Cisco Converged Broadband Routers Hardware Installation Guide

First Published: 2015-03-25

Last Modified: 2022-10-26

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

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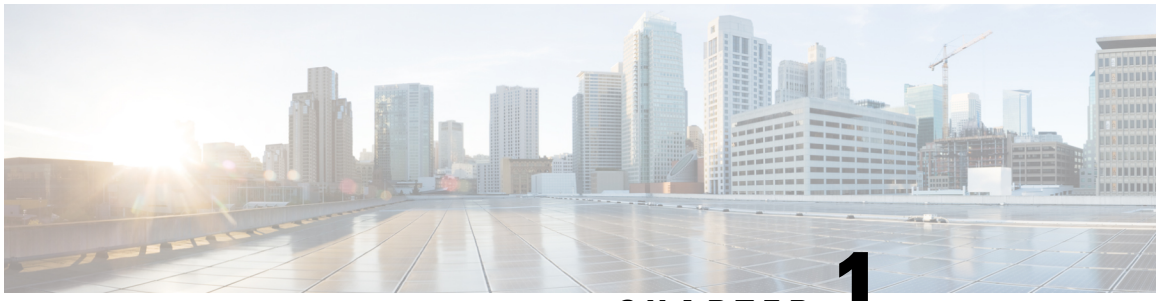

CHAPTER 1

What is a Cisco cBR Series Converged Broadband Router

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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.

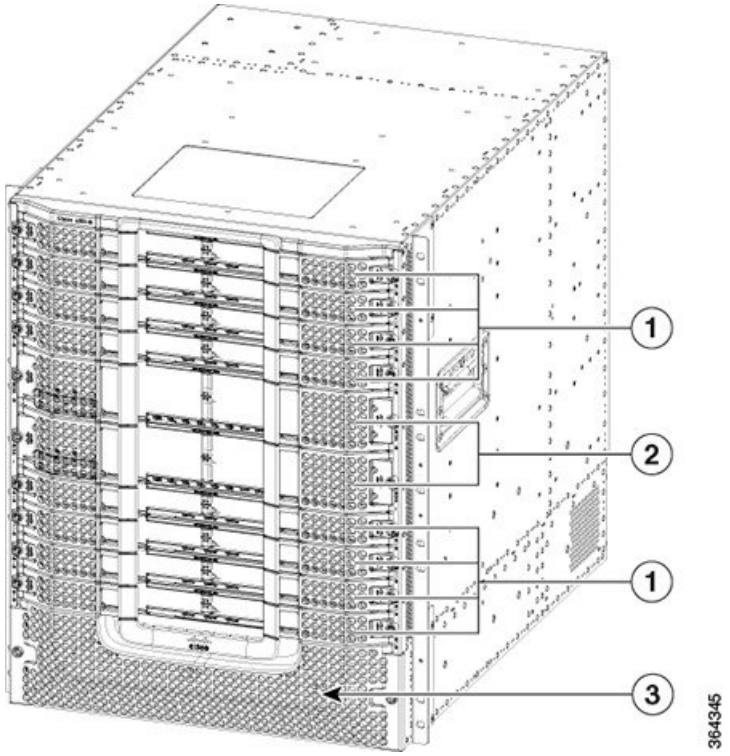
1. Data packets from the Internet are received by the network uplink cards (Ten Gigabit Ethernet).
2. The packets are forwarded to the forwarding processor (FP) on the Supervisor module.
3. The FP performs MAC classification to determine the type of frame or packet to be processed.
4. The route processor 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.

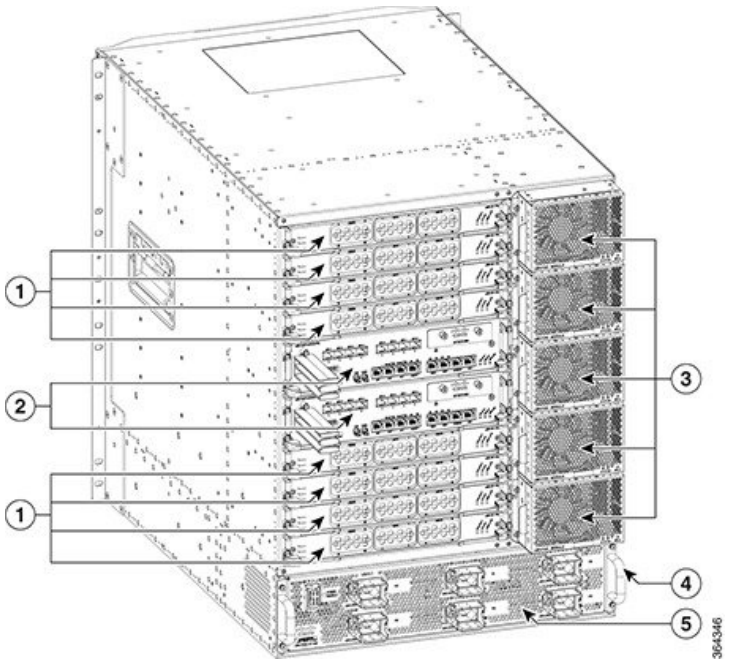
The front card modules plug into the Digital Midplane and the associated Physical Interface Card (PIC) plugs into the rear of the chassis. All permanent connections to the Cisco cBR-8 chassis are made at the rear.

Figure 1: Chassis Front View



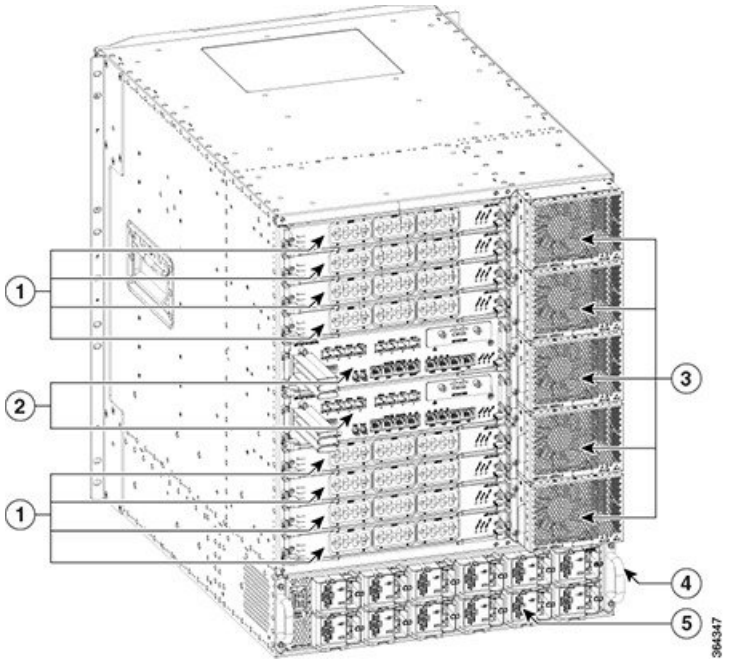
1	Line Cards	3	Front Power Entry Bezel
2	Supervisor Cards		

Figure 2: Chassis Rear View with AC FPEM



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

Figure 3: Chassis Rear View with DC FPEM



1	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) or Eight Cisco cBR DPIC cards (if -R line cards are installed)
- One Cisco cBR RF PROT PIC card (if the chassis is configured in RF 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

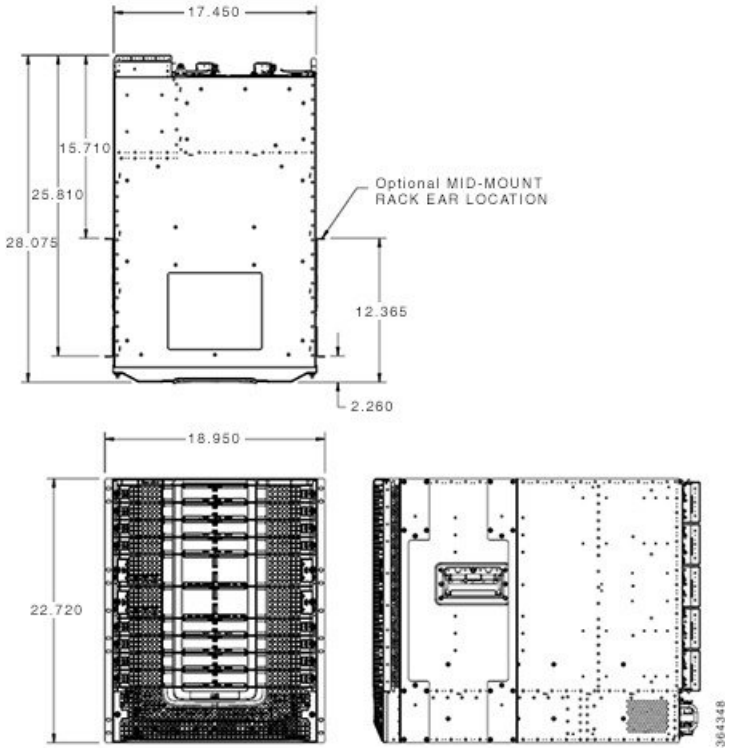
Table 1: Cisco cBR-8 Chassis Physical Description Summary

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

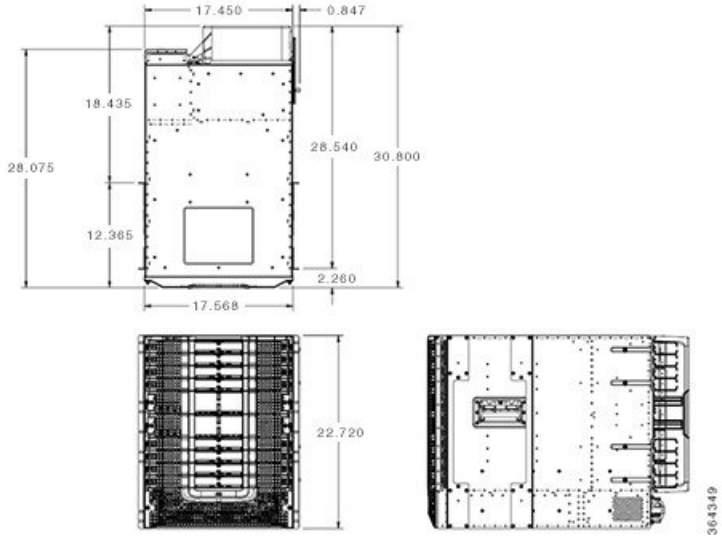
The below image shows the basic dimensions of the Cisco cBR-8 chassis.

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. However, on Cisco IOS-XE, the **show platform** command does not show the second number 0 for front-mounted cards.
Supervisor Cards	Identified as SUP0 and SUP1.

Component	Slot Numbering
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

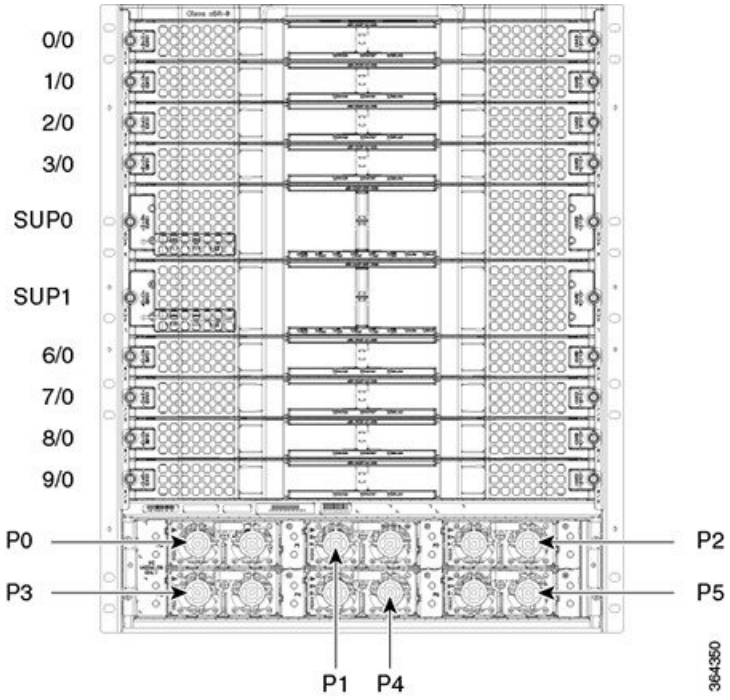


Figure 7: Slot Numbering—Front of the Chassis With DC Power Module

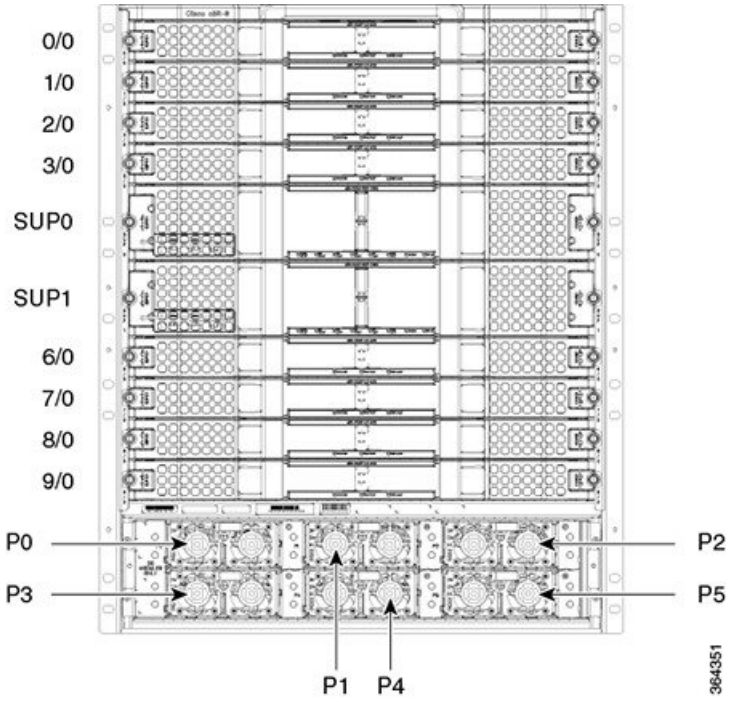


Figure 8: Slot Numbering—Rear of the Chassis With AC Power Module

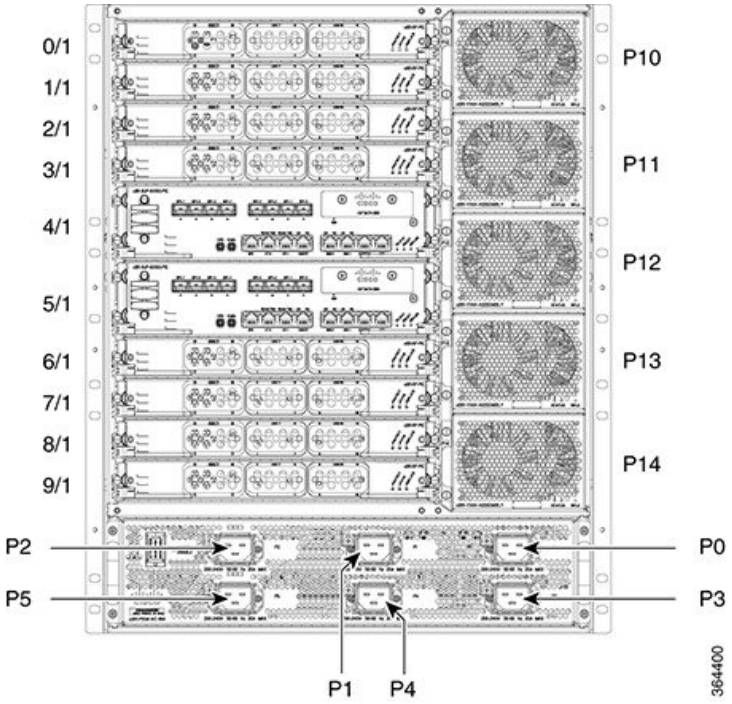


Figure 9: Slot Numbering—Rear of the Chassis With DC Power Module

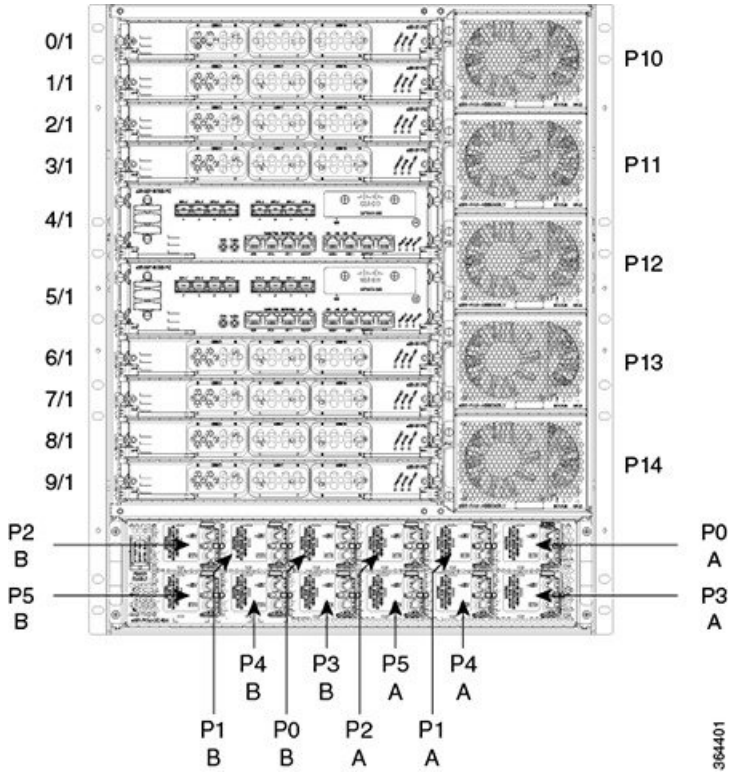


Table 3: Logical Slot Numbering on the Cisco cBR-8 Router

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
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)

Variable	Component	Description	Valid Range/Values
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 159
	Interface card (upstream)	RF channel number on the interface card.	0 to 11
	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	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.
SSI PIC	Provides the physical interface to the facility for the SSI Cards.
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.

Hardware Module	Function Description
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	8 in the front of chassis on a 1.48” pitch
SSI PIC Slots	8 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.

Module	Maximum Weight
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
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”

Module	Envelope Size (width x height x depth)
DC Power Supply Module	4.00” x 1.60 x 16.94”
Power Cassette Module	17.3" x 3.7" X 16.9"

Supervisor

Cisco cBR-8 Converged Cable Access Router Supervisor 160G

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, egress packet buffering, queueing, and egress packet scheduling functions. The FP complex supports Network Address Translation (NAT), flexible pattern matching, and tunneling protocols.

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)

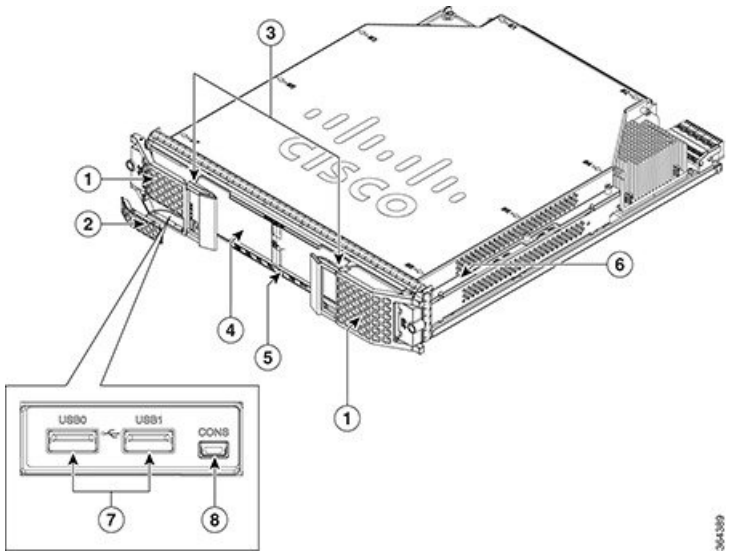
The Cisco cBR-8 supports:

- Two 160G Supervisor Cards
- Two 8x10G 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.

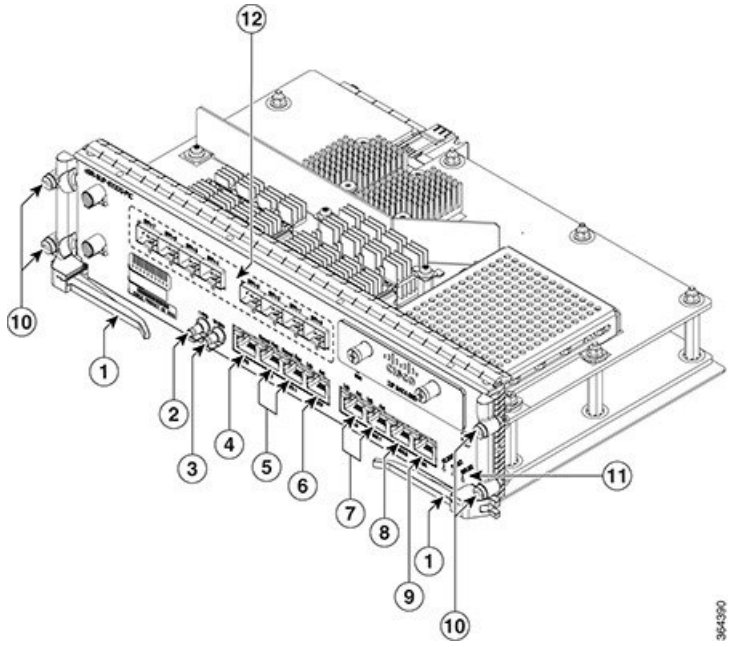
- CBR-CCAP-SUP-160G—Supervisor Card with 160 Gbps forwarding capacity. It supports a maximum of eight interface cards, working in N+1 protection mode, on the Cisco cBR-8 router.

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.
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

LED	Description
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

Cisco cBR-8 Converged Cable Access Router Supervisor 250G

The Cisco® cBR-8 Converged Cable Access Router Supervisor 250G perform the data forwarding and routing processing functions of carrier-class and high performance cBR-8 Converged Cable Access Router. Not only does the supervisor provide advanced routing capabilities, but it also monitors and manages other components in the Cisco® cBR-8 Converged Cable Access Router. The supervisor consists of two FRU (Field Replaceable Unit): Supervisor and Supervisor PIC (Physical Interface Card). Supervisor PIC card has all the physical interface ports and related PHY component on board.

As the management processor for the Cisco® cBR-8 Converged Cable Access Router, the supervisor also performs the following management functions: chassis management including activation and initialization of the other cards, selection/switchover of active vs. standby cards, image management and distribution, logging facilities, distribution of user configuration information, monitor and manage the power and temperature of system components such as line cards, power supplies, and fans, provide out-of-band system console and auxiliary ports, USB, and Ethernet ports for router configuration and maintenance etc. Supervisor works together with SUP PIC offering below main features:

- Provides up to 250Gbps Downstream and Upstream aggregated forwarding capacity
- Flexible data path interconnection between active and standby supervisors to support a total of 2x100G worth of active-active backhaul bandwidth
- Integrate full range of industry-leading Cisco IOS® Software features and services
- SSD memory (240G) for syslog/debug information/image/package storage
- Run with the modular Cisco IOS XE Software for the Cisco® cBR-8 Converged Cable Access Router
- Provide 1+1 redundant-supervisor support
- Two Integrated 1x100G NSI (Network Side Interface) backhaul interfaces on Supervisor PIC. The interface can support either QSFP28 or QSFP+ module
- Two RJ45 GE network management ports are hardware capable of supporting Synchronous Ethernet
- High Availability: 1+1 active/active NSI or iNSI interface redundancy, 1+1 DTI client (PIC) redundancy, 1+1 network timing redundancy (DOCSIS, PTP, Synchronous Ethernet)
- Offer field-replaceable and hot-swappable capabilities to help ensure minimal service disruption

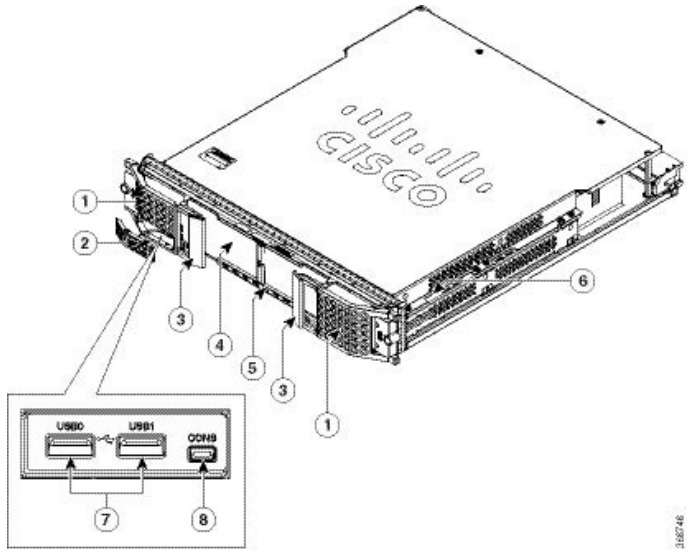
The Cisco cBR-8 supports:

- Two 250G Supervisor Cards
- Two 2x100G 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 12: 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 13: Physical Specifications of the Supervisor Card

Unit	Value
Depth	19.98 in (50.7 cm)
Width	16.27 in (41.3 cm)
Height	2.82 in (7.16 cm)
Maximum weight	26 lb (11.8 kg)

Table 14: 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.

Port	Description
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:

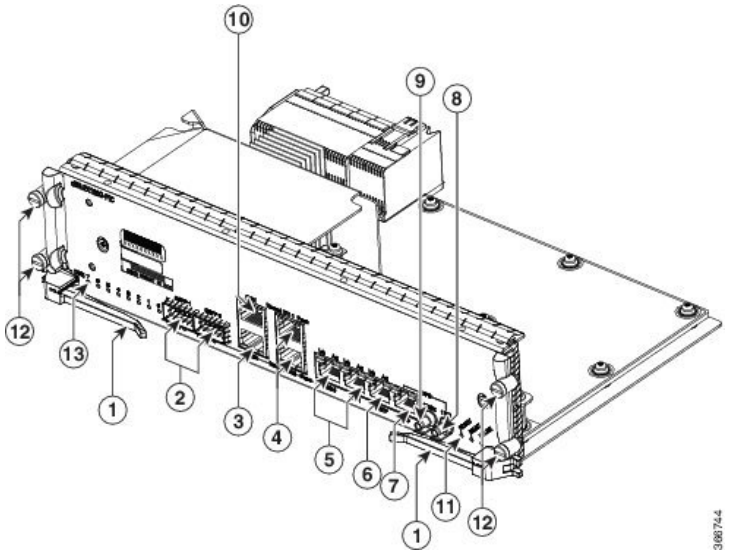
LED	Description
PWR STAT	Power status LED
RP STAT	RP status LED
RP ACT	RP active LED
FP STAT	FP status LED
FP ACT	FP active LED
INSI ACT	iNSI active LED
ALRM	Alarm LED
RPLC	Replace LED

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 13: Supervisor PIC



1	Ejector lever	8	Timing port (1 PPS)
2	QSFP ports	9	Timing port (10 MHz)
3	Auxiliary port	10	Console port
4	DTI ports	11	LEDs
5	NME ports	12	Captive screws
6	CM/DTP port	13	10G LED
7	TOD port		

Table 15: Physical Specifications of the Supervisor PIC

Unit	Value
Depth	8.1 in (20.6 cm)
Width	11.79 in (29.9 cm)
Height	2.82 in (7.16 cm)
Maximum weight	3.44 lb (1.56 kg)

Table 16: Ports on the Supervisor PIC

Port	Description
QSFP ports	The Supervisor PIC has two QSFP 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.
TOD port	The Supervisor PIC has a Time of Date (ToD) port.
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.
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

LED	Description
SSD	SSD access status LED
CM/DTP Lnk	Reserved for future use
CM/DTP Act	Reserved for future use

Interface Cards

The Subscriber Side Interface (SSI) card (line card) provides the DOCSIS MAC/PHY or DOCSIS MAC function in the Cisco cBR router.

The front of the 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, DOCSIS MAC or DOCSIS MAC/PHY line card)—Provides the service side functionality such as DOCSIS, Edge QAM, EPON, or other service blades.
- RF Through PIC or Digital Through PIC—Connects to the interface line card. This PIC provides the physical interface to the facility for the line card.
- RF Protect PIC or Digital Protect PIC—Provides connection of the redundant line card to the appropriate Through PIC.

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.

PIC Blank

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

Protect Zone

To configure N+1 RF redundancy, the interface line card installed in the uppermost slot is configured as the Protect line card with the Protect PIC installed in the corresponding PIC slot. The working line cards and the 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 Protect PIC card at the top with a set of 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 Protect PIC installed in the corresponding PIC slot in the rear of the chassis.

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

DOCSIS MAC/PHY Cards

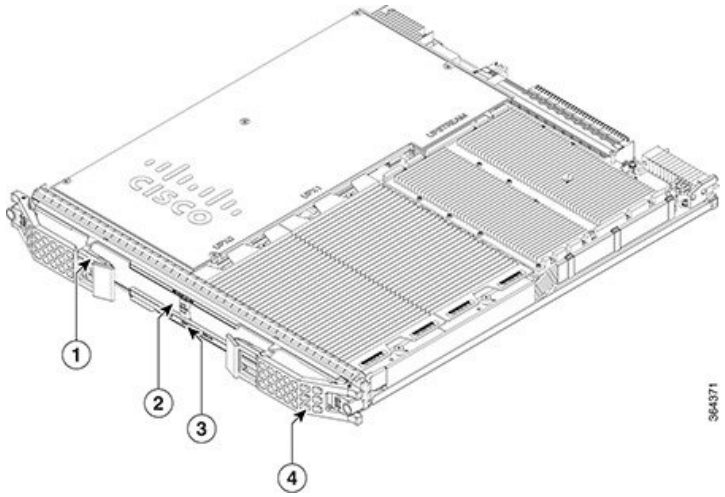
A DOCSIS MAC/PHY line card is paired with an RF Physical Interface Card (RF Through PIC or RF Protect PIC).

RF Interface Line Cards

The Cisco cBR chassis supports the following RF Interface Line Cards:

- DOCSIS MAC/PHY SSI Card with two downstream D3.1 modules and one upstream D3.1 module installed. [PID: CBR-LC-8D31-16U31]
- DOCSIS MAC/PHY SSI Card with one downstream D3.1 modules and one upstream D3.1 module installed. [PID: CBR-LC-4D31-16U31]
- DOCSIS MAC/PHY SSI Card with two downstream D3.0 modules and one upstream D3.0 module installed. [PID: CBR-LC-8D30-16U30]

Figure 14: RF Interface Line Card



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

Table 17: 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 18: 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 PHY 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.

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]

Note Cisco IOS XE Gibraltar 16.12.x and later releases do not support downstream D3.0 module. [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.

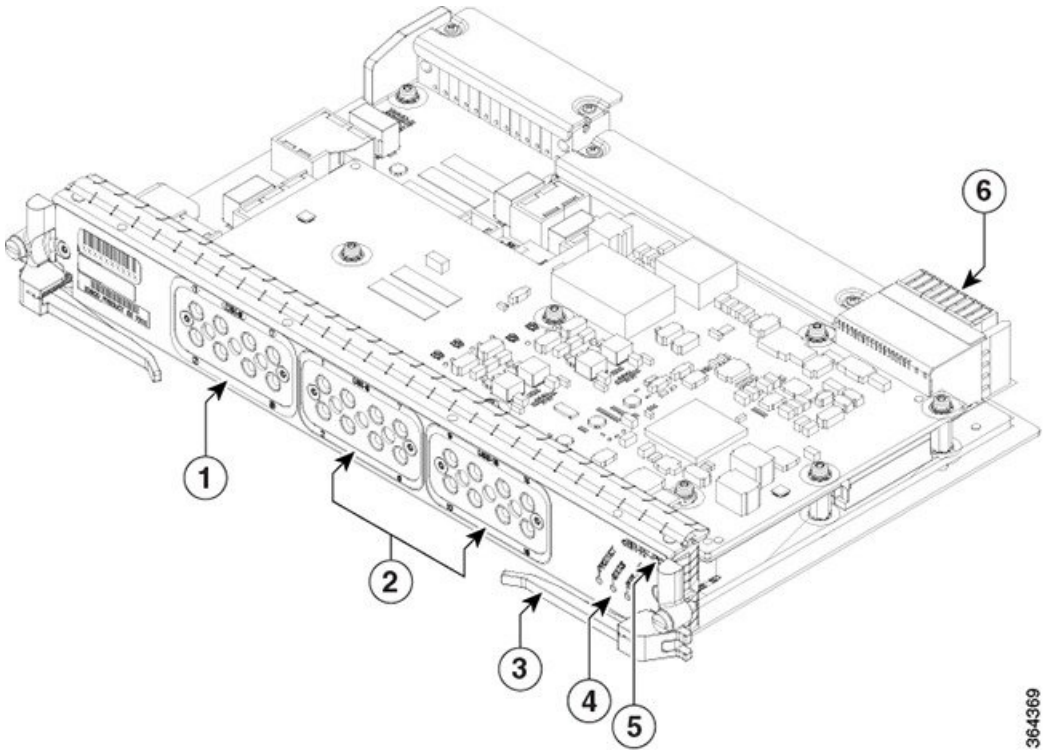
The RF PICs support the PHY and RF interface connections for the interface line cards. The following are the two types of RF PICs used in the Cisco cBR chassis:

- 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 DOCSIS MAC/PHY line card.

Figure 15: 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 19: Physical Specifications of the RF PICs

Unit	Value
Depth	7.8 in (19.8 cm)
Width	11.8 in (30 cm)
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 50-1200 MHz RF connector ports that provide downstream channel connectivity.

Ports	Description
US0 to US7 and US8 to US15	The RF Through PIC has sixteen 5-204 MHz RF connector ports that provide upstream channel connectivity.

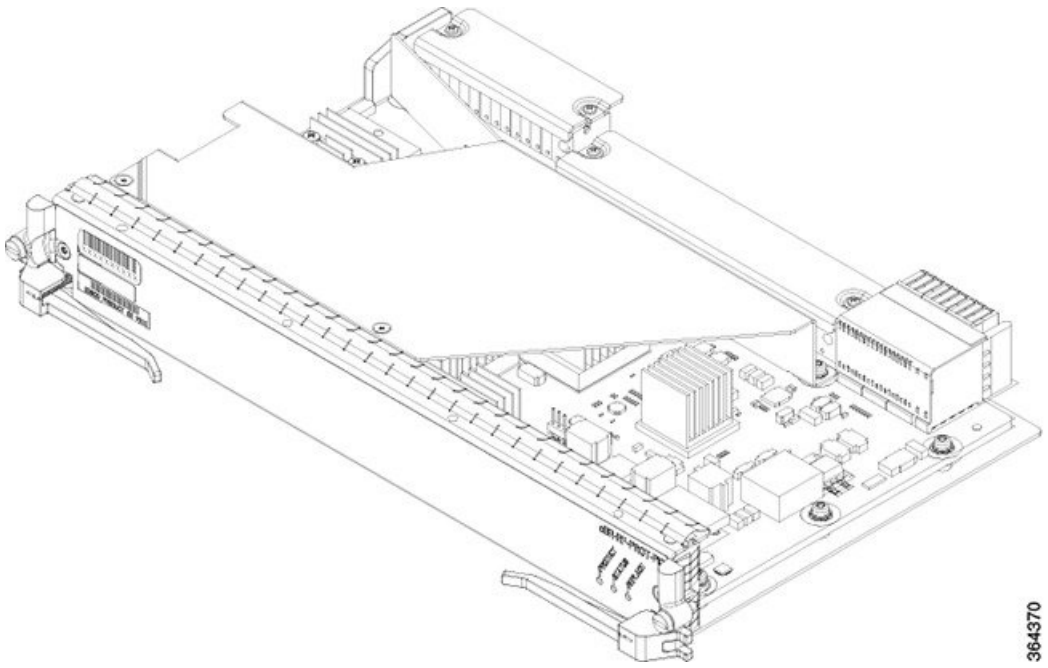
The RF PICs have the following LEDs:

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 16: RF Protect PIC



DOCSIS MAC Cards

A DOCSIS MAC line card is paired with an Digital Interface Card (DPIC).

Digital Interface Line Cards

The Cisco cBR chassis supports the following Digital Interface Line Cards:

- DOCSIS MAC SSI Card (40Gbps). [PID: CBR-CCAP-LC-40G-R]

- DOCSIS MAC SSI Card (80Gbps). [PID: CBR-CCAP-LC-G2-R]

Digital PICs

The Cisco Digital Physical Interface Card (DPIC) is used to connect a cBR-8 DOCSIS MAC Line card to an external Remote PHY Node Device (RPD) or Remote PHY Shelf product.

The DPIC is installed in the cBR-8 and connects to a RPD node/shelf via Metro Ethernet. It supports both downstream and upstream traffic.

The Cisco cBR chassis supports the following Digital PICs:

- cBR CCAP Digital Through PIC. [PID: cBR-DPIC-8X10G]
- cBR-8 2x100G Digital Physical Interface Card. [PID: cBR-DPIC-2X100G]

cBR CCAP Digital Through PIC

Table 20: Physical Specifications of the DPIC

Unit	Dimensions
Width	10.96 in (27.8cm)
Height	1.43 in (3.6cm)
Depth	7.32 in (18.6cm) with handle
Weight	2.943lb (1.335kg)

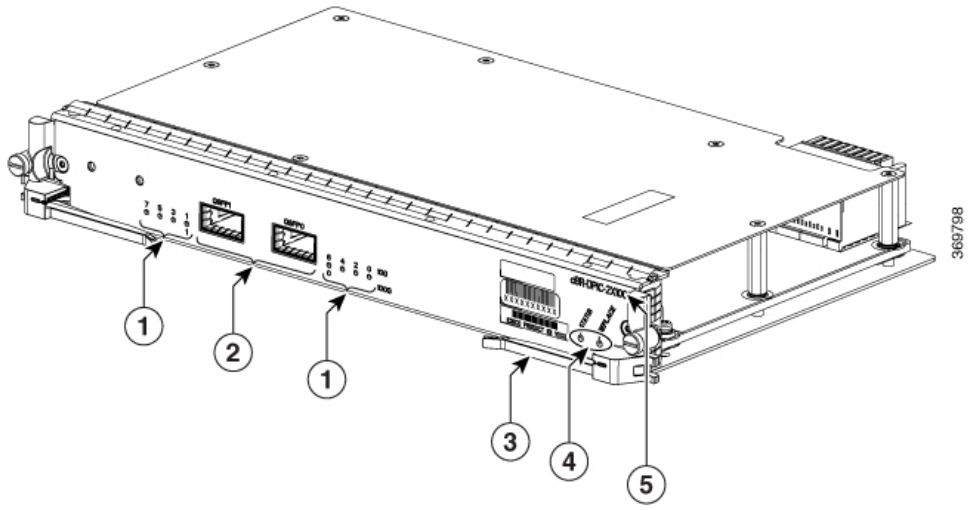
The DPIC supports:

- Eight ten gigabit Ethernet SFP+ interfaces
- 80 gigabit non-blocking switching architecture with 40+40 protection scheme
- Cisco SFP-10G-SR-S/Cisco SFP-10G-LR-S/Cisco SFP-10G-ZR-S/Cisco SFP-10G-ER-S/SFP-10G-AOC3M= optic modules
- MACSec and 1588 TC

The faceplate of the Cisco DPIC has the following:

- Optic Cable Clip—Helps route and manage the optic cables.
- 8 x SFP+ ports—Used as 8 x 10GE lanes for DOCSIS traffic to the Cisco RPDs.
- 10GE Link Status LED—Indicates the status of the 10GE link.
- Status LED—Indicates the status of the Cisco DPIC.
- Replace LED—Indicates the Cisco DPIC must be replaced.

cBR-8 2x100G Digital Physical Interface Card



1	Link LEDs	4	LEDs
2	QSFP Ports	5	Product Identifier (PID)
3	Plastic latch		

Table 21: Physical Specifications of the 2x100G DPIC

Unit	Dimensions
Width	10.96 in (27.8cm)
Height	1.43 in (3.6cm)
Depth	7.32 in (18.6cm) with handle
Weight	2.943lb (1.335kg)

The 2x100G DPIC supports:

- Two hundred gigabit Ethernet QSFP interfaces
- 100GE and 10GE working modes
- At least two 4x10G interfaces via breakout cables
- 1x100G + 1x100G interfaces with link layer redundancy
- QSFP-100GE-LR/QSFP-100GE-SR/QSFP-100GE-SM-SR/QSFP-40G-LR (4x10G mode) /QSFP-40G-SR (4x10G mode) /QSFP-4X10G-AOCxM (4x10G mode) optic modules
- Backward compatible with SUP-60, SUP-160 and SUP-250

The faceplate of the 2x100G DPIC has the following:

- Optic Cable Clip—Helps route and manage the optic cables.
- 2x QSFP ports—Used as 1 x 100GE or 8 x 10GE interfaces.

- Link Status LED—Indicates the status of the link. QSFP0 port is mapped to LED 0,2,4,6 if it works in 10GE mode and mapped to LED 0 if works in 100GE mode. QSFP1 port is mapped to LED 1,3,5,7 if it works in 10GE mode and mapped to LED 1 if works in 100GE mode.
- Status LED—Indicates the status of the 2x100G DPIC.
- Replace LED—Indicates the 2x100G DPIC must be replaced.

Note If the QSFP-100G-SM-SR module is used in the DPIC 100G card, the cBR-8 router chassis ambient temperature must be limited to 50ºC at sea level.

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.

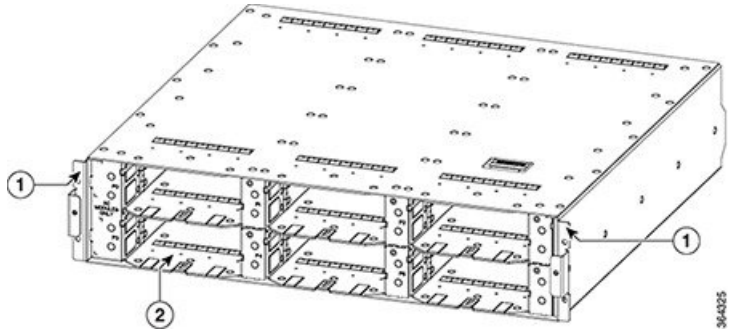
- For the AC-powered Cisco cBR with 1+1 redundancy, the chassis must have six operational AC Power Modules to be functional.

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.

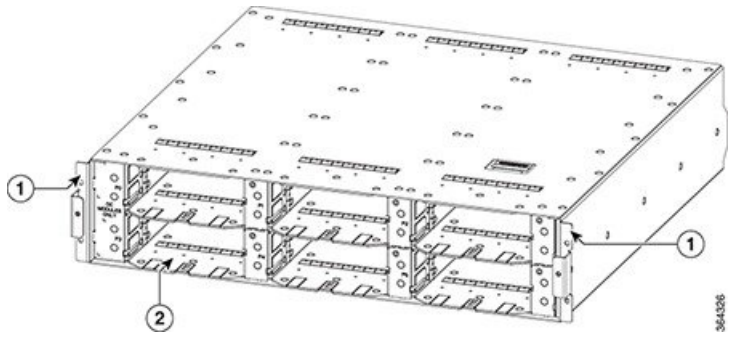
This module is installed in the front of the Cisco cBR chassis.

Figure 17: AC Power Cassette Module



1	Mounting flange	2	AC Power Module bay

Figure 18: DC Power Cassette Module



1	Mounting flange	2	DC Power Module bay

Table 22: 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)

Unit	Value
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.

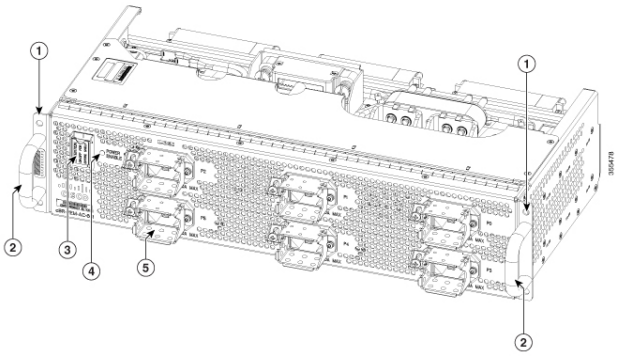
FPEM

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 19: AC FPEM

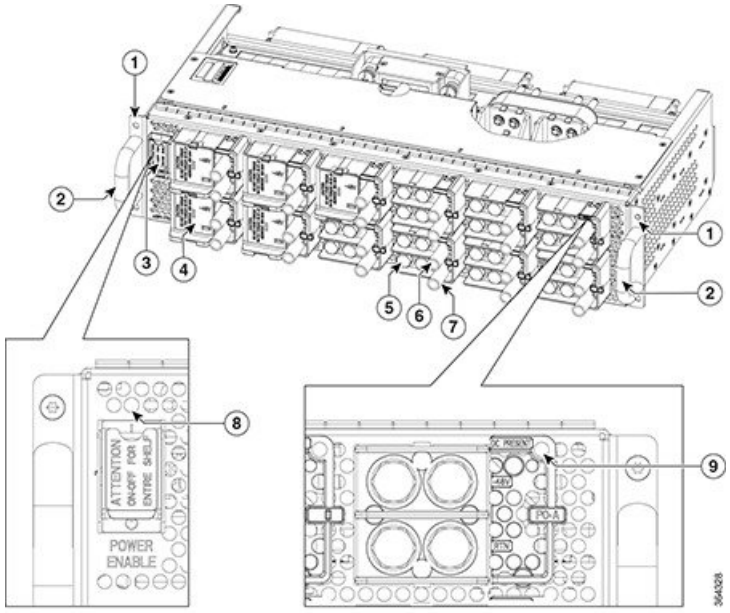


Note Starting from April, 2018, Cisco ships the cBR8 router with AC FPEM VER 02 with no AC PRESENT LEDs as shown in the figure. VER 01 of AC FPEM has P0 AC PRESENT through P5 AC PRESENT that indicates input AC power for the corresponding AC Power Module (also indicated on the front-side of the Power Module).

1	Mounting flange	4	Power Enable LED
2	Handle	5	AC power input connector

3	Power switch		

Figure 20: 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 23: Physical Specifications of the FPEM

Unit	Value
AC 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)
DC 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)

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

The AC FPEM has the following LED:

- POWER ENABLE—Power status LED

The DC FPEM has the following LEDs:

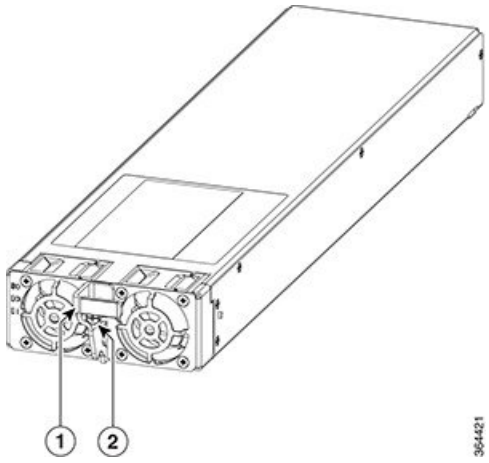
- POWER ENABLE—Power status LED
- DC PRESENT—Input DC power status LED for each terminal block

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.

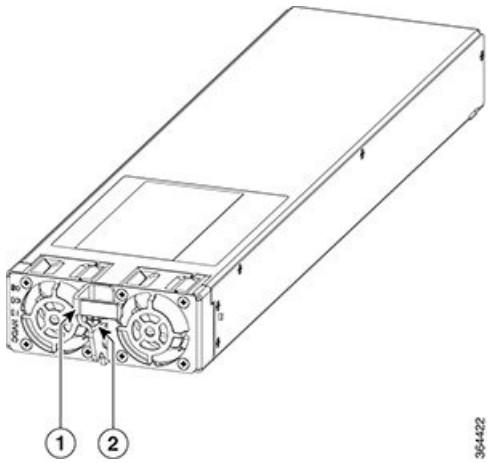
The Power Modules are installed in the front of the Cisco cBR chassis.

Figure 21: AC Power Module



1	Handle	2	Screw

Figure 22: DC Power Module



1	Handle	2	Screw

Table 24: 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)

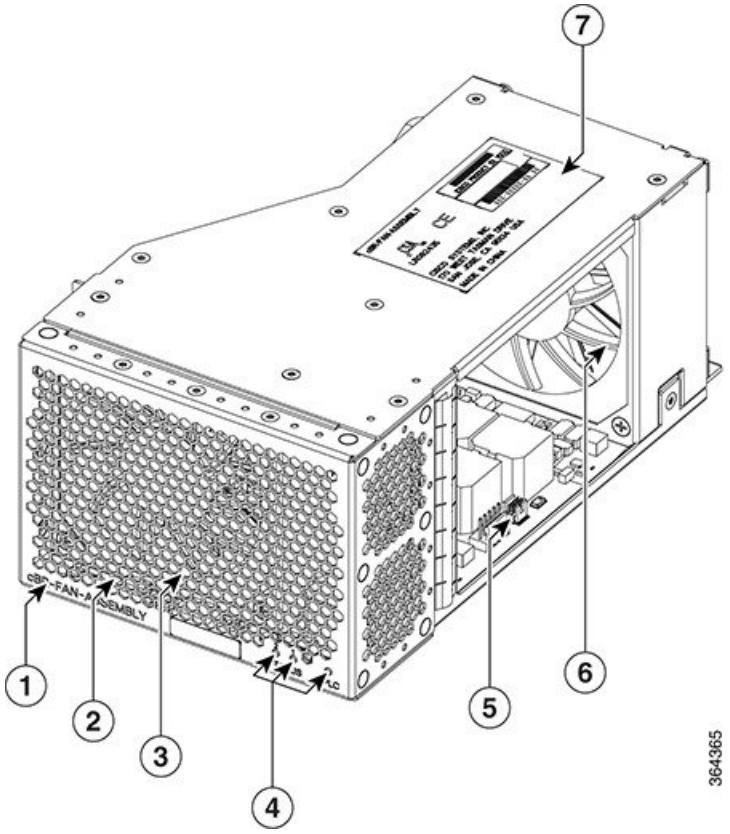
Both AC and DC Power Modules have the following LEDs:

- 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 23: 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.

Warning 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 25: 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. It removes dust in the air that is drawn into the router by the cooling fans. We recommend that you examine the air filter at least once a month or more often if required. Do not clean and re-use air filters. They must be replaced 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 26: 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
Power Module Blanks (for empty Power Module bays)	CBR-PS-BLANK
Fan Module	CBR-FAN-ASSEMBLY
Chassis Installation Handle (optional)	CBR-CHASSI-HANDLE=

Table 27: Ordering Information for Cisco cBR-8 Router Supervisor

Product Description	Part Number
Cisco cBR-8 Supervisor Modules	
Supervisor for cBR series -250G	CBR-SUP-250G
Supervisor for cBR series -250G, SPARE	CBR-SUP-250G=
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

Product Description	Part Number
Supervisor with 60G forwarding capability. It does not have the DC board. It ships with 48 GB of memory.	CBR-CCAP-SUP-60G
Supervisor 250 PIC, 2x100GE, 10GE with breakout cables	CBR-2X100G-PIC
Supervisor 250 PIC, 2x100GE, 10GE with breakout cables, SPARE	CBR-2X100G-PIC=
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 SFP-10G-AOC3M=
100GBASE SR4 QSFP Transceiver, MPO, 100m over OM4 MMF	QSFP-100G-SR4-S
100GBASE LR4 QSFP Transceiver, LC, 10km over SMF	QSFP-100G-LR4-S
100GBASE QSFP Transceiver, 40 km reach over SMF, Duplex LC	QSFP-100G-ER4L-S
40GBASE-SR4 QSFP Transceiver Module with MPO Connector	QSFP-40G-SR4
QSFP 4x10G Transceiver Module, SM MPO, 10KM, Enterprise-Class	QSFP-4X10G-LR-S
100GBASE CWDM4 Lite QSFP Transceiver, 2km over SMF, 10-60C	QSFP-100G-SM-SR
Cisco 40GBase-AOC QSFP to 4 SFP+ Active Optical breakout Cable, 5-meter	QSFP-4X10G-AOC5M
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 28: Ordering Information for Cisco cBR-8 Router Interface and Modules

Product Description	Part Number
Cisco cBR-8 CCAP line cards	
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
The cBR CCAP line card with no Downstream or Upstream modules.	CBR-CCAP-LC-40G-R
The cBR CCAP second generation Remote PHY Line Card.	CBR-CCAP-LC-G2-R
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 CCAP Digital Through PIC	cBR-DPIC-8X10G
cBR-8 2x100G Digital Physical Interface Card	cBR-DPIC-2X100G
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=

Table 29: Ordering Information for Cisco Remote PHY Device

Product Description	URL
Cisco 1x2 RPD	http://www.cisco.com/c/en/us/products/collateral/video/cbr-series-converged-broadband-routers/datasheet-c78-738961.html
Cisco GS7000 1218-MHz 4-Port Fiber Deep Node	http://www.cisco.com/c/en/us/products/collateral/video/gs7000-node/datasheet-c78-737266.html
Cisco Smart PHY 300 and 600 Shelves	https://www.cisco.com/c/en/us/products/collateral/video/cbr-series-converged-broadband-routers/datasheet-c78-739789.html
Cisco Remote PHY Shelf 7200	https://www.cisco.com/c/en/us/products/collateral/video/cbr-series-converged-broadband-routers/datasheet-c78-741697.html

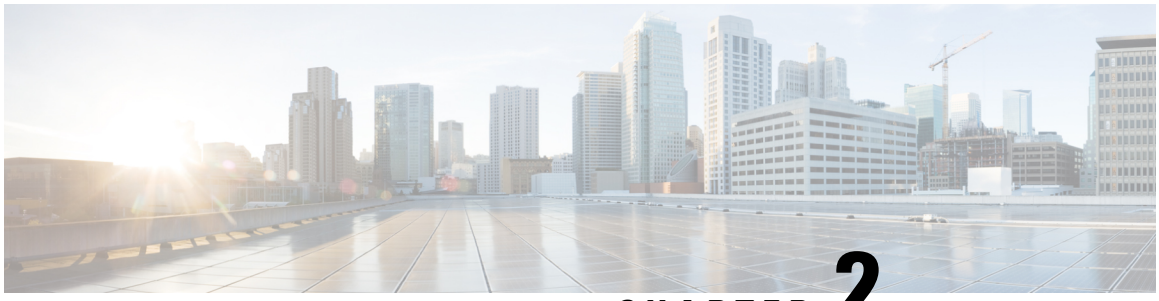
License Information

Table 30: License Information

Product Description	Part Number
Software Licenses For Cisco cBR-8 Supervisor Modules	
10G WAN license	CBR-SUP-10G-LIC
100G WAN License	CBR-SUP-100G-LIC
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
DOCSIS 3.1 Upstream Exclusive License	CBR-D31-US-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, on page 47
- Safety Instructions, on page 48
- Warning Definition, on page 48
- Preventing Electrostatic Discharge Damage, on page 49
- Plant Wiring Guidelines, on page 49
- Electrical Equipment Guidelines, on page 50
- Unpacking and Verifying Shipping Contents, on page 50
- Chassis-Lifting Guidelines, on page 51
- General Rack Installation Guidelines, on page 51
- Cabling Guidelines, on page 53

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.

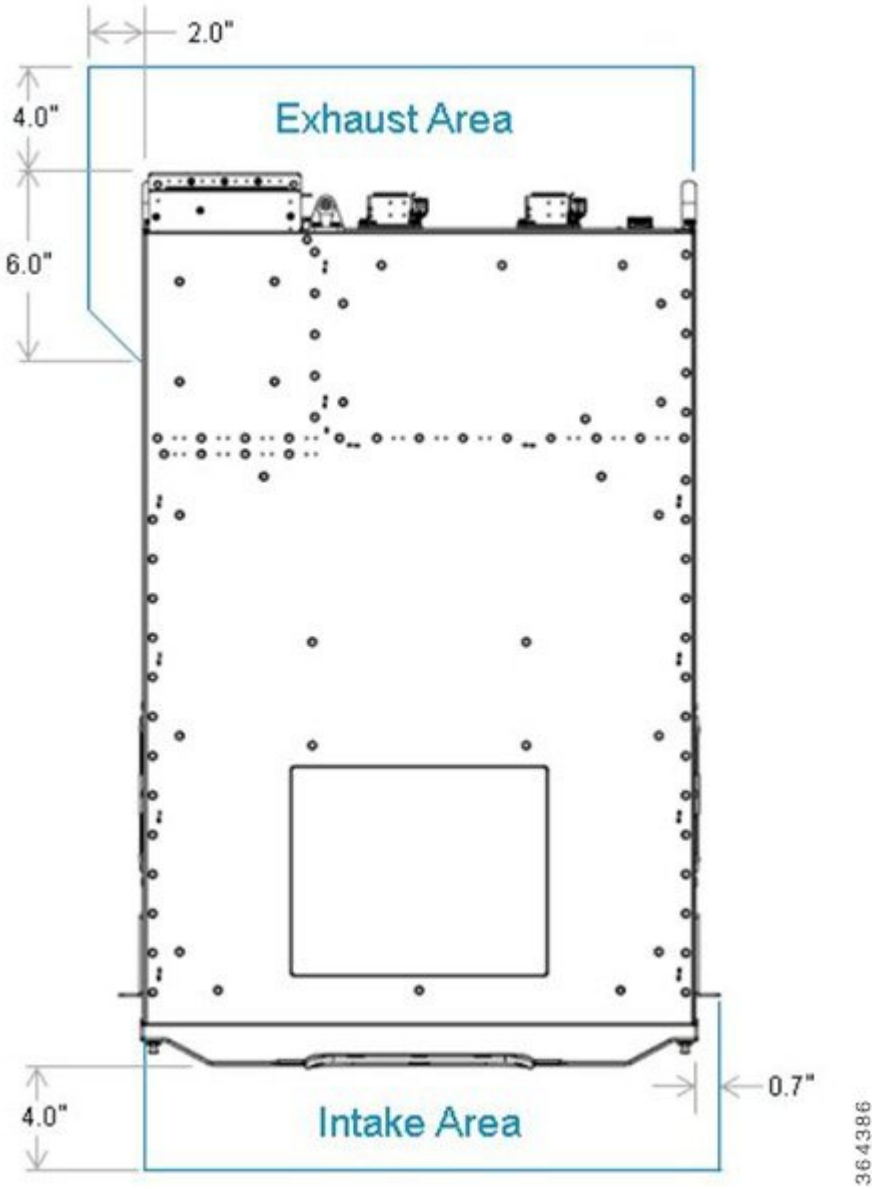
General Rack Installation Guidelines

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 24: 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

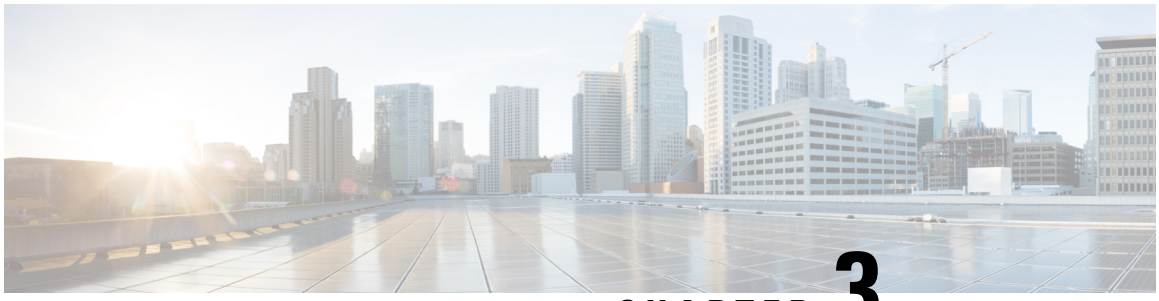
The size of your networks and the distances between connections depend on the type of signal, the signal speed, and the transmission media (the type of cabling used to transmit the signals). For example, standard coaxial cable has a greater channel capacity than twisted-pair cabling. The distance and 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, on page 55
- Verifying Rack Dimensions, on page 56
- Installing Chassis Installation Brackets, on page 56
- Attaching the Chassis Rack-Mount Brackets, on page 57
- Installing the Chassis Installation Handle (Optional), on page 59
- Installing the Cisco cBR-8 in a Rack, on page 60
- Attaching the Cable-Management Brackets, on page 65
- Attaching the Fiber or Cable Routing Guide on Chassis, on page 66
- Attaching a Chassis Ground Connection, on page 70

Installation Methods

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

Note The Cisco cBR-8 router is usually shipped fully loaded. The fully configured system weighs approximately 430 lb. You must remove the components from the chassis to make the chassis lighter for the 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 lb. For instructions on how to remove the components, see the monitoring sections.

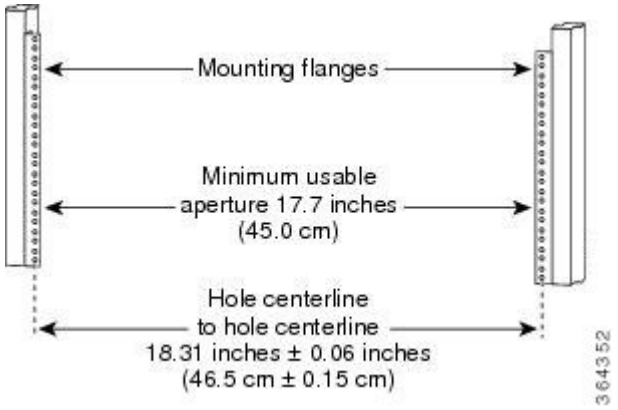
Note Make sure that you place the cards and modules in an anti-static bag until you install the chassis in the rack.

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 following figure.

Figure 25: Equipment Rack Dimensions



Step 1 Mark and measure the distance between two holes on the left and right mounting rails.

The distance must 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. These brackets are used as a support base to vertically position and set the chassis before installing the rack mount screws.

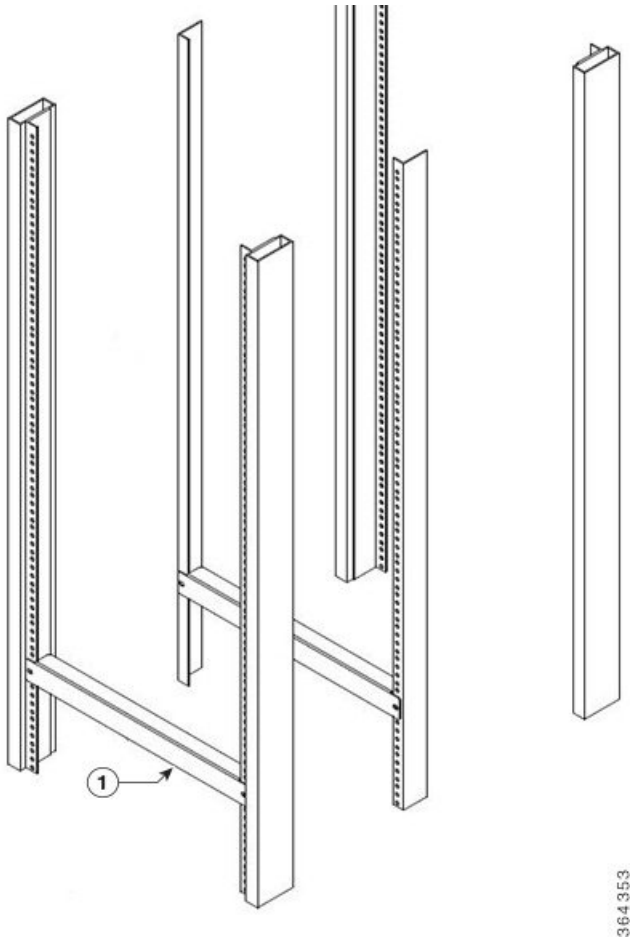
Step 1 Determine the position in the rack where you want to mount the chassis.

If you are mounting more than one chassis in the rack, start from the bottom or the center of the rack. Hold the chassis installation bracket, where the bottom of the chassis will be positioned vertically in the rack.

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

If a second internal rack rail is present which is not more than 23 inches from the front rail, position the second installation bracket to create a rear support for the chassis during installation.

Figure 26: Chassis Installation Bracket



1	Chassis Installation Bracket

Note After you install the chassis and secure it to the rack, remove the chassis installation brackets from the rack. The chassis does not need these brackets for supporting the weight, 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 After you install the chassis rack-mount brackets and mount the chassis in the rack, the rear RF cable-management brackets are installed on the chassis.

Attach the rack-mounting brackets either in the front or the middle of the chassis.

- Front Rack-Mount Bracket Installation—The chassis is shipped with the rack-mount brackets installed in 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, so that you can recess the chassis in the rack or install the chassis in a two-post rack unit.

Note If the chassis is mid-mounted, you cannot install the chassis installation handle.

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 in the front of the chassis by unscrewing the M5 undercut flat-head screws using a #2 Phillips torque screwdriver.

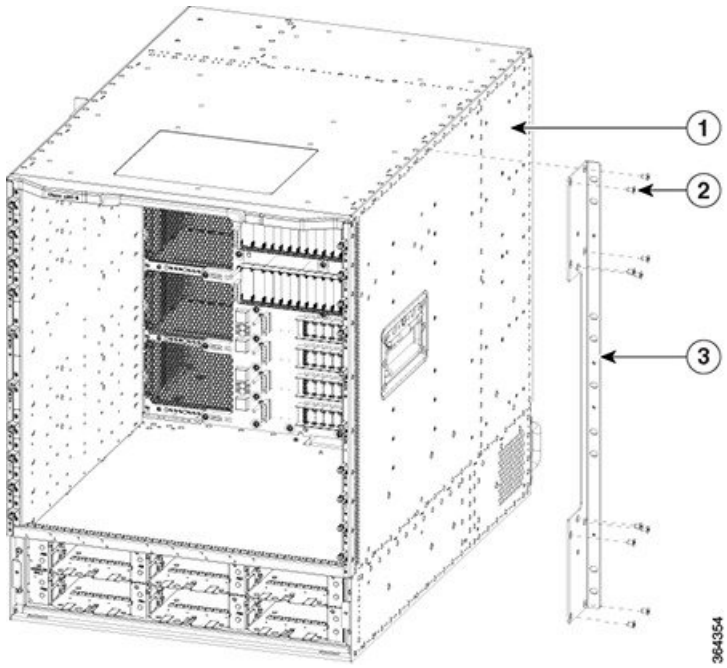
Step 2 Locate the threaded holes at the middle on the side of the chassis that align with the holes in the rack-mount bracket.

Step 3 Install the 10 M5 undercut flat-head screws to secure each rack-mounting bracket to the chassis.

Secure five screws on each end of the rack-mounting bracket.

Step 4 Repeat the steps 1, 2, and 3 on the other side of the chassis.

Figure 27: 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 must be mid-mounted in the rack.

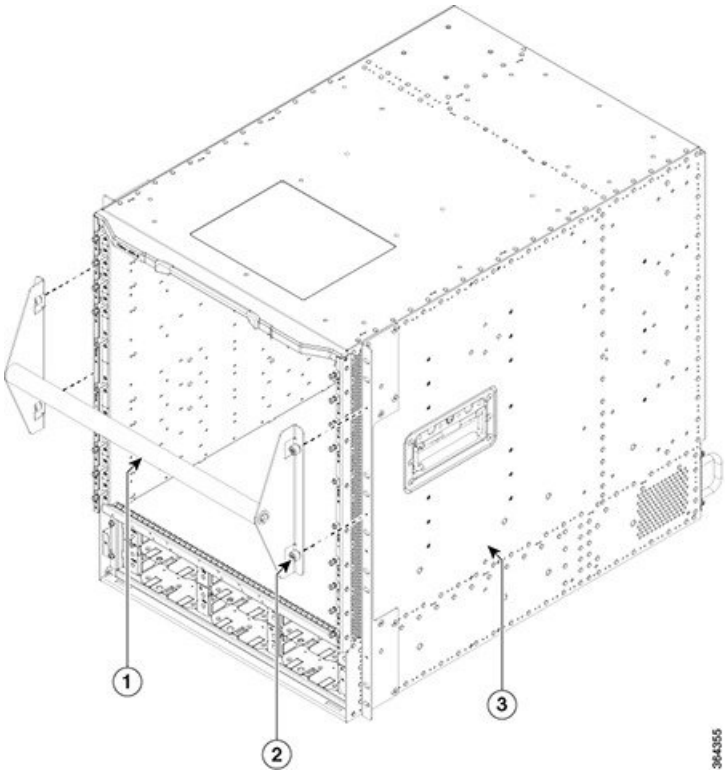
Step 1 Locate two M5 threaded holes on each chassis rack mount bracket that align with the chassis lifting handle captive screw holes.

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 28: Attaching the Chassis Installation Handles to the Cisco CBR-8 Router



1	Chassis Installation Handle	3	Chassis
2	Captive Screw		—

The rack mount brackets support both low and high installation of the handles. It facilitates 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

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 physical 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:

- If you have to mount only one unit in the rack, mount it at the bottom of 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.

Procedure

	Command or Action	Purpose
Step 1	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.

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.

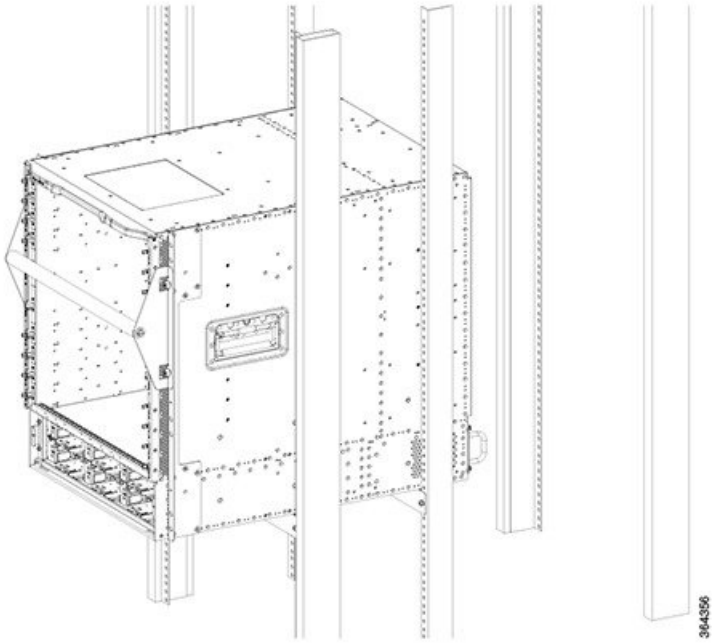
Step 2 Ensure that your path to the rack is unobstructed.

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

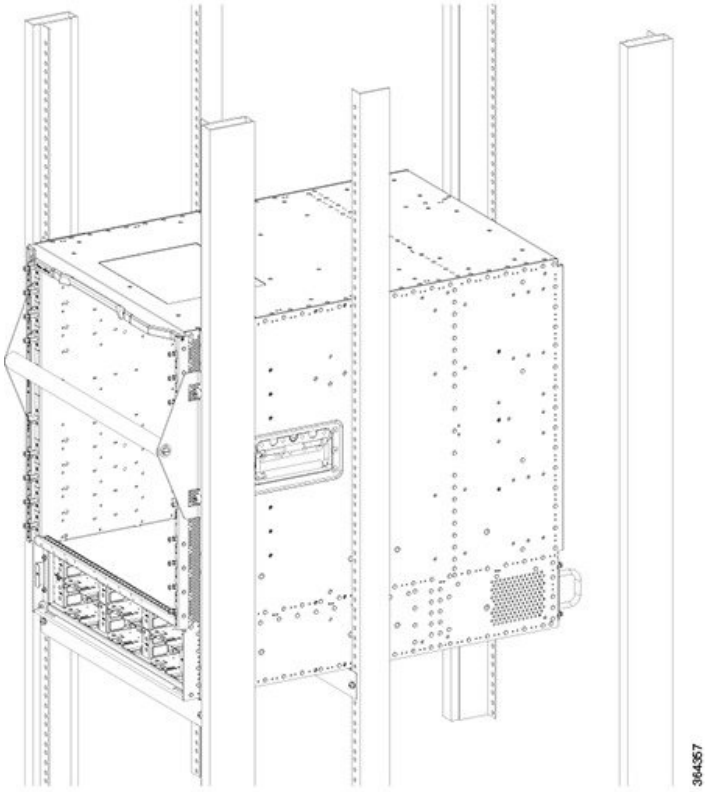
Figure 29: Lifting the Chassis into Position



Step 4 After the rear weight of the chassis is resting on the installation bracket, one person can hold it in place when the second person moves to the rear of the rack to 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 30: 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 four 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 necessary, 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

You can install the Cisco cBR chassis in a two-post 19-inch (48.26 cm) rack either as a front mount or a mid-mount.

The procedure for front mounting a chassis in a two-post rack is similar to the procedure for front mounting in a four-post rack, except that 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 physical injury, and avoid damage to the component.

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 when 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. You can also use the handles at the rear Power entry area or by placing your hands under 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.

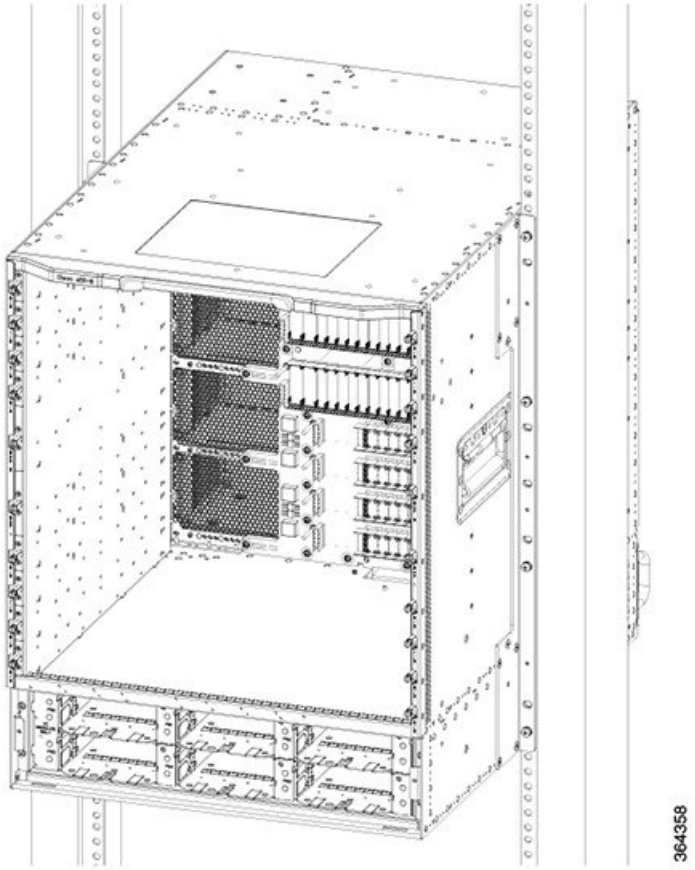
Step 6 Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

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 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 31: 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 cardslot.

Before you begin

Required Tools and Equipment

- #2 Phillips torque screwdriver

Step 1 Align the cable-management bracket captive screws to the captive nuts on the right rear side panel of the chassis.

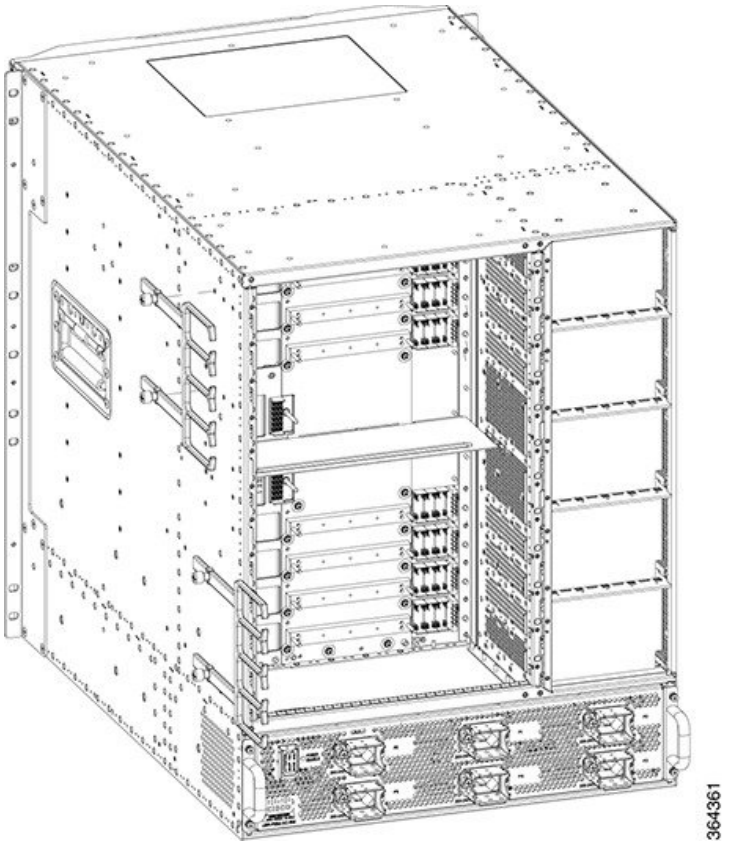
There are multiple positions that allow you to determine the position of the bracket that best suits your installation.

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-lb.

Figure 32: Installing the Cable-Management Brackets



Attaching the Fiber or Cable Routing Guide on Chassis

The fiber or cable routing accessories are made up of the following components:

- 2 strap-down clips
- 4 snap-on plastic fiber or 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 for the following purposes:

- Strap down cable bundles or conduit (there are multiple tie-down points on each strap-down clip).
- A base for two snap-on plastic fiber or cable routing guides.

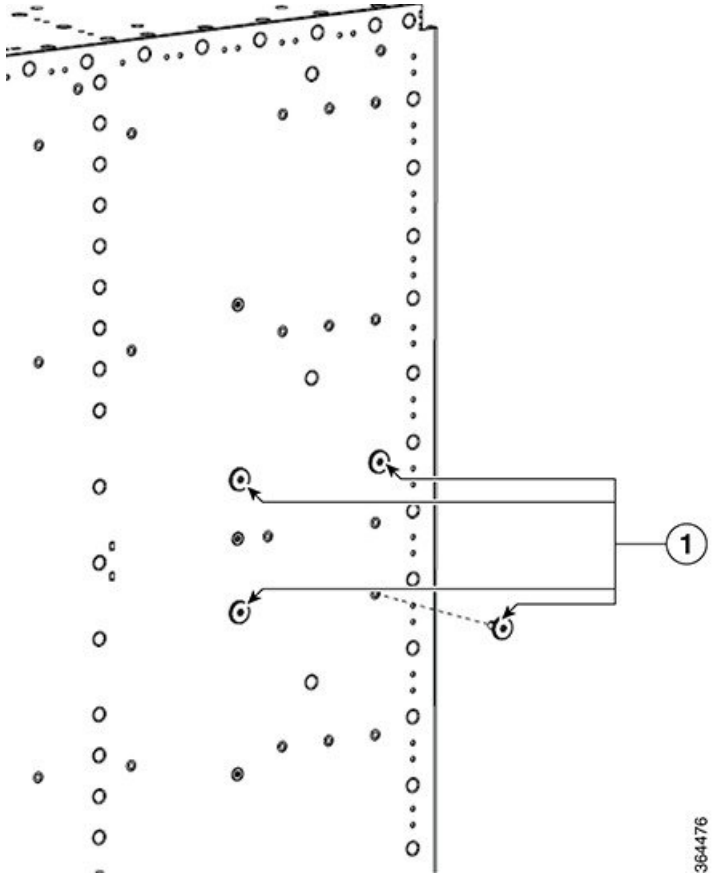
Before you begin

Required Tools and Equipment

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

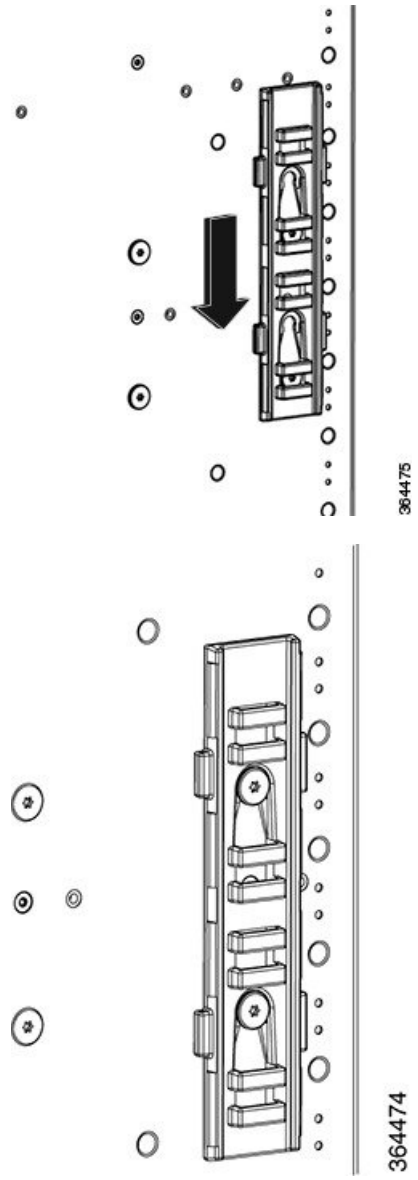
Step 1 Insert the four knurled retaining screws on the side of the chassis and tighten them using a T15 Torx driver (up to a torque of 6 to 8 in-lb).

If the screw location is not accessible for a driver, you can tighten the knurled screws by hand.



1	Knurled retaining screws		—

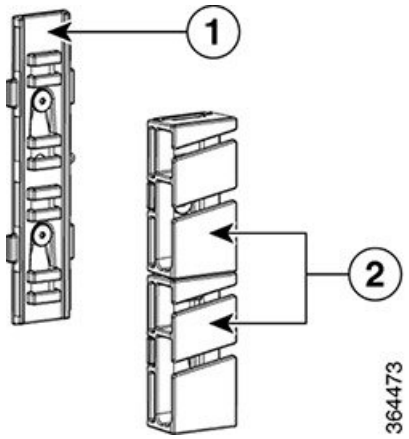
Step 2 Align the slots on the strap-down clip with the knurled screws installed on the chassis and push down until it snaps in place.



Step 3 Repeat Step 2, on page 68 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 or 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 or Cable Routing Guide

Figure 33: Chassis with Strap-Down Clips

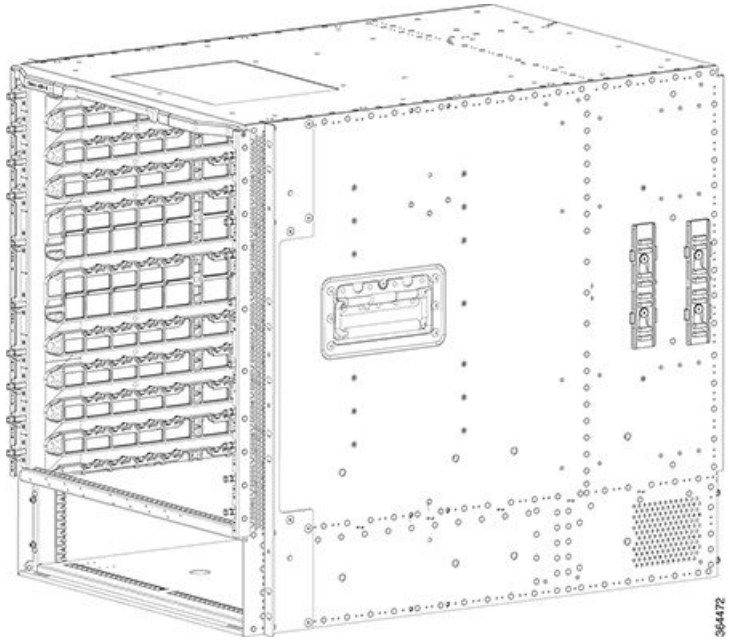
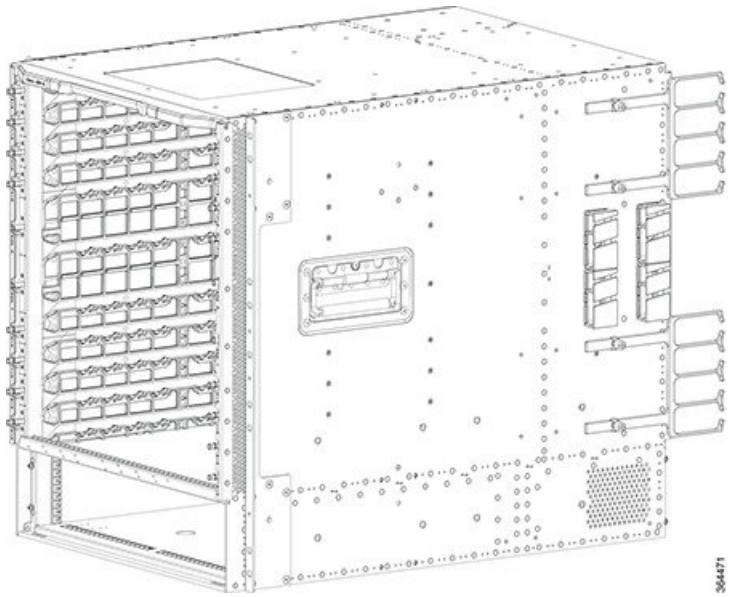


Figure 34: Chassis with Fiber or Cable Routing Guides and RF Cable Management Brackets



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 the power or turn on the power to the chassis, you must provide an adequate chassis ground (earth) connection for the chassis. A chassis ground connector is available 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 a square cone lock washer (available in the accessory kit)
- 2 hole 4-AWG dual crimp compression lug (available in the accessory kit)

- 4 or 2 AWG grounding wire—The ground wire and lug must be always as large as the input gauge. For example, to use 2 AWG for the DC inputs, the ground lug and wire must be 2 AWG or bigger.
- Crimping tool for the 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.

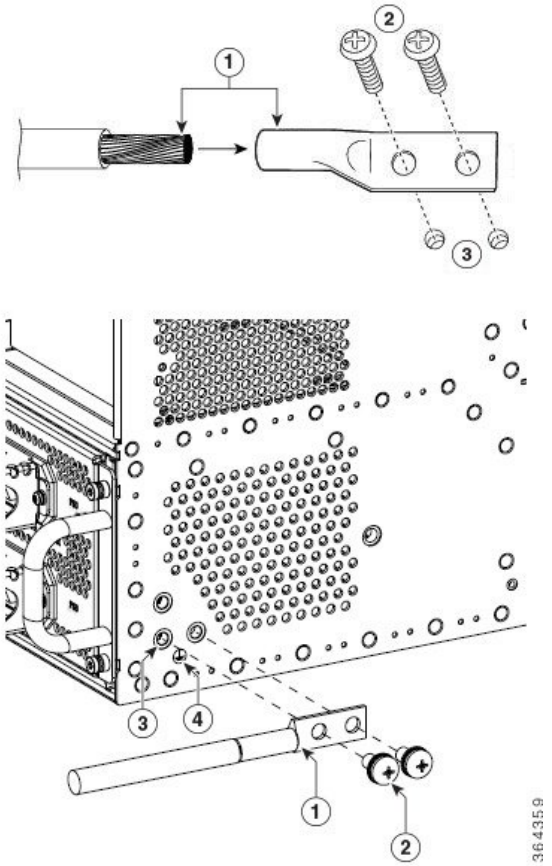
Step 4 Locate the chassis ground area on the rear lower left-side panel of your chassis.

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

Note The captive nuts are available on the rear lower left side of the chassis for attaching a two-hole ground lug. In addition, three nuts are available for attaching, so that you can mount the lug horizontally or vertically depending on the wire routing preferences.

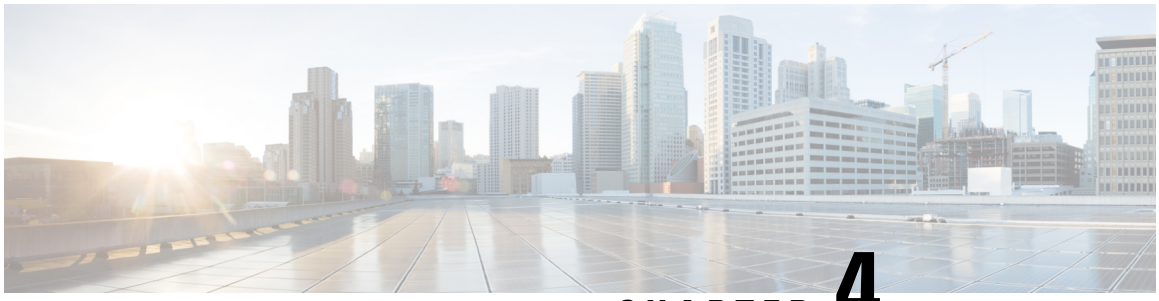
Step 6 Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

Figure 35: 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

You can mount the grounding lug horizontally (as in the figure) or vertically depending on the site preference.



CHAPTER 4

Installing the Fan Module in Cisco cBR

- Installing the Fan Module in the cBR Chassis, on page 73

Installing the Fan Module in the cBR Chassis

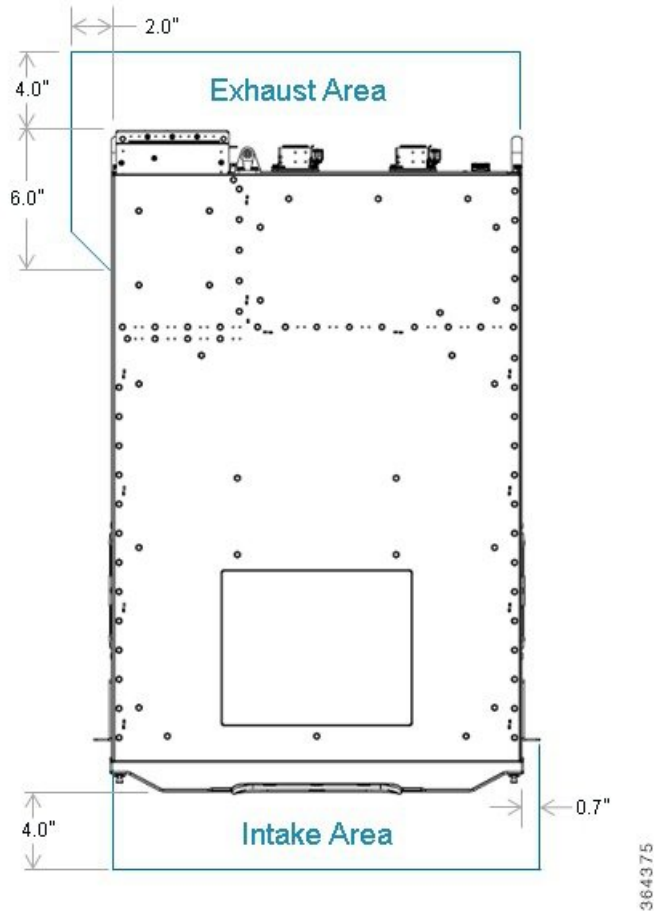
Before you begin

- 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 36: Keep-Out Areas for the Cisco cBR-8 Chassis



Restrictions

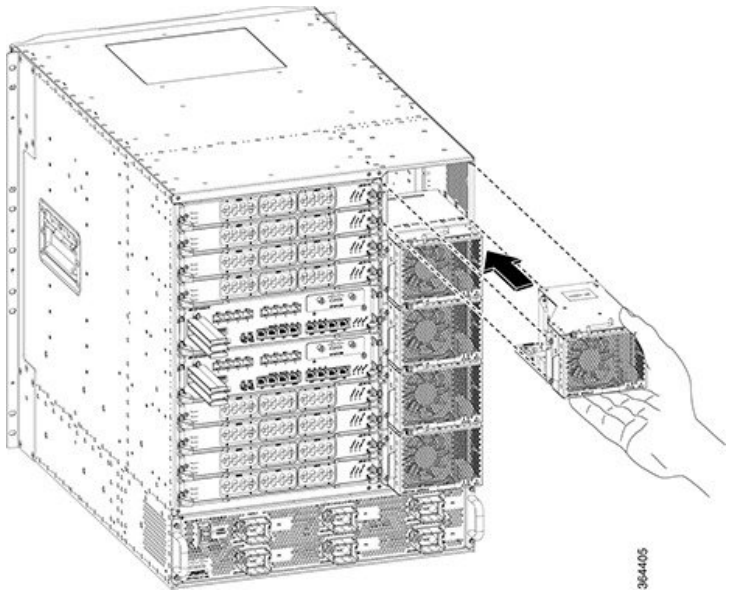
- Do not boot the chassis unless all the Fan Modules are installed.
- Only one fan module should be removed at a time for servicing or replacement.
- Do not operate the chassis with an empty fan bay even if the Supervisor Card allows it.

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 37: Aligning the Fan Module

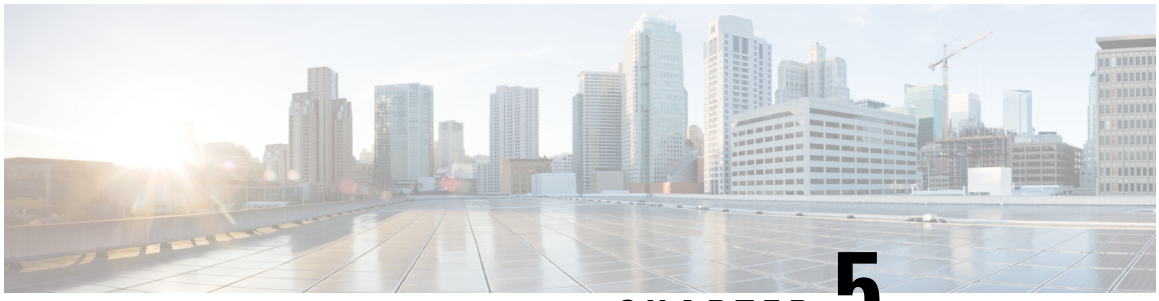


Step 2 Tighten the captive screws on front left flange of the Fan Module.

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, on page 77
- Installing the FPEM in the Cisco cBR Chassis, on page 79
- Installing the Power Module in the Cisco cBR Chassis, on page 81
- Connecting Power to the AC-Powered Cisco cBR Chassis, on page 84
- Connecting Power to the DC-Powered Cisco cBR Chassis, on page 85

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**

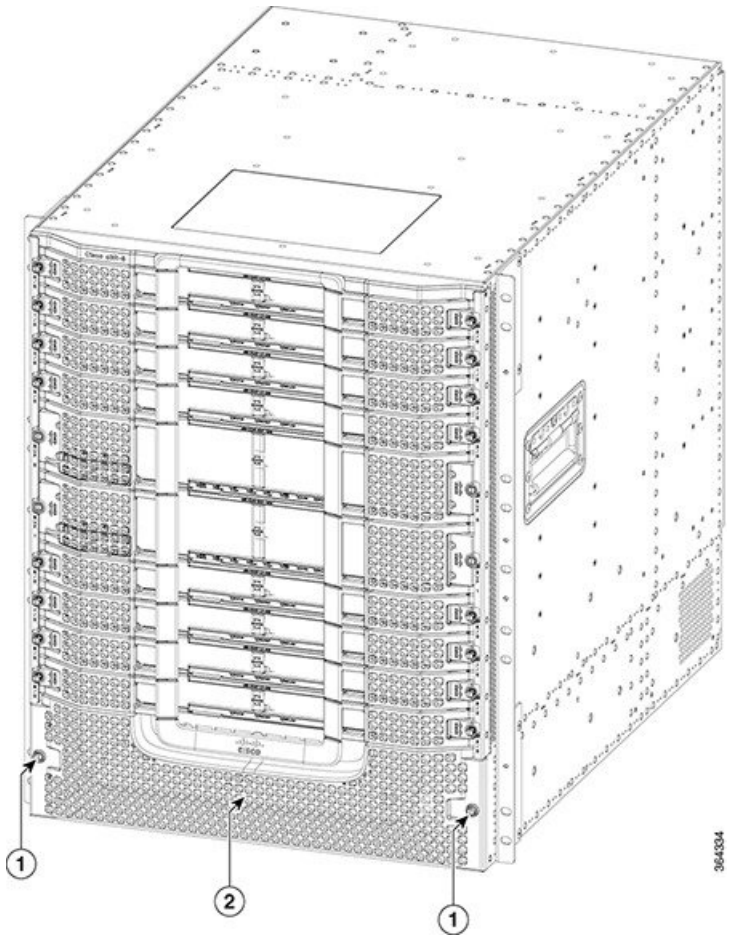
- Be aware of the weight and size of the equipment. Handle it with care.

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 38: Removing the Front Power Entry Bezel from the Chassis

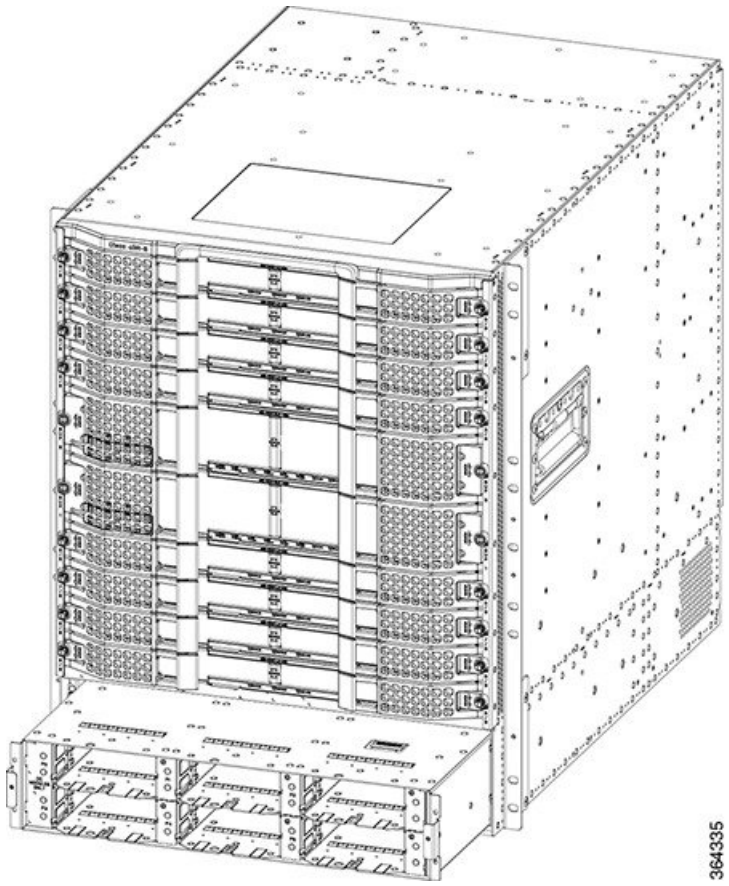


1	Screw	2	Front power entry bezel

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 39: 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 FPEM.
- 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

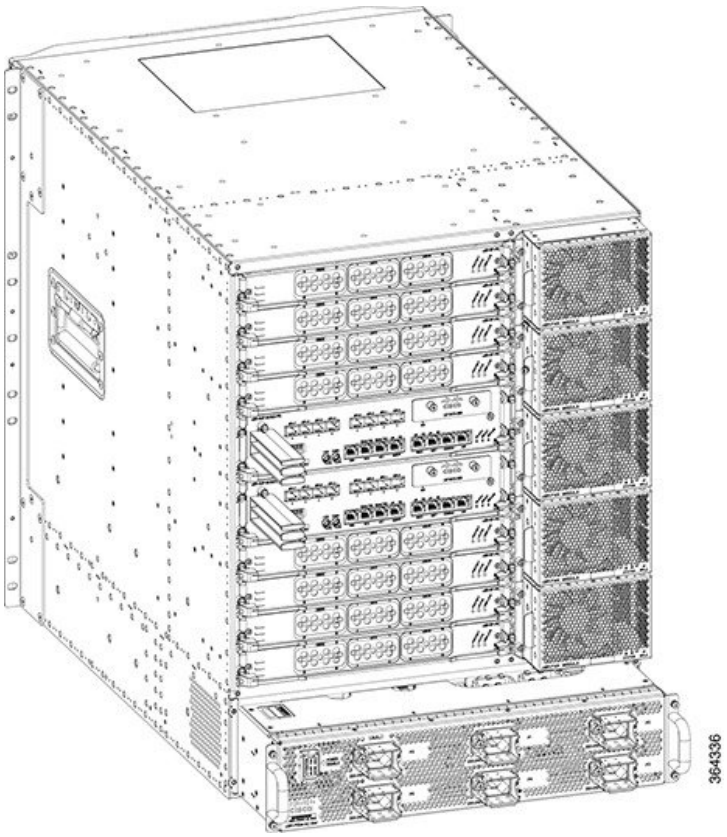
- ESD-preventive wrist strap
- AC or DC FPEM
- T10 Torx torque screwdriver

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 40: 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.

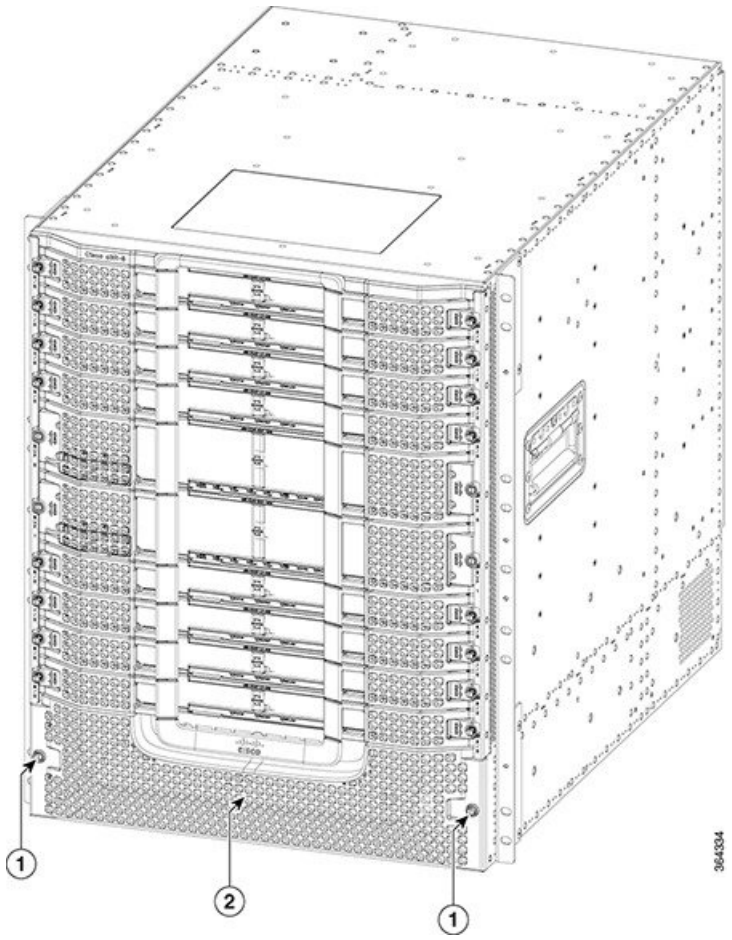
- Install the Power Cassette Module.
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the FPEM.
- Be aware of the weight and size of the equipment. Handle it with care.

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 41: Removing the Front Power Entry Bezel from the Chassis

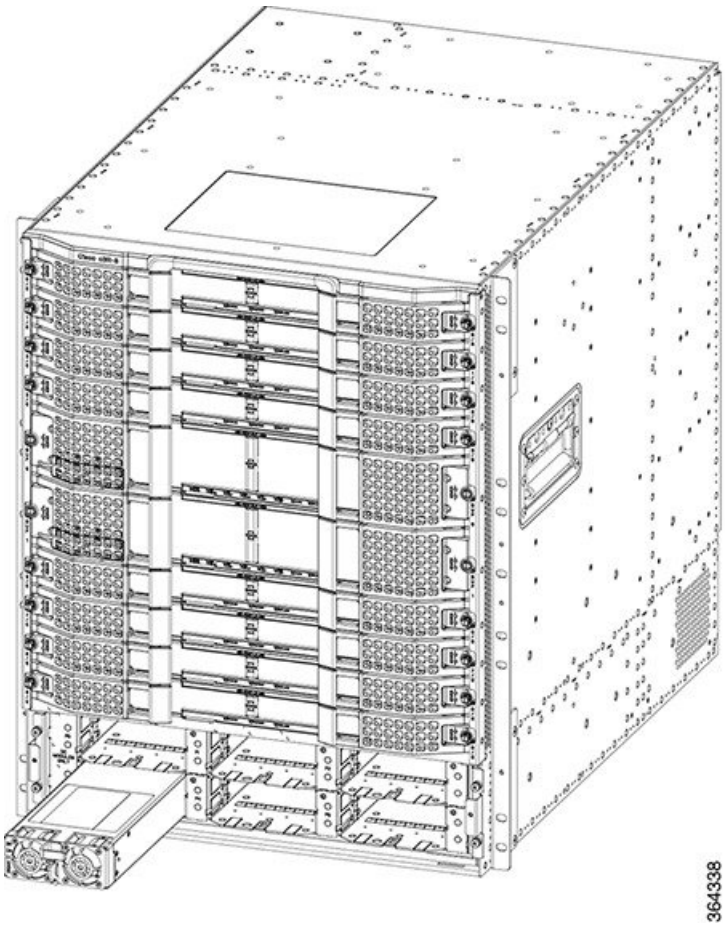


1	Screw	2	Front power entry bezel

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 42: 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 82 to Step 4, on page 83 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.

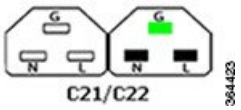
  For an DC-powered Cisco cBR chassis, connect the DC power.
- If all the interfaces and other cables are connected, power up the Cisco cBR chassis.
- Verify that the input power LED on the Power Module illuminates green.

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 FPEM.
- Install the AC Power Modules.

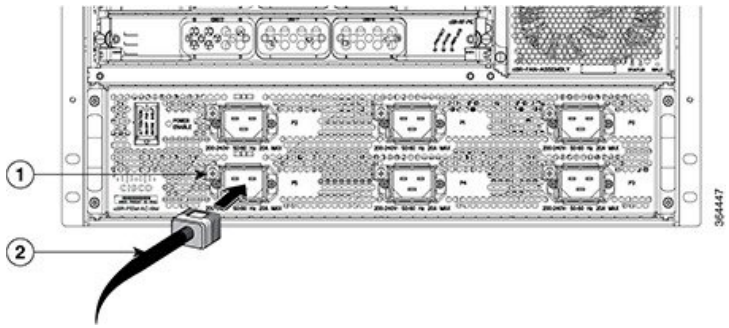
Required Tools and Equipment

- 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 43: 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 85 to Step 4, on page 85 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 31: 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 or AWG # 6	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 FPEM.
- 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

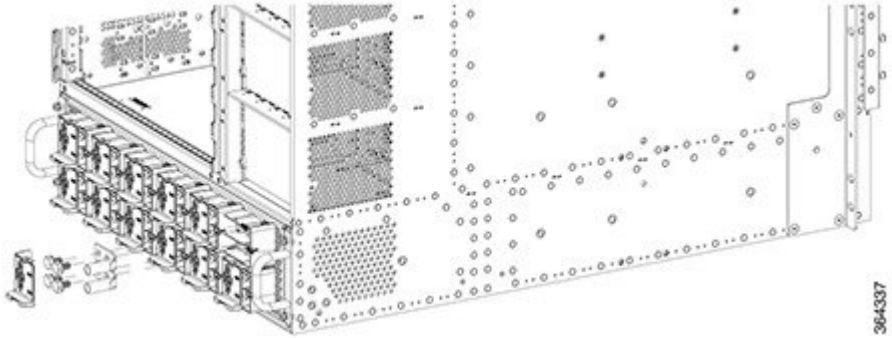
- Insulating sleeving
- Torque wrench
- 7/16" hex socket
- Lugs for the cables
- Cables for positive and negative leads
- Crimping tool

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 44: 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).

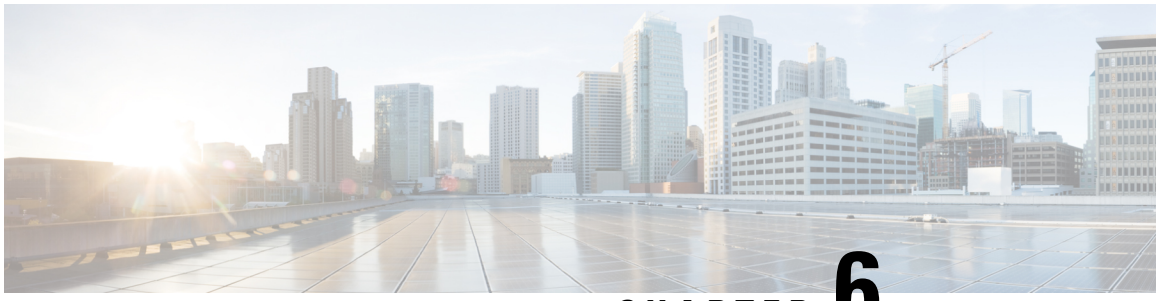
Step 6 Connect the positive lead cable and secure it in place with the 1/4-20 terminal bolts using a torque wrench and 7/16" hex socket with a torque of 45-50 in-lb (5.08-5.65 Nm).

Step 7 Repeat Step 5, on page 88 and Step 6, on page 88 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

This section provides information on installing the Supervisor.

Check if your hardware might have a supervisor card. For supervisor cards that are shipped as a spare module, the supervisor card bootflash would be empty. Ensure that you manually copy the image on the bootflash to avoid issues while booting.

Note Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.

- Installing the Supervisor 160G, on page 89
- Installing the Supervisor 250G, on page 110

Installing the Supervisor 160G

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.

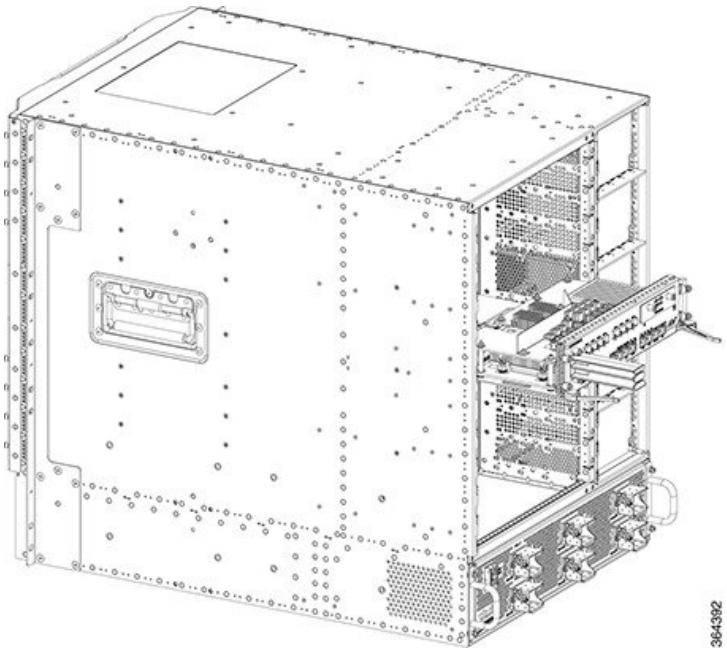
Step 2 Carefully align the PIC with the plastic guides in the slot.

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.

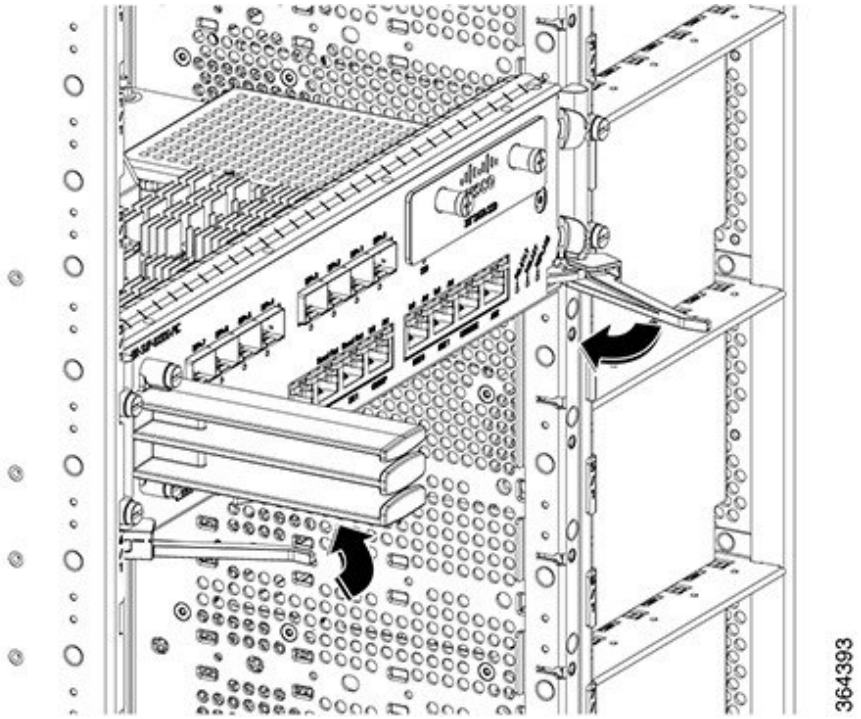
Caution To prevent damage to the midplane connectors, do not use excessive force when inserting the PIC into the slot.

Figure 45: 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 46: 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).

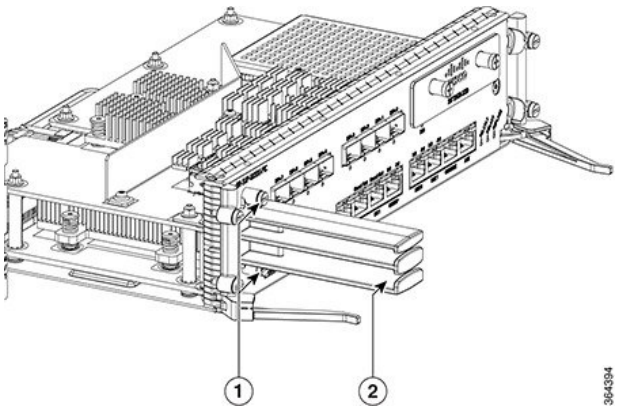
Required Tools and Equipment

- 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 47: 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

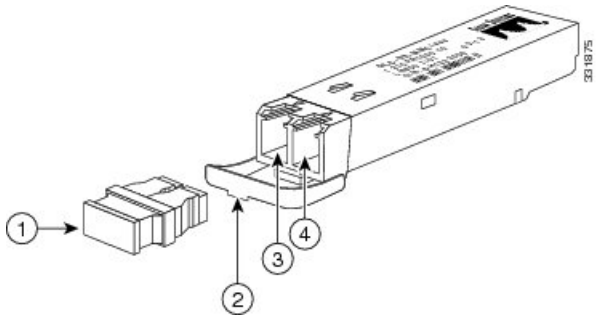
Required Tools and Equipment

- 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 48: 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.

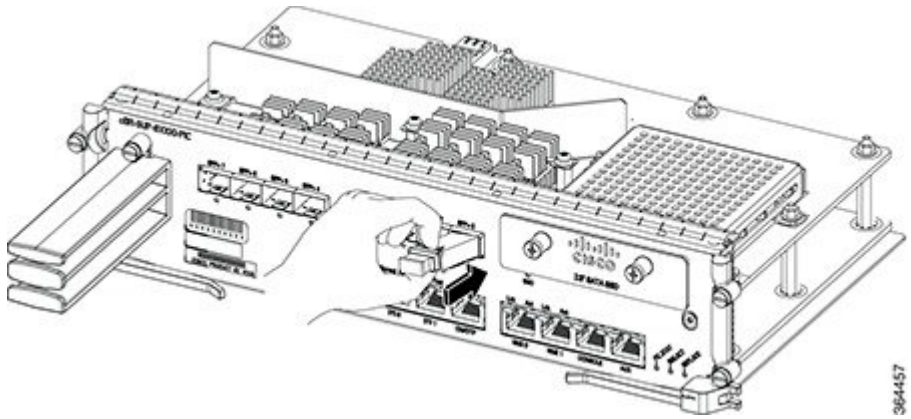
Step 3 Find the send (TX) and receive (RX) markings that identify the top side of the SFP+ module.

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 49: 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 94 to Step 6, on page 95 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,

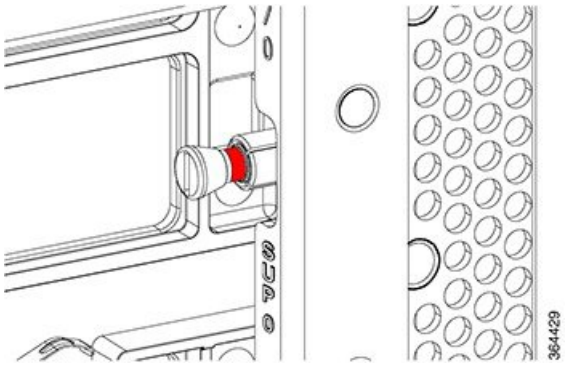
- Slot 4/1 for the Supervisor PIC corresponds to slot SUP0 for the Supervisor Card.
- Slot 5/1 for the Supervisor PIC corresponds to slot SUP1 for the Supervisor Card.

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 50: 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.

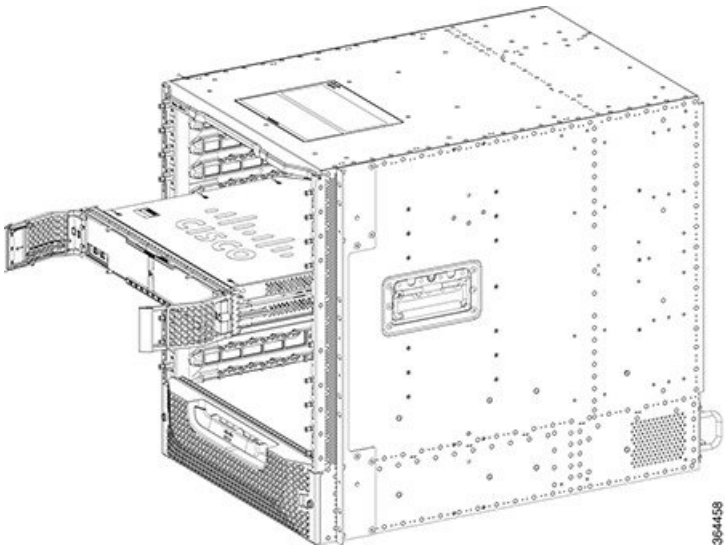
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

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 51: 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 52: Closing the Spring-Loaded Ejectors on the Supervisor Card

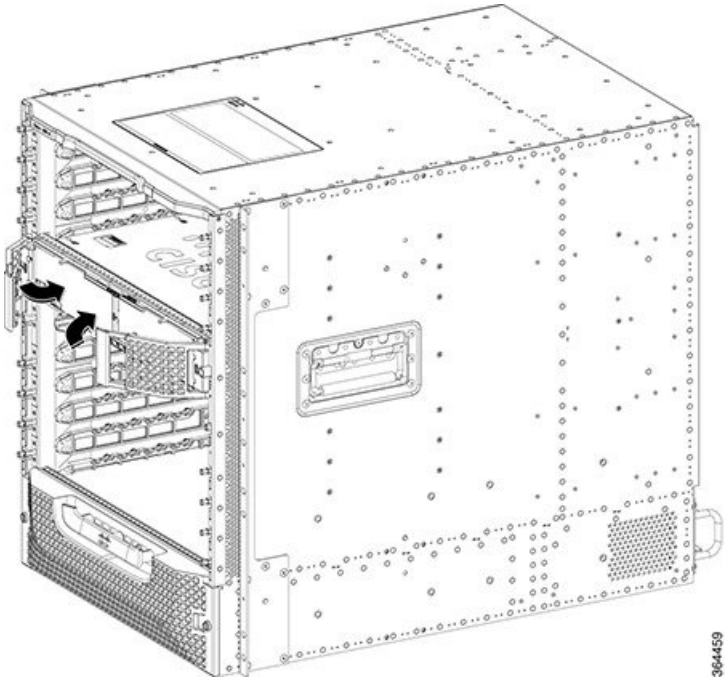
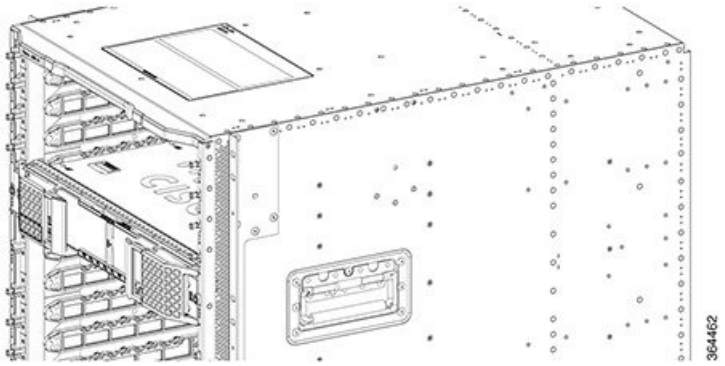


Figure 53: Closed and Secured Spring-Loaded Ejectors on the Supervisor Card



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.

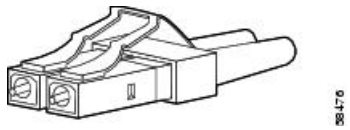
Step 2 Inspect and clean the LC connector end-faces.

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 54: 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

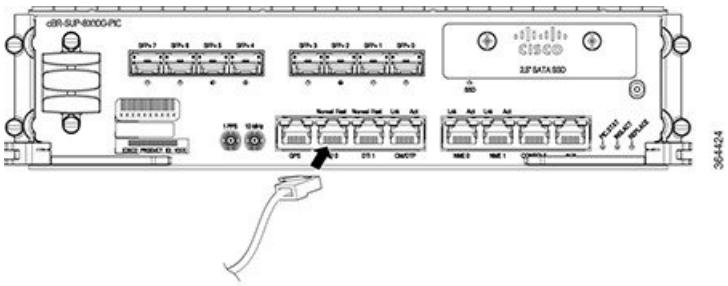
- Install the Supervisor PIC.
- Install the Supervisor Card.

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 55: 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

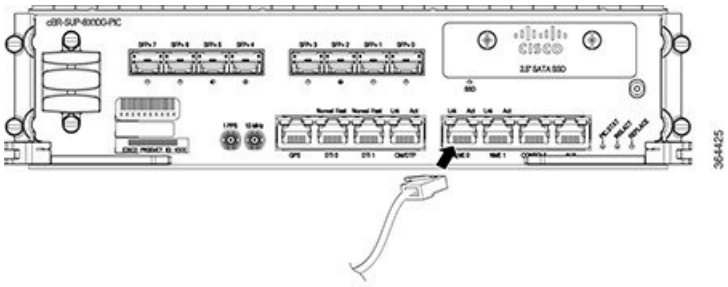
- Install the Supervisor PIC.
- Install the Supervisor Card.

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 56: 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

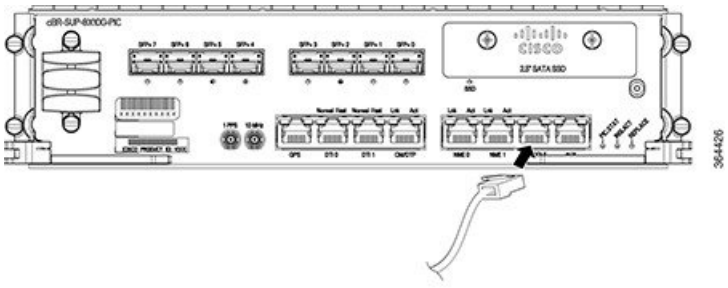
- Each Supervisor PIC must have a console port connection when running a redundant configuration in the chassis.

Required Tools and Equipment

- RJ-45 cable
- RJ-45-to-DB-9 adapter
- PC or terminal

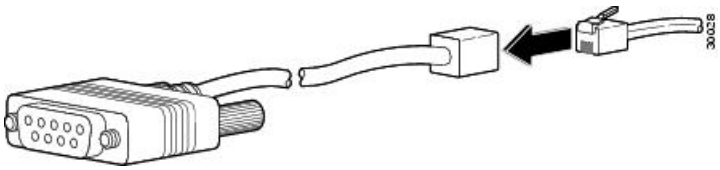
Step 1 Connect one end of the RJ-45 cable to the console port on the Supervisor PIC.

Figure 57: 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 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 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

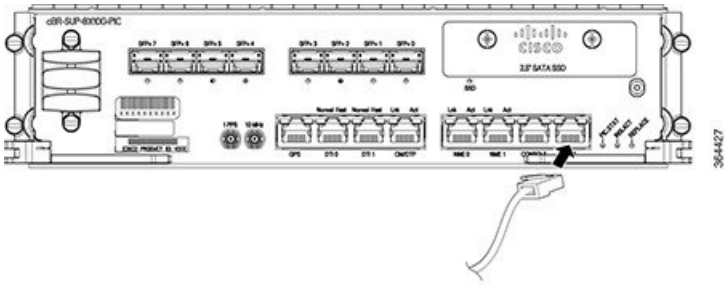
- Install the Supervisor PIC.
- Install the Supervisor Card.

Required Tools and Equipment

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

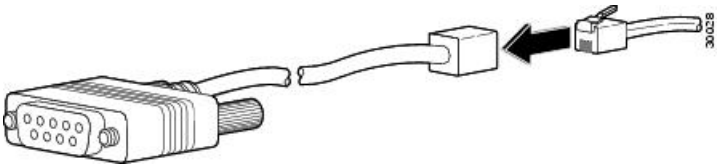
Step 1 Connect one end of the RJ-45 cable to the auxiliary port on the Supervisor PIC.

Figure 59: 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 60: 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

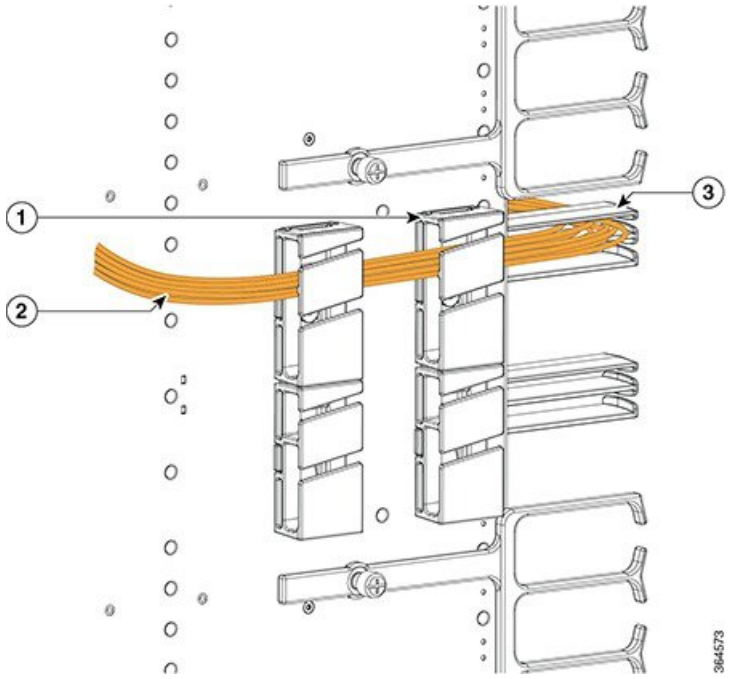
- Cable ties

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.

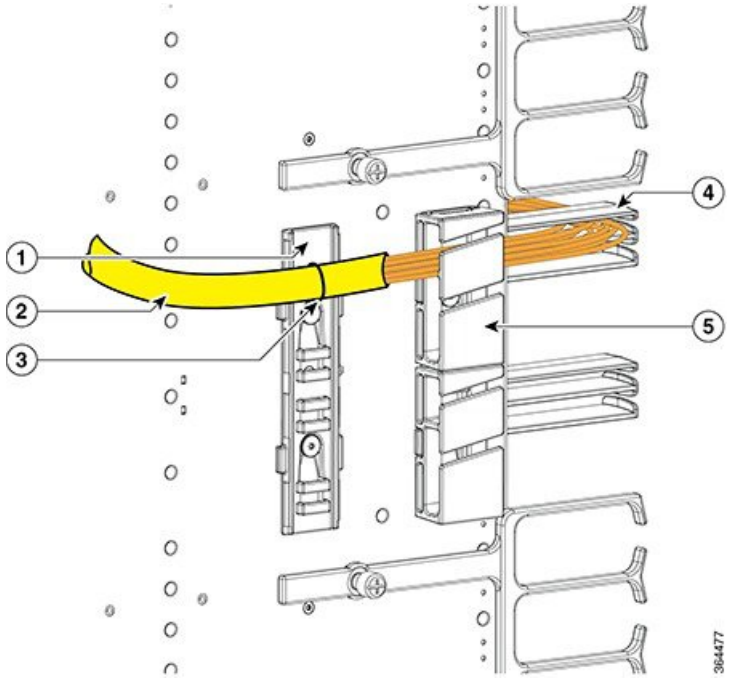
The following figures illustrate the possible cable routing options for the fiber-optic cables connected to the Supervisor PIC:

Figure 61: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 1



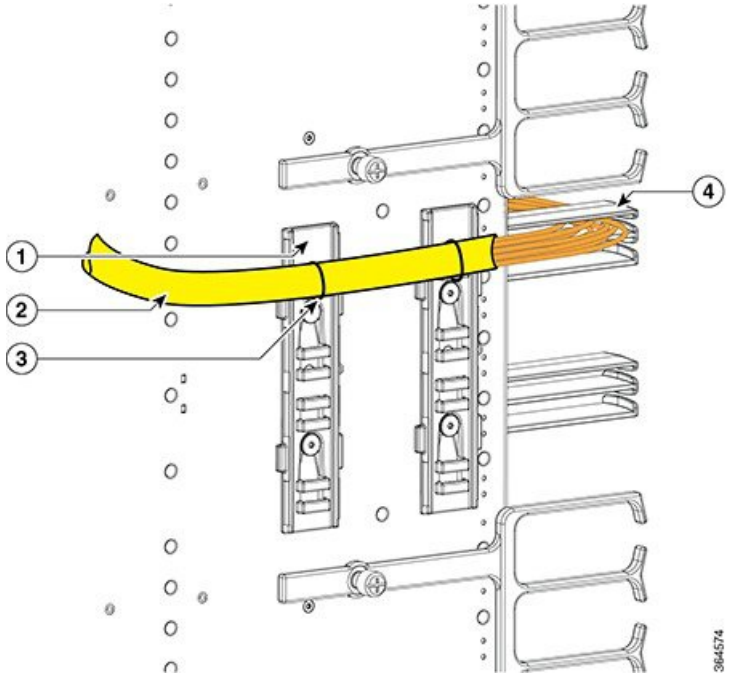
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	Fiber-optic cable bundle		—

Figure 62: 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 63: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 3



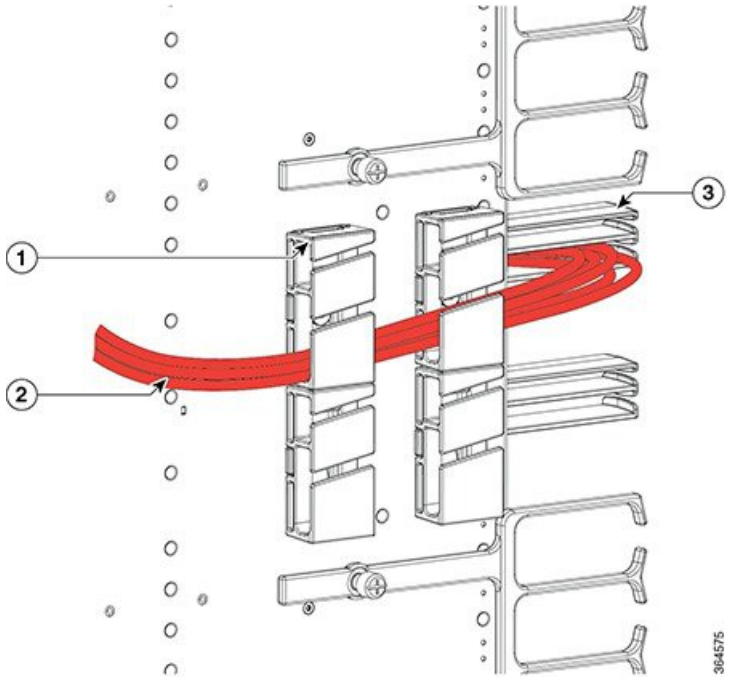
1	Strap-down clip	3	Cable tie
2	Fiber-optic cable bundle in flexible conduit	4	Supervisor PIC cable management bracket

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.

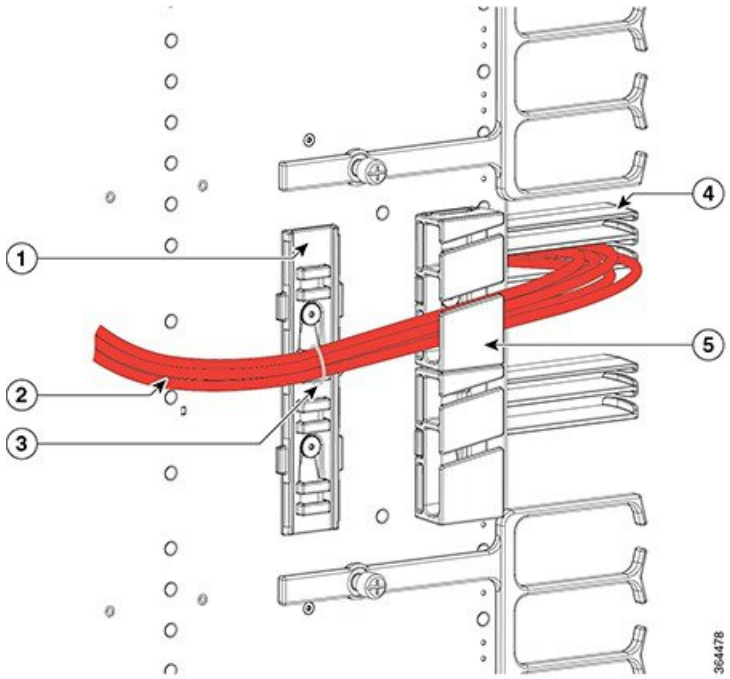
The following figures illustrate the possible cable routing options for the RJ-45 cables connected to the Supervisor PIC:

Figure 64: Routing the RJ-45 Cables Connected to the Supervisor PIC—Option 1



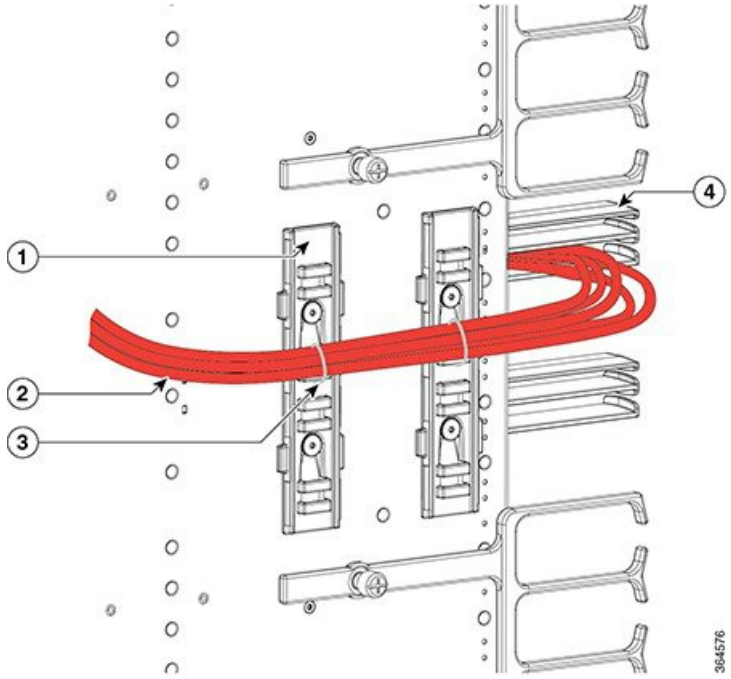
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	RJ-45 cable bundle		—

Figure 65: 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 66: 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 103 and Step 2, on page 105 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

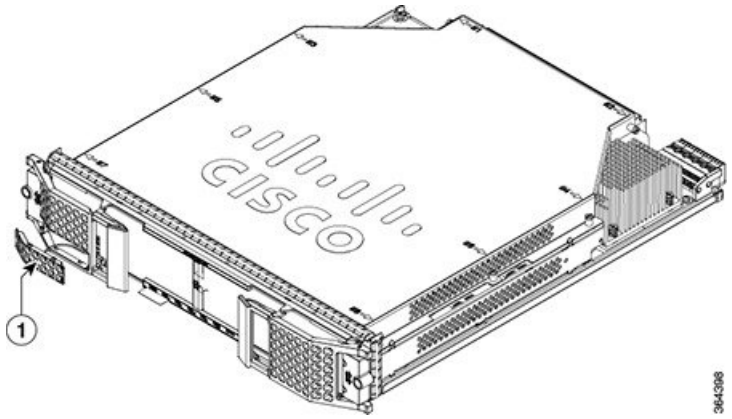
The USB ports on the Supervisor Card are used for temporary connections. For all permanent connections, you must use the ports on the Supervisor PIC.

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.

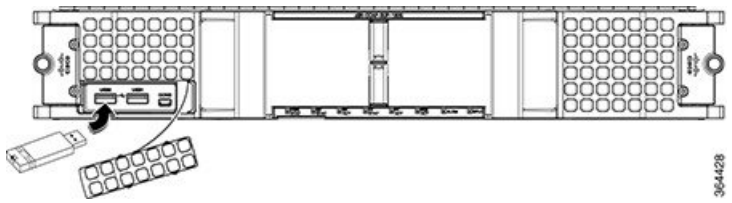
Figure 67: Opening the Tethered I/O Door on the Supervisor Card



1	Tethered I/O door		—

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

Figure 68: 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

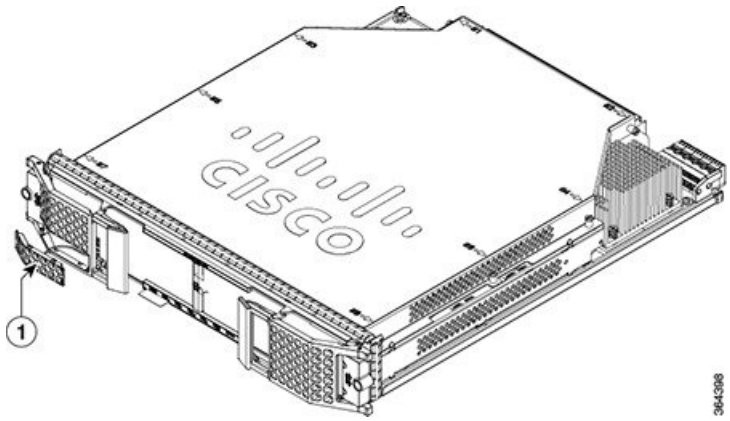
- When running a redundant configuration in the chassis, each Supervisor Card or Supervisor PIC must have a console port connection.
- The console port on the Supervisor Card is for temporary connections. For permanent console connection, you must use the port on the Supervisor PIC.

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.

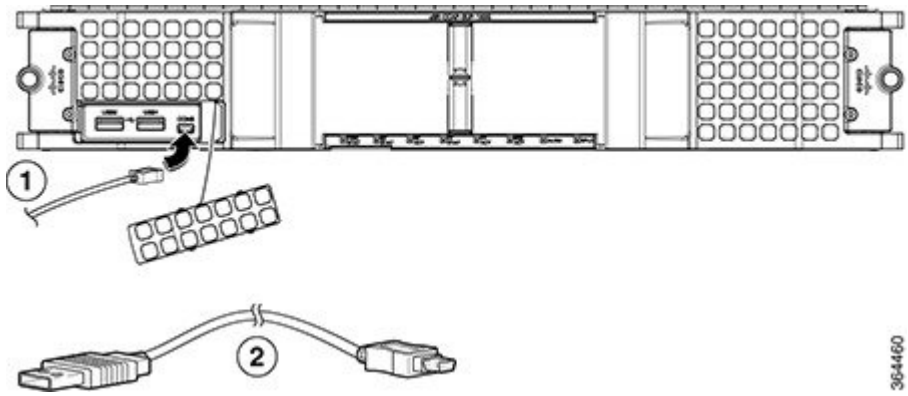
Figure 69: Opening the Tethered I/O Door on the Supervisor Card



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 70: 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

Installing the Supervisor 250G

Installing the Supervisor PIC in the Cisco cBR Chassis

Perform this procedure to install the following PICs:

- Supervisor PIC
- Blank PIC for the Supervisor

Note Do not support mix use of 250G and 160G SUP and SUP-PIC.

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.

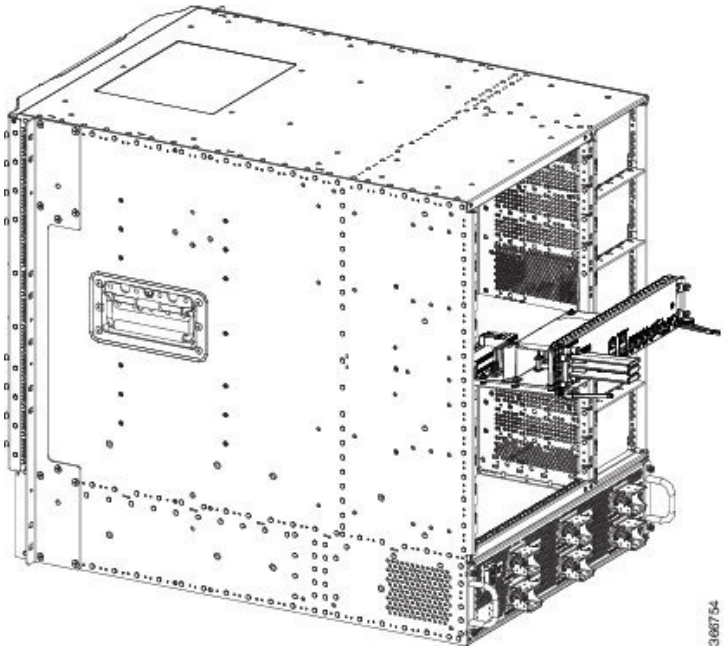
Step 2 Carefully align the PIC with the plastic guides in the slot.

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.

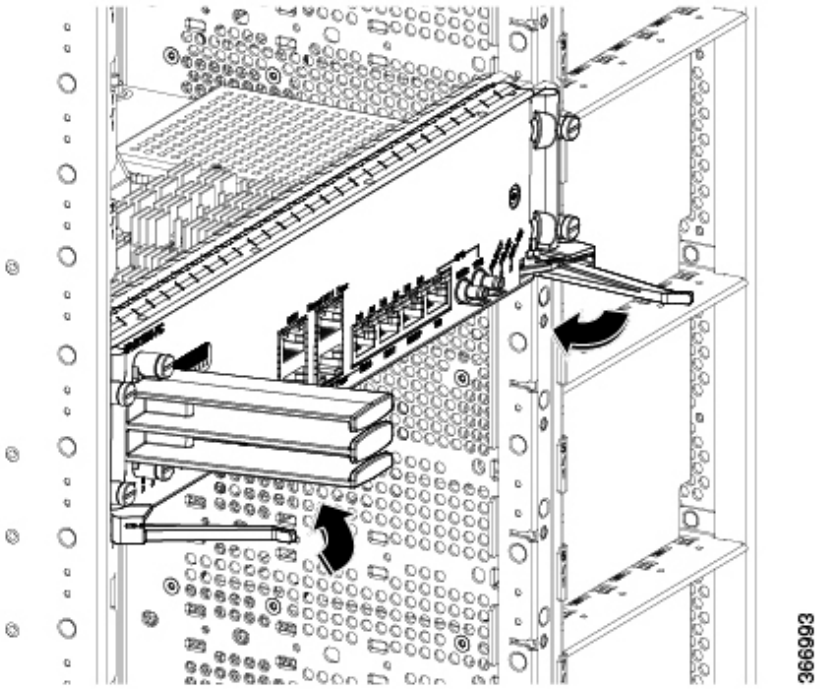
Caution To prevent damage to the midplane connectors, do not use excessive force when inserting the PIC into the slot.

Figure 71: 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 72: 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).

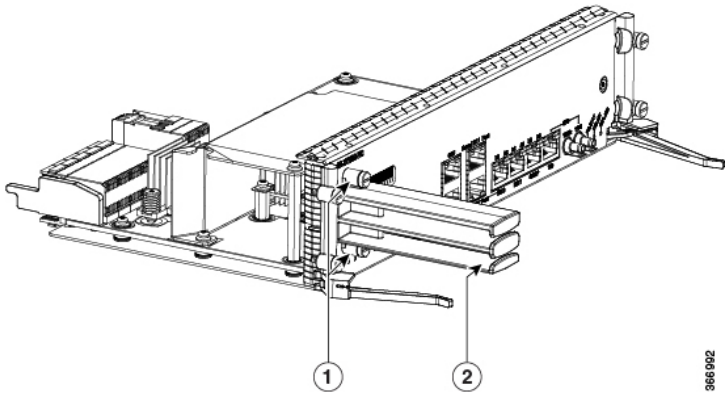
Required Tools and Equipment

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

Figure 73: 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

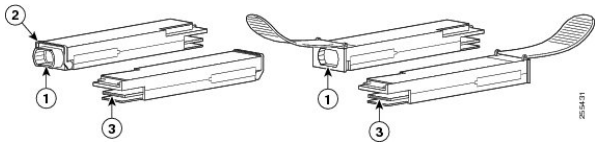
- Install the chassis-mounted fiber/cable routing guide (if not already installed).
- Route the Supervisor PIC cables through the Supervisor PIC cable management bracket and chassis-mounted fiber/cable routing guide.

Installing the QSFP+ or QSFP28 Transceiver Modules in the Supervisor PIC

The 40-Gigabit (GE) QSFP+ and 100 Gigabit (QSFP28) transceiver module is a hot-swappable, parallel fiber-optical module with four independent optical transmit and receive channels. These channels can terminate in another 40-Gigabit QSFP+ transceiver, or the channels can be broken out to four separate 10-Gigabit SFP+ transceivers. The QSFP+ transceiver module connects the electrical circuitry of the system with an optical external network.

The following figure shows the 40-Gigabit optical QSFP+ transceiver. The transceiver is used primarily in short reach applications in switches, routers, and data center equipment where it provides higher density than SFP+ modules. The 100-Gigabit optical QSFP28 transceiver is similar to the 40-Gigabit optical QSFP transceiver.

Figure 74: 40-Gigabit QSFP+ Transceiver Module (Optical)



1	40GBASE QSFP+ transceiver body	3	Electrical connection to the module circuitry
2	Bail-clasp latch		

The QSFP+ or QSFP28 transceiver module can have either a bail-clasp latch or a pull-tab latch. Installation procedures for both types of latches are provided.

Before you begin

Caution Do not install or remove the QSFP28 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 QSFP28 module latching properly into its socket connector. Disconnect all cables before removing or installing an QSFP28 module.

Caution The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with system modules.

- 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 QSFP28 modules. The following QSFP28 modules are supported on the Supervisor PIC:
  - QSFP-100G-ER4L-S
  - QSFP-100G-SR4-S
  - QSFP-100G-LR4-S
  - QSFP-40G-SR4 with breakout cable
  - QSFP-4x10G-LR-S with breakout cable
  - QSFP-100G-SM-SR

Note If the QSFP-100G-SM-SR module is used in the SUP 250 PIC card, the cBR-8 router chassis ambient temperature must be limited to 54ºC at sea level.

Required Tools and Equipment

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

Step 1 Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.

Step 2 Remove the QSFP+ or QSFP28 transceiver module from its protective packaging.

Step 3 Check the label on the QSFP+ or QSFP28 transceiver module body to verify that you have the correct model for your network.

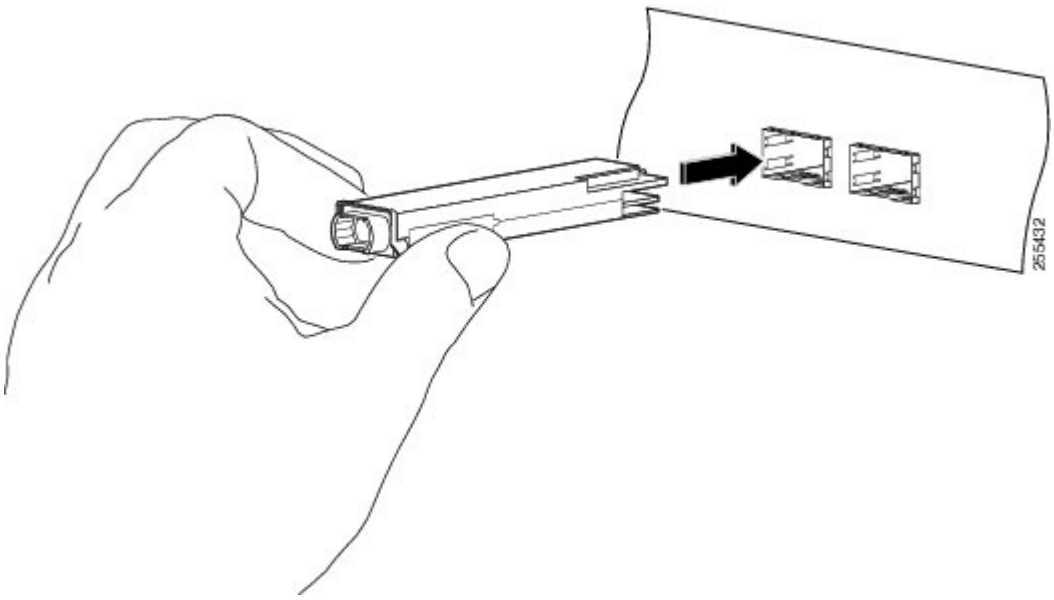
Step 4 For optical QSFP+ or QSFP28 transceiver modules, remove the optical bore dust plug and set it aside.

Step 5 For QSFP+ or QSFP28 transceiver modules equipped with a pull-tab, hold the transceiver so that the identifier label is on the top.

Step 6 For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch, keep the bail-clasp aligned in a vertical position.

Step 7 Align the QSFP+ or QSFP28 transceiver module in front of the module's transceiver socket opening and carefully slide the QSFP+ or QSFP28 transceiver into the socket until the transceiver makes contact with the socket electrical connector (see the figure below).

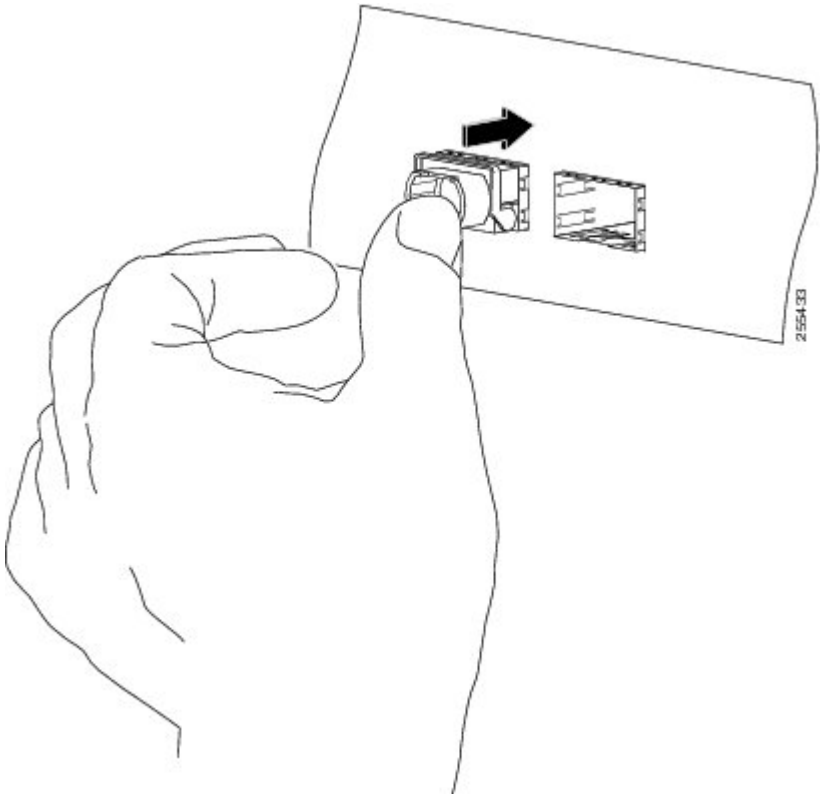
Figure 75: Installing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)



Step 8 Press firmly on the front of the QSFP+ or QSFP28 transceiver module with your thumb to fully seat the transceiver in the module's transceiver socket (see the below figure).

Caution If the latch is not fully engaged, you might accidentally disconnect the QSFP+ or QSFP28 transceiver module.

Figure 76: Seating the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)



Step 9 For optical QSFP+ or QSFP28 transceiver modules, reinstall the dust plug into the QSFP+ or QSFP28 transceivers optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

What to do next

- Verify if the QSFP+ or QSFP28 module is seated and latched properly. Grasp the QSFP+ or QSFP28 module and try to remove it without releasing the latch. If the QSFP+ or QSFP28 module cannot be removed, it is installed and seated properly. If the QSFP+ or QSFP28 module can be removed, reinstall it.
- Connect fiber-optic cable to the QSFP+ or QSFP28 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,

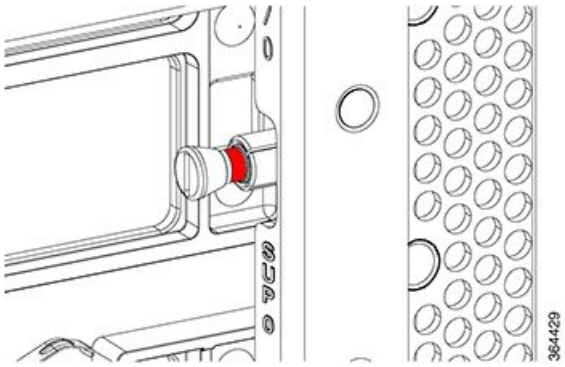
- Slot 4/1 for the Supervisor PIC corresponds to slot SUP0 for the Supervisor Card.
- Slot 5/1 for the Supervisor PIC corresponds to slot SUP1 for the Supervisor Card.

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 77: 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.

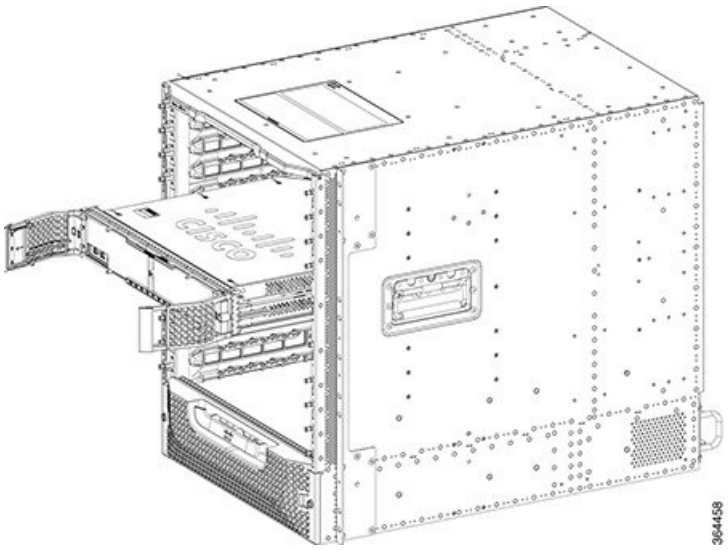
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

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 78: 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 79: Closing the Spring-Loaded Ejectors on the Supervisor Card

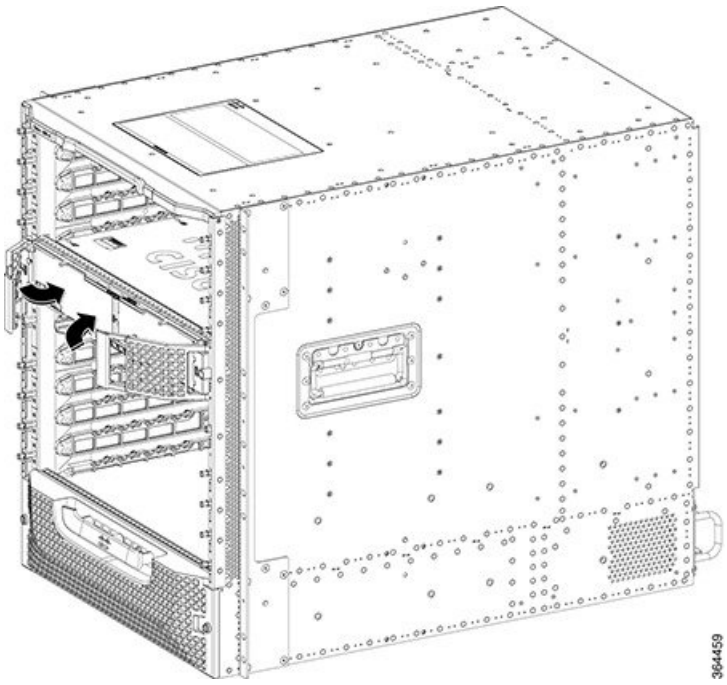
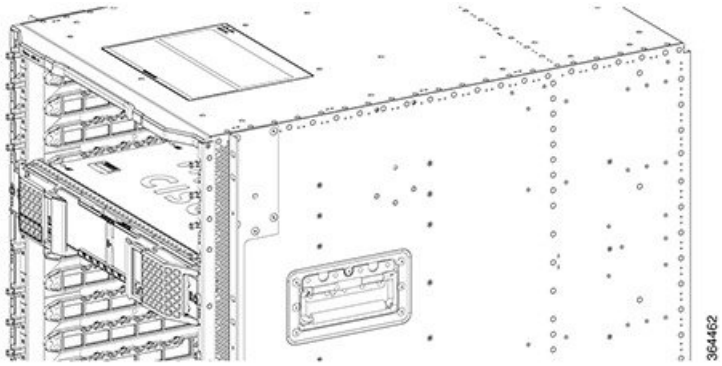


Figure 80: Closed and Secured Spring-Loaded Ejectors on the Supervisor Card



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).

Attaching the Optical Network Cable

Before you begin

- Install the Supervisor PIC.
- Install the QSFP+ or QSFP28 module in the Supervisor PIC
- Install the Supervisor Card.

Before removing the dust plugs and making any optical connections, follow these guidelines:

- Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.
- Inspect and clean the MPO connector end faces just before you make any connections.
- Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.

Note 40-Gigabit QSFP+ or QSFP28 transceiver modules are keyed to prevent incorrect insertion.

Note The multiple-fiber push-on (MPO) connectors on the optical QSFP+ or QSFP28 transceivers support network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The MPO connectors on the optical QSFP+ or QSFP28 transceivers do not support network interface cables with an angle-polished contact (APC) face type.

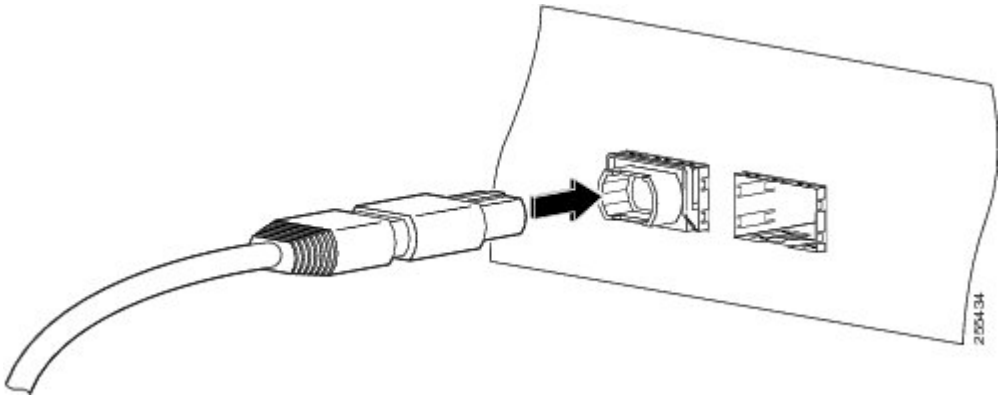
Step 1 Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.

Step 2 Inspect and clean the MPO connector's fiber-optic end faces.

Step 3 Remove the dust plugs from the QSFP+ or QSFP28 transceiver module optical bores.

Step 4 Immediately attach the network interface cable MPO connectors to the QSFP+ or QSFP28 transceiver module (see the figure below).

Figure 81: Cabling a 40-Gigabit QSFP+ or QSFP28 Transceiver Module



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

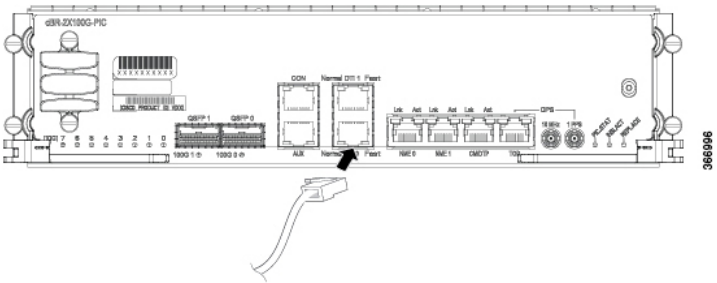
- Install the Supervisor PIC.
- Install the Supervisor Card.

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 82: 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

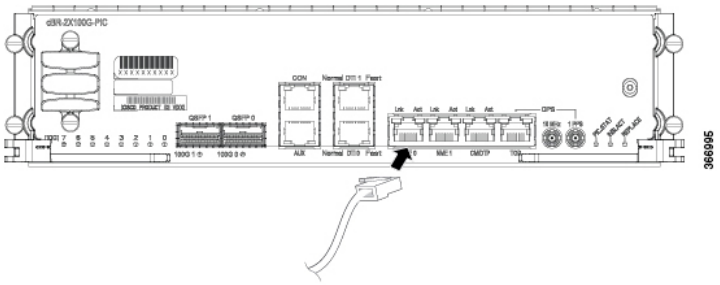
- Install the Supervisor PIC.
- Install the Supervisor Card.

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 83: 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

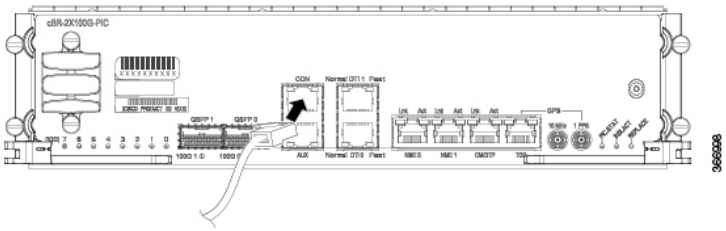
- Each Supervisor PIC must have a console port connection when running a redundant configuration in the chassis.

Required Tools and Equipment

- RJ-45 cable
- RJ-45-to-DB-9 adapter
- PC or terminal

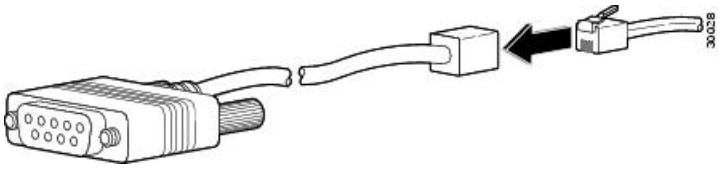
Step 1 Connect one end of the RJ-45 cable to the console port on the Supervisor PIC.

Figure 84: 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 85: 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

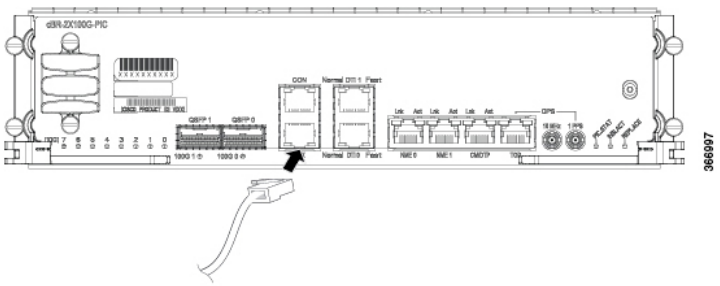
- Install the Supervisor PIC.
- Install the Supervisor Card.

Required Tools and Equipment

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

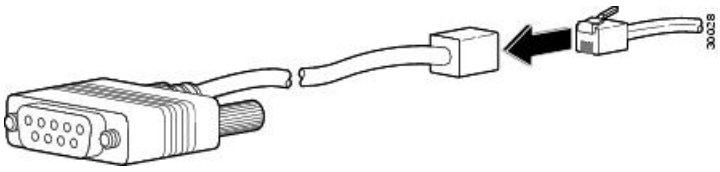
Step 1 Connect one end of the RJ-45 cable to the auxiliary port on the Supervisor PIC.

Figure 86: 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 87: 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

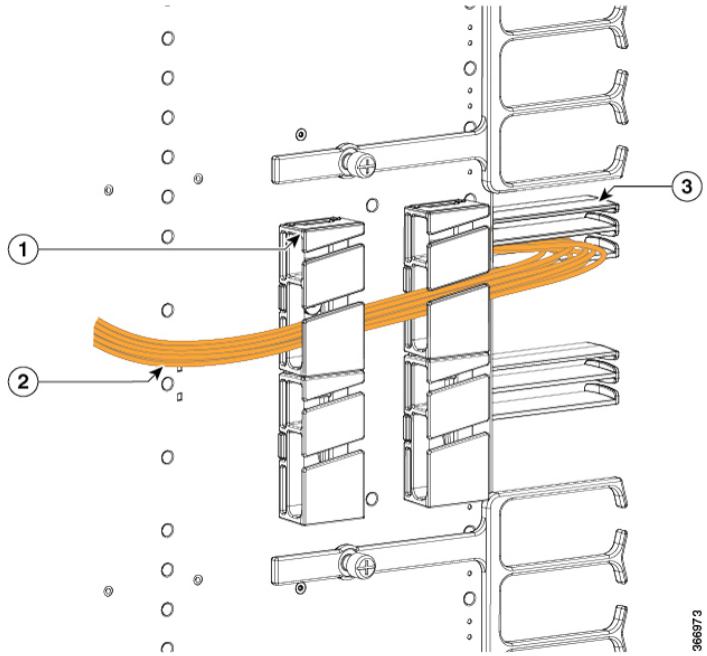
- Cable ties

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.

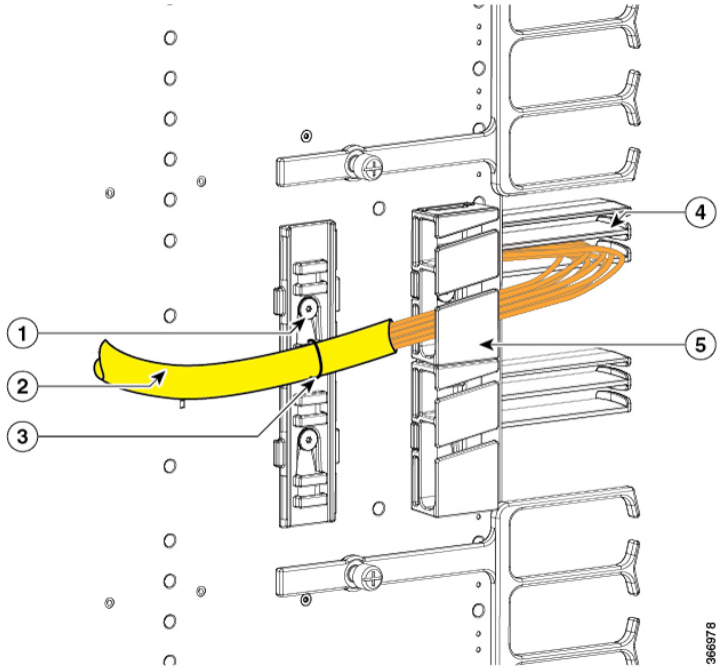
The following figures illustrate the possible cable routing options for the fiber-optic cables connected to the Supervisor PIC:

Figure 88: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 1



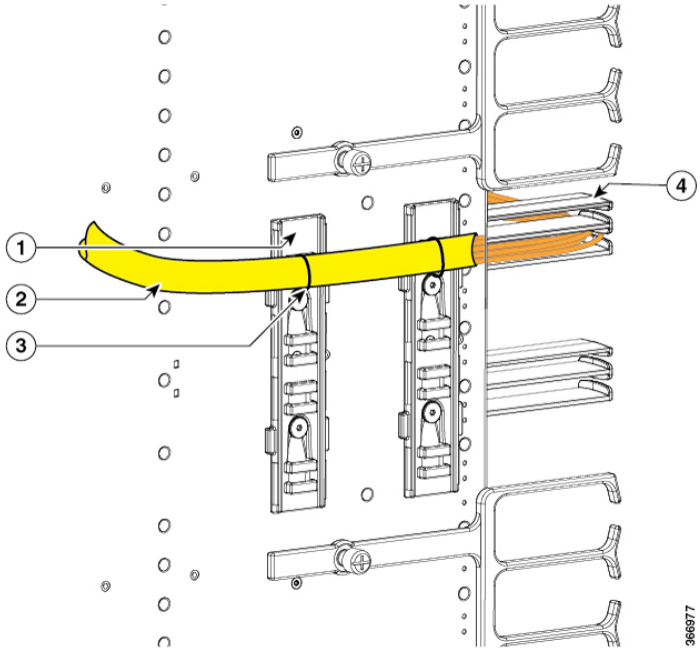
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	Fiber-optic cable bundle		—

Figure 89: 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 90: Routing the Fiber-Optic Cables Connected to the Supervisor PIC—Option 3



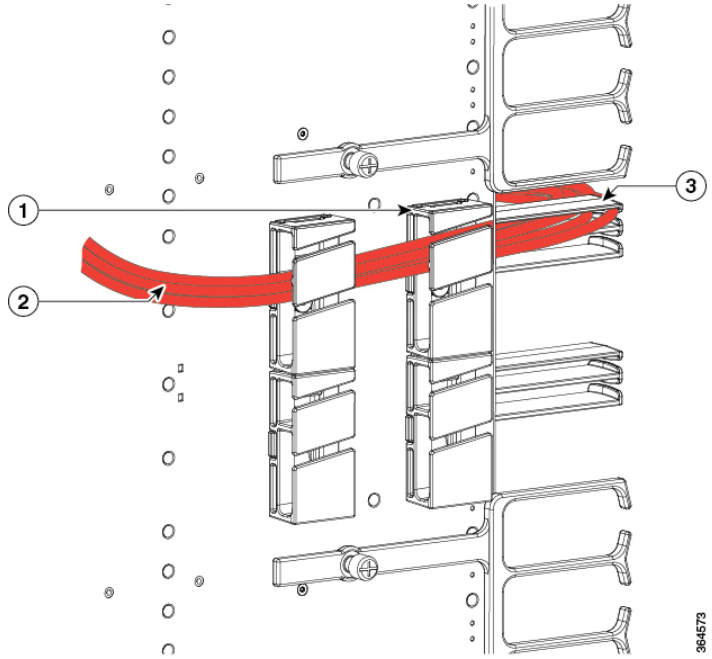
1	Strap-down clip	3	Cable tie
2	Fiber-optic cable bundle in flexible conduit	4	Supervisor PIC cable management bracket

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.

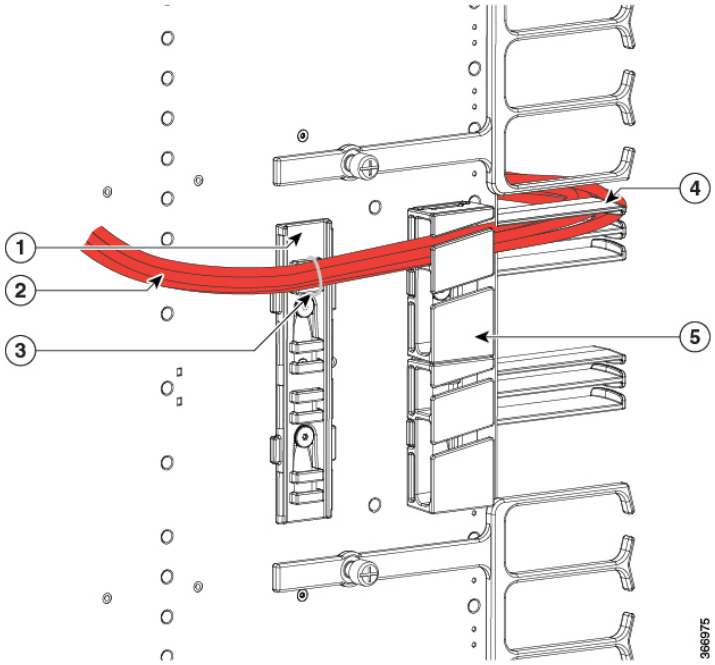
The following figures illustrate the possible cable routing options for the RJ-45 cables connected to the Supervisor PIC:

Figure 91: Routing the RJ-45 Cables Connected to the Supervisor PIC—Option 1



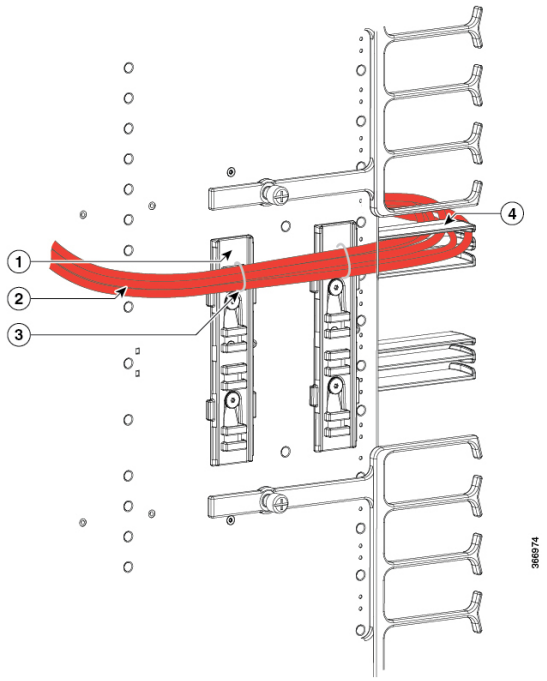
1	Snap-on plastic fiber/cable routing guides	3	Supervisor PIC cable management bracket
2	RJ-45 cable bundle		—

Figure 92: 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 93: 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 103 and Step 2, on page 105 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

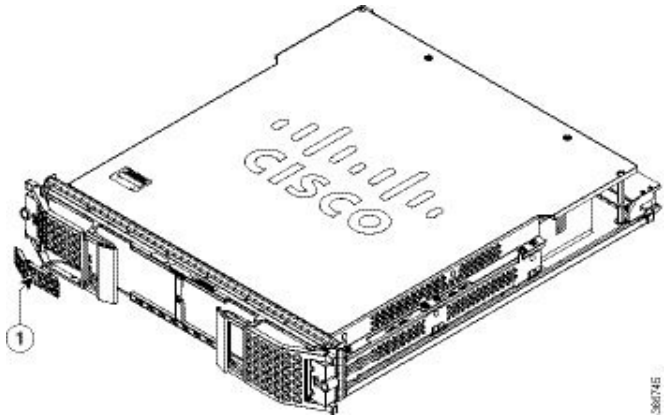
The USB ports on the Supervisor Card are used for temporary connections. For all permanent connections, you must use the ports on the Supervisor PIC.

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.

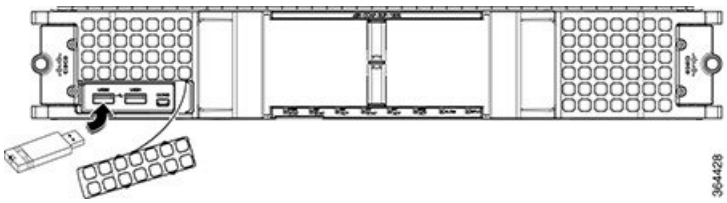
Figure 94: Opening the Tethered I/O Door on the Supervisor Card



1	Tethered I/O door		—

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

Figure 95: 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

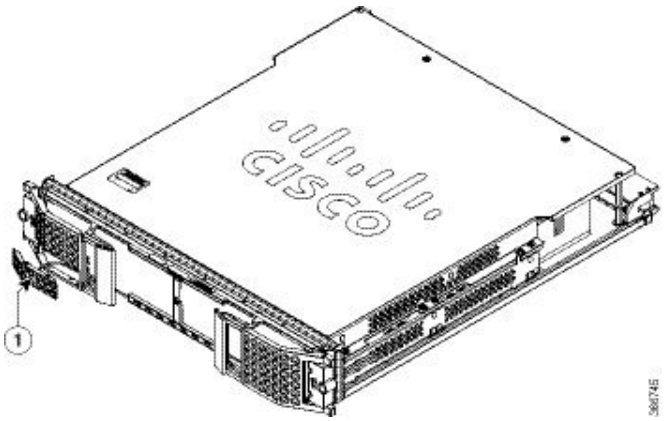
- When running a redundant configuration in the chassis, each Supervisor Card or Supervisor PIC must have a console port connection.
- The console port on the Supervisor Card is for temporary connections. For permanent console connection, you must use the port on the Supervisor PIC.

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.

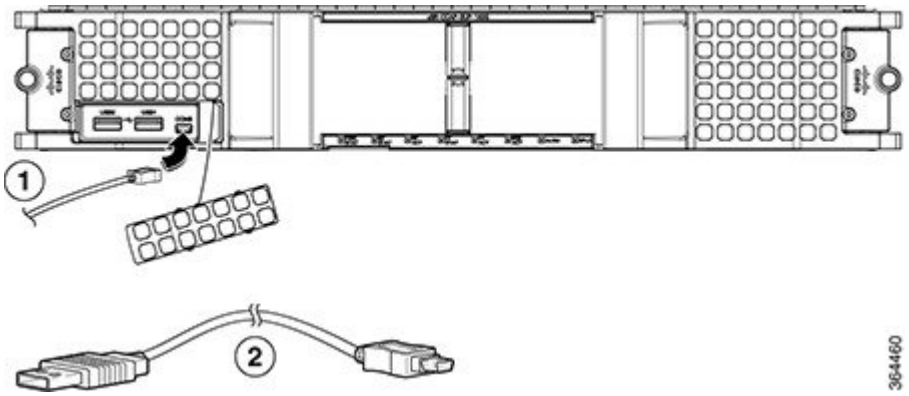
Figure 96: Opening the Tethered I/O Door on the Supervisor Card



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 97: 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

Swap Supervisor 160G to Supervisor 250G 10GE Mode

Backup the Configuration and IOS Code

Step 1 Insert the Cisco certified eUSB disk into the USB0 on the active SUP160 board.

Step 2 Edit the configuration follow the steps below:

Please note that on SUP250, all 10G and 100G interfaces are visible regardless of whether the related QSFP module is inserted or not. The backhaul interface numbering scheme on SUP250 is different from SUP160, shown as below:

	100GE interface	**10GE interface**
SUP4	Hu4/1/0 ~ Hu4/1/1	Te4/1/2 ~ Te4/1/9
SUP5	Hu5/1/0 ~ Hu5/1/1	Te5/1/2 ~ Te5/1/9

Therefore, we recommend the user to copy the SUP160 configuration out to the server and edit the SUP160 configuration manually before copy back to the SUP250.

a) Replace the card type **sup-pic-8x10g** with **sup-pic-2x100g-8x10g** on both card 4/1 and 5/1.

```
card 0/0 cBR-CCAP-LC-40G r-phy
card 1/0 cBR-CCAP-LC-40G r-phy
card 2/0 cBR-CCAP-LC-40G
card 3/0 cBR-CCAP-LC-40G
card 4/1 sup-pic-2x100g-8x10g
card 5/1 sup-pic-2x100g-8x10g
card 6/0 cBR-CCAP-LC-40G
card 7/0 cBR-CCAP-LC-40G
card 8/0 cBR-CCAP-LC-40G r-phy
card 9/0 cBR-CCAP-LC-40G r-phy
```

b) Relocate the backhaul related configuration based on the numbering scheme listed in the above chart. The mappings are Ten4/1/0 – Ten 4/1/7 (SUP160) as Ten4/1/2 – Ten4/1/9 (SUP250), Ten5/1/0 – Ten5/1/7 (SUP160) as Ten5/1/2 – Ten5/1/9 (SUP250).

c) Modify the bootvar to the correct value.

```
boot system bootflash:<image_name>
```

d) Save the configuration as a sup250.txt file.

Step 3 Copy the sup250.txt into eUSB.

Step 4 Copy the IOS image into eUSB.

```
copy ftp://<username>:<password>@<server ip>/dir/<image_name>
```

Step 5 Execute md5 check for IOS image.

```
verify /md5 usb0:<image_name>
```

Swap the Supervisor

Step 1 Power off the cbr-8 chassis.

Step 2 Loosen the hook screw on the active SUP and pull out the SUP160 board from the chassis.

Step 3 Loosen the hook screw on the standby SUP and pull out the SUP160 board from the chassis.

Step 4 Label the cables connected to the active SUP PIC, then pull out all the cables from the SUP PIC. Loosen the hook screw on the active SUP PIC and pull out the SUP160 PIC from the chassis.

Step 5 Label the cables connected to the standby SUP PIC, then pull out all the cables from the SUP PIC. Loosen the hook screw on the standby SUP PIC and pull out the SUP160 PIC from the chassis.

Step 6 Insert the SUP250 board into the slot 4 on the rear side of the chassis and tighten the hook screw.

Step 7 Insert another SUP250 board into the slot 5 on the rear side of the chassis and tighten the hook screw.

Step 8 Insert the SUP250 PIC into the slot 4 on the front side of the chassis and tighten the hook screw.

Step 9 Insert another SUP250 PIC into the slot 5 on the front side of the chassis and tighten the hook screw.

Step 10 Insert the 1-to-4 breakout fibers into the QSFP module on SUP in slot 4 and slot 5 respectively.

Step 11 Connect all the cables into the new SUP250 PIC and SUP250 board on slot 4 and slot 5.

Step 12 Power on the chassis.

Step 13 Log in the active SUP via the active console port and log in the standby SUP via the standby console port, both boards should be in rommon mode. Send break and make sure the board is in rommon mode if it does not in rommon mode after boot up.

Step 14 Insert the eUSB into the USB0 of the SUP in slot4, boot the SUP from rommon to IOS.

```
boot usb0:<image_name>
```

Step 15 Once the SUP enter the IOS mode, copy the image from eUSB to bootflash on the SUP.

```
copy usb0:<image_name> bootflash:
```

Step 16 Insert the eUSB into the USB0 of the SUP in slot 5, boot the SUP from rommon to IOS, Send break and make sure the board is in rommon mode if it does not in rommon mode after boot up.

```
boot usb0:<image_name>
```

Step 17 Once the SUP enter the IOS mode, and SUP redundancy reach SSO mode, On active SUP, copy the image from eUSB to bootflash on the standby SUP.

```
copy stby-usb0:<image_name> stby-bootflash:
```

Step 18 Copy pre-saved running configuration from eUSB to nvram.

```
copy usb0:sup250.txt startup-config
```

Step 19 Pull out the eUSB.

Step 20 Change the config-reg to 0x2102.

```
Router(config)# config-register 0x2102
```

Step 21 Reload the system without saving the configuration on the active SUP.

```
reload
System configuration has been modified. Save? [yes/no]: no
```

Step 22 Once the system enter the IOS mode, verify SUP redundancy reach SSO via below show command:

```
Router# show redundancy
Load for five secs: 41%/2%; one minute: 67%; five minutes: 70%
Time source is NTP, 11:34:45.548 CST Wed Sep 20 2017
Redundant System Information :
------------------------------
Available system uptime = 4 days, 18 hours, 39 minutes
Switchovers system experienced = 2
Standby failures = 0
Last switchover reason = user forced
Hardware Mode = Duplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = sso
Maintenance Mode = Disabled
Communications = Up
Current Processor Information :
-------------------------------
Active Location = slot 4
Current Software state = ACTIVE
Uptime in current state = 1 day, 23 hours, 59 minutes
Image Version = Cisco IOS Software [Fuji], cBR Software
(X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental Version
16.7.20171024:133607 [v167_throttle-/nobackup/mcgourtm/v167_throttle_ece2 103]
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Tue 24-Oct-17 12:43 by mcgourtm
BOOT = bootflash:cbrsup-universalk9.BLD_V167_THROTTLE_LATEST_20171019_050605.SSA.bin,12;
CONFIG_FILE =
Configuration register = 0x2102
Peer Processor Information :
----------------------------
Standby Location = slot 5
Current Software state = STANDBY HOT
Uptime in current state = 1 day, 23 hours, 49 minutes
Image Version = Cisco IOS Software [Fuji], cBR Software
(X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental Version
16.7.20171024:133607 [v167_throttle-/nobackup/mcgourtm/v167_throttle_ece2 103]
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Tue 24-Oct-17 12:43 by mcgourtm
BOOT = bootflash:cbrsup-universalk9.2017-10-24_12.51_mcgourtm.SSA.bin,12
CONFIG_FILE =
Configuration register = 0x2102
```

Step 23 Verify the state of the 10GE backhaul interface links. If the 10GE backhaul interface links are administratively down, run the `no shutdown` command for the backhaul interfaces.

Step 24 Save the configuration by running the `wr` command.

Step 25 Save & backup current configuration.

```
copy running-config startup-config
```

Step 26 Copy the configuration into bootflash for backup.

```
copy running-config bootflash:sup250.cfg
copy running-config stby-bootflash:sup250.cfg
```

Step 27 Check the WAN port connection by ping the peer device.

Step 28 Check the system health and service with the following commands:

```
show version
show platform
show platform diag
show environment
show cable modem summary total
show processes cpu sorted
show logging
```

Upgrade Supervisor 160G to Supervisor 250G 100GE Mode

Backup the Configuration and IOS Code

Step 1 Insert the Cisco certified eUSB disk into the USB0 on the active SUP160 board.

Step 2 Edit the configuration follow the steps below:

Please note that on SUP250, all 10G and 100G interfaces are visible regardless of whether the related QSFP module is inserted or not. The backhaul interface numbering scheme on SUP250 is different from SUP160, shown as below:

	100GE interface	**10GE interface**
SUP4	Hu4/1/0 ~ Hu4/1/1	Te4/1/2 ~ Te4/1/9
SUP5	Hu5/1/0 ~ Hu5/1/1	Te5/1/2 ~ Te5/1/9

Therefore, we recommend the user to copy the SUP160 configuration out to the server and edit the SUP160 configuration manually before copy back to the SUP250.

a) Replace the card type **sup-pic-8x10g** with **sup-pic-2x100g-8x10g** on both card 4/1 and 5/1.

```
card 0/0 cBR-CCAP-LC-40G
card 1/0 cBR-CCAP-LC-40G
card 2/0 cBR-CCAP-LC-40G
card 3/0 cBR-CCAP-LC-40G
card 4/1 sup-pic-2x100g-8x10g
card 5/1 sup-pic-2x100g-8x10g
card 6/0 cBR-CCAP-LC-40G
card 7/0 cBR-CCAP-LC-40G
card 8/0 cBR-CCAP-LC-40G
card 9/0 cBR-CCAP-LC-40G
```

b) Remove all TenGig interface configurations from file, for example:

```
interface TenGigabitEthernet4/1/0,
interface TenGigabitEthernet4/1/1,
interface TenGigabitEthernet4/1/2,
interface TenGigabitEthernet4/1/3,
interface TenGigabitEthernet4/1/4,
interface TenGigabitEthernet4/1/5,
```

```
interface TenGigabitEthernet4/1/6,
interface TenGigabitEthernet4/1/7,
interface TenGigabitEthernet5/1/0,
interface TenGigabitEthernet5/1/1,
interface TenGigabitEthernet5/1/2,
interface TenGigabitEthernet5/1/3,
interface TenGigabitEthernet5/1/4,
interface TenGigabitEthernet5/1/5,
interface TenGigabitEthernet5/1/6,
interface TenGigabitEthernet5/1/7,
```

c) Add HundredGigE interfaces configuration based on the network topology, for example:

```
interface HundredGigE4/1/0
 mtu 2000
 no ip address
 load-interval 30
 plim qos input map ip dscp-based
 plim qos input map ip dscp 40 queue strict-priority
 plim qos input map mpls exp 5 queue strict-priority
 cdp enable
 service-policy output parent-egress-to-core
 channel-group 10 mode active
end
interface HundredGigE4/1/1
 mtu 2000
 no ip address
 load-interval 30
 plim qos input map ip dscp-based
 plim qos input map ip dscp 40 queue strict-priority
 plim qos input map mpls exp 5 queue strict-priority
 cdp enable
 service-policy output parent-egress-to-core
 channel-group 11 mode active
end
interface HundredGigE5/1/0
 mtu 2000
 no ip address
 load-interval 30
 plim qos input map ip dscp-based
 plim qos input map ip dscp 40 queue strict-priority
 plim qos input map mpls exp 5 queue strict-priority
 cdp enable
 service-policy output parent-egress-to-core
 channel-group 10 mode active
end
interface HundredGigE5/1/1
 mtu 2000
 no ip address
 load-interval 30
 plim qos input map ip dscp-based
 plim qos input map ip dscp 40 queue strict-priority
 plim qos input map mpls exp 5 queue strict-priority
 cdp enable
 service-policy output parent-egress-to-core
 channel-group 11 mode active
end
```

d) Modify routing configuration, L2VPN configuration, passive interface configuration etc. as needed. For example. search for TenGigabitEthernet in previous configuration and replace with HundredGigE.

e) Modify the bootvar to the correct value.

```
boot system bootflash:<image_name>
```

f) Save the configuration as a sup250.txt file.

Step 3 Copy the sup250.txt into eUSB.

Step 4 Copy the IOS image into eUSB.

```
copy ftp://<username>:<password>@<server ip>/dir/<image_name>
```

Step 5 Execute md5 check for IOS image.

```
verify /md5 usb0:<image_name>
```

Swap the Supervisor

Step 1 Power off the cbr-8 chassis.

Step 2 Loosen the hook screw on the active SUP and pull out the SUP160 board from the chassis.

Step 3 Loosen the hook screw on the standby SUP and pull out the SUP160 board from the chassis.

Step 4 Label the cables connected to the active SUP PIC, then pull out all the cables from the SUP PIC. Loosen the hook screw on the active SUP PIC and pull out the SUP160 PIC from the chassis.

Step 5 Label the cables connected to the standby SUP PIC, then pull out all the cables from the SUP PIC. Loosen the hook screw on the standby SUP PIC and pull out the SUP160 PIC from the chassis.

Step 6 Insert the SUP250 board into the slot 4 on the rear side of the chassis and tighten the hook screw.

Step 7 Insert another SUP250 board into the slot 5 on the rear side of the chassis and tighten the hook screw.

Step 8 Insert the SUP250 PIC into the slot 4 on the front side of the chassis and tighten the hook screw.

Step 9 Insert another SUP250 PIC into the slot 5 on the front side of the chassis and tighten the hook screw.

Step 10 Connect the 100G QSFP on SUP slot 4 and slot 5 respectively.

Step 11 Power on the chassis.

Step 12 Log in the active SUP via the active console port and log in the standby SUP via the standby console port, both boards should be in rommon mode. Send break and make sure the board is in rommon mode if it does not in rommon mode after boot up.

Note If you see garbage, then check the baudrate and use speed 115200 or 9600.

Step 13 Insert the eUSB into the USB0 of the SUP in slot4, boot the SUP from rommon to IOS.

```
boot usb0:<image_name>
```

Step 14 Once the SUP enter the IOS mode, copy the image from eUSB to bootflash on the SUP.

```
copy usb0:<image_name> bootflash:
```

Step 15 Insert the eUSB into the USB0 of the SUP in slot 5, boot the SUP from rommon to IOS, Send break and make sure the board is in rommon mode if it does not in rommon mode after boot up.

```
boot usb0:<image_name>
```

Step 16 Once the SUP enter the IOS mode, and SUP redundancy reach SSO mode, On active SUP, copy the image from eUSB to bootflash on the standby SUP.

```
copy stby-usb0:<image_name> stby-bootflash:
```

Step 17 Copy pre-saved running configuration from eUSB to nvram.

```
copy usb0:sup250.txt startup-config
```

Step 18 Pull out the eUSB.

Step 19 Change the config-reg to 0x2102.

```
Router(config)# config-register 0x2102
```

Step 20 Reload the system without saving the configuration on the active SUP.

```
reload
System configuration has been modified. Save? [yes/no]: no
```

Step 21 Once the system enter the IOS mode, verify SUP redundancy reach SSO via below show command:

```
Router# show redundancy
Load for five secs: 41%/2%; one minute: 67%; five minutes: 70%
Time source is NTP, 11:34:45.548 CST Wed Sep 20 2017
Redundant System Information :
------------------------------
Available system uptime = 4 days, 18 hours, 39 minutes
Switchovers system experienced = 2
Standby failures = 0
Last switchover reason = user forced
Hardware Mode = Duplex
Configured Redundancy Mode = sso
Operating Redundancy Mode = sso
Maintenance Mode = Disabled
Communications = Up
Current Processor Information :
-------------------------------
Active Location = slot 4
Current Software state = ACTIVE
Uptime in current state = 1 day, 23 hours, 59 minutes
Image Version = Cisco IOS Software [Fuji], cBR Software
(X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental Version
16.7.20171024:133607 [v167_throttle-/nobackup/mcgourtm/v167_throttle_ece2 103]
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Tue 24-Oct-17 12:43 by mcgourtm
BOOT = bootflash:cbrsup-universalk9.BLD_V167_THROTTLE_LATEST_20171019_050605.SSA.bin,12;
CONFIG_FILE =
Configuration register = 0x2102
Peer Processor Information :
----------------------------
Standby Location = slot 5
Current Software state = STANDBY HOT
Uptime in current state = 1 day, 23 hours, 49 minutes
Image Version = Cisco IOS Software [Fuji], cBR Software
(X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental Version
16.7.20171024:133607 [v167_throttle-/nobackup/mcgourtm/v167_throttle_ece2 103]
Copyright (c) 1986-2017 by Cisco Systems, Inc.
Compiled Tue 24-Oct-17 12:43 by mcgourtm
BOOT = bootflash:cbrsup-universalk9.2017-10-24_12.51_mcgourtm.SSA.bin,12
CONFIG_FILE =
Configuration register = 0x2102
```

Step 22 Verify the state of the 100GE backhaul interface links. If the 100GE backhaul interface links are administratively down, run the `no shutdown` command for the backhaul interfaces.

Step 23 Save the configuration by running the `wr` command.

Step 24 Save & backup current configuration.

```
copy running-config startup-config
```

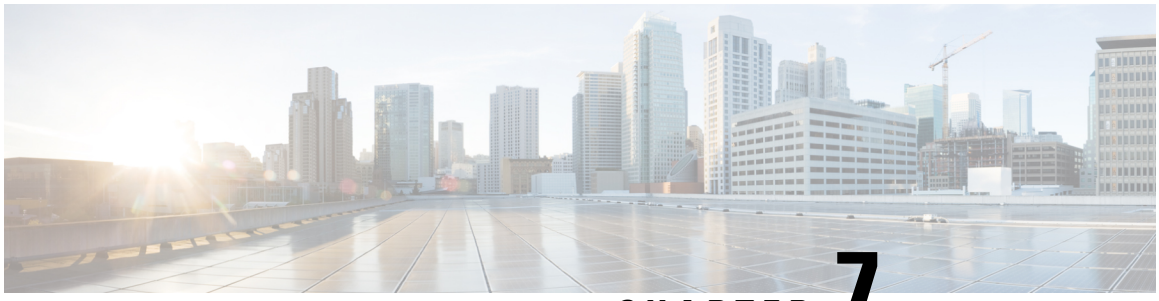
Step 25 Copy the configuration into bootflash for backup.

```
copy running-config bootflash:sup250.cfg
copy running-config stby-bootflash:sup250.cfg
```

Step 26 Check the WAN port connection by ping the peer device.

Step 27 Check the system health and service with the following commands:

```
show version
show platform
show platform diag
show environment
show cable modem summary total
show processes cpu sorted
show logging
```



CHAPTER 7

Installing the Interface and PIC Cards in the Cisco cBR Chassis

Note Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.

- Installing the DOCSIS MAC/PHY Interface and PIC Card, on page 141
- Installing the DOCSIS MAC Interface and PIC Card, on page 150

Installing the DOCSIS MAC/PHY Interface and PIC Card

Note Configure the DOCSIS MAC/PHY Interface and PIC card before installing it in Cisco cBR-8 router. For example, if you use CBR-CCAP-LC-G2-R and cBR-DPIC-8X10G, pre-configure the slot before inserting new LC into slot x using the **card x/0 CBR-CCAP-LC-G2-R r-phy** command.

Installing RF PIC in the Cisco cBR Chassis

Warning 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 RF HA features, install the Protect PIC.

When HA must be configured, ensure that the Protect or Through PICs are installed in consecutive slots, with the 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 Through PICs or between an Protect PIC and 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 PIC Blank card, open the ejector levers and fully insert the PIC blank into the slot until the ejectors touch the chassis flanges.

Figure 98: Opening the Ejector Levers on the PIC

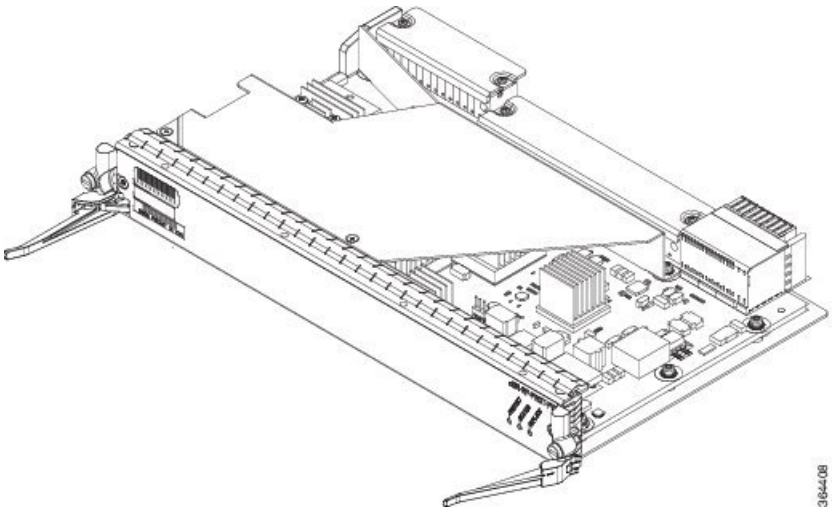
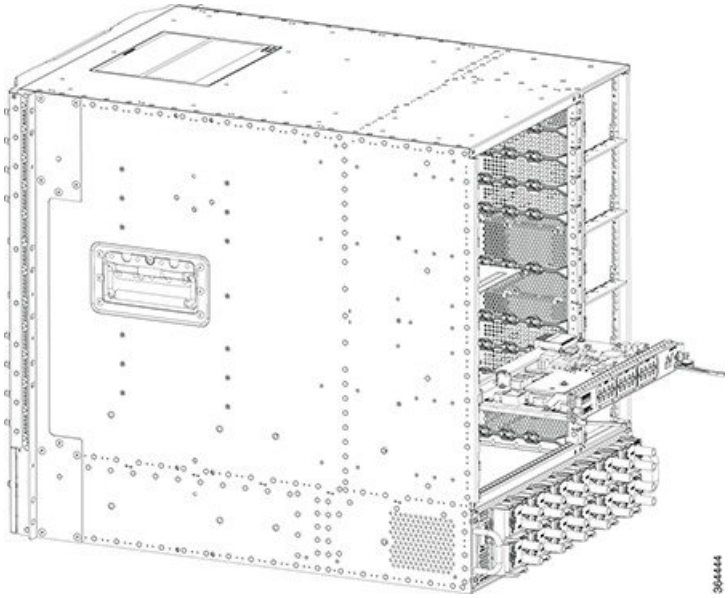
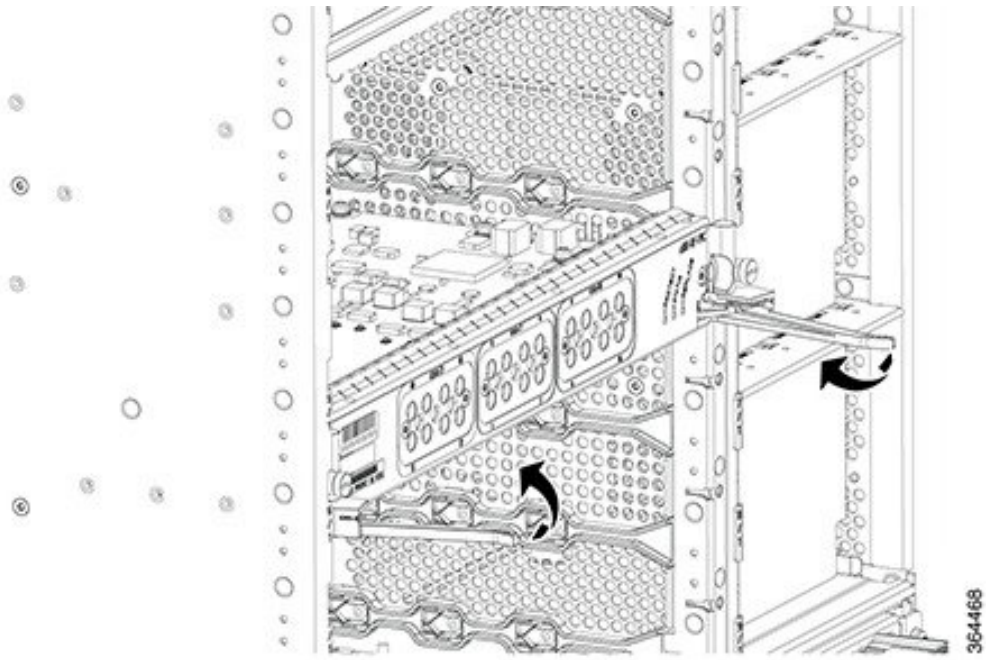


Figure 99: Inserting the PIC



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

Figure 100: Closing the Ejector Levers on the 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 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 RF Through 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

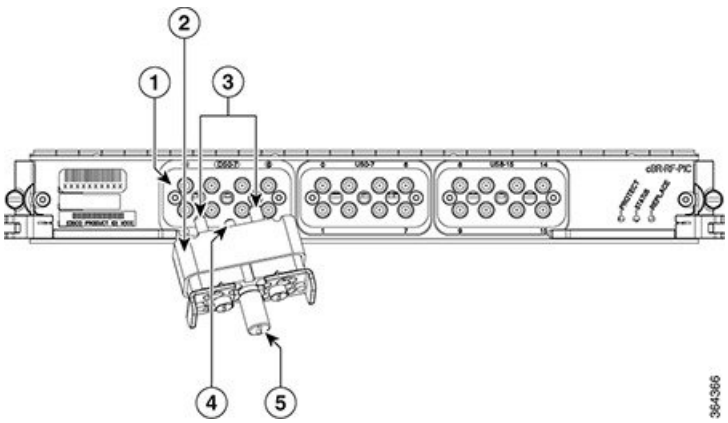
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Install the corresponding PIC.
- Install the chassis-mounted cable management bracket (if not already installed).

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 101: 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 DOCSIS MAC/PHY 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.

Warning 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.

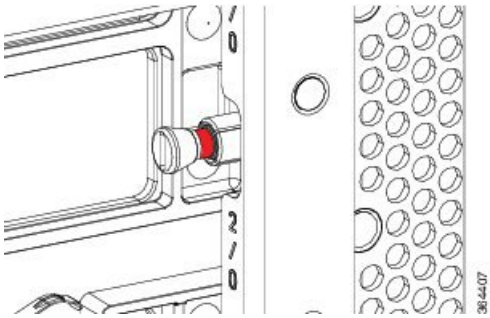
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver
- One of the following SSI Cards (line cards):
  - DOCSIS 3.0 MAC/PHY line card [PID: CBR-LC-8D30-16U30]
  - DOCSIS 3.1 MAC/PHY line card [PID: CBR-LC-8D31-16U31, or CBR-LC-4D31-16U31]
  - 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.

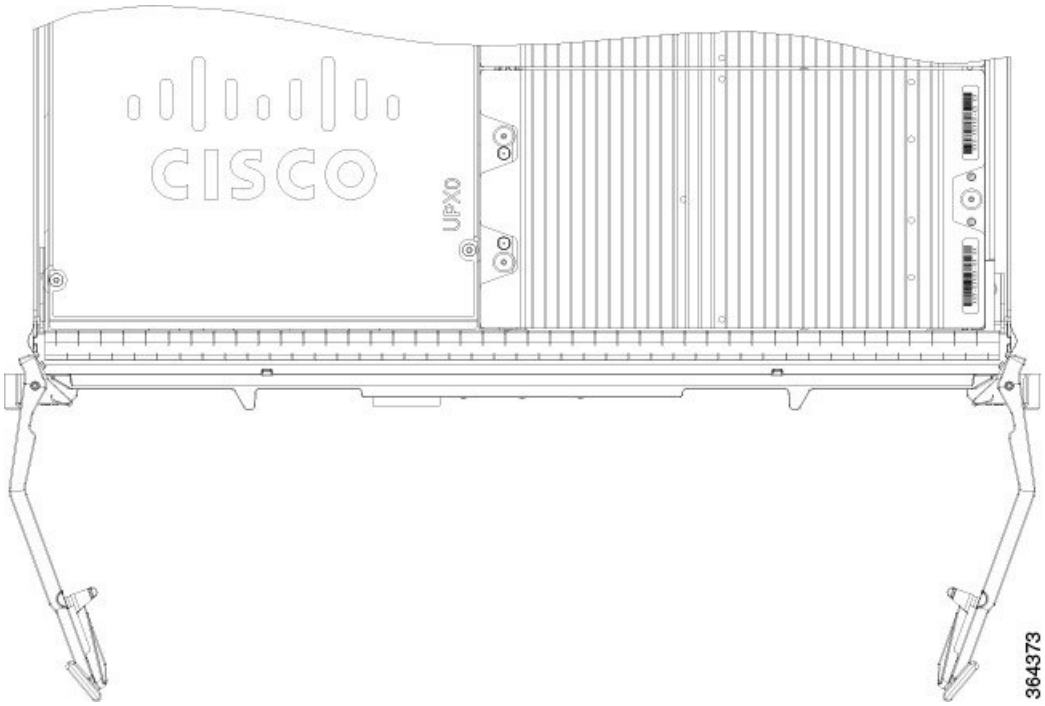
Note Ensure that the red band on the screws are visible.

Figure 102: 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 103: Opening the Spring-Loaded Ejectors on the Interface Line Card



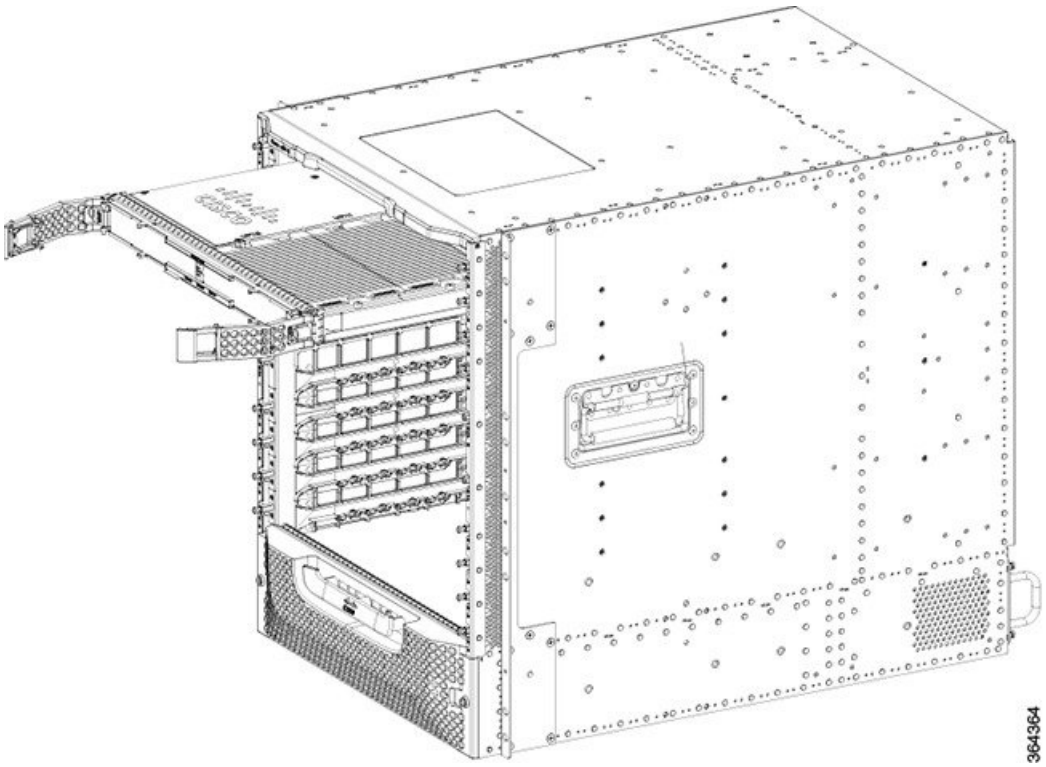
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

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 104: 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 105: Closing the Spring-Loaded Ejectors on the Interface Line Card

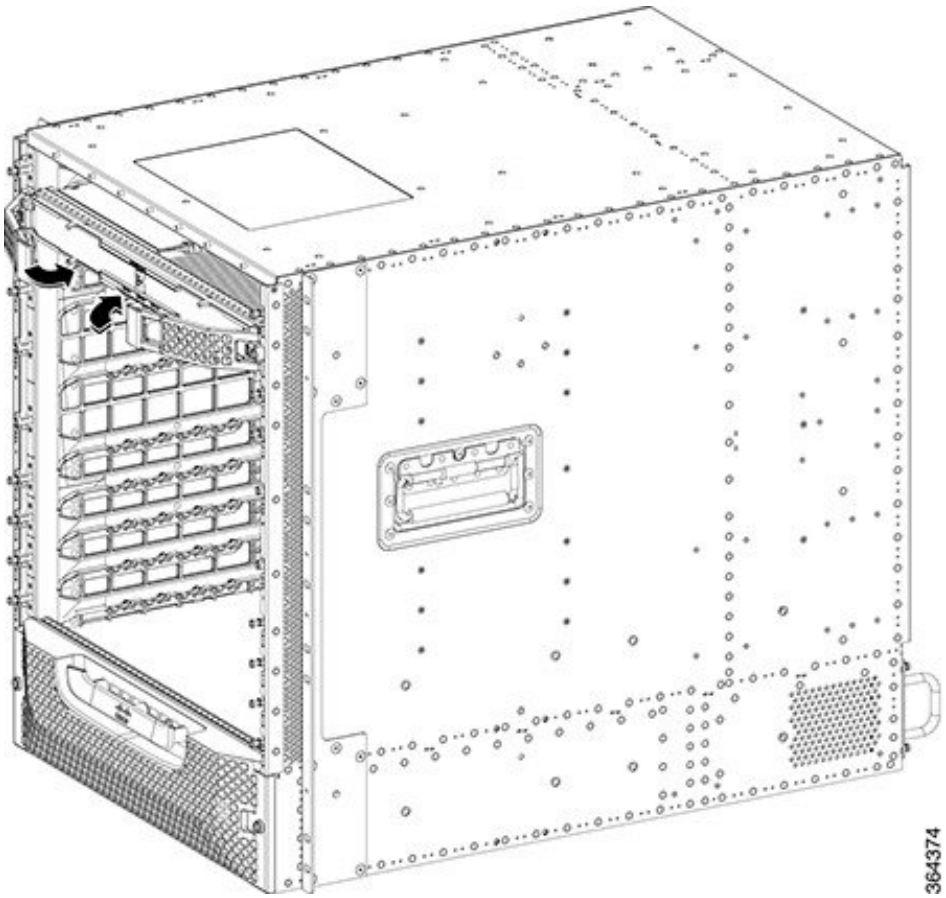
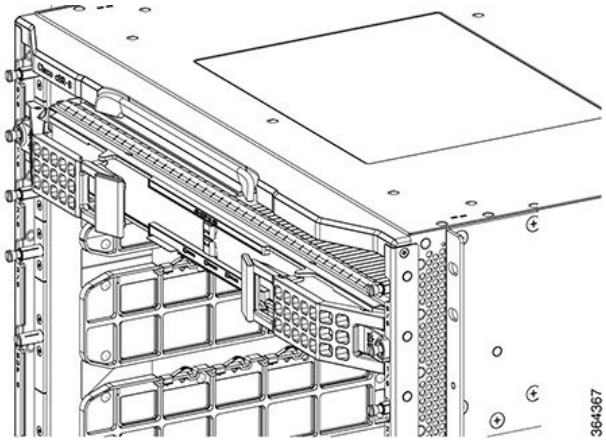


Figure 106: Closed and Secured Spring-Loaded Ejectors on the Interface Line Card



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

A 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 or upstream PHY module was replaced or upgraded.

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

Installing the DOCSIS MAC Interface and PIC Card

Note Configure the DOCSIS MAC/PHY Interface and PIC card before installing it in Cisco cBR-8 router. For example, if you use CBR-CCAP-LC-G2-R and cBR-DPIC-8X10G, pre-configure the slot before inserting new LC into slot x using the **card x/0 CBR-CCAP-LC-G2-R r-phy** command.

Installing Digital PIC in the Cisco cBR Chassis

Warning 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:

- Digital Through PIC
- Digital PIC Blank card

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 Through PICs.

Before you begin

- 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
- Digital Through PIC or Digital 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 PIC Blank card, open the ejector levers and fully insert the PIC blank into the slot until the ejectors touch the chassis flanges.

Figure 107: Opening the Ejector Levers on the PIC

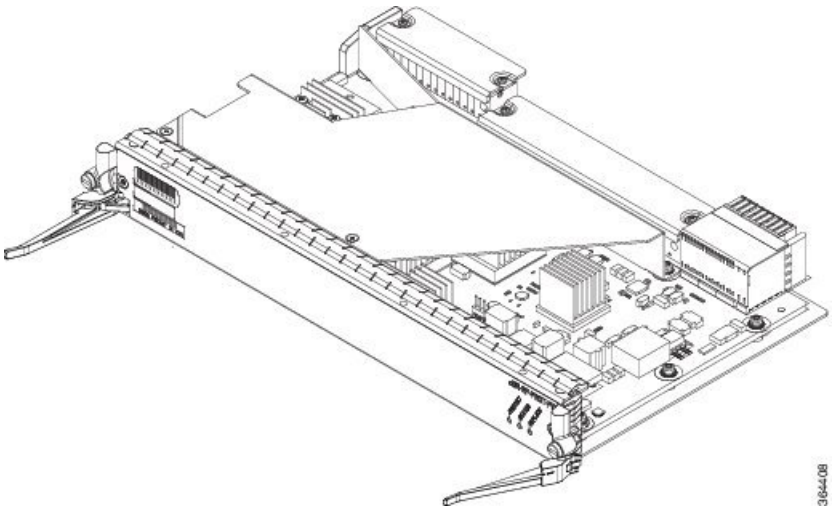
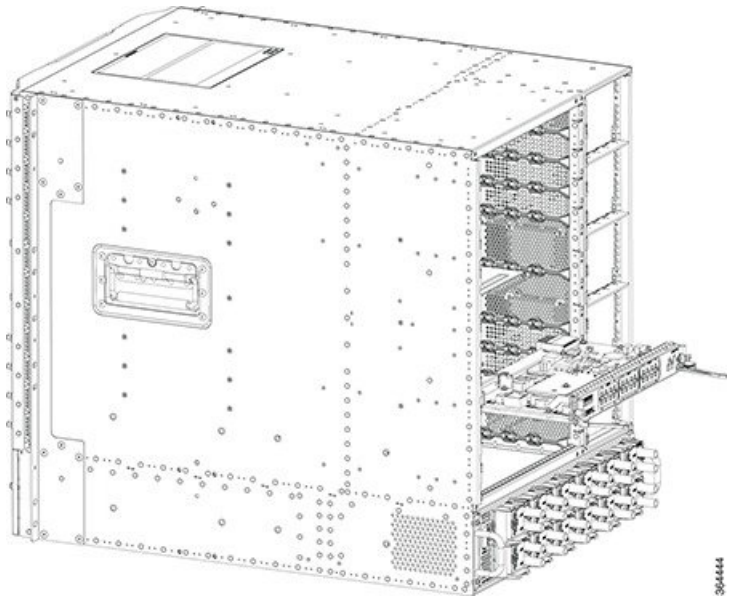
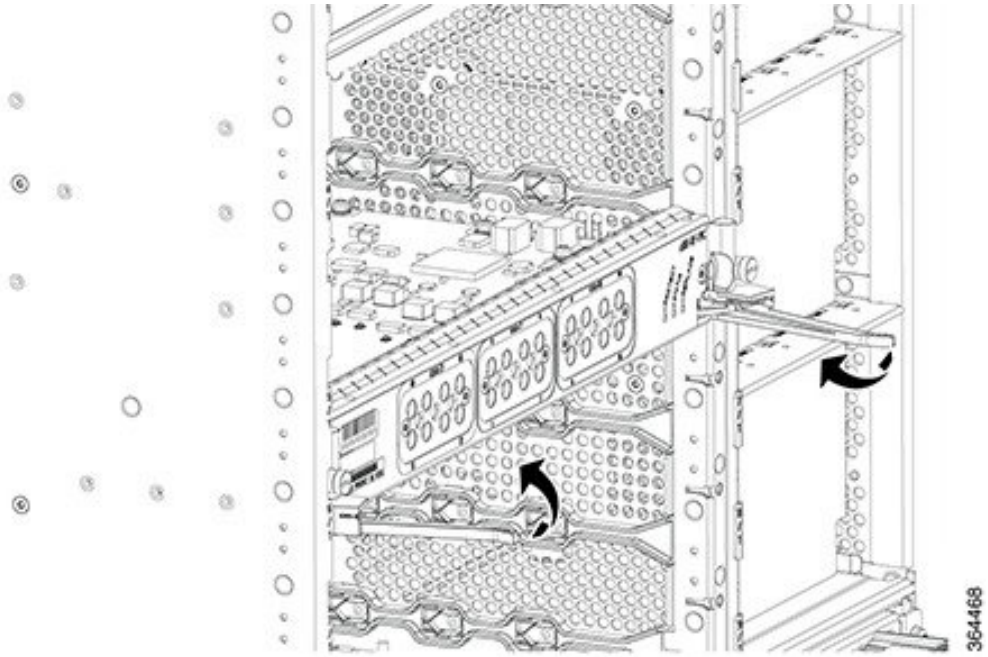


Figure 108: Inserting the PIC



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

Figure 109: Closing the Ejector Levers on the 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 PIC.
- Install the Interface line card.
- If a card is not installed in the slot, install a blank filler card.

Installing the DOCSIS MAC 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.

Warning 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.
- Installing Digital PIC in the Cisco cBR Chassis, on page 150
- 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 Digital Protect or Digital Through PIC installed.

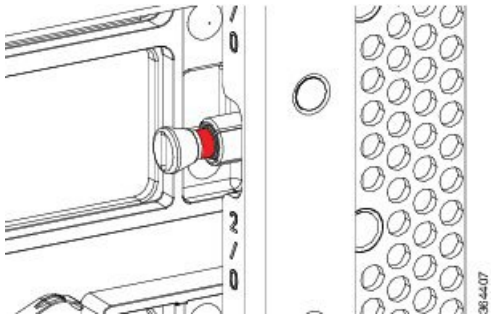
Required Tools and Equipment

- ESD-preventive wrist strap
- 3/16" flat-blade torque screwdriver
- One of the following SSI Cards (line cards):
  - DOCSIS MAC line card (40G) [PID: CBR-CCAP-LC-40G]
  - DOCSIS MAC line card (80G) [PID: CBR-CCAP-LC-G2-R]
  - 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.

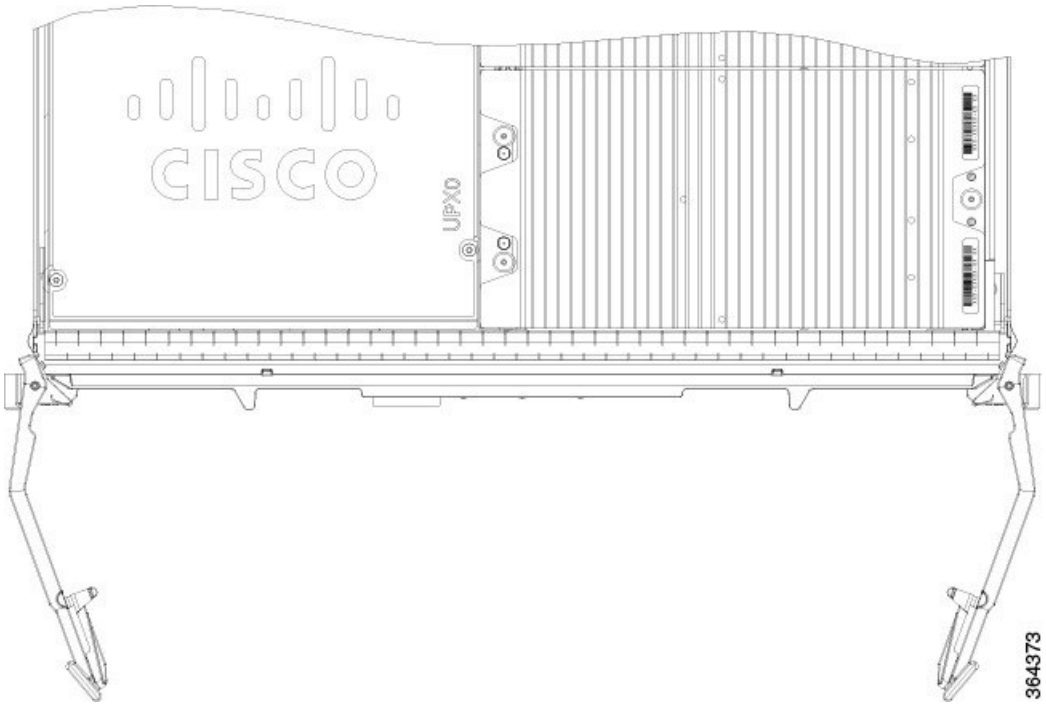
Note Ensure that the red band on the screws are visible.

Figure 110: 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 111: Opening the Spring-Loaded Ejectors on the Interface Line Card



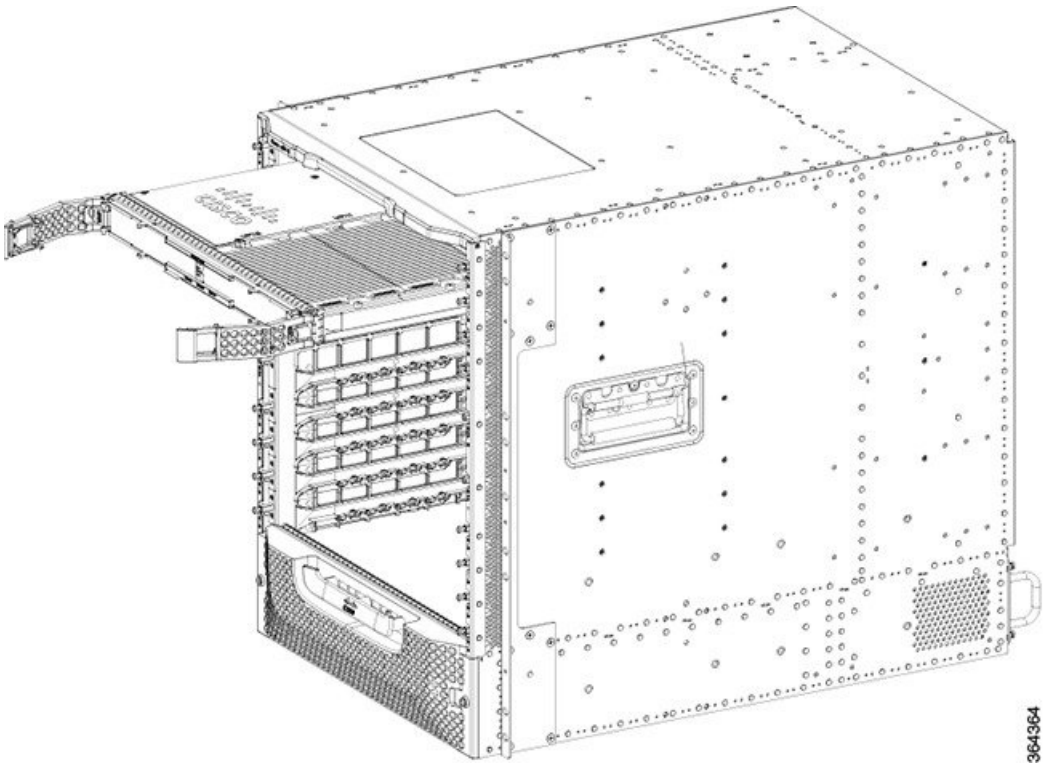
Step 3 Grasp the faceplate of the card with one hand and place your other hand under the card to support its weight.

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 112: 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 113: Closing the Spring-Loaded Ejectors on the Interface Line Card

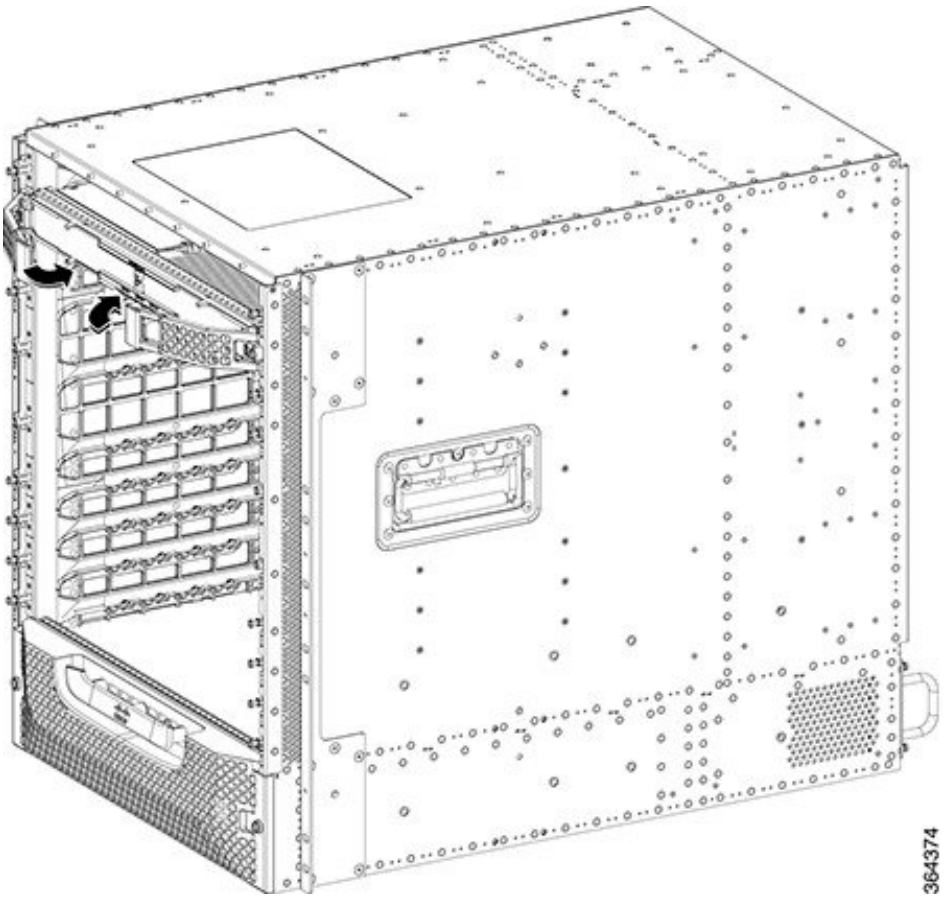
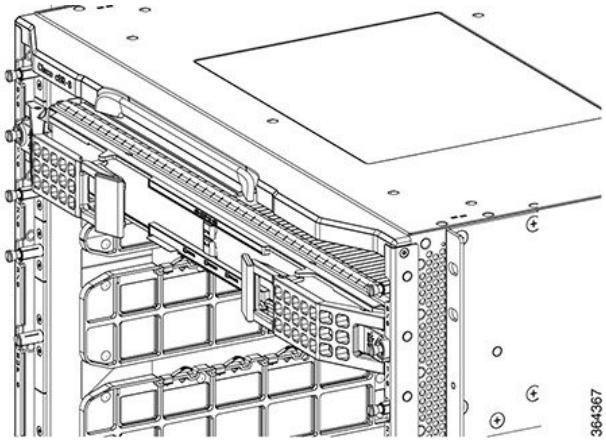


Figure 114: Closed and Secured Spring-Loaded Ejectors on the Interface Line Card



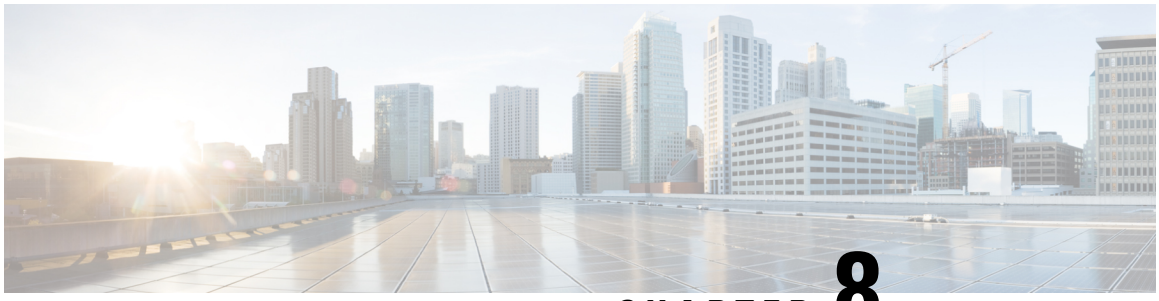
Step 7 Tighten the two captive screws using a 3/16" flat-blade torque screwdriver with a torque of 10-12 lb-in (1.12-1.36 Nm) to secure the card.

What to do next

A 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 or upstream PHY module was replaced or upgraded.

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



CHAPTER 8

Powering Up the Cisco cBR Chassis

- Powering Up the Cisco cBR, on page 159

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.

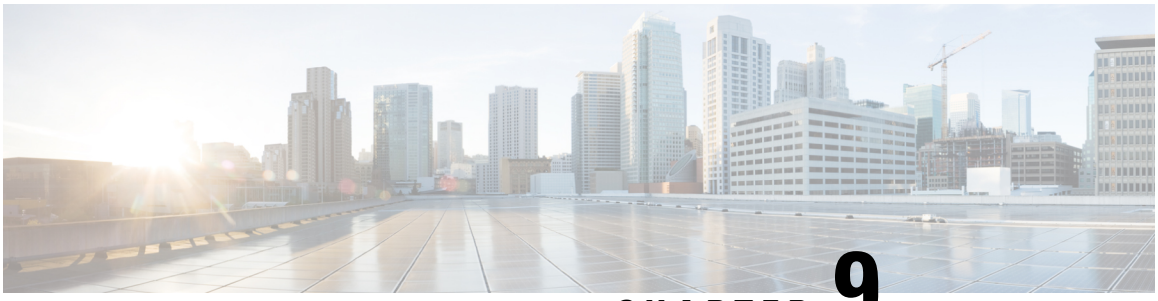
Step 1 Make sure the chassis ground connection is attached.

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

What to do next

Ensure the POWER ENABLE LED on the FPEM illuminates green.

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



CHAPTER 9

Monitoring the Cisco cBR Chassis

- Monitoring the Cisco cBR Chassis Using CLI, on page 161

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
```

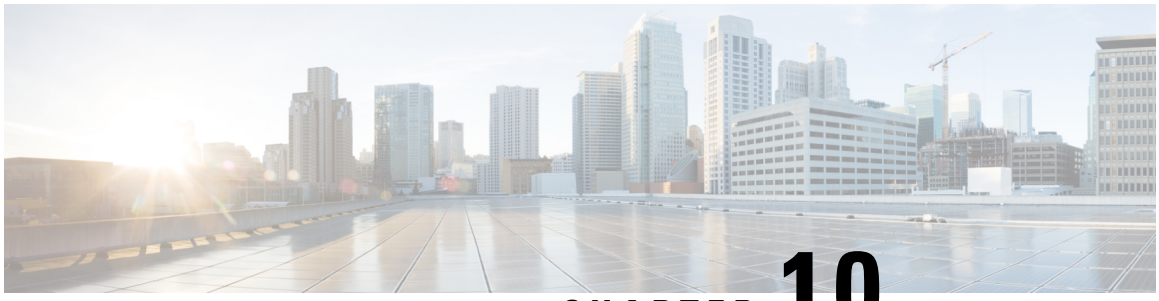
```
Temp: 3882_7B    R0               Normal           35 Celsius
Temp: 3882_8     R0               Normal           47 Celsius
Temp: 3882_8A    R0               Normal           45 Celsius
Temp: 3882_8B    R0               Normal           41 Celsius
Temp: 3882_9     R0               Normal           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, on page 169
- Monitoring the Fan Module using CLI in the Cisco cBR Chassis, on page 170

Monitoring the Fan Module on the Cisco cBR using LEDs

Table 32: 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.

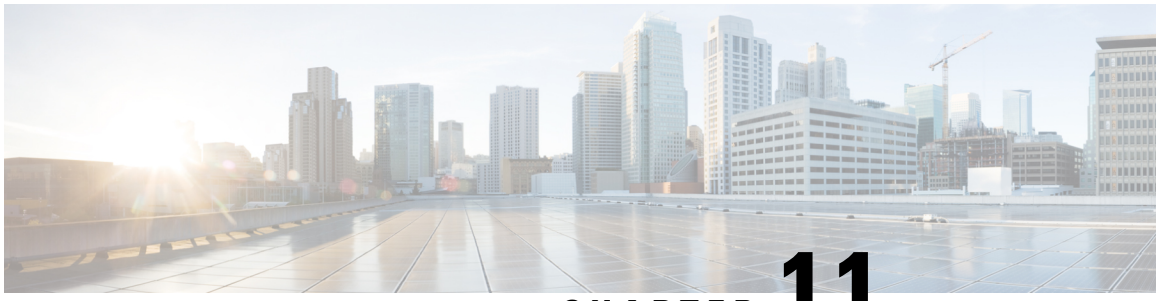
[3] Indicates the status of the back fan.
[4] Indicates the status of the front fan.

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, on page 171
- Monitoring the Power System in the Cisco cBR Chassis Using CLI, on page 173

Monitoring the Power System in the Cisco cBR Chassis Using LEDs

Table 33: 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.

Note VER 01 of the AC FPEM has P0 AC PRESENT LED through P5 AC PRESENT LED. The PRESENT LEDs indicate input AC power for the corresponding AC Power Modules (also indicated on the front of the Power Module). Updated AC FPEM started shipping from April, 2018.

Table 34: 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 35: 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 36: Verifying the LEDs on the DC Power Module

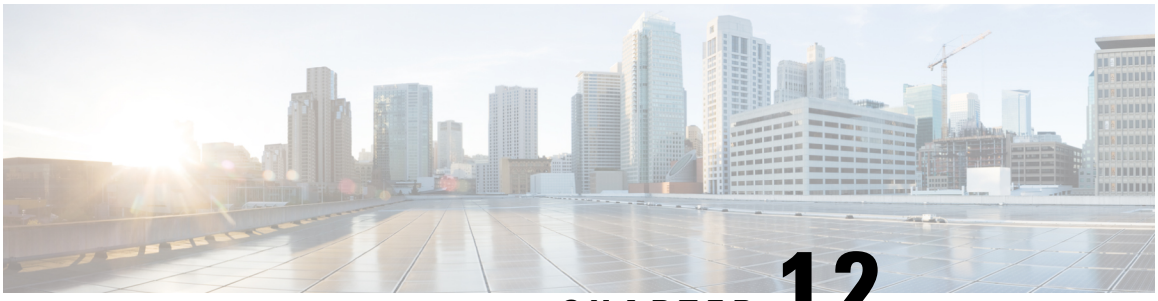
LED	Status	Description
Input power LED	Green	Dual DC input voltages are present and within the correct range (-40 V to -72 V).
	Blinking	The DC Power Module is in single input operation mode and at least one DC input voltage is out of the acceptable range.
	Off	Dual DC input voltages are less than -26 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.
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 160G in the Cisco cBR Chassis Using LEDs, on page 176
- Monitoring the Supervisor 250G in the Cisco cBR Chassis Using LEDs, on page 179

Monitoring the Supervisor 160G in the Cisco cBR Chassis Using LEDs

Table 37: 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 38: 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.
REPLACE	Off	The Supervisor PIC does not need to be replaced.
	Green	The Supervisor PIC needs to be replaced.

LED	Status	Description
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.

Monitoring the Supervisor 250G in the Cisco cBR Chassis Using LEDs

Table 39: Verifying the LEDs on the Supervisor Card

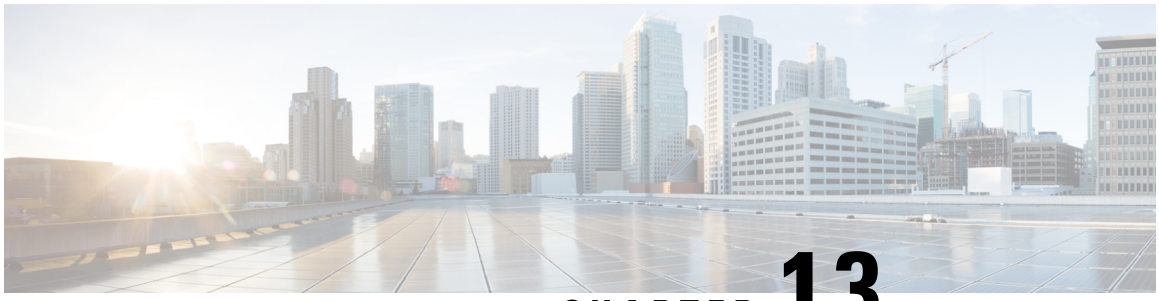
LED	Status	Description
PWR STAT	Off	Supervisor Card is not powered up.
	Green	Supervisor Card is powered up.
	Yellow	Supervisor Card has a power fault - at least one voltage rail exceeded its voltage threshold limit.
	Blinking green at a 2 seconds rate	Supervisor Card has a power fault - less than the 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 40: 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.
REPLACE	Off	The Supervisor PIC does not need to be replaced.
	Green	The Supervisor PIC needs to be replaced.

LED	Status	Description
100G 0-1	Off	The 100G backhaul port is not powered up or it is not in 100G mode.
	Yellow	The 100G backhaul port 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.
10G 0-7	Off	The 10G backhaul port is not powered up or it is not in 10G mode.
	Yellow	The 10G backhaul port 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.
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 Line Cards in the Cisco cBR Chassis using LEDs, on page 183
- Monitoring the Digital Physical Interface Cards in the Cisco cBR Chassis using LEDs, on page 184

Monitoring the Interface Line Cards in the Cisco cBR Chassis using LEDs

Table 41: Verifying the LEDs on the Interface Line Cards

LED	Status	Description
STATUS	Off	The line card has not initialized correctly.
	Yellow	The line card has initialized, but HA fault is detected. Possible hardware fault.
	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.

Monitoring the Digital Physical Interface Cards in the Cisco cBR Chassis using LEDs

cBR CCAP Digital Through PIC

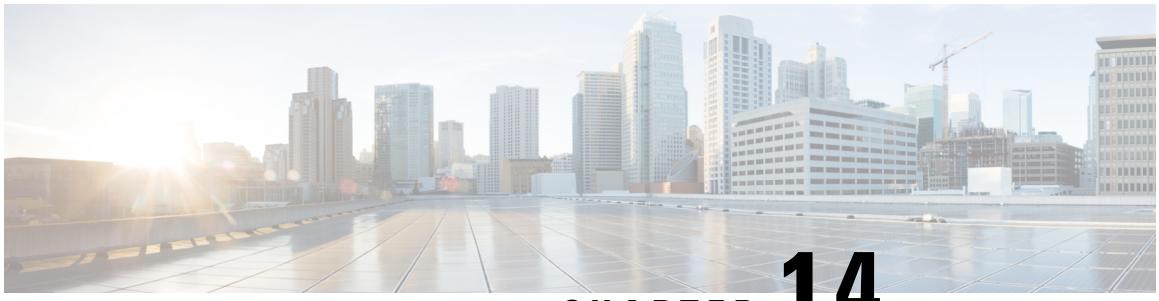
Table 42: Verifying the LEDs

LED	Status	Description
STATUS	Off	The card is not powered up.
	On	The card is operational.
10GE Link Status	Off	The specific link is down or the optical module is absent.
	On	The specific link is up.
REPLACE	Off	The card is operational and does not require replacement.
	On	The card requires replacement.

cBR-8 2x100G Digital Physical Interface Card

Table 43: Verifying the LEDs

LED	Status	Description
STATUS	Off	The card is not powered up.
	On	The card is operational.
Link Status	Off	The specific link is down or the optical module is absent.
	On	Thespecific link is up. QSFP0 port is mapped to LED 0,2,4,6 if it works in 10GE mode and mapped to LED 0 if works in 100GE mode. QSFP1 port is mapped to LED 1,3,5,7 if it works in 10GE mode and mapped to LED 1 if works in 100GE mode.
REPLACE	Off	The card is operational and does not require replacement.
	On	The card requires replacement.



CHAPTER 14

Maintaining the Cisco cBR Chassis

- Powering Down the Cisco cBR Chassis, on page 185
- Unmounting the Cisco cBR Chassis, on page 185

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.

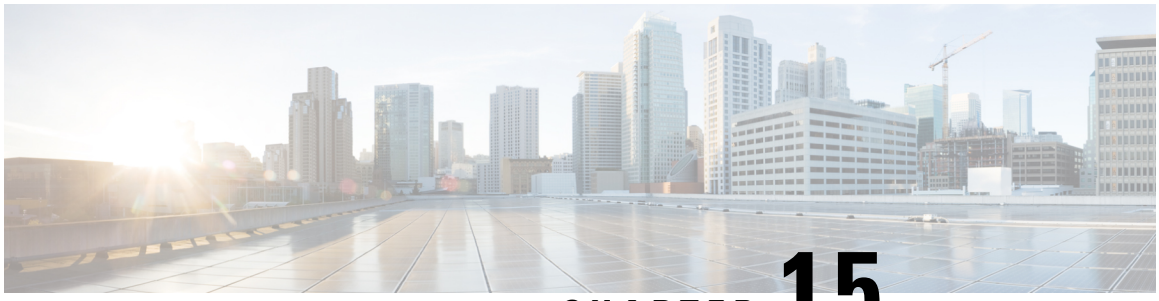
Step 4 Loosen the screws inserted into the side cable management bracket using a #2 Phillips screwdriver.

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, on page 187

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.

Warning 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

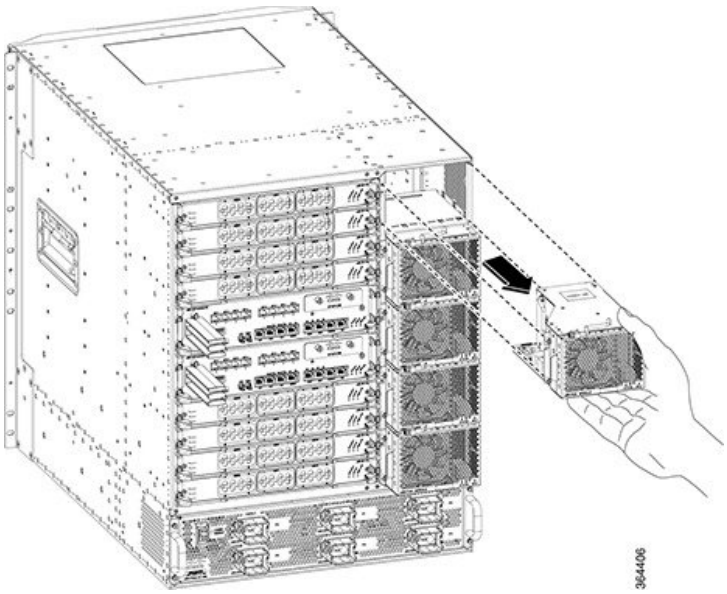
- A flat-blade screwdriver

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.

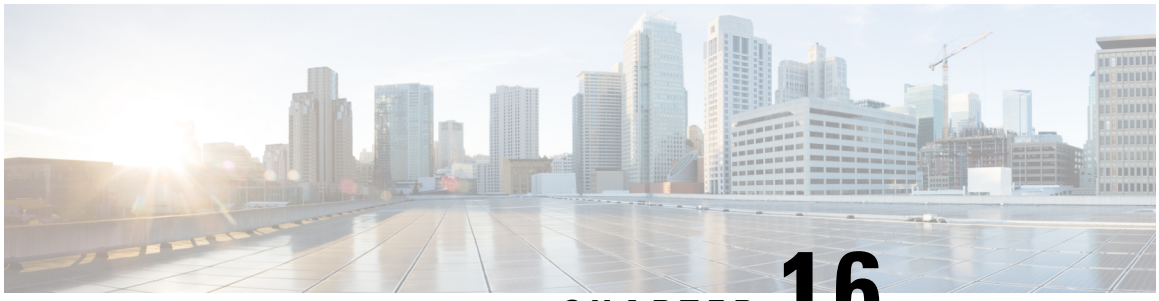
Step 3 Grasp the top and bottom frame of the Fan Module with your hand and pull it gently out of the chassis.

Figure 115: 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, on page 189
- Removing the DC Power Connections from the Cisco cBR Chassis, on page 190
- Removing the Power Module from the Cisco cBR Chassis, on page 191
- Removing the FPEM from the Cisco cBR Chassis, on page 193
- Removing the Power Cassette Module from the Cisco cBR Chassis, on page 195

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

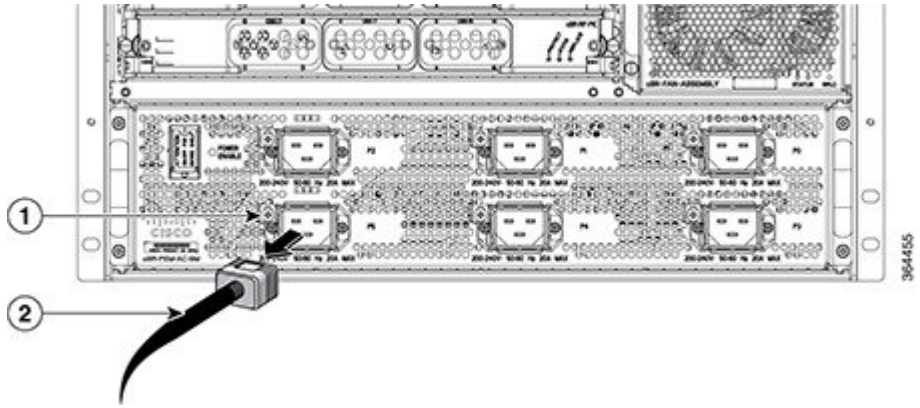
Step 1 Power down the AC FPEM using the power switch.

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 116: 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 189 to Step 4, on page 189 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.

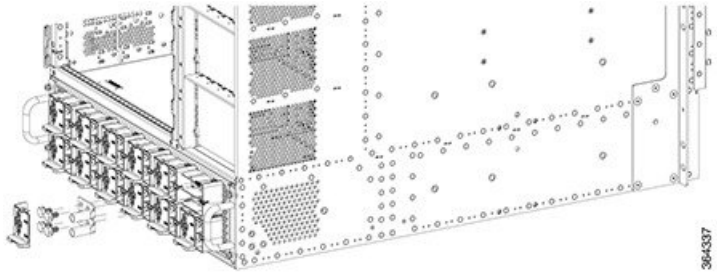
Step 2 Power down the circuit or power supply to which the positive and negative lead cables are connected.

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 117: Removing the DC Power Connection from the DC FPEM



Step 6 Repeat Step 2, on page 191 and Step 5, on page 191 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.

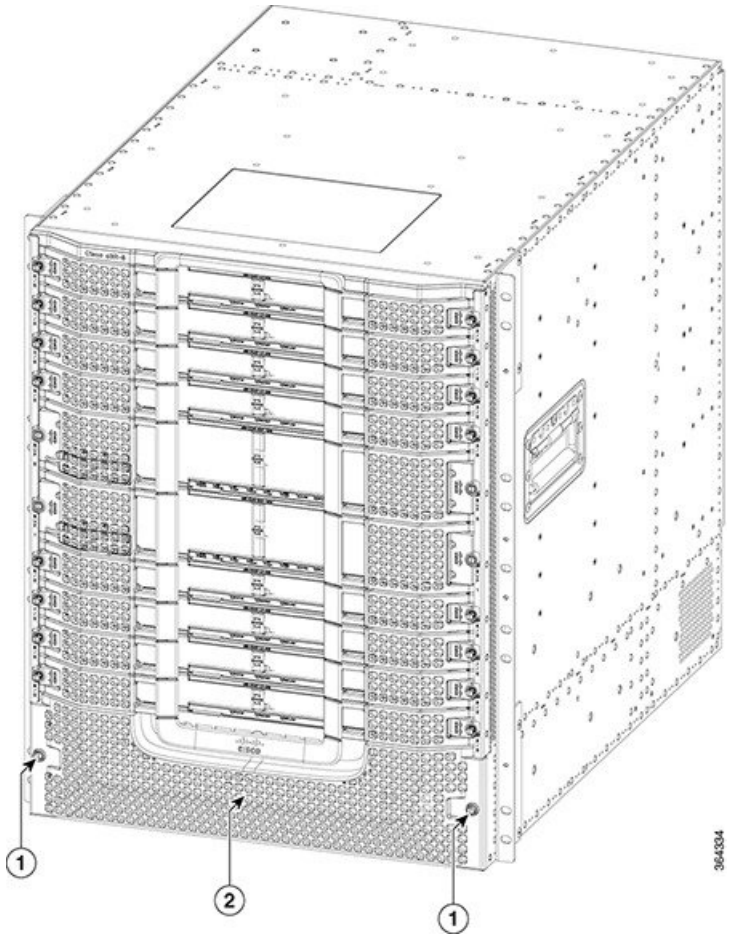
- For the AC-powered Cisco cBR with 1+1 redundancy, ensure that the chassis has six operational AC Power Modules for the chassis to be functional.

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 118: Removing the Front Power Entry Bezel from the Chassis

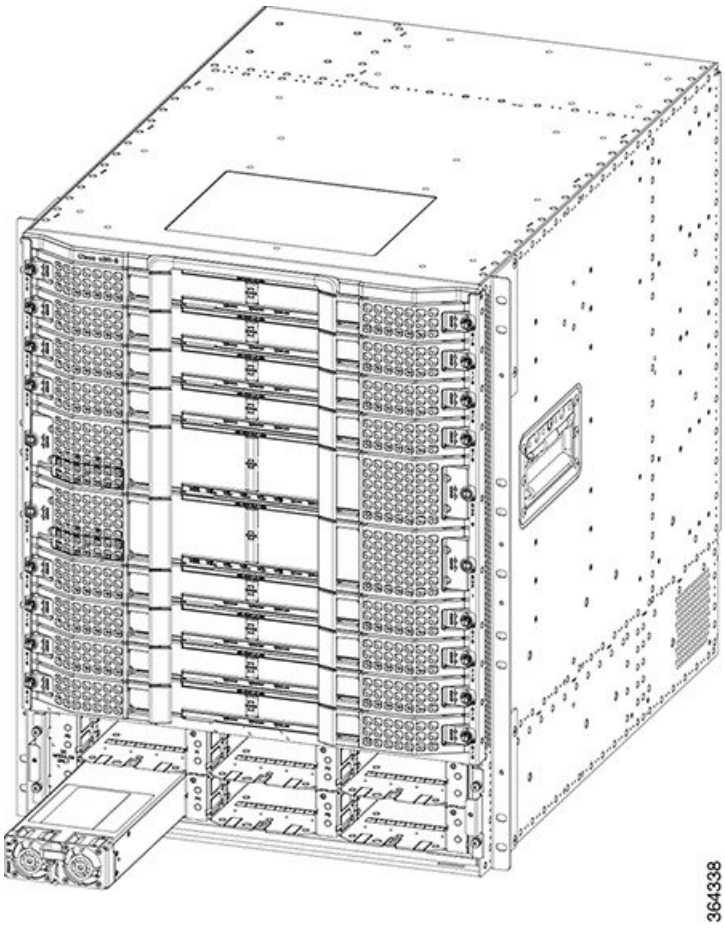


Step 2 Loosen the screw on the Power Module using a 3/16" flat-blade torque screwdriver.

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 119: 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.

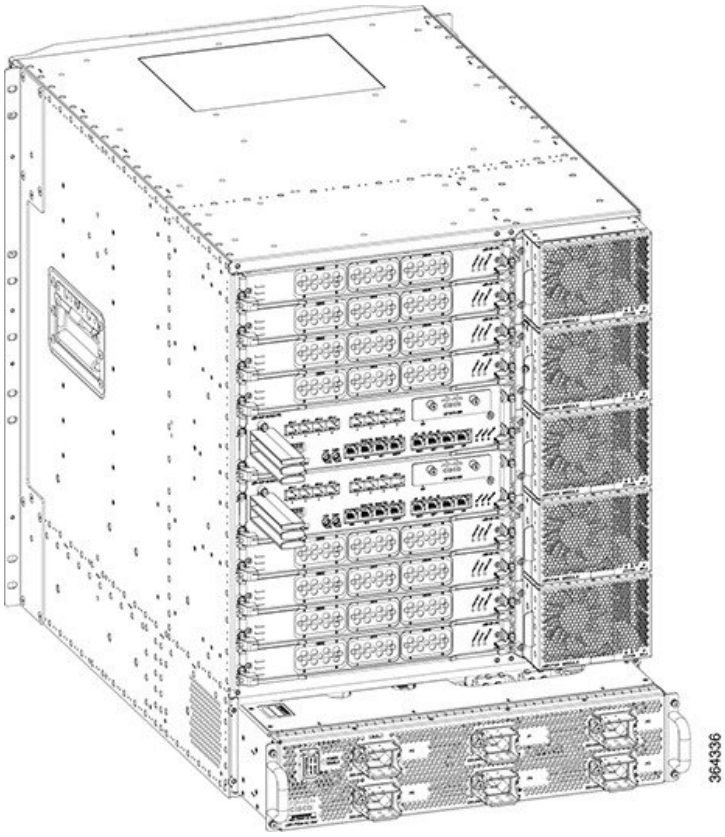
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Remove the Power Modules.
- If you are replacing the entire power system, remove the Power Cassette Module.
- Be aware of the weight and size of the equipment. Handle it with 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 120: 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

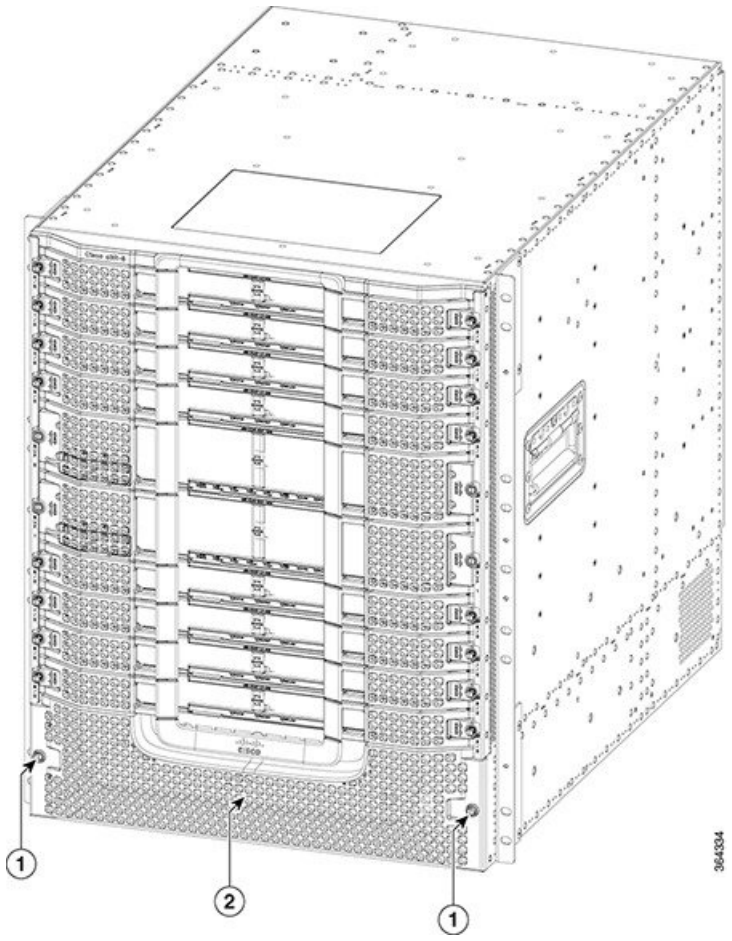
- Remove the Power Modules.
- Be aware of the weight and size of the equipment. Handle it with care.

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 121: Removing the Front Power Entry Bezel from the Chassis

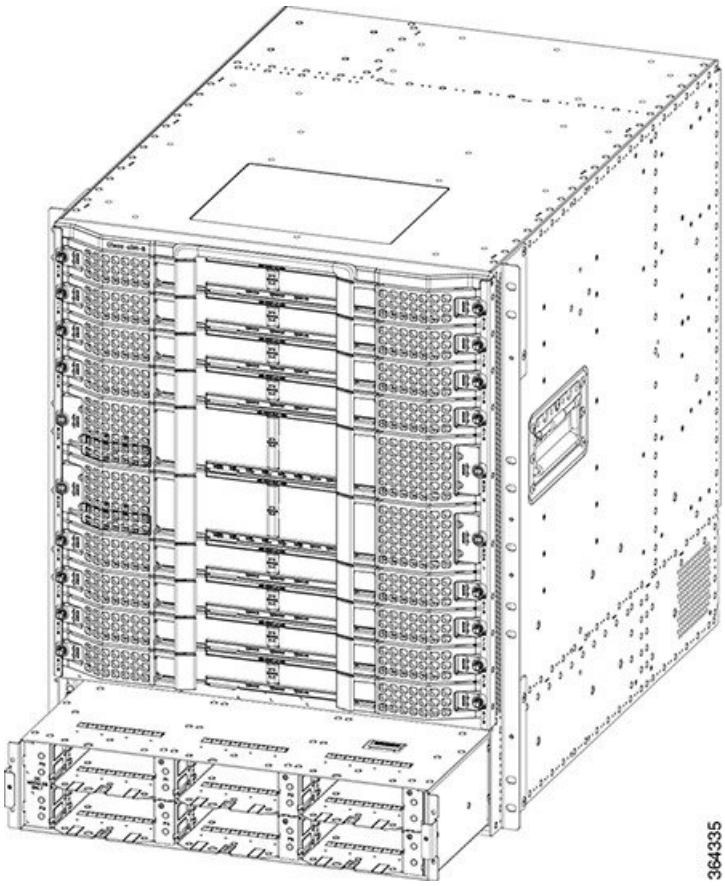


1	Screw	2	Front power entry bezel

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

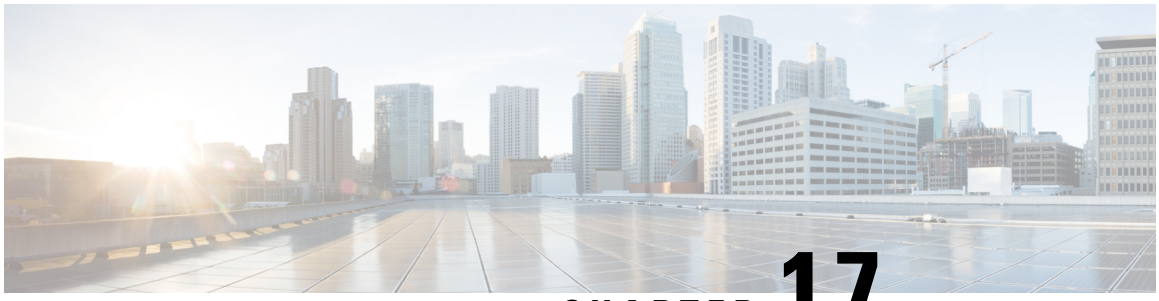
Step 3 Hold the side flanges on the Power Cassette Module with both your hands. Pull and slide the module out of the chassis applying even pressure to both your hands.

Figure 122: 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

Note Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.

- Maintaining the Supervisor 160G, on page 199
- Maintaining the Supervisor 250G, on page 207

Maintaining the Supervisor 160G

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

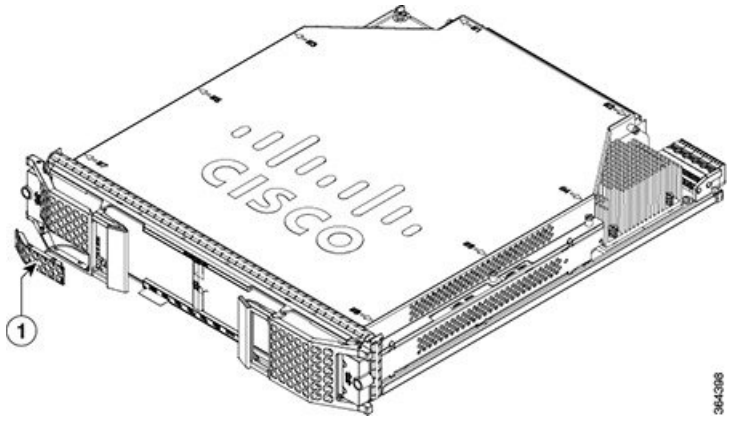
Caution

- 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 123: 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.

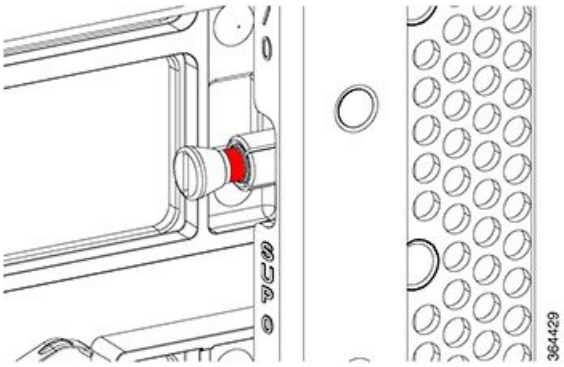
Caution After removing the Supervisor Card or blank card from an operational chassis, install the replacement Supervisor Card or blank card in the chassis within 3 minutes to prevent the chassis from shutting down due to possible overheating of some components.

Required Tools and Equipment

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

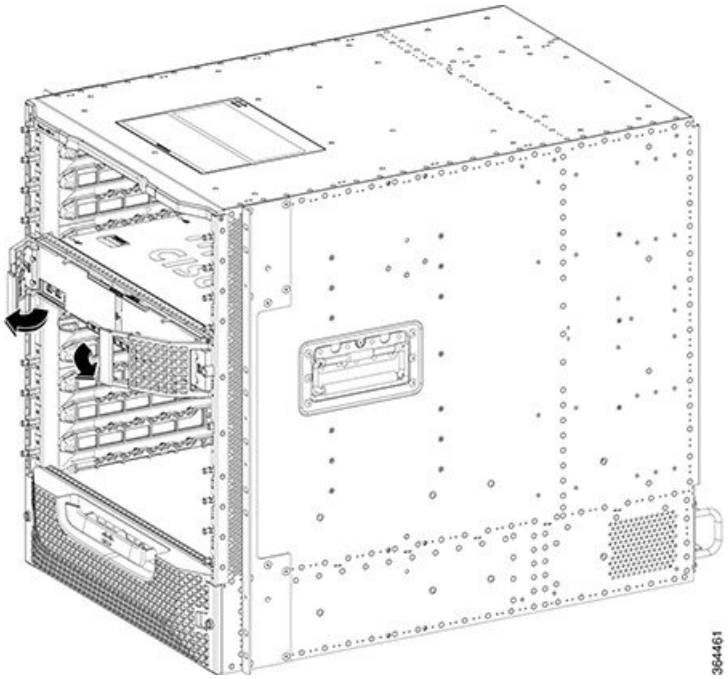
Step 1 Loosen the captive screws on the card using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

Figure 124: Loosening the Captive Screws on the Chassis



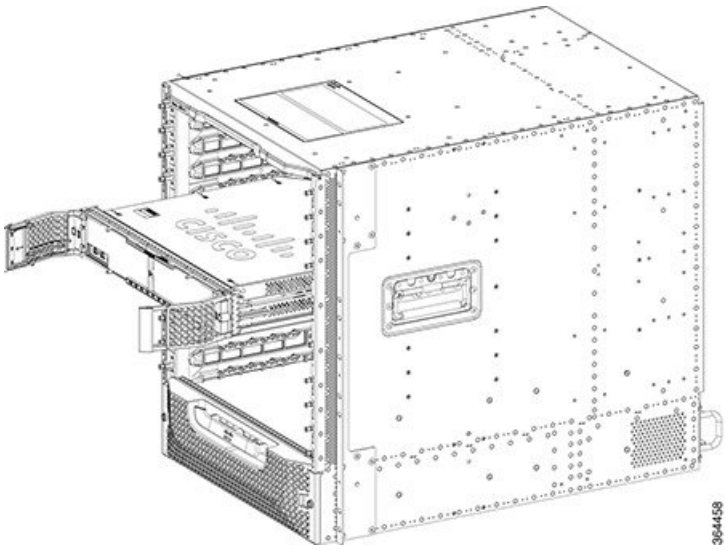
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 125: 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 126: 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

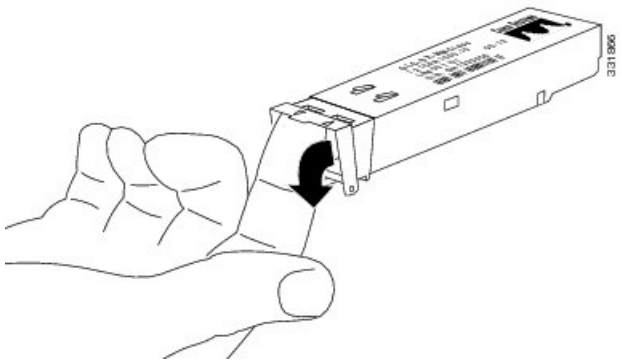
- ESD-preventive wrist strap
- Dust plugs for the SFP+ module
- Antistatic bag

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 127: 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

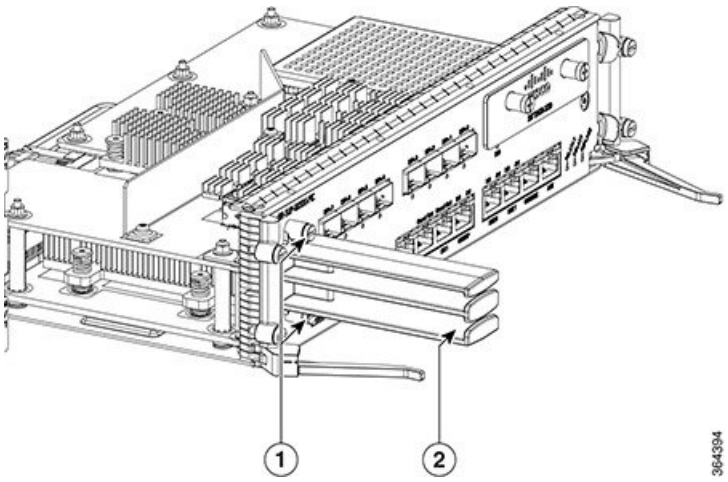
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Remove all the cables that are routed through the Supervisor PIC cable management bracket.

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 128: 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.

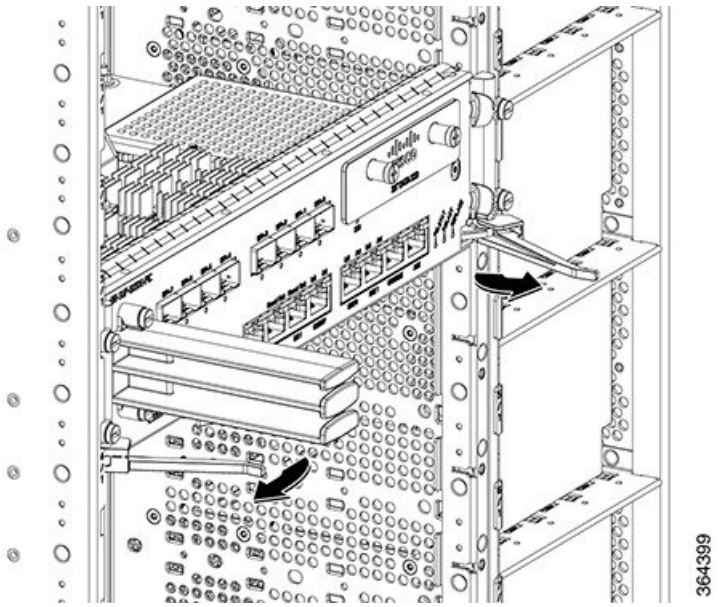
Required Tools and Equipment

- 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.

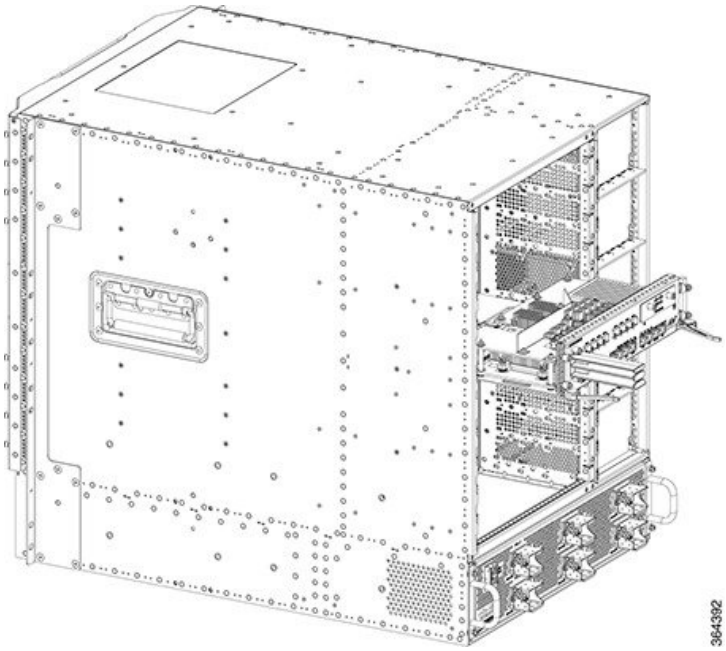
Step 2 Pull the ejector levers on the PIC to disengage the midplane connectors.

Figure 129: 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 130: 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.

Maintaining the Supervisor 250G

Removing the Supervisor Card from the Cisco cBR Chassis

Perform this procedure to remove the following cards:

- Supervisor Card
- Blank card for the Supervisor

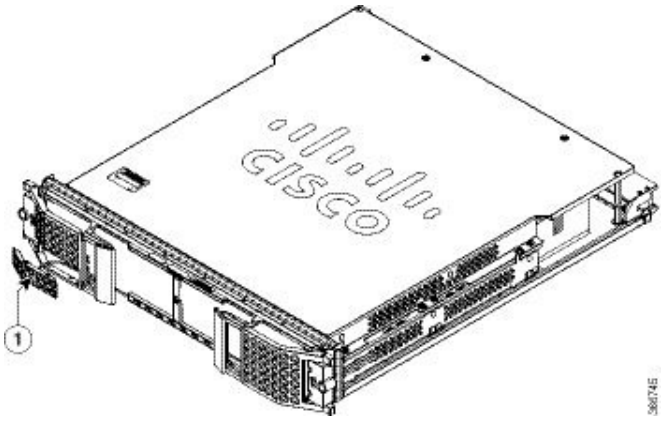
Before you begin

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 131: 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.

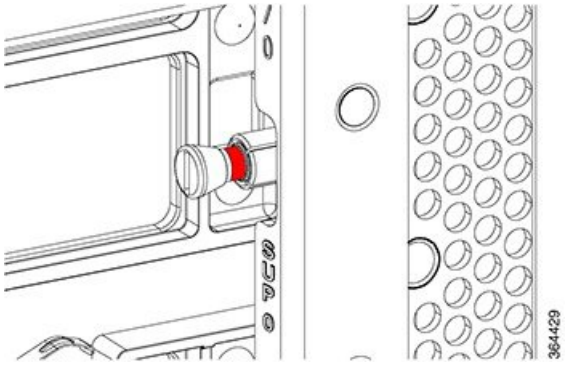
Caution After removing the Supervisor Card or blank card from an operational chassis, install the replacement Supervisor Card or blank card in the chassis within 3 minutes to prevent the chassis from shutting down due to possible overheating of some components.

Required Tools and Equipment

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

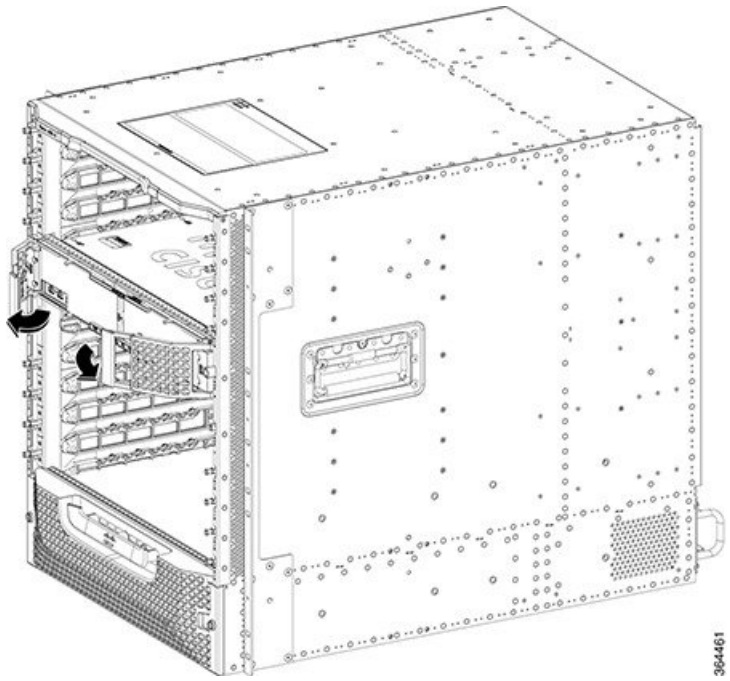
Step 1 Loosen the captive screws on the card using a 3/16" flat-blade torque screwdriver until the red bands are visible on the captive screws.

Figure 132: Loosening the Captive Screws on the Chassis



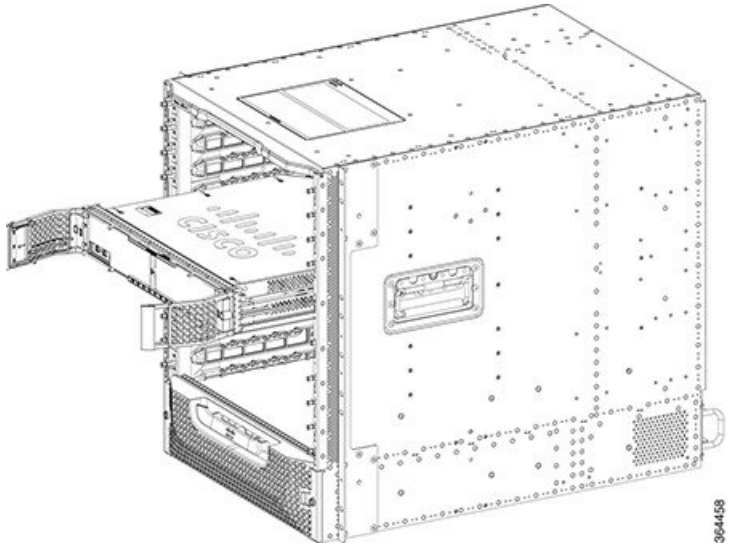
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 133: 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 134: 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 QSFP+ or QSFP28 Transceiver Module from the Supervisor PIC

Before you begin

Caution Do not install or remove the QSFP28 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 QSFP28 module latching properly into its socket connector. Disconnect all cables before removing or installing an QSFP28 module.

Caution The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with modules.

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

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

Step 1 For optical QSFP+ or QSFP28 transceiver modules, disconnect the network interface cable from the QSFP+ or QSFP28 transceiver connector.

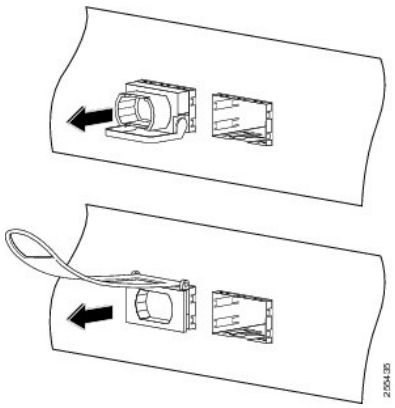
Step 2 For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch (see the below figure, top view):

a) Pivot the bail-clasp down to the horizontal position.
b) Immediately install the dust plug into the transceivers optical bore.
c) Grasp the sides of the QSFP+ or QSFP28 transceiver and slide it out of the module socket.

Step 3 For QSFP+ or QSFP28 transceivers equipped with a pull tab latch (see the below figure, bottom view):

a) Immediately install the dust plug into the transceiver's optical bore.
b) Grasp the tab and gently pull to release the transceiver from the socket.
c) Slide the transceiver out of the socket.

Figure 135: Removing the 40-Gigabit QSFP+ or 100-Gigabit QSFP28 Transceiver Module



Step 4 Place the QSFP+ or QSFP28 transceiver module into an antistatic bag.

What to do next

Replace the QSFP+ or QSFP28 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

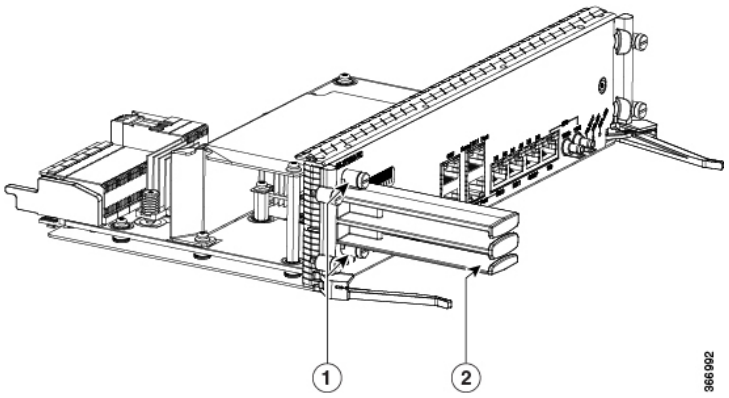
- Attach an ESD-preventive wrist strap to your wrist and connect the other end to the grounding lug connected to the chassis.
- Remove all the cables that are routed through the Supervisor PIC cable management bracket.

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 136: 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.

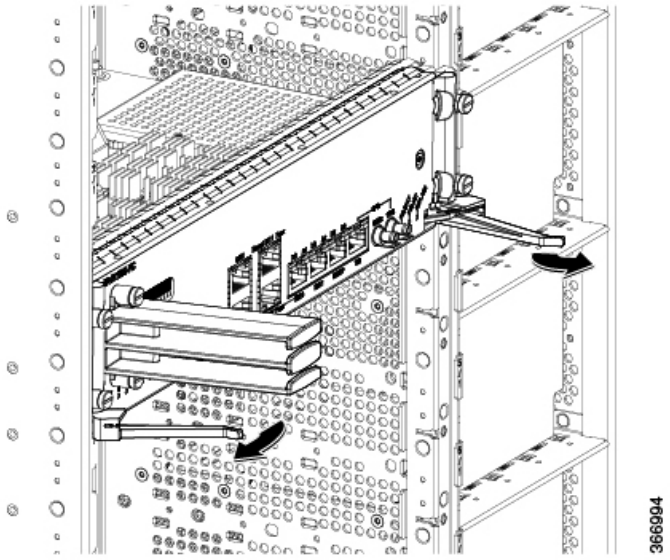
Required Tools and Equipment

- 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.

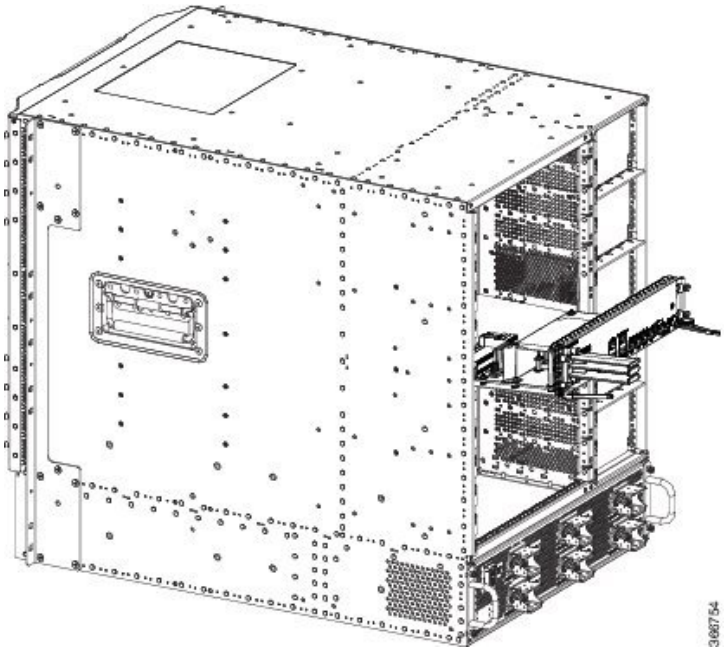
Step 2 Pull the ejector levers on the PIC to disengage the midplane connectors.

Figure 137: 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 138: Removing the Supervisor PIC from the Chassis

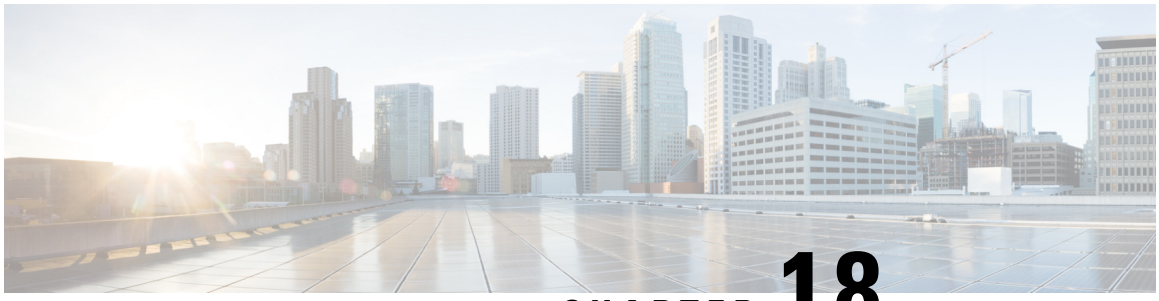


Step 4 Place the removed Supervisor PIC in an antistatic bag.

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 and PIC Cards in the Cisco cBR Chassis

Note Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.

- Maintaining the DOCSIS MAC/PHY Interface and PIC Card, on page 215
- Maintaining the DOCSIS MAC Interface and PIC Card, on page 223

Maintaining the DOCSIS MAC/PHY Interface and PIC Card

Removing the DOCSIS MAC/PHY Interface Line Card from the Cisco cBR Chassis

It is not necessary to power down the chassis to remove an DOCSIS MAC/PHY 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 DOCSIS MAC/PHY 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.

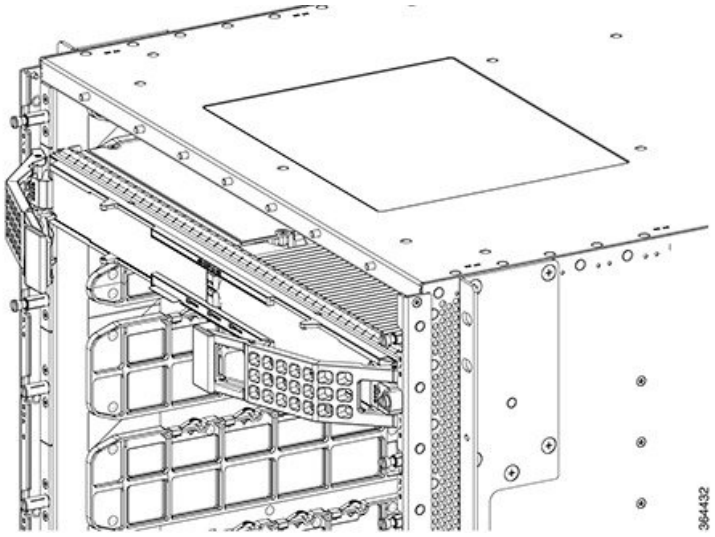
Required Tools and Equipments

- 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.

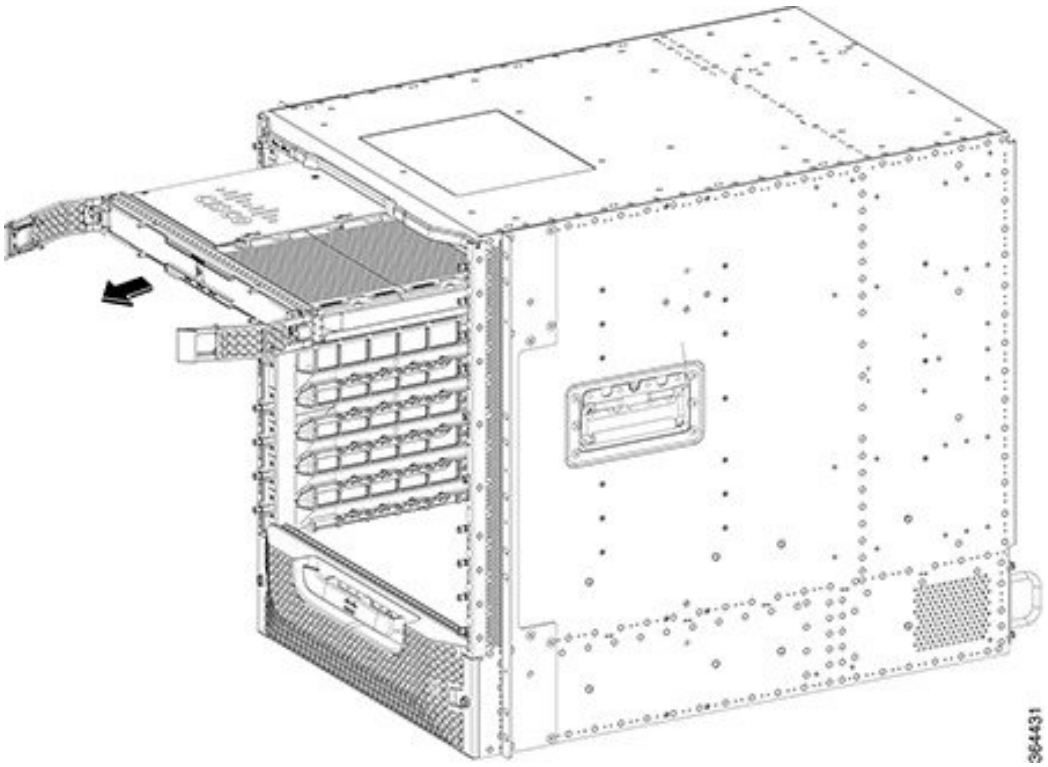
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 139: 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 140: 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 PIC

Three UCH.8 connectors are connected to the RF Through PIC. To remove a PIC, the UCH.8 connectors connected to the 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 the PIC or a PIC Blank from an operational chassis, install the replacement 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 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 141: Opening the Ejector Levers of the PIC

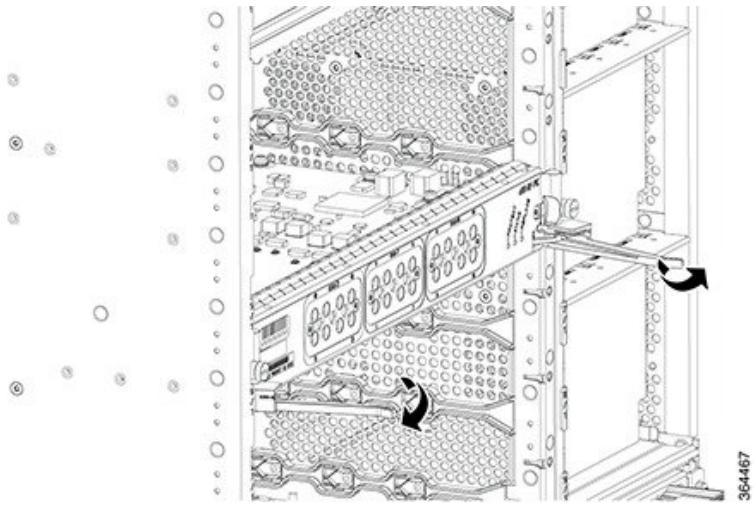
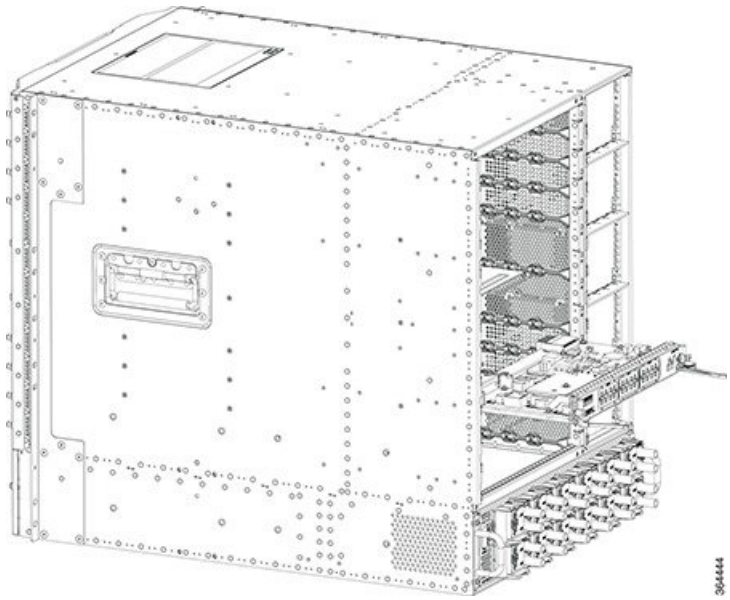


Figure 142: Removing the PIC from the Chassis



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

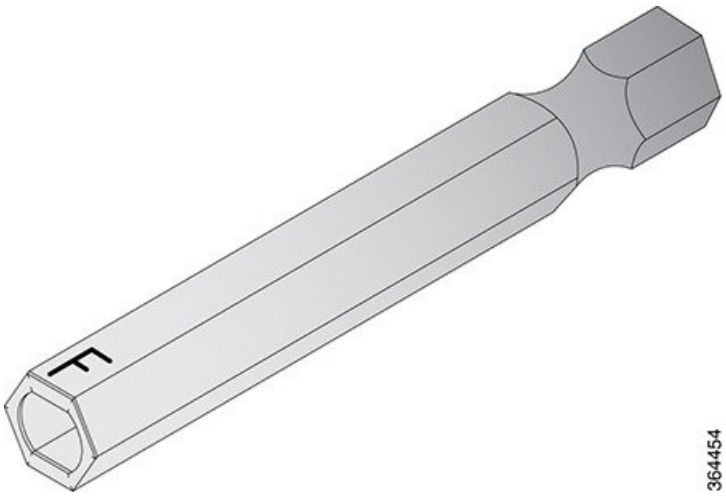
- Ensure that a replacement line card or line card blank is available for installation into the vacated line card slot.
- Ensure that the replacement interface line card or line card blank is installed within three minutes of removal.

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)

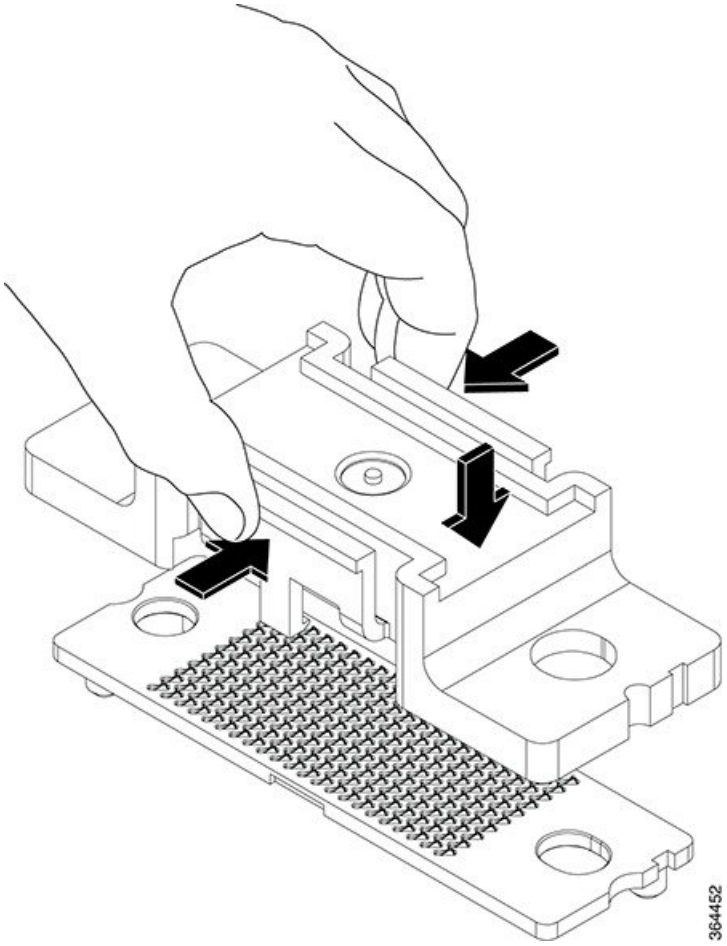
Figure 143: Hex Socket Bit for 10830 Cap-Screw



- 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 144: 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.

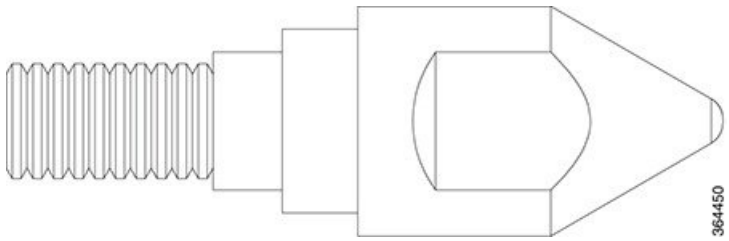
Restrictions

- 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 145: 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.

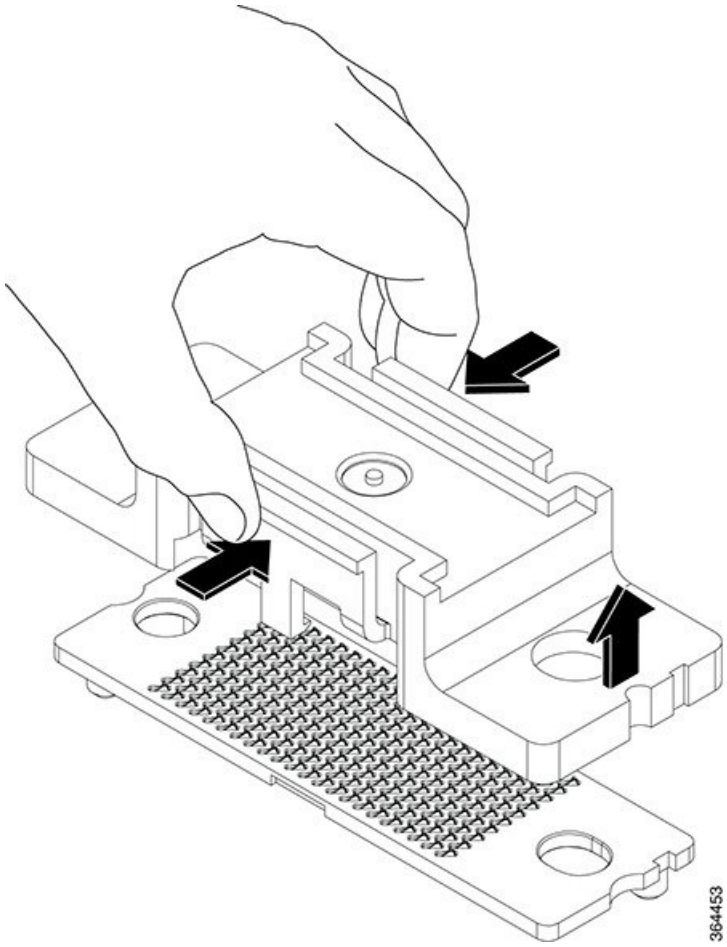
Step 2 Align the guide pins below the cLGA connector with the guide holes in the PCB and set the cLGA connector on the PCB.

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 146: Removing the Protective Cover from the cLGA Connector



- Install the Downstream D3.0 Module.

Maintaining the DOCSIS MAC Interface and PIC Card

Removing the DOCSIS MAC Interface Line Card from the Cisco cBR Chassis

It is not necessary to power down the chassis to remove an DOCSIS MAC 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 DOCSIS MAC 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.

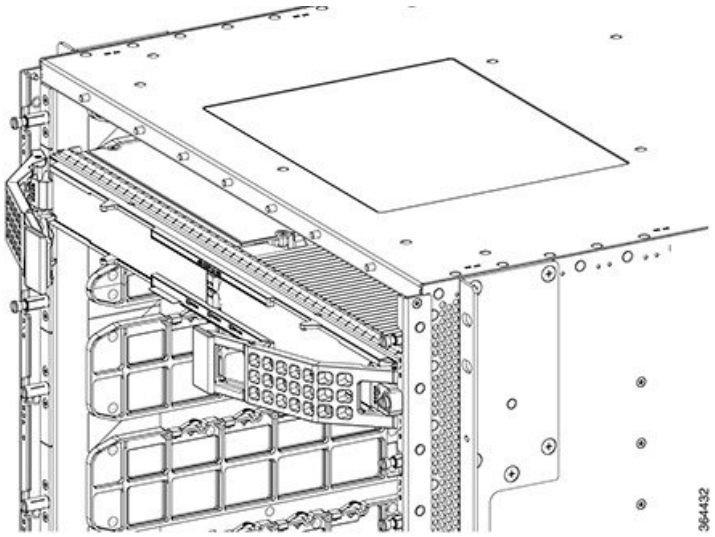
Required Tools and Equipments

- 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.

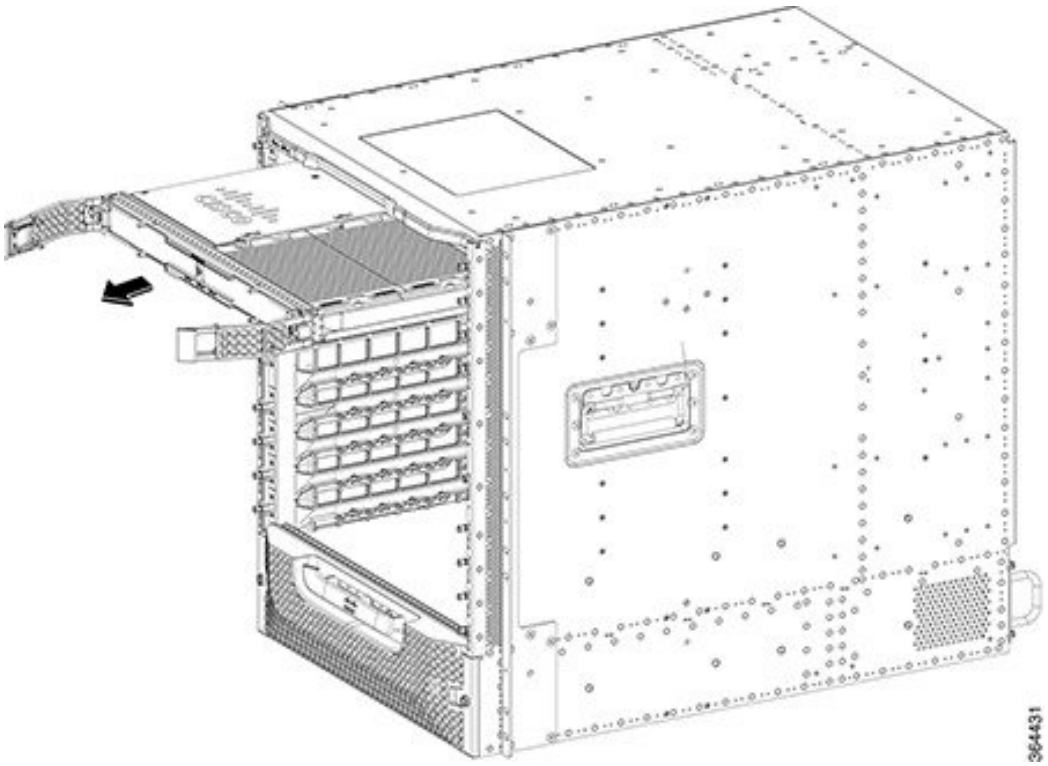
Step 2 Pull the spring-loaded ejectors on the card until they release and are perpendicular to the faceplate. This disengages the card from the chassis.

Figure 147: 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 148: 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 Digital PIC from the Cisco cBR Chassis

Before you begin

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

- PIC Blank

Caution After removing the PIC or a PIC Blank from an operational chassis, install the replacement 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.

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 149: Opening the Ejector Levers of the PIC

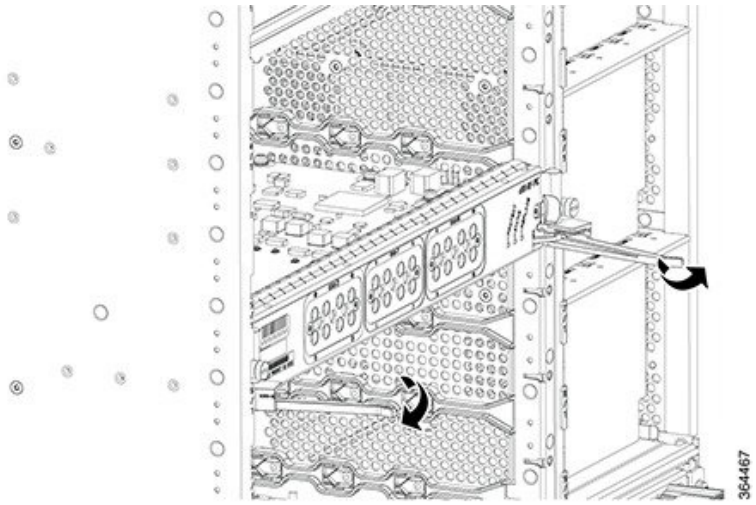
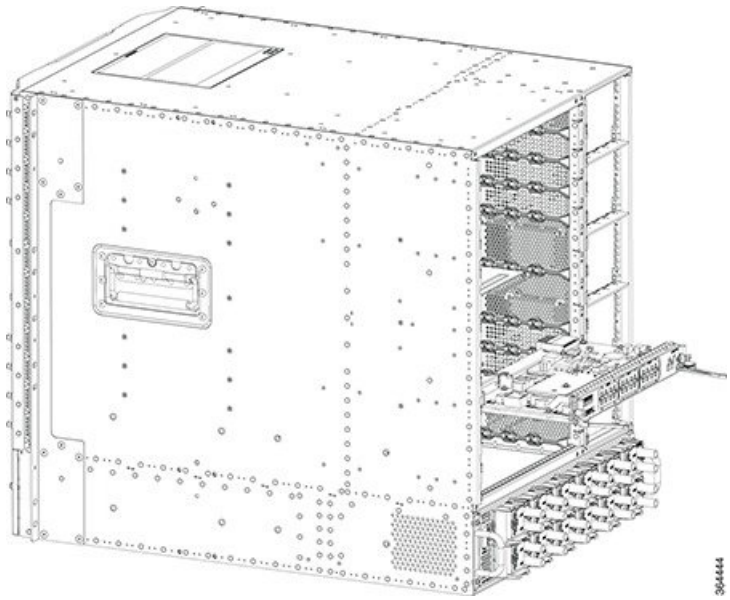


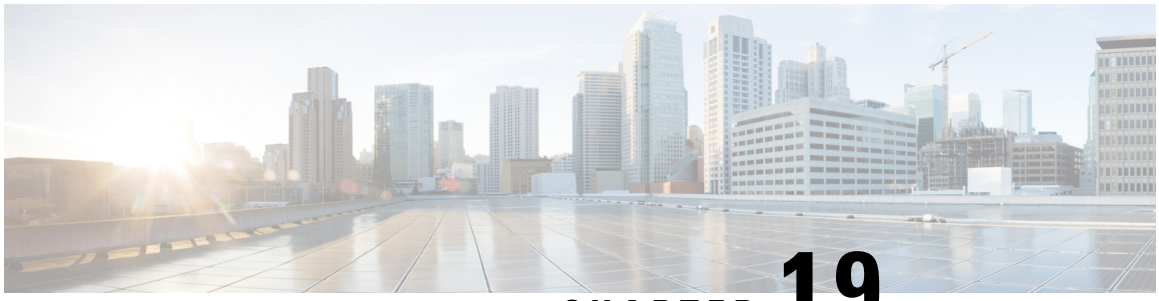
Figure 150: Removing the PIC from the Chassis



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.



CHAPTER 19

Maintaining the PHY Modules in the Cisco cBR Chassis

- Removing the Downstream PHY Module in the Interface Line Card, on page 229
- Installing the Downstream PHY Module in the Interface Line Card, on page 230
- Removing the Upstream PHY Module in the Interface Line Card , on page 232
- Installing the Upstream PHY Module in the Interface Line Card , on page 233

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.

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

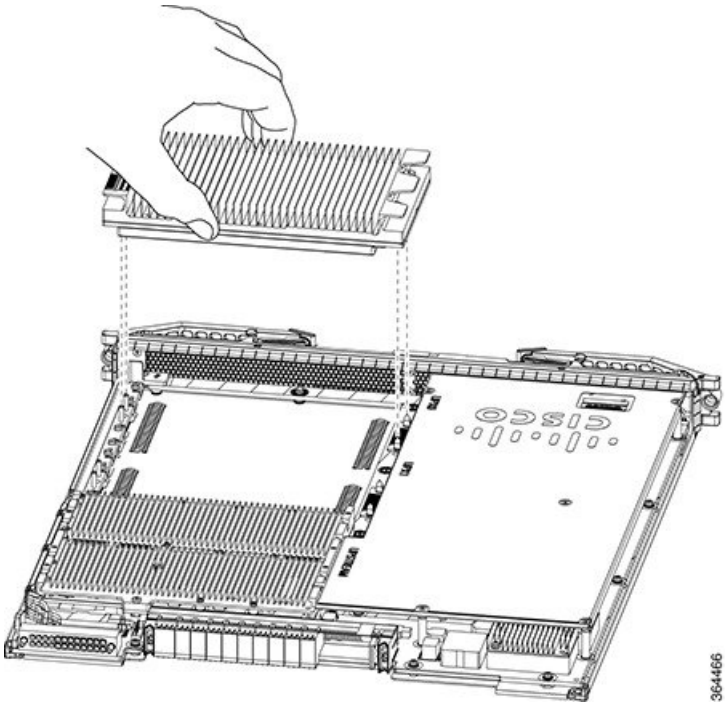
- Ensure that the guide holes at the rear of the Downstream PHY module are aligned properly. If the Downstream PHY module alignment is reversed, the cLGA connector guide pins will damage the connecting surface of the Downstream PHY module.

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 151: 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.

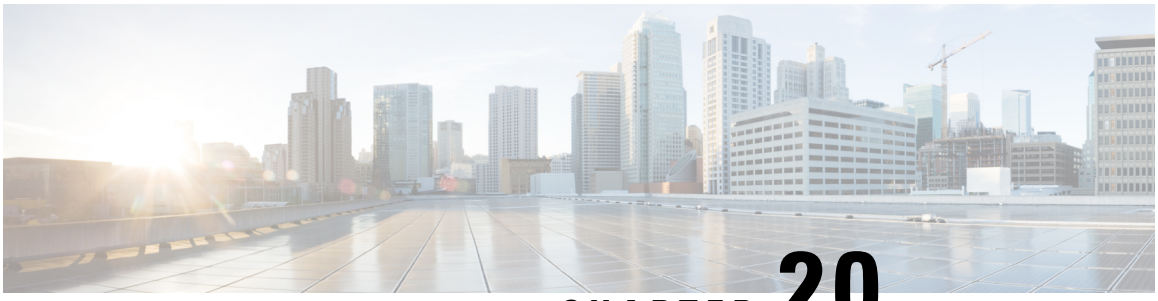
Step 2 Firmly press the module down to seat the connectors. Do not use excessive force.

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, on page 235
- Installing the Air Filter on a Card, on page 237

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 152: Removing Air Filter from an RF Line Card

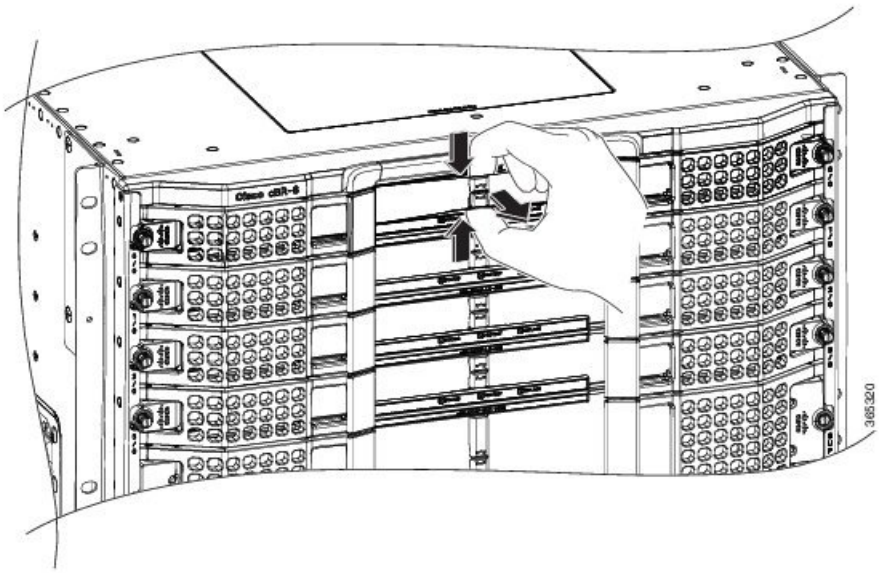
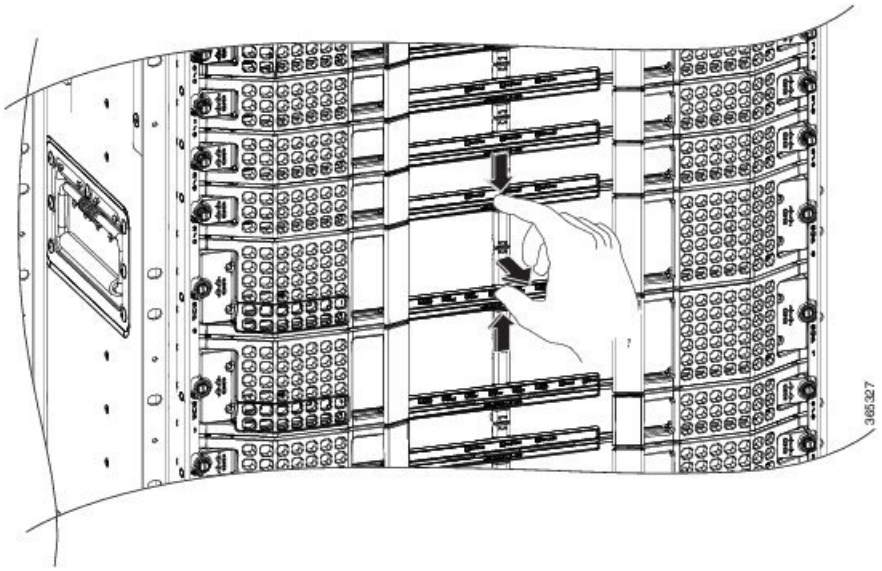


Figure 153: Removing Air Filter from a Supervisor Card



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 154: Air Filter for the RF Line Card Orientation

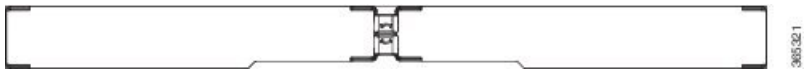
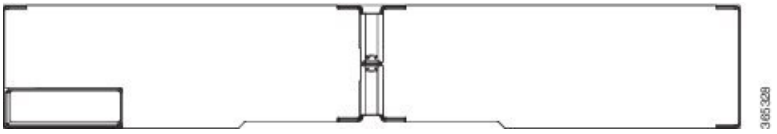
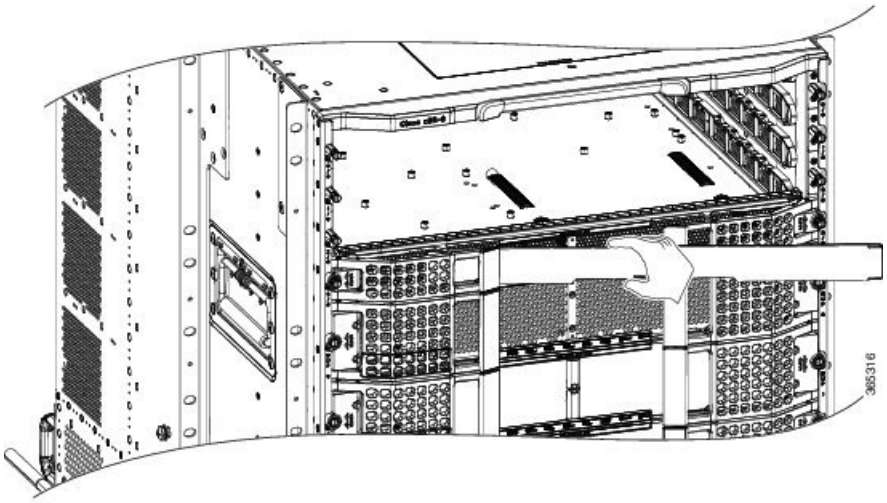


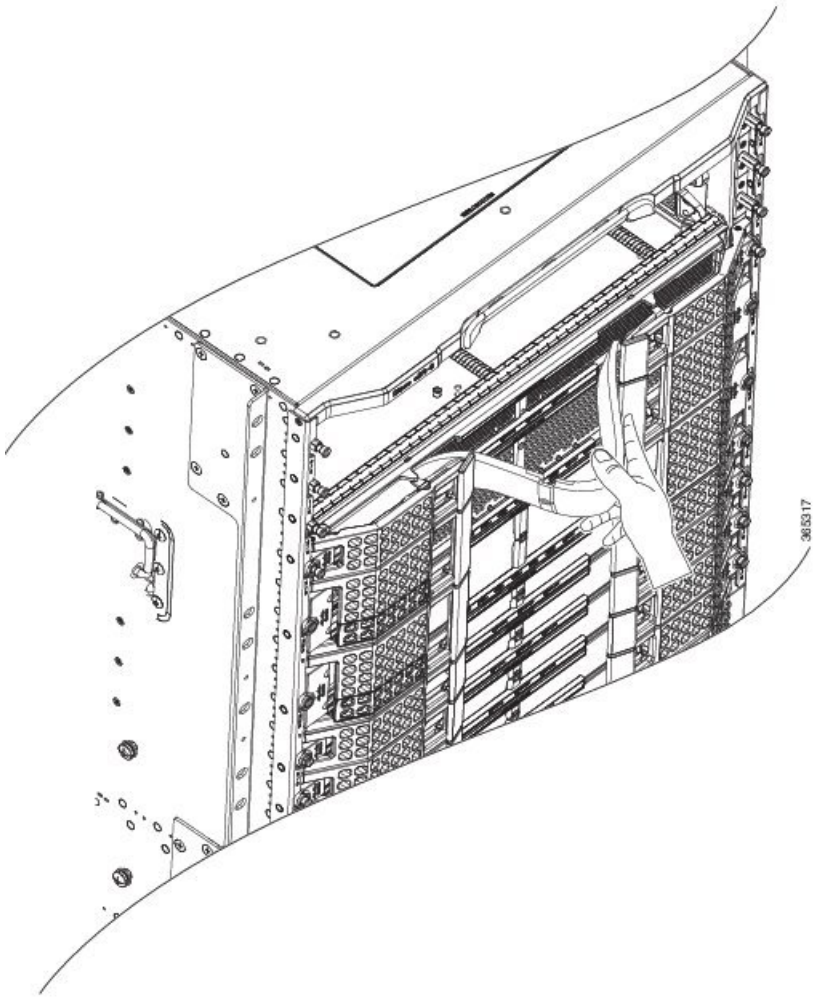
Figure 155: Air Filter for the Supervisor Card Orientation

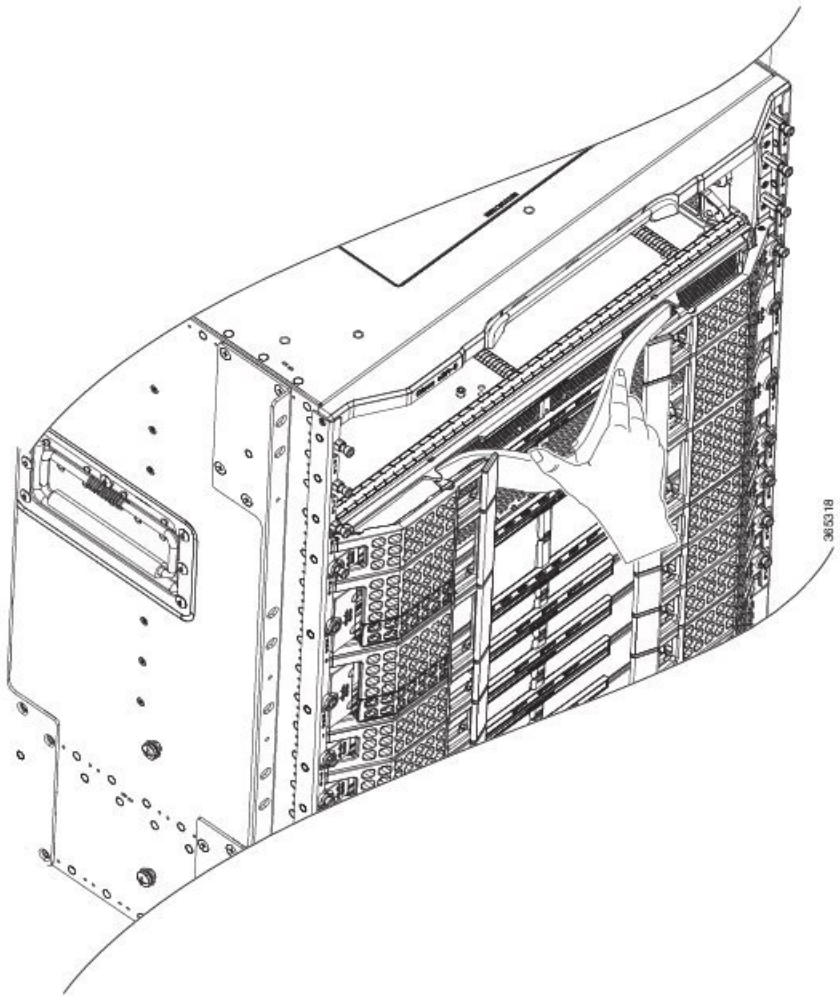


Step 2 Insert one end of the air filter at an angle under the ejector handle and slide it under the bezel filter guide rail on the card faceplate.

Figure 156: Inserting the Air Filter in the RF Line Card






365318

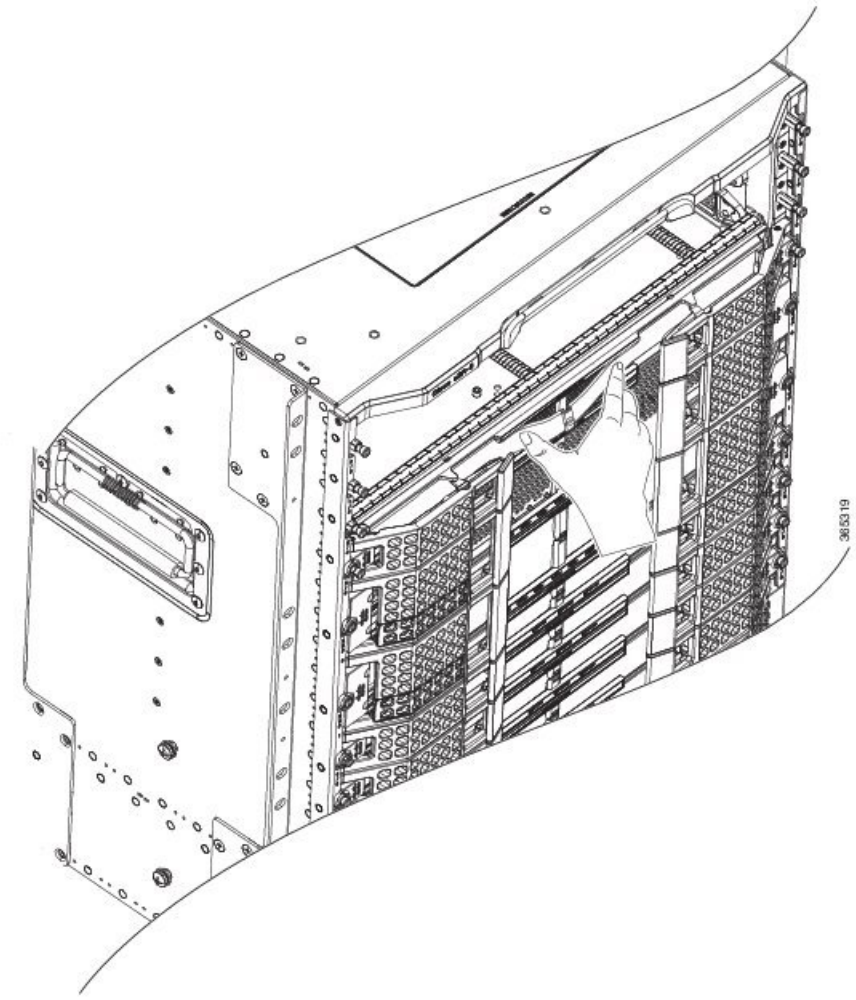
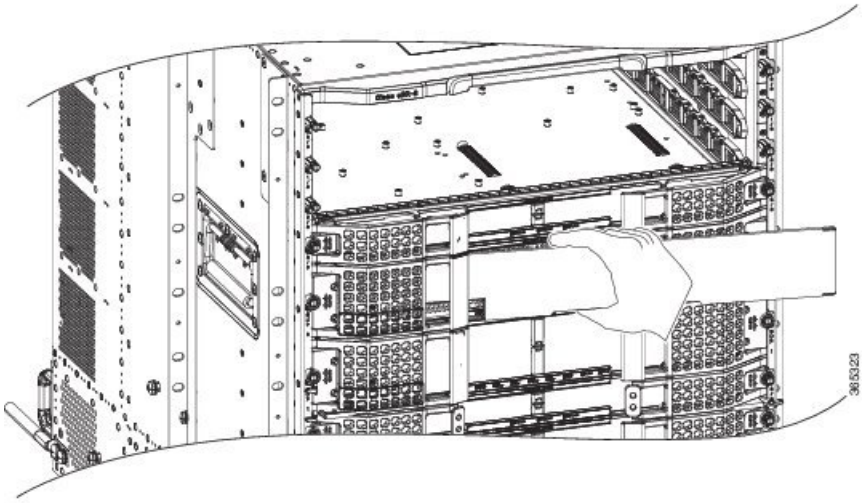
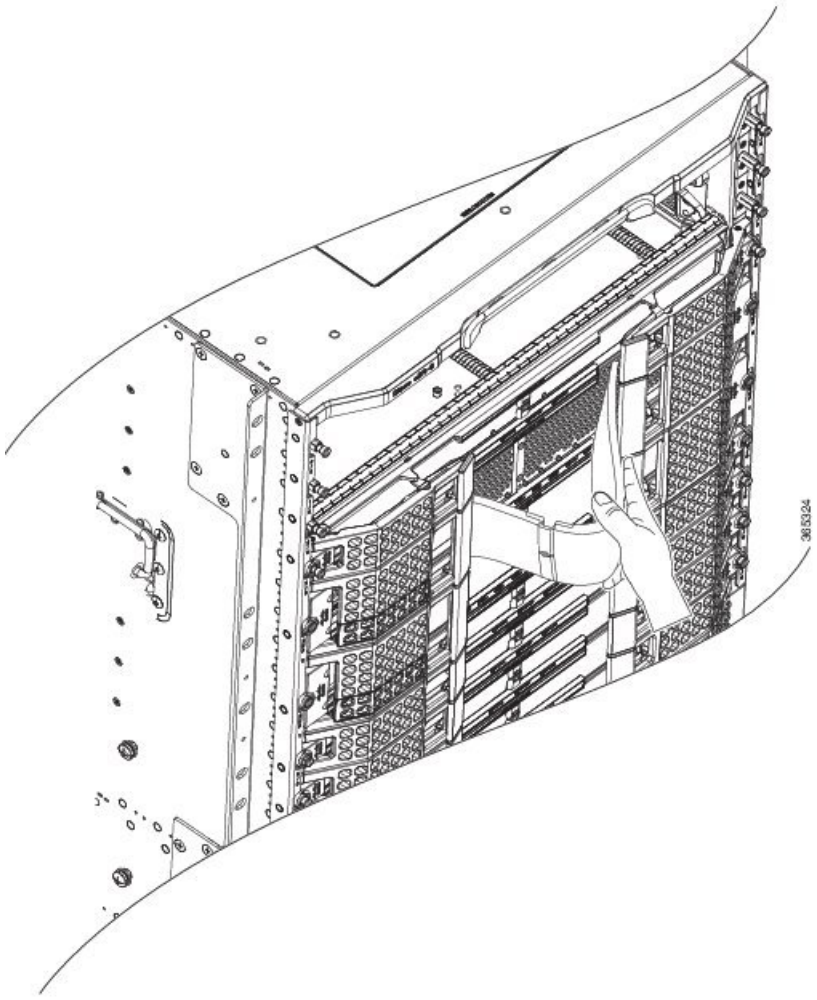

365319

Figure 157: Inserting the Air Filter in the Supervisor Card

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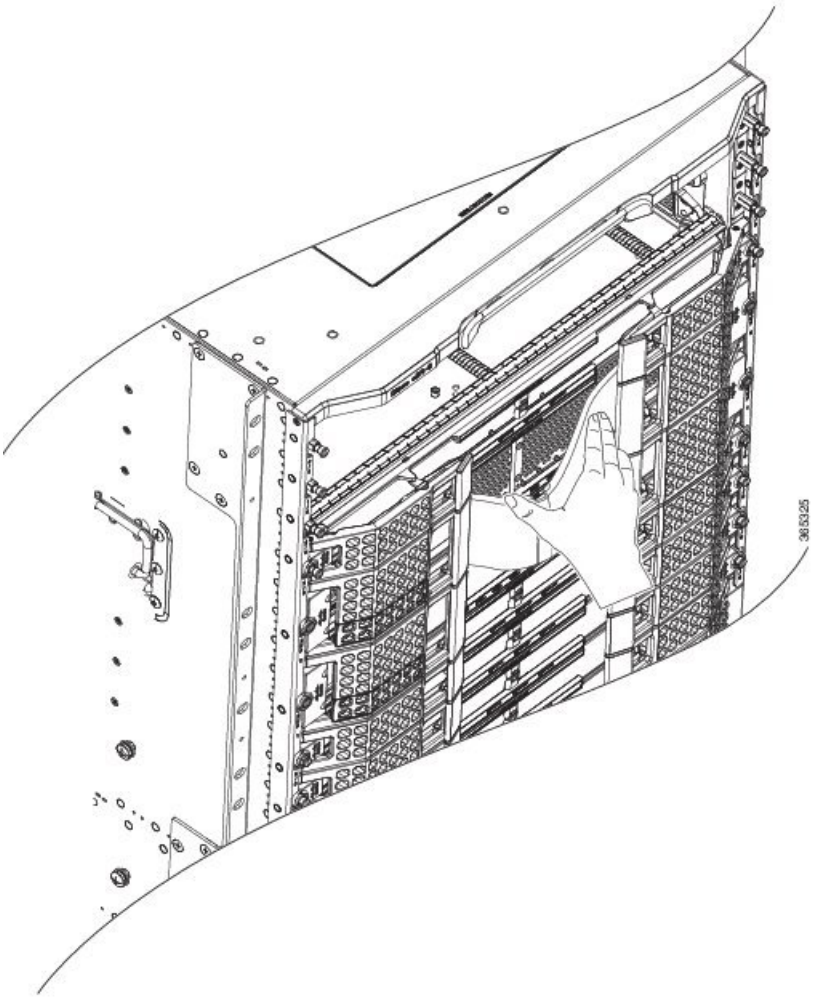
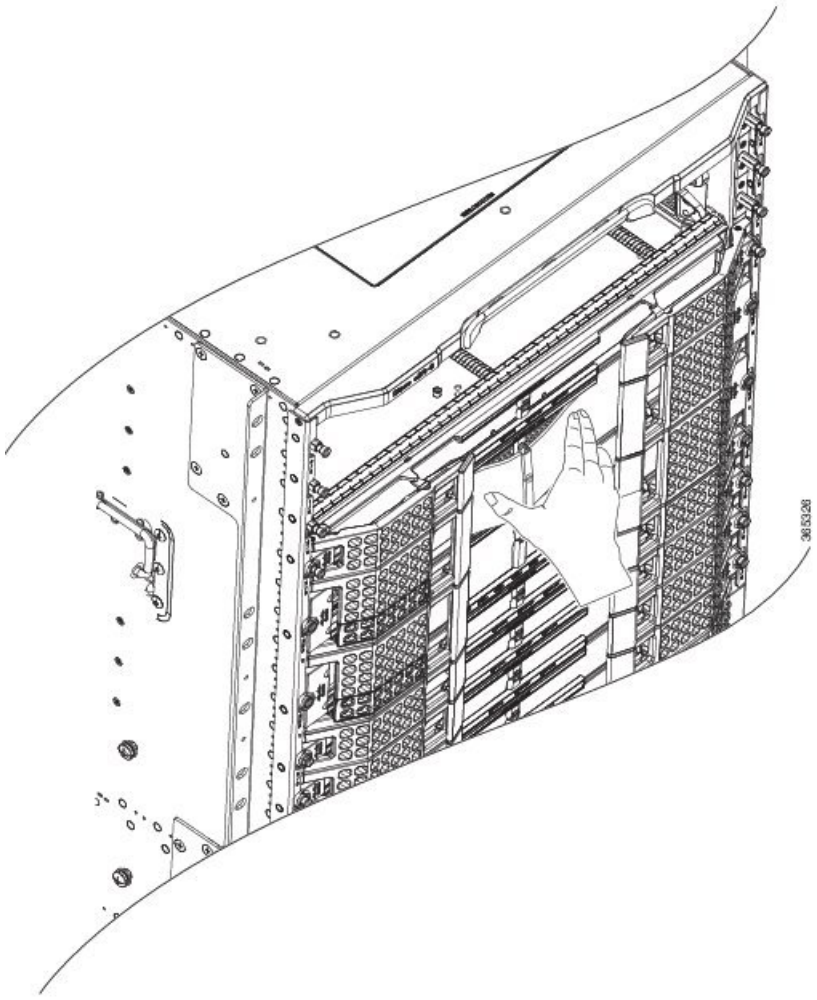

365325



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 158: Seating the Air Filter in the RF Line Card

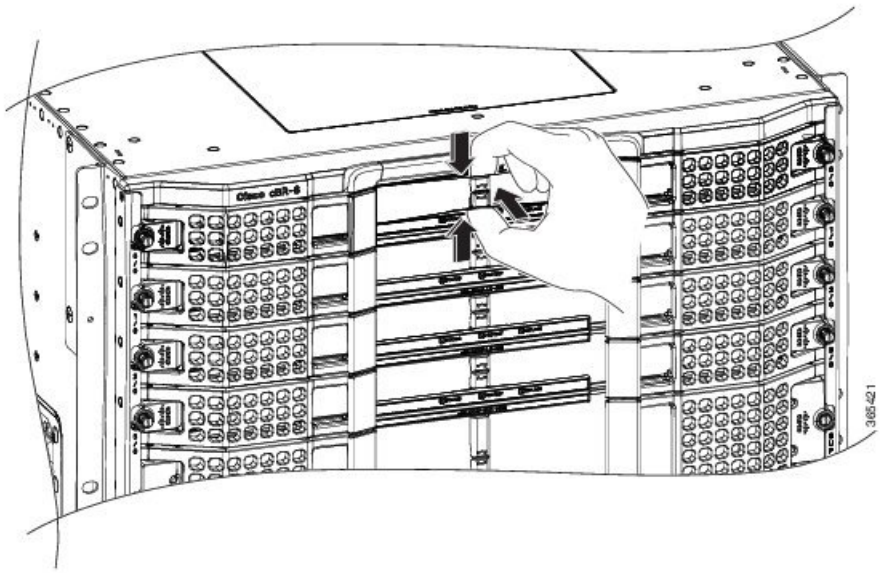
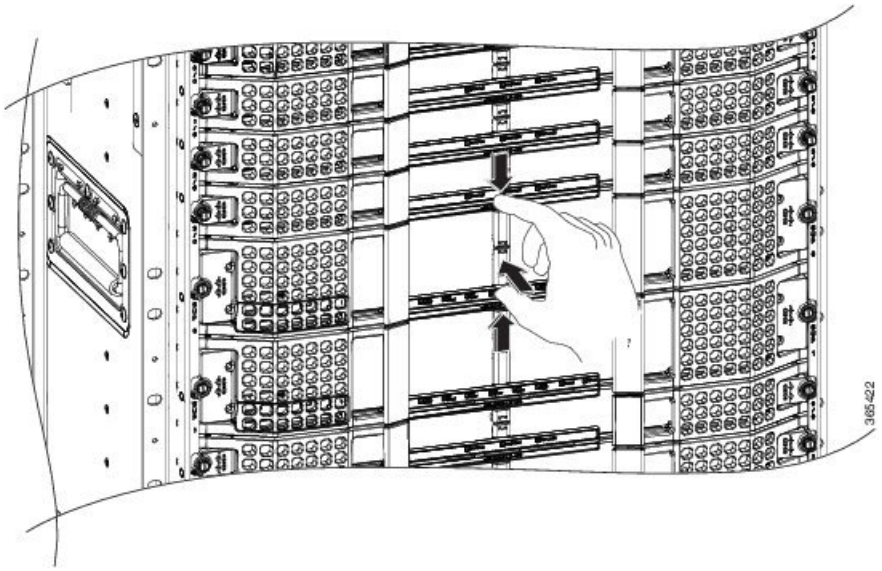


Figure 159: Seating the Air Filter in the Supervisor Card

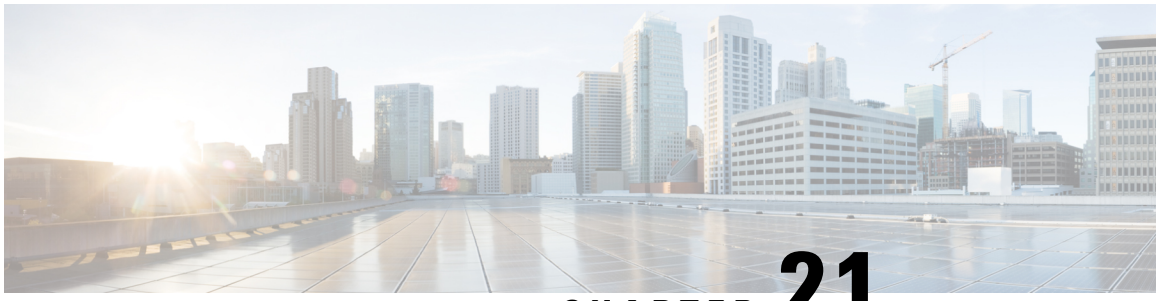


Step 4 Tuck the air filter behind the LED panel. Visually check whether the air filter is seated behind the bezel guide rails.

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, on page 249
- What Does an OIR Do?, on page 249
- Guidelines for Performing an OIR, on page 250
- OIR on Cisco cBR, on page 250
- How Do I Perform an OIR?, on page 250
- Verifying Status after an OIR, on page 251

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.

- Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.
- 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.

- Any time a physical Online Insertion/Removal (OIR) is performed, the removed module must be left out 30-60 seconds before re-inserting it in the cBR-8 chassis.
- 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.

Refer to the hardware installation guide for inserting or removing any card.

Supervisor Card and Supervisor PIC supports OIR without any software operation, but here are some recommendations if you need to perform OIR of the Supervisor Card and Supervisor PIC:

- Check the Active/Standby state of the Supervisor Card or Supervisor PIC, which will perform OIR, by using the **show redundancy** command.
- Use the **redundancy force-switchover** command if the location of the Supervisor Card or Supervisor PIC is on the active slot.
- Perform OIR.

  When you perform an OIR, the power supply to the corresponding Supervisor Card or Supervisor PIC is cut off.

If you are performing an OIR on a standby Supervisor Card or a Supervisor PIC, cBR-8 might show error messages, which you can ignore. When you insert the Supervisor Card or a Supervisor PIC the next time, the card will function properly.

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

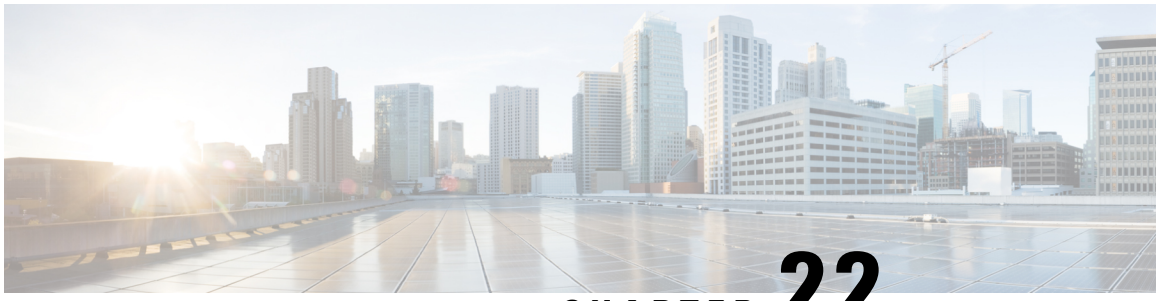
```
Router#show platform
Chassis type: CBR-8-CCAP-CHASS

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

Troubleshooting the Cisco cBR

- Troubleshooting the Fan Module in the Cisco cBR, on page 255
- Troubleshooting the Power System in the Cisco cBR, on page 257
- Troubleshooting the Interface Cards in Cisco cBR Chassis, on page 257
- General Troubleshooting, on page 259

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 44: 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 45: 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.

General Troubleshooting

Problem	Possible Cause	Solution
Unable to configure the Cisco cBR-8 router unless password enablement and password entry steps are performed.	Cisco cBR-8 routers shipped to customers from June 29, 2016 to August 5, 2016 have default startup configuration password **c**.	

Problem	Possible Cause	Solution

		Clean up Cisco cBR-8 NVRAM configuration. See the steps below.
		1. Power up Cisco cBR-8 router. Wait for about 15 minutes for the system to boot up and get ready.
		`cisco cBR1013 (CBR) processor (revision CBR) with 3628094K/6147K bytes of memory. Processor board ID FXS2022Q1KY 32768K bytes of non-volatile configuration memory. 50331648K bytes of physical memory. 7739391K bytes of eUSB flash at bootflash:. 97620247K bytes of SATA hard disk at harddisk:.`
		`Press RETURN to get started!`
		2. When "Press RETURN to get started!" message appears, press the **Enter** key.
		3. Type **enable** command after the **Router>** prompt, press the **Enter** key. Type **c** after the **Password:** prompt.
		`Router>enable Password: Router#`
		4. Type **erase startup-config** command, press the **Enter** key. Press the **Enter** key again when **Continue? [confirm]** appears.
		`Router#erase startup-config ********** Erasing Nvram will not clear license registration. License De-Registration has to be done seperately ********** Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]`

Problem	Possible Cause	Solution

		`[OK]`
		`Erase of nvram: complete`
		`Router#`
		
		5. Type **erase nvram:** command, press the **Enter** key. Press the **Enter** key again when **Continue? [confirm]** appears.
		
		`Router#erase nvram:`
		`****************************************`
		`Erasing Nvram will not clear license registration. License De-Registration has to be done seperately`
		`****************************************`
		`Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]`
		`[OK]`
		`Erase of nvram: complete`
		`Router#`
		
		Note If there are 2 SUPs, type **erase stby-nvram:** command after this step to erase the NVRAM on the stand-by SUP.
		
		6. Verify whether the startup configuration is empty using **show configuration** command. The desired output is **startup-config is not present**.
		
		`Router#show configuration`
		`startup-config is not present`
		`Router#`
		
		7. Power down the system then power up to reboot the system.

Problem	Possible Cause	Solution
SNMP-3-RESPONSE_DELAYED error message in **show logging** output.	SNMP process is consumed by 5 seconds to get an OID.	1. Check the CPU usage using **show process cpu history** 2. Execute **test snmp cpu-stats start**, wait for SNMP-3-RESPONSE_DELAYED error message to appear again, then check the output of **show snmp cpu-stats** to see if the OID in SNMP-3-RESPONSE_DELAYED displays a big value. If so, contact cBR support, otherwise, it is a CPU issue, please check the reason why the CPU usage is high.