

Hardware Installation Guide for Cisco 8400 Series Routers

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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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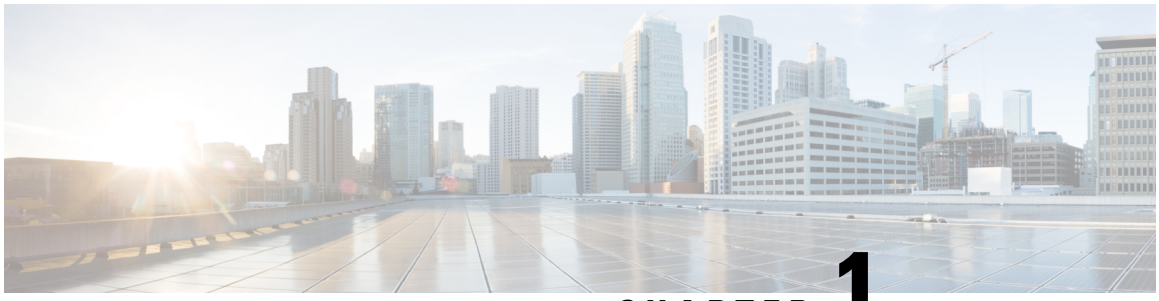
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CHAPTER 1

Cisco 8400 Router Overview

The Cisco 8404-SYS-D (4RU) router is a full-featured, modular and programmable aggregation router. It is designed for the cost-effective delivery of converged mobile (IP RAN, Mobile xHaul), residential, and business services (layer 2/layer 3 and EVPN). The Cisco 8404-SYS-D router provides redundancy, shallow depth, low power consumption, high Ethernet interface density, and high services scale, is optimized for aggregation and remote Point-Of-Presence (POP) applications.

The Cisco 8404-SYS-D router combines the redundancy and I/O diversity of distributed systems with the economics and simple elegance of fixed platforms.

For more details on the Cisco 8404 series routers, see *Cisco 8404 Router Data Sheet*.

- Cisco 8404-SYS-D router features, on page 1
- System Specifications, on page 3
- Modular Port Adapters, on page 4
- Fan tray module and external alarm inputs, on page 5
- RSP Modules (8404-RSP1-48-EM), on page 9
- Power Entry Module (8404-DC-PEM), on page 11
- Network timing interfaces with GNSS, on page 12
- USB ports, on page 13
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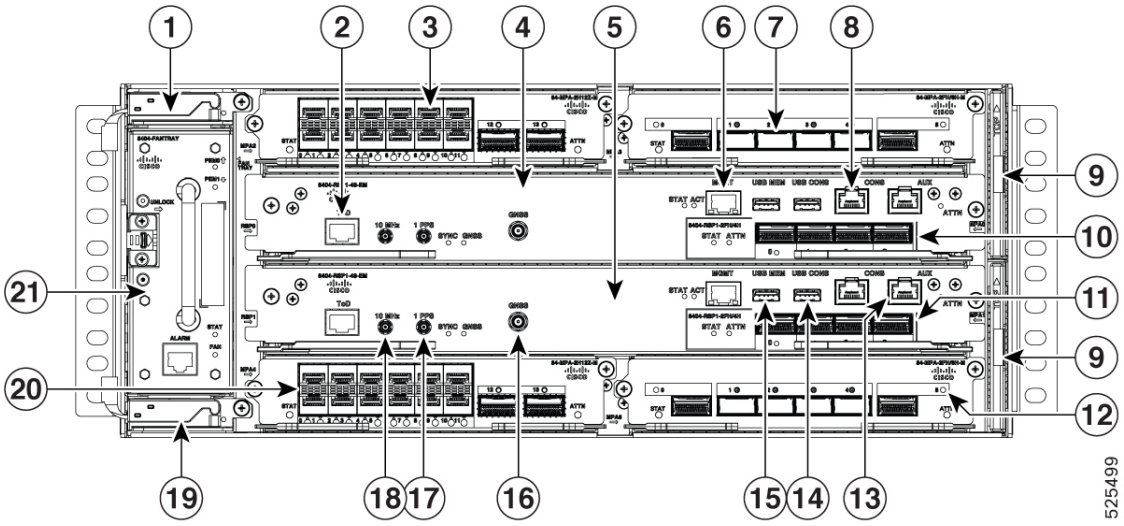
Cisco 8404-SYS-D router features

- Fully redundant and centralized forwarding
- Cisco Silicon One K100 ASIC with network bandwidth of 4.8Tbps.
- Six Modular Port Adapters (MPA) that comprises:
  - Four slots of MPAs with bandwidth of 0.8 Tbps each and total bandwidth of 3.2 Tbps.
  - Two Integrated MPA with bandwidth of 0.8 Tbps each and total bandwidth of 1.6 Tbps.
- Single fan tray working with right to left airflow.

- Support for 1+1 power entry modules with redundancy configurations, capable of delivering a maximum 1.8KW to the router.

The image below illustrates the Cisco 8404-SYS-D Router chassis design.

Figure 1: Cisco 8404-SYS-D Router Front Panel



1	PEM0	2	Time of the Day (ToD) port
3	Modular Port Adapter (MPA) slot 2	4	Route switch Processor (RSP) slot 0
5	RSP slot 1	6	Management (MGMT) port
7	MPA slot 3	8	Console port
9	Dust filters	10	Integrated MPA slot 0
11	Integrated MPA slot 1	12	MPA slot 5
13	Auxilary console port	14	USB console port
15	USB Memory port	16	GNSS antenna module
17	1 PPS in/out port	18	10 MHz in/out port
19	PEM1	20	MPA slot 4
21	Fan Tray	-	-

The cabling for all interfaces (power, data and control) are on the front side of the chassis. The chassis grounding point is located on the rear side of the chassis.

System Specifications

Figure 2: Cisco 8404-SYS-D Router System Specifications

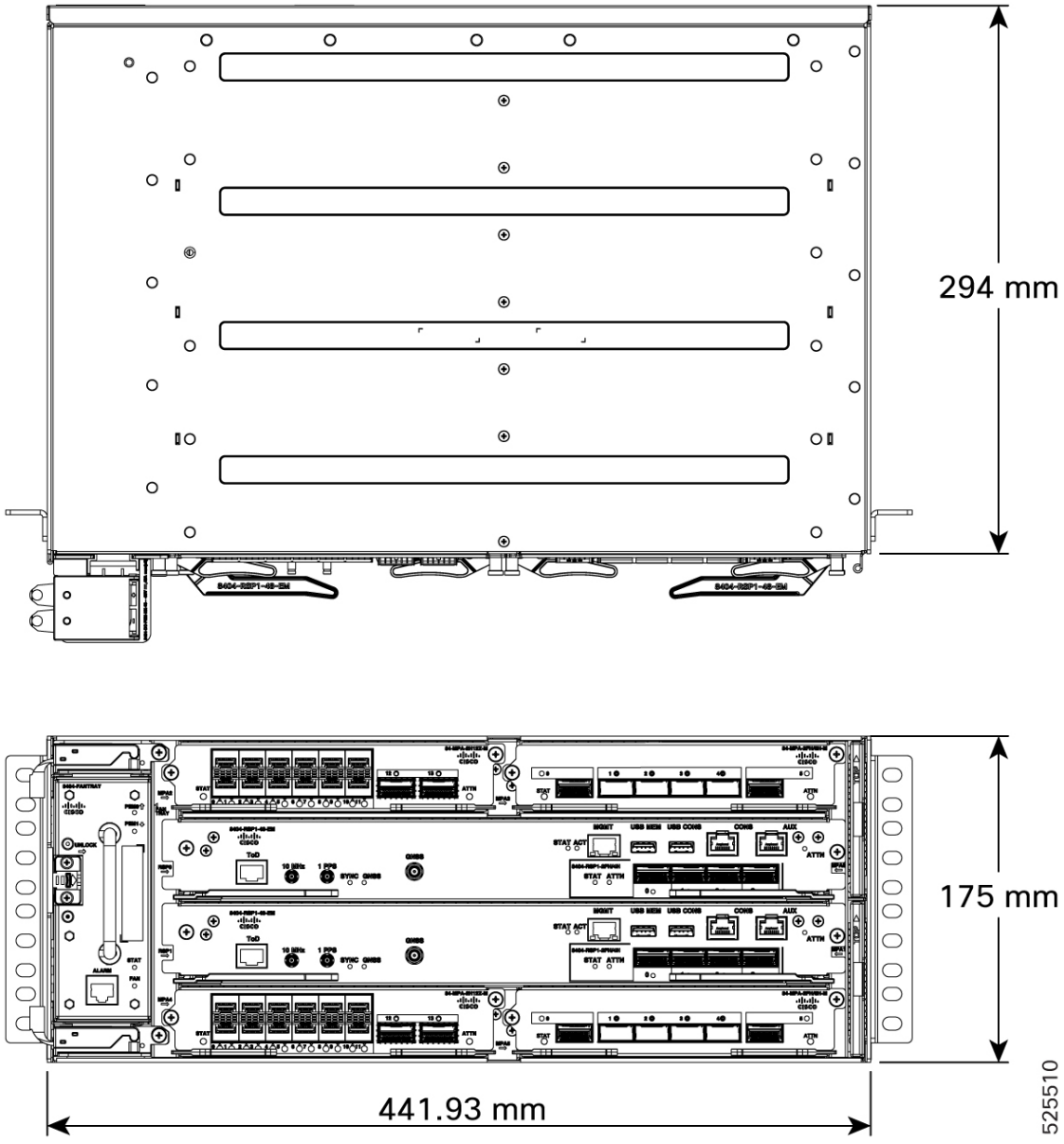


Table 1: System Specifications - Abridged

Component	Specification
Cisco 8404-SYS-D Router - Physical	Height: 6.88 in. (175 mm) - 4RU Width: 17.40 in. (442 mm) Depth: 11.61 in. (295 mm) Weight: • Fully loaded chassis approximate maximum weight: 58.86 lb (26.7 kg)
Power input (Maximum)	DC feed (-40 to -72V) 1+1 Redundancy
DC input voltage	For 1200W DC PEM, voltage range: –40.8V to –72V DC, nominal –48V/–60V DC

For the complete set of specifications, see the *Cisco 8404 Router Data Sheet*.

Modular Port Adapters

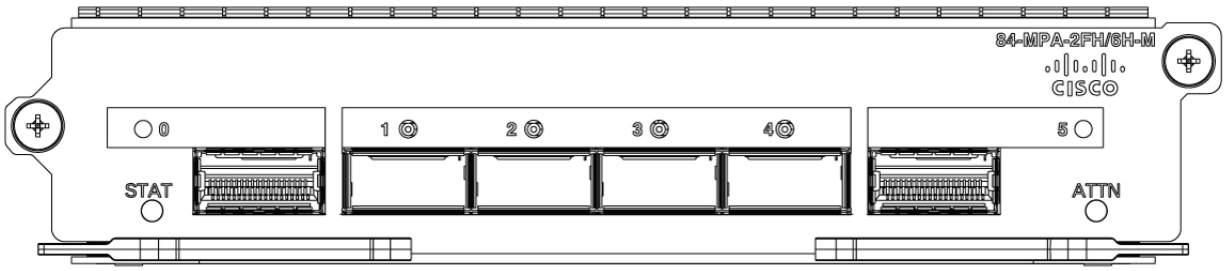
There are three Modular Port Adapters (MPAs) for the Cisco 8404-SYS-D router:

- 84-MPA-2H12Z-M with 2-port 100G QSFP-28 and 12-port 1G/10G/25G/50G SFP56
- 84-MPA-4H2FH-M with 2-port 400G or 6-port 100G QSFP-DD
- Integrated Modular Port Adapter with 2-port 400G or 4-port 100G (4 x QSFP-DD)

84-MPA-4H2FH-M with 2-port 400G or 6-port 100 GE QSFP-DD

A modular 2-port QSFP56-DD and 4-port QSFP28 MPA capable of supporting 2 x 400G or 6 x 100G that can occupy the MPA slots from 2 to 5. This MPA provides 800 Gbps of maximum throughput with MACsec support on all ports. The MPA can be operated either in 2 x 400G native mode or a mix of 400G and 100G with each of the three adjacent ports sharing the total of 400G of capacity.

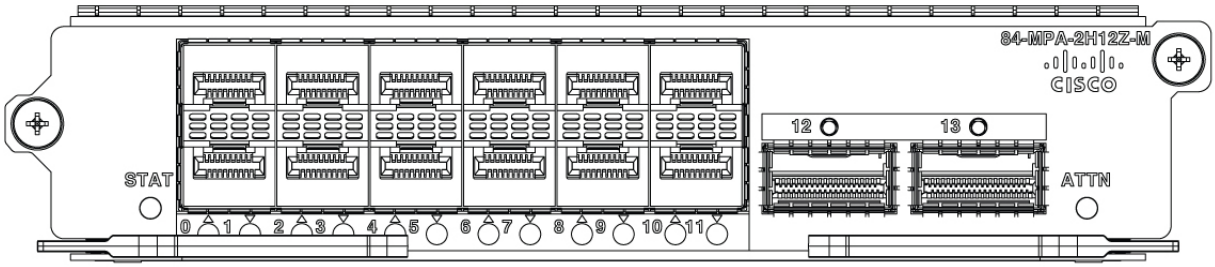
Figure 3: 2-port QSFP56-DD and 4-port QSFP28 MPA



84-MPA-2H12Z-M with 2-port 100G QSFP-28 and 12-port 1G/10G/25G/50G SFP56

A modular 12-port SFP56 and 2-port QSFP-28 MPA that can occupy the MPA slots from 2 to 5. This MPA provides 800 Gbps of maximum throughput with MACsec support on all ports. The MPA supports 12-port 1G/10G/25G/50G and 2-port 100G ports. It supports 4-port 10G or 4-port 25G breakout.

Figure 4: 12-port SFP56 and 2-port QSFP-28 MPA



Integrated Modular Port Adapter

The RSP incorporates an integrated MPA, the iMPA, with 2-port 400G or 4-port 100G ports. This is a true MPA that can also be accessed by a second installed RSP for full redundancy.

Figure 5: Cisco 8404 route switch card

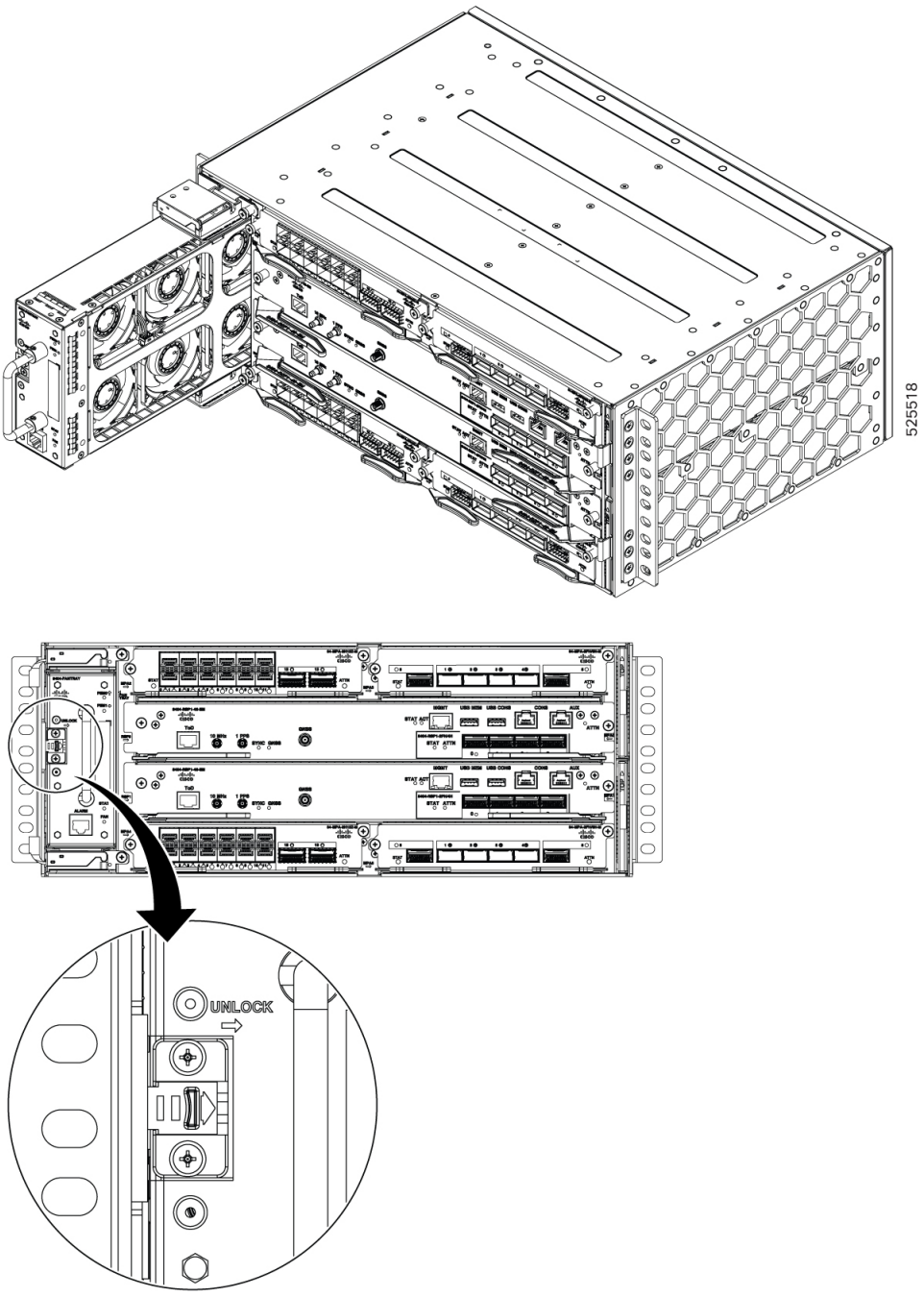


Fan tray module and external alarm inputs

Fan tray module (8404-FAN-TRAY)

Fan-tray modules are vertically mounted, on the left of the chassis that pulls air through the horizontally mounted active cards. The airflow direction of the fan tray module is from right to left.

Figure 6: Fan tray module (8404-FAN-TRAY)



The fan trays are located on the left side of the chassis, while the dust filters are located on the right side of the chassis.

Figure 7: 8404-FAN-TRAY

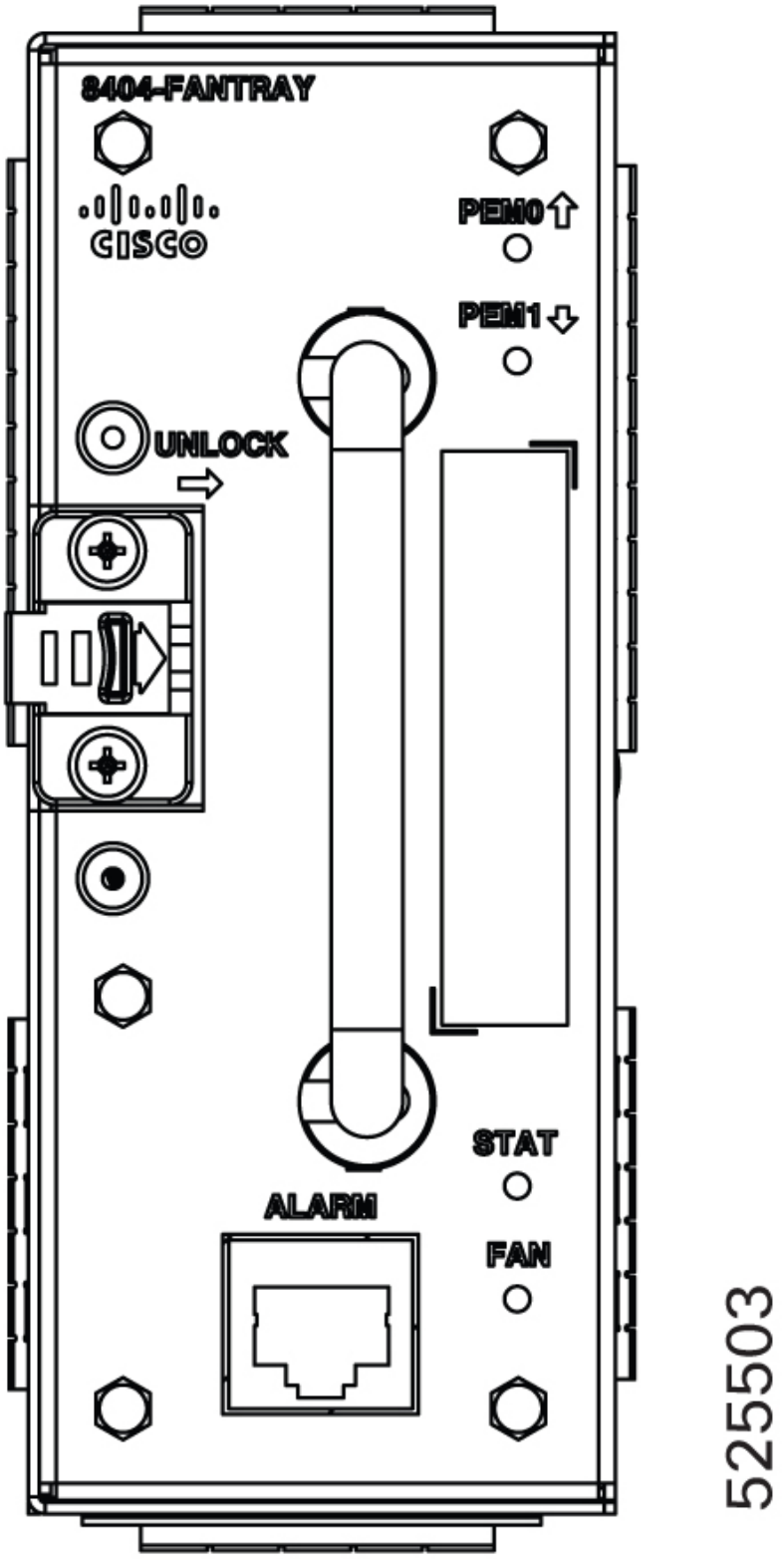
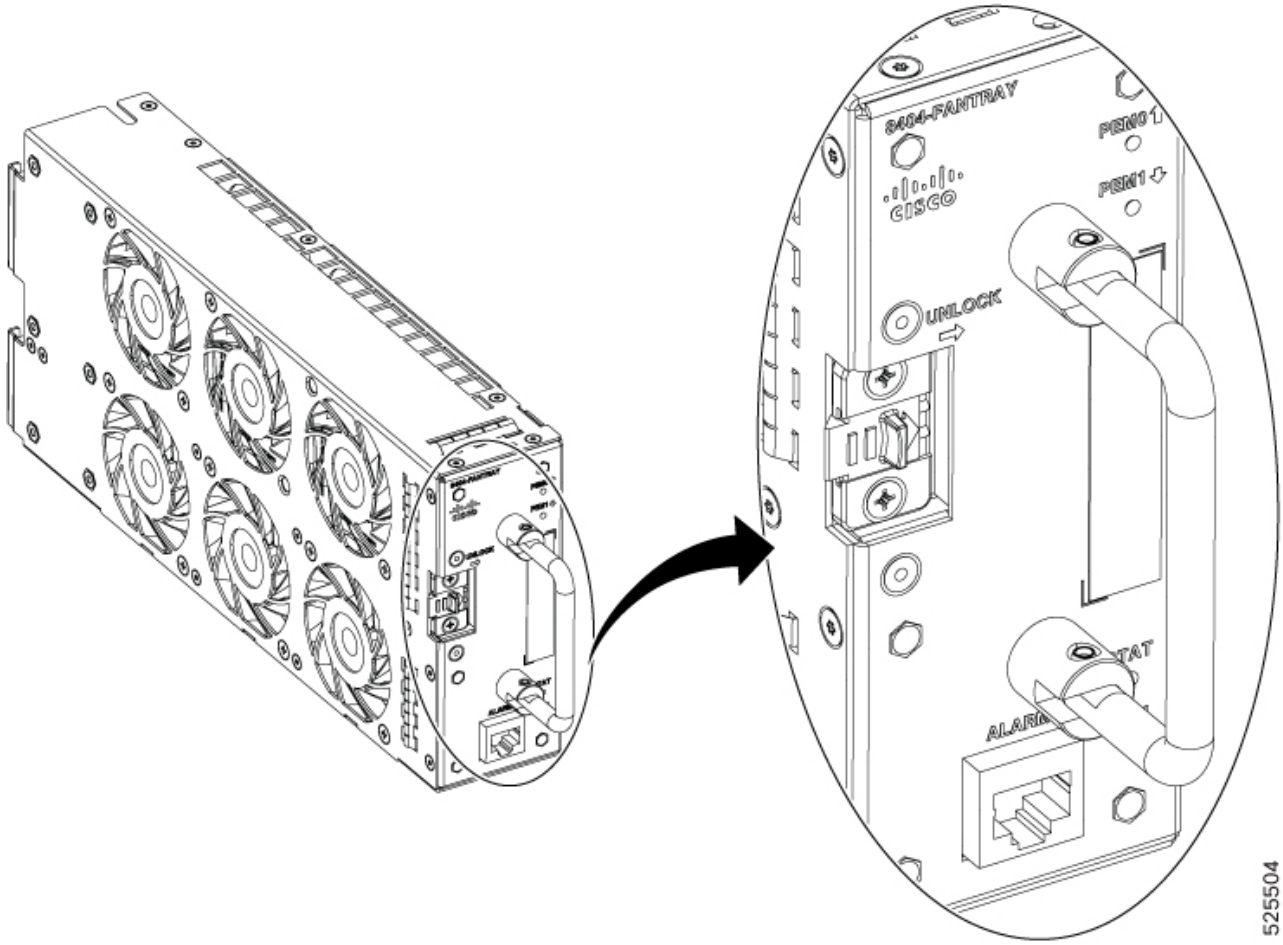


Figure 8: Detailed view of 8404-FAN-TRAY



Fan redundancy is supported on the following conditions:

- The router can work indefinitely on a single fan failure. And the time to replace the fan tray may depend upon the temperature levels of the critical components.
- During two or more fan failures, the router does continue to work as long as all the critical components in the router are within the specified temperature limits.

Dust Filter

The two set of dust filters (set of two filters) are located on the right side of the chassis to prevent dust from entering the chassis.

External alarm inputs

The router supports four dry contact alarm inputs through an RJ45 jack on the fan tray.

The alarm condition is normally open, which indicates that no current flows through the alarm circuit, and the alarm is generated when the current is flowing.

Each alarm input can be provisioned as being critical, major, or minor.

RSP Modules (8404-RSP1-48-EM)

The Cisco 8404-SYS-D router has horizontally mounted single card with height of 1.74 inches.

Note On the Cisco 8404-SYS-D platform, dual Route Switch Processors (RSPs) can be installed. However, it is recommended to use a single active RSP and disable the second RSP. Note that Route Processor Failover (RPFO) is not supported in Cisco IOS XR releases 26.1.1 and 26.2.1.

When redundant RSP is installed, the control and data plane are 1+1 redundant and the standby RSP components are in hot-standby state, ready to take over as active in the event of a failover.

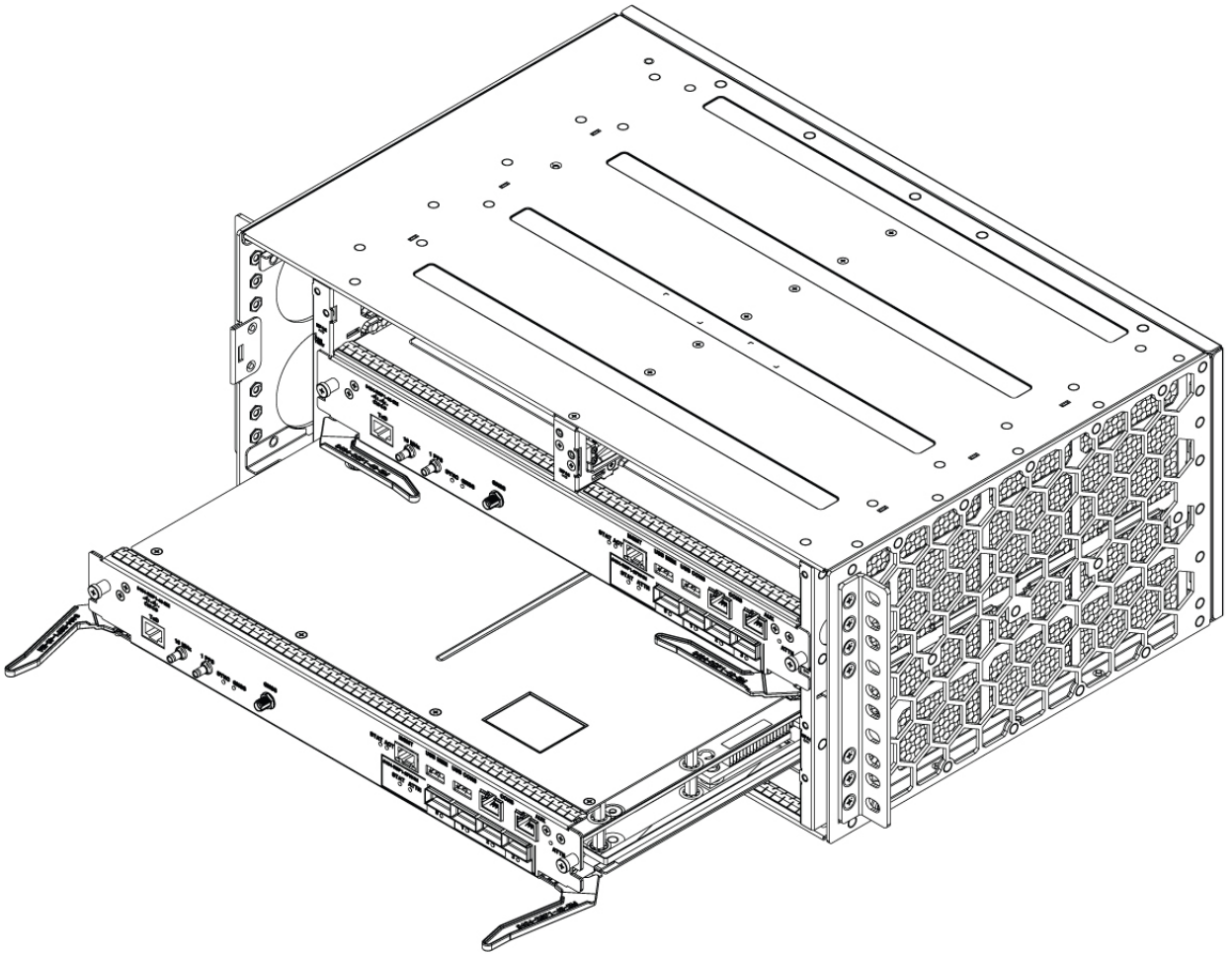
Note A failover indicates a failure in the software or in the card due to reasons, such as RSP card OIR, host kernel crash or virtual machine crash triggering heartbeat failure.

Whereas, switchover is a graceful operator-initiated task that leads to the RSP being brought down.

The RSP modules handle the data plane, network timing, and control plane functionalities for the router. The RSP configuration allows you to use Cisco IOS XR software to control chassis management, redundancy, external management, and system status indications on the router.

The card has an integrated MPA which functions as a MPA card .The RSP card has four QSFP-DD ports on its front panel part of the integrated MPA.

Figure 9: View of RSP Module in the chassis



RSP features include:

- Redundant RSP management—The RSP manages detection of RSPs, exchange of health and status information, role negotiation, function for detection, health and status exchange, role negotiation.
- Traffic management, including buffering, queuing, and scheduling, Ethernet MAC functions.
- Network clocking functions including phase and time-of-day for 1 PPS, 10 MHz, and 1588 PTP clock references.
- Storage of software images, system configuration, and sysLog.
- External management interfaces (RS232 console, management ENET, USB console, USB storage) and system status LED indicators.
- Centralized data plane, timing, and control plane functions for the system.
- High-level control of interface modules.
- Management functionalities for the router.

- The swtich card has integrated MPA with a front panel that supports configuration for either 2x400G or 4x100G optical ports. The two adjacent ports are designed to share a combined maximum bandwidth of 400 Gbps.
- Control plane (host) CPU and associated memory in which IOS-XR and platform control software runs

Power Entry Module (8404-DC-PEM)

The Cisco 8404-SYS-D router supports two DC Power Entry Modules (PEM), PEM0 and PEM1 in 1+1 mode.

The DC power entry modules support:

- -48V DC to 60V DC, 45A max
- Reverse polarity protection
- DC power oring for 1+1 redundancy
- DC surge protection and filtering
- Power green LED on front panel to indicate valid input DC input voltage above 36V.

The PEM front side power connector is the DC power entry to the system. The 6-AWG, 2-hole lugs are crimped to the DC PEM wires. The lugs are then screwed to the PEM connector. The router can accept unregulated negative DC supply and is powered on within the operating voltage range as specified in the *DC Power Entry Module Specifications* Table. As the router is designed to accept a direct DC feed, specific care needs to be taken before powering on the PEM as mentioned in the warning statement.

Warning Before connecting the PEM module to the live supply, ensure that the supply provided is DC supply and maximum voltage does not exceed the maximum operating voltage. The PEM does not protect against continuous DC high voltage above 72 V, any wrong feed to an AC source can cause severe damage to the equipment. Cisco does not guarantee protection of equipment in such scenarios.

Ensure that the router is powered from a DC feed which has proper isolation and necessary protection mechanisms against any high voltage crossing on this feed.

Refer the table for the DC PEM specifications.

Table 2: DC Power Entry Module Specifications

Part numbers	Values
Input maximum current specification	45 A
Minimum input voltage	-40 VDC
Maximum input voltage	-72 VDC
Recommended wire gauge of the lug for DC input	6 AWG

Maximum power	1800 W

Note We highly recommend you to use an external surge protector device for the deployments where there is a risk of higher surge than specified for these PEMs.

Redundancy

The router supports two PEMs units that can be used in 1+ 1 modes, depending on the overall power requirement of the system.

The Cisco 8404-SYS-D router supports voltage redundancy between the PEM modules. The router will draw current from the PEM with the higher input voltage.

If you install a redundant PEM on the Cisco 8404-SYS-D router, we recommend that you connect each PEM to a separate input power source in order to ensure that the router maintains power in the event of a power interruption that is caused by an electrical failure, a wiring fault, or a tripped circuit breaker.

Network timing interfaces with GNSS

The route processor supports the following network timing interfaces:

- 1PPS input or output—Mini coaxial connectors
- 10 MHz input or output—Mini coaxial connectors

Network timing interfaces support redundancy in a redundant RSP configuration. Network timing interfaces on a redundant RSP remain in operation while the RSP is in hot standby mode.

- 1PPS input or output and ToD input or output—The interface is used for input or output of Time-of-Day (ToD) and 1PPS pulses. ToD format includes both NTP and IEEE 1588-2008 time formats.
- The same RS422 pins for 1PPS and ToD are shared between the input and output directions. The direction for each can be independently configurable through software.

GNSS

The GNSS module is present on the RSP. It is an integrated module that allows direct interface with the external antenna.

Warning To avoid safety issues, use only No. 26 AWG or larger telecommunication line cord. Statement 1023

Note The GNSS module is not hot swappable.

GNSS Module RF Input Requirements

- The GNSS module requires an active GPS/GNSS antenna with built-in Low-Noise Amplifier (LNA) for optimal performance. The antenna LNA amplifies the received satellite signals for two purposes:
  - Compensation of losses on the cable
  - Lifting the signal amplitude in the suitable range for the receiver frontend

  The Amplification required is 22dB gain + cable/connector loss + Splitter signal loss.

  The recommended range of LNA gain (LNA gain minus all cable and connector losses) at the connector of the receiver module is 22dB to 30dB with a minimum of 20dB and a maximum of 35dB.
- GNSS module provides 5V to the active antenna through the same RF input.
- Surge requirement:
  - GNSS modules have built-in ESD protections on all pins, including the RF-input pin. However, additional surge protection may be required if rooftop antennas are being connected, to meet the regulations and standards for lightning protection in the countries where the end-product is installed.
  - A lightning protection must be mounted at the place where the antenna cable enters the building. The primary lightning protection must be capable of conducting all potentially dangerous electrical energy to PE (Protective Earth).
  - Surge arrestors should support DC-pass and suitable for the GPS frequency range (1.575GHz) with low attenuation.
- Antenna Sky visibility:



Note The antenna terminal should be earthed at the building entrance in accordance with the ANSI/NFPA 70, the National Electrical Code (NEC), in particular Section 820.93, Grounding of Outer Conductive Shield of a Coaxial Cable.

- Use a passive splitter if more than one GNSS modules are fed from a single antenna.

USB ports

A single USB 2.0 Type-A receptacle on the front panel of the router provides console access for Cisco software and diagnostics. While it uses the Type-A connector, it operates as a USB peripheral only for connection to an external host computer. This interface requires the use of a Type-A to Type-A connector instead of a standard USB cable.

USB memory port

A single USB port supports USB3.0 which is used as an external memory interface. The maximum memory limitaion is <value>.

Note

- Use of the USB port is mutually exclusive of the RS232 console port.
- This interface requires the use of a Type-A to Type-A USB cable.
- If you insert the USB cable and connect to the host computer, then you can only enter the commands using the USB.

RS232 console

The RS232 console port in RJ45 form factor on the front panel of the router is for Cisco software and diagnostics access.

Table 3: RS232 console pin definition

Pin Number	Signal	Direction	Description
1	--	--	No Connection
2	--	--	No Connection
3	TXD	Output	RS232 Transmit Data
4	GND	Ground	Ground
5	GND	Ground	Ground
6	RXD	Input	RS232 Receive Data
7	--	--	No Connection
8	--	--	No Connection

AUX port

Online Insertion and Removal

The Cisco routers, MPA, and fan tray are designed to support online insertion and removal (OIR). However, time-to-OIR for fan tray is dependent on the temperature of the chassis. At room temperature of up to 30° C, fan tray OIR should be done within two minutes.

Table 4: Ambient Teperature and Fan Tray OIR

Ambient Temperature (in Celsius)	Fan Operation	Replacement Time	Remarks
40°	Single fan failure	2 minutes	Single fan failure and all other fans running at maximum speed

Note It is not recommended to perform fan tray OIR above the ambient temperature of 40° C.

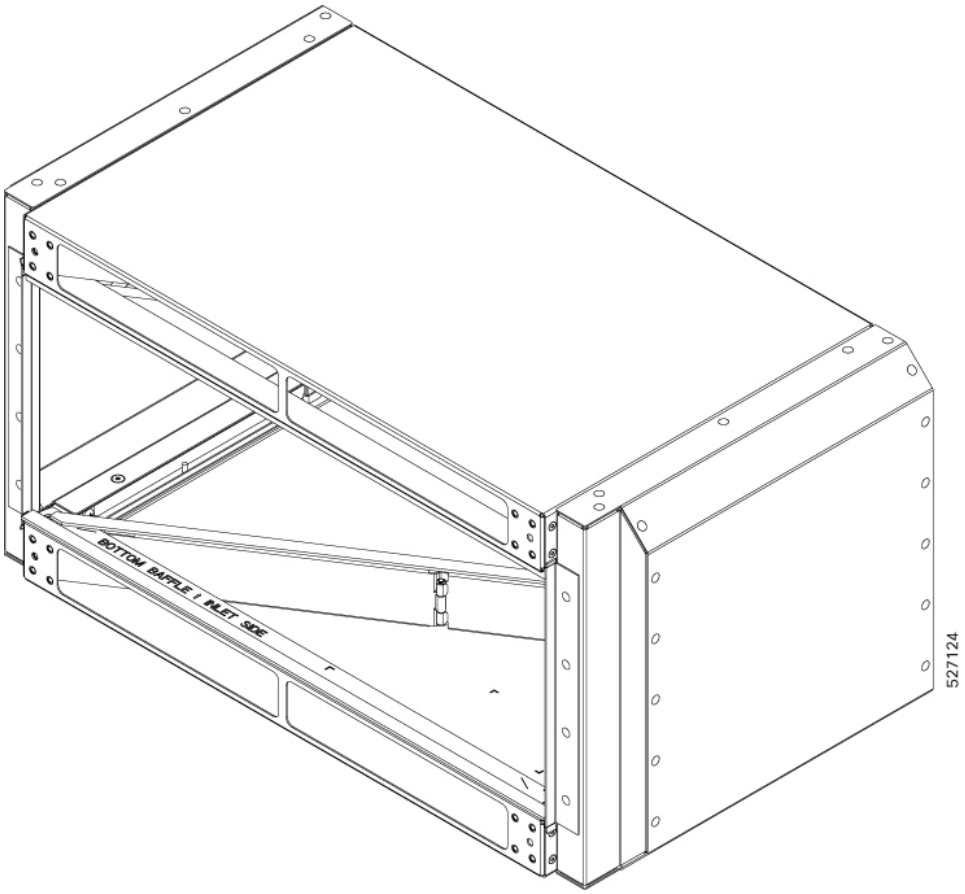
Supported Transceiver Modules

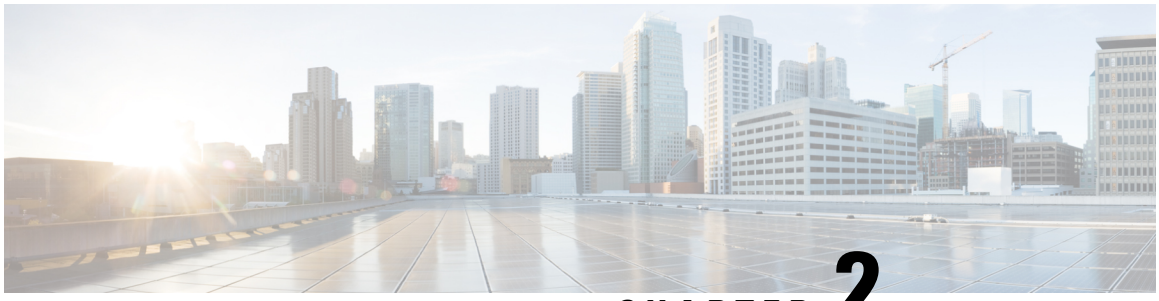
For more information on the supported transceiver modules, see Transceiver Module Group (TMG) Compatibility Matrix. In the **Begin your Search** search box, enter the keyword and click **Enter**.

Air plenum

Air Plenum is used change the air flow pattern of the unit. When the router is installed with the plenum, the air flow pattern is changed from side-side to front-back.

Figure 10: Air plenum





CHAPTER 2

Prepare for Installation

The following sections describe how to prepare for the installation of the router at your site:

- General Precautions, on page 17
- Compliance and Safety Information, on page 18
- Laser Safety, on page 19
- Energy Hazard, on page 19
- Preventing Electrostatic Discharge Damage, on page 19
- Cautions and regulatory compliance statements for NEBS, on page 20
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General Precautions

Observe the following general precautions when using and working with your router:

- Keep your system components away from radiators and heat sources and do not block cooling vents.
- Do not spill food or liquids on your system components and never operate the product in a wet environment.

- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and PEM cables carefully. Route system cables and the PEM cable and plug so that they cannot be stepped on or tripped over. Be sure that nothing else rests on your system component cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local and national wiring rules.
- If you turn off your system, wait at least 30 seconds before turning it on again to avoid system component damage.

Compliance and Safety Information

The Cisco 8400 Series Routers are designed to meet the regulatory compliance and safety approval requirements. For detailed safety information, see *Regulatory Compliance and Safety Information—Cisco 8400 Series Routers*.



Note An instructed person is someone who has been instructed and trained by a skilled person and takes the necessary precautions when working with equipment.

A skilled person or qualified personnel is someone who has training or experience in the equipment technology and understands potential hazards when working with equipment.



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



Warning To reduce risk of electric shock or fire, installation of the equipment must comply with local and national electrical codes.



Warning Only a skilled person should be allowed to install, replace, or service this equipment. See statement 1089 for the definition of a skilled person.



Warning Only an instructed person or skilled person should be allowed to install, replace, or service this equipment. See statement 1089 for the definition of an instructed person or skilled person.

Warning Blank faceplates and cover panels serve three important functions: they reduce the risk of electric shock and fire, they contain electromagnetic interference (EMI) that might disrupt other equipment, and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

Laser Safety

Warning Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

Warning Invisible laser radiation is present. Do not expose to users of telescopic optics. This applies to Class 1/1M laser products.



Warning Pluggable optical modules comply with IEC 60825-1 Ed. 3 and 21 CFR 1040.10 and 1040.11 with or without exception for conformance with IEC 60825-1 Ed. 3 as described in Laser Notice No. 56, dated May 8, 2019.

Energy Hazard

The routers can be configured for a DC power source. Do not touch terminals while they are live. Observe the following warning to prevent injury.

Warning Hazardous voltage or energy may be present on power terminals. To reduce the risk of electric shock, make sure the power terminal cover is in place when the power terminal is not being serviced. Be sure uninsulated conductors are not accessible when the cover is in place.

Preventing Electrostatic Discharge Damage

Many router components can be damaged by static electricity. Not exercising the proper electrostatic discharge (ESD) precautions can result in intermittent or complete component failures. To minimize the potential for

ESD damage, always use an ESD-preventive antistatic wrist strap (or ankle strap) and ensure that it makes adequate skin contact.

Note Check the resistance value of the ESD-preventive strap periodically. The measurement should be 1–10 megohms.

Before you perform any of the procedures in this guide, attach an ESD-preventive strap to your wrist and connect the leash to the chassis.

Cautions and regulatory compliance statements for NEBS

The NEBS-GR-1089-CORE regulatory compliance statements and requirements are discussed in this section.

Note This equipment may be ESD sensitive. Always use an ESD ankle or wrist strap before handling equipment. Connect the equipment end of the ESD strap to an unfinished surface of the equipment chassis or to the ESD jack on the equipment if provided.

Warning The intrabuilding port(s) of the equipment or subassembly, which is the management Ethernet port, must use shielded intrabuilding cabling/wiring that is grounded at both ends.

Warning The intrabuilding port(s) of the equipment or subassembly, the management Ethernet port, is suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring for more than 6 meters (approximately 20 feet). These interfaces are designed for use as intrabuilding interfaces only (Type 2, 4, or 4a ports as described in GR-1089) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection in order to connect these interfaces metallically to an OSP wiring system.

Note This equipment is suitable for installations using the CBN.

Note Treat the battery return conductor of this equipment as Isolated DC return (DC-I).

Note This equipment is suitable for installation in network telecommunications facilities.

Note This equipment is suitable for installation in locations where the NEC applies.

PEM Considerations

Check the power at your site to ensure that you are receiving clean power (free of spikes and noise). Install a power conditioner if necessary.

Guidelines for DC PEM

Basic guidelines for DC PEM includes the following:

- Each chassis PEM has its own dedicated input power source. The source must comply with the safety extra-low voltage (SELV) requirements in the UL 60950-1, UL 62368-1, CSA 60950-1, CSA 62368-1, EN 60950-1, EN 62368-1, IEC 60950-1, and IEC 62368-1 standards.
- Protect the circuit by a dedicated two-pole DC circuit breaker. Ensure that the circuit breaker is sized according to the PEM input rating and local or national code requirements.
- The circuit breaker is considered as the disconnect device and is easily accessible.
- The system ground is the power supply and chassis ground.
- Use the grounding lug to attach a wrist strap for ESD protection during servicing.
- Do not connect the DC return wire to the system frame or to the system-grounding equipment.
- Ensure that the DC return is grounded at the source side.
- Ensure that each power feed of the equipment is connected to different power sources.

Prevent Power Loss

Use the following guidelines to prevent power loss to the device:

- To prevent input power loss, ensure that the maximum load on each circuit supplying the power is within the current ratings of the wiring and breakers.
- In some systems, you can use an UPS to protect against power failures at your site. Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems such as the device, which can have substantial current-draw fluctuations due to bursty data traffic patterns.

Determining power requirements is useful for planning the power distribution system to support the device.

Safety Guidelines

Before you begin the installation of the router, review the safety guidelines in this chapter to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the router, review the safety warnings listed in *Regulatory Compliance and Safety Information for the Cisco 8400 Series Routers*.

Standard Warning Statements

To see translations of the warnings that appear in this publication, refer to the Regulatory Compliance and Safety Information document that accompanied this device.



Warning To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety: This unit should be mounted at the bottom of the rack if it is the only unit in the rack. When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack. If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006



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



Warning To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 149°F (65°C). Statement 1047



Warning The chassis should be mounted on a rack that is permanently affixed to the building. Statement 1049



Warning Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051



Warning Class 1M laser radiation when open. Do not view directly with optical instruments. Statement 1053



Warning Class I (CDRH) and Class 1M (IEC) laser products. Statement 1055



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



Warning This is a Class A Device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this type was sold or purchased by mistake, it should be replaced with a residential-use type. Statement 294



Warning This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. Statement 340



Warning This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Safety With Electricity



Warning Before working on a chassis or working near power supplies, disconnect the power at the circuit breaker on DC units. Statement 12



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



Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001



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



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



Warning This product relies on the building's installation for short-circuit (overcurrent) protection. For -48/-60 VDC installation, the wire shall be 6 AWG wire and 60A circuit breaker. Statement 1005



Warning When you connect or disconnect the power and relay connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that power is removed from the switch and alarm circuit. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed. Statement 1058



Warning Take care when connecting units to the supply circuit so that wiring is not overloaded. Statement 1018



Warning The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device. Statement 1019



Warning To avoid electric shock, do not connect safety extra-low voltage (SELV) circuits to telephone-network voltage (TNV) circuits. LAN ports contain SELV circuits, and WAN ports contain TNV circuits. Some LAN and WAN ports both use RJ45 connectors. Use caution when connecting cables. Statement 1021



Warning A readily accessible two-poled disconnect device must be incorporated in the fixed wiring. Statement 1022



Warning To reduce the risk of fire, use only 26 AWG or larger telecommunication line cord. Statement 1023



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



Warning Use copper conductors only. Statement 1025



Warning This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028



Warning To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit. Statement 1032



Warning Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool. Statement 1035



Warning Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Statement 1036



Warning Before opening the unit, disconnect the telephone-network cables to avoid contact with telephone-network voltages. Statement 1041



Warning This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. Statement 1043

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

Warning When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Warning Never install an AC power module and a DC power module in the same chassis. Statement 1050

Warning Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed. Statement 1058

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.

Warning If you connect or disconnect the console cable with power applied to the switch or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. To verify switch operation, perform POST on the switch in a nonhazardous location before installation. Statement 1065

Warning Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning Hazardous voltage or energy may be present on DC power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place. Statement 1075

When working on equipment powered by electricity, follow these guidelines:

- Locate the room's emergency power-off switch. If an electrical accident occurs, you will be able to quickly turn off the power.
- Before working on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.

- Before doing the following, disconnect all power:
  - Working on or near power supplies
  - Installing or removing a router chassis or network processor module
  - Performing most hardware upgrades
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- Never assume that power is disconnected from a circuit; always check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Turn off power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.
  - Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Site Planning Checklist

Use the following checklist to perform and account for all the site planning tasks described in this chapter:

- The site meets the environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the router.
- The floor space that the router occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the router complies with the requirements.
- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The router Ethernet cabling distances are within limitations.
- The equipment rack in which you plan to install the router complies with requirements.
- In selecting the location of the rack, careful consideration has been given to safety, ease of maintenance, and proper airflow.

Environmental Requirements

Environmental monitoring in the router protects the system and components from damage caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration *before* installation. After installation, make sure that the site maintains the environmental characteristics described in the *Cisco 8404-SYS-D Series Routers Datasheet*.

For outside plant installation (cell site cabinet, hut, and so on), equipment must be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements. Sealed equipment chamber with air-conditioning or a heat exchanger is recommended for OSP deployments. The equipment chamber must comply with the temperature and clearance requirements. Examples of such cabinets include IP 65/66 cabinets with heat exchanger complying with Telcordia GR487. Temperature must be maintained within –20ºC to +65ºC. The equipment shall be placed inside an enclosure (that is protected from direct outside weather and environmental stresses by the enclosure), and where the operating climate, as defined by Class 2 of GR-3108-CORE, is between: –40 to 149°F (–20 to +65°C) 5% and 85% RH.

For more information on Environmental properties and Regulatory standards, see the Cisco 8404-SYS-D datasheet

Temperature

Temperature extremes may cause a system to operate at reduced efficiency and cause various problems, including premature aging and failure of chips, and failure of mechanical devices. Extreme temperature fluctuations may also cause chips to become loose in their sockets.

Observe the following guidelines:

- Ensure that the chassis has adequate ventilation.
- Don’t place the chassis within a closed-in wall unit or on top of cloth, which can act as thermal insulation.
- Don’t place the chassis where it receives direct sunlight, particularly in the afternoon.
- Don’t place the chassis next to a heat source of any kind, including heating vents.
- Adequate ventilation is important at high altitudes. Make sure that all the slots and openings on the system remain unobstructed, especially the fan vent on the chassis.
- Clean the installation site at regular intervals to avoid the buildup of dust and debris, which may cause a system to overheat.

Failure to observe these guidelines may damage the chassis' internal components.

Site Planning

The following sections describe how to plan for the installation of the router.

General Precautions

Observe the following general precautions when using and working with your router:

- Keep your system components away from radiators and heat sources and do not block cooling vents.
- Do not spill food or liquids on your system components and never operate the product in a wet environment.
- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and PEM cables carefully. Route system cables and the PEM cable and plug so that they cannot be stepped on or tripped over. Be sure that nothing else rests on your system component cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local and national wiring rules.
- If you turn off your system, wait at least 30 seconds before turning it on again to avoid system component damage.

Site Planning Checklist

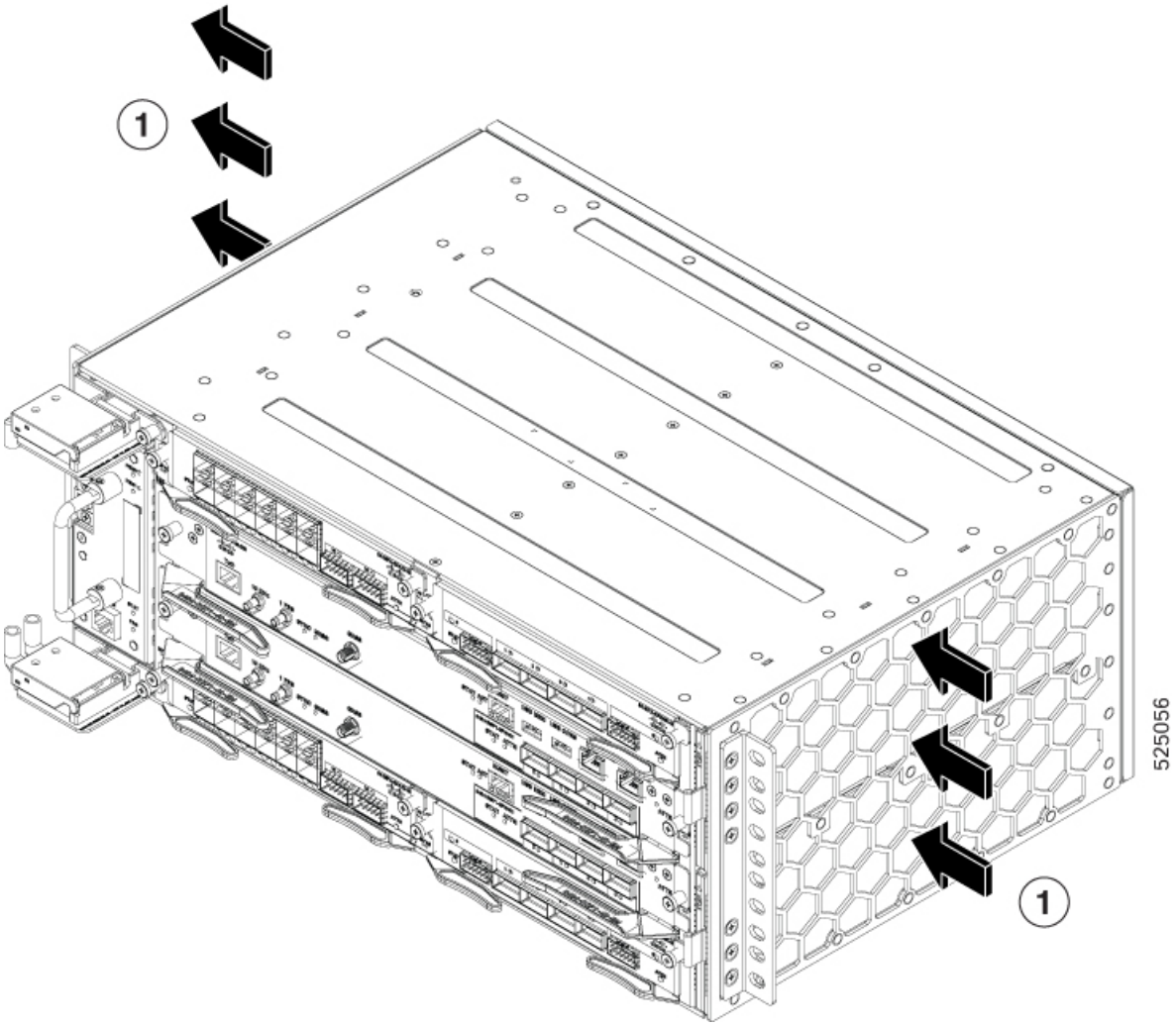
Use the following checklist to perform and account for all the site planning tasks described in this chapter:

- The site meets the environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the router.
- The floor space that the router occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the router complies with the requirements.
- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The router Ethernet cabling distances are within limitations.
- The equipment rack in which you plan to install the router complies with requirements.
- In selecting the location of the rack, careful consideration has been given to safety, ease of maintenance, and proper airflow.

Air Flow Guidelines

Cool air is circulated through the router by fan tray located along the left side of the router. Air flow is right to left, as shown in the figure below.

Figure 11: Cisco 8404-SYS-D Router Chassis Air Flow



1	Direction of air flow — from the right side of the router to the left side

The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis.

The following guidelines will help you plan your equipment rack configuration:

- To ensure adequate air flow through the equipment rack, we recommend that you maintain a clearance of at least 80 mm (3.15 inches) on each side of the router at all times.
- If airflow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an overtemperature condition can occur within the rack and the routers that occupy it.
- The site should also be as dust-free as possible. Dust tends to clog the router fans, reducing the flow of cooling air through the equipment rack and the routers that occupy it, thus increasing the risk of an overtemperature condition.

- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested, because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat that is generated by the equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the side intakes and the exhaust fans.
- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off all other equipment in the rack (and in adjacent racks) to give the router maximum cooling air and clean power.
- Avoid setting up the router in a location in which the router air intake vents may draw in the exhaust air from adjacent equipment. Consider how the air flows through the router; the airflow direction is side to side, with ambient air drawn in from the vents located on the front right of the router.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco 8404-SYS-D Router in a 4-post enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for 800mm racks).

Site Power Guidelines

The chassis has specific power and electrical wiring requirements. Adhering to these requirements ensures the reliable operation of the system. Follow these precautions and recommendations when planning your site power for the chassis:

- The redundant power option provides a second, identical power supply to ensure uninterrupted power supply.
- Connect each power supply to a separate input power source. Otherwise, it results in a total power failure to the system due to a fault in the external wiring or a tripped circuit breaker.
- To prevent loss of input power, ensure that the maximum load on each circuit is within the current ratings of the wiring and the breakers.
- Circuit breaker specifications—a maximum of 60A for DC power feed is supported.
- Check the power at your site before installation, and periodically after installation, to ensure that you are receiving clean power. If necessary, install a power conditioner.
- Provide proper grounding to avoid personal injury and damage to the equipment due to power surges or lightning striking power lines. The chassis ground must be attached to a central office or other interior ground system.



Note The chassis installation must comply with all the applicable codes, and is approved for use with only copper conductors. The ground bond-fastening hardware must be compatible and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with a 6-AWG gauge wire copper ground conductor.

Caution The DC PSU requires external surge protection devices for installations where electrical surges higher than 2KV common mode and 1KV differential mode are expected. Failure to do so can result in permanent damage to the product.

Electrical Circuit Requirements

Each Cisco router requires a dedicated electrical circuit. If you equip it with dual power feeds, provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The routers are powered only by a DC source. Ensure that equipment grounding is present and observe the power-strip ratings. Ensure that the total ampere rating of all the products plugged into the power strip does not exceed 80% of the rating.

Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the Cisco 8404-SYS-D Router, consider the type of cable required for each component, and the cable limitations. Consider the distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.

Also consider any additional interface equipment you need, such as transceivers, hubs, switches, modems, channel service units (CSU), or data service units (DSU).

Before you begin, read these important notes about cabling:

- Shielded cables must be used to connect to the RJ-45 alarm connector on the fan tray in order to comply with FCC/EN55022/CISPR22 Class A emissions requirements.

Before you install the Cisco 8404-SYS-D Router, have all the additional external equipment and cables on hand. For information about ordering, contact a Cisco customer service representative.

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

- Signal type
- Signal speed
- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline in planning your network connections prior to installing the Cisco 8404-SYS-D Router.

If wires exceed the 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.

Asynchronous Terminal Connections

The Cisco 8404-SYS-D router provides a console port to connect a terminal or computer for local console access. The port has an RJ45 connector and supports RS-232 asynchronous data with distance recommendations specified in the IEEE RS-232 standard.

Interference Considerations

When wires are run for any significant distance, there is a risk that stray signals will be induced on the wires as interference. If interference signals are strong, they can cause data errors or damage to the equipment.

The following sections describe sources of interference and how to minimize its effects on the Cisco 8404-SYS-D router system.

Electromagnetic Interference

All equipment powered by AC current can propagate electrical energy that can cause EMI and possibly affect the operation of other equipment. The typical sources of EMI are equipment power cords and power service cables from electric utility companies.

Strong EMI can destroy the signal drivers and receivers in the Cisco 8404-SYS-D router and even create an electrical hazard by causing power surges through the power lines into installed equipment. These problems are rare but could be catastrophic.

To resolve these problems, you need specialized knowledge and equipment that could consume substantial time and money. However, you can ensure that you have a properly grounded and shielded electrical environment, paying special attention to the need for electrical surge suppression.

For information about the electro magnetic compliance standards supported on the Cisco 8404-SYS-D router, see *Regulatory Compliance and Safety Information for the Cisco 8404-SYS-D Series Routers*.

Radio Frequency Interference

When electromagnetic fields act over a long distance, radio frequency interference (RFI) may be propagated. Building wiring can often act as an antenna, receiving the RFI signals and creating more EMI on the wiring.

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal.

Lightning and AC Power Fault Interference

If signal wires exceed the recommended cabling distances, or if signal wires pass between buildings, you should consider the effect that a lightning strike in your vicinity might have on the Cisco 8404-SYS-D router.

The electromagnetic pulse (EMP) generated by lightning or other high-energy phenomena can couple enough energy into unshielded conductors to damage or destroy electronic equipment. If you have previously experienced such problems, you should consult with RFI and EMI experts to ensure that you have adequate electrical surge suppression and shielding of signal cables in your Cisco 8404-SYS-D router operating environment.

Rack-Mounting Guidelines

The following sections provide guidelines for rack-mounting the Cisco8404-SYS-D Router:

Precautions for Rack-Mounting

The following rack-mount guidelines are provided to ensure your safety:

- Do not move large racks by yourself. Due to the height and weight of a rack, a minimum of two people are required to accomplish this task.
- Ensure that the rack is level and stable before extending a component from the rack.
- Ensure that proper airflow is provided to the components in the rack.
- Do not step on or stand on any component or system when servicing other systems or components in a rack.
- When mounting the Cisco 8404-SYS-D router 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.

Rack Selection Guidelines

The Cisco 8404-SYS-D Router can be mounted in most two-post or four-post, EIA 19-inch, EIA 23-inch and ETSI equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks. The rack must have at least two posts with mounting flanges to mount the chassis.



Caution When mounting a chassis in any type of rack equipment, ensure that the inlet air to the chassis does not exceed 65 degrees C.

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inches

± 0.06 inch (46.50 cm ± 0.15 cm). The rack-mounting hardware included with the chassis is suitable for most 19-inch equipment racks.

Consider installing the Cisco 8404-SYS-D Router in a rack with the following features:

- Network Equipment Building System (NEBS) compliant, 19-inch (48.3 cm) wide rack.
- EIA or European Telecommunications Standards Institute (ETSI) hole patterns in the mounting rails. The required mounting hardware is shipped with the Cisco 8404-SYS-D Router. If the rack that you plan to install the system in has metric-threaded rails, you must provide your own metric-mounting hardware.
- Perforated top and open bottom for ventilation to prevent overheating.
- Leveling feet for stability.

Note The Cisco 8404-SYS-D Router should not be installed in an enclosed rack because the chassis requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of enclosed rack—*even with the side doors removed*—could disrupt the air flow, trap heat next to the chassis, and cause an overtemperature condition inside the router. If you use an enclosed rack, ensure that there are air vents on all sides of the rack and there is proper ventilation.

Cabinet Selection Guidelines

Equipment that is intended for installation in controlled environmental space has average yearly levels of contamination. Ventilated cabinets or racks can be used if pollutant levels are maintained within allowable limits.

Equipment intended for installation in outside plant (OSP) areas must have sealed cabinets with heat exchanger that meet the IP66 or IP65 protection and low average yearly levels of concentration of contaminants inside the cabinet.

Note Ventilated cabinets and racks are not recommended for OSP applications.

Table 5: Cabinet Type for Indoor and Outdoor Installation

Cabinet Type	Suitable for Indoor Installation?	Suitable for Outdoor Installation?
Open rack with no front and rear doors	Yes	No
Ventilated cabinets with normal air filter at intake and fans	Yes	No
Sealed cabinets with heat exchanger that meet NEMA -4 or IP65 protection	Yes	Yes
Sealed cabinets with air-conditioners that meet NEMA -4 or IP65 protection	Yes	Yes

Allowable limits for Environmental Pollutants

Concentration of pollutant levels in outdoor and indoor environment must be less than pollutant levels mentioned in Table 2.3 and Table 2.4 of *NEBS GR-63-CORE Issue 5 Dec 2017*, respectively. High concentrations of pollutants have a negative impact on the equipment life time.

Allowable Temperature and Humidity

Maximum allowable temperature and humidity levels must be within the values that are mentioned in the data sheets. Do not install in places where condensation may occur, or where equipment is exposed to high humidity for long time, such as near the sea, rivers, and large water bodies.

Installations in Highly-corrosive Environment

Installation in highly corrosive area is not recommended. Examples of highly corrosive areas are seashore, less than 10 meters from high traffics roadway, and areas having high industrial pollutants.

Periodic Measurement of Environmental Pollutants

We recommend that you check concentration of pollutants periodically. Necessary protection should be provided to ensure the equipment is not exposed to high concentration level of pollutants.

Equipment Rack Guidelines

The placement of the rack can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics described in the *Cisco 8404-SYS-D Routers Datasheet*. Choose a proper location for the Cisco 8404-SYS-D router by following the guidelines listed below.

Locating for Safety

If the Cisco 8404-SYS-D Router is the heaviest or the only piece of equipment in the rack, consider installing it at or near the bottom to ensure that the rack's center of gravity is as low as possible.

For additional information about the proper placement of electronic equipment, consult the document GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection.

Locating for Easy Maintenance

Keep at least three feet (36 inches) of clear space at the front and two feet (24 inches) at the back of the rack. This space ensures that you can remove the Cisco 8404-SYS-D Router components and perform routine maintenance and upgrades easily.

Avoid installing the Cisco 8404-SYS-D Router in a congested rack and consider how routing of cables from other pieces of equipment in the same rack could affect access to the router cards.

The sides of the chassis must remain unobstructed to ensure adequate airflow and prevent overheating inside the chassis.

Allow the following clearances for normal system maintenance:

- At the top of the chassis—At least 3 inches (7.6 cm)
- Sides of the chassis—3 to 4 ft (91.44 cm to 121.92 cm)

To avoid problems during installation and ongoing operations, follow these general precautions when you plan equipment locations and connections:

- Use the **show environment all** command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings about high temperature and creates reports on other potentially dangerous occurrences. If warning messages are displayed, take immediate action to identify the cause, and correct the problem.
- Keep the Cisco 8404-SYS-D Router off the floor and out of areas that collect dust.
- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Locating for Proper Airflow

Ensure that the Cisco 8404-SYS-D Router location has enough airflow to keep the system operating within the environmental characteristics and the air temperature is sufficient to compensate for the heat dissipated by the system.

Rack Compatibility

We recommend that you follow these rack specifications.

Rack Types

Figure 12: Rack specification EIA (19 inches and 23 inches)

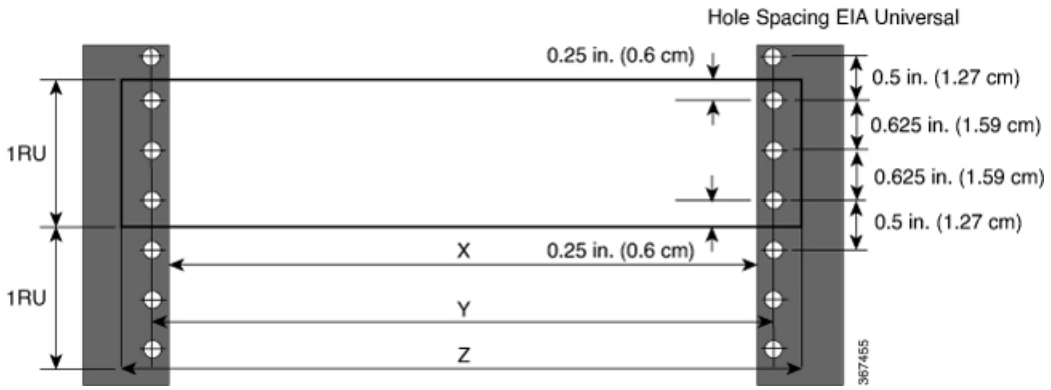
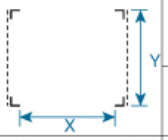
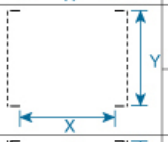
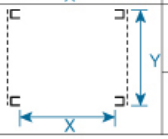


Table 6: Rack specification EIA (19 inches and 23 inches) for the Cisco 8404-SYS-D Router

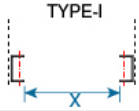
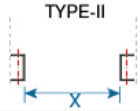
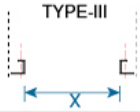
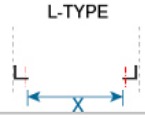
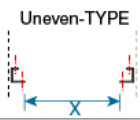
Post Type	Rack Type	Rack Front Opening (X)	Rack Mounting Hole Centre-Centre (Y)	Mounting Flange Dimension (Z)
4 Post	19 inches (48.3 centimeters)	450.8mm (17.75”)	465mm (18.312”)	482.6mm (19”)
2 Post				
4 Post	23 inches (58.4 centimeters)	552.45mm (21.75”)	566.7mm (22.312”)	584.2mm (23”)
2 Post				

Figure 13: Four Post Rack Type

4 – Post Type (Hole EIA Universal)		Width Available (X)	Compatibility with Chassis	Compatibility with Plenum
All 23" Type rack		21.75" (552.45mm)	Yes	Yes
All ETSI rack (21" rack)		19.68" (500.0mm)	Yes	Yes
19" Type rack L-Type Post		17.75" (450.8mm)	Yes	Yes
		17.50" (444.5mm)	Yes	Yes
19" Type Racks Flat-Post		17.75" (450.8mm)	Yes	Yes
		17.50" (444.5mm)	Yes	Yes
19" Type racks C- Type Post		17.75" (450.8mm)	No	No
		17.50" (444.5mm)	No	No

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Figure 14: Two Post Rack Type

2 – Post Type (Hole EIA Universal)	X – 19" Rack	Compatibility with Chassis	Compatibility with Plenum	X-23" Rack	Compatibility with Chassis and Plenum
TYPE-I 	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
TYPE-II 	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
TYPE-III 	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
L-TYPE 	17.75" (450.8 mm)	Yes	Yes	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	Yes	Yes	21.75" (552.45mm)	Yes
Uneven-TYPE 	17.75" (450.8 mm)	Yes	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	Yes	No	21.75" (552.45mm)	Yes

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Installation Checklist

Use the Installation Checklist that is shown in the following table to provide a record of what was done by whom and when. Use this list to record the completion and verification of each procedure. After the checklist is completed, place it in your Site Log along with the other records pertaining to your new Cisco router.

Table 7: Installation Checklist

Task	Verified By	Date
Date on which chassis received		
Chassis and all accessories unpacked		
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist that is copied.		
Site Log established and background information entered		
Site power voltages verified		
Site environmental specifications verified		
Required passwords, IP addresses, device names, and so on, available		
Required tools available		
Network connection equipment available		
Cable-management brackets that are installed (optional, but recommended).		
DC power cables that are connected to DC sources and router.		
Network interface cables and devices connected		
System power that is turned on.		
System boot completes (STATUS LED is on).		
Correct software configuration that is displayed after system banner appears		

Creating a Site Log

The Site Log provides a record of all the actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to the installation. See the *Site Log and Manufactures* section for more information on the Site Log as well as a sample Site Log that can be used to make copies.

Chassis-Lifting Guidelines

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

Each time you lift the chassis, follow these guidelines:

- Ensure that your footing is solid, and balance the weight of the chassis between your feet.
- Lift the chassis slowly; never move suddenly or twist your body as you lift.
- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the chassis, bend at the knees, not at the waist, to reduce the strain on your back muscles.
- Do not remove installed components from the chassis.
- Always disconnect all external cables before lifting or moving the chassis.



Warning To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit. Lift the unit only by using handles that are an integral part of the chassis, or by grasping the chassis underneath its lower edge. Statement 163

Floor Loading Considerations

Ensure that the floor under the rack supporting the Cisco 8404-SYS-D routers are capable of supporting the combined weight of the rack and all the other installed equipment.

For additional information about floor loading requirements, consult *GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection*.

Tools and Equipment

You need the following tools and equipment to install and upgrade the router and its components:

- ESD-preventive cord and wrist strap
- Antistatic mat or antistatic foam
- Number 1 and Number 2 Phillips-head screwdrivers
- Flat-blade screwdrivers: Small 3/16-inch (0.476 cm) and medium 1/4-inch (0.625 cm):
  - To install or remove modules
  - To remove the cover if you are upgrading the memory or other components
- #12-24 pan-head screws to secure the router to the equipment rack

- Cables for connecting to the WAN and LAN ports (depending on the configuration)
- Ethernet hub or switch or PC with a network interface card for connecting to the Ethernet ports
- Console terminal (an ASCII terminal or a PC running terminal emulation software) that is configured for 115200 baud, 8 data bits, no parity, and two stop bits
- Console cable for connecting to the console port
- (Optional) Modem for connecting to the auxiliary port for remote administrative access
- Auxiliary cable for connecting to the auxiliary port (you can supply this cable or order one)
- Ratcheting torque screwdriver with a Phillips head that exerts up to 30 pound-force per square inch (in-lb) of pressure
- Crimping tool as specified by the ground lug manufacturer
- 6 AWG copper wire for the power cord
- Wire-stripping tools for stripping both 6 AWG wire
- Tape measure and level

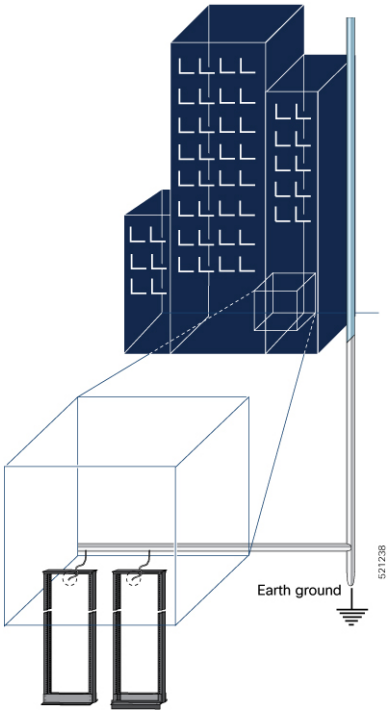


Warning Only trained and qualified personnel should be allowed to install or replace this equipment. Statement 49

Prepare Your Location

This section illustrates how the building that houses the chassis must be properly grounded to the earth ground.

Figure 15: Building with Rack Room Connected to Earth Ground

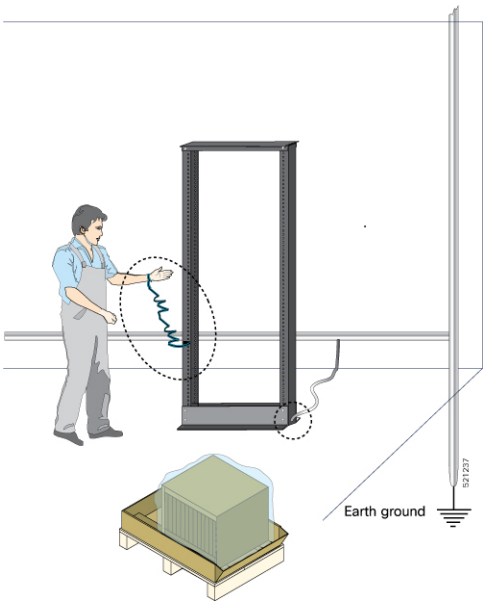


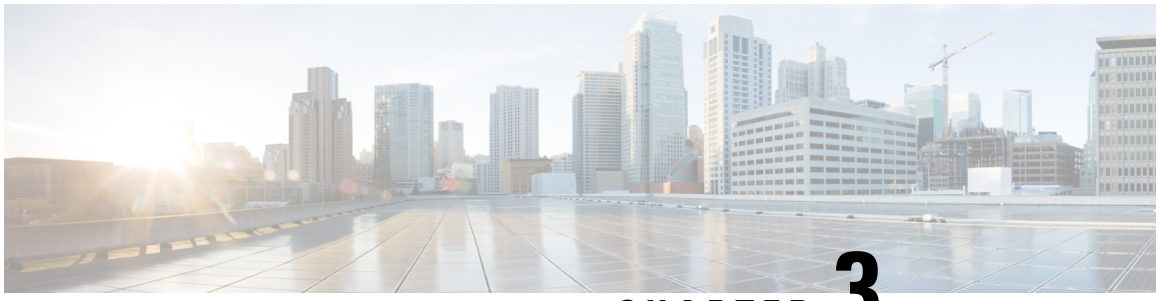
Prepare Yourself

This section illustrates how to prepare yourself before removing the chassis from the sealed antistatic bag. The figures show how to wear the ESD strap around the wrist and how to connect the other end of the strap to the ground. ESD wrist straps are the primary means of controlling static charge on personnel.

Note: These images are for only representation purposes. The chassis' actual appearance and size would vary.

Figure 16: Wearing the ESD Strap





CHAPTER 3

Unpack and verify shipped contents

Procedure

Step 1 Inspect the shipping container for any shipping damage. If there is obvious physical damage, contact your Cisco service representative, else continue with the remaining steps.

Figure 17: Cisco 8404-SYS-D router packaged in a shipping container

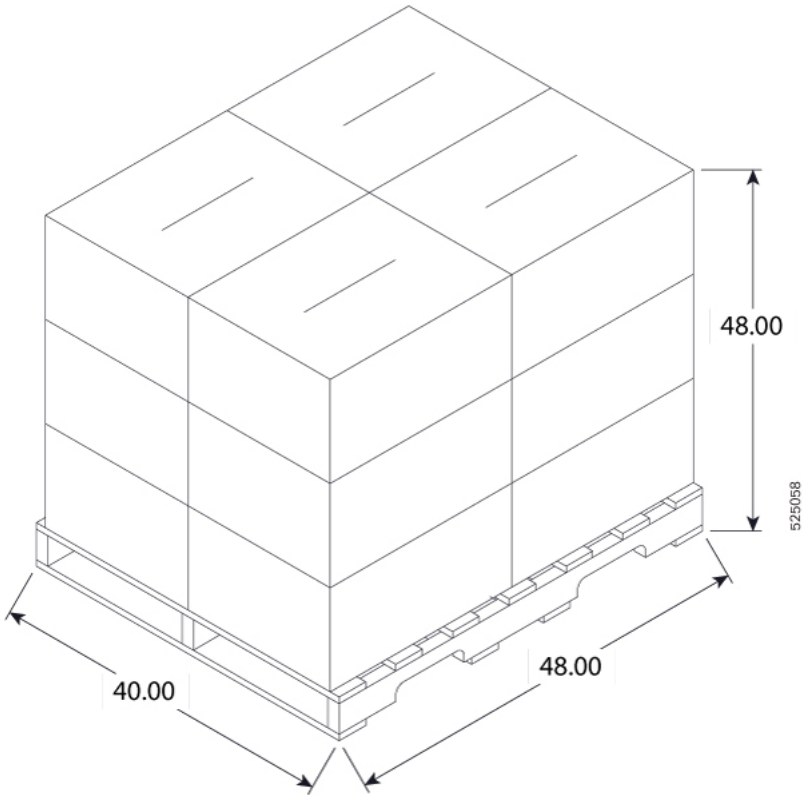


Figure 18: Cisco 8404-SYS-D router packaged for shipping

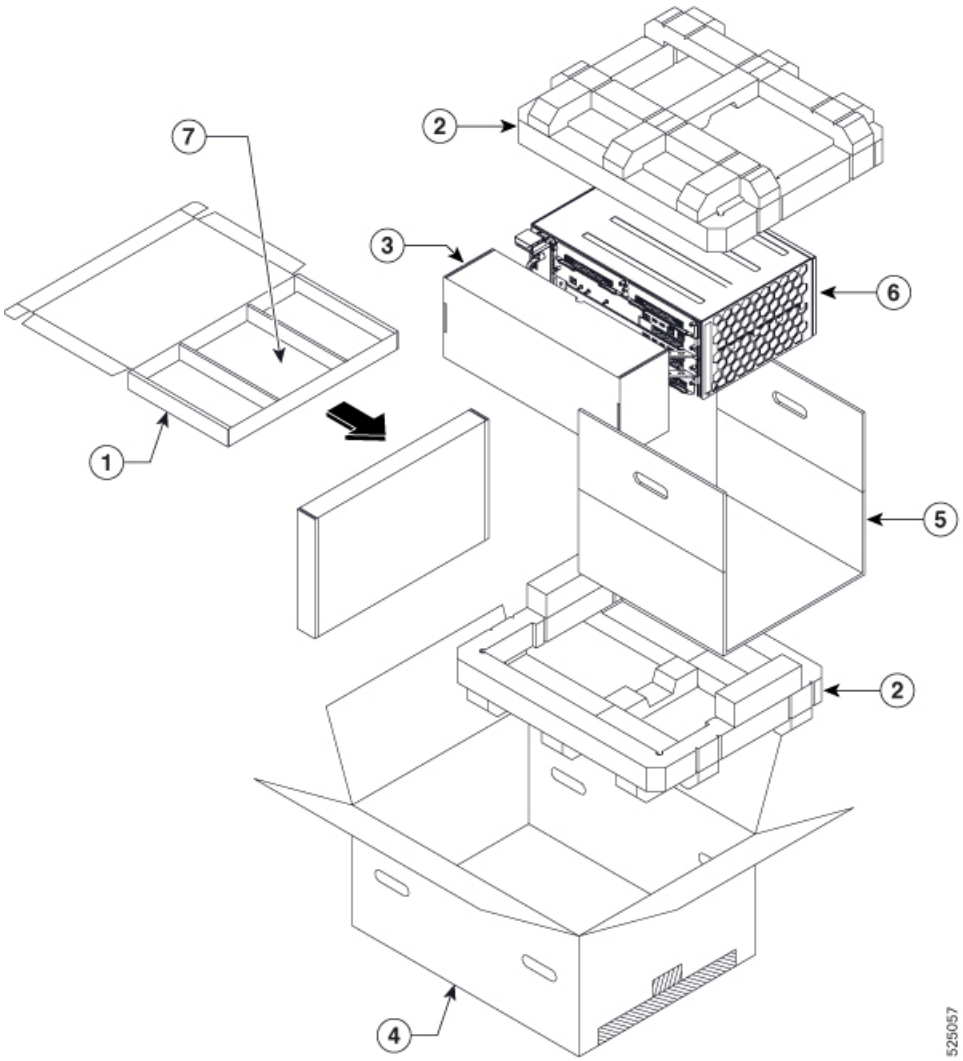


Table 8: Shipping components of Cisco 8404-SYS-D router

1	Packaging Accessory tray
2	Packaging foam
3	Packaging Corrugated front cap
4	Packaging regularslotted container
5	Packaging llift sling
6	Chassis
7	Accessories for installation

Step 2 Unpack the router.

Step 3 Inspect the router.

Step 4 Use the following table to verify the contents of the container. Do not discard the shipping container. You will need the container in the future if you move or ship the router.

What to do next

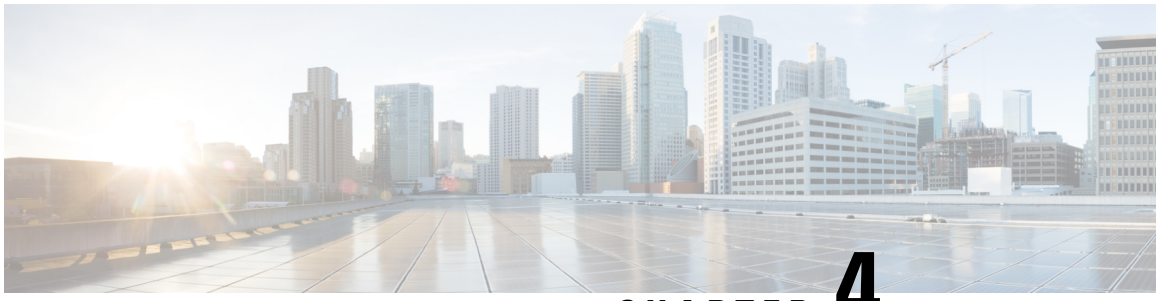
Table 9: Cisco 8404-SYS-D router shipping container contents

Component	Description	Quantity
Chassis	Chassis cabinet (8404-SYS-D)	1
	Route Switch Processor (8404-RSP1-48-EM)	1
	Fan Trays	1
	PEM	2
Accessories kit	Rack mount adapter screws (for 23-inch and ETSI adaptors)	
	Four cable-management brackets (one per bracket)	4
	Earth lug with two 10-32 screws.	1
	1 RJ45 to RJ45 crossover cable 1 RJ45 to DB-9 (female) adapter	1
	19-inch rack mount brackets	-
ETSI Bracket (To be used when the router is used as a reverse flow system)	BRCKT	-
ESD, wrist strap (disposable)	One disposable wrist strap (optional)	1
Documentation	*Regulatory Compliance and Safety Information for the Cisco 8404 Router*	-

Note Most Cisco documentation is available online. The chassis pointer card that is shipped with your Cisco 8404-SYS-D router contains links and information to other online documentation.



Note If the product is not in use, store the device in the initial packaged condition or in an ESD PE sealed bag with silica gel.



CHAPTER 4

Install the Cisco 8404-SYS-D router

This chapter describes how to install the various components in the Cisco 8404-SYS-D router and includes the following sections:

- Prerequisites, on page 49
- Install the router in a rack, on page 50
- Install the chassis ground connection, on page 52
- Attach the cable management brackets, on page 56
- Install MPA, on page 57
- Install PEM, on page 59
- Install the DC PEM Cables, on page 60
- Install an RSP module, on page 68
- Install the fan tray, on page 70
- Install the air plenum (8K-4RU-F2B-AIR), on page 73
- Install dust caps, on page 86
- Install and remove SFP modules, on page 86
- Port Connection Guidelines , on page 87
- Connect to the Console Port , on page 88
- Connect to the Management Ethernet Port, on page 89
- Connecting Timing Cables, on page 90
- Connecting Cables to Timing Interfaces Card, on page 90
- Install and Remove Transceiver Module, on page 90

Prerequisites

Before installing the Cisco 8404-SYS-D Router, it is important to prepare for the installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOP). For more information, see the *Prepare for Installation* section.
- Unpacking and inspecting the Cisco 8404-SYS-D Router
- Gathering the tools and test equipment required to properly install the Cisco 8404-SYS-D Router

Install the router in a rack

The following sections describe how to install the Cisco 8404-SYS-D Router in a rack:

Procedure

Step 1 Remove the rack-mount brackets from the accessory kit and position them beside the router chassis.

Step 2 Position one of the brackets against the chassis side and align the screw holes.

Step 3 Secure the bracket to the chassis with the screws removed when performing Step 1. The recommended maximum torque is 6.2 in.-lb (0.7 N-m).

The following figures show how to attach the brackets on the Cisco 8404-SYS-D router for a ETSI rack and a 23-inch EIA rack.

Figure 19: Installing the Mounting Brackets for n ETSI Rack

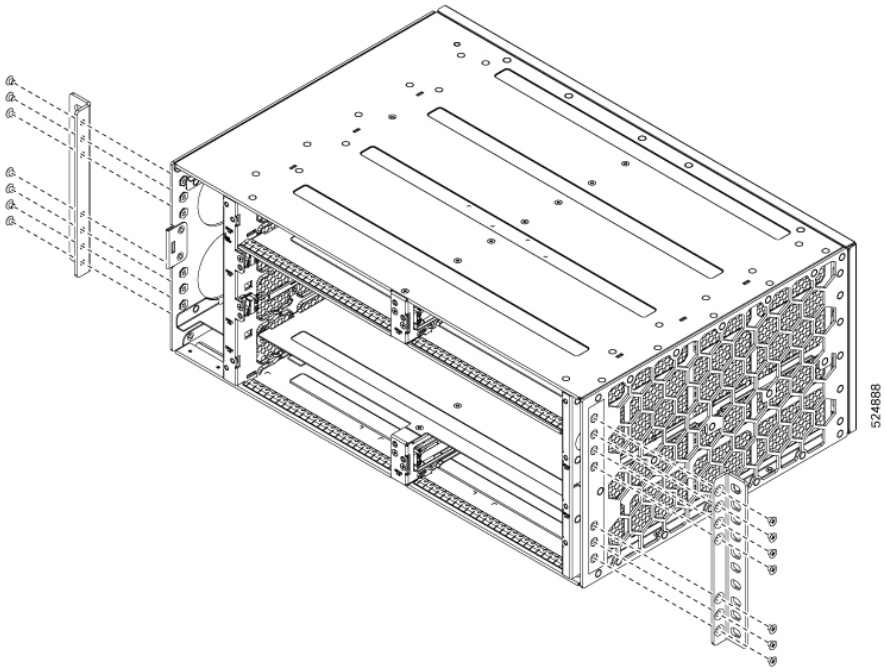
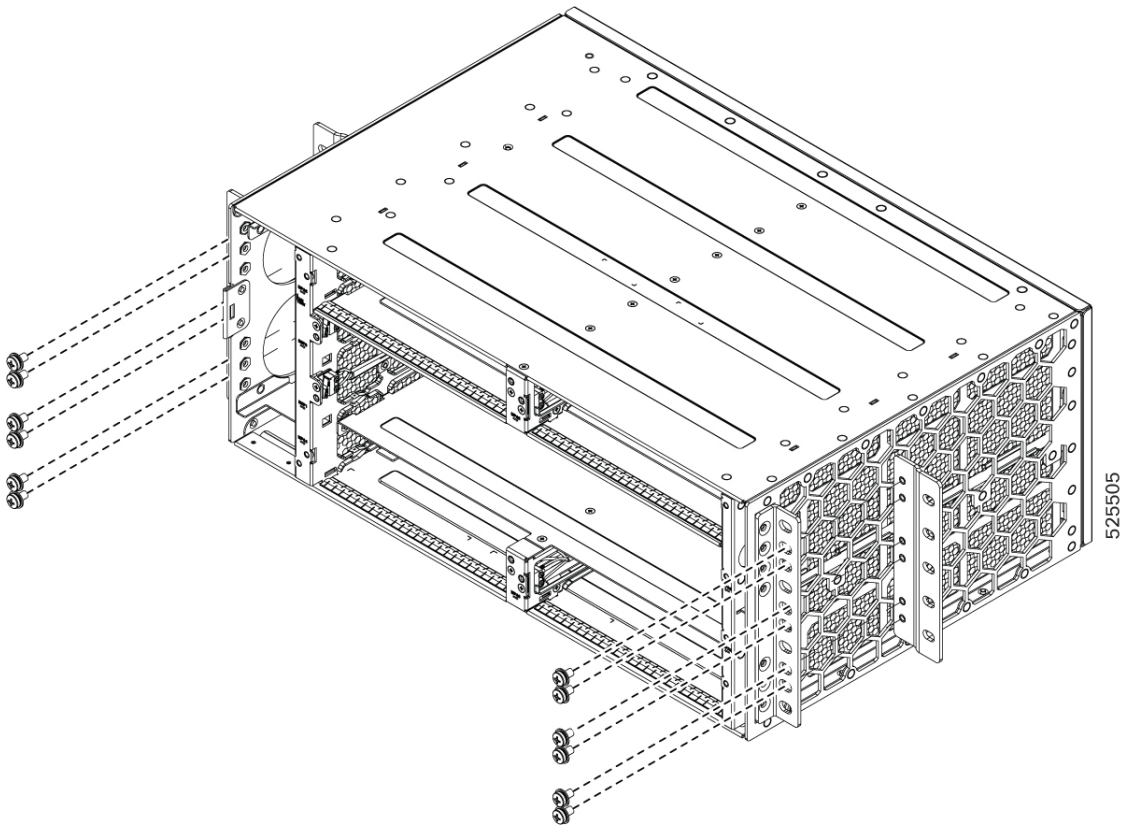


Figure 20: Installing the Mounting Brackets for the 23-inch EIA Rack



Step 4 Position the chassis in the rack as follows:

- If the front of the chassis (front panel) is at the front of the rack, insert the rear of the chassis between the mounting posts.
- If the rear of the chassis is at the front of the rack, insert the front of the chassis between the mounting posts.

Step 5 Align the mounting holes in the bracket with the mounting holes in the equipment rack.

Do not use module ejector lever as handles to lift the modules.

Note
The router can be mounted in an ETSI rack but the required bend radius for the cables and fibers within the 300 mm ETSI specification cannot be maintained.

If you want to mount the router in ETSI cabinets, you need to have a custom-made cabinet front door to meet the fiber bend radius requirement.

Step 6 Install chassis using 12 no rack screws. These screws can be arranged based on the rack used.

Step 7 Use a tape measure and level to verify that the chassis is installed straight and level.

Install the chassis ground connection

Before you connect the power or turn on the power to the Cisco 8404-SYS-D Router, you must provide an adequate chassis ground (earth) connection to your router.

This section describes how to ground the Cisco 8404-SYS-D Router. The router provides two locations for attaching a 2-hole grounding lug according to the rack-mounting brackets you use to install the router.

Figure 21: Attaching a Grounding Lug to the rear of the Router

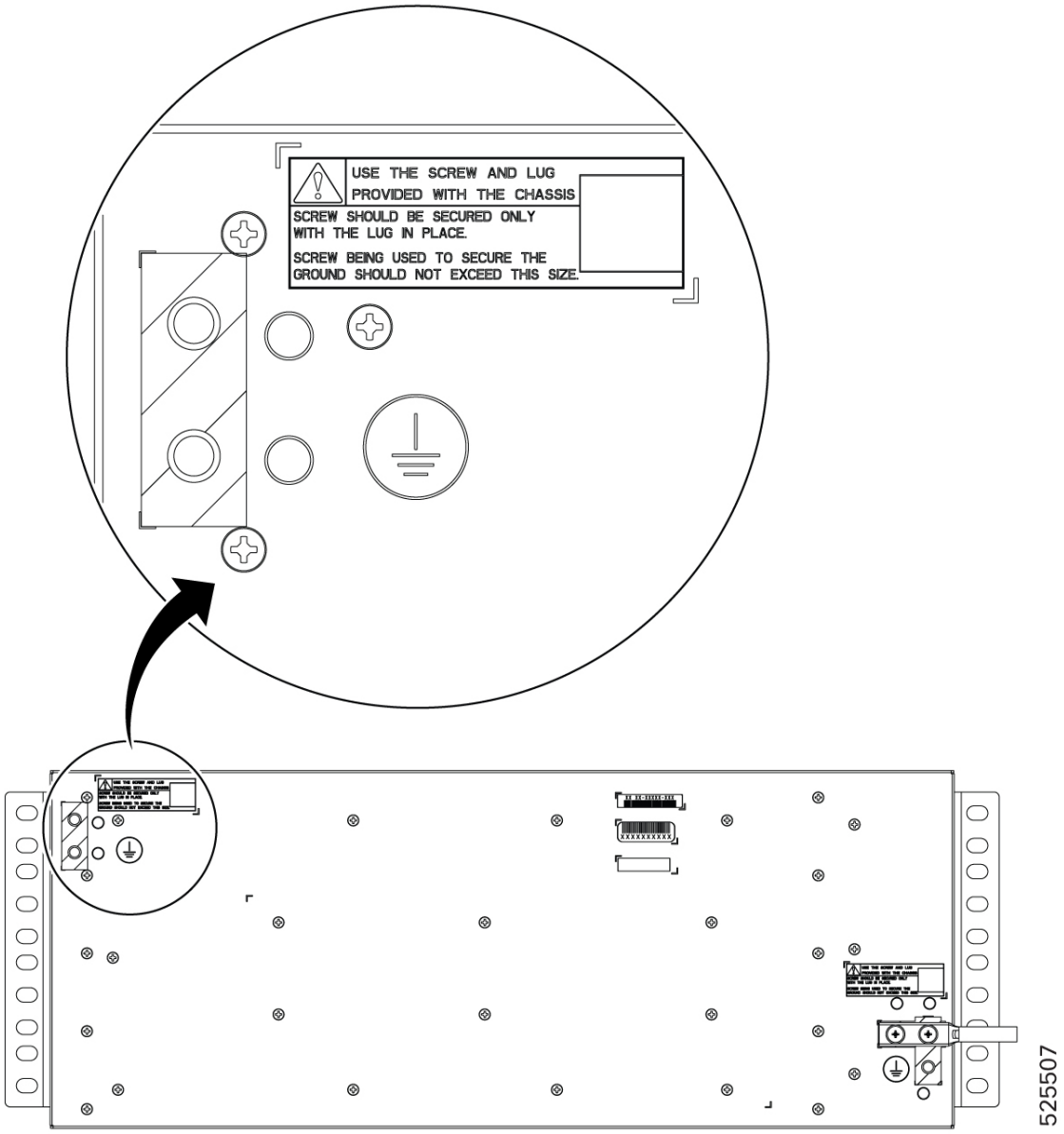
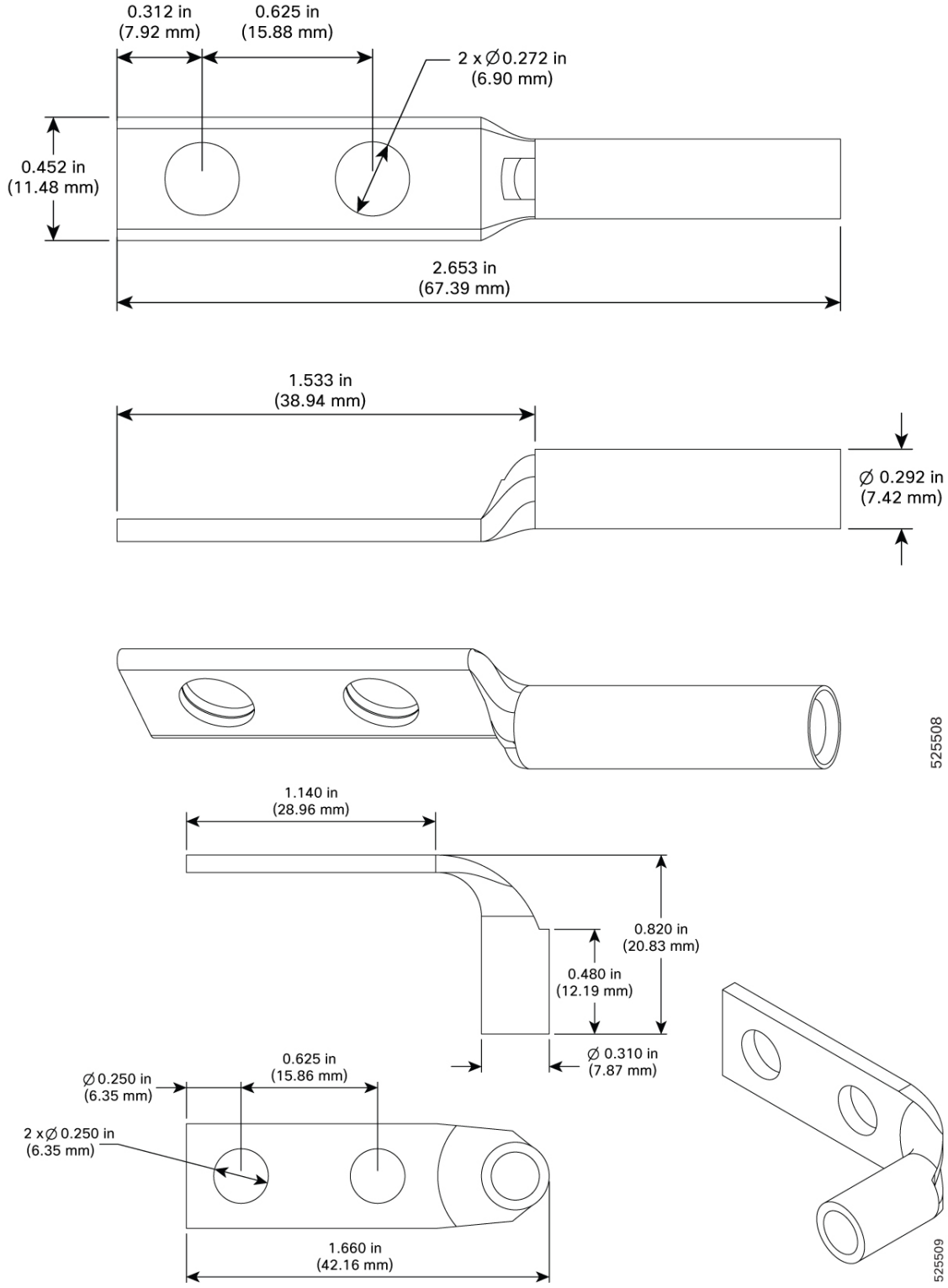


Figure 22: Grounding Lug Dimensions



To ensure that the chassis ground connection that you provide is adequate, you need the following parts and tools:

- Ratcheting torque screwdriver with Phillips head that exerts up to 20 in.-lb (2.25 N-m) of pressure for attaching the ground wire to the router

Caution Ensure that you secure the lugs only with the Cisco-provided screw or a Phillips head screw with an integrated washer of 10-32 x 0.3125 inch. Secure the screws only while assembling the lugs.

- Crimping tool as specified by the ground lug manufacturer
- 6 AWG or larger copper wire for the ground wire
- Wire-stripping tools appropriate to the wire you are using

Caution Before making connections to the Cisco 8404-SYS-D Router, ensure that you disconnect the power at the circuit breaker. Otherwise, severe injury to you or damage to the router may occur.

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

Warning Use copper conductors only. Statement 1025

Warning When installing the unit, the ground connection must always be made first and disconnected last. Statement 42

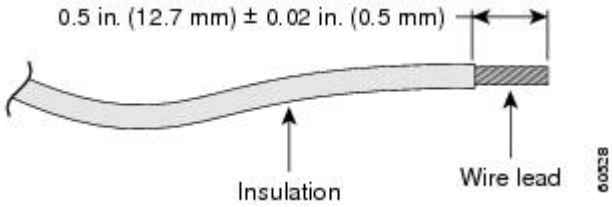
This unit is to be installed in a restrictive access location and must be permanently grounded to minimum 6 AWG copper ground wire.

Perform the following procedure to ground the router using a 2-hole lug and the corresponding mounting point. Most carriers require a minimum 6 AWG ground connection. Verify your carrier's requirements for the ground connection.

Procedure

Step 1 If your ground wire is insulated, use a wire-stripping tool to strip the ground wire to 0.5 inch ± 0.02 inch (12.7 mm ±0.5 mm) As shown in the figure below.

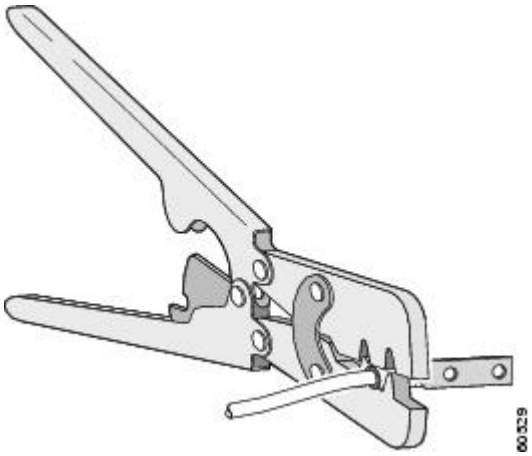
Figure 23: Stripping a Ground Wire



Step 2 Slide the open end of your 2-hole ground lug over the exposed area of the ground wire.

Step 3 Using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire as shown in figure below.

Figure 24: Crimping a Ground Lug onto the Ground Wire



Step 4 Use a Phillips head screwdriver to attach the 2-hole ground lug and wire assembly to the router with the 2 pan-head Phillips head screws. For all racks, attach the 2-hole ground lug to the rear of the router.

Step 5 Connect the other end of the ground wire to a suitable grounding point at your site.

Attach the cable management brackets

The router supports the following bracket:

- 8404-CBLMGMT—This bracket helps in routing the cables from the interface modules, router switch processors (RSPs), and PEM units; thereby enabling a proper cable bending radius.

Note You can install the cable brackets along with the rack mount screws while installing the chassis. Or, you can install the cable brackets after the chassis is monted on the rack. However, ensure the brackets are positioned such that they aid cable routing and provide enough slack for fan trays and air filter removal.

Procedure

Step 1 Position the cable management brackets against the front of the chassis and align the four screw holes, as shown in the figure below.

Figure 25: Attaching Cable Management Brackets to the 19-inch Rack

Step 2 Secure the cable management brackets with four M4 screws. The recommended maximum torque is 10 in.-lb (1.12 N-m).

Install MPA

There are four MPA slots: slots 2, 3 at the chassis top and slots 4,5 on the bottom side of the chassis.

To install an MPA module in the router chassis, perform the following steps:

Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

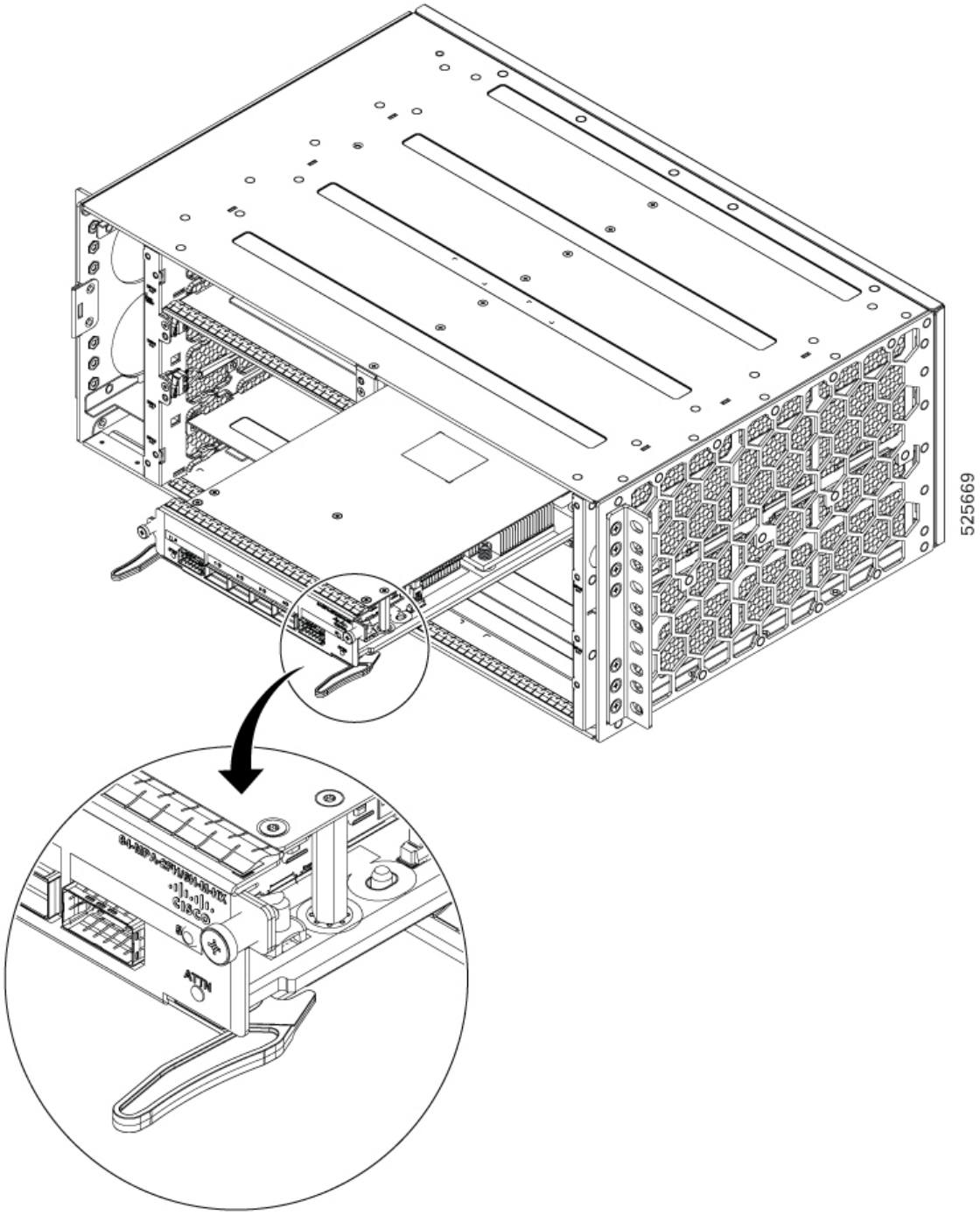
Step 2 Choose a slot for the module. Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head screws.

Step 3 Fully open both the ejector levers on the new module.

Caution
To prevent ESD damage, handle modules by carrier edges only.

Step 4 Position the module in the slot. Make sure that you align the sides of the module with the guides on each side of the slot, as shown in the figure below.

Figure 26: MPA Installation



Step 5 Carefully slide the module into the slot until the EMI gasket on the module makes contact with the module in the adjacent slot and both the ejector levers have closed to approximately 45 degrees with respect to the module faceplate.

Caution
If the top slot already has an MPA module installed, and you install a second MPA module in the slot below it, be careful not to damage the EMI gasket of the bottom MPA module against the ejector levers of the top MPA during insertion.

Step 6 While pressing down, simultaneously close both the ejector levers to fully seat the module in the backplane connector. The ejector levers are fully closed when they are flush with the module faceplate.

Step 7 Tighten the two captive installation screws on the module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Note
Make sure that the ejector levers are fully closed before tightening the captive installation screws.

Step 8 Tighten the captive screw within three minutes after the full insertion of the card. After three 3 minutes, the card will be shown as *shutdown*. Reload the chassis with the force option using the **reload location** command to bring the card to the operational mode.

```
RP/0/RP0/CPU0:ios##reload location 0/<slot #> force
```

Step 9 Verify that the captive installation screws are tightened on all of the modules installed in the chassis. This step ensures that the EMI gaskets on all the modules are fully compressed in order to maximize the opening space for the new or replacement module.

Note
If the captive installation screws are loose, the EMI gaskets on the installed modules will push adjacent modules toward the open slot, which reduces the size of the opening and makes it difficult to install the new module.

Note
When installing the cabling to an MPA, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

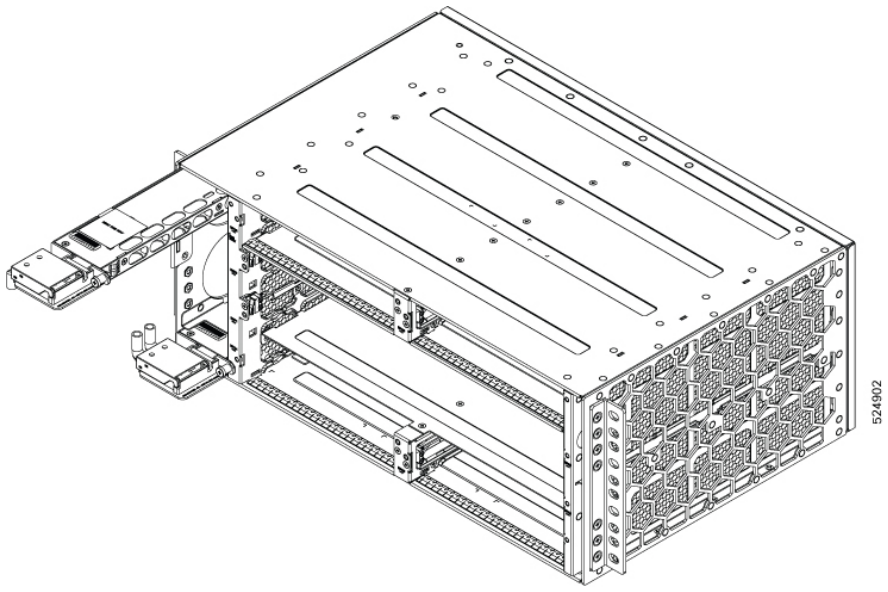
Note
Close all unused optics ports on the MPA module using the appropriate dust caps to prevent dust from accumulating inside the cage. For information on dust caps, see the *Installing dust caps*.

Install PEM

On the chassis above and below fan tray, there are two slots for the DC PEM card. PEM1 at bottom of fan tray and PEM0 on top of the tray. The chassis is shipped with the PEMs installed .

This procedure provides steps required to install a PEM on the slot.

Figure 27: PEM



Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Choose a slot for the module.Position the module in the slot. Ensure that you align the sides of the module with the guides on each side of the slot, as shown in the figure below.

Step 3 Slide the module carefully into the slot until the EMI gasket on the module makes contact with the chassis and the captive screws on both sides of the module are aligned with the chassis screw holes.

Step 4 Tighten the captive screws.The recommended maximum torque is <Value> . Ensure that the EMI gaskets are fully compressed.

Note
The chassis gets its DC power from the PEM's. To connet the DC power to PEM's, see *Install the DC Power Cables*. Ensure that the PEM is powered from the right DC source and maintained within the operating voltage range as specificed in the *Table 2. DC Power Entry Module Specifications*.

Install the DC PEM Cables

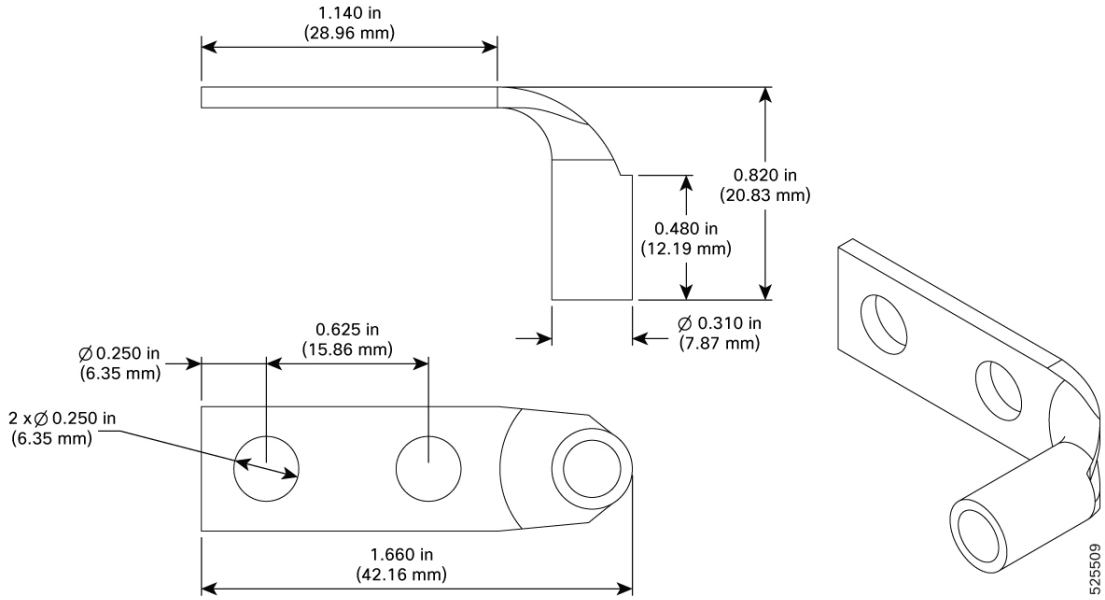
Note When installing DC PEM, use 6 AWG cables and 90°C temperature rated cable. The recommended cable length is three meters maximum from source.

Note

- Always ensure that the building's installation for short-circuit (overcurrent) protection does not exceed 60A.
- We recommend you to use a circuit breaker or a fast acting fuse with a maximum DC rating, based on the router variants for over current protection.

Note We recommend that you do not install the lugs while the PEM is mounted on the chassis. First, remove the PEM from the chassis to ensure safe and proper handling. With the PEM removed, attach the lugs securely to the PEM. After the lugs are attached and all connections are secure, insert the PEM back into the chassis carefully.

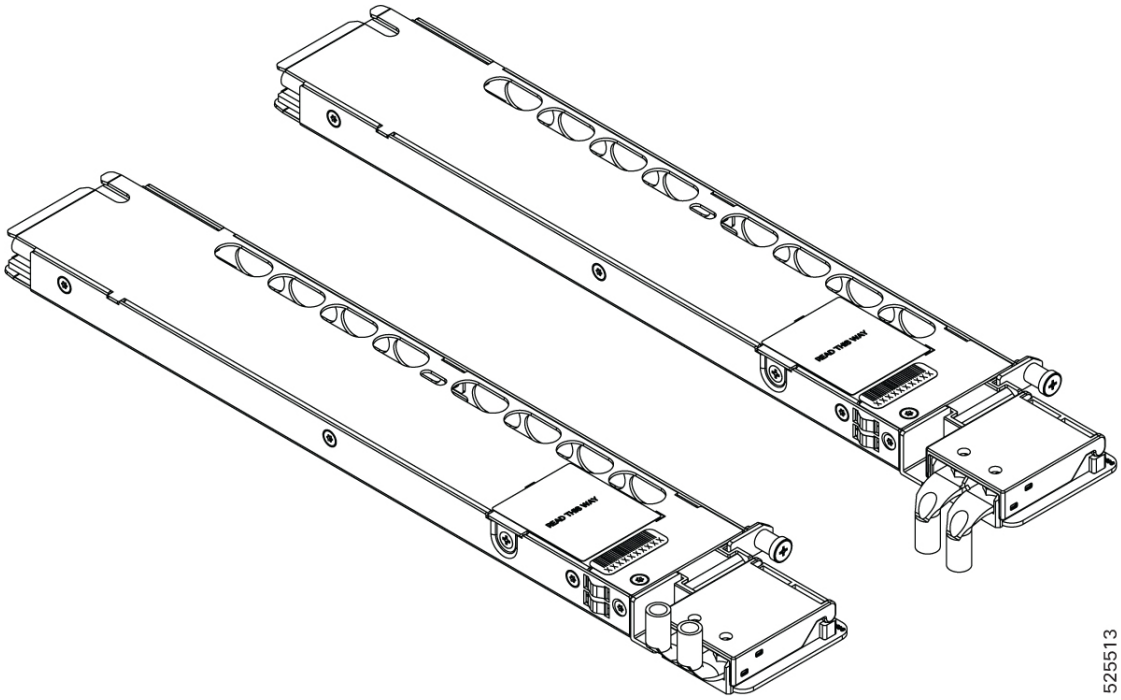
Figure 28: DC Lug Dimensions



To attach the DC PEM:

1. Locate the terminal block plug.
2. Insert the DC-input power source wires into the terminal block plug.
3. Attach the DC supply wires using the designated screws.
4. Use a ratcheting torque screwdriver to torque the terminal block plug captive screw. (See the following figure.)

Figure 29: DC PEM



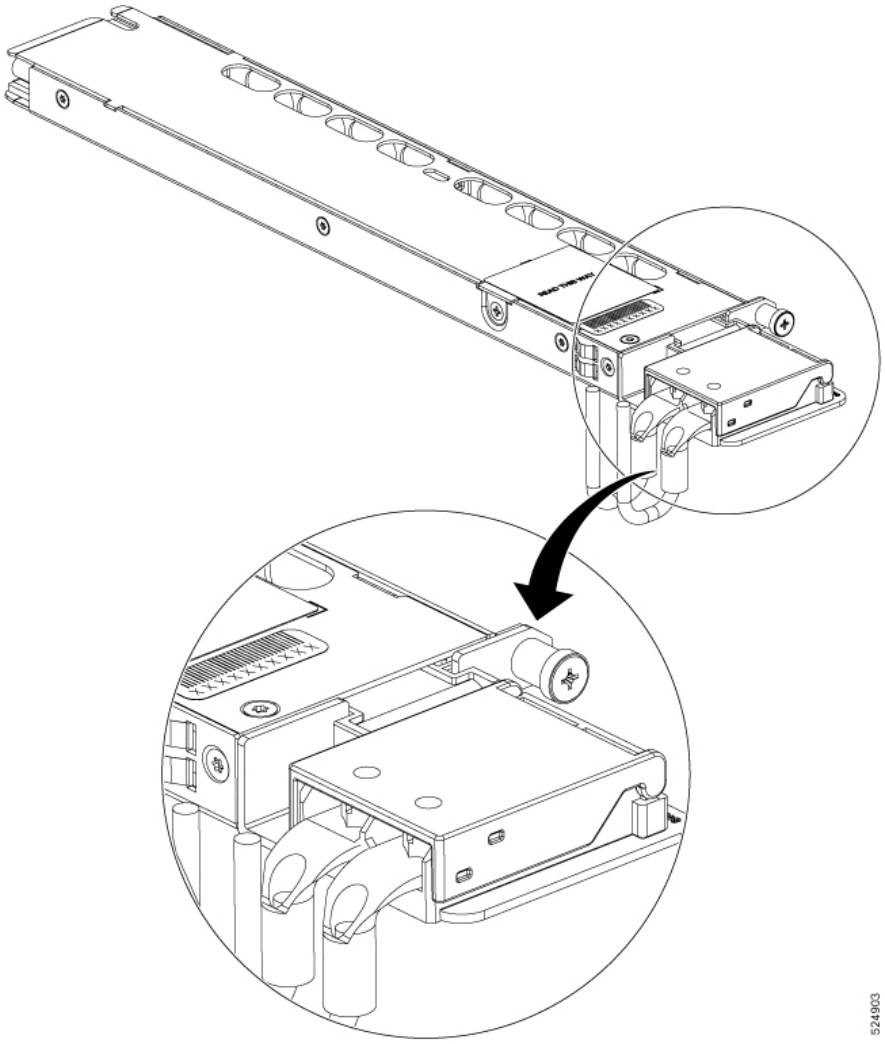
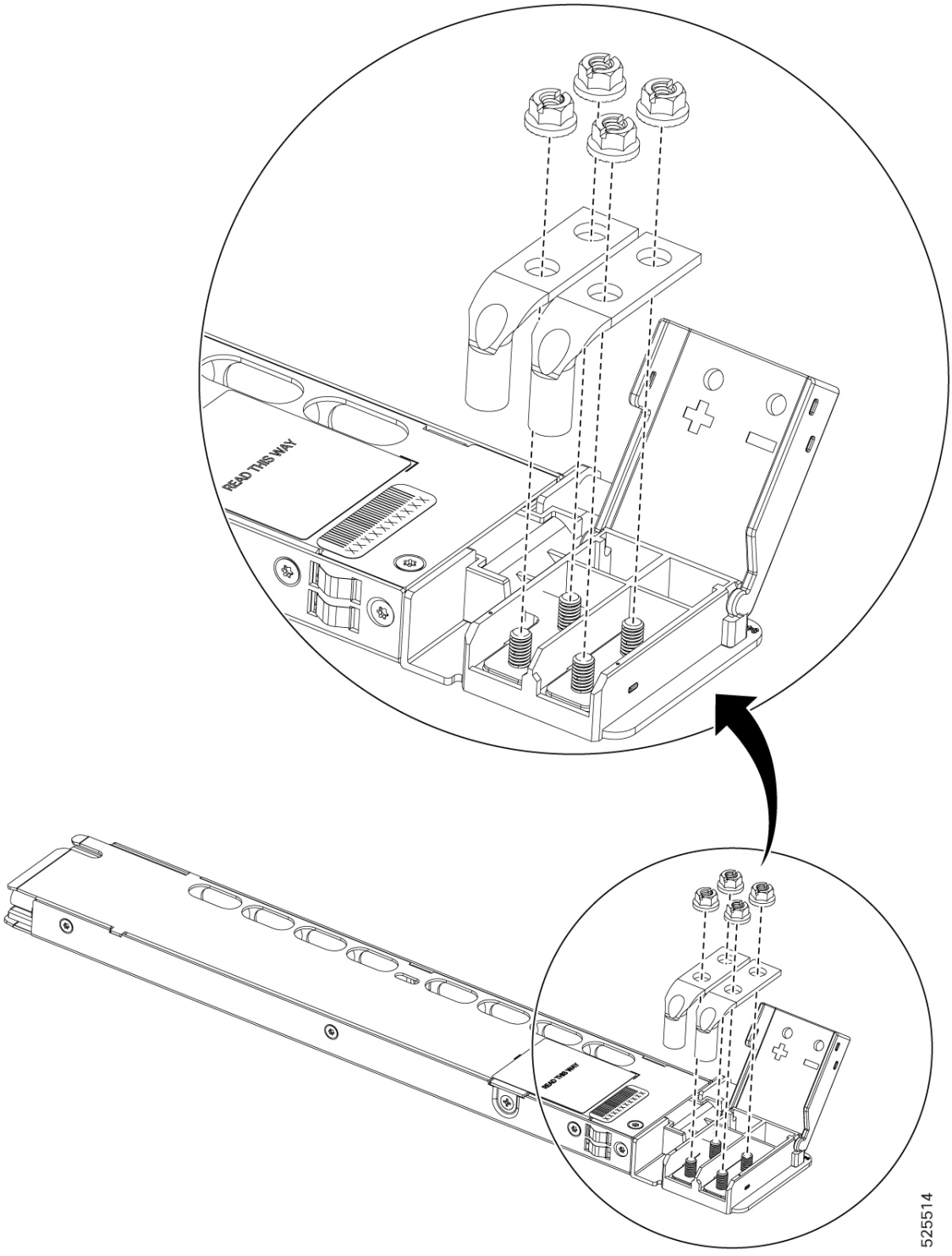
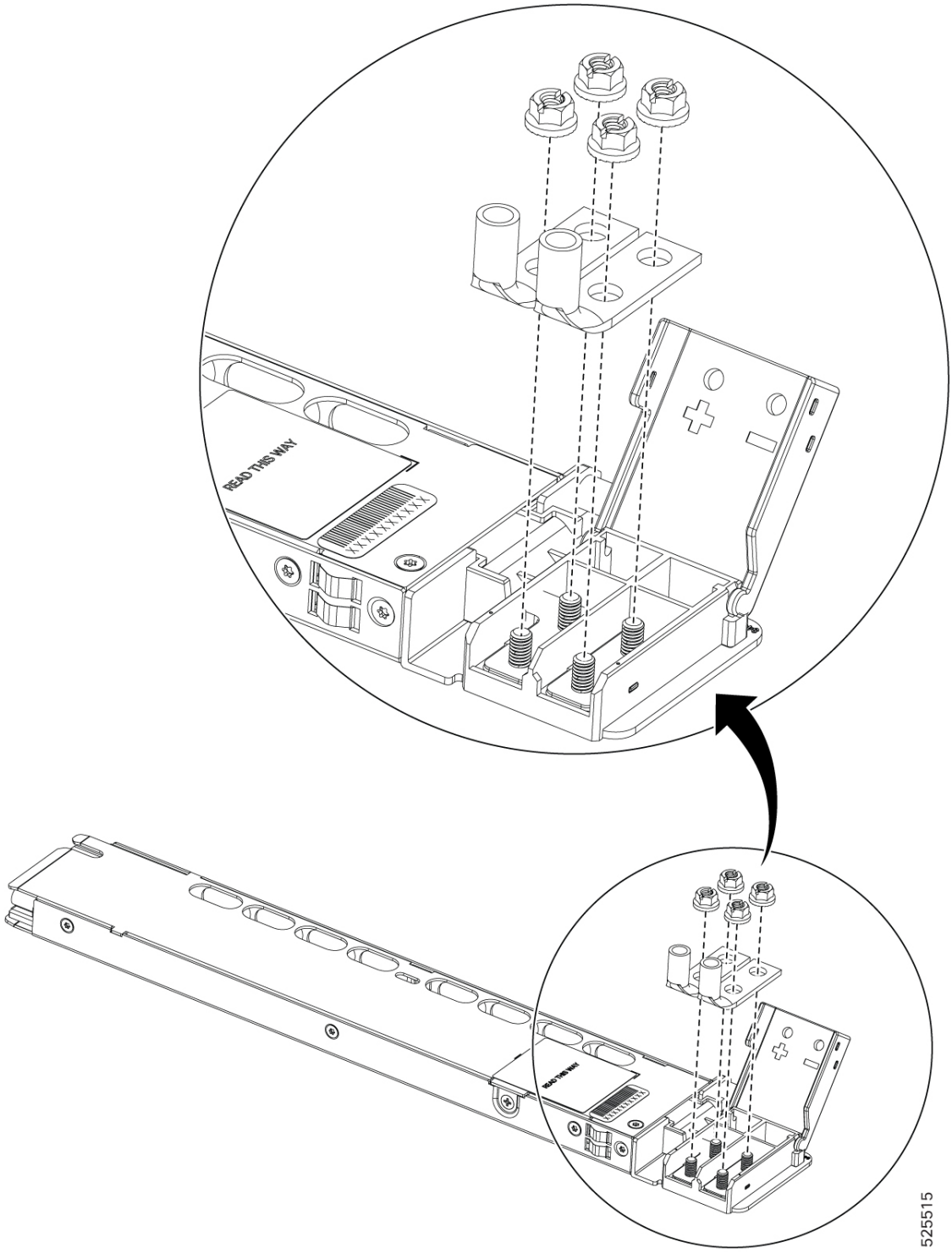
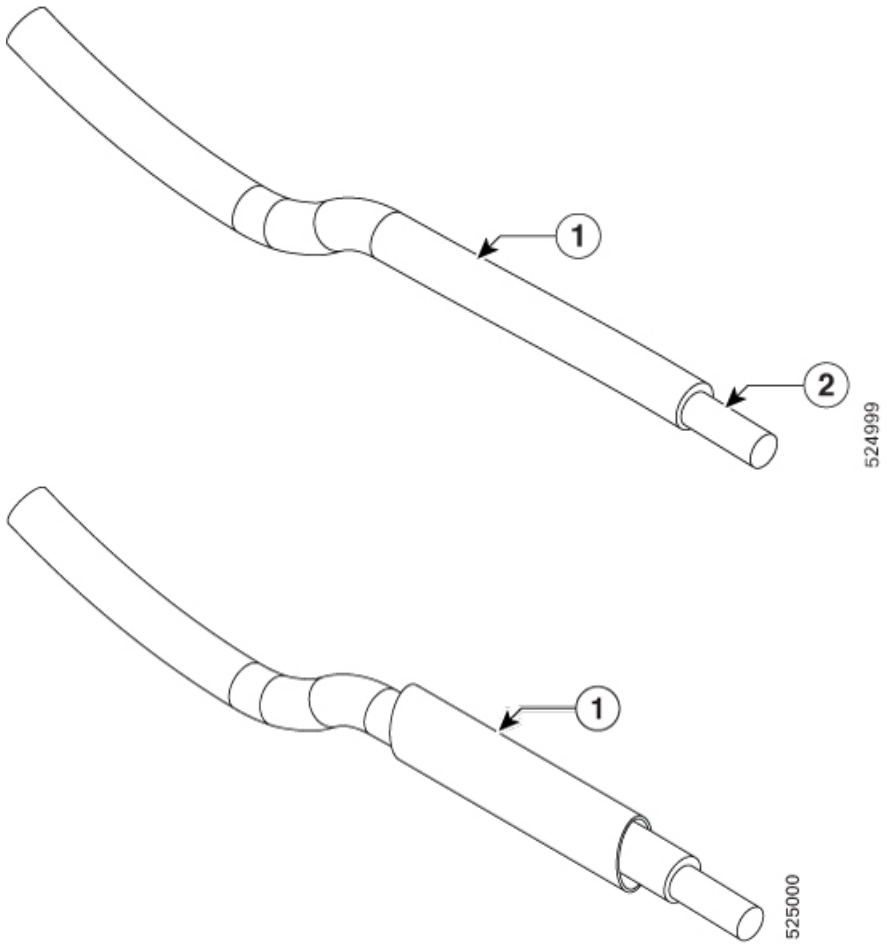
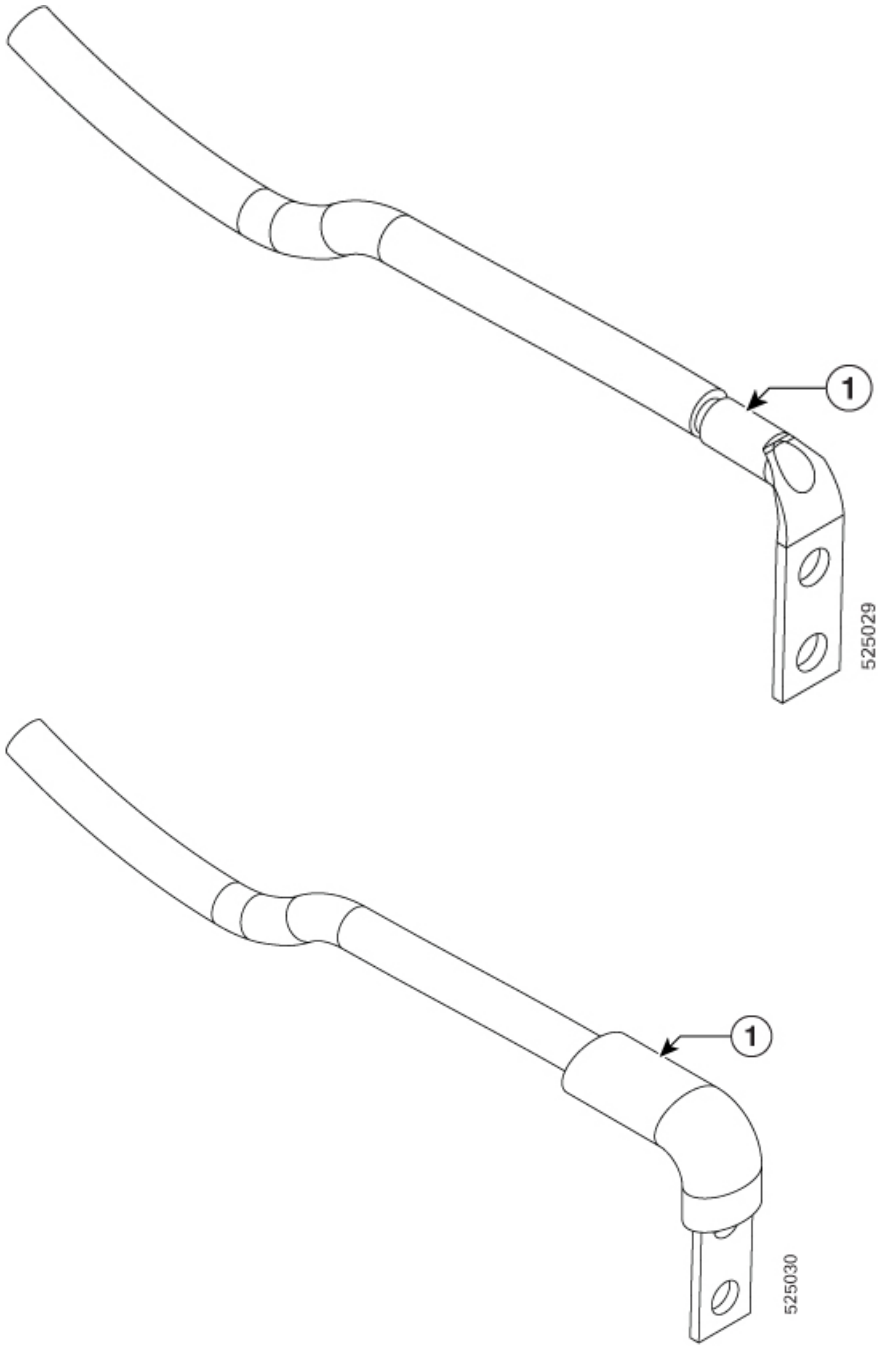

524903

Figure 30: DC PEM




READ THIS WAY
525515


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1
525000



Turn On a DC PEM

Perform the following procedure to activate a DC PEM:

1. Verify the PEM operation by checking whether the respective PEM front panel LED (PS0 or PS1) is green.
2. If the LEDs indicate any issues with power problem, see *LEDs*.
3. If you are also connecting a redundant DC PEM, repeat these steps for the second power source.

Note If you are connecting a redundant DC PEM, ensure that each PEM is connected to a separate power source in order to prevent power loss in the event of a power failure.

The operating voltage range is -40V to 72VDC, 45A maximum.

Install an RSP module

To install an RSP module in the router chassis, perform the following steps:

Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

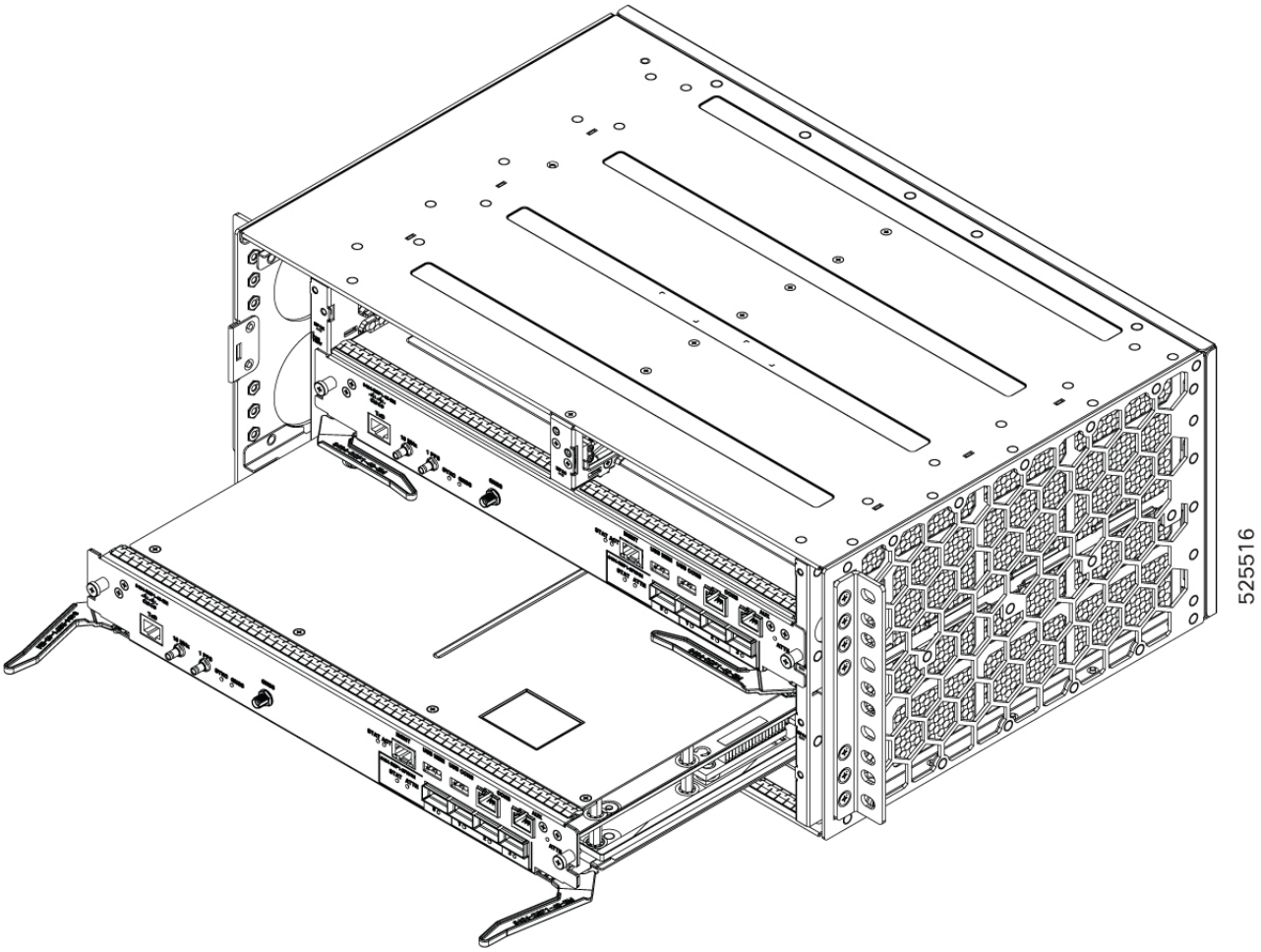
Step 2 Choose a slot for the module. Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head screws.

Step 3 Fully open both the ejector levers on the new module.

Caution
To prevent ESD damage, handle modules by carrier edges only.

Step 4 Position the module in the slot. Make sure that you align the sides of the module with the guides on each side of the slot, as shown in the figure below.

Figure 31: RSP Installation



Step 5 Carefully slide the module into the slot until the EMI gasket on the module makes contact with the module in the adjacent slot and both the ejector levers have closed to approximately 45 degrees with respect to the module faceplate.

Caution
If the top slot already has an RSP module installed, and you install a second RSP module in the slot below it, be careful not to damage the EMI gasket of the bottom RSP module against the ejector levers of the top RSP during insertion.

Step 6 While pressing down, simultaneously close both the ejector levers to fully seat the module in the backplane connector. The ejector levers are fully closed when they are flush with the module faceplate.

Step 7 Tighten the two captive installation screws on the module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Note
Make sure that the ejector levers are fully closed before tightening the captive installation screws.

Note
- After inserting the card completely, ensure that the captive screw is tightened within 3 minutes.
- If the screw is not tightened within the specified time, the card will transition to a *shutdown* state.

- To recover the card and bring it back to operational mode, you will need to manually execute the **reload location** command with the force option.

```
RP/0/RP0/CPU0:ios#reload location 0/RP0-1/<slot #> force
```

Step 8 Tighten the captive screw within three minutes after the full insertion of the card. After three 3 minutes, the card will be shown as *shutdown*. Reload the chassis with the force option using the **reload location** command to bring the card to the operational mode.

```
RP/0/RP0/CPU0:ios##reload location 0/<slot #> force
```

Step 9 Verify that the captive installation screws are tightened on all of the modules installed in the chassis. This step ensures that the EMI gaskets on all the modules are fully compressed in order to maximize the opening space for the new or replacement module.

Note
If the captive installation screws are loose, the EMI gaskets on the installed modules will push adjacent modules toward the open slot, which reduces the size of the opening and makes it difficult to install the new module.

Note
When installing the cabling to an RSP, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Note
Close all unused optics ports on the MPA module using the appropriate dust caps to prevent dust from accumulating inside the cage. For information on dust caps, see the *Installing dust caps*.

Install the fan tray

The fan tray is a modular unit that provides cooling to the Cisco 8404-SYS-D router.

Note Do not introduce body parts or objects in the fan tray slot when installing or removing the fan tray module. Exposed circuitry is an energy hazard.

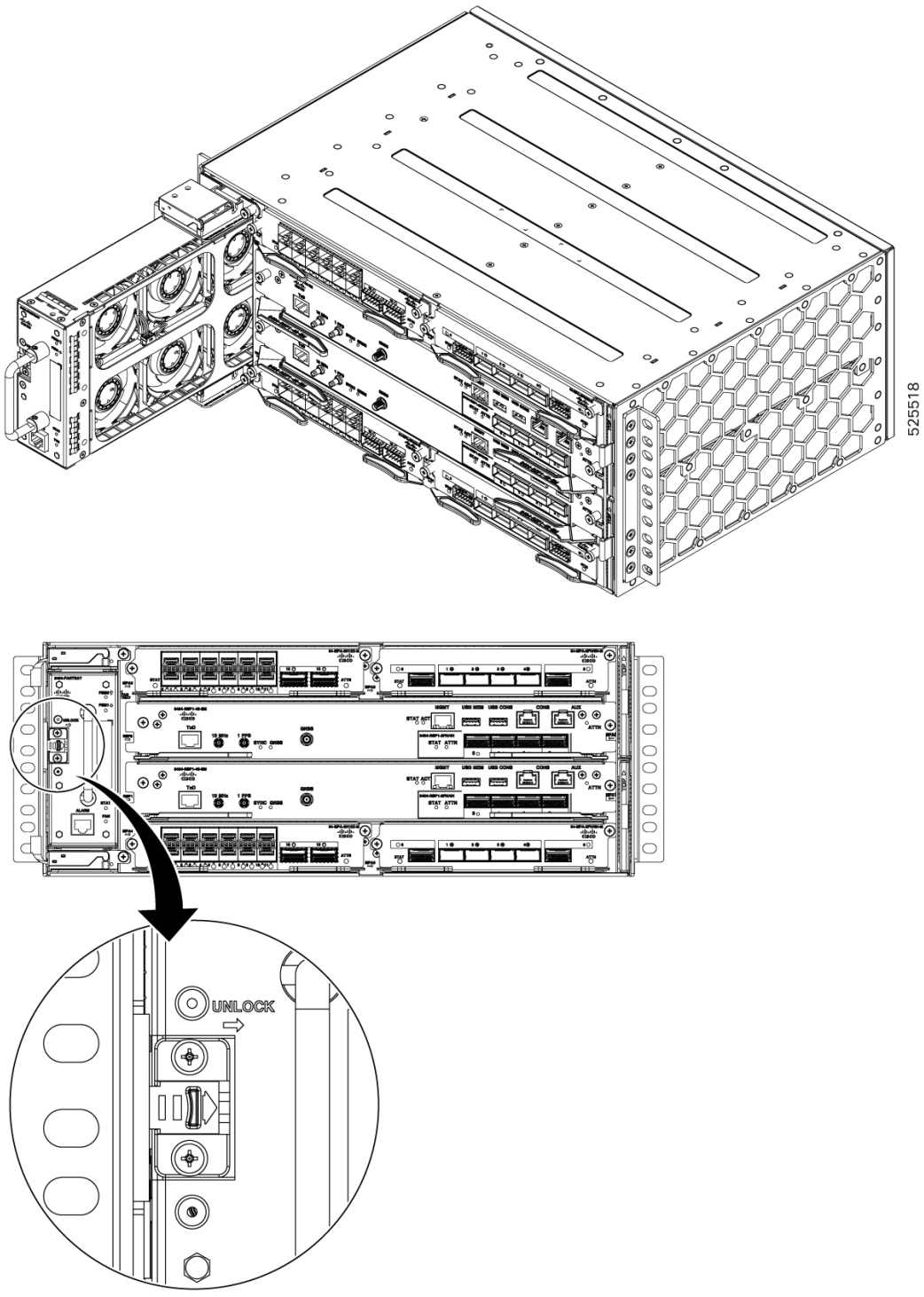
Follow these steps to install the primary fan tray in the chassis:

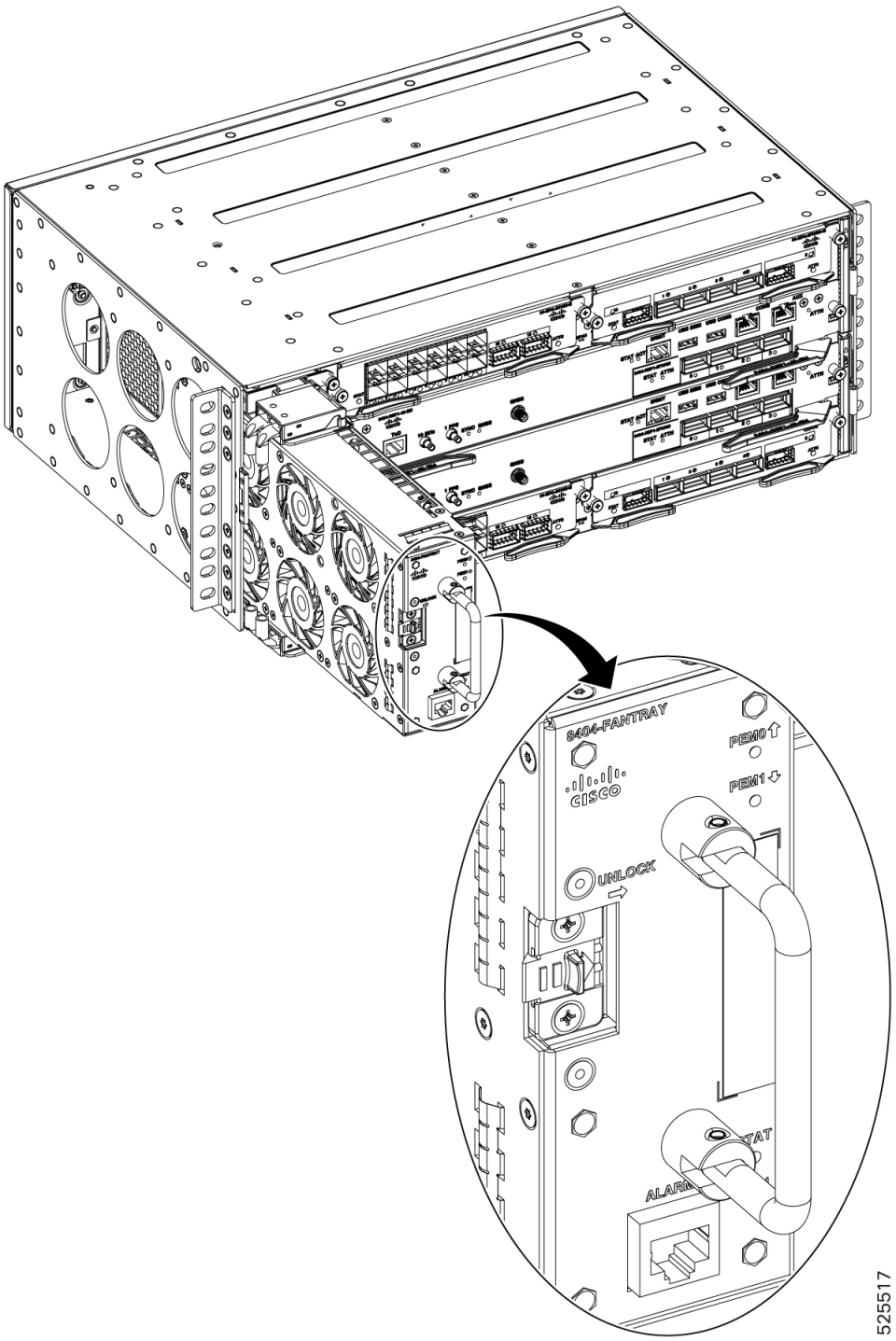
Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Orient the fan tray so that the latch is on the left side of the fan tray's front panel. The figure below shows how to orient the fan tray.

Figure 32: Install the Fan Tray





Step 3 Guide the fan tray into the chassis using the front handle and thumb finger to move the latch position to the right.

Caution
The fan is exposed on the right side of the fan tray. Keep your fingers, clothing, and jewellery away from the fans. Always handle the fan tray by the handle.

Step 4 After the fan tray is fully seated in the chassis, release the latch carefully to ensure that the latch is fully locked.

Air filter maintenance

A periodic health check of the filter, every 3 months based on the level of air in the environment, helps in avoiding over clogging of the filters and provides a better life. This product's filter is used as a single-use component. If the product is installed in a controlled environment, check and replace the filter every three months, otherwise replace the filter every month with PID (Cisco 8404-FILTER) or equivalent.

Install the air plenum (8K-4RU-F2B-AIR)

The Cisco air plenum kit maintains optimal hardware temperatures by efficiently managing airflow and directing exhaust.

Installation is flexible, allowing for air plenum deployment from either the front or the rear of the rack depending on your site access requirements.

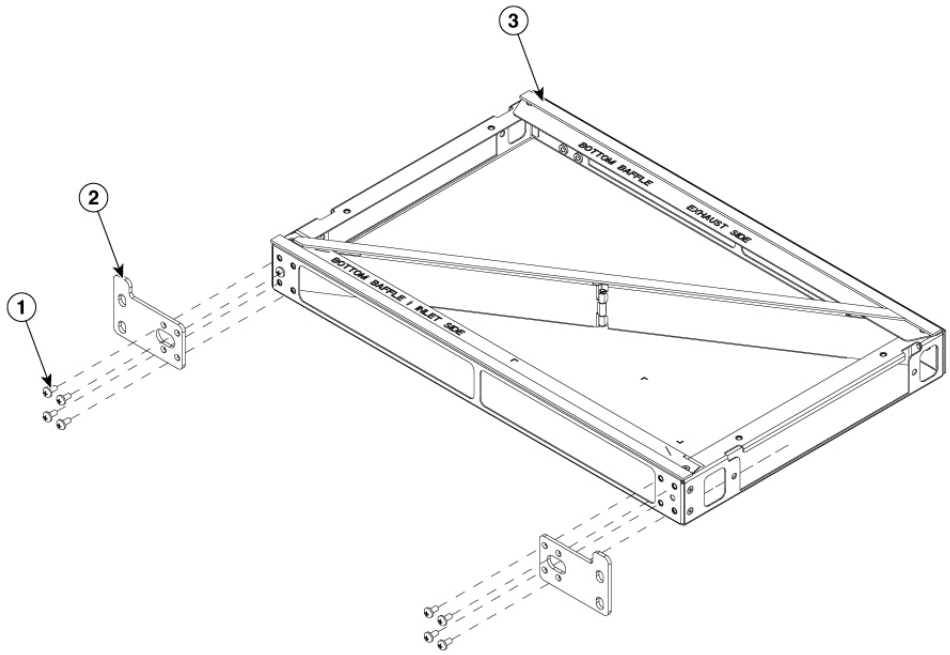
Install air plenum assembly (8K-4RU-F2B-AIR) (only with front side rack access)

Use this procedure to install air plenum (8K-4RU-F2B-AIR) from the front side of the rack.

Procedure

Step 1 Attach rack mounting brackets to the base of the plenum.

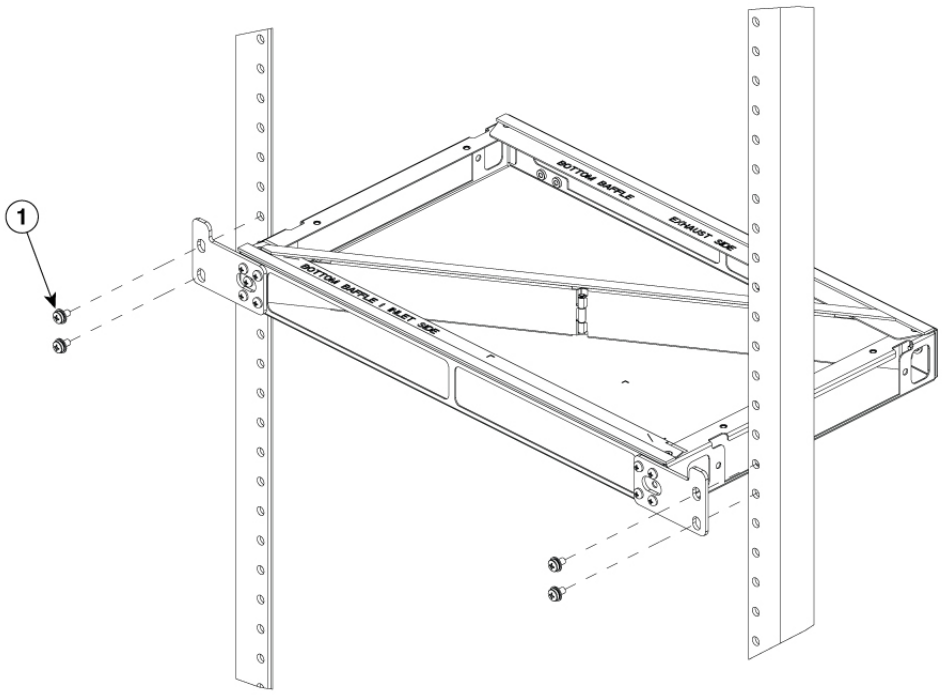
Figure 33: Air plenum base



Note
Ensure that you select 19-inches, 21-inches, or 23-inches adapter for the plenum based on your rack size.

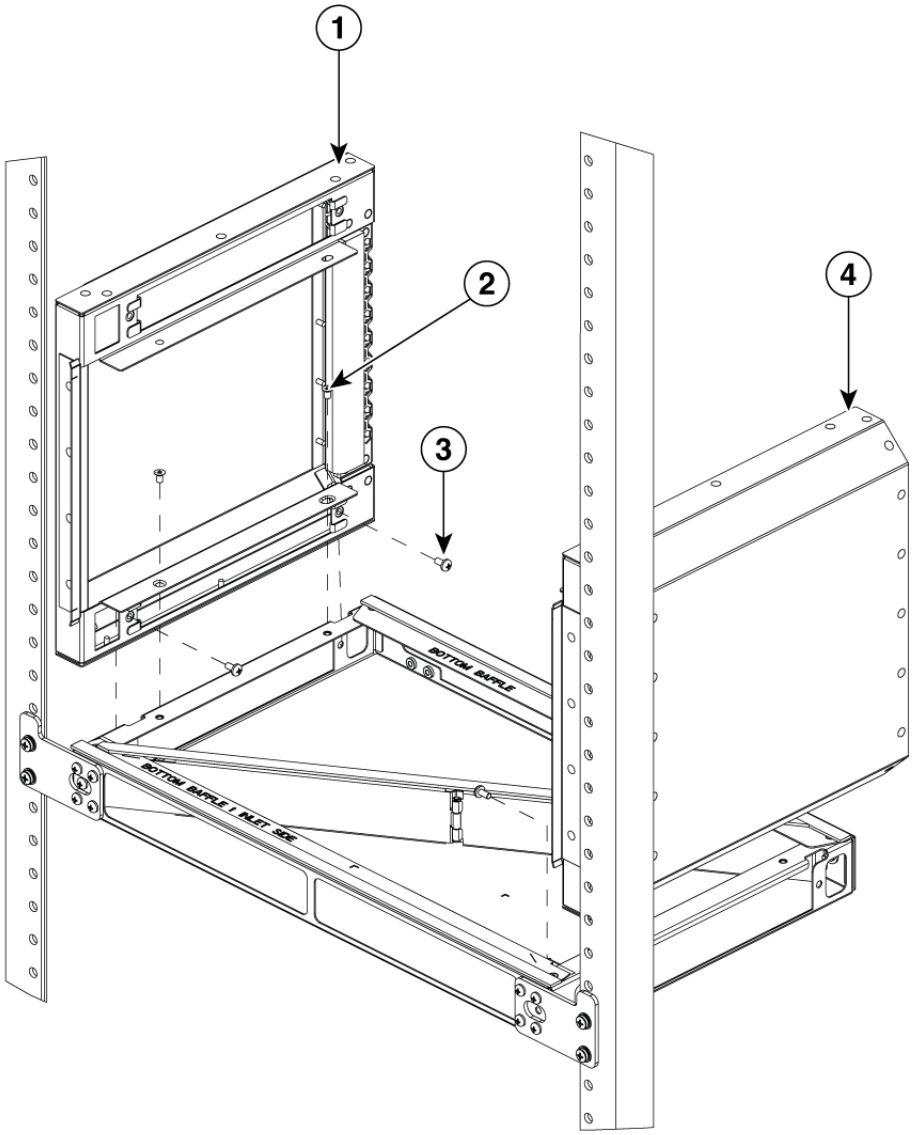
Step 2 Fix the base of the plenum in the rack.

Figure 34: Air plenum base with rack



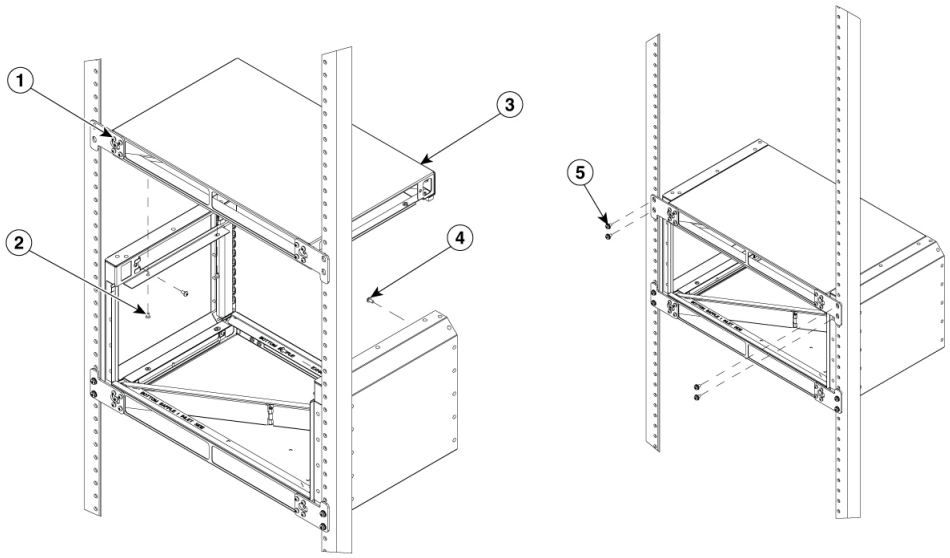
Step 3 Fix air baffle on both sides of the rack from the base of plenum.

Figure 35: Attach air baffle on both sides of rack from base of air plenum



Step 4 Repeat step 1 and step 2 to complete the plenum assembly on the top side of the plenum base.

Figure 36: Assembled air plenum



Part No	Part Description	Quantity
1	Flat-head M4 screw (48-101783-XX)	8
2	Pan-head M4 screw (48-0398-XX)	24
3	Base Plenum (800-51957-XX)	1
4	Left Baffle (800-51963-XX)	1
5	Right Baffle (800-51964-XX)	1
6	Top Plenum (800-51965-XX)	1
7	Rack Screw	8
8	Rack Plenum Bracket	4
9	Router Unit	1

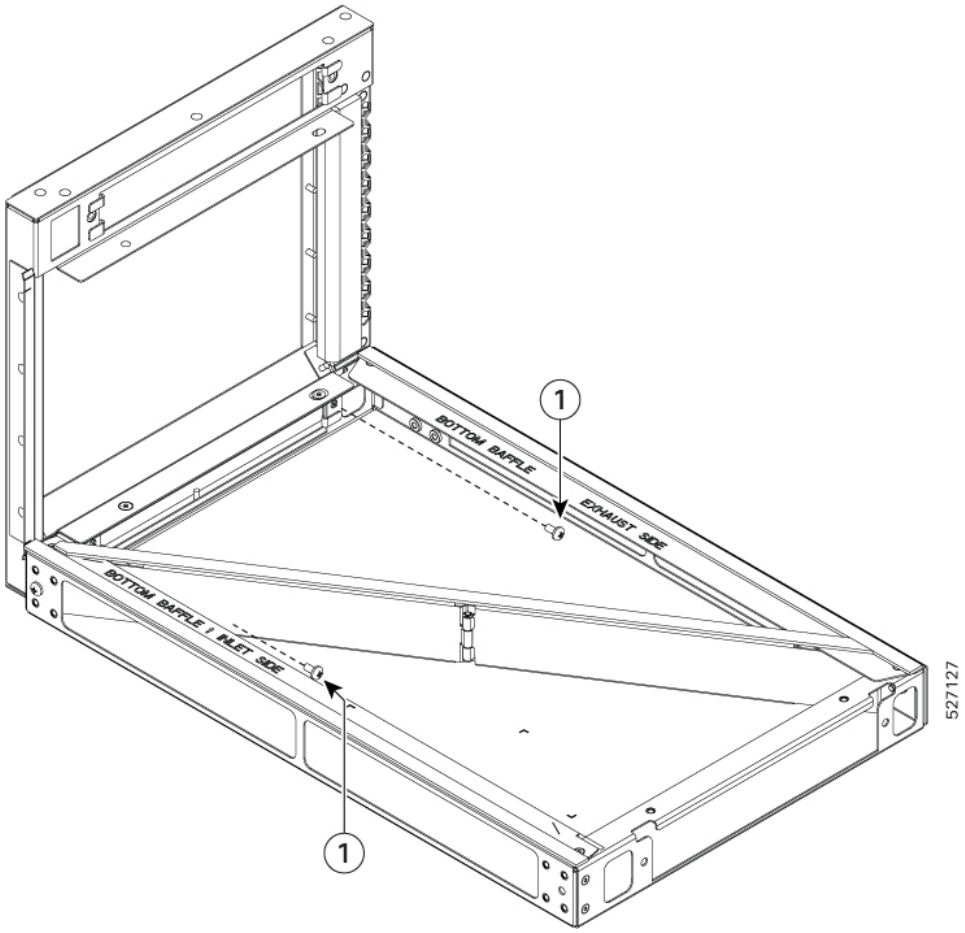
Install air plenum (8K-4RU-F2B-AIR) assembly (optional with rear side rack access)

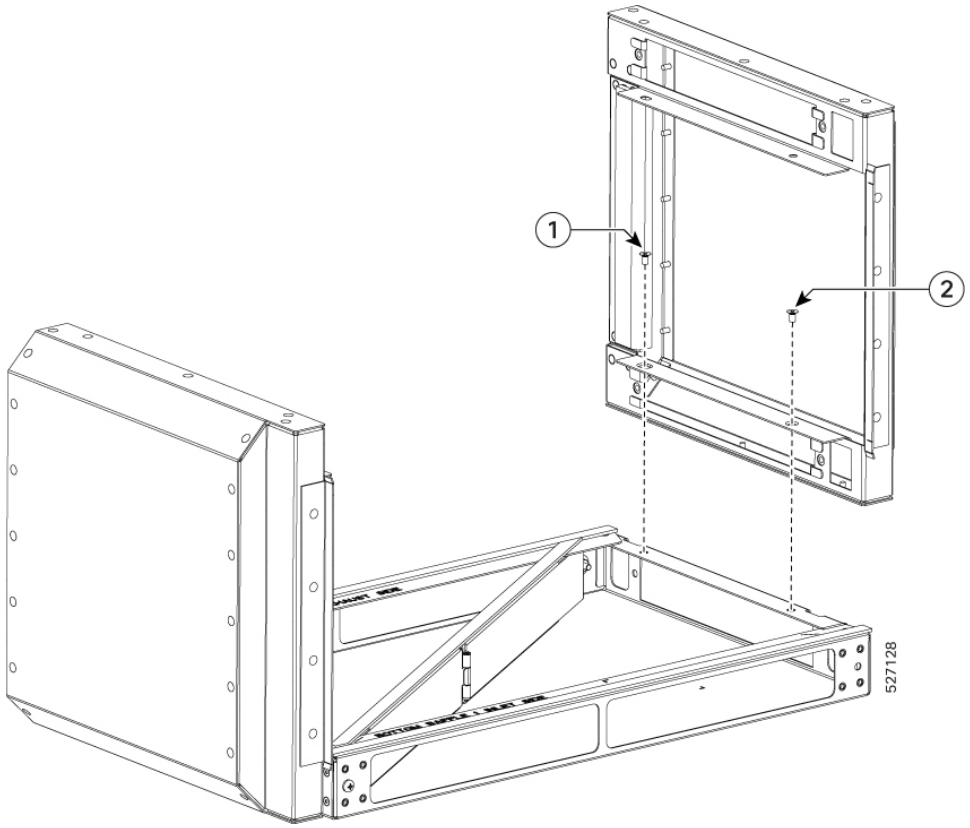
You can use this procedure if you have access to assemble the air plenum from the rear side of the rack and the depth of the rack is more than 500 mm.

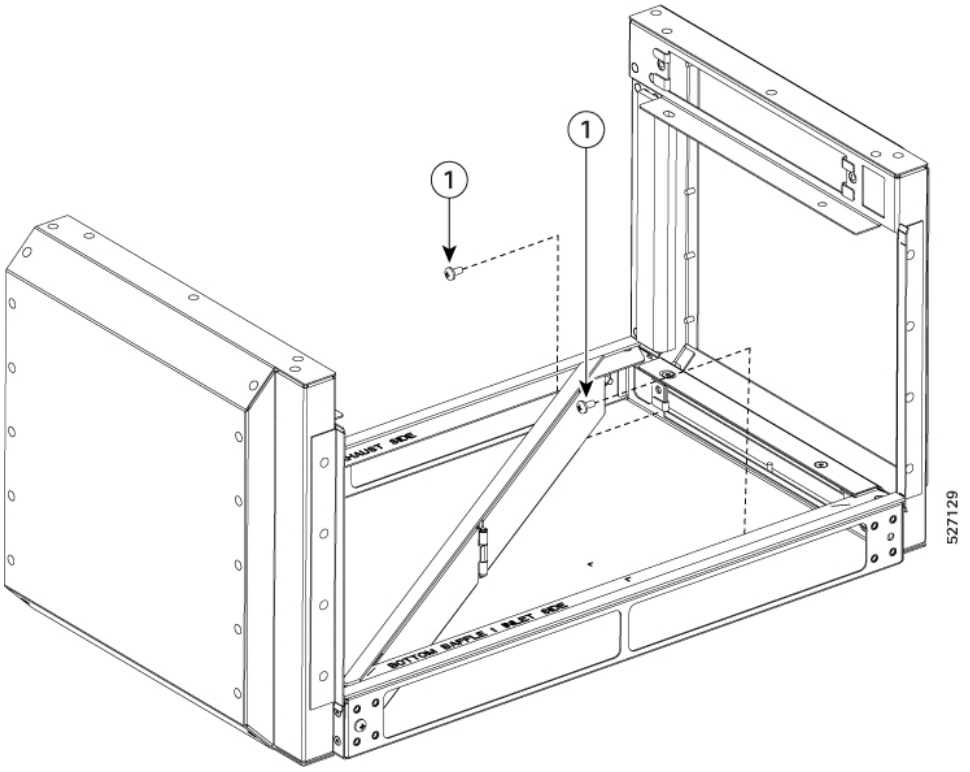
Procedure

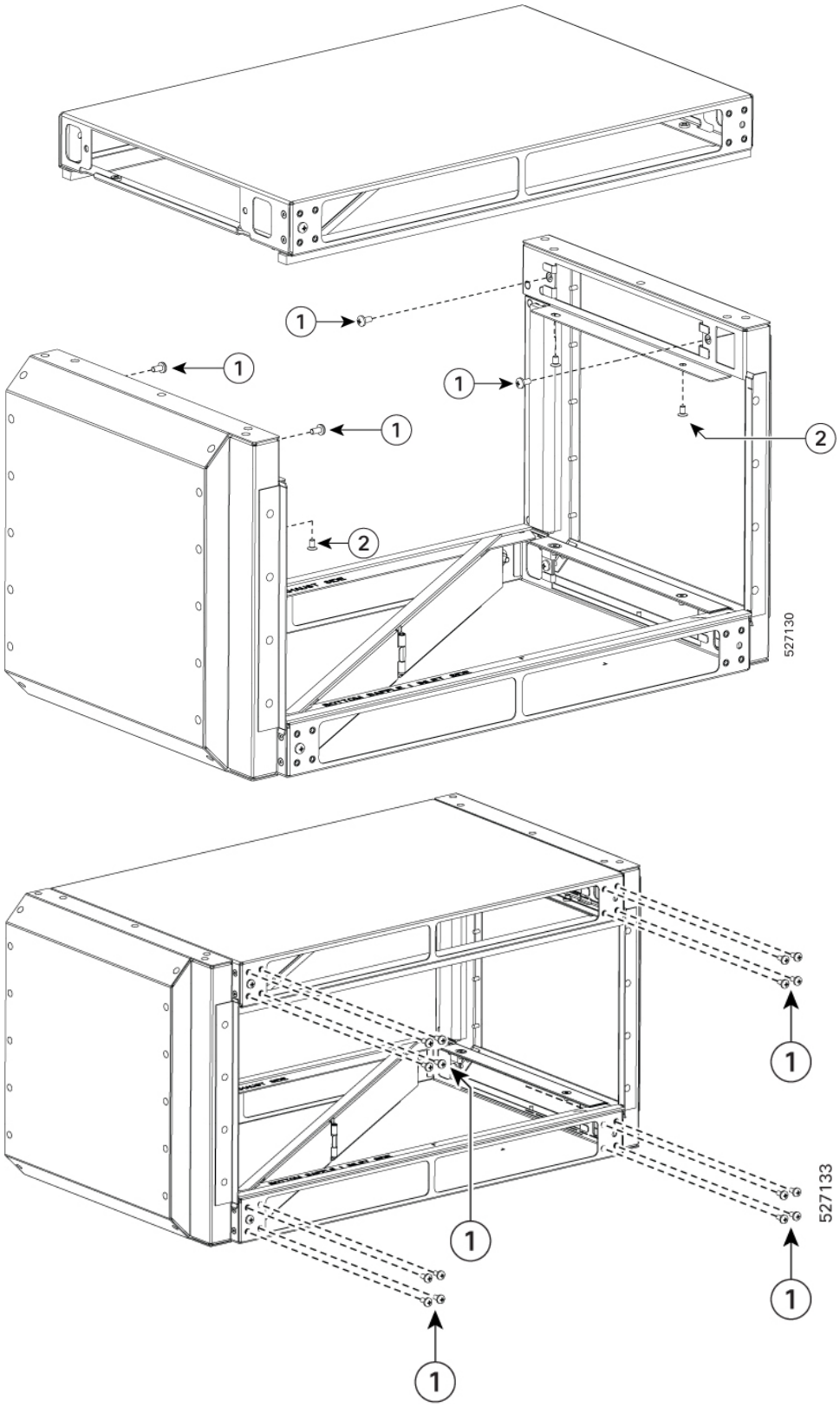
Step 1 Prepare the air plenum assembly box.

Figure 37: Air plenum assembly box




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527128

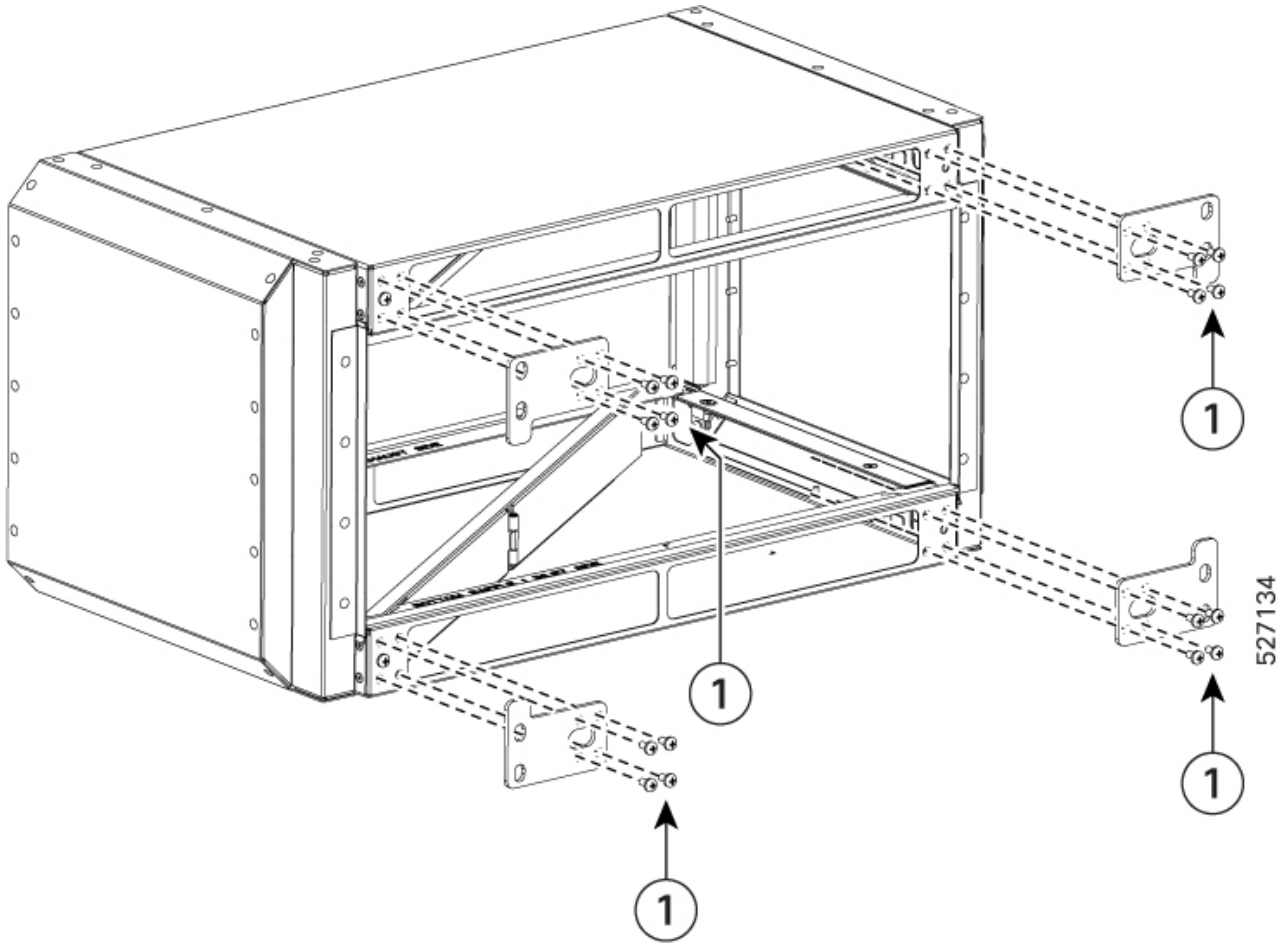

1
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527129


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527133

Part No	Description
1	Pan-head M4 screw
2	Flat-head M4 screw

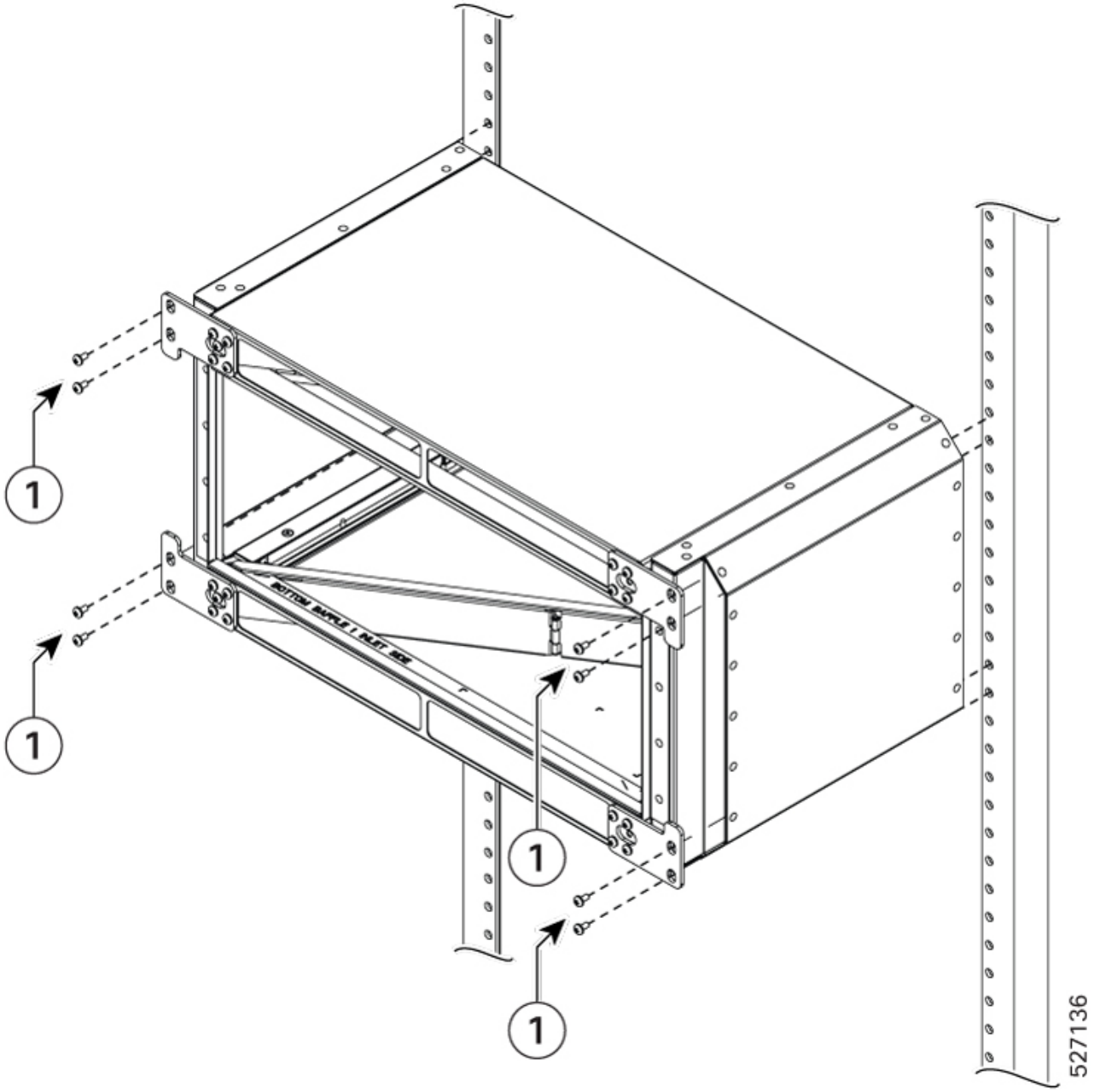
Step 2 Attach the rack-mount bracket to the air plenum assembly box.

Figure 38: Air plenum assembly box with rack-mount bracket



Step 3 Attach the air plenum assembly box to the rack.

Figure 39: Air plenum assembly box in a rack



Install the chassis in the air plenum (8K-4RU-F2B-AIR)

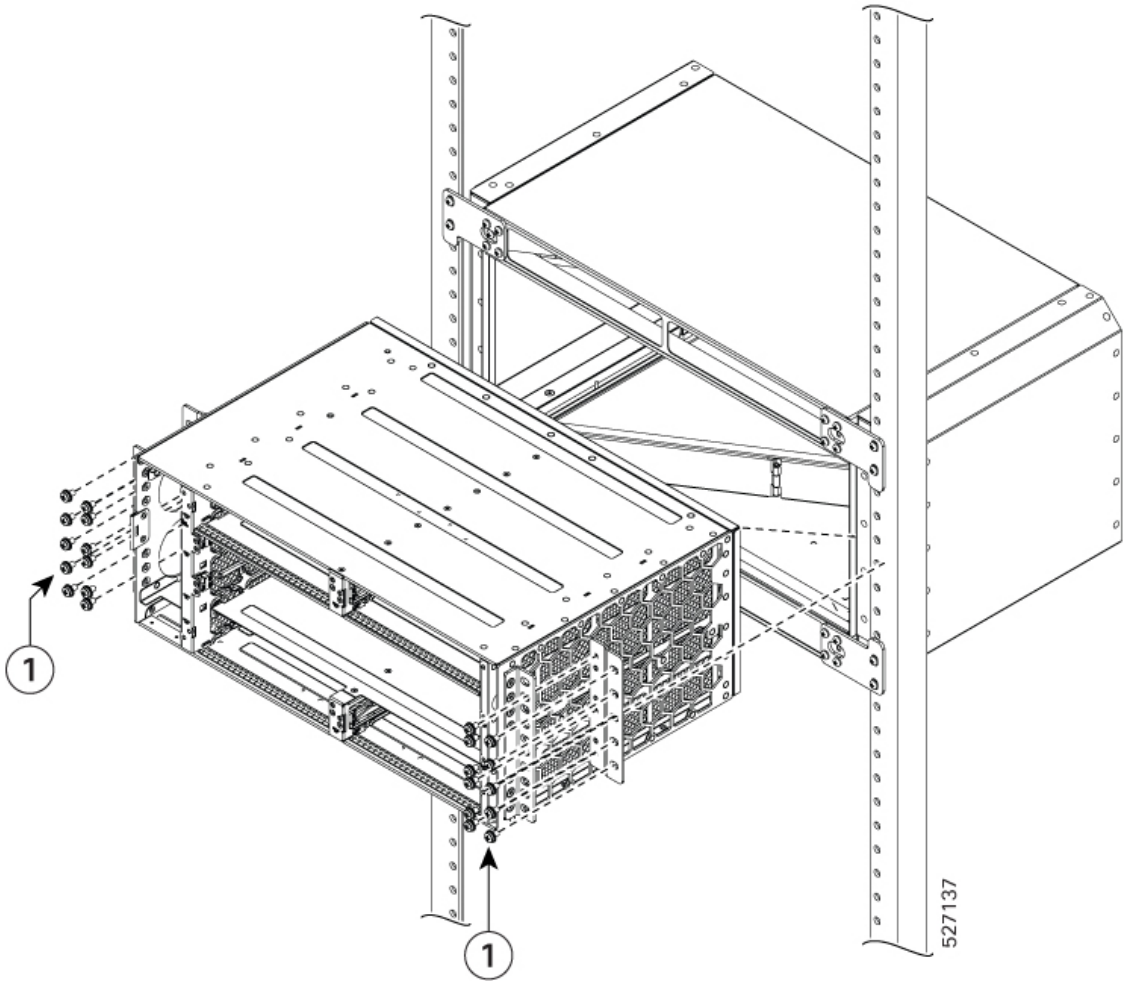
Note Ensure that the router is not installed in the air plenum while mounting it on the rack.

For instructions on mounting the air plenum on the rack.

Procedure

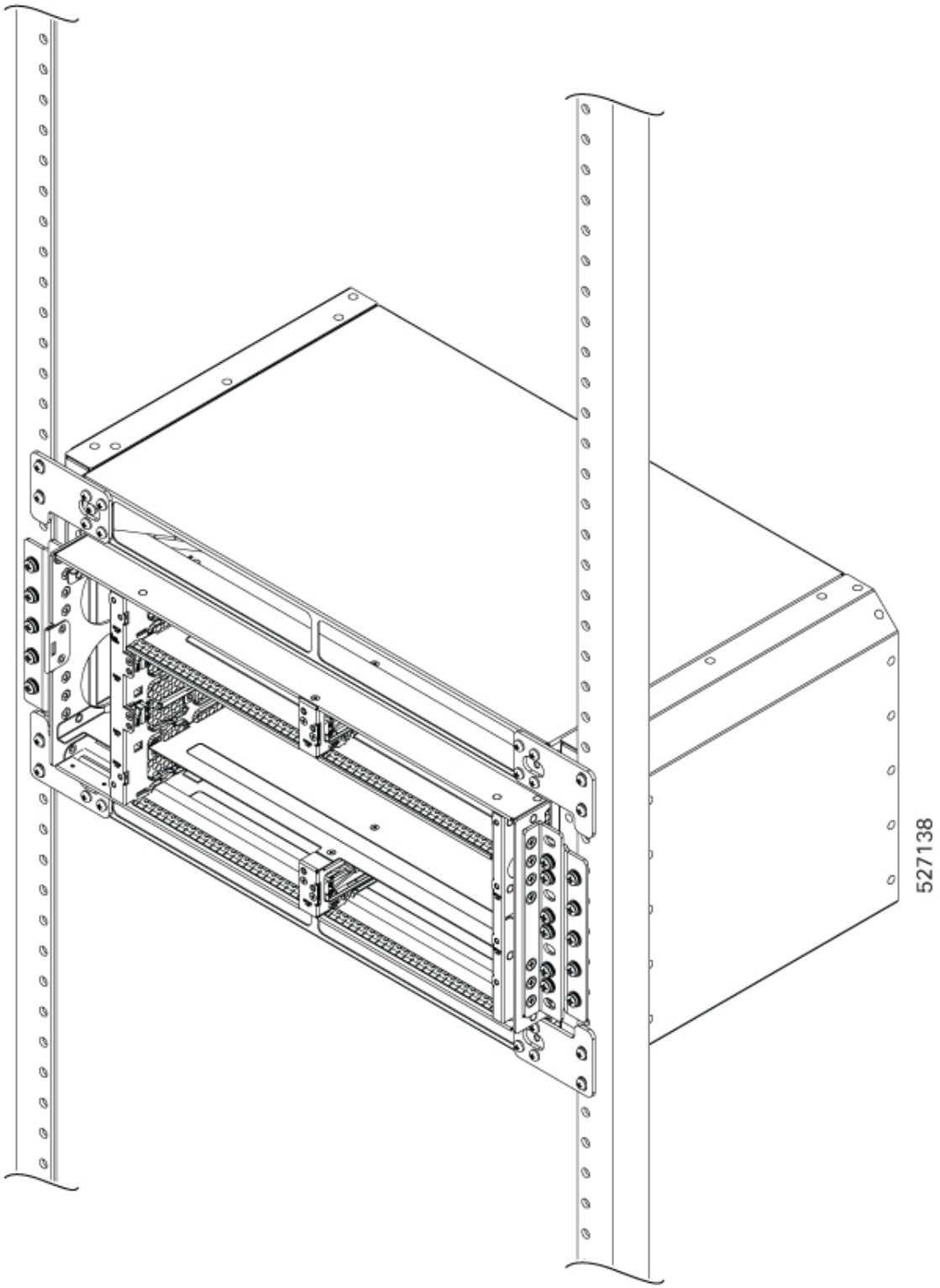
Step 1 Position the chassis so that the rear of the chassis is at the front of the plenum.

Figure 40: Installing chassis in air plenum



Step 2 Slide the chassis into the plenum so that the front of the chassis is in flush with the mounting rails and brackets.

Figure 41: Chassis with air plenum



Install dust caps

The following list provides the product IDs (PIDs) for the dust caps that are available for each port type:

- A900-DCAP-RJ45
- A900-DCAP-SFP
- A900-DCAP-USB
- 8000-QSFP-DCAP
- RJ-45—A900-DCAP-RJ45-S= (24 dust caps per package) or A900-DCAP-RJ45-L= (240 caps per package)
- SFP—A900-DCAP-SFP-S= (24 caps per package) or A900-DCAP-SFP-L= (240 caps per package)
- USB—A900-DCAP-USB-S= (12 dust caps per package) or A900-DCAP-USB-L= (120 dust caps per package)

To install the dust cap:

1. Hold the dust cap by its handle.
2. Insert the dust cap in to the appropriate unused ports (RJ-45, SFP, USB, or QSFP) on the chassis front panel.

Install and remove SFP modules

The Cisco 8404-SYS-D router supports a variety of SFP modules, including optical and Ethernet modules. For information on how to install and remove SFP modules, see the documentation for the SFP module at

http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html

For information about inspecting and cleaning fiber-optic connections, see http://www.cisco.com/en/US/partner/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

Caution We recommend that you wait 30 seconds between removal and insertion of an MPA and RSP on an interface module. This time is recommended to allow the transceiver software to initialize and synchronize with the standby RSP. Changing an SFP more quickly could result in transceiver initialization issues that disable the SFP.

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

Warning There are no serviceable parts inside. To avoid risk of electric shock, do not open. Statement 1073

Warning An instructed person is someone who has been instructed and trained by a skilled person and takes the necessary precautions when working with equipment.

A skilled person or qualified personnel is someone who has training or experience in the equipment technology and understands potential hazards when working with equipment. Statement 1089

Warning Only a skilled person should be allowed to install, replace, or service this equipment. Refer to statement 1089 for the definition of a skilled person. Statement 1090

Warning Only an instructed person or skilled person should be allowed to install, replace, or service this equipment. See statement 1089 for the definition of an instructed or skilled person. Statement 1091

Warning Hot surface. Use care when handling. Statement 1092

Note For information regarding the wait time guidelines applicable for Cisco 8404-SYS-D with 84-MPA-2H12Z-M MPA, see the Online Insertion and Removal for optical modules section in the Router Hardware Management Guide for Cisco 8000 Series Routers, Cisco IOS XR Release.

Port Connection Guidelines

Depending on the chassis, you can use Quad Small Form-Factor Pluggable Plus (QSFP+), QFSP-DD, QSFP28, SFP, SFP+, and RJ45 connectors to connect the ports on the line cards to other network devices.

To prevent damage to the fiber-optic cables, we recommend that you keep the transceivers disconnected from their fiber-optic cables when installing the transceiver in the line card. Before removing a transceiver from the router, remove the cable from the transceiver.

To maximize the effectiveness and life of your transceivers and optical cables, do the following:

- Wear an ESD-preventative wrist strap that is connected to an earth ground whenever handling transceivers. The router is typically grounded during installation and provides an ESD port to which you can connect your wrist strap.

- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep the transceivers and fiber-optic cables clean and dust free to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be kept below 0.35 dB.
  - Clean these parts before installation to prevent dust from scratching the fiber-optic cable ends.
  - Clean the connectors regularly; the required frequency for cleaning depends upon the environment. In addition, clean connectors when they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.
  - Do not touch the ends of connectors. Touching the ends can leave fingerprints and cause other contamination.
- Inspect routinely for dust and damage. If you suspect damage, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

Connect to the Console Port

- The router must be fully installed in its rack, connected to a power source, and grounded.
- The necessary cabling for the console, management, and network connections must be available.
  - An RJ45 rollover cable and DB9F/RJ45 adapter are provided in the router accessory kit.
  - Network cabling should already be routed to the location of the installed router.

Before you create a network management connection for the router or connect the router to the network, you must create a local management connection through a console terminal and configure an IP address for the router. You also can use the console to perform the following functions (each of which can be performed through the management interface after you make that connection):

- Configure the router using the command-line interface (CLI).
- Monitor network statistics and errors.
- Configure Simple Network Management Protocol (SNMP) agent parameters.
- Download software updates.

The system console port is an RJ45 receptacle for connecting a data terminal to perform the initial configuration of the router. The console cable is shipped with the hardware.

Note Only RJ45 to DB-9 adapter cable is provided in the package.

Figure 42: Connecting the USB Type-A Console Cable to the Chassis

1	USB Type-A console port	2	USB Type-A to USB Type-A cable

Follow this procedure to connect a data terminal to the console port:

1. Set your terminal to these operational values: 115200 bps, 8 data bits, no parity, and two stop bits.
2. Attach the terminal end of the cable to the interface port on the data terminal.
3. Attach the other end of the cable to the console port.

Connect to the Management Ethernet Port

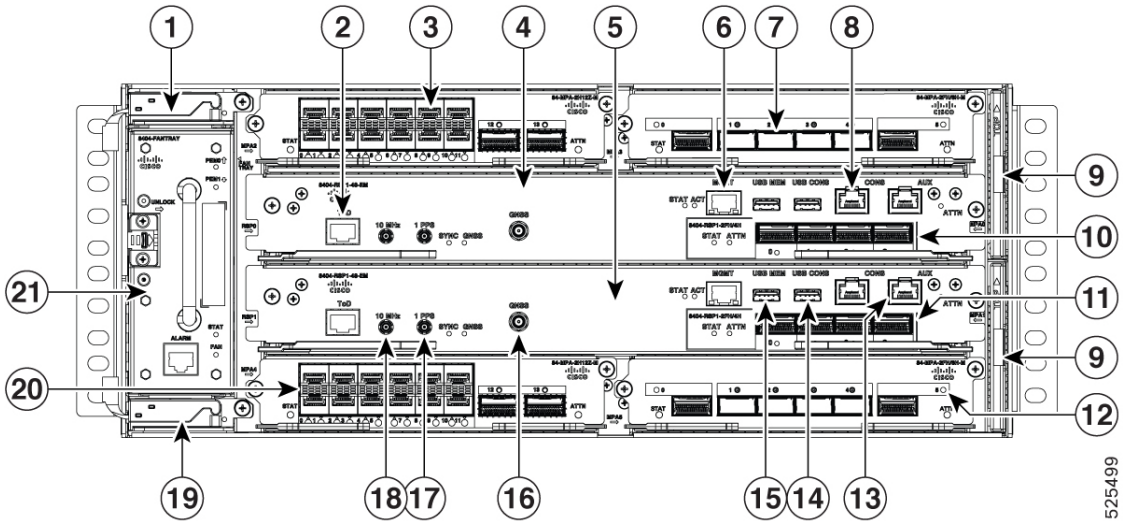
You must complete the initial router configuration.

The management Ethernet port provides out-of-band management, which enables you to use the Command Line Interface (CLI) to manage the router by its IP address. This port uses a 100/1000 Ethernet connection with an RJ45 interface.

Note To prevent an IP address conflict, do not connect the management Ethernet port until the initial configuration is complete.

To connect cables to the system management port, attach Category 5 cables directly to the RJ45 receptacle on the management Ethernet port.

Figure 43: Connect to the Management Ethernet Port



6	Management (MGMT) port

Note To comply with GR-1089-CORE, the intra-building port(s) of the equipment must use shielded intra-building cabling or wiring that is grounded at both ends.

1. Plug the cable directly into the RJ45 receptacle.

2. Connect the network end of your RJ45 cable to a switch, hub, repeater, or other external equipment.

Connecting Timing Cables

The following sections describe how to connect timing cables.

Connecting Cables to Timing Interfaces Card

Perform the following steps on how to connect cables from the router to a Timing Interfaces Card unit for input 10Mhz or 1PPS interface.

1. Connect one end of a mini-coax cable to the Timing Interfaces Card unit.
2. Connect the other end of the mini-coax cable to the 10MHz or 1PPS port on the router.

Install and Remove Transceiver Module

This section shows how to install and remove transceiver module.

Safety precautions for module installation and removal

Be sure to observe the following safety precautions when you work on the chassis.

Install and Remove SFP Modules

Before you remove or install an SFP or SFP+ module, read the installation information in this section.

Caution Protect all the unused ports by inserting clean dust covers or dust caps into them.

Caution Protect the line card by inserting a clean SFP/SFP+ module cage cover (shown in the following figure) into the optical module cage when there is no SFP or SFP+ module installed. The SFP/SFP+ module cage cover is not a standard part of the accessories kit.

Figure 44: SFP/SFP+ Module Cage Cover



Caution Protect the SFP or SFP+ modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module. Avoid getting dust and other contaminants into the optical ports of your SFP or SFP+ modules, because the optics do not work correctly when obstructed by dust.

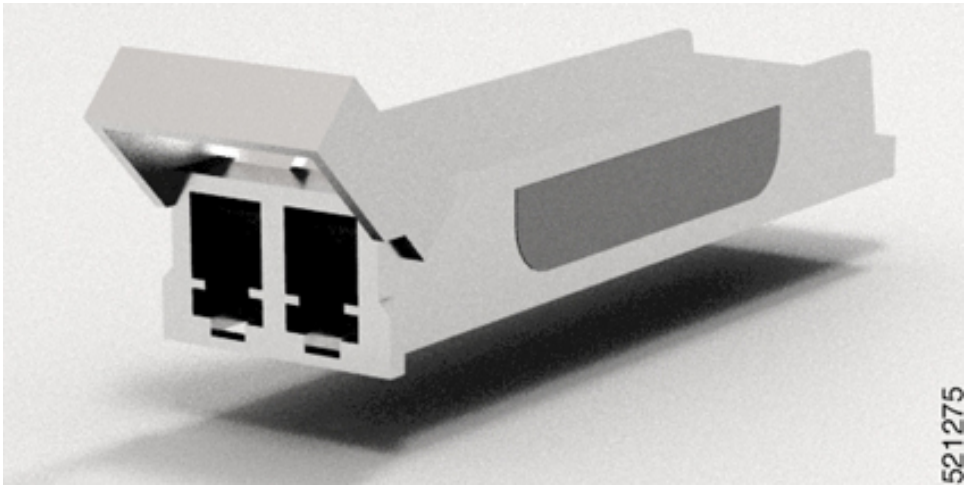
Caution We strongly recommend that you do not install or remove the SFP or SFP+ module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the module. Disconnect all cables before removing or installing an SFP or SFP+ module. Removing and inserting a module can shorten its useful life; so you should not remove and insert modules more than it is absolutely necessary.

Note When installing an SFP or SFP+ module, you would hear a click as the triangular pin on the bottom of the module snaps into position into the hole in the receptacle. The click indicates that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP or SFP+ module.

Bale Clasp SFP or SFP+ Module

The bale clasp SFP or SFP+ module has a clasp that you use to remove or install the module. (See the figure below.)

Figure 45: Bale Clasp SFP or SFP+ Module

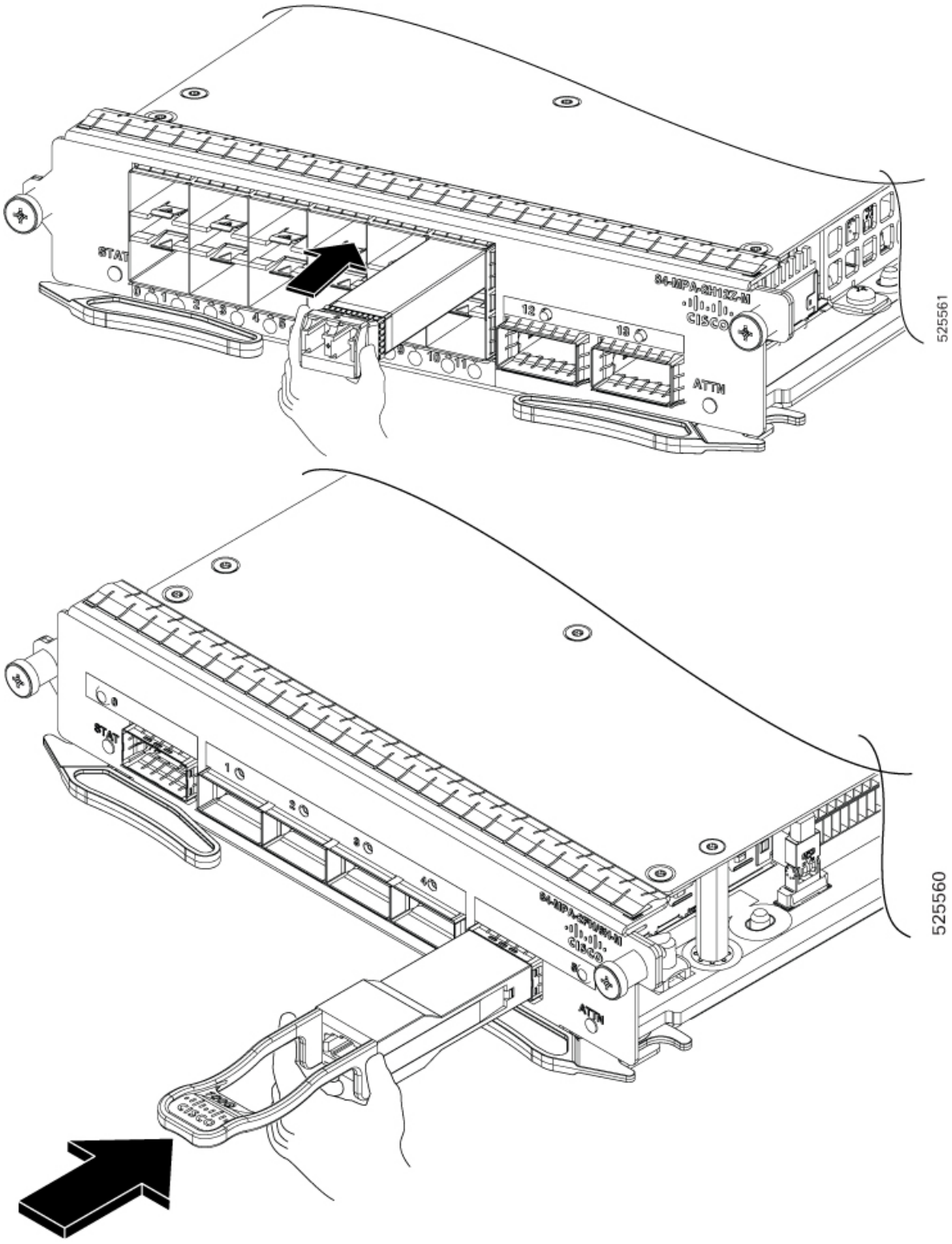


Install a Bale Clasp SFP or SFP+ Module

To install this type of SFP or SFP+ module:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Close the bale clasp before inserting the SFP module.
3. Line up the SFP module with the port and slide it into the port. (See the figure below.)

Figure 46: Installing a Bale Clasp SFP Module into a Port



Note When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle. This click indicates that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

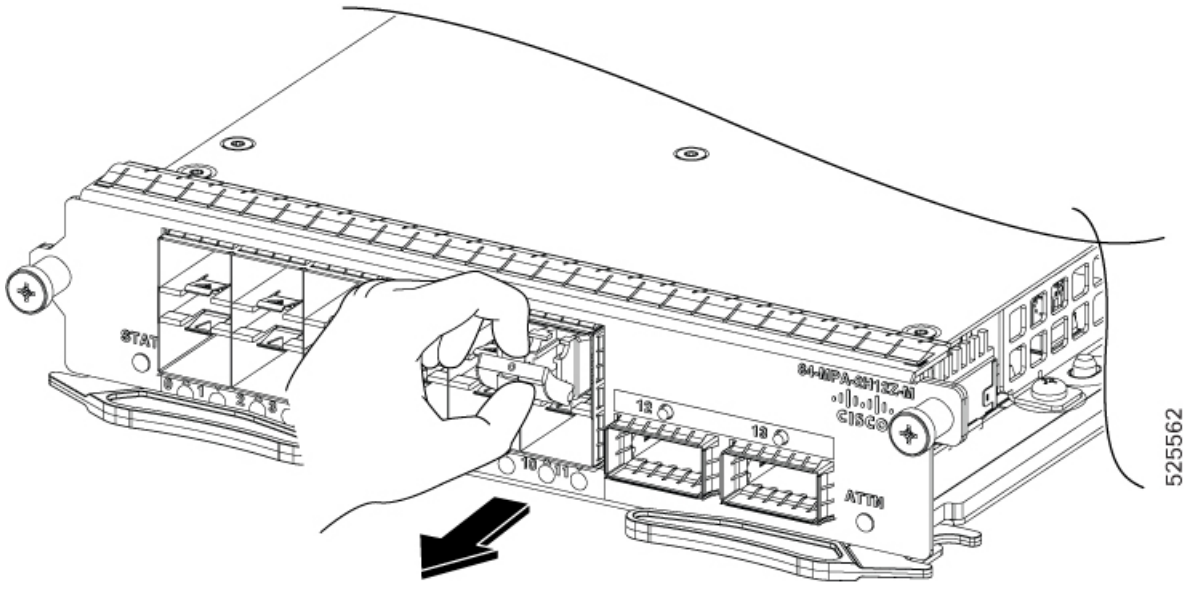
Remove a Bale Clasp SFP or SFP+ Module

To remove this type of SFP or SFP+ module:

1. Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
2. Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
3. Open the bale clasp on the SFP module with your index finger, as shown in the figure below. If the bale clasp is obstructed and if you cannot open it, use your index finger, use a small flat-blade screwdriver or other long, narrow instrument to open the bale clasp.
4. Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in the figure below.

Note This action must be performed during your first instance. After all ports are populated, this may not be possible.

Figure 47: Removing a Bale Clasp SFP or SFP+ Module



5. Place the SFP module that you removed on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

6. Protect your line card by inserting a clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Connect Interface Ports

You can connect optical interface ports on line cards with other devices for network connectivity.

Connect a Fiber-Optic Port to the Network

Depending on the line card model that you are using, you can use either QSFP+ or QSFP28 transceivers. Some transceivers work with fiber-optic cables that you attach to the transceivers and other transceivers work with pre-attached copper cables. When installing fiber-optic cables for a port, you must install SFP transceivers for 1-Gigabit optical ports or install SFP+ transceivers for 10-Gigabit optical ports or QSFP+ transceivers for 100-Gigabit ports before installing the fiber-optic cable in the transceivers.

Caution Removing and installing a transceiver can shorten its useful life. Do not remove and insert transceivers more than it is absolutely necessary. We recommended that you disconnect cables before installing or removing transceivers to prevent damage to the cable or transceiver.

Disconnect Optical Ports from the Network

When you need to remove fiber-optic transceivers, you must first remove the fiber-optic cables from the transceiver before you remove the transceiver from the port.

Maintain Transceivers and Optical Cables

To maintain high signal accuracy and to prevent damage to the connectors, transceivers and fiber-optic cables must be kept clean and free of dust. Attenuation (loss of light) is increased by contamination and should be below 0.35 dB.

Refer to Inspection and Cleaning Procedures for Fiber-Optic Connections document for inspection and cleaning processes for fiber optic connections.

Consider the following maintenance guidelines:

- Transceivers are static sensitive. To prevent ESD damage, wear an ESD-preventative wrist strap that is connected to the grounded chassis.
- Do not remove and insert a transceiver more than it is necessary. Repeated removals and insertions can shorten its useful life.
- Keep all optical connections covered when not in use. Clean them before use to prevent dust from scratching the fiber-optic cable ends.
- Do not touch the ends of connectors. Touching the ends would leave fingerprints and cause other contamination.
- Clean the connectors regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors if they are exposed to dust or have been accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.

- Inspect routinely for dust and damage. Clean and then inspect fiber ends under a microscope to determine whether any damage has occurred.

Install and Remove QSFP Transceiver Modules

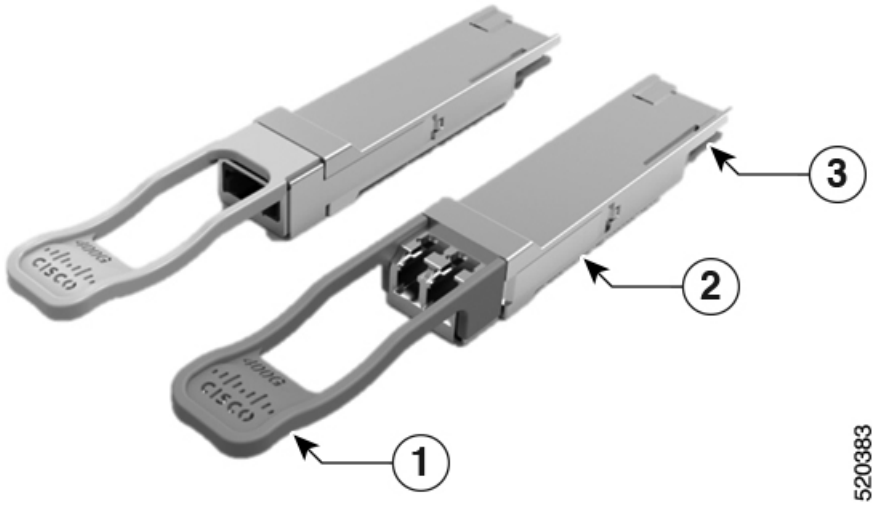
This section provides the installation, cabling, and removal instructions for the Quad Small Form-Factor Pluggable transceiver modules. Refer to the *Cisco Optical Transceiver Handling Guide* for additional details on optical transceivers.

Caution When inserting optical transceiver modules into host ports, handle them carefully. Ensure that the applied force does not exceed 20 lbs (9.1kg).

Note The router diagrams are provided for reference purposes only and may not represent the actual product.

The following figure shows a 400-Gigabit QSFP-DD optical transceiver.

Figure 48: 400-Gigabit QSFP-DD Transceiver Module



1	Pull-tab	2	QSFP-DD transceiver body
3	Electrical connection to the module circuitry		

Installing the Transceiver Module

Warning This icon is a hot surface warning. To avoid personal injury, do not touch without proper protection.



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

Caution Protect the transceiver ports by inserting clean dust caps (8000-QSFP-DCAP) into any ports not in use and do not have optical modules plugged in. If optical modules are plugged in but not in use, the dust caps that were supplied with the optical modules, should be used to protect the TX and RX surfaces of the optical module.

Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module.

The router ships with dust caps plugged in. We highly recommend you to keep the dust caps plugged in until you are ready to plug an optic.

The dust caps protect the ports from possible EMI interference and also avoid contamination due to dust collection. To meet the EMI interference requirements, you must use the metal dust caps when the ports are not in use by optical modules.

The following table provides the supported port details and operating temperature of the QDD-400G-ZR-S and QDD-400G-ZRP-S optical modules when port side exhaust or port side intake fans and power supplies are used.

The QSFP transceiver module has a pull-tab latch. To install a transceiver module, follow these steps:

Procedure

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

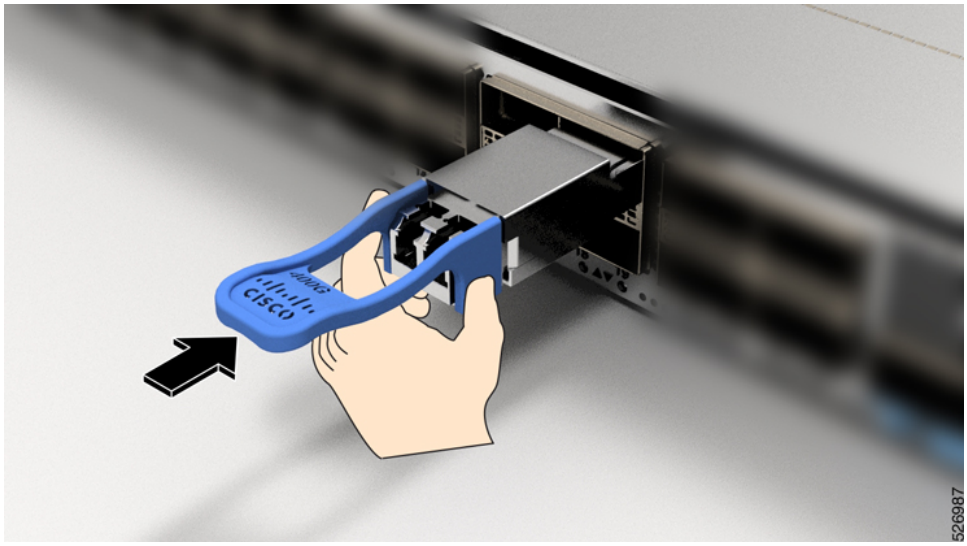
Step 2 Remove the transceiver module from its protective packaging.

Step 3 Check the label on the transceiver module body to verify that you have the correct model for your network. Do not remove the dust plug until you're ready to attach the network interface cable. Dust plug is not shown in the images.

Step 4 Hold the transceiver by the pull-tab so that the identifier label is on the top.

Step 5 Align the transceiver module in front of the module's transceiver socket opening and carefully slide the transceiver into the socket until the transceiver contact with the socket electrical connector.

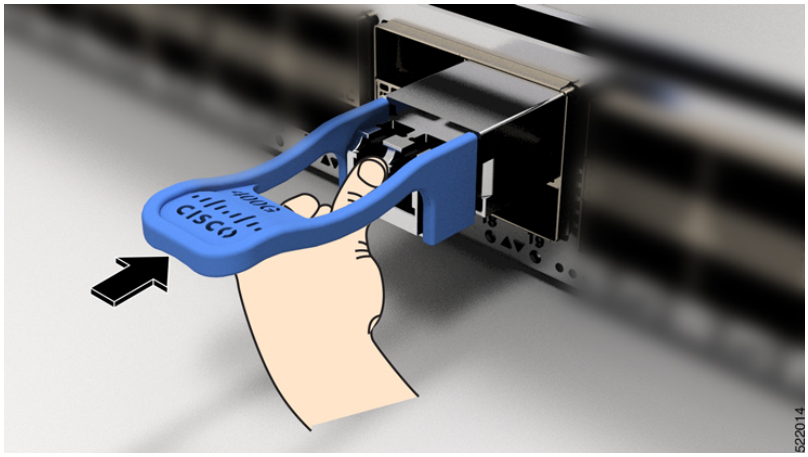
Figure 49: Installing the QSFP Transceiver Module



Step 6 Press firmly on the front of the transceiver module with your thumb to fully seat the transceiver in the module's transceiver socket (see the below figure).

Caution
If the latch isn't fully engaged, you might accidentally disconnect the transceiver module.

Figure 50: Seating the QSFP Transceiver Module



Attach the Optical Network Cable

Before you begin

Before you remove the dust plugs and make 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 optical connector end faces just before you make any connections.
- Grasp the optical connector only by the housing to plug or unplug a fiber-optic cable.

Note The transceiver modules and fiber connectors are keyed to prevent incorrect insertion.

Note The multiple-fiber push-on (MPO) connectors on the optical 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 transceivers do not support network interface cables with an angle-polished contact (APC) face type.

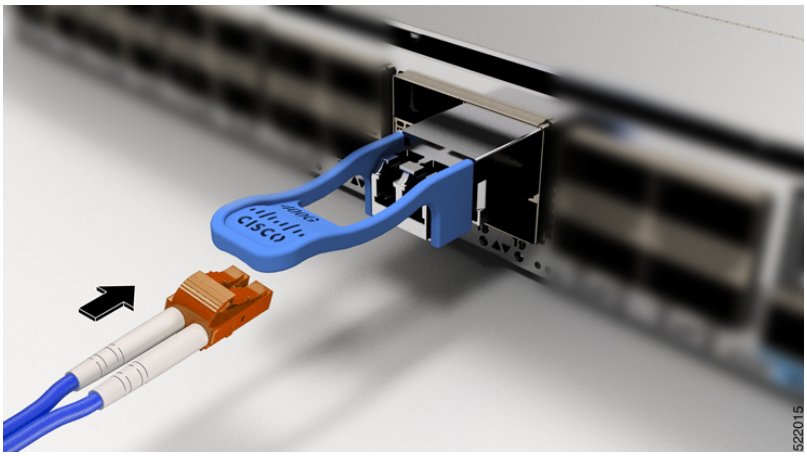
Note Inspect the MPO connector for the correct cable type, cleanliness, and any damage. For complete information on inspecting and cleaning fiber-optic connections, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document.

Procedure

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

Step 2 Attach the network interface cable MPO connectors immediately to the transceiver module.

Figure 51: Cabling a Transceiver Module



Removing the Transceiver Module

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

To remove a transceiver module, follow these steps:

Procedure

Step 1 Disconnect the network interface cable from the transceiver connector.

Step 2 Install the dust plug immediately into the transceiver's optical bore.

Step 3 Grasp the pull-tab and gently pull to release the transceiver from the socket.

Figure 52: Removing the QSFP Transceiver Module

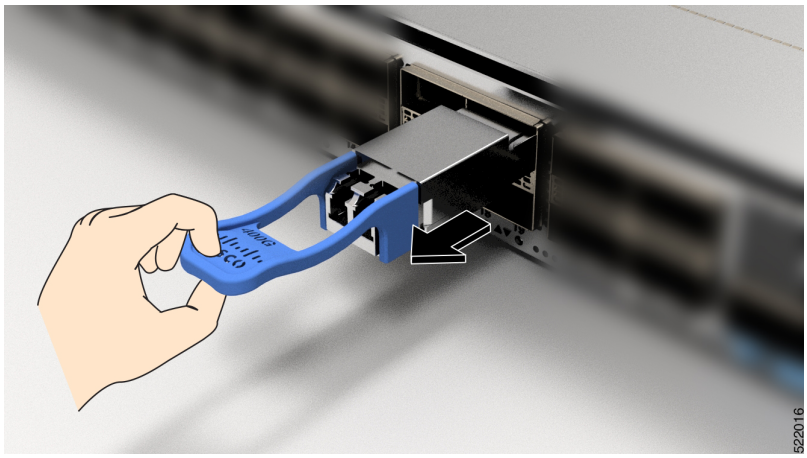
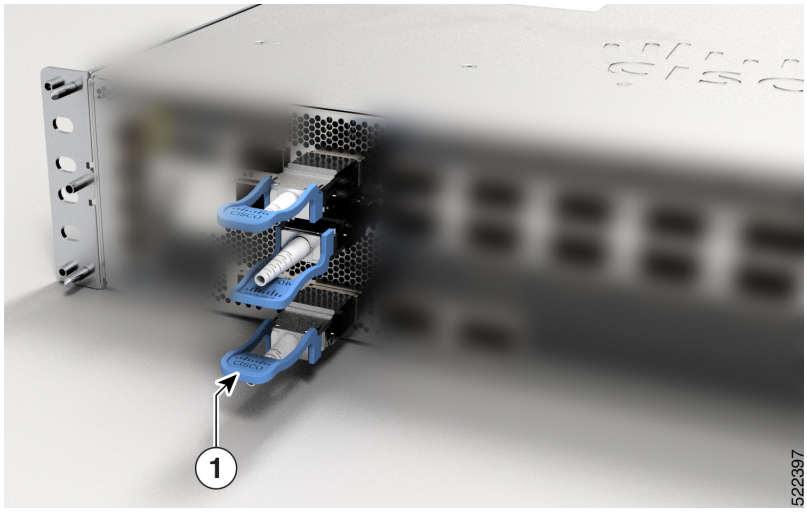


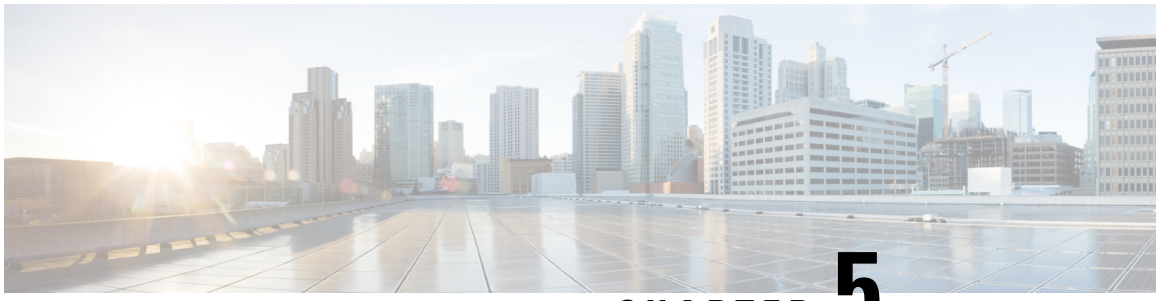
Figure 53: Removing the QSFP Transceiver Module from router



1	Grasp the pull-tab and gently pull to release the transceiver from the socket.

Step 4 Slide the transceiver out of the socket.

Step 5 Place the transceiver module into an antistatic bag.



CHAPTER 5

Connect Router to the Network

Note The images in this chapter are only for representation purposes, unless specified otherwise. The chassis' actual appearance and size may vary.

- Secure the cables around the cable management brackets, on page 103
- Connect the router to the network, on page 103
- Create the Initial Router Configuration, on page 110

Secure the cables around the cable management brackets

Procedure

Step 1 Gather cables from the interface modules (IM) on the left side of the chassis and secure them with velcro. Repeat this process with the MPAs on the right side, the cables from the RSPs and the cables from the PEM.

Step 2 Secure the cables around the cable management brackets.

Connect the router to the network

This section describes the various ways to connect the router to the network.

Connect console cables

Note You cannot use the USB and RS232 console ports at the same time; if you insert the USB cable into the router, the RS232 port is disabled.

Connect to the serial port using Microsoft Windows

This procedure shows how to connect to the serial port using Microsoft Windows.

Note Install the USB device driver before establishing a physical connection between the router and the PC, by using the USB Console cable plugged into the USB serial port. Otherwise, the connection will fail. For more information, see the *Installing the Cisco Microsoft Windows USB Device Driver*.

Procedure

Step 1 Connect the end of the console cable with the RJ45 connector to the light blue console port on the router. or Connect a USB Type A-to-Type A cable to the USB console port. If you are using the USB serial port for the first time on a Windows-based PC, install the USB driver now according to the instructions in the following sections.

- *Installing the Cisco Microsoft Windows XP USB Driver*
- *Installing the Cisco Microsoft Windows 2000 USB Driver*
- *Installing the Cisco Microsoft Windows Vista USB Driver*

Note
You cannot use the USB port and the EIA port concurrently. See *Connecting to the Auxiliary Port* section. When the USB port is used it takes priority over the RJ45 EIA port.

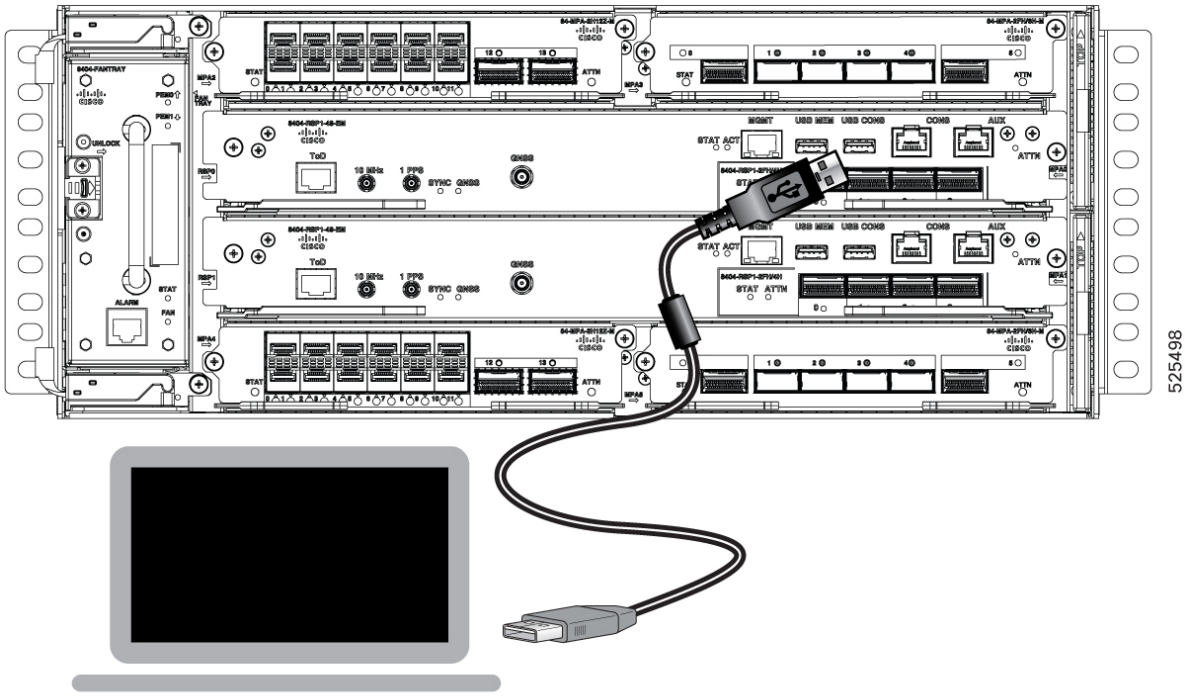
Note
The USB Type A-to-Type A cable is not included with the Cisco 8404-SYS-D router; it is ordered separately.

Step 2 Connect the end of the cable with the DB-9 connector (or USB Type-A) to the terminal or PC. If your terminal or PC has a console port that does not accommodate a DB-9 connector, you must provide an appropriate adapter for that port.

Step 3 To communicate with the router, start a terminal emulator application, such as Microsoft Windows HyperTerminal. This software should be configured with the following parameters:

- 115200 baud
- 8 data bits
- no parity
- 2 stop bits
- no flow control

Figure 54: Connecting the USB Console Cable to the Cisco 8404-SYS-D router



Connect to the console port using Mac OS X

This procedure describes how to connect a Mac OS X system USB port to the console using the built in OS X Terminal utility.

Procedure

Step 1 Use the Finder to go to Applications → Utilities → Terminal.

Step 2 Connect the OS X USB port to the router.

Step 3 Enter the following commands to find the OS X USB port number:

Example:

```
macbook:user$ cd /dev
macbook:user$ ls -ltr /dev/*usb*
crw-rw-rw-  1 root    wheel       9,  66 Apr  1 16:46 tty.usbmodem1a21 DT-macbook:dev user$
```

Step 4 Connect to the USB port with the following command followed by the router USB port speed

Example:

```
macbook:user$ screen /dev/tty.usbmodem1a21 9600
```

To disconnect the OS X USB console from the Terminal window enter **Ctrl-a** followed by Ctrl-\.

Connect to the console port using Linux

This procedure shows how to connect a Linux system USB port to the console using the built in Linux Terminal utility.

Procedure

Step 1 Open the Linux Terminal window.

Step 2 Connect the Linux USB port to the router.

Step 3 Enter the following commands to find the Linux USB port number

Example:

```
root@usb-suse# cd /dev
root@usb-suse /dev# ls -ltr *ACM*
crw-r--r--    1 root     root     188,   0 Jan 14 18:02 ttyACM0
root@usb-suse /dev#
```

Step 4 Connect to the USB port with the following command followed by the router USB port speed

Example:

```
root@usb-suse /dev# screen /dev/ttyACM0 9600
```

To disconnect the Linux USB console from the Terminal window enter **Ctrl-a** followed by : then quit

Connect to the auxiliary port

When a modem is connected to the auxiliary port, a remote user can dial in to the router and configure it. Use a light blue console cable and the DB-9-to-DB-25 connector adapter.

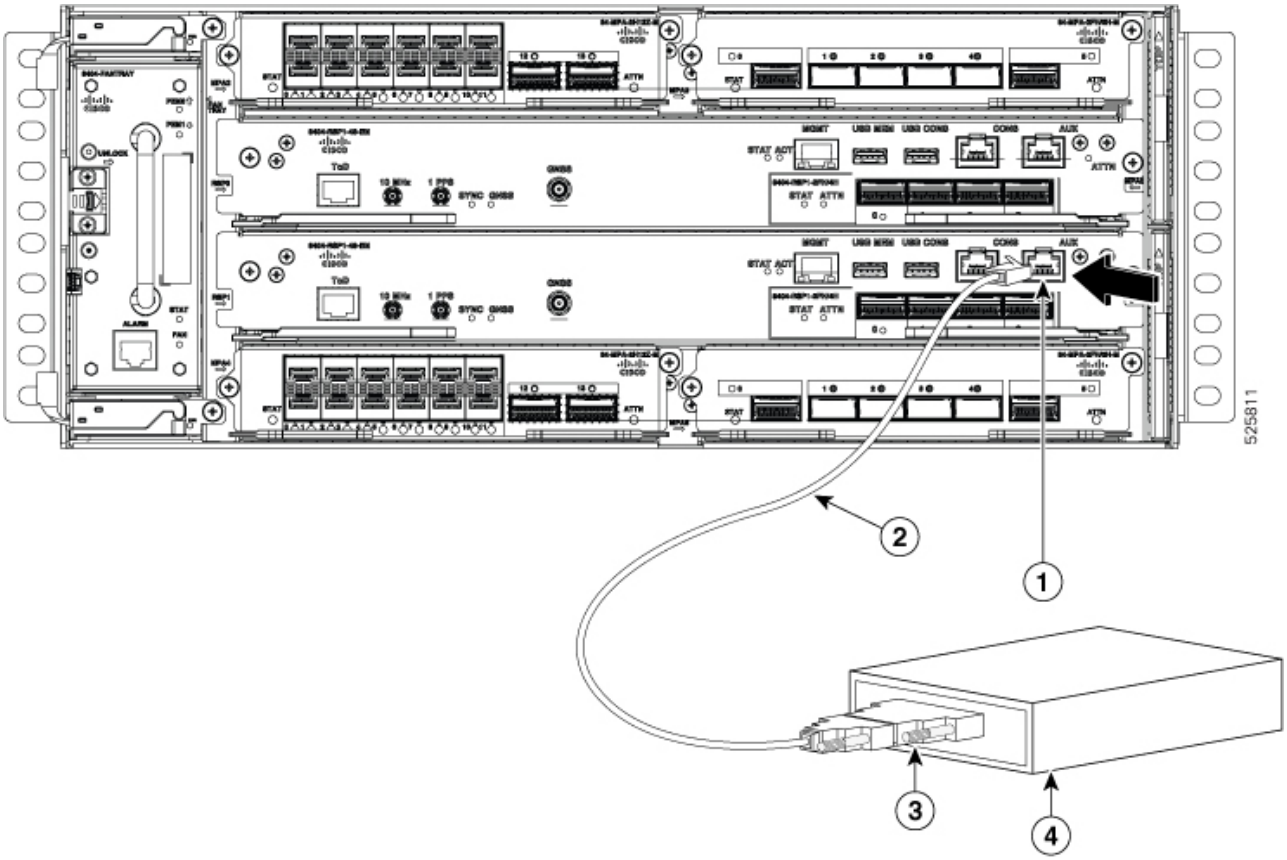
Note The console cable and DB-9-to-DB-25 connector are not included with the Cisco 8404-SYS-D router; they are ordered separately.

To connect a modem to the router, follow these steps:

Procedure

Step 1 Connect the RJ45 end of the adapter cable to the black AUX port on the router, as shown in the figure below.

Figure 55: Connecting a Modem to the Cisco 8404-SYS-D router



1	RJ45 AUX port	3	RJ45 to DB-9
2	DB-9 to DB-25 adapter	4	Modem

Step 2 Connect the DB-9 end of the console cable to the DB-9 end of the modem adapter.

Step 3 Connect the DB-25 end of the modem adapter to the modem.

Step 4 Make sure that your modem and the router auxiliary port are configured for the same transmission speed (up to 115200 bps is supported) and for mode control with data carrier detect (DCD) and data terminal ready (DTR) operations.

Connect a management Ethernet cable

When using the Ethernet Management port in the default mode (speed-auto and duplex-auto) the port operates in auto-MDI/MDI-X mode. The port automatically provides the correct signal connectivity through the Auto-MDI/MDI-X feature. The port automatically senses a crossover or straight-through cable and adapts to it.

However, when the Ethernet Management port is configured to a fixed speed (100 or 1000 Mbps) through command-line interface (CLI) commands, the port is forced to MDI mode.

When in a fixed-speed configuration and MDI mode:

- Use a crossover cable to connect to an MDI port
- Use a straight-through cable to connect to an MDI-X port

Warning To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the Management Ethernet ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Connect cables to SFP modules

For information on connecting cables to Cisco optical and Ethernet SFP interfaces, see

Connect a USB flash device

To connect a USB flash device to the Cisco 8404 router, insert the memory stick in the USB port labeled MEM. The Flash memory module can be inserted in only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Connect time cables

The following sections describe how to connect timing cables to the Cisco 8404 router:

Note When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Note 10 MHz and 1 PPS connectors must be configured as inputs through CLI.

Connect cables to the input 10Mhz or 1PPS interface

Procedure

Step 1 Connect one end of a mini-coax Y-cable to the GPS unit.

Step 2 Connect one end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the primary RSP of the router.

Step 3 Connect the other end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the backup RSP of the router.

Note
In the Cisco 8404-sys-D router, there is single port (mini coax DIN 1.0 or 2.3) for 1PPS or 10 MHz work as input and output. Configure the mode according to the use case through CLI

Connect cables to the ToD interface

Procedure

Step 1 Connect one end of a straight-through Ethernet cable to the GPS unit.

Step 2 Connect one end of the split-side Y-cable Ethernet to the ToD port on the primary RSP of the router.

Step 3 Connect the other end of the split-side Y-cable Ethernet to the ToD port on the backup RSP of the router.

Note
For instructions on how to configure clocking, see the *Timing and Synchronization Configuration Guide for Cisco 8000 Series Routers, Cisco IOS XR Releases*.

Warning
To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the ToD ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Connect cables to a GNSS interface

The following sections describe how to connect cables from the Cisco 8404 router to a GPS unit for input or output timing of frequency.

Note A Y-cable is required to connect to a primary and backup RSP in order to ensure that the router continues to transmit timing signals in the event of a network failure. For a mini-coax connection, this Y-cable can be part number CAB-BNC-7INY (7 inch BNC Y-cable). For an Ethernet connection, this Y-cable can be a RJ45 Cat5 1-to-2 splitter (3 female port RJ45 connector).

Note When installing the cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Connect a cable to the GNSS antenna interface

Procedure

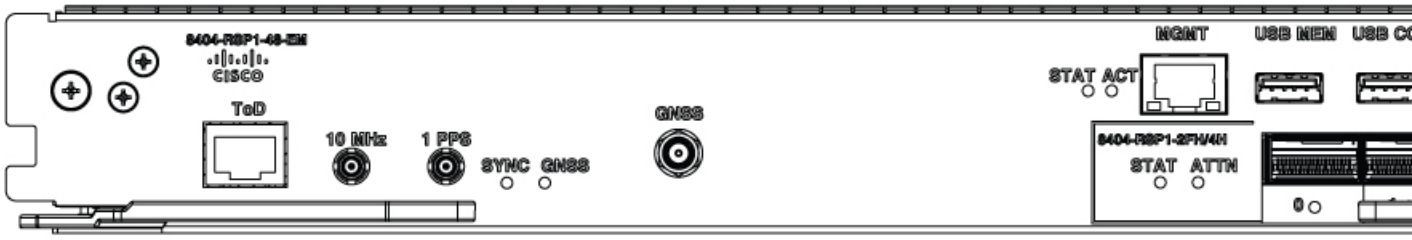
Step 1 Connect one end of a shielded coaxial cable to the GNSS RF IN port.

Step 2 Connect the other end of the shielded coaxial cable to the GNSS antenna after the primary protector.

Note
The GNSS RF In port should have a primary protector installed to meet the Local Safety guidelines.

Note
The GNSS RF In coaxial cable shield must be connected to the Facility Equipment Ground through the chassis. The chassis must have the ground wire connected to the Facility Equipment Ground.

Figure 56: GNSS antenna port integrated in RSP



Create the Initial Router Configuration

You must assign an IP address to the router management interface so that you can then connect the router to the network.

When you initially power up the router, it boots up and asks a series of questions to help configure the router. To enable you to connect the router to the network, you can use the default choices for each configuration except for the IP address, which you must provide.

Before you begin

- A console device must be connected with the router.
- The router must be connected to a power source.

Procedure

Step 1 Power up the router.

The LEDs on each PEM light up (green) when the PEM units are sending power to the router, and the software asks you to specify a password to use with the router.

Step 2 When the system is booted up for the first time, a new username and a password is to be created. The following prompt appears:

```
!!!!!!!!!!!!!!!!!!! NO root-system username is configured. Need to configure root-system username.
 !!!!!!!!!!!!!!!!!!!

--- Administrative User Dialog ---


Enter root-system username:
% Entry must not be null.

Enter root-system username: root
Enter secret:
Use the 'configure' command to modify this configuration.
User Access Verification

Username: root
Password:


RP/0/RP0/CPU0:ios#
```

Step 3 Enter a new password to use for this router.

The software checks the security strength of it and rejects your password if it is not considered to be a strong password. To increase the security strength of your password, make sure that it adheres to the following guidelines:

- At least eight characters
- Minimizes or avoids the use of consecutive characters (such as "abcd")
- Minimizes or avoids repeating characters (such as "aaa")
- Does not contain recognizable words from the dictionary
- Does not contain proper names
- Contains both uppercase and lowercase characters
- Contains both numbers and letters

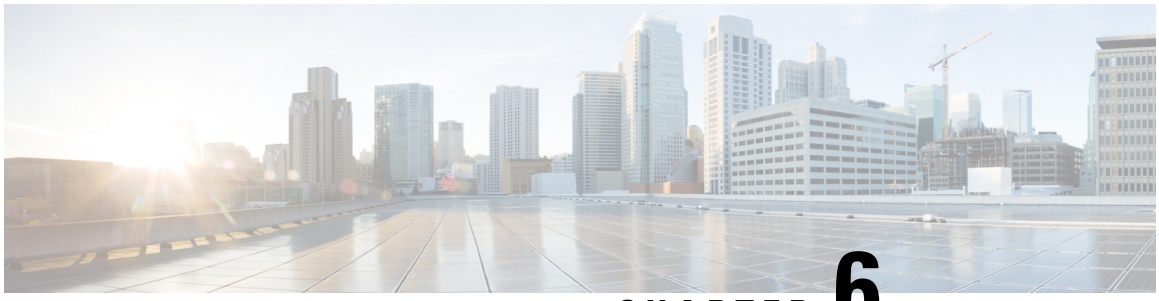
Note
Clear text passwords cannot include the dollar sign ($) special character.

Tip
If a password is trivial (such as a short, easy-to-decipher password), the software rejects the password configuration. Be sure to configure a strong password as described by the guidelines in this step. Passwords are case sensitive.

If you enter a strong password, the software asks you to confirm the password.

Step 4 Reenter the password.

When you enter the same password, the software accepts the password.



CHAPTER 6

Replace chassis components

Note The images in this chapter are only for representation purposes, unless specified otherwise. The chassis' actual appearance and size may vary.

- Remove the DC PEM, on page 113
- Replace the DC PEM, on page 114
- Remove and replace the air filter, on page 115
- Remove and replace the fan tray, on page 116
- Remove an RSP module, on page 117
- Remove MPA, on page 119
- Hot-swap an RSP or MPA, on page 119

Remove the DC PEM

This section provides information about removing and replacing the DC PEM in the Cisco 8404-SYS-D router.

Note The Cisco 8404-SYS-D router power supplies are hot-swappable. If you have installed redundant PEM modules, you can replace a single PEM without interrupting power to the router.

Caution To avoid erroneous failure messages, allow at least two minutes for the system to reinitialize after a PEM has been removed or replaced.

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

Warning Installation of the equipment must comply with local and national electrical codes. Statement 1074

Follow these steps to remove and replace the DC PEM on the Cisco 8404-SYS-D router:

Procedure

Step 1 Before servicing the PEM, switch off the circuit breaker in your equipment area. As an additional precaution, tape the circuit-breaker switch in the Off position.

Step 2 Slip on the ESD-preventive wrist strap that is included in the accessory kit.

Step 3 Switch the PEM circuit-breaker switch to the Off (O) position.

Step 4 Remove the PEM out of the chassis with the captive screws unscrewed and pull out half way from the chassis.

Step 5 Open the protective cover of the PEM which is planned to remove . Using a screw nut remover, remove the two screws from the terminal connector and take the DC power LUGs with the DC power cables.

Step 6 Place the screws removed back to the terminal connector and close the protective LID.

Step 7 Pull out the PEM from the chassis fully.

Replace the DC PEM

This section provides information about removing and replacing the DC PEM in the Cisco 8404-SYS-D router.

The Cisco 8484-SYS-D router supports two DC power entry modules 8404-DC-PEM. The PEM can accept negative DC input voltage -40V to -72V and dual feed support power redundancy without disrupting power to router.

Caution To avoid erroneous failure messages, allow at least two minutes for the system to reinitialize after a PEM has been removed or replaced.

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

Warning Installation of the equipment must comply with local and national electrical codes. Statement 1074

Follow these steps to remove and replace the DC PEM on the Cisco 8404-SYS-D router:

Procedure

Step 1 Before servicing the PEM, switch off the circuit breaker in your equipment area. As an additional precaution, tape the circuit-breaker switch in the Off position.

Step 2 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 3 Loosen the captive screws on the DC PEM and pull out the PEM partially so that there is enough space to open the terminal block cover.

Step 4 Open the terminal block cover to unscrew and remove the lugs.

Step 5 Grasping the PEM handle with one hand, pull the PEM out from the chassis while supporting it with the other hand.

Step 6 Replace the DC PEM within 5 minutes.

Remove and replace the air filter

The chassis is shipped with two blank fan filter covers with the same product identifier.

Note Air filters are consumable items and must be ordered separately by customers. Customers may contact TAC for assistance in identifying the correct air filter PID to order. We recommend having spare air filters in stock.

To install the air filter:

Before you begin

If the cables from the interface modules on the right of the chassis cross over the air filters, gently lift the cables to clear enough space to remove the air filters from the chassis.

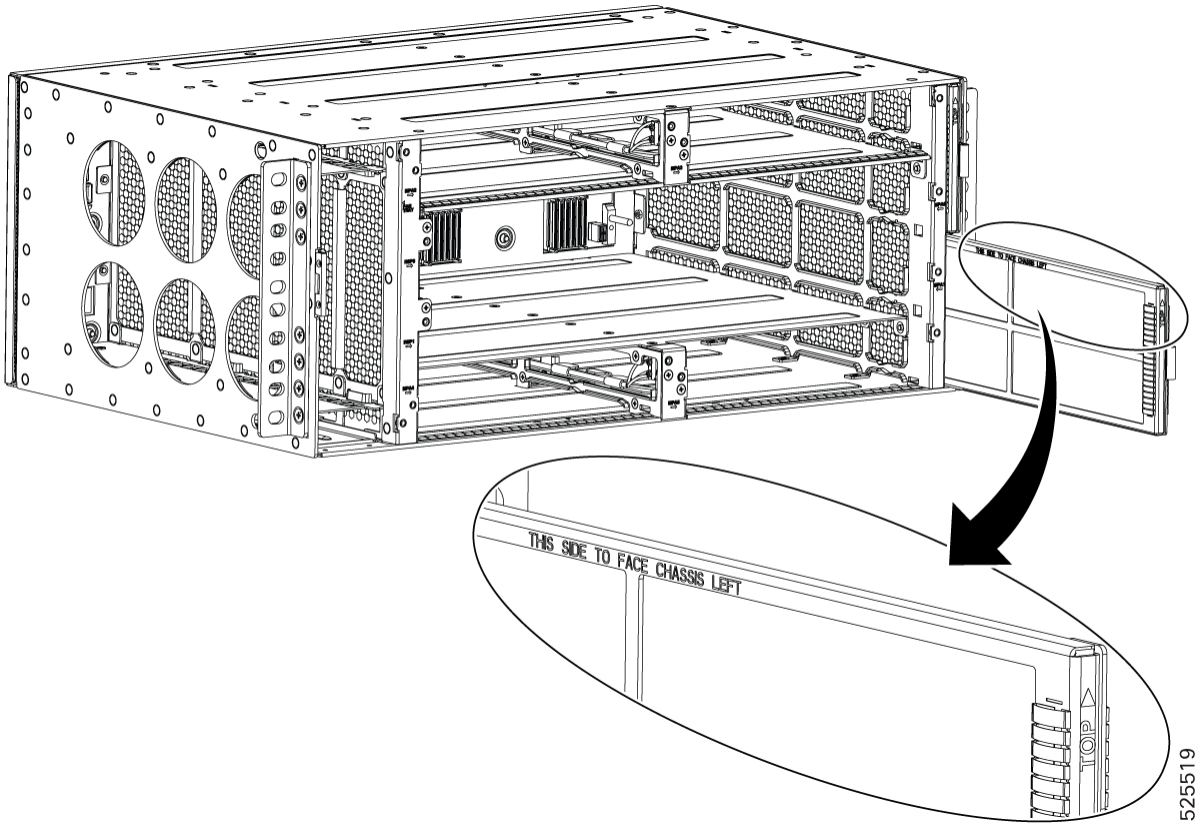
Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Pull out the blank fan filter covers.

Step 3 Slide the new air filters onto the fan tray as shown in the figure below.

Figure 57: air Filter



Note
The air filter is a sungle-use component.

Remove and replace the fan tray

This section describes the removal and replacement of the fan tray module (8404-FAN-TRAY).

Note Ensure that you keep your fingers, clothing, and jewelry away from the fans when installing or removing the fan tray module. Exposed circuitry is an energy hazard.

Caution To avoid erroneous failure messages, allow at least two minutes for the system to reinitialize after the fan tray has been replaced.

Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Using a No. 2 Phillips screwdriver, loosen the captive installation screw.

Step 3 Move the latch unlock slider to the right to unlock the fan tray from the chassis. The latch is found in the left side from middle of the fan tray.

Step 4 Grasp the fan tray handle with one hand and the outside of the chassis with the other hand with the latch slider in the unlock position.

Caution
The fans are exposed on the right side of the fan tray. Keep your fingers, clothing, and jewelry away from the fans. Always handle the fan tray by the handle.

Step 5 Pull the fan tray toward you no more than 1 inch to disengage it from the power receptacle on the midplane.

Step 6 Wait at least 5 seconds to allow the fans to stop spinning. Then, pull the fan trayrout toward you and out of the router.

Note
As the fan tray slides out of the chassis, support the bottom of the fan tray with one hand and keep your other hand on the fan tray handle.

Note
The chassis must not be allowed to operate without functioning fans for more than 5 minutes.

Remove an RSP module

Before you remove an RSP from the router, you should save the current configuration on a TFTP server or an external USB flash drive, using the **copy running-config** {**ftp** | **tftp** | **harddisk:**} command. This saves you time when bringing the module back online.

Warning Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing. Statement 1034

Warning Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

To remove an RSP module:

Procedure

Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Disconnect any cables attached to the ports on the module.

Step 3 Verify that the captive installation screws on all the RSP modules in the chassis are tight. This step ensures that the space created by the removed module is maintained.

Note
If the captive installation screws are loose, the EMI gaskets on the installed modules will push the modules toward the open slot, which in turn reduces the size of the opening and makes it difficult to remove the module.

Step 4 Loosen the two captive installation screws securing the RSP module you intend to remove from the chassis.

Step 5 Observe the status LED on the RSP module. Wait until the LED turns off—this typically takes about 5 to 8 seconds.

Step 6 To ensure the RSP is ready for removal, verify that it is in the SHUTDOWN state by entering the **show platform** command from the console.

Once the status LED is off or the RSP is confirmed to be in the SHUTDOWN state, then RSP can be pulled out from the slot.

Step 7 Place your thumbs on the ejector levers (see). Simultaneously rotate both ejector levers outward to unseat the RSP module from the backplane connector.

Step 8 Observe the status LED on the RSP. If the LED remains green and the RSP is still in the Operational state, do not remove the module yet.

Step 9 Use the **rsp shutdown** command to transition the RSP to a safe state for removal. Wait for the status LED to turn off and verify that the RSP is no longer operational.

Step 10 Once the RSP is in the shutdown state and the LED is off, you may safely pull the RSP out of its slot.

Caution
To prevent ESD damage, handle modules by the carrier edges only. Do not hold the RSP with the ejector levers as weight of the RSP card might bend the lever.

Step 11 Place the module on an antistatic mat or antistatic foam, or immediately reinstall the module in another slot.

Step 12 Install blank module filler plates (Cisco part number: 8404-RSP-BLANK) in empty slots, if any.

Warning
Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029

Remove MPA

To remove an MPA module:

Procedure

Step 1 Slip on the ESD-preventive wrist strap available in the accessory kit.

Step 2 Remove optics and cables from the front panel.

Step 3 Loosen the two captive installation screws on the MPA module you plan to remove from the chassis.

Step 4 Wait for the status LED to turn off; this process typically takes about 5 to 8 seconds. You can also verify that the MPA has entered the SHUTDOWN state by checking the console log or issuing the **`show platform`** command.

Step 5 Once the status LED turns off or the MPA is confirmed to be in the SHUTDOWN state, it is safe to remove the MPA from the slot. Position your thumbs on the ejector levers (refer to the illustration) and, at the same time, rotate both ejector levers outward to disengage the module from the backplane connector.

Step 6 If the status LED remains green and the MPA is still in the Operational state, issue the **`MPA shutdown`** command before attempting to remove the MPA from its slot.

Step 7 Firmly grasp the front edge of the module and carefully slide it straight out of the slot. For chassis with horizontal slots, support the module from underneath with one hand as you remove it to prevent it from dropping. Avoid touching any circuitry on the module to prevent damage from static electricity or physical contact.

Step 8 Place the module on an antistatic mat or antistatic foam or immediately reinstall the module in another slot.

Step 9 Install blank module filler plates (84-MPA-BLANK and 84-RSP-BLANK) in any empty slots to maintain proper airflow and ensure system integrity.

Warning
Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029 (edited)

Hot-swap an RSP or MPA

The Cisco 8404-SYS-D router provides a feature that allows you to remove and replace a redundant RSP module without powering down the router. This feature, called hot-swapping or OIR, allows you to remove and replace a redundant module without disrupting router operation.

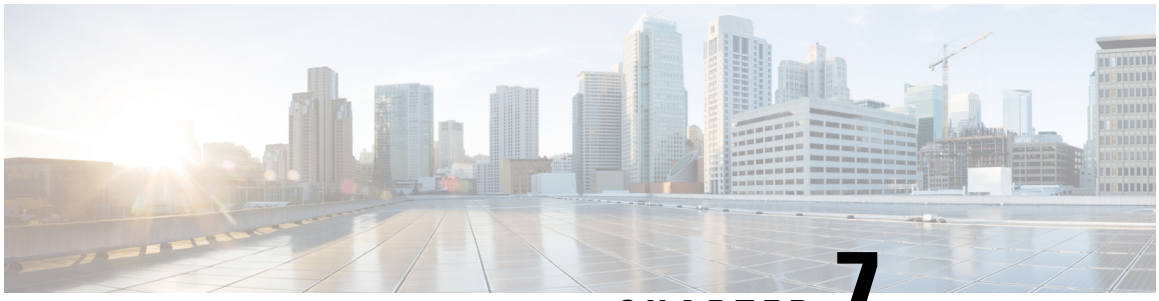
Note Before replacing the card, you must perform a graceful shutdown of the card to avoid disk corruption

When two redundant modules are installed in the router, only one of the modules is active. The other one runs in standby mode, ready to take over processing if the active module fails.

The RSP planned to remove to be gracefully shutdown so the other RSP will be in active mode

Use the following guidelines when performing an OIR on an MPA:

- Allow at least two minutes for the system to reinitialize before inserting a new MPA.
- Avoid inserting a new MPA during bootup until the active and standby RSPs have reached an OK state.
- When inserting multiple MPAs into the chassis, wait until each MPA reaches an OK state before inserting the next MPA.



CHAPTER 7

LEDs

- RSP LEDs, on page 121
- MPA LEDs, on page 122
- Fan tray LEDs, on page 123
- Power entry modules LEDs, on page 123

RSP LEDs

Table 10: RSP LEDs

LED	Color/State	Description
Status (STAT)	Off	No Power (SW has no control)
	Amber	RSP is turned OFF. Active, GNSS, SYNC, ATTN - all OFF
	Blinking	RSP is booting up
	Green	RSP is successfully booted and Status OK
Active (ACT)	Green	RSP module is in ACTIVE/Master mode.
	Yellow	RSP module is in STANDBY mode.
	OFF	RSP is OFF
Management port (MGMT)	GREEN	1 GE link is up
	GREEN Blinking	1 GE data transfer in progress
	ORANGE	10 or 100 m Ethernet link is up
	ORANGE Blinking	10 or 100m Ethernet data transfer is in progress
	OFF	Link down

LED	Color/State	Description
Sync status (SYNC)	Green	Time core is synchronized to an external source including IEEE 1588.
	Yellow	Free run
	Amber	Free Run or holdover - Time core is in free run or holdover mode.
	OFF	RSP is OFF
ATN	Blue Blink	To indicate that the RSP requires attention
	OFF	RSP is OFF
GNSS	Green	GNSS is locked and good
	Amber	GNSS failed
	OFF	RSP is OFF

MPA LEDs

Table 11: MPA LEDs

LED	Color/State	Description
Stat	OFF	Main power feed failure
	Red	MPA Power failure
	Blinking red	Alarm major or critical
	Blinking Amber	Alarm minor
	Amber	Card unrecognized
	Blinking Green	FPD upgrade event
	Green	MPA Powered and Operational
ATN	Blinking Blue	To indicate that the MPA requires attention
	OFF	MPA is OFF

Fan tray LEDs

Note A major alarm condition indicates the failure of a single fan in the fan tray; a critical alarm indicates the failure of multiple fans. In the event that a single fan fails, the router software adjusts the fan speed to prevent excessive heat within the chassis.

Table 12: Primary Fan Tray LED Details

LED	Color/State	Description
Status (TEMP)	Off	Disabled/power down
	Amber	Over temperature
	Green	OK
Fan (FAN)	Green	Fan rotation in range
	Amber	Fan fault
	Red	Two or more fan faults
Minor (MIN)	Off	No minor alarm
	Amber	Minor alarm
Major (MAJ)	Off	No major alarm
	Red	Major Alarm
Critical (CRIT)	Off	No critical alarm
	Red	Critical alarm (defaults to ON upon RSP reset)

Table 13: Secondary Fan Tray LED Details

LED Color	Fan Fail Status
Green	All fans working fine
Amber	Single fan failure
Red	Two or more fans have failed

Power entry modules LEDs

The table below summarizes the PEM LEDs for DC power supplies.

Table 14: Power Supply LEDs

LED	Color/State	Description
Input OK	Off	No Input Voltage
	Amber	Input voltage out of range
	Green	Input voltage within acceptable operating range
Output Fail	Off	Disabled/Forced Shut down/No input power
	Red	Power supply fault (internal failure such as over temperature)
	Green	Operational
	Blinking Red	Output ORING FET Failed