR Chassis, page 157

Powering Down the Cisco cBR Chassis

You may want to power down the chassis to perform certain tasks, including:

- Transporting the chassis to a new location
- Repairing or upgrading the chassis hardware
- Mounting the chassis

Before You Begin

Step 1 Push the toggle switch on the FPEM (AC or DC) on the rear of the chassis to OFF position.

Step 2 Disconnect AC or DC power.

What to Do Next

- Unmount the Cisco cBR chassis.
- Power up the Cisco cBR chassis.

Unmounting the Cisco cBR Chassis

Before You Begin

- Install the chassis installation handle (Optional).

Required Tools and Equipment

- #2 Phillips screwdriver

Step 1 Power down the chassis.

Step 2 Disconnect AC or DC power.

Step 3 Remove all external cables.

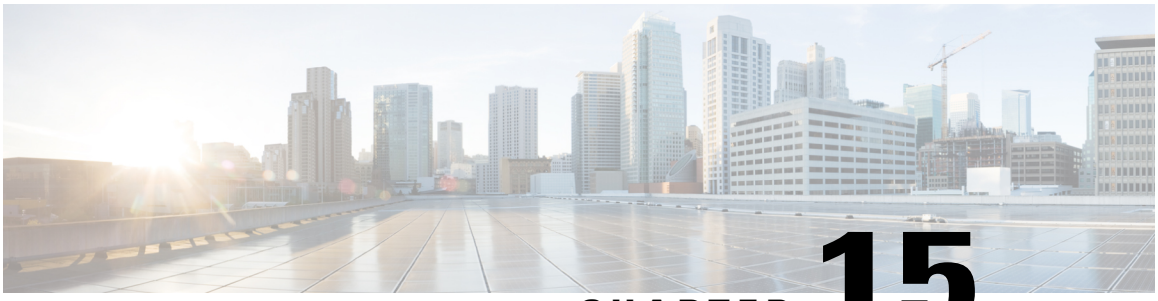
Step 4 Loosen the screws inserted into the side cable management bracket using a #2 Phillips screwdriver.

Step 5 Loosen the screws inserted into the rack mount ear on each side using a #2 Phillips screwdriver.

Step 6 Remove the chassis from the rack.

What to Do Next

- Move the equipment to another location.
- To return the equipment to Cisco, pack the chassis in the original Cisco box that you received during shipment and visit Cisco Ordering website.



CHAPTER 15

Maintaining the Fan Module for Cisco cBR

- Removing the Fan Module from the Cisco cBR Chassis, page 159

Removing the Fan Module from the Cisco cBR Chassis

Before You Begin

Attach an ESD-preventive wrist strap to your wrist.

Restrictions

- Only one fan module should be removed at a time for servicing or replacement.

  Ensure that all Fan Module bays must have functioning Fan Modules. If a Fan Module is removed, replace a functioning Fan Module within one minute of the removal, to avoid possible shutdown of the system due to overheating of individual components.

- Do not operate the chassis with an empty fan bay even if the Supervisor Card allows it.
- Cisco cBR's Supervisor Cards are prevented from powering up if one or more of the Fan Modules have a serious failure such that the error prevents both fans from operating.
- The chassis powers up even if at least one fan in each Fan Module is working.

Required Tools and Equipment

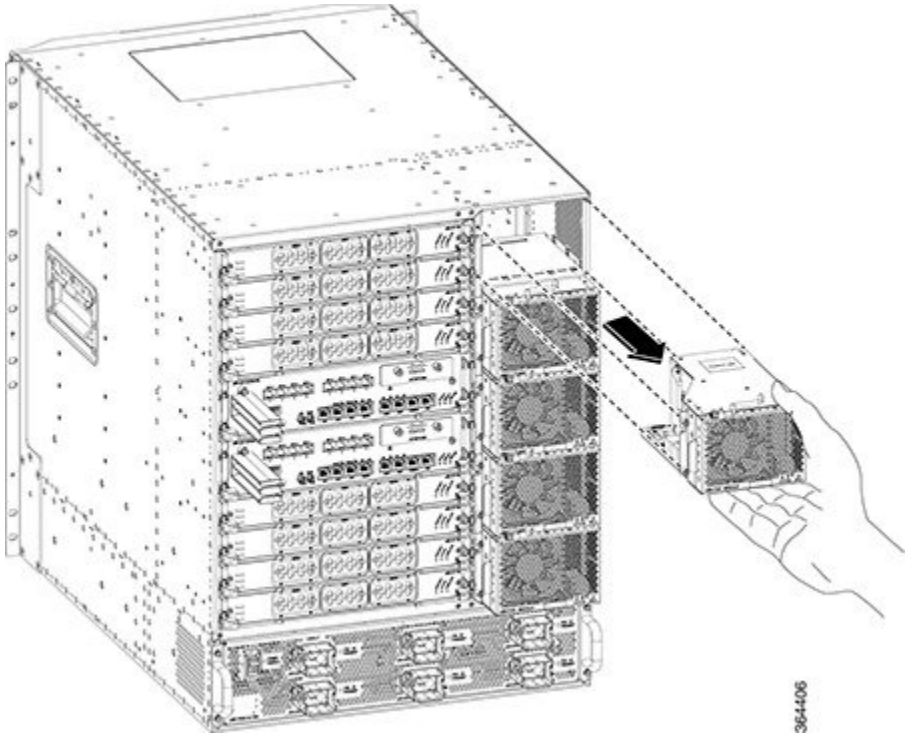
- A flat-blade screwdriver

Step 1 Loosen the captive screws on the left side of the Fan Module, until the screws are disengaged from the chassis.

Step 2 Pull the fan module from the chassis slightly, grasping the sides of the Fan Module.

Step 3 Grasp the top and bottom frame of the Fan Module with your hand and pull it gently out of the chassis.

Figure 78: Removing the Fan Module



What to Do Next

Install a working (new or serviced) fan module in the empty bay. See the installation procedure specified in Installing the Fan Module.

CHAPTER 16

Maintaining the Power System in the Cisco cBR Chassis

- Removing the AC Power Connections from the Cisco cBR Chassis, page 161
- Removing the DC Power Connections from the Cisco cBR Chassis, page 162
- Removing the Power Module from the Cisco cBR Chassis, page 164
- Removing the FPEM from the Cisco cBR Chassis, page 167
- Removing the Power Cassette Module from the Cisco cBR Chassis, page 169

Removing the AC Power Connections from the Cisco cBR Chassis

Warning The chassis ground connection must always be made first and disconnected last.

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

Before You Begin

Required Tools and Equipment

- #2 Phillips screwdriver

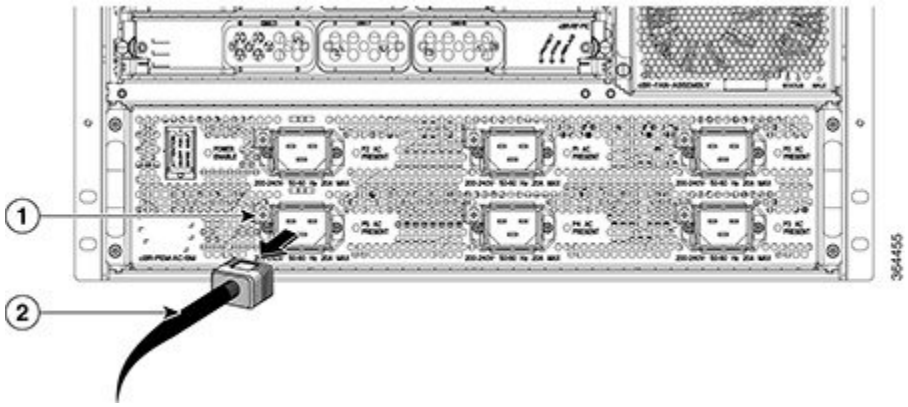
Step 1 Power down the AC FPEM using the power switch.

Step 2 Power down the AC circuit or power source to which the AC power cord is connected.

Step 3 Loosen the Phillips-head screw on the cable retaining bracket using a #2 Phillips screwdriver.

Step 4 Unplug the AC power cord from the receptacle on the AC FPEM.

Figure 79: Removing AC Power Cord from the AC FPEM



1	Screw on the cable retaining bracket	2	AC power cord

Step 5 Repeat Step 2, on page 162 to Step 4, on page 162 for each AC power connection.

Removing the DC Power Connections from the Cisco cBR Chassis

Warning The terminal block covers are an integral part of the safety design of the product. Do not operate the unit without the covers installed. **Statement 1077**

Warning When you install the unit, the ground connection must always be made first and disconnected last. **Statement 1046**

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. **Statement 1003**

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

Before You Begin

Required Tools and Equipment

- Torque wrench
- 7/16" hex socket

Step 1 Power down the DC FPEM using the power switch.

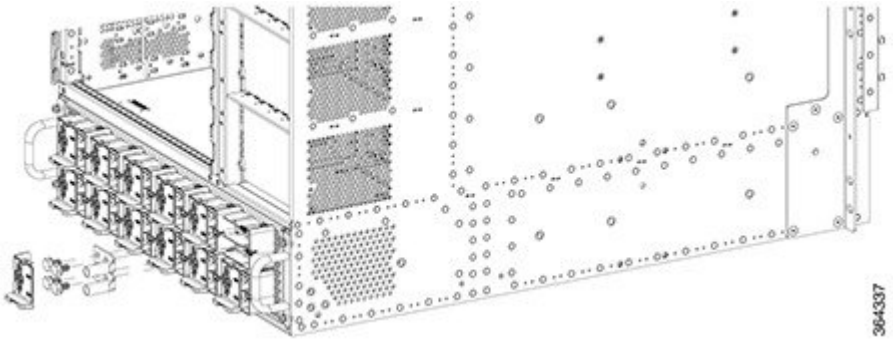
Step 2 Power down the circuit or power supply to which the positive and negative lead cables are connected.

Step 3 Remove the terminal block cover on the terminal block, from which you need to disconnect power, by pushing down on the bottom tab then pivoting the bottom out.

Step 4 Loosen the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket and remove them. Disconnect the positive lead cable.

Step 5 Loosen the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket and remove them. Disconnect the negative lead cable.

Figure 80: Removing the DC Power Connection from the DC FPEM



Step 6 Repeat Step 2, on page 163 and Step 5, on page 163 to disconnect each terminal block connection.

Step 7 Insert the 1/4-20 terminal bolts and secure them using a torque wrench and 7/16" hex socket with a torque of 45-50 in-lb (5.08-5.65 Nm).

Step 8 Reinstall the terminal block covers by clipping them on the top edge of the terminal block housing and then rotating them down until they snap into place.

Removing the Power Module from the Cisco cBR Chassis

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.

Restrictions

- For the DC-powered Cisco cBR with N+1 redundancy, ensure that the chassis has at least five operational DC Power Modules for the chassis to be functional.
- For the AC-powered Cisco cBR with N+1 redundancy, ensure that the chassis has at least four operational AC Power Modules for the chassis to be functional.
- For the AC-powered Cisco cBR with 1+1 redundancy, ensure that the chassis has six operational AC Power Modules for the chassis to be functional.

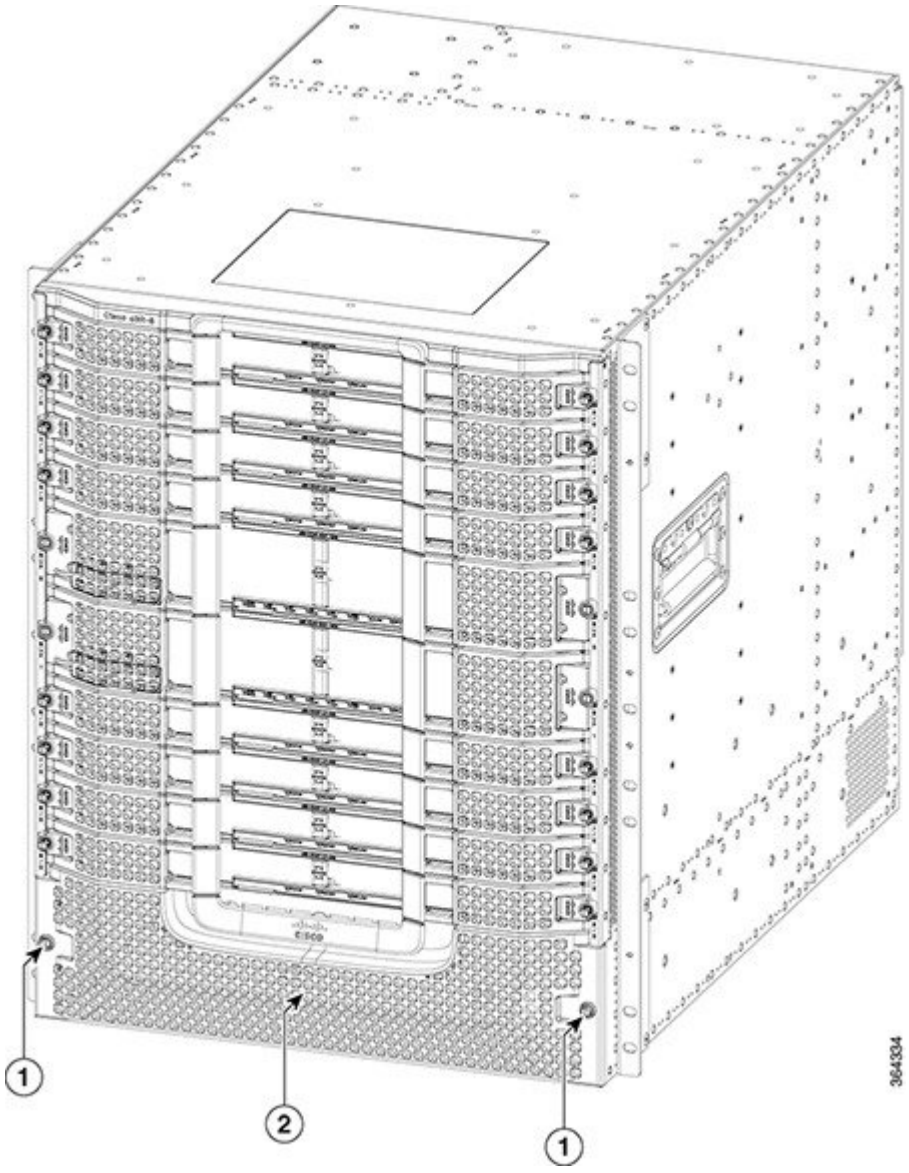
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver

- Antistatic bag

Step 1 Loosen the two screws on the front power entry bezel using a 3/16" flat-blade torque screwdriver. Remove the front power entry bezel from the chassis.

Figure 81: Removing the Front Power Entry Bezel from the Chassis

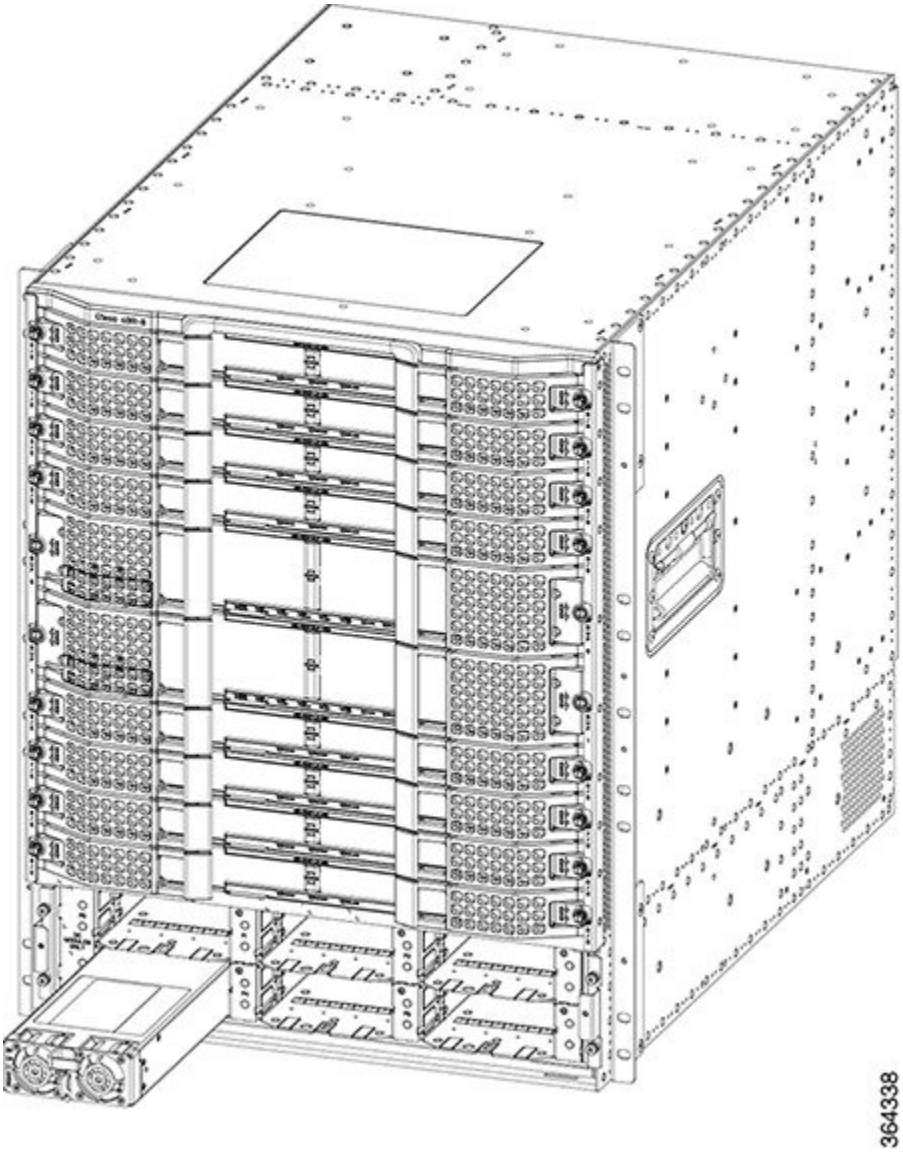


Step 2 Loosen the screw on the Power Module using a 3/16" flat-blade torque screwdriver.

Step 3 Pull the handle down to disengage the Power Module from the chassis.

Step 4 Slide the Power Module out of its bay with one hand while supporting the base of the module with your other hand.

Figure 82: Removing the Power Module



Step 5 Place the removed Power Module in an antistatic bag.

What to Do Next

- Replace the Power Module (if required).

- Position the front power entry bezel on the chassis. Insert and tighten the two screws using a 3/16" flat-blade torque screwdriver with a torque of 5-7 in-lb (0.56-0.79 Nm) to secure the bezel.

Removing the FPEM from the Cisco cBR Chassis

Before You Begin

- For an AC-powered Cisco cBR chassis, remove the AC power connections.

  For an DC-powered Cisco cBR chassis, remove the DC power connections.
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Remove the Power Modules.
- If you are replacing the entire power system, remove the Power Cassette Module.
- Be aware of the weight and size of the equipment. Handle it with care.

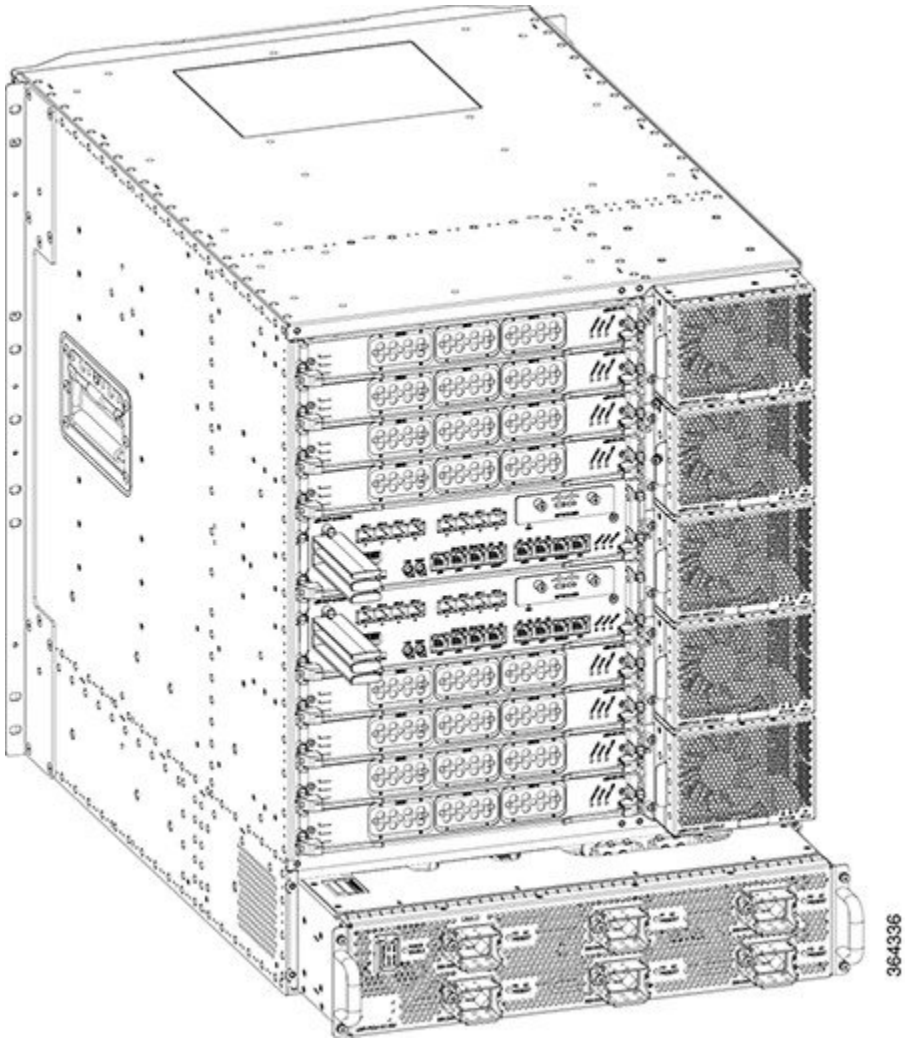
Required Tools and Equipment

- ESD-preventive wrist strap
- T10 Torx screwdriver

- Antistatic bag

Step 1 Loosen and remove the four #6-32 Torx-head screws on the mounting flanges of the FPEM using a T10 Torx screwdriver.

Figure 83: Removing the FPEM from the Chassis



Step 2 Slide the FPEM out of the chassis using the handles on either side applying even pressure to both handles.

Step 3 Place the removed FPEM in an antistatic bag.

What to Do Next

Replace the FPEM (if required).

Removing the Power Cassette Module from the Cisco cBR Chassis

Before You Begin

- Remove the Power Modules.
- Be aware of the weight and size of the equipment. Handle it with care.

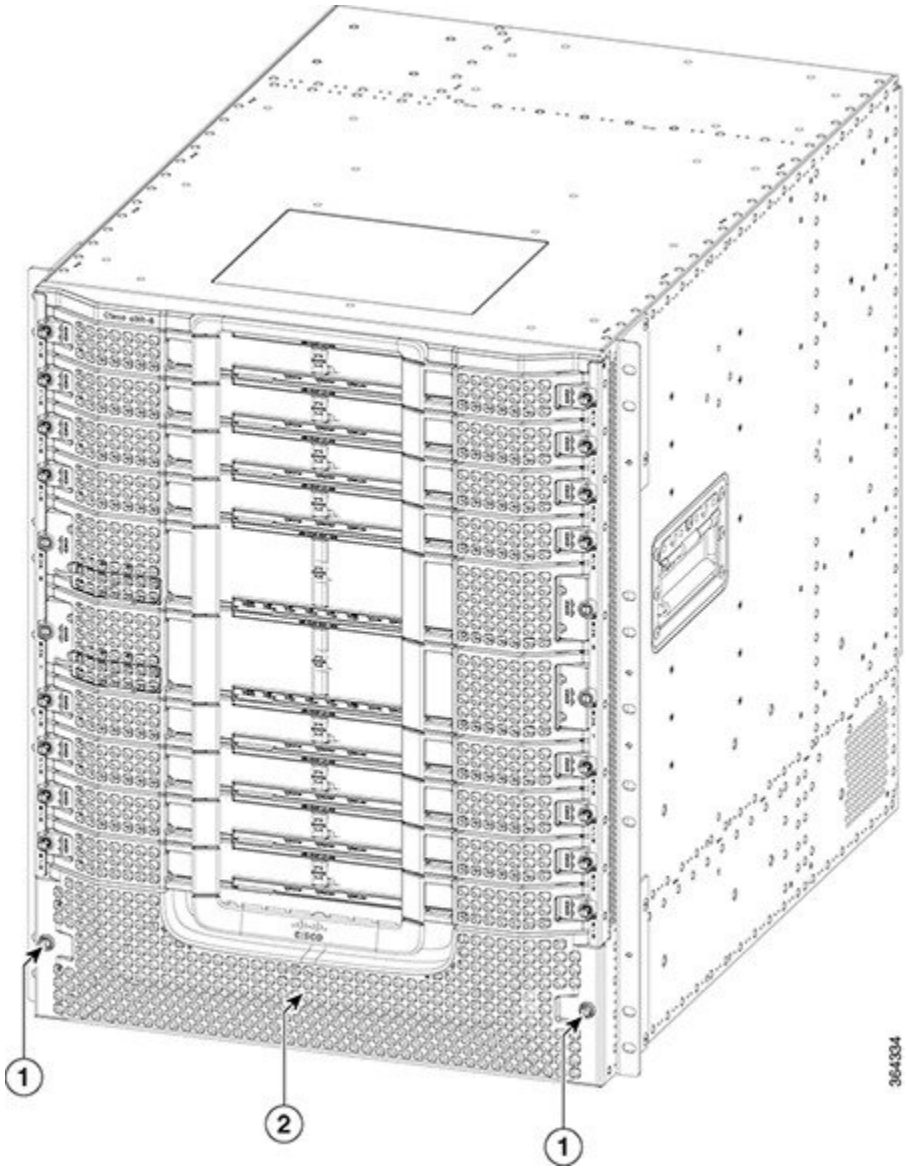
Required Tools and Equipment

- 3/16" flat-blade torque screwdriver

- T10 Torx screwdriver

Step 1 Loosen the two screws on the front power entry bezel using a 3/16" flat-blade torque screwdriver. Remove the bezel from the chassis.

Figure 84: Removing the Front Power Entry Bezel from the Chassis

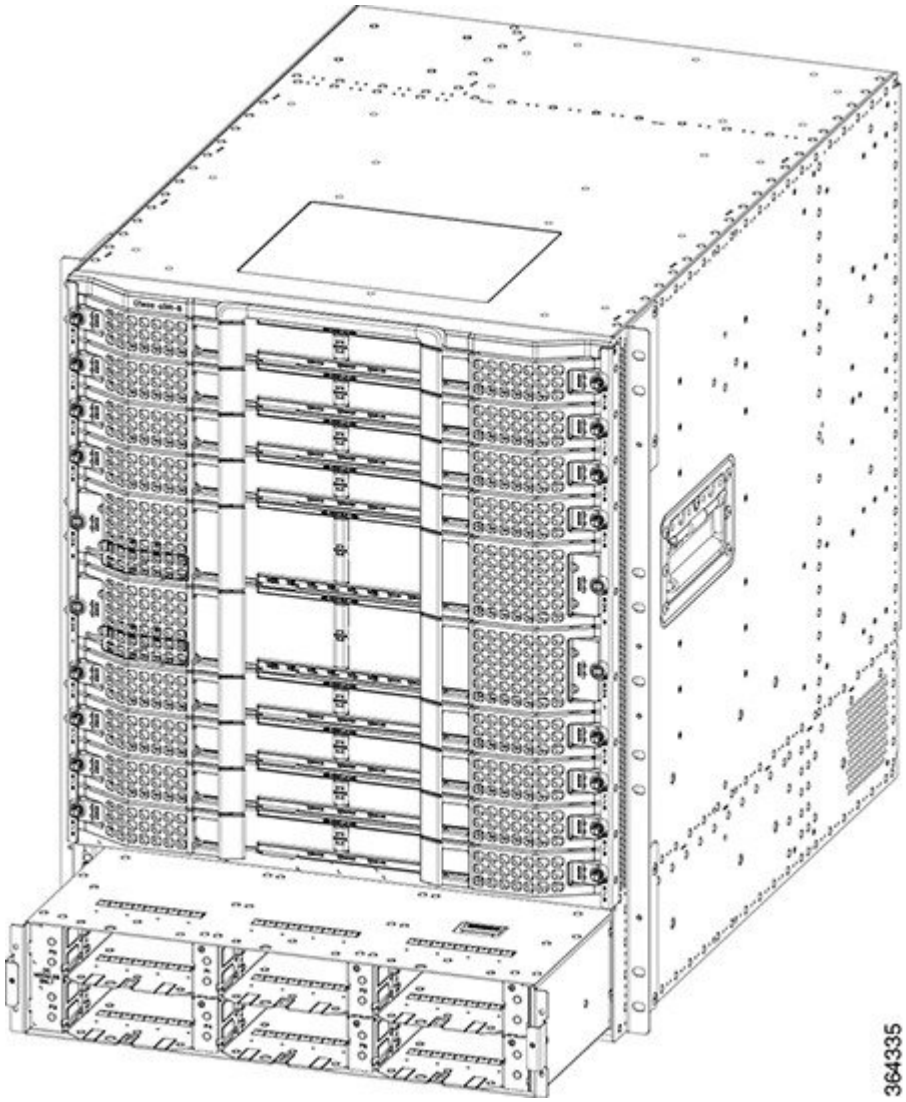


1	Screw	2	Front power entry bezel

Step 2 Loosen and remove the four #6-32 Torx-head screws on the Power Cassette Module using a T10 Torx screwdriver.

Step 3 Hold the side flanges on the Power Cassette Module with both your hands. Pull and slide the module out of the chassis applying even pressure to both your hands.

Figure 85: Removing the Power Cassette Module from the Chassis



What to Do Next

- Replace the Power Cassette Module (if required).
- Position the front power entry bezel on the chassis. Insert and tighten the two screws using a 3/16" flat-blade torque screwdriver with a torque of 5-7 in-lb (0.56-0.79 Nm) to secure the bezel.

CHAPTER 17

Maintaining the Supervisor in the Cisco cBR Chassis

- Removing the Supervisor Card from the Cisco cBR Chassis, page 173
- Removing the SFP+ Module from the Supervisor PIC, page 177
- Removing the Supervisor PIC Cable Management Bracket, page 179
- Removing the Supervisor PIC from the Cisco cBR Chassis, page 180

Removing the Supervisor Card from the Cisco cBR Chassis

Perform this procedure to remove the following cards:

- Supervisor Card
- Blank card for the Supervisor

Before You Begin

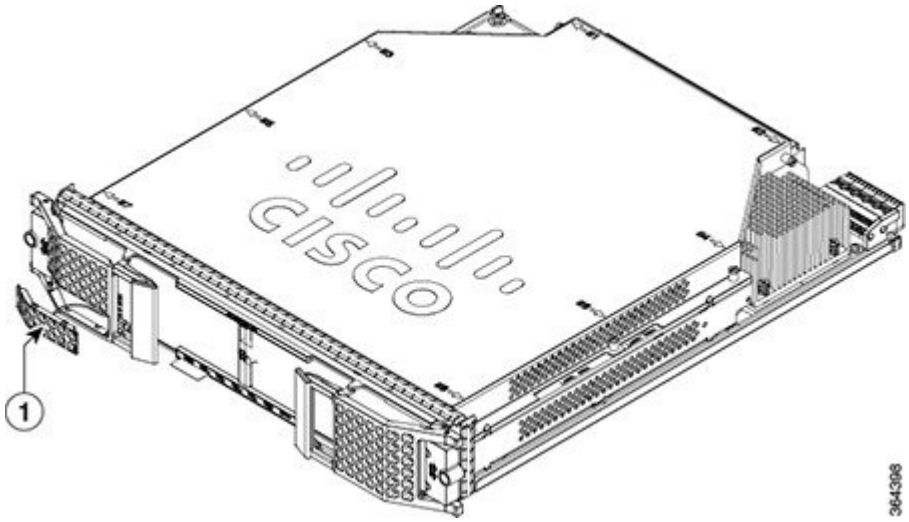
Caution

- In a Cisco cBR with 1+1 Supervisor redundancy, removing the active Supervisor Card or Supervisor PIC results in switchover.
- In a Cisco cBR with 1+1 Supervisor redundancy, removing the standby Supervisor Card or Supervisor PIC may result in limited packet loss in the active-active backhaul configuration.
- In a Cisco cBR without Supervisor redundancy, removing the Supervisor Card or Supervisor PIC results in complete loss of service.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Disconnect all the cables and memory stick or flash drives from the Supervisor Card.

- Close the tethered I/O door by pushing the door until it snaps into place on the spring-loaded ejector of the Supervisor Card.

Figure 86: Closing the Tethered I/O Door on the Supervisor Card



1	Tethered I/O door		—

- Be aware of the weight and size of the equipment. Handle it with care.
- Ensure that a replacement Supervisor Card or a blank card is readily available to replace the removed Supervisor Card or blank card in an operational chassis.

Caution After removing the Supervisor Card or blank card from an operational chassis, install the replacement Supervisor Card or blank card in the chassis within 3 minutes to prevent the chassis from shutting down due to possible overheating of some components.

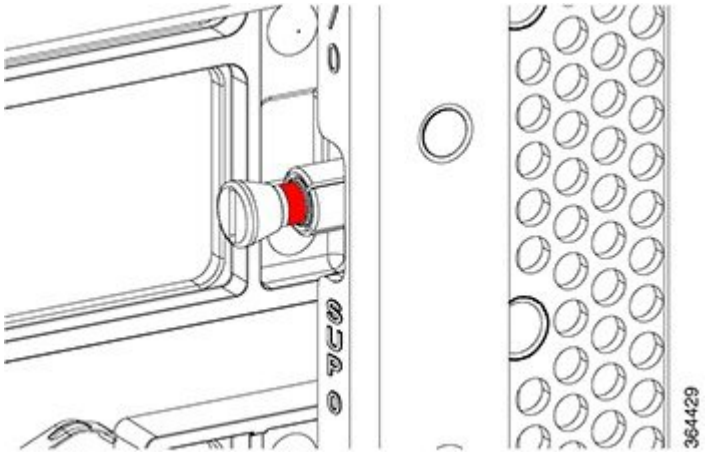
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade screwdriver

- Antistatic bag

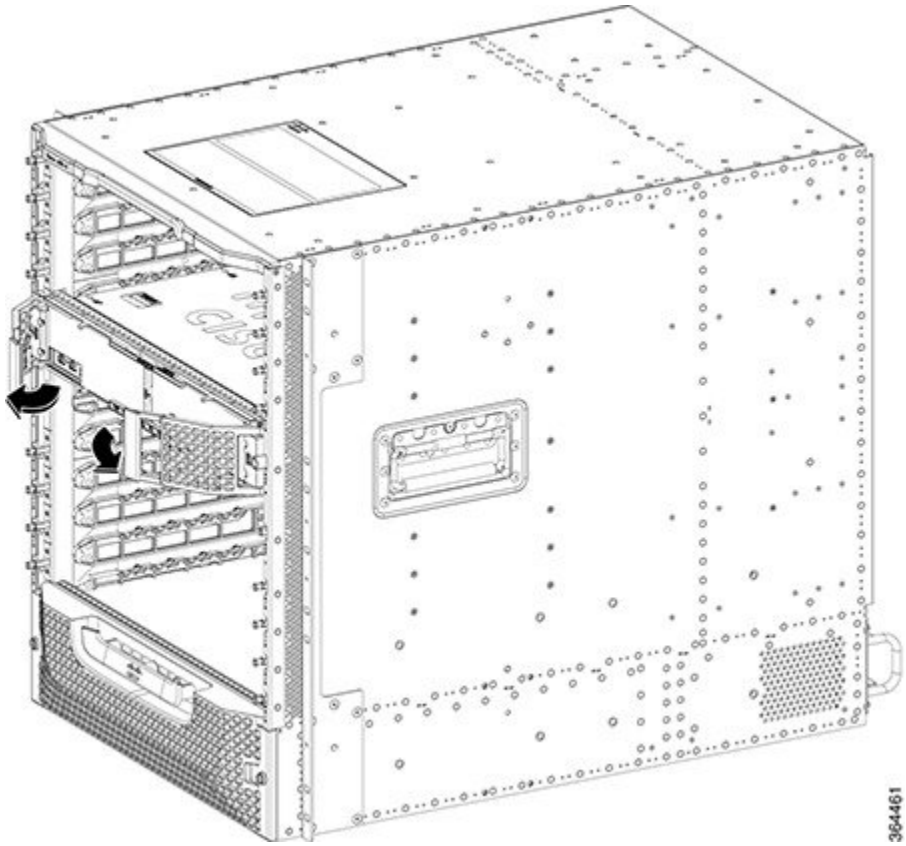
Step 1 Loosen the captive screws on the card using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

Figure 87: Loosening the Captive Screws on the Chassis



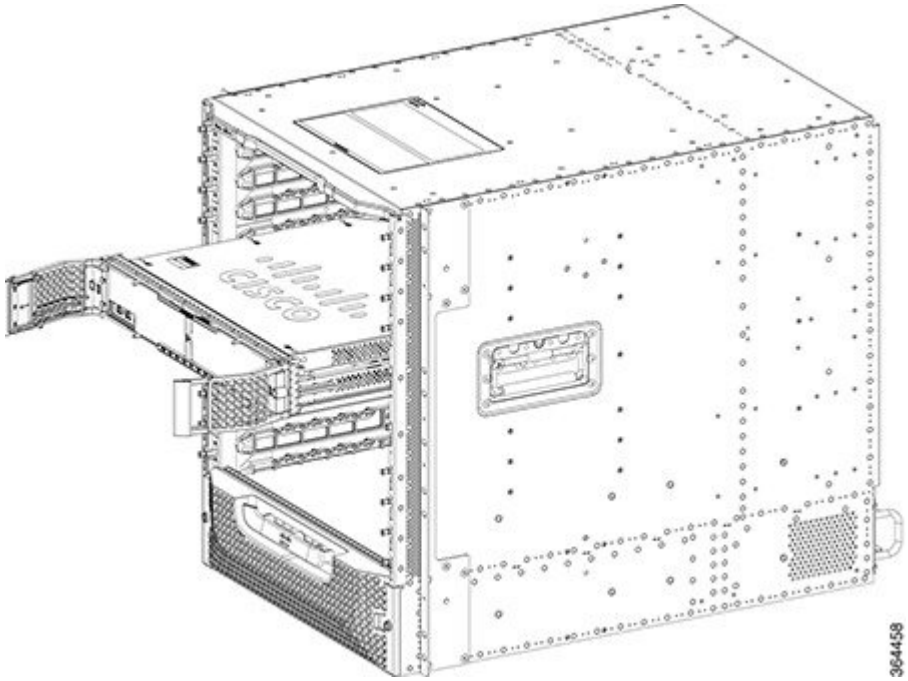
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 88: Opening Spring-loaded Ejectors on the Supervisor Card



Step 3 Carefully slide the card out of its slot applying even pressure using both your hands.

Figure 89: Removing the Supervisor Card from the Chassis



Step 4 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight, and remove the card from its slot.

Step 5 Place the removed Supervisor Card in an antistatic bag.

Note The removed blank card does not need to be placed in an antistatic bag.

What to Do Next

- Replace the Supervisor Card or blank card.

Removing the SFP+ Module from the Supervisor PIC

Before You Begin

Caution Do not install or remove the SFP+ module with fiber-optic cables still attached to it. Doing so may damage cables, cable connectors, or the optical interfaces and may interfere with the SFP+ module latching properly into its socket connector. Disconnect all cables before removing or installing an SFP transceiver module.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Removing and installing an SFP+ module can shorten its useful life. Do not remove and insert SFP+ modules more often than is absolutely necessary.

Required Tools and Equipment

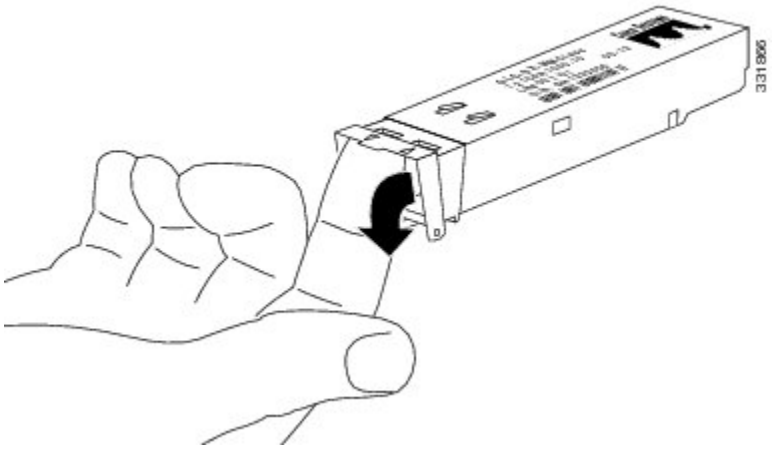
- ESD-preventive wrist strap
- Dust plugs for the SFP+ module
- Antistatic bag

Step 1 Disconnect the fiber-optic cable from the SFP+ port for removing the SFP+ module from the Supervisor PIC. Immediately reinstall the dust plug in the optical bores and the fiber-optic cable LC connectors .

Tip For reattachment of fiber-optic cables, note which connector plug is send (TX) and which is receive (RX).

Step 2 Release the bail clasp on the SFP+ module, by pushing the small tab up and outwards with your index finger to release the bail clasp.

Figure 90: Removing the SFP+ Module Equipped with a Bail Clasp Latch with Tab



Step 3 Grasp the SFP+ module between your thumb and index finger and carefully remove it from the socket.

Step 4 Place the removed SFP+ module in an antistatic bag.

What to Do Next

Replace the SFP+ module (if required).

Removing the Supervisor PIC Cable Management Bracket

The Supervisor PIC cable management bracket is usually removed when the Supervisor PIC needs to be replaced.

Before You Begin

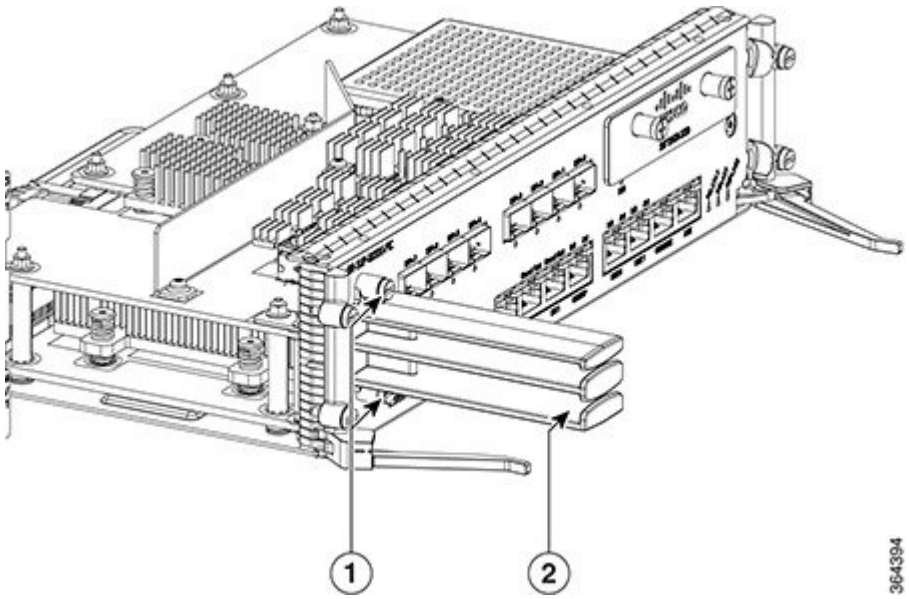
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Remove all the cables that are routed through the Supervisor PIC cable management bracket.

Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade screwdriver

Step 1 Loosen the two captive screws that secure the Supervisor PIC cable management bracket using a 3/16" flat-blade screwdriver.

Figure 91: Removing the Supervisor PIC Cable Management Bracket



1	Captive screws	2	Supervisor PIC cable management bracket

Step 2 Remove the Supervisor PIC cable management bracket.

What to Do Next

Replace the cable management bracket (if required).

Removing the Supervisor PIC from the Cisco cBR Chassis

Perform this procedure to remove the following PIC:

- Supervisor PIC
- Blank PIC for the Supervisor

Before You Begin

Caution

- In a Cisco cBR with 1+1 Supervisor redundancy, removing the active Supervisor Card or Supervisor PIC results in switchover.
- In a Cisco cBR with 1+1 Supervisor redundancy, removing the standby Supervisor Card or Supervisor PIC may result in limited packet loss in the active-active backhaul configuration.
- In a Cisco cBR without Supervisor redundancy, removing the Supervisor Card or Supervisor PIC results in complete loss of service.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Disconnect all the cables from the Supervisor PIC.
- Be aware of the weight and size of the equipment. Handle it with care.
- Ensure that a replacement Supervisor PIC or a blank PIC is readily available to replace the removed Supervisor PIC or blank PIC in an operational chassis.

Caution After removing the Supervisor PIC or blank PIC from an operational chassis, install the replacement Supervisor PIC or blank PIC in the chassis within 3 minutes to prevent the chassis from shutting down due to possible overheating of some components.

Restrictions

- The Supervisor Card does not power up if the Supervisor PIC is not present during powering up of the chassis.

Required Tools and Equipment

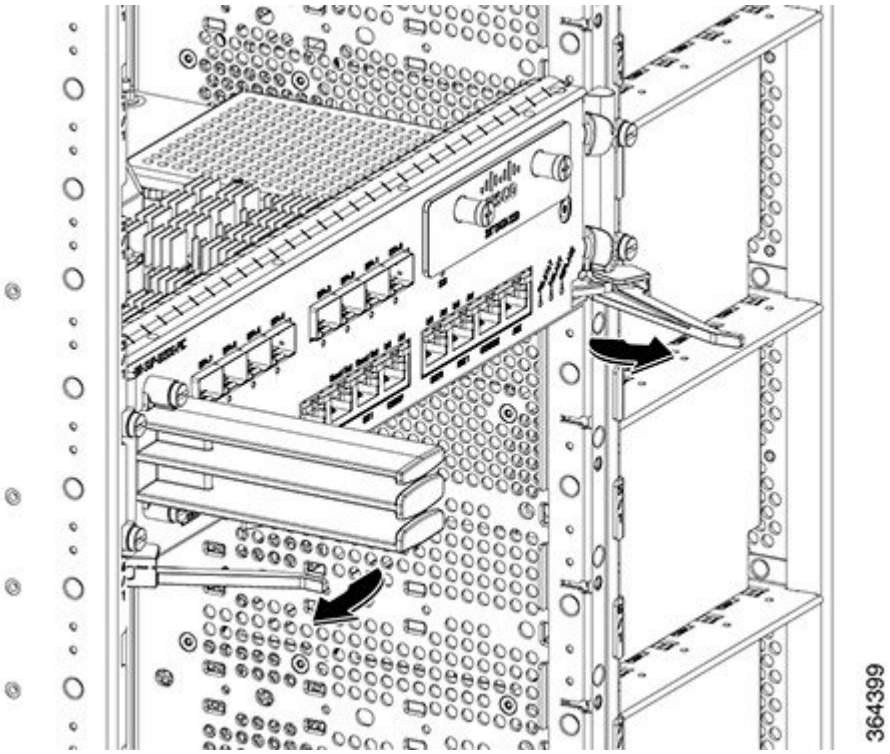
- ESD-preventive wrist strap
- 3/16" flat-blade screwdriver

- Antistatic bag

Step 1 Loosen the four captive screws on the PIC using a 3/16" flat-blade screwdriver.

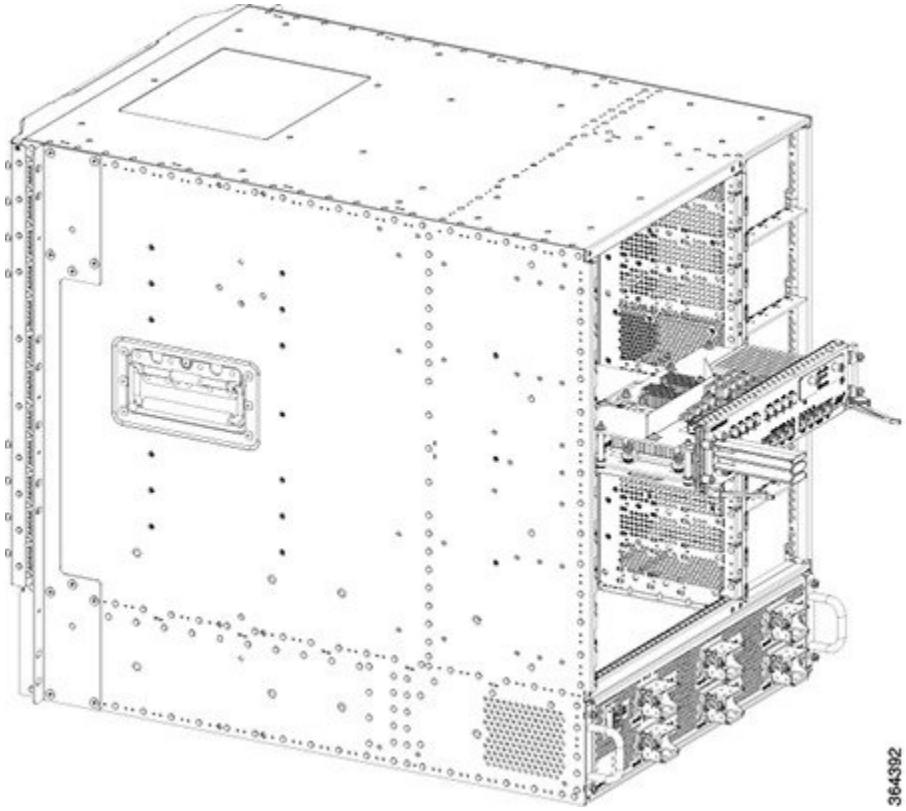
Step 2 Pull the ejector levers on the PIC to disengage the midplane connectors.

Figure 92: Opening the Ejector Levers on the Supervisor PIC



Step 3 Carefully slide the PIC out of the slot applying even pressure using both your hands.

Figure 93: Removing the Supervisor PIC from the Chassis

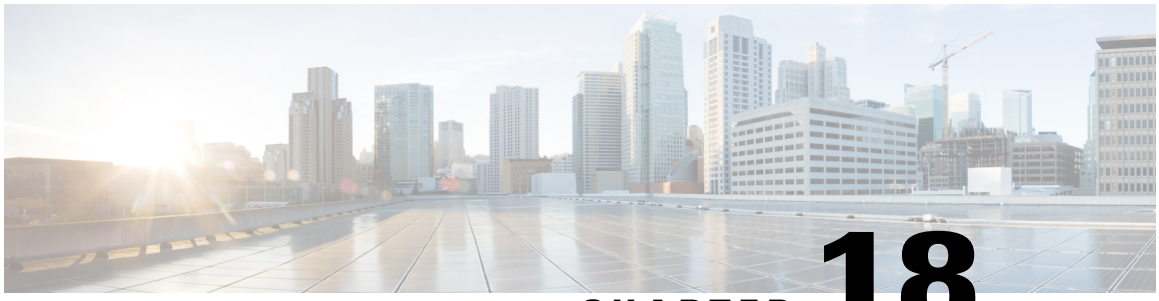


Step 4 Place the removed Supervisor PIC in an antistatic bag.

Note The removed blank PIC does not need to be placed in an antistatic bag.

What to Do Next

Replace the Supervisor PIC or blank PIC.



CHAPTER 18

Maintaining the Interface Cards in the Cisco cBR Chassis

- Removing the Interface Line Card from the Cisco cBR Chassis, page 183
- Removing the UCH.8 Connectors from the RF PICs, page 185
- Removing the RF PIC from the Cisco cBR Chassis, page 186
- Removing the cLGA Connector from an Interface Line Card, page 188
- Installing the cLGA Connector on the Line Card PCB, page 191

Removing the Interface Line Card from the Cisco cBR Chassis

It is not necessary to power down the chassis to remove an interface line card.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.
- Before removing an interface line card, ensure that one of the following cards is available for immediate replacement in the chassis:
  - replacement interface line card
  - line card blank

Caution After removing a line card or a line card blank from an operational chassis, install the replacement line card or line card blank in the chassis within three minutes to avoid critical thermal alarms relating to overheating of individual components.

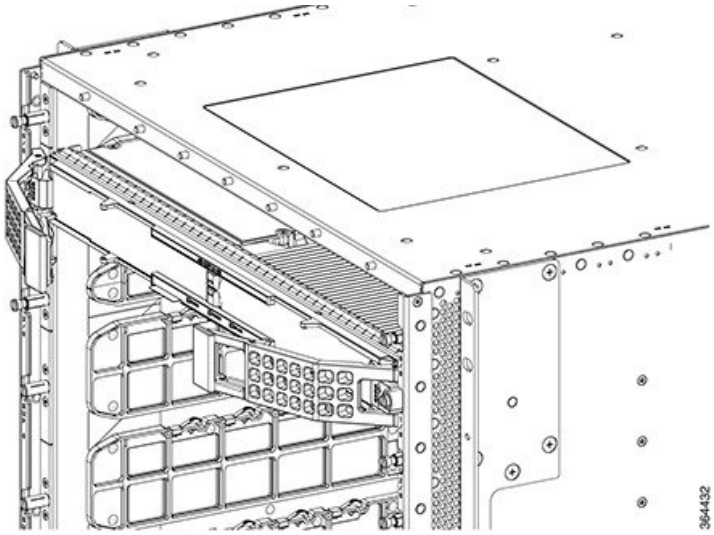
Required Tools and Equipments

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver
- Antistatic bag

Step 1 Loosen the captive screws on the appropriate slot using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

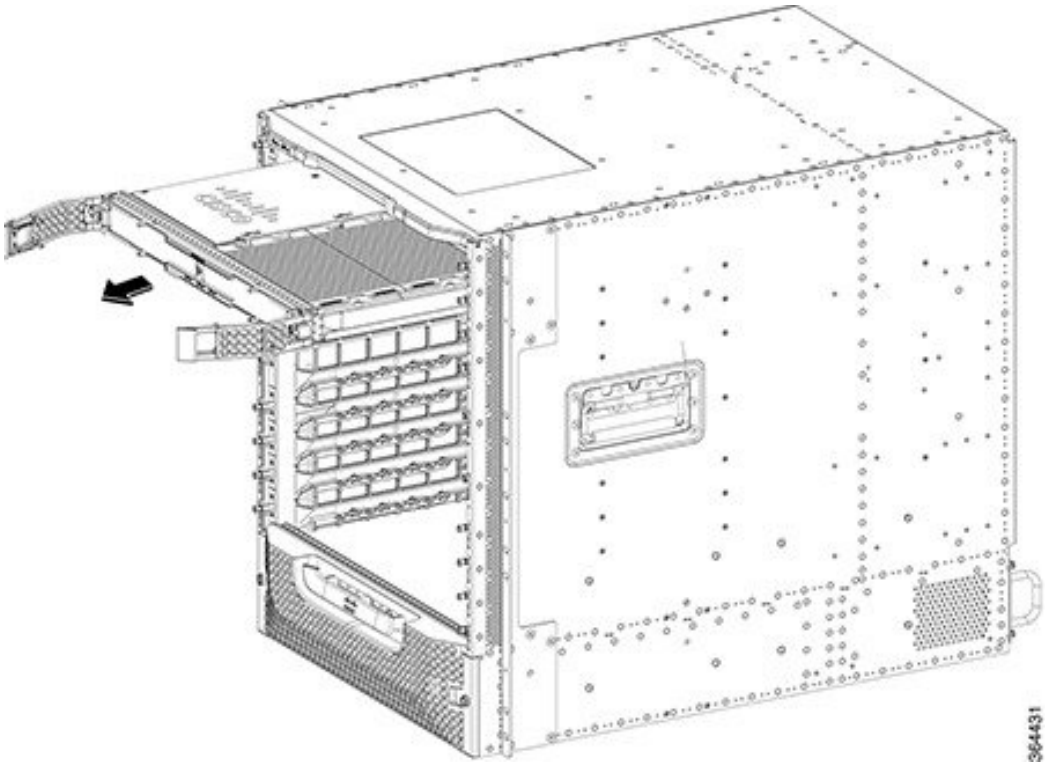
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 94: Opening Spring-loaded Ejectors on the Interface Card



Step 3 Carefully slide the card out of its slot applying even pressure using both your hands.

Figure 95: Removing the Interface Card from the Slot



Step 4 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight, and remove the card from its slot.

Step 5 Place the removed card in an antistatic bag.

Note If a line card blank is removed, it need not be placed in an antistatic bag.

Note Close the spring-loaded ejectors before placing it in the anti-static bag.

What to Do Next

- Replace the Interface Line Card or install a line card blank (as required).

Removing the UCH.8 Connectors from the RF PICs

Three UCH.8 connectors are connected to the RF Through PIC. To remove an RF PIC, the UCH.8 connectors connected to RF PIC must be removed first. This procedure is used only for RF Through PICs. The following steps describe how to remove one UCH.8 connector. Repeat the procedure to remove all the three UCH.8 connectors.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.

Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade screwdriver

Step 1 Loosen the lead screw on the UCH.8 connector using a 3/16" flat-blade screwdriver.

Step 2 Loosen and pull the UCH.8 connector until it is disconnected from the port.

What to Do Next

Remove the RF Through PIC (if required).

Removing the RF PIC from the Cisco cBR Chassis

Before You Begin

- Before removing an RF PIC, ensure that one of the following cards is available for immediate replacement in the chassis:
  - replacement RF Through PIC or RF Protect PIC
  - PIC Blank

Caution After removing an RF PIC or a PIC Blank from an operational chassis, install the replacement RF PIC or blank PIC in the chassis within three minutes to avoid critical thermal alarms relating to overheating of individual components.

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.
- To remove an RF Through PIC, first remove the UCH.8 connectors.

Required Tools and Equipments

- ESD-preventive wrist strap
- 3/16" flat-blade screwdriver

- Antistatic bag

Step 1 Loosen the captive screws on the appropriate slot using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

Step 2 Pull the ejectors levers until the PIC is disengaged from the connectors on the midplane. Carefully slide the PIC out of the slot applying even pressure using both your hands.

Figure 96: Opening the Ejector Levers of the RF PIC

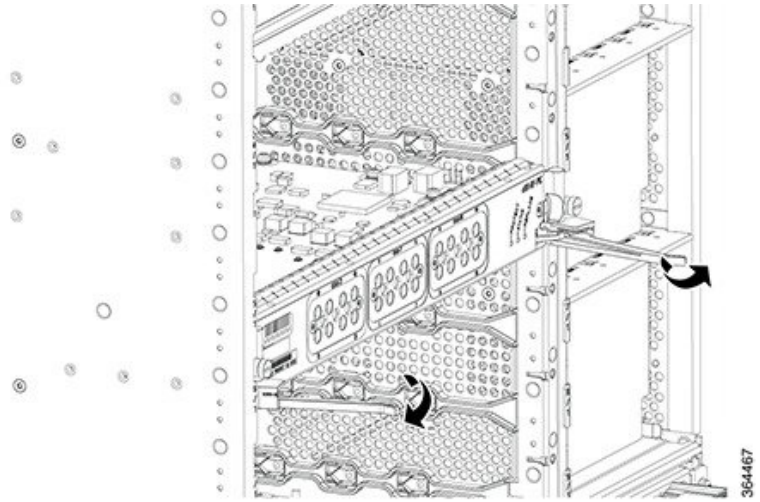
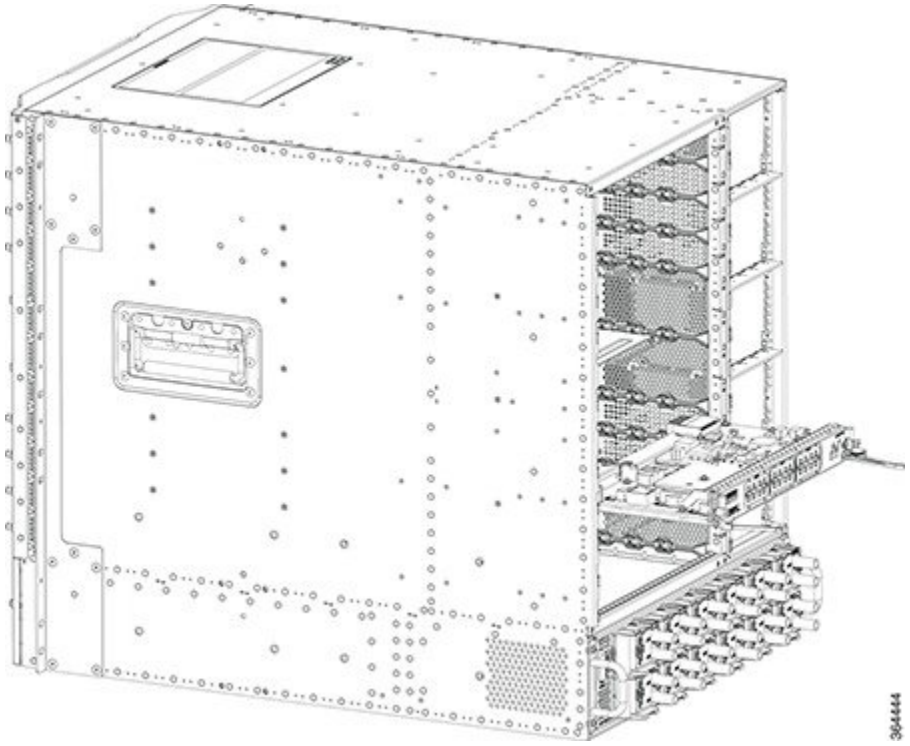


Figure 97: Removing the RF PIC from the Chassis



Step 3 Place the removed card in an antistatic bag.

What to Do Next

- Replace with RF Through PIC, RF Protect PIC or PIC Blank.

Removing the cLGA Connector from an Interface Line Card

The cLGA 10 X 22 Position .050 C/L Connector (cLGA connector) must be removed only in case of a failure or fault.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.
- Wear latex gloves while handling the cLGA connector, to prevent contamination of the connector surface.
- Remove the interface line card.
- Remove the Downstream D3.0 Module.

Restrictions

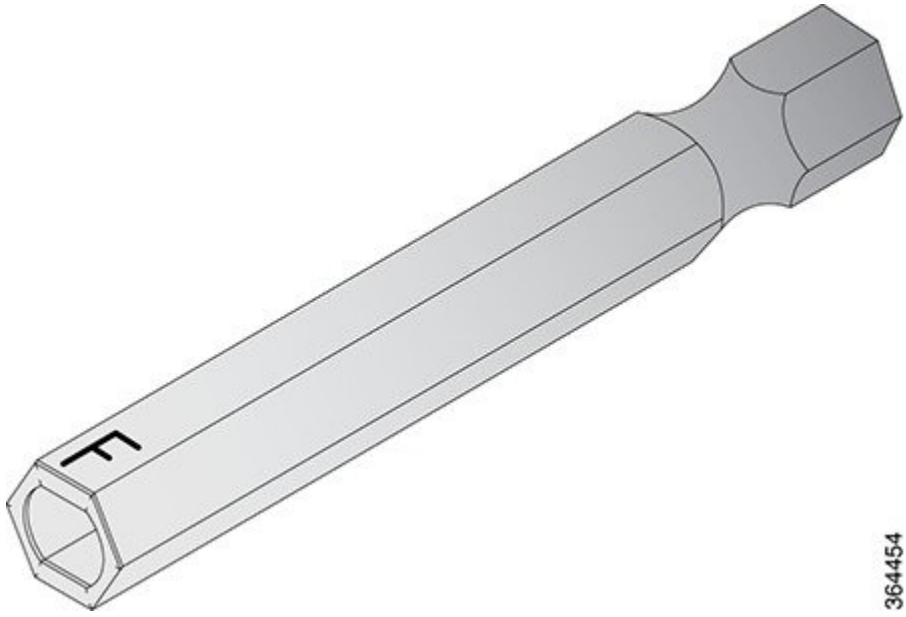
- Ensure that a replacement line card or line card blank is available for installation into the vacated line card slot.
- Ensure that the replacement interface line card or line card blank is installed within three minutes of removal.

Caution The line card slot must not remain empty for more than three minutes, to avoid shutdown of chassis due to overheating of the components.

Required Tools and Equipment

- ESD-preventive wrist strap
- Hex socket bit for 10830 cap-screw (used with a screwdriver with detachable bits)

Figure 98: Hex Socket Bit for 10830 Cap-Screw

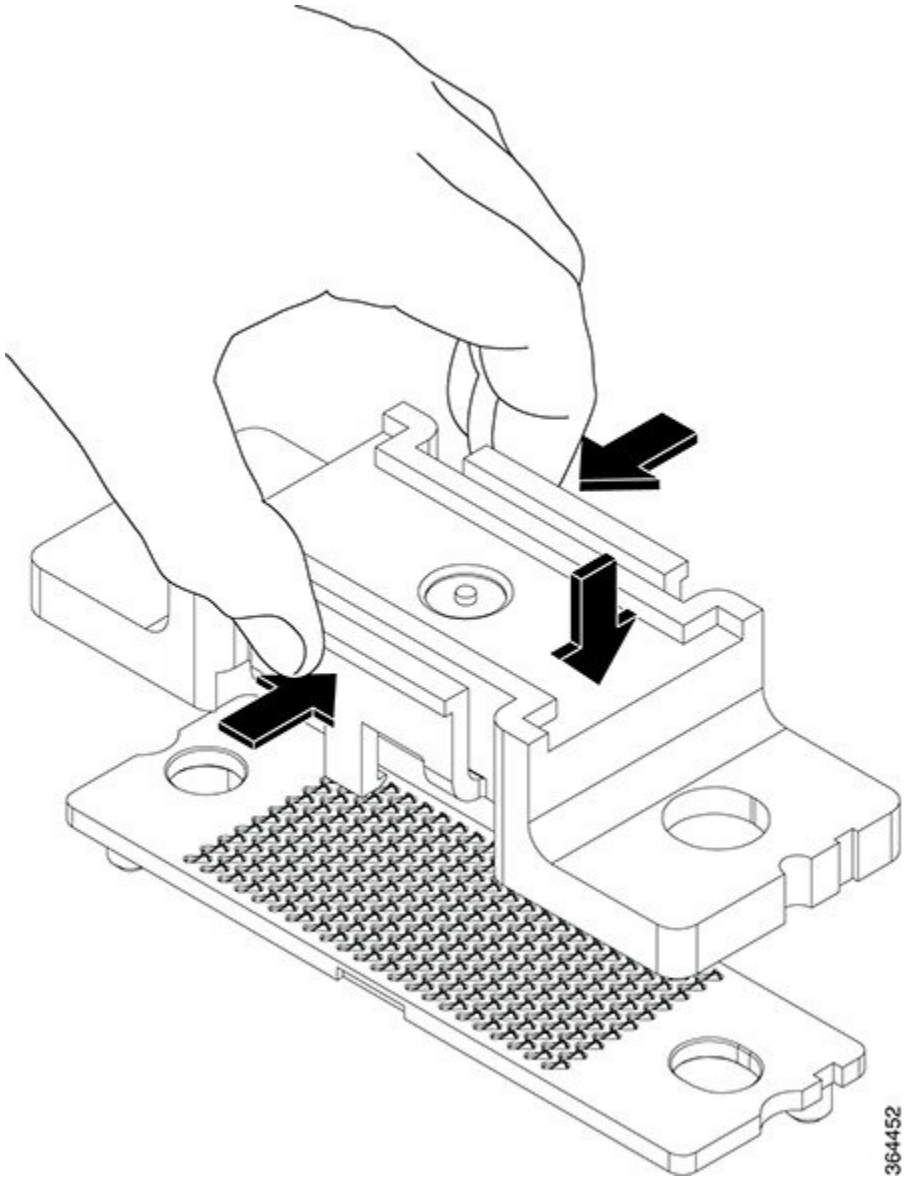


- Replacement line card or line card blank (in case it is not possible to re-install the removed line card within three minutes)

- Antistatic Bag

Step 1 Replace the protective cover on the cLGA connector by pinching the side clamps on the cover with your thumb and index finger and placing the cover in the cLGA connector and releasing the clamps. Ensure the clamp locks on the cLGA connector.

Figure 99: Installing the Protective Cover on the cLGA Connector



Step 2 Loosen and remove the two 10830 cap-screws that fasten the cLGA connector to the PCB.

Step 3 Hold the cLGA connector with protective cover using your thumb and index finger. Lift the cLGA connector up until the guide pins at the bottom of the cLGA connector are removed from the guide holes in the PCB.

Step 4 Place the cLGA connector in an antistatic bag.

What to Do Next

Install a replacement cLGA Connector.

Installing the cLGA Connector on the Line Card PCB

Note Do not remove the cap of the cLGA connector until the Downstream D3.0 Module is ready to be installed.

The cLGA connector must be installed before installing the Downstream D3.0 Module, during replacement of the Downstream D3.0 Module, on the interface line card.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.
- Wear latex gloves while handling the cLGA connector, to prevent contamination of the connector surface.

Restrictions

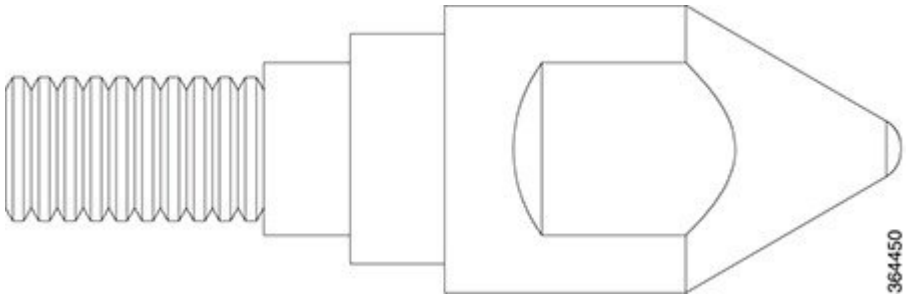
- Install the interface line card in the slot corresponding to the RF Protect or RF Through PIC installed.

Required Tools and Equipment

- ESD-preventive wrist strap
- cLGA Connector Installation kit consisting of the following:
  - Hex socket bit for 10830 cap-screw (use with a screwdriver with detachable bits)

◦ 10830 cap-screws

Figure 100: 10830 Cap-screws



◦ cLGA 10 X 22 Position .050 C/L Connector (cLGA connector)

Note After installation, save the hex socket bit for future use. These will be required while removing the cLGA connector.

Step 1 Hold the cLGA connector by the sides of its protective cap, using your thumb and index finger.

Caution Do not pinch the sides of protective cap of the cLGA connector with pressure. Applying pressure on the sides of the protective cap will release the clamp of the cap that holds the cLGA connector.

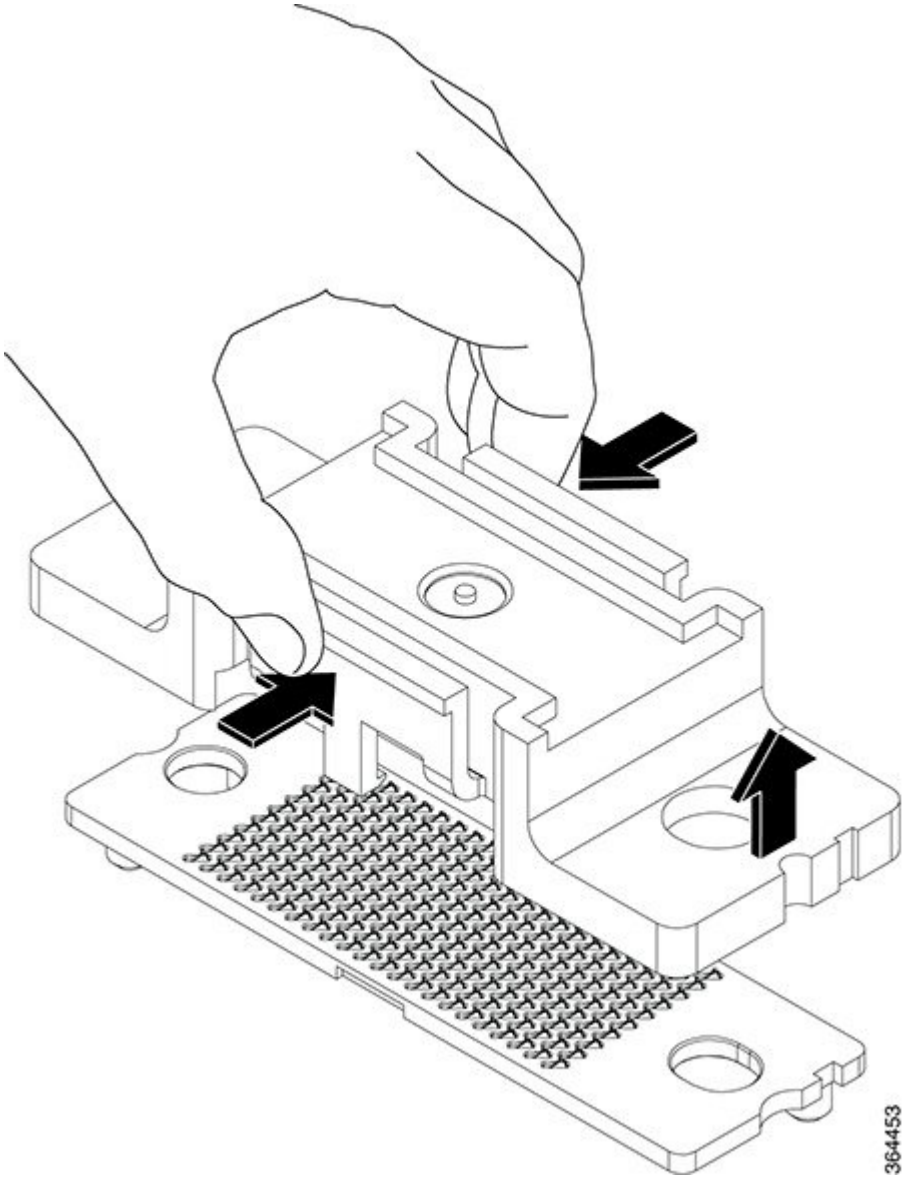
Step 2 Align the guide pins below the cLGA connector with the guide holes in the PCB and set the cLGA connector on the PCB.

Step 3 Insert the 10830 cap-screws into the and tighten using the hex socket driver with a torque of 4.4 lb-inch (0.5 Nm).

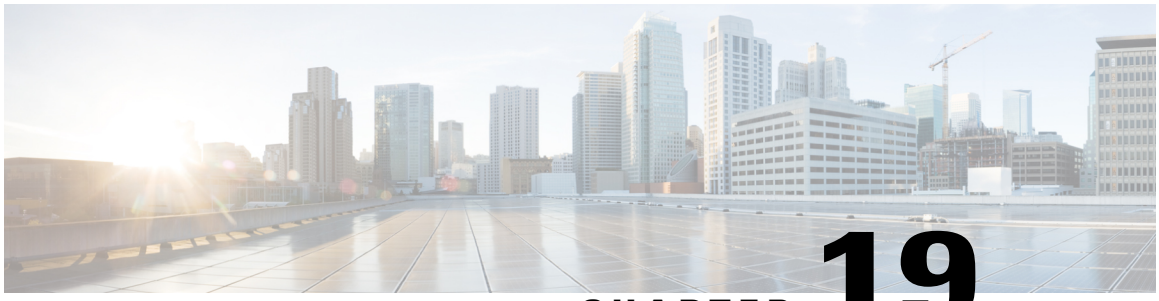
What to Do Next

- Remove the protective cover from the cLGA connector before the Downstream D3.0 Module is installed.

Figure 101: Removing the Protective Cover from the cLGA Connector



- Install the Downstream D3.0 Module.



CHAPTER 19

Maintaining the PHY Modules in the Cisco cBR Chassis

- Removing the Downstream PHY Module in the Interface Line Card, page 195
- Installing the Downstream PHY Module in the Interface Line Card, page 197
- Removing the Upstream PHY Module in the Interface Line Card , page 199
- Installing the Upstream PHY Module in the Interface Line Card , page 200

Removing the Downstream PHY Module in the Interface Line Card

The Downstream PHY module is removed for replacement or upgrade.

Caution Do not touch the cLGA connector.

Before You Begin

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.
- Remove the interface line card.

Restrictions

- Ensure that a working Downstream PHY module is available for replacement.
- Ensure that the interface line card removed for the Downstream PHY module replacement, is re-installed or replaced by another interface line card or a line card blank, within three minutes of removal.

Caution The line card slot must not remain empty for more than three minutes, to avoid critical thermal alarms relating to overheating of individual components.

Required Tools and Equipment

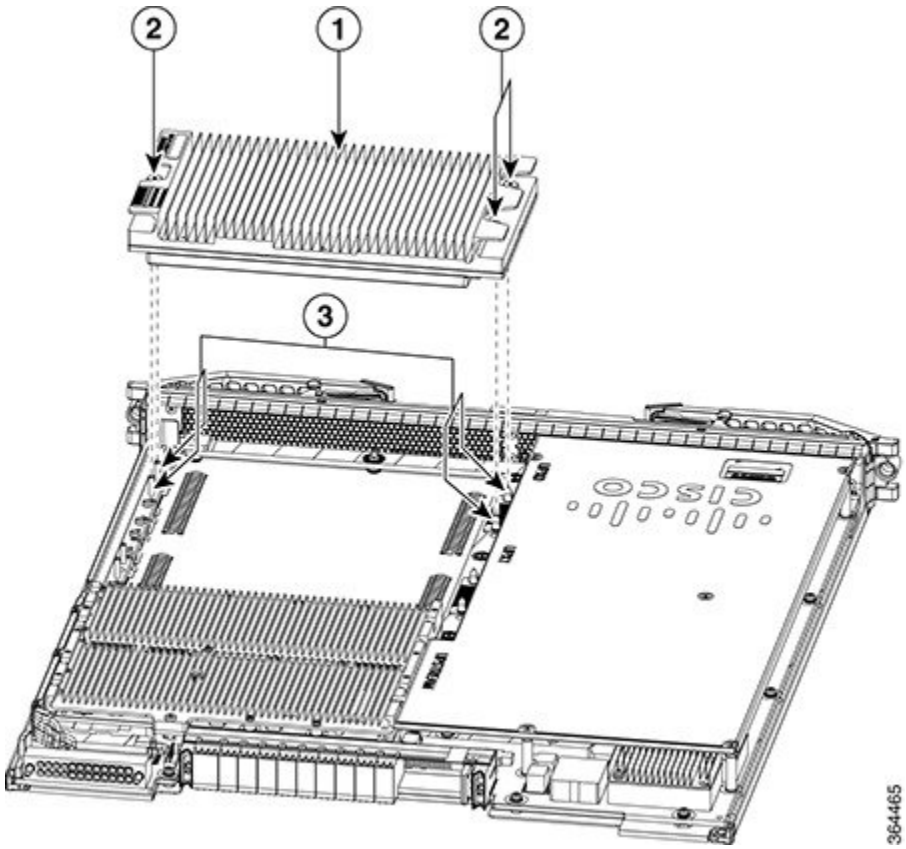
- ESD-preventive wrist strap
- T10 Torx-blade screwdriver
- Replacement line card or line card blank
- Antistatic Bag or mat

Step 1 Loosen the retaining screws (two in the front and one in the rear) using a T10 Torx-blade torque driver.

Step 2 Grasp the Downstream PHY module by its sides.

Step 3 Lift the Downstream PHY module off the cLGA connector guide pins and the rear guide pins on the line card.

Figure 102: Lift the Downstream PHY module



1	Downstream PHY module	3	Guide pins
2	Captive screws		

Note Ensure that the Downstream PHY module is held horizontal when it is lifted off the guide pins, to prevent damage to the cLGA connector surface.

Step 4 Place the removed Downstream PHY module in an antistatic bag.

What to Do Next

Replace the Downstream PHY module.

Installing the Downstream PHY Module in the Interface Line Card

The Downstream PHY module is installed as a replacement or an upgrade from downstream D3.0 module to a downstream D3.1 module.

Caution Do not touch the cLGA connector.

Before You Begin

Prerequisites

- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Be aware of the weight and size of the equipment. Handle it with care.

Restrictions

- Ensure that the guide holes at the rear of the Downstream PHY module are aligned properly. If the Downstream PHY module alignment is reversed, the cLGA connector guide pins will damage the connecting surface of the Downstream PHY module.

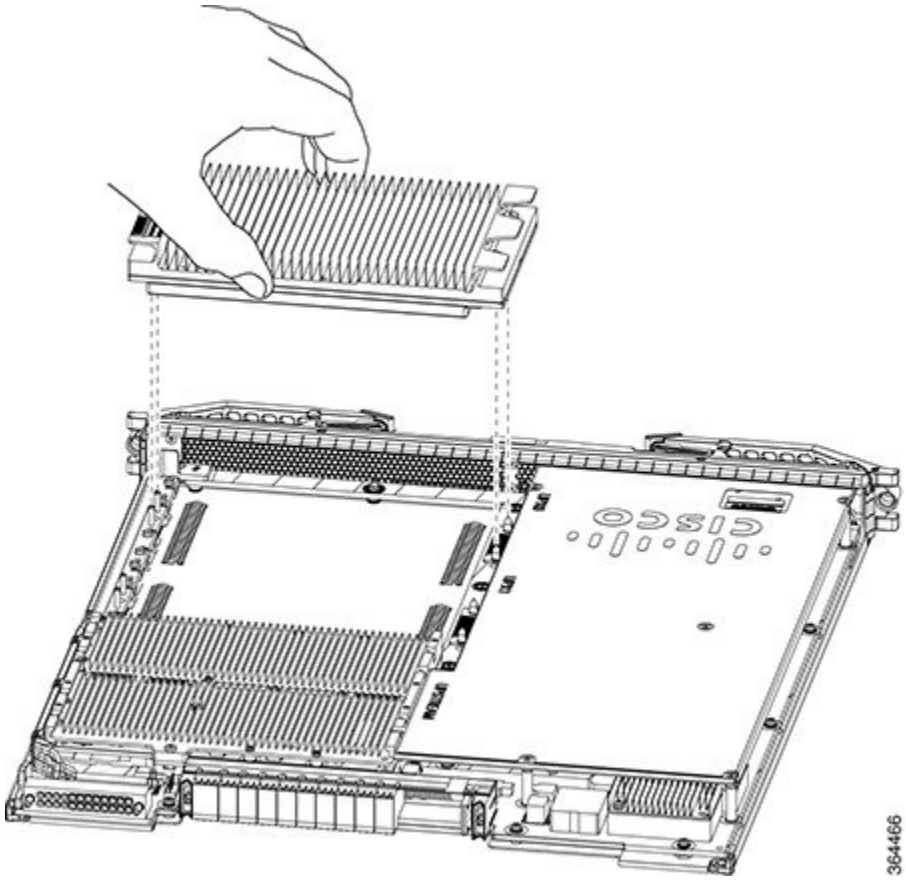
Required Tools and Equipment

- ESD-preventive wrist strap
- T10 Torx-blade torque driver

- Downstream PHY module (Refer to the FRU list and the ordering information for the correct module.)

Step 1 Grasp the Downstream PHY module by its sides.

Figure 103: Grasp the Downstream PHY module



Step 2 Align the front and rear guide holes of Downstream PHY module with the front and rear guide pins on the line card.

Step 3 Gently lower the Downstream PHY module on to the guide pins of the line card.

Step 4 Tighten the three retaining screws using a T10 Torx-blade torque screwdriver.

Caution Use a torque of 8 lb-inch (0.90 Nm) to tighten the screws.

What to Do Next

- Install the Interface line card.
- After the Interface line card is installed and reloading it, verify that the downstream PHY module is upgraded from downstream D3.0 to downstream D3.1 module using the **show inventory** command. For more details on the verification, refer to Verifying the Downstream PHY Module Upgrade.

Removing the Upstream PHY Module in the Interface Line Card

The Upstream PHY module is removed for replacement or upgrade.

Before You Begin

Prerequisites

- Attach an ESD-preventive wrist strap to your wrist and connect its end to the grounding lug that is connected to the chassis.
- Be aware if the weight and size of the equipment. Handle the equipment with care.
- Remove the interface line card.

Restrictions

- Ensure that a working Upstream PHY module is available for replacement.
- Ensure that the interface line card removed for the Upstream PHY module replacement, is re-installed or replaced by another interface line card or a line card blank, within three minutes of removal.

Caution The line card slot must not remain empty for more than three minutes, to avoid critical thermal alarms relating to overheating of individual components.

Required Tools and Equipment

- Upstream module extractor tools:
  - Extractor plunger assembly
  - Extractor pull assembly
- ESD-preventive wrist strap
- T10 Torx-blade torque screwdriver
- 3/16" flat-blade torque screwdriver
- Configured replacement RF line card or line card blank
- Upstream D3.1 modules for upgrade
- Antistatic mat or bag

Step 1 Loosen all four T10 screws on the upstream module by turning the screws in counter clockwise direction using a T10 Torx screwdriver.
Make sure that all four screws are disengaged properly.

Step 2 To attach the upstream module extractor plunger assembly, align the plunger assembly between the center heatsink fin separation and the last row of heatsink fins.

Step 3 Firmly press down the thumb rest on the flange of the plunger assembly and snap onto the heatsink. Do not press the plunger.

Step 4 To engage the extractor catch with the heatsink, press the extractor catch release button.

Step 5 To attach the extractor pull assembly, align the pull assembly between the center heatsink fin separation and the last row of heatsink fins.

Step 6 Firmly press down the thumb rest on the flange of the plunger assembly and snap onto the heatsink.

Step 7 Press the extractor catch release button to engage the extractor catch with the heatsink.

Step 8 Check whether all four T10 screws on the upstream module are completely loose.

Step 9 To disengage the connectors and release the upstream module, hold the two assemblies using the flange and then using your thumb firmly press down the plunger on the extractor plunger assembly and pull the upstream module up keeping the level straight.
Place the upstream module on an antistatic mat.

Step 10 To remove the extractor assemblies from the upstream module, press the extractor catch release button on both the extractor assemblies and pull them up.

What to Do Next

Replace the Upstream PHY module.

Installing the Upstream PHY Module in the Interface Line Card

The Upstream PHY module is installed as a replacement or an upgrade from downstream D3.0 module to a downstream D3.1 module.

Before You Begin

Prerequisites

- Attach an ESD-preventive wrist strap to your wrist and connect its end to the grounding lug that is connected to the chassis.
- Be aware if the weight and size of the equipment. Handle the equipment with care.

Required Tools and Equipment

- ESD-preventive wrist strap
- T10 Torx-blade torque screwdriver
- 3/16" flat-blade torque screwdriver
- Configured replacement RF line card or line card blank
- Upstream D3.1 modules for upgrade

- Antistatic mat or bag

Step 1 Align the guide holes on the module with the alignment posts on the RF line card.

Step 2 Firmly press the module down to seat the connectors. Do not use excessive force.

Step 3 Tighten all the four T10 securing screws in clockwise direction to a torque of 8 pound inch.

Step 4 Snug-tighten all the screws in the clockwise direction in the same order as done in the previous step.

What to Do Next

- Remove the replacement RF line card or the line card blank from the chassis.
- And then install the upgraded RF line card in the chassis.
- Verify whether the version of the control FPGA is displayed as *00020009* using the **show platform diag** command.
- Verify whether the PID of the upstream PHY module on the upgraded RF line card is displayed as *CBR-D31-US-MOD* using the **show diag slot slot_number eeprom details** command on the Supervisor.

CHAPTER 20

Maintaining the Air Filter in the Cisco cBR Chassis

- Removing the Air Filter on a Card, page 203
- Installing the Air Filter on a Card, page 205

Removing the Air Filter on a Card

Note Attach an ESD-preventive wrist strap to your wrist and connect its end to the grounding lug that is connected to the chassis.

Before You Begin

Required Tools and Equipment

- ESD-preventive Wrist Strap

- 3/16” Flat-blade Torque Screwdriver

Step 1 Check whether the captive screws on the card are secure and tightened to a torque of 10 to 12 lb-in. The red band on the captive screw should not be visible. If the screws are not secure, traffic may get interrupted.

Step 2 To remove the air filter from the card, use your finger to pinch the handle at the middle of the air filter and pull the air filter until it separates from the card.

Figure 104: Removing Air Filter from an RF Line Card

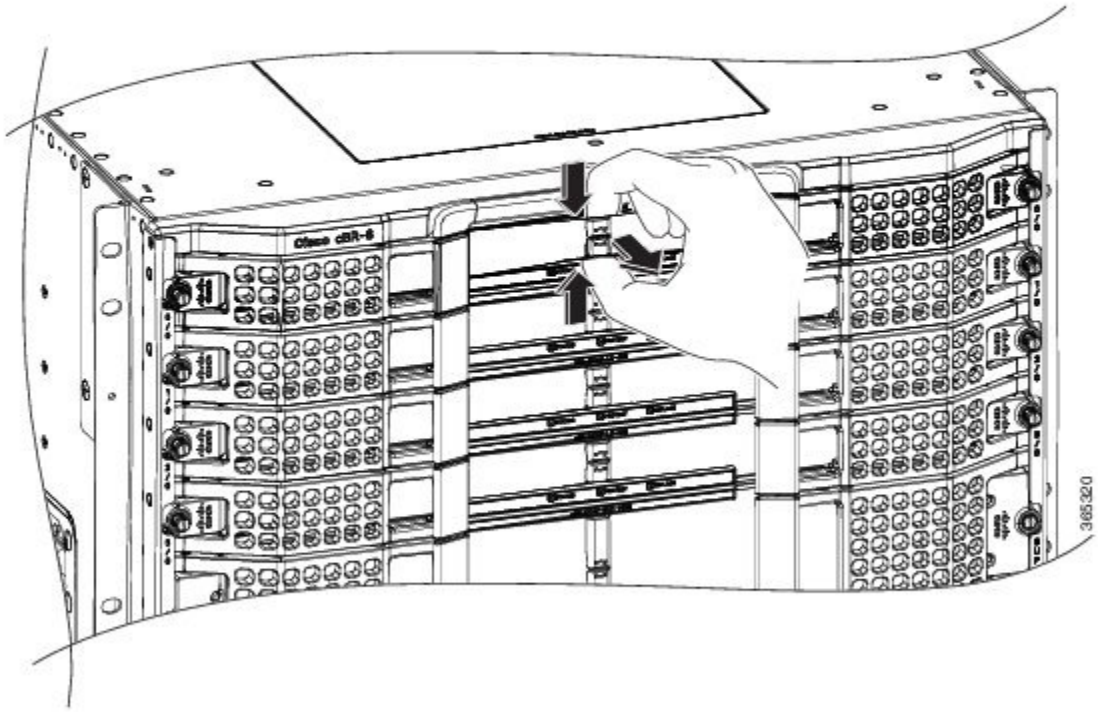
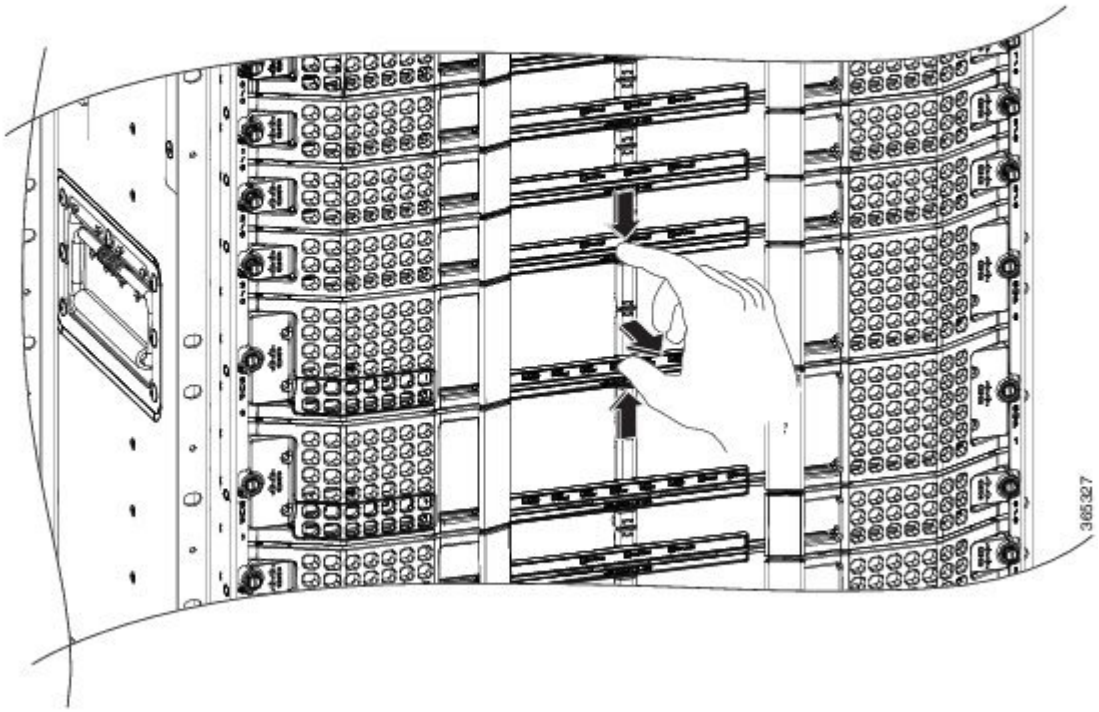


Figure 105: Removing Air Filter from a Supervisor Card



What to Do Next

Dispose the air filter according to local safety and compliance guidelines.

Installing the Air Filter on a Card

Note Attach an ESD-preventive wrist strap to your wrist and connect its end to the grounding lug that is connected to the chassis.

Before You Begin

Required Tools and Equipment

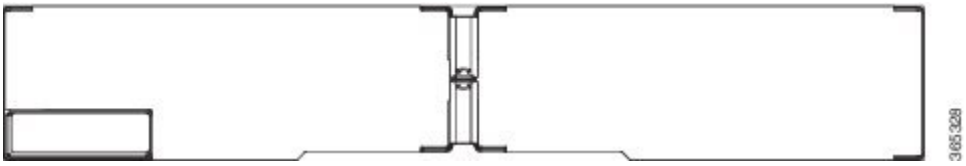
- Air filter for the RF line card (PID—CBR-LC-FILTER and CBR-LC-FILTER=)

- Air filter for the Supervisor card (PID—CBR-SUP-FILTER and CBR-SUP-FILTER=)
- ESD-preventive Wrist Strap

Step 1 Hold the air filter with the orientation as shown below during installation.

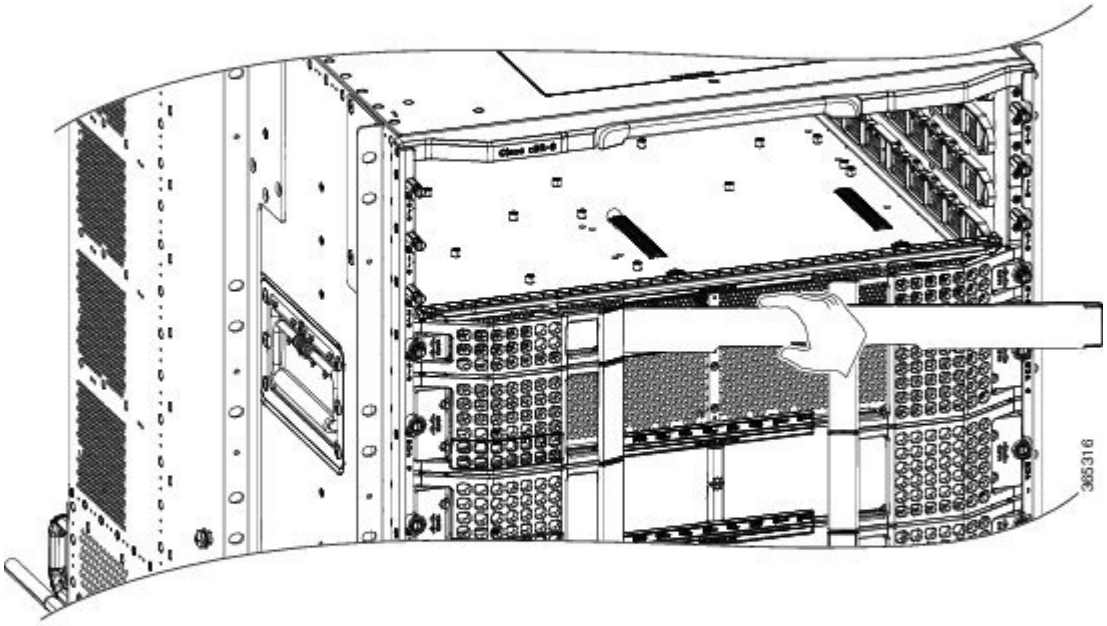
Figure 106: Air Filter for the RF Line Card Orientation

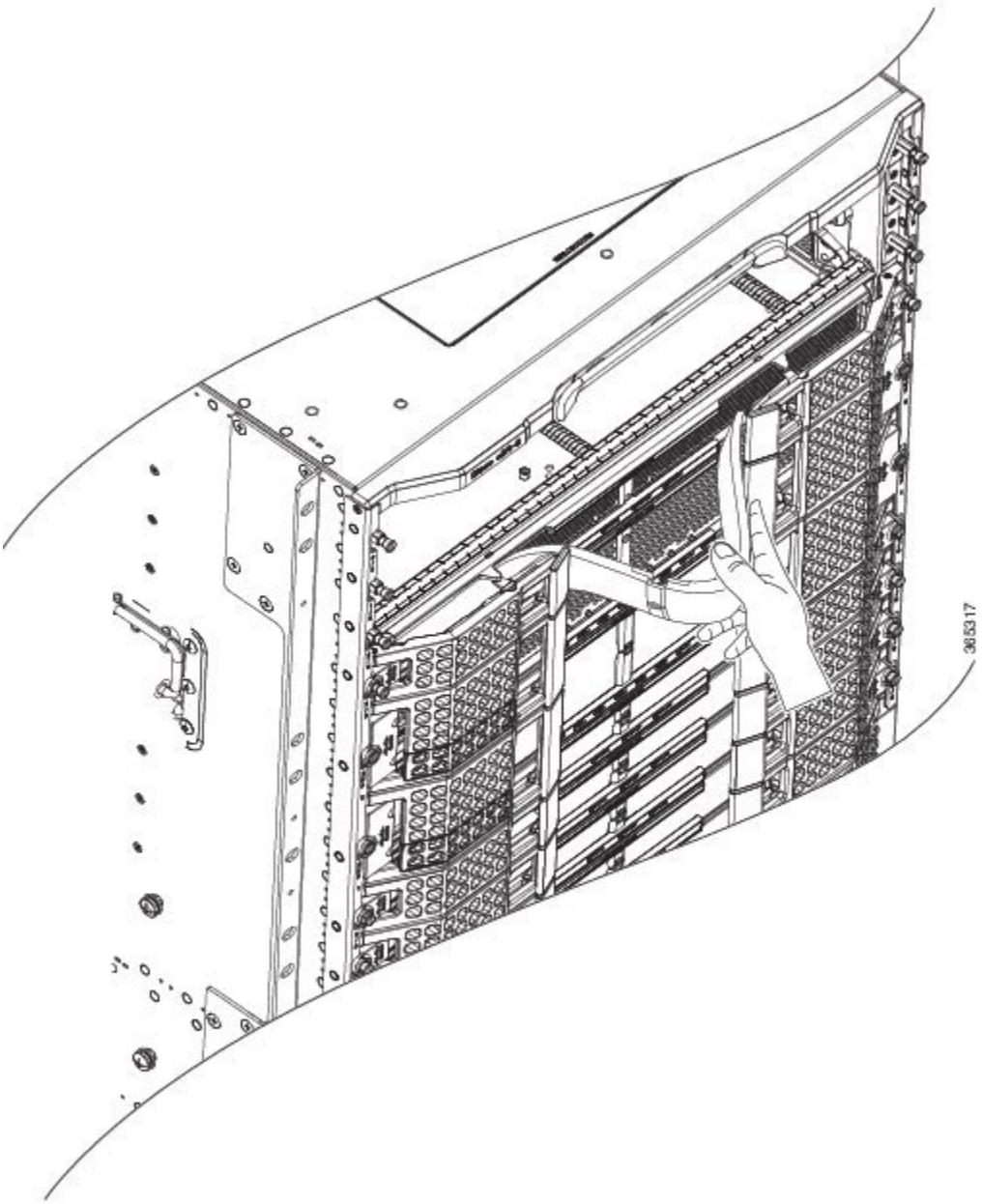
Figure 107: Air Filter for the Supervisor Card Orientation

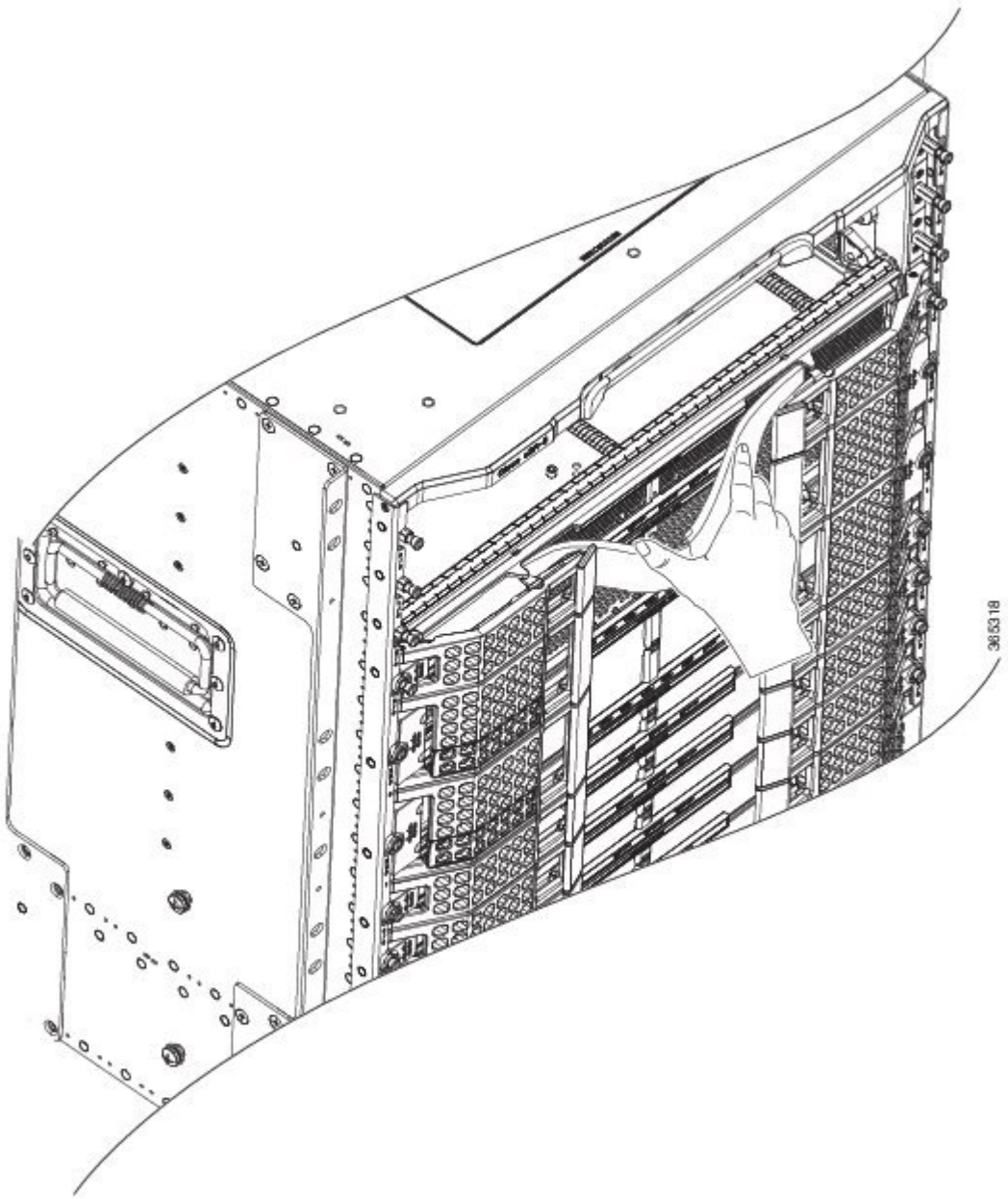


Step 2 Insert one end of the air filter at an angle under the ejector handle and slide it under the bezel filter guide rail on the card faceplate.

Figure 108: Inserting the Air Filter in the RF Line Card




365317


365318

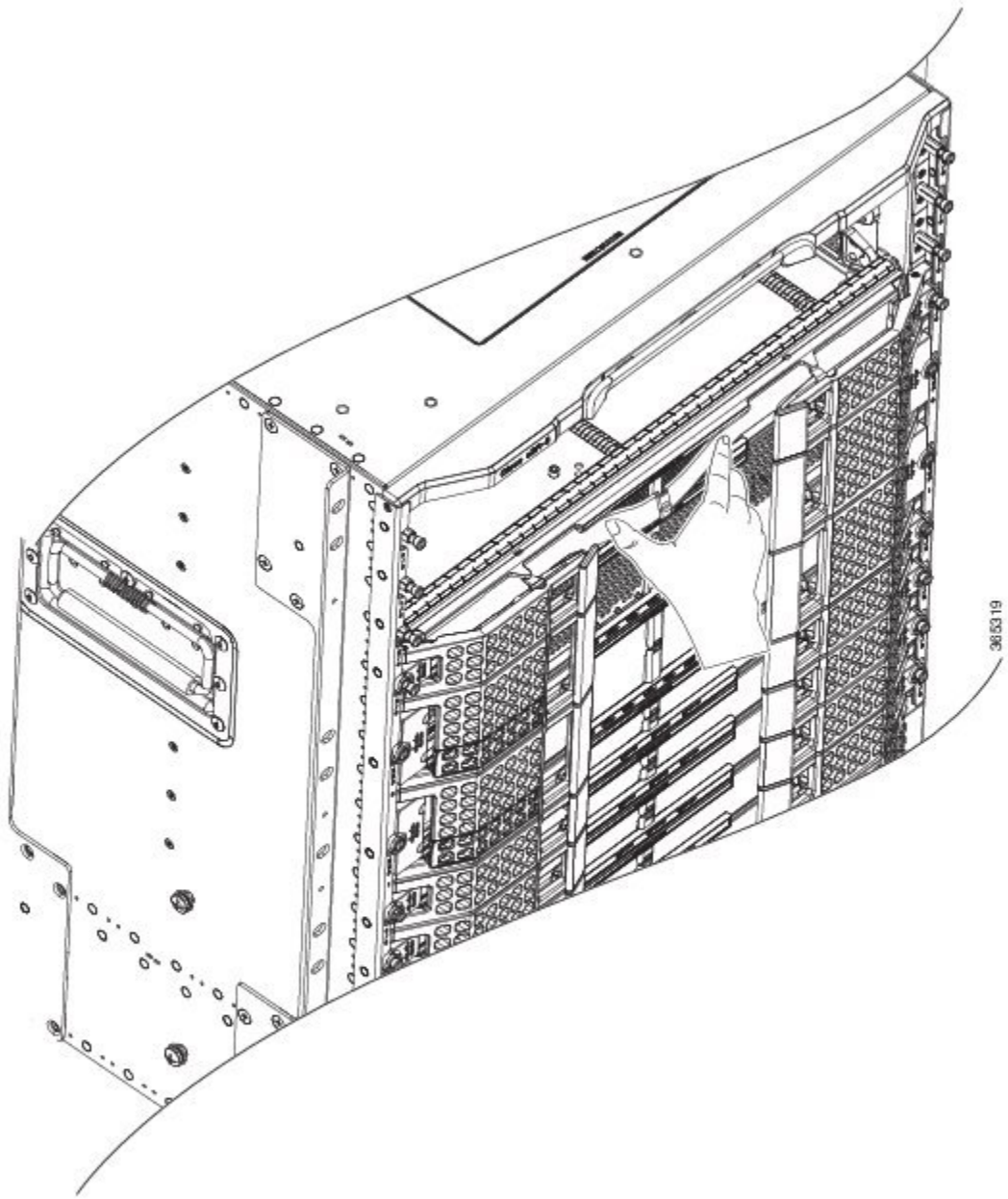
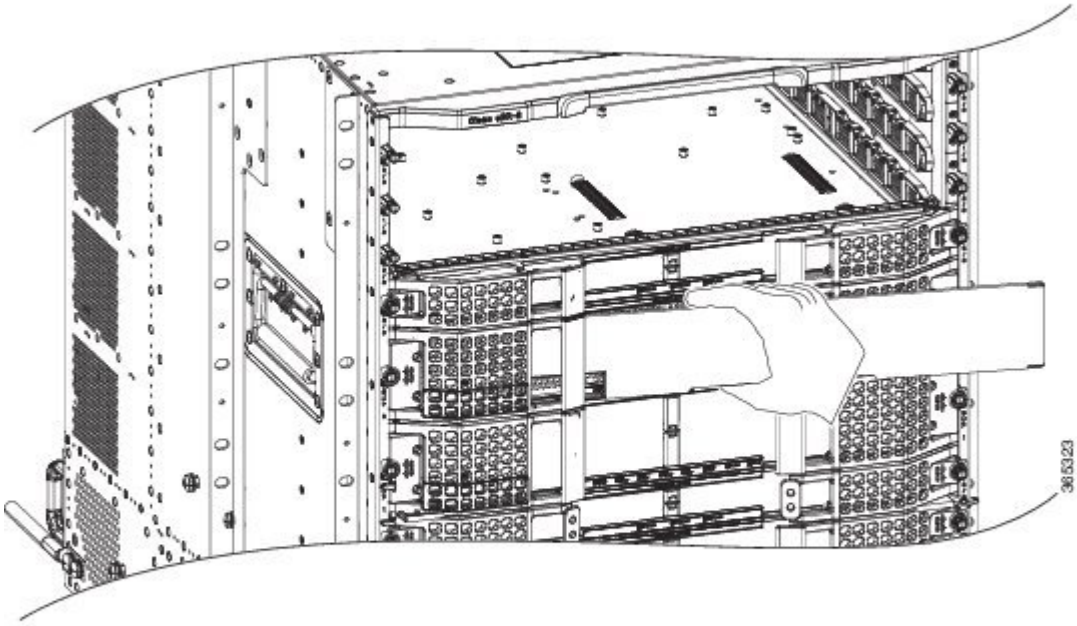
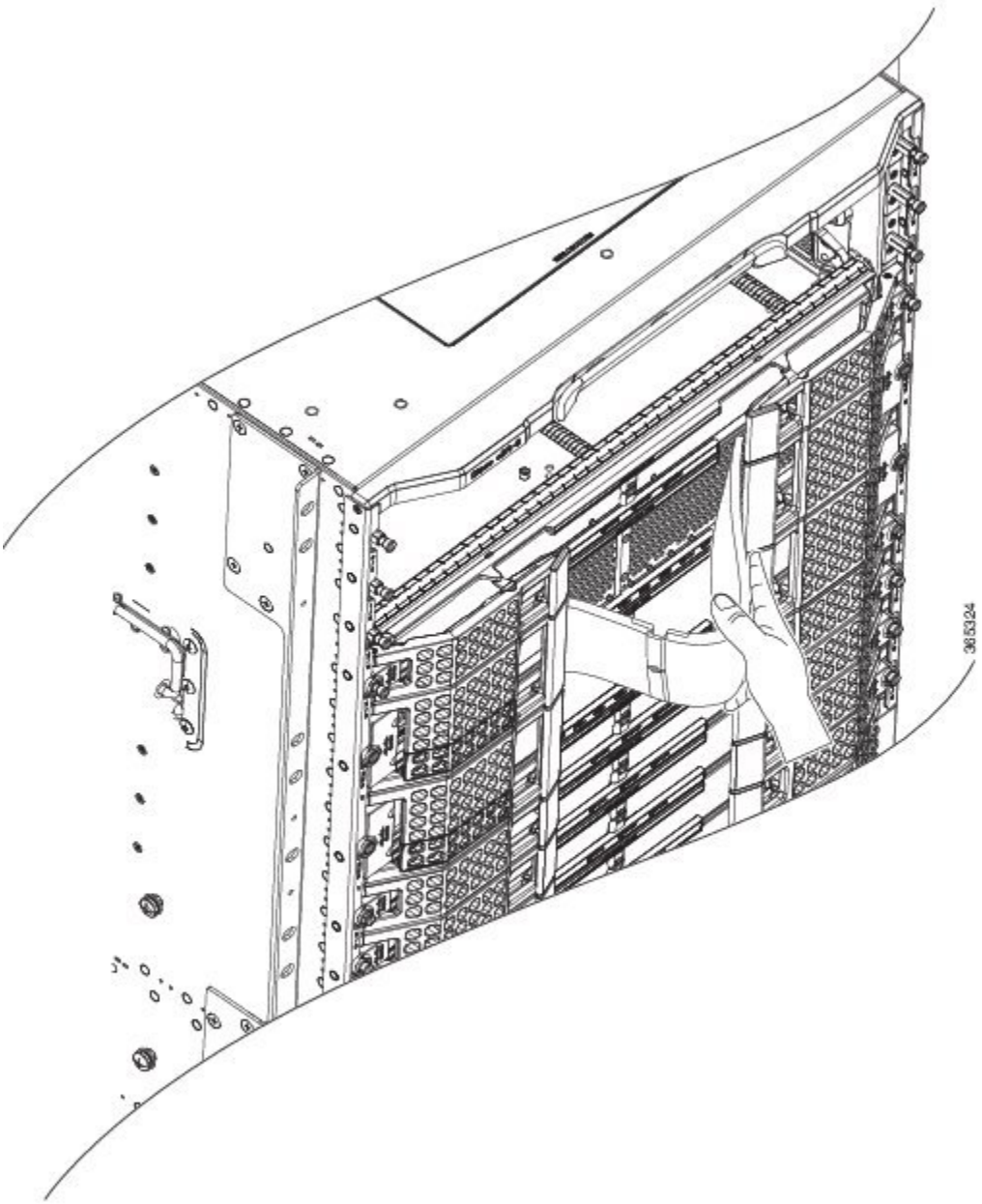
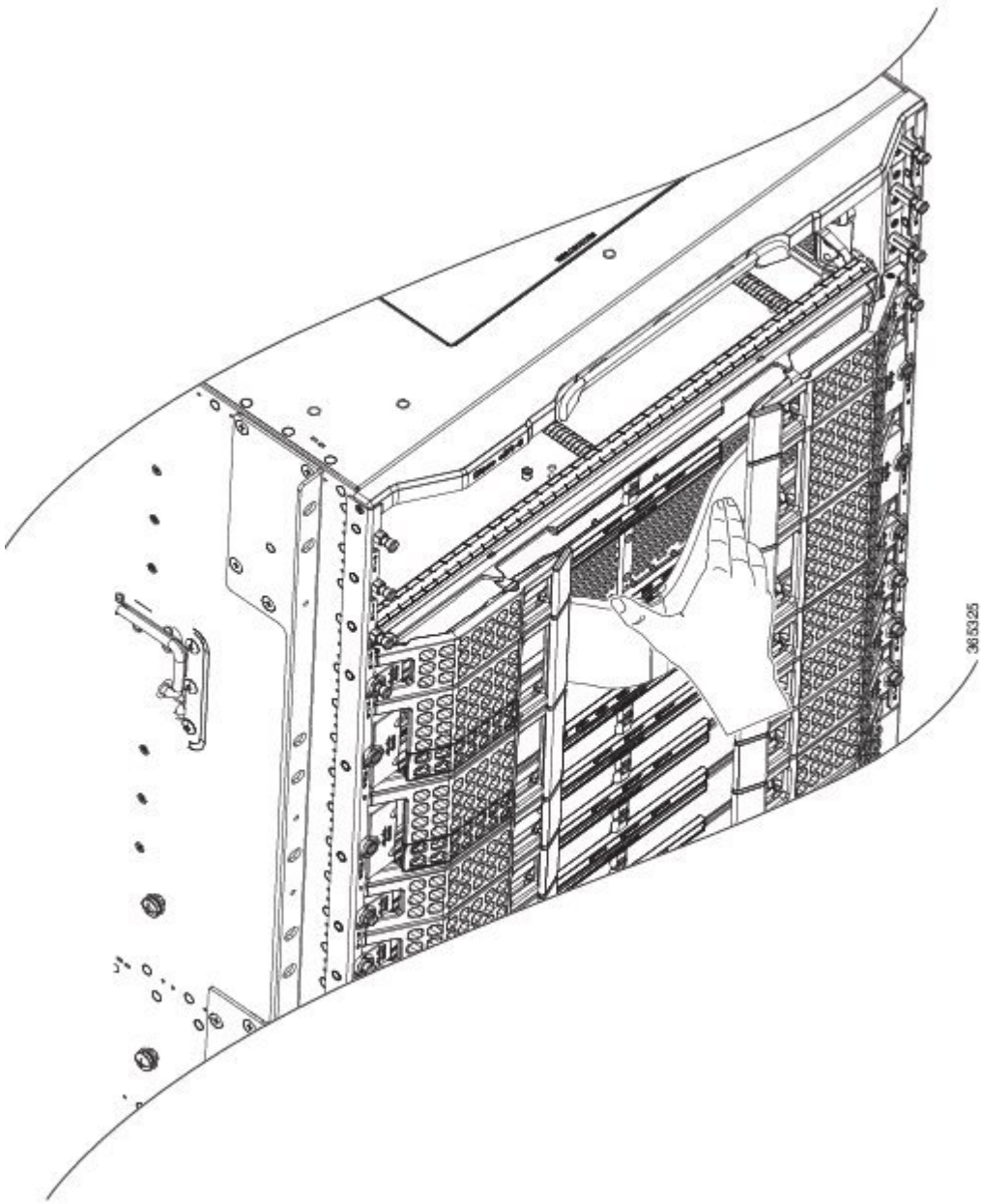
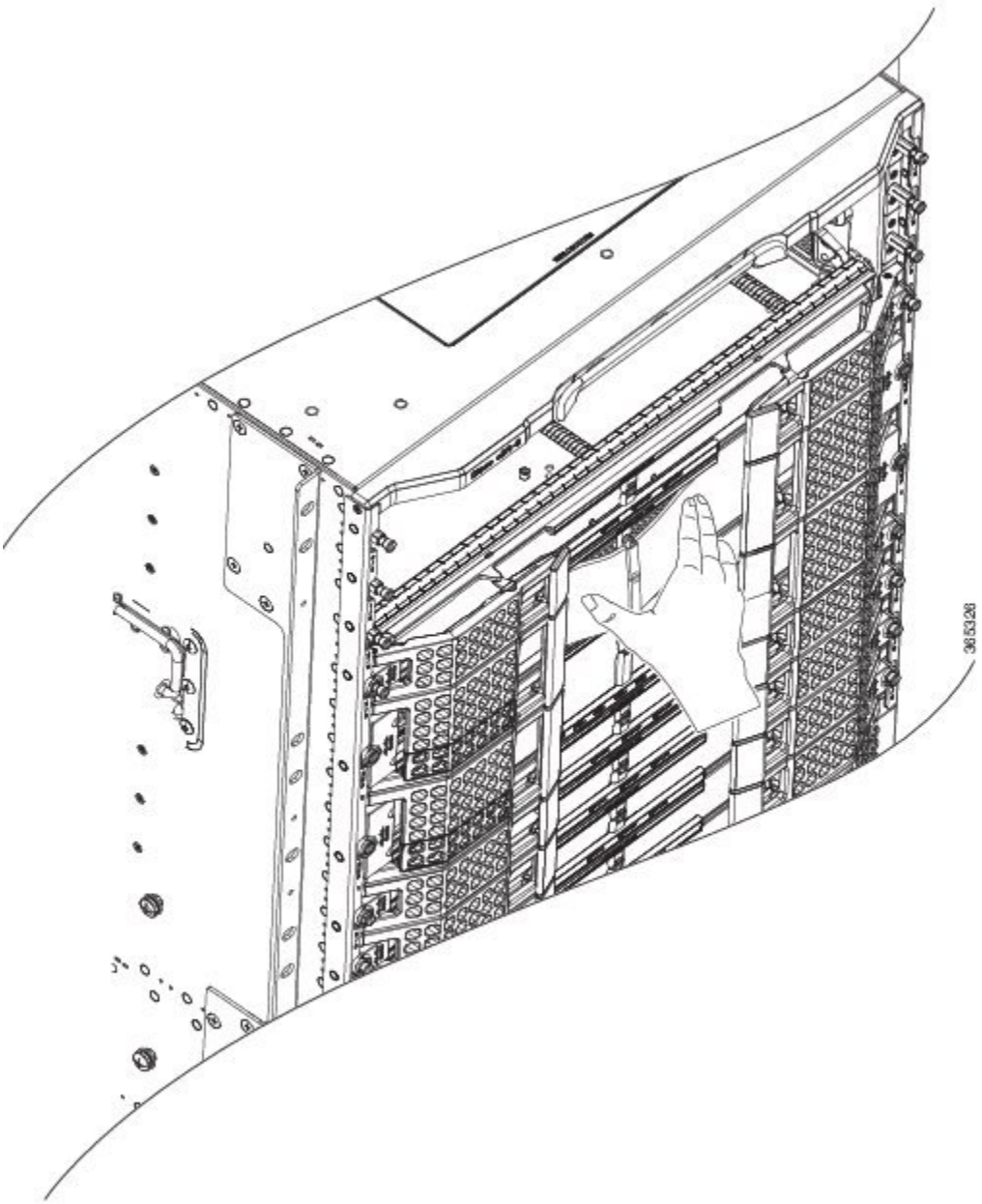


Figure 109: Inserting the Air Filter in the Supervisor Card


365323


365324


365325



Repeat this for the other end of the air filter.

Step 3 Using your finger, pinch the handle at the middle of the air filter to insert the bottom and top edges of the air filter into the card faceplate rail.

Figure 110: Seating the Air Filter in the RF Line Card

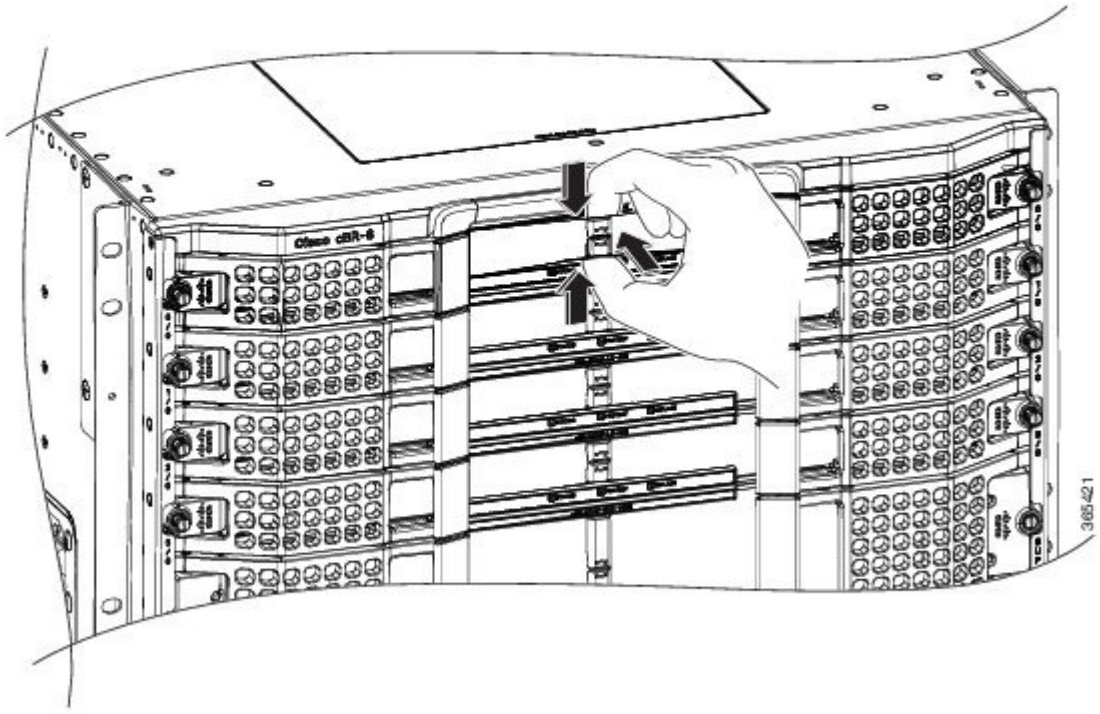
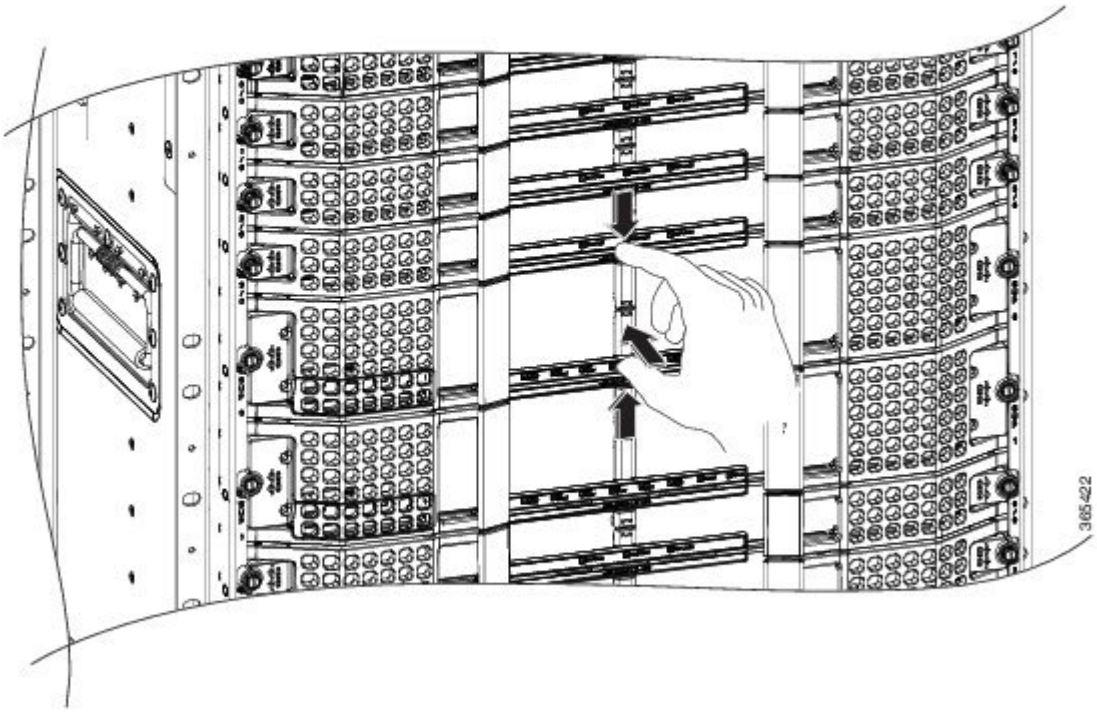


Figure 111: Seating the Air Filter in the Supervisor Card

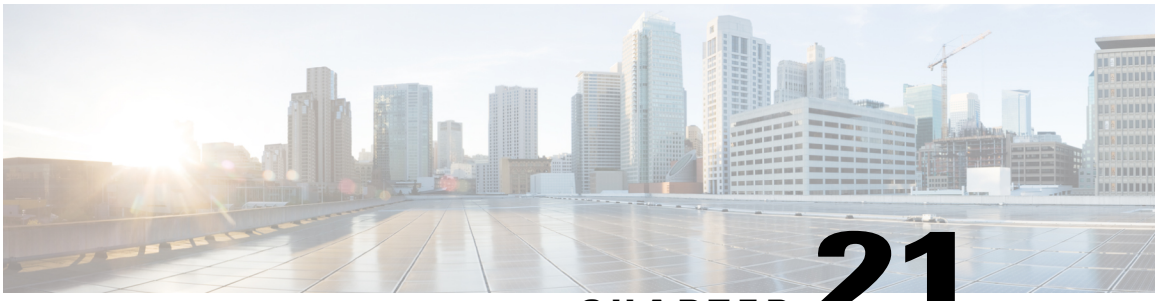


Step 4 Tuck the air filter behind the LED panel. Visually check whether the air filter is seated behind the bezel guide rails.

Step 5 Press the handle on the air filter flat to seat it correctly.

What to Do Next

- One or both ejectors may snap past their retention stops during the procedure, snap the ejectors past the stops to restore them to their original positions.
- After installing the Supervisor air filter, check whether the front console ports behind the ejector levers are accessible. If the air filter is installed upside down, the ports would be covered.



CHAPTER 21

Online Insertion and Removal of Cards on the Cisco cBR

- About OIR, page 217
- What Does an OIR Do?, page 218
- Guidelines for Performing an OIR, page 218
- OIR on Cisco cBR, page 218
- How Do I Perform an OIR?, page 219
- Verifying Status after an OIR, page 219

About OIR

Online Insertion and Removal (OIR) was developed to enable you to replace faulty parts without affecting system operation. When a card is inserted, power is available on the card, and it initializes itself to start working.

Hot swap functionality allows the system to determine when a change occurs in the unit's physical configuration, and reallocate the unit's resources to allow all interfaces to function adequately. This feature allows interfaces on the card to be reconfigured while other interfaces on the router remain unchanged. The interrupt routine must ensure that the interrupt line has reached a stable state.

The software performs the necessary tasks involved in handling the removal and insertion of the card. A hardware interrupt is sent to the software subsystem when a hardware change is detected, and the software reconfigures the system:

- When a card is inserted, it is analyzed and initialized in such a way that the end user can configure it properly. The initialization routines used during OIR are the same as those called when the router is powered on. System resources, also handled by software, are allocated to the new interface.
- When a card is removed, the resources associated with the empty slot must either be freed or altered to indicate the change in its status.

What Does an OIR Do?

When an OIR is performed, the router:

1. Rapidly scans the backplane for configuration changes.
2. Initializes all newly inserted interfaces and places them in the administratively shut down state.
3. Brings all previously configured interfaces on the card back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shut down state.

The only effect on the routing tables is that routes through a removed interface are deleted, as are routes learned through that interface. The Address Resolution Protocol (ARP) cache is selectively flushed, and routing caches are completely flushed.

If a card is reinserted into the same slot from which it was removed, or if an identical card is inserted in its place, many of the control blocks from the previous installation are reused. This is necessary due to the implementation by Cisco IOS-XE software of certain control blocks, and has the benefit of saving the configuration from the previously installed card.

Guidelines for Performing an OIR

It is always safer to power down the router when you perform any hardware changes, but here are some recommendations if you need to perform an OIR. The system may indicate a hardware failure if you do not follow proper procedures.

- Insert only one card at a time; you must allow the system time to complete the preceding tasks before you remove or insert another interface processor. If you disrupt the sequence before the system completes its verification, it can cause the system to detect spurious hardware failures.
- Insert the cards swiftly and firmly, but do not shove them in.
- If present, be sure to use the little plastic levers on the side of the card to lock the card in.
- If the OIR is successful, there is absolutely no need to schedule a reload of the router.

If you get a LONGSTALL message after an OIR, or a CPUHOG during the OIR process, but encounter no other problems, you may safely ignore those messages.

OIR on Cisco cBR

OIR is supported on the following FRUs in a Cisco cBR Series Router:

- Supervisor Card
- Supervisor PIC
- Interface Card
- Interface PIC

How Do I Perform an OIR?

It is always safer to power down the router when you perform any hardware changes, but here are some recommendations if you need to perform an OIR. The system may indicate a hardware failure if you do not follow proper procedures.

- Insert only one card at a time; you must allow the system time to complete the preceding tasks before you remove or insert another interface processor. If you disrupt the sequence before the system completes its verification, it can cause the system to detect spurious hardware failures.
- Insert the cards swiftly and firmly, but do not shove them in.
- If present, be sure to use the little plastic levers on the side of the card to lock the card in.
- If the OIR is successful, there is absolutely no need to schedule a reload of the router.

Please refer to hardware installation guide to do any card insertion and removal.

Supervisor Card and Supervisor PIC support OIR without any software operation, but here are some recommendations if you need to perform OIR of Supervisor Card and Supervisor PIC:

- Check Active/Standby state of the Supervisor Card or Supervisor PIC, which will perform OIR, by executing the **show redundancy** command.
- Execute the **redundancy force-switchover** command if the location of the Supervisor Card or Supervisor PIC is on active slot.
- Perform OIR .

Verifying Status after an OIR

Execute the **show platform** command to check the status.

Before Removing the Line Card

```
Router#show platform
Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
7         CBR-CCAP-LC-40G     ok                    06:03:17
SUP0      CBR-CCAP-SUP-160G   inserted              06:25:13
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    06:23:08
P0        PWR-3KW-AC-V2       ok                    06:23:28
P1        PWR-3KW-AC-V2       ok                    06:23:28
P2        PWR-3KW-AC-V2       ok                    06:23:28
P3        PWR-3KW-AC-V2       ok                    06:23:28
P4        PWR-3KW-AC-V2       ok                    06:23:28
P5        PWR-3KW-AC-V2       ok                    06:23:28
P11       CBR-FAN-ASSEMBLY    ok                    06:23:28
P11       CBR-FAN-ASSEMBLY    ok                    06:23:28
P12       CBR-FAN-ASSEMBLY    ok                    06:23:28
P13       CBR-FAN-ASSEMBLY    ok                    06:23:28
P14       CBR-FAN-ASSEMBLY    ok                    06:23:28
```

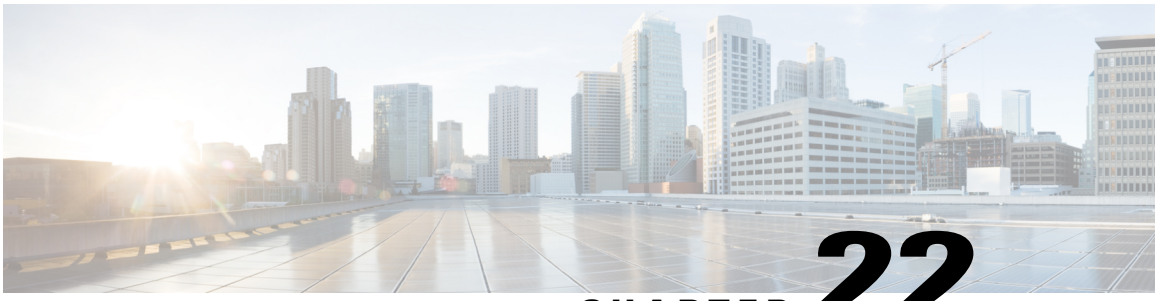
After Removing the Line Card

```
Router#show platform
Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
SUP0      CBR-CCAP-SUP-160G   inserted              06:35:13
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    06:33:08
P0        PWR-3KW-AC-V2       ok                    06:33:28
P1        PWR-3KW-AC-V2       ok                    06:33:28
P2        PWR-3KW-AC-V2       ok                    06:33:28
P3        PWR-3KW-AC-V2       ok                    06:33:28
P4        PWR-3KW-AC-V2       ok                    06:33:28
P5        PWR-3KW-AC-V2       ok                    06:33:28
P11       CBR-FAN-ASSEMBLY    ok                    06:33:28
P11       CBR-FAN-ASSEMBLY    ok                    06:33:28
P12       CBR-FAN-ASSEMBLY    ok                    06:33:28
P13       CBR-FAN-ASSEMBLY    ok                    06:33:28
P14       CBR-FAN-ASSEMBLY    ok                    06:33:28
```

After Inserting the Line Card

```
Router#show platform
Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
7         CBR-CCAP-LC-40G     booting               00:00:35
SUP0      CBR-CCAP-SUP-160G   inserted              06:45:13
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    06:43:08
P0        PWR-3KW-AC-V2       ok                    06:43:28
P1        PWR-3KW-AC-V2       ok                    06:43:28
P2        PWR-3KW-AC-V2       ok                    06:43:28
P3        PWR-3KW-AC-V2       ok                    06:43:28
P4        PWR-3KW-AC-V2       ok                    06:43:28
P5        PWR-3KW-AC-V2       ok                    06:43:28
P11       CBR-FAN-ASSEMBLY    ok                    06:43:28
P11       CBR-FAN-ASSEMBLY    ok                    06:43:28
P12       CBR-FAN-ASSEMBLY    ok                    06:43:28
P13       CBR-FAN-ASSEMBLY    ok                    06:43:28
P14       CBR-FAN-ASSEMBLY    ok                    06:43:28


Router#show platform
Chassis type: CBR-8-CCAP-CHASS

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
7         CBR-CCAP-LC-40G     ok                    00:03:35
SUP0      CBR-CCAP-SUP-160G   inserted              06:25:13
 R0                           ok, active
 F0                           ok, active
 4                            ok, active
 4/1      CBR-SUP-8X10G-PIC   ok                    06:46:08
P0        PWR-3KW-AC-V2       ok                    06:46:28
P1        PWR-3KW-AC-V2       ok                    06:46:28
P2        PWR-3KW-AC-V2       ok                    06:46:28
P3        PWR-3KW-AC-V2       ok                    06:46:28
P4        PWR-3KW-AC-V2       ok                    06:46:28
P5        PWR-3KW-AC-V2       ok                    06:46:28
P11       CBR-FAN-ASSEMBLY    ok                    06:46:28
P11       CBR-FAN-ASSEMBLY    ok                    06:46:28
P12       CBR-FAN-ASSEMBLY    ok                    06:46:28
```

```
P13         CBR-FAN-ASSEMBLY    ok                  06:46:28
P14         CBR-FAN-ASSEMBLY    ok                  06:46:28
```



CHAPTER 22

Upgrading the Programmable Hardware Devices in the Cisco cBR

- Overview of Firmware Images and Packages, page 223
- Programmable Hardware Devices in the Cisco cBR, page 228
- Bundled FPGA Images, page 228
- Field-Programmable Devices, page 230
- HW-Programmable Upgrades, page 233
- Verifying the Firmware Versions after the Upgrade, page 254

Overview of Firmware Images and Packages

With the Cisco cBR Series Routers, the Cisco IOS-XE image comes with the bundled firmware images and packages. In case of a firmware incompatibility, an error message is displayed notifying that an upgrade to a compatible firmware is required.

You can view the current firmware images and packages on your router, using the methods outlined in the following sections.

Displaying Current and Minimum Required FPD Image Versions

To display the current version of FPD images on the FRUs installed on your router, use the **show hw-module** [*slot*/*subslot* | **all**] **fpd** command, where *slot* is the slot number where the FRU is installed, and *subslot* is the number of the FRU subslot where a target FRU is located. Entering the all keyword shows information for hardware in all router slots.

The following examples show the output when using this **show** command. The output display in this example shows that FPD versions on the FRUs in the system meet the minimum requirements:

```
Router# show hw-module all fpd
==== ===================== ====== ==========================================
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
==== ===================== ====== ================== =========== ==============
0/1 CBR-RF-PROT-PIC 0.0 35-CBR STEALTHSTAR 7.14 7.13
```

```
---- ---------------------- ------ ------------------ ----------- --------------
2/1 CBR-RF-PROT-PIC 3.0 35-CBR STEALTHSTAR 5.0 7.13 *
---- ---------------------- ------ ------------------ ----------- --------------
3/1 CBR-RF-PIC 0.0 34-CBR RFSW PIC 6.2 7.35 *
---- ---------------------- ------ ------------------ ----------- --------------
4/1 CBR-SUP-8X10G-PIC 2.4 36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
5/1 CBR-SUP-8X10G-PIC 3.0 36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
6/1 CBR-RF-PIC 3.0 34-CBR RFSW PIC 5.0 7.35 *
==== ====================== ====== ============================================
```

This example shows the output when using the *slot*/*subslot* argument to identify a particular FRU:

```
Router# show hw-module subslot 0/1 fpd

==== ====================== ====== ============================================
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
==== ====================== ====== ================== =========== ==============
0/1 CBR-RF-PROT-PIC 0.0 35-CBR STEALTHSTAR 7.14 7.13
==== ====================== ====== ============================================
```

The output display in this example shows that the FRU in subslot 0/1 is disabled because one of the programmable devices does not meet the minimum version requirements.

```
Router#show hw-module all fpd

==== ====================== ====== ============================================
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
==== ====================== ====== ================== =========== ==============
0/1 CBR-RF-PROT-PIC 0.0 35-CBR STEALTHSTAR 7.14 7.13
---- ---------------------- ------ ------------------ ----------- --------------
2/1 CBR-RF-PROT-PIC 3.0 35-CBR STEALTHSTAR 5.0 7.13 *
---- ---------------------- ------ ------------------ ----------- --------------
3/1 CBR-RF-PIC 0.0 34-CBR RFSW PIC 6.2 7.35 *
---- ---------------------- ------ ------------------ ----------- --------------
4/1 CBR-SUP-8X10G-PIC 2.4 36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
5/1 CBR-SUP-8X10G-PIC 3.0 36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
6/1 CBR-RF-PIC 3.0 34-CBR RFSW PIC 5.0 7.35 *
==== ====================== ====== ============================================
NOTES:
- FPD images that are required to be upgraded are indicated with a '*'
character in the "Minimal Required Version" field.
```

Displaying Information About the Default FPD Image Package

You can use the **show upgrade fpd package default** command to find out which FRUs are supported with your current Cisco IOS-XE release and which FPD image package you need for an upgrade.

```
Router# show upgrade fpd package default

Load for five secs: 2%/0%; one minute: 3%; five minutes: 4%
Time source is NTP, 16:09:07.658 PDT Tue Jul 28 2015


********************************************************************************
This Cisco IOS software image requires the following default FPD Image
Package for the automatic upgrade of FPD images (the package is available
from Cisco.com and is accessible from the Cisco Software Center page where
this IOS software image can be downloaded):
********************************************************************************

Version: 15.5(3)S
```

```
Package Filename: cbr-fpd-bundle.pkg

List of card type supported in this package:

Minimal
No. Card Type HW Ver.
---- ---------------------------------------- -------
1) RF Switch PIC 0.0
2) RF Switch PIC 0.0
3) 8x10GE Supervisor PIC 0.0
---- ---------------------------------------- -------
```

Displaying All Firmware on the Router

Use the **show platform diag** command to view all firmware available on the router.

```
Router#show platform diag
Chassis type: CBR-8-CCAP-CHASS

Pic: 0/1, CBR-RF-PROT-PIC
Internal state : inserted
Physical insert detect time : 00:03:27 (00:15:07 ago)
Firmware version: : 0000070E

Slot: 2, CBR-CCAP-LC-40G
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:41 (00:16:53 ago)
Software declared up time : 00:05:04 (00:13:30 ago)
CPLD version : 0000001C
Rommon version : 2011.03.12
Basestar version : 00110002
Raider version : 01010006
Caprica version : 00000017
PSOC 0 version : v3.0
PSOC 1 version : v3.0

Pic: 2/1, CBR-RF-PROT-PIC
Internal state : inserted
Physical insert detect time : 00:03:28 (00:15:06 ago)
Firmware version: : 00000500

Slot: 3, CBR-CCAP-LC-40G
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:41 (00:16:53 ago)
Software declared up time : 00:05:03 (00:13:31 ago)
CPLD version : 0000001C
Rommon version : 2011.03.12
Basestar version : 00110002
Raider version : 01010006
Caprica version : 00000017
PSOC 0 version : v4.2
PSOC 1 version : v4.2

Pic: 3/1, CBR-RF-PIC
Internal state : inserted
Physical insert detect time : 00:03:29 (00:15:05 ago)
Firmware version: : 00000602

Slot: 6, CBR-CCAP-LC-40G
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:41 (00:16:53 ago)
```

```
Software declared up time : 00:05:02 (00:13:31 ago)
CPLD version : 0000001C
Rommon version : 2011.03.12
Basestar version : 00110002
Raider version : 01010006
Caprica version : 00000017
PSOC 0 version : v4.2
PSOC 1 version : v4.2

Pic: 6/1, CBR-RF-PIC
Internal state : inserted
Physical insert detect time : 00:03:30 (00:15:04 ago)
Firmware version: : 00000500

Slot: SUP0, CBR-CCAP-SUP-160G
Physical insert detect time : 00:01:41 (00:16:53 ago)
CPLD version : 14121111
ViperSO CPLD version : 13032701
ViperSIO CPLD version : 14010901
Rommon version : 15.5(2r)S
Blackbird version : 00000112
Raptor ESI version : 00010035
Raptor MAC version : 0001002D
SUP-PIC CPLD version : 14071504
SUP-DC CPLD version : ffffffff
DTI Client FPGA version : 00000005
DTI Firmware version : 00000A03
Cortina PHY version : 201402061607
SUP PSOC 0 version : v4.0.8
SUP PSOC 1 version : v4.0.8
SUP PSOC 2 version : v4.0.9_IVY
SUP PSOC 3 version : v4.0.6
SUP-DC PSOC 0 version : N/A
SUP-DC PSOC 1 version : N/A
SUP-PIC PSOC 0 version : V2.0.5
SUP-PIC PSOC 1 version : V2.0.5

Slot: R0, CBR-CCAP-SUP-160G
Running state : ok, active
Internal state : online
Internal operational state : ok
Software declared up time : 00:01:41 (00:16:53 ago)

Slot: F0, CBR-CCAP-SUP-160G
Running state : ok, active
Internal state : online
Internal operational state : ok
Software declared up time : 00:03:22 (00:15:12 ago)
Hardware ready signal time : 00:00:00 (never ago)
Packet ready signal time : 00:03:41 (00:14:53 ago)

Slot: 4, CBR-CCAP-SUP-160G
Running state : ok
Internal state : online
Internal operational state : ok
Software declared up time : 00:03:27 (00:15:07 ago)

Pic: 4/1, CBR-SUP-8X10G-PIC
Internal state : inserted
Physical insert detect time : 00:03:31 (00:15:03 ago)

Slot: SUP1, CBR-CCAP-SUP-160G
Physical insert detect time : 00:01:47 (00:16:47 ago)
CPLD version : 14121111
ViperSO CPLD version : 13080901
ViperSIO CPLD version : 14050801
Rommon version : 15.5(2r)S
Blackbird version : 00000112
Raptor ESI version : 00010035
Raptor MAC version : 0001002D
SUP-PIC CPLD version : 14071504
SUP-DC CPLD version : ffffffff
DTI Client FPGA version : 00000005
```

```
DTI Firmware version : 00000A03
Cortina PHY version : 201402061607
SUP PSOC 0 version : v4.0.8
SUP PSOC 1 version : v4.0.8
SUP PSOC 2 version : v4.0.9_IVY
SUP PSOC 3 version : v4.0.6
SUP-DC PSOC 0 version : N/A
SUP-DC PSOC 1 version : N/A
SUP-PIC PSOC 0 version : V2.0.5
SUP-PIC PSOC 1 version : V2.0.5

Slot: R1, CBR-CCAP-SUP-160G
Running state : ok, standby
Internal state : online
Internal operational state : ok
Software declared up time : 00:01:47 (00:16:47 ago)

Slot: F1, CBR-CCAP-SUP-160G
Running state : ok, standby
Internal state : online
Internal operational state : ok
Software declared up time : 00:05:07 (00:13:26 ago)
Hardware ready signal time : 00:00:00 (never ago)
Packet ready signal time : 00:05:28 (00:13:05 ago)

Slot: 5, CBR-CCAP-SUP-160G
Running state : ok
Internal state : online
Internal operational state : ok
Software declared up time : 00:05:12 (00:13:22 ago)

Pic: 5/1, CBR-SUP-8X10G-PIC
Internal state : inserted
Physical insert detect time : 00:03:32 (00:15:02 ago)

Slot: P0, PWR-3KW-AC-V2
State : ok
Physical insert detect time : 00:03:27 (00:15:07 ago)

Slot: P1, PWR-3KW-AC-V2
State : ok
Physical insert detect time : 00:03:27 (00:15:07 ago)

Slot: P2, PWR-3KW-AC-V2
State : ok
Physical insert detect time : 00:03:27 (00:15:07 ago)

Slot: P3, Unknown
State : ps, fail
Physical insert detect time : 00:00:00 (never ago)

Slot: P4, Unknown
State : ps, fail
Physical insert detect time : 00:00:00 (never ago)

Slot: P5, Unknown
State : ps, fail
Physical insert detect time : 00:00:00 (never ago)

Slot: P10, CBR-FAN-ASSEMBLY
State : ok
Physical insert detect time : 00:03:37 (00:14:57 ago)
Firmware version : CBR-FAN FW 1.4

Slot: P11, CBR-FAN-ASSEMBLY
State : ok
Physical insert detect time : 00:03:37 (00:14:56 ago)
Firmware version : CBR-FAN FW 1.4

Slot: P12, CBR-FAN-ASSEMBLY
State : ok
Physical insert detect time : 00:03:37 (00:14:57 ago)
Firmware version : CBR-FAN FW 1.4
```

```
Slot: P13, CBR-FAN-ASSEMBLY
State : ok
Physical insert detect time : 00:03:37 (00:14:57 ago)
Firmware version : CBR-FAN FW 1.4

Slot: P14, CBR-FAN-ASSEMBLY
State : ok
Physical insert detect time : 00:03:37 (00:14:57 ago)
Firmware version : CBR-FAN FW 1.4
```

Programmable Hardware Devices in the Cisco cBR

The Cisco cBR-8 Series router has programmable hardware devices that are run by firmware that require upgrades to deploy new features and functions. The following are the two types of programmable hardware devices on the Cisco cBR-8.

- Field-Prgrammable Devices (FPD)—The components on the Supervisor card, the RF Through PIC, the RF Protect PIC, and the Supervisor PIC are examples of FPDs.
- HW-Programmable Devices—The ROM Monitor, the Fan Programmable System-on-Chip (PSoC), the line card firmware, the line card PSoC and the Supervisor complex programmable logic device (CPLD) are examples of the HW-Programmable devices

Firmware Upgrades for the Cisco cBR

The following three types of firmware upgrades are available for the Cisco cBR-8 Series router:

- Field Programmable Gate Array (FPGA) images bundled into the Cisco IOS-XE software image, like certain Supervisor and LC components.
- FPD images packages that are upgraded separately or with the Cisco IOS-XE software image upgrade, like the PIC images.
- HW-Programmable device upgrades that include ROM Monitor (ROMMON) upgrades, Universal Boot (U-boot) upgrades, PSoC and CPLD upgrades.

Link to Download the Latest Packages

Select and download the latest firmware packages from the following URL:

Firmware Image download

Bundled FPGA Images

The Field-Programmable Gate Array (FPGA) images are bundled in the Cisco IOS-XE software image. These FPGA images are automatically installed when the Cisco IOS-XE software image is upgraded.

Two methods may be used to upgrade the Cisco IOS-XE software image, as outlined in the following sections.

Upgrading Your Cisco IOS-XE Release and FPD Image

To upgrade your Cisco IOS-XE release and your FPD image, do the following steps:

Step 1 Download the package for the Cisco IOS-XE release that you are upgrading to. The package contains both the Cisco IOS-XE image and the FPD image.

Step 2 Boot the new version of Cisco IOS-XE. When the new version of Cisco IOS-XE boots, search for the bundled FPD image. The FPD images will be updated automatically as part of the Cisco IOS-XE boot process.

Step 3 When the router has booted, verify the upgrade was successful by entering the **show hw-module all fpd** command. The time for updating the FPGA can be read in the log messages. The following is a sample for the log message:

```
#show hw-module all fpd
==== ====================== ======       ===============================================
H/W  Field Programmable     Current Min. Required Slot Card Type Ver. Device: "ID-Name" Version
Version
==== ====================== ======       ================= =========== ==============
3/1  CBR-RF-PIC             0.0          34-CBR RFSW PIC 7.35 7.35
---- ---------------------- ------ ------------------ ----------- --------------
4/1  CBR-SUP-8X10G-PIC      2.4          36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
5/1  CBR-SUP-8X10G-PIC      3.0          36-CBR SUP PIC 0.130 0.130
---- ---------------------- ------ ------------------ ----------- --------------
7/1  CBR-RF-PROT-PIC        0.0          35-CBR STEALTHSTAR 7.13 7.29 *
==== ====================== ====== ===============================================
NOTES: FPD images that are required to be upgraded are indicated with a '*' character in the "Minimal
 Required Version" field.
```

Upgrading Only Your Cisco IOS-XE Release and Retaining Your Current FPD Image

You may choose to upgrade your Cisco IOS-XE release with or without retaining your current FPD image.

Note You may choose to upgrade your Cisco IOS-XE image and retain your current FPD image, although this is not recommended.

Step 1 Use the **no upgrade fpd auto** command to disable the bundled FPD image.
Note The automatic upgrade feature is disabled once you enter the **no upgrade fpd auto** command.

Step 2 Save the configuration before loading the new image.

Step 3 Load the new image.
Note If your current FPD image is not compatible with the new image, the FRUs do not come online.

Field-Programmable Devices

Field-programmable devices (FPDs) are hardware devices implemented on router cards that support separate upgrades.

FPD Upgrade

If you retained the current FPD images and only upgraded the Cisco IOS-XE software image, then use the procedures described in this section to upgrade the FPD images.

These instructions are not always feasible for operating network environments. If these methods of upgrade are not suitable for your situation, see other sections of this document for other methods of upgrading FPDs.

Upgrading FPD Images in a Production System

Adding a FRU to a production system presents the possibility that the FRU may contain versions of FPD images that are incompatible with the Cisco IOS-XE release currently running the router. In addition, the FPD upgrade operation can be a very CPU-intensive operation and therefore the upgrade operation may take more time when it is performed on a production system. The performance impact will vary depending on various factors, including network traffic load, the type of processing engine used, type of FRU, and the type of service configured.

For these reasons, we recommend that one of the following alternatives be used to perform the FPD upgrade on a production system if possible:

Verifying System Compatibility First

If a spare system is not available to perform an upgrade, you can check for system compatibility by disabling the automatic upgrade feature before inserting the FRU.

- If the FPD images on the FRU are compatible with the system, you will only need to re-enable the automatic upgrade feature (the automatic upgrade feature can be re-enabled using the **upgrade fpd auto** command).
- If the FPD images on the FRU are not compatible with the system, the FRU is disabled but will not impact system performance by attempting to perform an automatic upgrade.

Use the following procedure to check the FPD images on the FRU for system compatibility:

Step 1 Disable the automatic upgrade feature using the **no upgrade fpd auto** global configuration command.

Step 2 Insert the FRU into the system.
If the FPD images are compatible, the FRU will operate successfully after bootup.

If the FPD images are not compatible, the FRU is disabled. At this point we recommend that you wait for a scheduled maintenance when the system is offline to manually perform the FPD upgrade as described in the Manually Upgrading FRU FPD Images section.

Step 3 Re-enable the automatic upgrade feature using the **upgrade fpd auto** global configuration command.

Using a Nonproduction System to Upgrade the Cisco cBR Series Converged Broadband Routers FPD Image

Use the following procedure to perform an upgrade on a spare system:

Before You Begin

- The spare system is running the same version of the Cisco IOS-XE software release that the target production system is running.
- The automatic upgrade feature is enabled on the spare system. (The automatic upgrade feature is enabled by default. It can also be enabled using the **upgrade fpd auto** command).

Step 1 Insert the FRU into the spare system.
If an upgrade is required, the system will perform the necessary FPD image updates so that when this FRU is inserted to the target production system it will not trigger an FPD upgrade operation there.

Step 2 Verify the upgrade was successful by entering the **show hw-module all fpd** command.

Step 3 Remove the FRU from the spare system after the upgrade.

Step 4 Insert the FRU into the target production system.

Optional FPD Procedures

This section provides information for optional FPD-related functions. None of the topics discussed in this section are necessary for completing FPD upgrades, but may be useful in some FPD-related scenarios. It covers the following topics:

Manually Upgrading FRU FPD Images

To manually upgrade the current FPD version on a FRU, use the following command:

Router# **upgrade hw-module subslot** [*slot*/*subslot*] **fpd bundle** [**reload**]

In this example, *slot* is the slot where the FRU is installed, *subslot* is the subslot number where the FRU is located, **fpd** indicates the type of upgrade required, **bundle** selects the bundled FPD package, and **reload** specifies that the FRU is automatically reloaded after the upgrade. Note that **subslot** *slot*/*subslot* is used to specify a FRU FPD upgrade. The FRU will automatically be reloaded to complete the FPD upgrade.

Caution An image upgrade can require a long period of time to complete depending on the FRU.

Upgrading Multiple FPD Images

A single piece of hardware can contain multiple FPD images. The Cisco cBR Series Routers can upgrade up to three FPD images simultaneously. However, only one FPD upgrade per router slot can occur at a time, so all FPD images on all FRUs in a single slot will have to wait for another FPD upgrade to finish.

Note Some FPD images require the FRU to reload to complete. The FPD upgrade process will perform this step automatically, so users do not have to intervene. However, the other FPDs in the hardware of the specified slot will have to wait for this reload to complete before their upgrade process begins.

Note With a manual upgrade, you must include the reload option to cause the FRU to reload automatically.

During an automatic upgrade, the Cisco cBR Series Routers will upgrade as many FPDs as possible at a time. No user intervention is possible or necessary. The upgrade process will not stop until all FPD images have been updated.

During manual upgrades, it is important to note that users can only specify upgrades for a single piece of hardware each time the **upgrade hw-module subslot** [*slot*/*subslot*] command is entered. The maximum of three simultaneous upgrades applies to manual upgrades as well. If you individually specify multiple manual FPD upgrades, only three FPDs can be upgraded simultaneously and that can only occur when the hardware is in different router slots. The FPD upgrade process will stop when all FPDs for the specified hardware have been upgraded.

Verifying the FPD Image Upgrade Progress

You can use the **show upgrade fpd progress** command to view a snapshot of the upgrade progress while an FPD image upgrade is in progress. The following example shows the type of information this command displays:

```
Router# show upgrade fpd progress

FPD Image Upgrade Progress Table:

4/1 CBR-SUP-8X10G-PIC 36-CBR SUP PIC 00:10:00 00:00:06 Updating...
==== ================== ==================================================
0/1 CBR-RF-PROT-PIC 35-CBR STEALTHSTAR --:--:-- --:--:-- Waiting...
```

Troubleshooting Problems with FPD Image Upgrades

This section contains information to help troubleshoot problems that can occur during the upgrade process.

It contains the following topics:

Power Failure or Removal of a FRU During an FPD Image Upgrade

These instructions should only be used if a previous upgrade attempt has failed due to an external factor such as a power failure or a FRU removal.

If the FPD upgrade operation is interrupted by a power failure or the removal of a FRU, it could corrupt the FPD image. This corruption of the FPD image file makes the FRU unusable by the router and the system will display an error message.

The **show hw-module all fpd** command can be used to verify that the FRU is using a corrupted FPD image.

```
Router# show hw-module all fpd
 ==== ===================== ====== ==========================================
H/W Field Programmable Current Min. Required
Slot Card Type Ver. Device: "ID-Name" Version Version
==== ===================== ====== ================== =========== ==============
0/1 CBR-RF-PROT-PIC 0.0 35-CBR STEALTHSTAR 7.14 7.13
---- --------------------- ------ ------------------ ----------- --------------
2/1 CBR-RF-PROT-PIC 3.0 35-CBR STEALTHSTAR 5.0 7.13 *
---- --------------------- ------ ------------------ ----------- --------------
3/1 CBR-RF-PIC 0.0 34-CBR RFSW PIC 6.2 7.35 *
---- --------------------- ------ ------------------ ----------- --------------
4/1 CBR-SUP-8X10G-PIC 2.4 36-CBR SUP PIC 0.130 0.130
---- --------------------- ------ ------------------ ----------- --------------
5/1 CBR-SUP-8X10G-PIC 3.0 36-CBR SUP PIC 0.130 0.130
---- --------------------- ------ ------------------ ----------- --------------
6/1 CBR-RF-PIC 3.0 34-CBR RFSW PIC 5.0 7.35 *
==== ===================== ====== ==========================================
```

Performing an FPD Recovery Upgrade

The recovery upgrade procedure can only be performed on a FRU that has been powered off by the system after it has failed all of the retries attempted to initialize the FRU.

Note Because a recovery upgrade is done at a more conservative speed, it may take more than the estimated upgrade time.

Note Other factors can cause the system to ask “Do you want to perform the recovery upgrade operation?” Only answer y to this question if you have attempted an FPD upgrade that has failed due to a power failure or a FRU removal. If you are prompted for this question without having previously had a failed upgrade attempt for one of the aforementioned reasons, contact Cisco Technical Support.

Perform the manual FPD image upgrade method using the **upgrade hw-module subslot** command to recover from a corrupted image after the FRU has been powered off by the system.

HW-Programmable Upgrades

This section provides information for the HW-Programmable device upgrades.

Effective from Cisco IOS-XE Release 3.16.1S, an all-in-one firmware package is introduced for HW-Programmable device upgrades. Packages such as PSoC, Line Card Daggits, UBoot Images and viper are bundled together into the all-one-one package and released along with Cisco IOS-XE Release 3.16.1S.

Note The all-in-one package is applicable only for Cisco IOS-XE Release 3.16.1S.

Upgrading ROMMON

The Cisco cBR boots up with the ROM monitor (ROMMON). ROMMON upgrades are released periodically. When a ROMMON upgrade image is released, use the procedure outlined in this section to upgrade the ROMMON in the Cisco cBR.

Use the **showmon** command to display the current image running of ROMMON.

```
rommon  > showmon
Current image running (0/1): Boot ROM0
...
```

There are two Boot ROMs that need to be upgraded, Boot ROM0 which is the running Boot ROM on the active SUP and Boot ROM1 which is the Boot ROM1 on the standby SUP not running currently. This procedure upgrades both the Boot ROMs. During the upgrade process, the Boot ROM1 is upgraded first to ensure a reliable backup copy in case the upgrade procedure fails.

During the upgrade process, the IOS sets the ROMMON upgrade flag. At the end of the upgrade procedure, the router is reloaded. After reload, it is important to ensure that the same IOS-XE image (that is on the active SUP) is loaded. There are two possible scenarios:

1. AUTOBOOT is set for the IOS-XE image that should be loaded. In this case, the router reload process will automatically load the same IOS-XE image.
2. AUTOBOOT is not set. In this case load the same IOS-XE using step 6 of this procedure.

Step 1 Boot the image to IOS prompt.

Step 2 Download the ROMMON package from Cisco.com and copy it to bootflash or harddisk.

Step 3 Run the following command in IOS prompt:

`Router#` **upgrade rom-monitor** *filename bootflash:[package name]* **r0**

The IOS upgrades ROMMON and sets ROMMON Upgrade Flag.

Step 4 Run the following command if you have a standby supervisor:

`Router#` **upgrade rom-monitor** *filename bootflash:[package name]* **r1**
This example shows the output that is displayed after the **upgrade rom-monitor** command is used.

```
Router#upgrade rom-monitor filename
harddisk:cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.01.SPA.pkg r0

Upgrade rom-monitor

Target copying rom-monitor image file
131072+0 records in
131072+0 records out
Checking upgrade image...
4194304+0 records in
8192+0 records out
Upgrade image MD5 signature is c4469e1cc016d36b6109252e6565514e
```

```
Burning upgrade partition...
4194304+0 records in
4194304+0 records out
Checking upgrade partition...
4194304+0 records in
4194304+0 records out
131072+0 records in
131072+0 records out
131072+0 records in
131072+0 records out
Upgrade flash partition MD5 signature is c4469e1cc016d36b6109252e6565514e
ROMMON upgrade complete.
To make the new ROMMON permanent, you must restart the RP.
```

Step 5 Reload the Supervisor cards after the upgrade is complete.

Note Do not power cycle the router. Power cycling the chassis may corrupt the ROMMON image.

Step 6 Rommon > b bootflash:<imagename>
Reload the Cisco IOS-XE software to reset the ROMMON upgrade flag.

Note This step is used in case AUTOBOOT is not set for the Cisco IOS-XE software image that should be loaded when the router is reloaded.

This example shows the **bootflash** command with the image name of the Cisco IOS-XE Release 3.16.0S software image.

```
Rommon > b bootflash:cbrsup-universalk9.03.15.00.S.155-2.S-std.SPA.bin
```

Upgrading Uboot

This section provides the procedure to upgrade the Uboot in Cisco cBR-8 router.

Step 1 Copy the firmware package file to the hard disk of the Cisco cBR-8 router.
copy ftp://location/*firmware-name* **harddisk:**

Step 2 Upgrade the Uboot using the following command:
upgrade hw-programmable cable *slot-id* **rommon pkg_name** *firmware-name*
Example:

```
upgrade hw-programmable cable 3 rommon pkg_name
/harddisk/cbrsub-rp-hw-programmable-firmware.156-1.r.S1-std.02.SPA.pkg
 UBOOT:
    FILE    : /tmp/fpd/mount/uboot.bin.SPA
    VERSION : U-Boot 2011.03.13
    BYTES   : 1441792
    Upgrade Field Region: SUCCESS!
```

Step 3 Reboot the line card after the upgrade command output is displayed using the following command:
hw-module slot *slot-id* **reload**

Upgrading the Line Card Daggit Firmware

The RF line card is run by the Daggit firmware. To upgrade the Daggit firmware, use the procedure outlined in this section.

Step 1 Copy the line card firmware package to harddisk.

copy *tftp:xxx harddisk:*

Step 2 Run the following pre-upgrade commands on the SUP IOS:

upgrade hw-programmable cable *active_SUP* **daggit pre-upgrade slot** *LC_slot_#*
Example:

```
Router# upgrade hw-programmable cable R0 daggit pre-upgrade slot 3
```

Step 3 Upgrade the line card firmware using the SUP IOS command.

Note Do not reboot the line card until the upgrade is complete. Upgrade takes approximately 15 minutes.

upgrade hw-programmable cable *LC_slot_#* **daggit pkg_name** *firmware_pkg_location_path*
Example (Cisco IOS-XE Release 3.16.1S):

```
Router# upgrade hw-programmable cable 3 daggit pkg_name /harddisk/
cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg

Initialize GPIO pins......

                Lattice Semiconductor Corp.

              ispVME V12.1 Copyright 1998-2008.

      For Daisy Chain of All In-System Programmable Devices

FREQUENCY 25000000 HZ;

   NOTE: Daggits upgrade will take 15 mins!

   Do Not Reboot Line Card!
```

Example (Cisco IOS-XE Release 3.16.0S):

```
Router#upgrade hw-programmable cable 3 daggit pkg_name
/harddisk/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg

Initialize GPIO pins......

                Lattice Semiconductor Corp.

              ispVME V12.1 Copyright 1998-2008.
```

```
      For Daisy Chain of All In-System Programmable Devices

FREQUENCY 25000000 HZ;

   NOTE: Daggits upgrade will take 15 mins!

   Do Not Reboot Line Card!
```

Step 4 After the upgrade is complete (takes approximately 15 minutes), the line card moves to **unknown** state. Check the status of the line card using the **show platform** command. When the line card is in **unknown** state, run the following command to recover the line card:

upgrade hw-programmable cable *active_SUP* **daggit lc-recovery slot** *LC_slot_#*
Example:

```
Router# upgrade hw-programmable cable R0 daggit lc-recovery slot 3
```

Note This takes approximately 10 minutes.

Step 5 The line card moves from **booting** to **active** state. Check the status of the line card using the **show platform** command. When the line card is in **active** state, run the following command to verify the upgrade:

upgrade hw-programmable cable *active_SUP* **daggit post-active slot** *LC_slot_#*
Example:

```
Router# upgrade hw-programmable cable R0 daggit post-active slot 3
```

Verify the output to check if it shows the latest version and if the image can be upgraded or is the golden image.

If the version is not what you expected and you are running golden image, the upgrade process did not complete. Start your upgrade again from step 1 and make sure you do not reboot the line card until the upgrade is complete.

Upgrading Both the Line Card Daggit Firmware and the UBoot Image

This section outlines the procedure for upgrading the line card Daggit firmware and the UBoot image.

Note The UBoot image is not released in Cisco IOS-XE Release 3.16.0S. This procedure cannot be used while upgrading the firmware for Cisco IOS-XE Release 3.16.0S.

Step 1 Copy the firmware package to harddisk.

copy *tftp:xxx harddisk:*

Step 2 Run the following pre-upgrade commands on the SUP IOS:

upgrade hw-programmable cable *active_SUP* **daggit pre-upgrade slot** *LC_slot_#*

Example:

```
Router# upgrade hw-programmable cable R0 daggit pre-upgrade slot 3
```

Step 3 Upgrade both the line card firmware and the uboot image using the following command:

```
Router#upgrade hw-programmable cable 2 pkg_name
/harddisk/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg
 UBOOT:
     FILE    : /tmp/fpd/mount/uboot.bin.SPA
     VERSION : U-Boot 2011.03.9
     BYTES   : 1441792
     Upgrade Field Region: SUCCESS!

  Daggits:
  Initialize GPIO pins......

                  Lattice Semiconductor Corp.

                ispVME V12.1 Copyright 1998-2008.

        For Daisy Chain of All In-System Programmable Devices

  FREQUENCY 25000000 HZ;
  Feature row programming
  +=======+
  | PASS! |
  +=======+

  Programming Daggits CPLD image...
  FREQUENCY 25000000 HZ;

     NOTE: Daggits upgrade will take 15 mins!
     Do Not Reboot Line Card!
```

Step 4 After the upgrade is complete (takes approximately 15 minutes), the line card moves to **unknown** state. Check the status of the line card using the **show platform** command. When the line card is in **unknown** state, run the following command to recover the line card:

upgrade hw-programmable cable *active_SUP* **daggit lc-recovery slot** *LC_slot_#*
Example:

```
Router# upgrade hw-programmable cable R0 daggit lc-recovery slot 3
```

Note This takes approximately 10 minutes.

Step 5 The line card moves from **booting** to **active** state. Check the status of the line card using the **show platform** command. When the line card is in **active** state, run the following command to verify the upgrade:

upgrade hw-programmable cable *active_SUP* **daggit post-active slot** *LC_slot_#*

Example:

```
Router# upgrade hw-programmable cable R0 daggit post-active slot 3
```

Verify the output to check if it shows the latest version and if the image is upgradable or golden.

If the version is not what you expected and you are running golden image, the upgrade process did not complete. Start your upgrade again from step 1 and make sure you do not reboot the line card until the upgrade is complete.

Use the **show platform diag** command to verify the internal state and firmware version of the line card.

Upgrading the Line Card PSoC Image in the Cisco cBR (Cisco IOS-XE Release 3.16.1S)

This section provides the procedure to upgrade the line card PSoC (LC PSoC) for Cisco IOS-XE Release 3.16.1S.

Step 1 Copy the firmware package to harddisk.

copy *tftp:xxx harddisk:*

Step 2 Run the following upgrade command:

upgrade hw-programmable cable *LC_slot_#* **psoc pkg_name** *firmware_pkg_location_path*

Example:

```
Router#upgrade hw-programmable cable 8 psoc pkg_name  /harddisk/
cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.04.SPA.pkg
```

The following message is displayed, indicating that the upgrade has successfully completed this step.

```
   PSOC pre-upgrading ready, the card will reload twice to finish the PSOC updating. It will take
20 mins in total.
```

Step 3 The line card reloads automatically. When the upgrade is completed, the following message is displayed.

```
002456: Sep  8 11:26:58.828 CST: %CMCC-3-FRU_HWPRG_UPG_PSOC_SUCCESS: CLC8: cmcc:  Hardware programmable
 PSOCs on Line card in slot 8 were successfully programmed. The card will reload to make new firmware
 work.
```

Step 4 The line card reloads automatically once again. After the line card reloads, wait for it to come online.

What to Do Next

Use the **show platform hardware slot** *slot* **psoc** *psoc id* **version** command to check the firmware version for each of the two PSoCs on each RF line card.

```
Router#show platform hardware slot 1 psoc 0 version
Load for five secs: 29%/6%; one minute: 30%; five minutes: 31%
Time source is NTP, 10:20:17.662 PORTUGAL-Summer Tue Aug 4 2015
PSOC Version

version name          version value
------------------------------------------------------
psoc_address          50-0063
reg_pmbus_revision    22
reg_mfr_id            Cypress Semicon
reg_mfr_model         039 Power Spvr
reg_mfr_revision      Version 2.0
reg_mfr_location      Seattle, WA
reg_mfr_date          2013-09-04
reg_mfr_serial        v3.0

Router#
```

Upgrading the Line Card PSoC Image in the Cisco cBR (Cisco IOS-XE Release 3.16.0S)

This section provides the procedure to upgrade the line card PSoC (LC PSoC).

Step 1 Copy the firmware package to harddisk.

copy *tftp:xxx harddisk:*

Step 2 Run the following upgrade command:

upgrade hw-programmable cable *LC_slot_#* **psoc pkg_name** *firmware_pkg_location_path*

Example:

```
Router#upgrade hw-programmable cable 7 psoc pkg_name
/harddisk/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.04.SPA.pkg
```

The following message is displayed, indicating that the upgrade has successfully completed this step.

```
PSOC pre-upgrading ready, please power-cycle the board to finish the PSOC updating.
```

Example:

The following message is displayed, indicating that the upgrade has successfully completed this step.

```
PSOC pre-upgrading ready, please power-cycle the board to finish the PSOC updating.
```

Step 3 Power-cycle the Cisco cBR chassis or perform an OIR of the RF line card.

Note Perform the OIR of the RF line card physically, by removing the RF line card from the slot and inserting it back into the slot.

```
Aug  4 09:02:59.836: %IOSXE_OIR-6-OFFLINECARD: Card (cc) offline in slot 1
Aug  4 09:02:59.839: %CABLE_CLC-5-LOGGER_LC_REMOVED: Carrier Card 1 removed
Aug  4 09:02:59.844: %BIPC-6-SESSION_DOWN: IPCCL Session to CLC1 is DOWN
Aug  4 09:02:59.937: %IOSXE_OIR-6-REMCARD: Card (cc) removed from slot 1
Aug  4 09:02:59.938: %CABLE_CLC-5-LOGGER_LC_REMOVED: Carrier Card 1 removed
LAB1_CBR8_DEMO#
Aug  4 09:03:15.622: %IOSXE_OIR-6-INSCARD: Card (cc) inserted in slot 1
```

Step 4 The RF line card reboots after the chassis power-cycle or the RF line card OIR is completed. The LC PSoC upgrade process continues after the RF line card reboots.

Note After the RF line card reboots, the LC PSoC upgrade process takes approximately 15 minutes to complete. Do not perform any operation on the RF line card while the upgrade process is running.

When the upgrade process is completed, the following sample message is displayed, indicating that the upgrade was successful.

```
Aug  4 09:06:31.571: %IOSXE_OIR-6-ONLINECARD: Card (cc) online in slot 1
Router# success
Aug  4 09:11:45.764: %CMCC-3-FRU_HWPRG_UPG_PSOC_SUCCESS: CLC1: cmcc:  Hardware programmable PSOCs
on Line card in slot 1
were successfully programmed. Please power-cycle or OIR the card to make them work
```

Step 5 Power cycle the Cisco cBR chassis or perform an OIR of the RF line card again.

The PSOC 0 and PSOC 1 versions are indicated in the display that appears after the chassis power-cycle or the RF line card OIR is complete and the RF line card reboots. This example shows the sample messages displayed after the RF line card reboots:

```
Aug  4 09:16:18.124: %IOSXE_OIR-6-ONLINECARD: Card (cc) online in slot 1
LAB1_CBR8_DEMO# success
LAB1_CBR8_DEMO#
Aug  4 09:16:29.021: %BIPC-6-SESSION_UP: IPCCL Session to CLC1 is UP
LAB1_CBR8_DEMO#sh plat diag
Load for five secs: 1%/0%; one minute: 5%; five minutes: 3%
Time source is NTP, 10:20:17.662 PORTUGAL-Summer Tue Aug 4 2015

Chassis type: CBR-8-CCAP-CHASS

Slot: 0, CBR-CCAP-LC-40G
Running state               : ok
Internal state              : online
Internal operational state  : ok
Physical insert detect time : 15:37:00 (00:59:22 ago)
Software declared up time   : 15:40:20 (00:56:01 ago)
CPLD version                : 00000021
Rommon version              : 2011.03.12
Basestar version            : 00110004
Raider version              : 01010008
Caprica version             : 00000020
PSOC 0 version              : v4.6
PSOC 1 version              : v4.6
```

```
Pic: 0/1, CBR-RF-PROT-PIC
Internal state              : inserted
Physical insert detect time : 00:03:22 (16:32:59 ago)
Firmware version:           : 0000071E

Slot: 1, CBR-CCAP-LC-40G
Running state               : ok
Internal state              : online
Internal operational state  : ok
Physical insert detect time : 16:29:06 (00:07:15 ago)
Software declared up time   : 16:32:23 (00:03:59 ago)
CPLD version                : 00000021
Rommon version              : 2011.03.12
Basestar version            : 00110004
Raider version              : 01010008
Caprica version             : 00000020
PSOC 0 version              : v4.6
PSOC 1 version              : v4.6

Pic: 1/1, CBR-RF-PIC
Internal state              : inserted
Physical insert detect time : 00:03:23 (16:32:59 ago)
Firmware version:           : 0000073E
```

What to Do Next

Use the **show platform hardware slot** *slot* **psoc** *psoc id* **version** command to check the firmware version for each of the two PSoCs on each RF line card.

```
Router#show platform hardware slot 1 psoc 0 version
Load for five secs: 29%/6%; one minute: 30%; five minutes: 31%
Time source is NTP, 10:20:17.662 PORTUGAL-Summer Tue Aug 4 2015
PSOC Version

version name          version value
------------------------------------------------------
psoc_address          50-0063
reg_pmbus_revision    22
reg_mfr_id            Cypress Semicon
reg_mfr_model         039 Power Spvr
reg_mfr_revision      Version 2.0
reg_mfr_location      Seattle, WA
reg_mfr_date          2013-09-04
reg_mfr_serial        v3.0

Router#
```

Upgrading the Fan PSoC Image in the Cisco cBR

This section provides the procedure to upgrade the fan module PSoC.

Before You Begin

You could identify the fan module hardware using the **show platform hardware slot** *Pslot* **psoc 0 version** command. The reg_ic_device_rev field shows the fan module firmware version.

Step 1 Copy the firmware package to harddisk.

copy *tftp:xxx harddisk:*

Step 2 Run the following upgrade command on the SUP IOS:
For Cisco IOS-XE Release 3.16.1S:

upgrade hw-programmable cable *active_SUP* **fan pkg_name** *firmware_pkg_location_path*

Example:

```
Router#upgrade hw-programmable cable R0 fan pkg_name
/harddisk/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg
```

For Cisco IOS-XE Release 3.16.0S:

Caution This command is specific to Cisco IOS-XE Release 3.16.0S alone. Using this command to upgrade the Fan PSoC firmware on Cisco IOS-XE Release 3.16.1S may cause unexpected results.

Caution For upgrading Cisco IOS-XE Release 3.16.0S, do not use the firmware package **cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg** released for Cisco IOS-XE Release 3.16.1S. Use the firmware package **cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.02.SPA.pkg** for upgrading Cisco IOS-XE Release 3.16.

upgrade hw-programmable cable *active_SUP* **psoc pkg_name** *firmware_pkg_location_path*

Example:

```
Router#upgrade hw-programmable cable R0 psoc pkg_name
/harddisk/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.02.SPA.pkg
```

It takes approximately 15 minutes to upgrade the fan module PSoC for all the fan modules.

Note Do not power-cycle or reload the router while the upgrade process is running.

When the upgrade is complete, the messages that indicate that the hardware programmable PSoC on each fan module in each fan bay is upgraded successfully, are displayed.

What to Do Next

Note The following procedures are applicable only for Cisco IOS-XE Release 3.16.0S and not for Cisco IOS-XE Release 3.16.1S.

Perform one of the following two procedures:

- OIR the Fan modules one by one. Do not remove the fan module fully from the chassis. Pull the fan modules out until the back connector is disconnected fully, then re-insert the fan module.
- Power cycle the Cisco cBR chassis.

Use the **show platform hardware slot** *Pslot* **psoc 0 version** command to check the firmware version for each slot and each of the two PSoCs on each fan module.

Upgrading Supervisor Viper Firmware in the Cisco cBR

This section provides the procedure to upgrade the Supervisor Viper firmware.

Before You Begin

Before upgrading the Supervisor Viper firmware, make sure the following requirements are met:

- Download Viper FPGA Package cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg from http://www.cisco.com
- System running IOS-XE image: 3.16.0, 3.16.1, 3.16 engineering specials, or 3.17.0
- Console connections and login to both Supervisor cards
- Run the following commands for each package to verify firmware versions on the cBR-8:

Command	Programmable Device	Current Version	Upgrade Version	Package Name
show platform	Sup ROMMON	15.5(2r)S	15.5(2r)S1	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.01.SPA.pkg
show platform diag	SUP PSOC	4.09	4.09	N/A
show platform diag	FAN PSOC	1.4	1.6	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.02.SPA.pkg
show platform	LC CPLD (Daggits)	0x1C (v28)	0x21(v33)	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg
show platform diag	LC PSOC	v4.3	v4.6	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.04.SPA.pkg
show platform	SUP CPLD (Viper)	14121111	15091511	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg

Step 1 Copy the new Viper firmware package to the cBR-8 using FTP.

copy *filename* **bootflash:**

copy *filename* **stby-bootflash:**
Example:

```
Router# copy ftp://location/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg bootflash:
Router# copy ftp://location/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg
stby-bootflash:
```

Step 2 Verify the Viper firmware files against the known md5 hash 2d80c109ece4178de15766d1f9c07b58.

verify /md5 bootflash:*filename*
Example:

```
Router# verify /md5 bootflash:cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg
```

Step 3 Log into active SUP0 using console connection.

Step 4 Check if there is any previous failed SUP0 and SUP1 Viper or other firmware attempt and delete if any.

dir bootflash:*already_in_progress_file*

delete bootflash:*already_in_progress_file*

dir stby-bootflash:*already_in_progress_file*

delete stby-bootflash:*already_in_progress_file*

Step 5 Run the following command to upgrade Viper firmware on SUP0 (R0) and SUP1 (R1):

upgrade hw-programmable cable R0 viper pkg_name *filename*

upgrade hw-programmable cable R1 viper pkg_name *filename*

Example:

```
Router# upgrade hw-programmable cable R0 viper pkg_name
/bootflash/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg
Router# upgrade hw-programmable cable R1 viper pkg_name
/bootflash/cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg
```

It takes about 10 minutes to upgrade. You should see the following messages when upgrade finished:

```
Upgrade successfully. Please make sure Rommon version is matched.
Please power cycle the chassis to let the new firmware take effect
```

Caution Disregard the power cycle instruction for now. Do not power cycle the chassis at this time.

Step 6 To mitigate the known modem registration rate issue, the following configuration commands needs to be added.

```
Router# configure terminal
Router(config)# platform punt-policer 24 50
Router(config)# platform punt-policer 24 50 high
```

```
Router(config)# platform punt-policer 105 300
Router(config)# platform punt-policer 100 100
Router(config)# platform punt-sbrl wan punt-cause 10 rate 4
Router(config)# platform punt-sbrl wan punt-cause 11 rate 4
Router(config)# platform punt-sbrl wan punt-cause 24 rate 4
Router(config)# platform punt-sbrl subscriber rate 16
Router(config)# interface bundle x
Router(config)# hold-queue 1024 in
Router(config)# hold-queue 1024 out
Router(config)# end
Router(config)# write memory
Router#
```

Step 7 Copy the system startup-config to bootflash: and stby-bootflash: as a precaution.

copy startup-config bootflash:*filename*

copy startup-config stby-bootflash:*filename*

Step 8 Set the config register to 0, so both SUPs will boot in ROMMON mode after reset.

```
Router# configure terminal
Router(config)# config-register 0x0
Router(config)# end
Router# write memory
```

Step 9 Check console connectivity on both SUP0 and SUP1. Then reload cBR-8.

```
Router# reload
```

Step 10 Confirm both SUP0 and SUP1 are in ROMMON mode, and check bootflash on both SUPs.

```
Router# dir bootflash:
```

Step 11 Power cycle the cBR-8. Wait for both SUP0 and SUP1 to load into ROMMON mode. You will see the new Viper version has been loaded on both SUPs from both console connections.

```
rommon 1 >

Initializing Hardware ...

?

System Bootstrap, Version 15.5(2r)S1, RELEASE SOFTWARE
Copyright (c) 1994-2015  by cisco Systems, Inc.

Current image running: Boot ROM1

Last reset cause: PowerOn

Viper version register: 0x15091511
Set Chassis Type to 13RU
Cisco cBR-8  platform with 50331648 Kbytes of main memory
```

Step 12 Boot the IOS-XE on SUP0 and SUP1 from ROMMON.

boot bootflash:*filename*

Step 13 Check the Viper firmware has been upgraded on both SUPs.

show platform
Example:

```
Router# show platform

Slot      CPLD Version        Rommon Version
--------- ------------------- ------------------------------------
0         00000021            2011.03.12
1         00000021            2011.03.12
2         00000021            2011.03.12
SUP0      15091511            15.5(2r)S1
SUP1      15091511            15.5(2r)S1
```

Step 14 After secondary SUP goes into STANDBY HOT state, set the config register back to 0x2102 (Both SUPs will be changed back to autoboot mode). Also check your boot statement in config to point to the desired image.

```
Router# configure terminal
Router(config)# config-register 0x2102
Router(config)# end
Router# write memory
```

Step 15 Verify that the bootvar has changed to point at the new image.

```
Router# show bootvar
```

Step 16 Verify that the config-register has changed to point at the new image on next reboot.

```
Router# show redundancy
```

Upgrading Docsis 3.0 downstream module and Docsis 3.1 downstream module

This section provides the procedure to upgrade the Docsis 3.0 downstream module and Docsis 3.1 downstream module installed in Cisco cBR-8 router.

Before You Begin

Before upgrading the module, make sure the following requirements are met:

- Put the new IOS-XE image file *image-file-name* in bootflash via FTP using **copy ftp://location/***image-file-name* **bootflash:** and **copy ftp://location/***image-file-name* **stby-bootflash:** command.
- Verify the IOS-XE image file against the known file md5 hash using **verify /md5** *image-file-name* command.
- Access to TSV, both console connections, all passwords including enable, and logging sessions for both supervisor cards.
- Insert a USB drive into the supervisor front USB port just behind the small cover. Verify that the system can read the drive directory usb0:. Backup the configuration to USB drive before upgrade using **copy running-config usb0:** *name.txt* command.

- Run the following commands for each package to verify firmware versions on the cBR-8:

Command	Programmable Device	Current Version	Package Name
show platform	SUP ROMMON	15.5(2r)S1	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.01.SPA.pkg
show platform diag	SUP PSOC	4.09	N/A
show platform diag	FAN PSOC	1.6	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.02.SPA.pkg
show platform	LC CPLD (Daggits)	0x21(v33)	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.03.SPA.pkg
show platform diag	LC PSOC	v4.5	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.04.SPA.pkg
show platform	SUP CPLD (Viper)	15091511	HW-Prog-Pkg: cbrsup-rp-hw-programmable-firmware.155-3.r.S3-ext.05.SPA.pkg

- Check if the redundancy is enabled using **show redundancy** command.
- Perform all Comcast standard pre-checks (total modems online, any 911 calls, etc). See verification section for **show** commands to verify system health before upgrade.

Step 1 Change the boot variable to point to desired IOS-XE image.

boot system bootflash:*image-file-name*
no boot system
end
write memory

Step 2 Verify that the bootvar has changed to point to the new image.

show bootvar

Step 3 To mitigate the known modem registration rate issue, the following configuration commands needs to be added.

configure terminal
no platform punt-policer 105 300
platform punt-policer 24 10
platform punt-policer 24 10 high
platform punt-policer 100 10
ipv6 access-list dhcp_up
permit ipv6 any host FF02::1:2 sequence 10

```
exit
ip access-list extended dhcp_v4_up
10 permit ip host 0.0.0.0 host 255.255.255.255
exit
class-map match-all dhcp_drop
match access-group name dhcp_up
class-map match-all dhcp_drop_v4
match access-group name dhcp_v4_up
policy-map copp_policy
class dhcp_drop
police rate 100 pps conform-action transmit exceed-action drop
class dhcp_drop_v4
police rate 100 pps conform-action transmit exceed-action drop
interface bundle 10
hold-queue 1024 in
hold-queue 1024 out
end
write memory
```

Step 4 Copy the system startup-config to bootflash: and stby-bootflash: as a precaution.

copy startup-config bootflash:*filename*

copy startup-config stby-bootflash:*filename*

Step 5 Check console connectivity on both SUP0 and SUP1. Then reload cBR-8.

```
Router# reload
```

Step 6 Once the system is up, check if it is running the new version of IOS-XE using **show redundancy** command. You will find following information in the command output if the new IOS-XE image is running:

```
Image Version = Cisco IOS Software, cBR  Software (X86_64_LINUX_IOSD-UNIVERSALK9-M),
cbrsup-universalk9.03.16.01.S.155-3.S1-ext.SPA.bin
```

Note The command output depends on the IOS-XE version.

Step 7 If the chassis has Docsis 3.0 downstream modules or Docsis 3.1 downstream modules on the line cards, the firmware of each line card will automatically upgrade. You need to watch the logs for a suggested line card reload.
If you find following content in the output of the **show log | include DSPHY** command, it means an upgrade is taking place.

```
router: CLC9: cdman:  DSPHY downloading gemini 0 FW done, total packets 514
```

If you find following content in the output of the **show log | include reload** command, it means an upgrade is complete.

```
router: CLC0: cdman: Suggest reload the line card for new FW to take effect using CLI:
```

Note No upgrade is occurring means router image upgrade is complete.

Step 8 Disable line card redundancy for line card reloads.

```
configure terminal
redundancy
mode sso
linecard-group 0 internal-switch
no member slot 0 secondary
end
```

Step 9 Verify that there is no line card redundancy using **show run | begin redundancy** command. The following information will not appear in the command output:

```
member slot 0 secondary
```

Step 10 At this point you need to reload each line card and wait for the modems to come back online. Reload one card at a time, allow approximate 5 minutes between each line card reload. This helps to stagger the modem recovery and will be faster than reloading all the line cards at once.

hw-module slot 0 reload
hw-module slot 1 reload
hw-module slot 2 reload
hw-module slot 3 reload
hw-module slot 4 reload
hw-module slot 5 reload
hw-module slot 6 reload
hw-module slot 7 reload
hw-module slot 8 reload
hw-module slot 9 reload

Step 11 Check to see if all Docsis 3.0 downstream modules or Docsis 3.1 downstream modules are upgraded.

show cable card 0/0 ds-phy display | include version
show cable card 1/0 ds-phy display | include version
show cable card 2/0 ds-phy display | include version
show cable card 3/0 ds-phy display | include version
show cable card 6/0 ds-phy display | include version
show cable card 7/0 ds-phy display | include version
show cable card 8/0 ds-phy display | include version
show cable card 9/0 ds-phy display | include version

Step 12 Check Docsis 3.0 downstream modules or Docsis 3.1 downstream modules status using **show log | include Gemini|XFI** command. Any event from Docsis 3.0 downstream modules or Docsis 3.1 downstream modules or event detected by line card CPU about Docsis 3.0 downstream modules or Docsis 3.1 downstream modules is reported in the system log. Any line card firmware upgrade failure will appear within 26 minutes of upgrade. Watch the log for any issues for 30 minutes after previous hardware module reset.

Step 13 Check for Docsis 3.0 downstream module or Docsis 3.1 downstream module detection status, repeat for each line card slot:

show cable card 0/0 ds-phy display | include detected
show cable card 1/0 ds-phy display | include detected
show cable card 2/0 ds-phy display | include detected
show cable card 3/0 ds-phy display | include detected
show cable card 6/0 ds-phy display | include detected
show cable card 7/0 ds-phy display | include detected
show cable card 8/0 ds-phy display | include detected
show cable card 9/0 ds-phy display | include detected

Step 14 Check for keepalive (KA) counts sent and received to match closely, repeat for each line card slot:

show cable card 0/0 ds-phy display | include KA MicoAPSeSet
show cable card 1/0 ds-phy display | include KA MicoAPSeSet
show cable card 2/0 ds-phy display | include KA MicoAPSeSet
show cable card 3/0 ds-phy display | include KA MicoAPSeSet
show cable card 6/0 ds-phy display | include KA MicoAPSeSet
show cable card 7/0 ds-phy display | include KA MicoAPSeSet

show cable card 8/0 ds-phy display | include KA MicoAPSeSet
show cable card 9/0 ds-phy display | include KA MicoAPSeSet

Step 15 Re-enable the line card redundancy.

configure terminal
redundancy
mode sso
linecard-group 0 internal-switch
member slot 0 secondary
end
write memory

Step 16 Verify if the redundancy has been re-enabled using **show run | begin redundancy** command. You can find following information in the command output:

```
member slot 0 secondary
```

What to Do Next

Perform verification test to determine if the upgrade is successful, include:

- Check facility alarms using **show facility-alarm status** command.

Note The Comcast deployments use 5 power supplies which are sufficient, but will show an major alarm which can be ignored.

- Check the status of the power supplies using **show environment power** command.
- Check PS status using **show platform hardware slot P<0-5> mcu status** command.
- Complete trace routes to known good off-network IP address using the source address of customer CPE blocks to verify routing is working.
- Check logs for error messages using **show log** command.

These **show** commands may be useful in the verification test:

- **show redundancy**
- **show platform**
- **show platform diag**
- **show environment**
- **show redundancy linecard all**
- **show isis neighbors**
- **show ip route rip**
- **show ip mroute**
- **show cops servers**
- **show cable modem voice**

- **show cable calls**
- **show cable metering verbose**
- **show version**
- **show cable licenses all**
- **show inventory**

Upgrading DSPHY CPLD Firmware

Step 1 Copy the DSPHY CPLD firmware package to hard disk of the cBR-8.

```
copy bootflash:cbrsup-rp-programmable-firmware.xxx.pkg harddisk:rp-prog.pkg
```

Step 2 Upgrade the DSPHY CPLD firmware using SUP IOS command, for each applicable slot.

upgrade hw-programmable cable *slot number* **dsphy cpld pkg-name** *package name*
Example:

```
Router# upgrade hw-programmable cable 3 dsphy cpld pkg-name /harddisk/rp-prog.pkg
```

Wait for DSPHY CPLD firmware upgrade to complete.

```
Router#
*Jan  1 09:08:22.830 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY manual downloading gemini 0 PSOC
or CPLD FW, 0 packets done
*Jan  1 09:08:28.671 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY manual downloading gemini 0 CPLD
FW, 1000 packets done
*Jan  1 09:08:33.381 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY manual downloading gemini 0 CPLD
FW, 2000 packets done
*Jan  1 09:08:38.117 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY manual downloading gemini 0 CPLD
FW, 3000 packets done
*Jan  1 09:08:42.822 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY manual downloading gemini 0 CPLD
FW, 4000 packets done
*Jan  1 09:08:43.036 EDT: %IOSXE-5-PLATFORM: CLC3: cdman:  DSPHY downloading gemini 0 FW done, total
 packets 4035
*Jan  1 09:08:43.036 EDT: %IOSXE-5-PLATFORM: CLC3: cdman: Suggest reload the line card for new FW
to take effect using CLI: hw slot <slot-id> reload
```

Step 3 After the upgrade is complete, reload the line card.

hw slot *slot number* **reload**
Example:

```
Router# hw slot 3 reload
Proceed with reload of module? [confirm]
```

Wait for the line card to return to State ok.

```
Router# show platform
Chassis type: CBR-8
Slot      Type                State    Insert time (ago)
------ ------------------- --------- -------------------
3        CBR-CCAP-LC-40G      ok        00:08:49
```

Step 4 Verify if the DSPHY CPLD firmware has been upgraded.

show cable card *slot*/**0 ds-phy display**
Example:

Verify the cpld version details using the following command:

```
Router# show cable card 3/0 ds-phy display
Internal GCP Status of module or AppCore 0:
. . .
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
. . .

Internal GCP Status of module or AppCore 1:
. . .
cpld ver 7, sector(1 base) 0, psoc ver 40004, sector(1 base) 0
. . .
```

Upgrading DSPHY PSoC Firmware

Step 1 Copy the DSPHY PSoC firmware package to hard disk of the cBR-8.

```
copy bootflash:cbrsup-rp-programmable-firmware.xxx.pkg harddisk:rp-prog.pkg
```

Step 2 Upgrade the DSPHY PSoC firmware using SUP IOS command, for each applicable slot.

upgrade hw-programmable cable *slot number* **dsphy psoc pkg-name** *package name*
Example:

```
Router# upgrade hw-programmable cable 3 dsphy psoc pkg-name /harddisk/rp-prog.pkg
```

Wait for DSPHY PSoC firmware upgrade to complete.

```
Router#
*Jan  1 09:24:21.026 EDT: %IOSXE-5-PLATFORM: CLC3: cdman: gemini psoc img ID 1, starting to download,
 is GeminiII ? 0
*Jan  1 09:24:21.046 EDT: %IOSXE-5-PLATFORM: CLC3: cdman: DSPHY manual downloading gemini 0 PSOC or
 CPLD FW, 0 packets done
*Jan  1 09:25:19.861 EDT: %IOSXE-5-PLATFORM: CLC3: cdman: DSPHY downloading gemini 0 FW done, total
 packets 430
*Jan  1 09:25:19.861 EDT: %IOSXE-5-PLATFORM: CLC3: cdman: Suggest reload the line card for new FW
to take effect using CLI: hw slot <slot-id> reload
```

Step 3 After the upgrade is complete, reload the line card.

hw slot *slot number* **reload**
Example:

```
Router# hw slot 3 reload
Proceed with reload of module? [confirm]
```

Wait for the line card to return to State ok.

Example:

```
Router# show platform
Chassis type: CBR-8-CCAP-CHASS
Slot       Type              State       Insert time (ago)
-------- ----------------- ------------ -------------------
3         CBR-CCAP-LC-40G     ok            00:34:19
```

Step 4 Verify if the DSPHY PSoC firmware has been upgraded.

show cable card slot/0 ds-phy display
Example:

Verify the psoc version details using the following command:

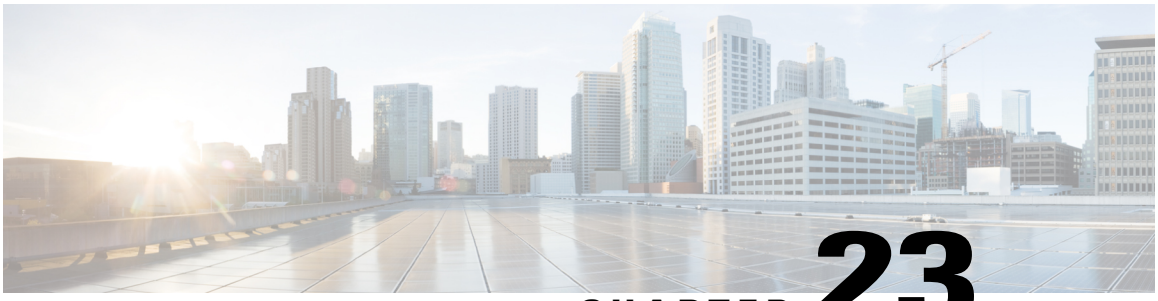
```
Router# show cable card 3/0 ds-phy display
Internal GCP Status of module or AppCore 0:
. . .
cpld ver 7, sector(1 base) 1, psoc ver 40004, sector(1 base) 1
. . .

Internal GCP Status of module or AppCore 1:
. . .
cpld ver 7, sector(1 base) 0, psoc ver 40004, sector(1 base) 0
. . .
```

Verifying the Firmware Versions after the Upgrade

Verify the firmware version of the programmable hardware devices after the upgrade is completed successfully.

Table 33: Firmware Versions

Command	Firmware	Correct Version
Cisco IOS-XE Release 3.16.0S		
show platform	ROMMON	15.5(2r)S1
show platform diag	Fan PSoC	CBR-FAN FW 1.6
show platform diag	LC PSoC	v4.6
show platform	LC Daggits/CPLD	00000021
show platform	SUP CPLD (Viper)	15091511



CHAPTER 23

Troubleshooting the Cisco cBR

- Troubleshooting the Fan Module in the Cisco cBR, page 255
- Troubleshooting the Power System in the Cisco cBR, page 257
- Troubleshooting the Interface Cards in Cisco cBR Chassis, page 257

Troubleshooting the Fan Module in the Cisco cBR

Problem	Possible Cause	Solution
The STATUS LED of a fan is not illuminated when the Cisco cBR-8 chassis is powered on. Less than 10 seconds have elapsed since the chassis has been powered ON.	Fan module starts up 10 seconds after the chassis is powered on.	The corresponding LED illuminates 10 seconds after the chassis is started up.
The STATUS LED of a fan is not illuminated when the Cisco cBR-8 chassis is powered on. More than 10 seconds have elapsed since the chassis has been powered ON.	There could be a failure of a Fan Module component.	Check the status of the LED labeled RPLC. If it is also illuminated then replace the fan module.
The STATUS LED of a fan is illuminated with Amber light and the Fan Module shows no acoustic indication of failure. Alternatively all fans are acoustically elevated with Amber illumination of one LED on a fan.	There could be a failure of a Fan Module hardware component. It could also be a minor alarm.	Replace the Fan Module.
The RPLC LED of a fan is illuminated with Amber light and the all the Fan Module are acoustically elevated with Amber illumination of one LED on a fan.	There could be a failure of a Fan Module hardware component. It could also be a minor alarm.	Replace the Fan Module.

Problem	Possible Cause	Solution
The RPLC LED of a fan is illuminated with White light. Any minor fan failure occurs. Any sensor or any controller or PCB fails.	The RPM of any fan is outside the set RPM limit setpoints by less than 300RPM or greater than 1000RPM. Temperature or barometric sensor failure is sensed by the Supervisor. The Supervisor could also set the RPLC LED to White due to the failure of a Fan Module hardware component. It could also be a minor alarm.	Replace the Fan Module.
The chip level thermal shutdown alarms could be tripped. The cards are powered off for thermal protection shut down.	This scenario, considered a double fault condition, occurs when there is a fan failure during elevated temperature conditions without all the fans functioning properly. The cards do not remain cool under such conditions.	Replace the faulty Fan Module.
Cisco cBR's Supervisor Cards are prevented from powering up.	One or more of the Fan Modules have a serious failure such that the error prevents both fans from operating. This could prevent the Cisco cBR's Supervisor Cards from powering up.	Replace the faulty Fan Module.
	The chassis does not have one or more Fan Modules.	
The sliding door of the fan bay does not close when the Fan Module is removed.	The sliding door is stuck.	Push front flap open and manually slide the door back and forth to ensure free movement of the door. If that doesn't work, pull the door closed to stop air bypass until a fan module is installed.
The output of the **show platform** command shows the Fan Module (P10 to P14) in failed state.	The Fan Module is not inserted.	Insert the Fan Module.
The output of the **show platform** command shows the Fan Module (P10 to P14) in failed state.	The Fan Module has entered an abnormal state.	Replace the Fan Module.

Troubleshooting the Power System in the Cisco cBR

Problem	Possible Cause	Solution
The output of the **show platform** command shows the Power Module (P0 to P5) in failed state.	The Power Module is not inserted in the chassis.	Insert the Power Module, if necessary.
The output of the **show platform** command shows the Power Module (P0 to P5) in failed state.	The Power Module is not receiving power.	Connect power to the corresponding FPEM for the Power Module, if necessary.
The output of the **show platform** command shows the Power Module (P0 to P5) in failed state.	The Power Module has entered an abnormal state.	Replace the Power Module.

Troubleshooting the Interface Cards in Cisco cBR Chassis

Table 34: Downstream PHY Module Troubleshooting

Problem	Possible Cause	Solution
The PowerGood value 0 in the output of the **show cable card** *slot/subslot* **ds-phy display | include PowerGood** command shows that the downstream PHY module in the line card is not powered up.	The downstream PHY module is not seated properly.	The downstream PHY module should be re-installed to ensure that it is properly seated.
	The downstream PHY module is damaged.	Refer to the RMA procedure for more information on service.
	The cLGA connector is damaged.	Contact the Cisco Technical Assistance Center (TAC) through the Cisco Support web site http://www.cisco.com/c/en/us/support/index.html.
	The line card is not providing power to the module.	
The STATUS LED is not illuminated.	The interface card is not booted.	Reboot the interface card. If the STATUS LED does not illuminate, replace the line card.
The REPLACE LED is illuminated in white color.	The interface card needs to be replaced.	Replace the interface card.

Table 35: Upstream PHY Module Troubleshooting

Problem	Possible Cause	Solution
The PowerGood value 0 in the output of the **show cable card** *slot/subslot* **us-phy display | include PowerGood** command shows that the upstream PHY module in the line card is not powered up.	The upstream PHY module is not seated properly.	The upstream PHY module should be re-installed to ensure that it is properly seated.
	The upstream PHY module is damaged.	Refer to the RMA procedure for more information on service.
The STATUS LED is not illuminated.	The interface card is not booted.	Reboot the interface card. If the STATUS LED does not illuminate, replace the line card.
The REPLACE LED is illuminated in white color.	The interface card needs to be replaced.	Replace the interface card.