Cisco ASR 9000 Series Fixed-Port Routers Hardware Installation Guide

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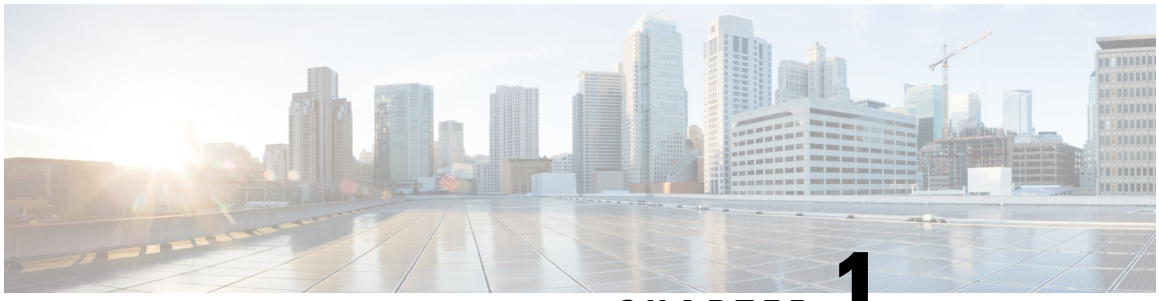


CHAPTER 1

Preparing for Installation

This chapter guides you through the process of preparing for router installation.

Before installing your Cisco ASR 9902 Router Cisco ASR 9903 Router, Cisco ASR 9901, or Cisco ASR 9001 Router, you must consider these requirements:

- Power and cabling requirements must be in place at your installation site.
- Special equipment must be available for installing the router.
- The environmental conditions that your installation site must meet to maintain normal operation.

The shipping package for the router is engineered to reduce chances of product damage that may result from routine material handling during shipment:

- Keep the router in the shipping container until you have determined the installation site.
- The router should always be transported or stored in its shipping package in the upright position.

Inspect all items for shipping damage. If an item appears damaged, contact a Cisco customer service representative immediately.

This chapter contains these installation topics:

- Overview, on page 1
- Safety Guidelines, on page 7
- Port Connection Guidelines, on page 11
- Site Requirement Guidelines, on page 20

Overview

This topic provides an overview of the following routers:

Cisco ASR 9902 Router

Table 1: Feature History Table

Hardware	Release Information	Description
Cisco ASR 9902 Compact High-Performance Router	Release 7.4.1	Cisco ASR 9902 (ASR-9902) is a compact, high-performance router that delivers up to 800 Gbps of non-blocking, full-duplex capacity in a two rack-unit (2RU) form factor. See Cisco ASR 9902 Compact High-Performance Router Data Sheet

This table lists the components of Cisco ASR 9902 router:

Table 2: Cisco ASR 9902 Router Components

Component	PID	Quantity
Route Processors (RPs)	A99-RP-F	2
Power Supply Modules (AC or DC)	PWR-1.6KW-AC PWR-1.6KW-DC	2
Fans	ASR-9902-FAN	3
Fixed Board Line Card	ASR-9902-LC	1

The router consists of the fixed board or line card with 48 ports. The 48 ports are grouped in slice 0 and slice 1. The slice 0 is color coded in blue, and slice 1 in purple. All ports support MACSec:

Note A slice is a logical grouping of physical ports.

- 2 ports that support QSFP-DD-based 100GE pluggables
- 6 ports that support QSFP28-based 100GE pluggables
- 16 ports that support SFP28-based 25GE/10GE dual-rate pluggables
- 24 ports that support SFP+- based LAN/WAN (OTN) pluggables

Figure 1: Front Panel of the Cisco ASR 9902 Router

Figure 2: Rear Panel of the Cisco ASR 9902 Router

Cisco ASR 9903 Router

Table 3: Feature History Table

Hardware	Release Information	Description
Online Insertion and Removal on Cisco ASR 9903 800G Multirate Port Expansion Card	Release 7.8.1	Cisco ASR 9903 800G Multirate Port Expansion Card (A9903-8HG-PEC) is an optional removable module. With this release, support for Online Insertion and Removal (OIR) is enabled. OIR allows you to remove and replace the Port Expansion Card while the power on and the system operating. See Cisco ASR 9903 Compact High-Performance Router Data Sheet
Cisco ASR 9903 800G Multirate Port Expansion Card	Release 7.4.1	Cisco ASR 9903 800G Multirate Port Expansion Card (A9903-8HG-PEC) is an optional removable module. It offers 48 physical ports with maximum 800G data bandwidth capacity. 32 of the 48 physical ports are 25GE/10GE multi-rate SFP28/SFP+ -based ports. The remaining 16 ports are 10GE SFP+ -based ports. See Cisco ASR 9903 Compact High-Performance Router Data Sheet

Hardware	Release Information	Description
ASR-9903	Release 7.1.25	Cisco ASR 9903 Router (ASR-9903) is a compact, high-performance router that delivers up to 3.6 Tbps of nonblocking, full-duplex capacity in a Three-Rack-Unit (3RU) form factor. The router consists of the fixed board, with 16 integrated QSFP28-based 100GE ports plus 20 integrated SFP+-based ports and an optional 2T (A9903-20HG-PEC) Port Expansion Card, which can be inserted into the dedicated slot on demand. See Cisco ASR 9903 Compact High-Performance Router Data Sheet

The Cisco ASR 9903 Router is a hybrid platform consisting of the following main components:

- Route Processors—up to two route processors may be used in a redundant configuration.
- Fixed Board—also known as a Line Card (LC0). The Fixed Board contains sixteen 100GE QSFP28 ports and twenty 10GE SFP+ ports. It is integrated with the chassis and provides up to 1.6-Tbps throughput.
- Port Expansion Cards—an optional removable module with different port options. There are two PECs available: 2T (A9903-20HG-PEC) and 0.8T (A9903-8HG-PEC). For more information, see ASR 9903 Port Expansion Cards, on page 135.

Note Cisco ASR 9903 Router supports Cisco IOS XR 64-bit OS.

The Cisco ASR 9903 Router is a compact and high performance router that provides the following capabilities:

- 1.6T to 3.6T capacity in a 3RU form factor
- Fully redundant configuration
- Ethernet port speeds from 1GbE, 10 GbE, up to 400GbE
- Support of MACSec, PTP Telecom Profiles, and Class C Timing
- Optimized cost per port

The chassis has a GPS input for stratum-1 clocking, building integrated timing supply (BITS) ports, and management ports. The following figure shows the front panel of the Cisco ASR 9903 Router:

Figure 3: Front Panel of the Cisco ASR 9903 Router

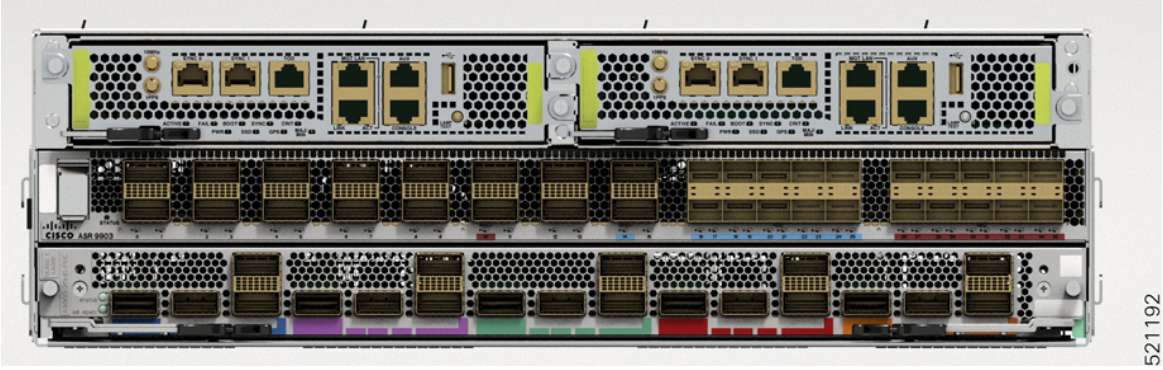


Figure 4: Rear Panel of the Cisco ASR 9903 Router

Cisco ASR 9901 Router

The Cisco ASR 9901 Router is a compact high-capacity provider edge (PE) router that delivers 456 Gbps of non-blocking, full-duplex fabric capacity in a two-rack-unit (2RU) form factor.

Note The Cisco ASR 9901 Router supports Cisco IOS XR 64-bit releases only.

The Cisco ASR 9901 Router has an integrated route processor (RP) and 42 fixed-configuration ports that support the following data rates:

- 24 ports that support 1 GbE (using SFP) or 10 GbE (using SFP+).

Note 1 GE copper transceivers are supported in dual-rate ports on Cisco ASR 9901 routers from Cisco IOS-XR Software Release 7.0.1 onwards. However, only 1 GE data rate is supported and 10 Mbps/100 Mbps data rates are not supported.

- 16 ports that support 1 GbE (using SFP).

Note 1GE copper SFPs operate only on 1000BASE-T rates; autonegotiation and speed configurations are not supported.

- 2 ports that support 100 GbE (using QSFP28).

Note Configuring breakout on port 20 will shut down ports 10 and 11. Configuring breakout on port 21 will shut down ports 24 and 25. Use the **no shutdown** command to reenable these ports.

The base chassis has a GPS input for stratum-1 clocking, building integrated timing supply (BITS) ports, and management ports. The following figure shows the front panel of the Cisco ASR 9901 Router.

Figure 5: Front Panel of the Cisco ASR 9901 Router

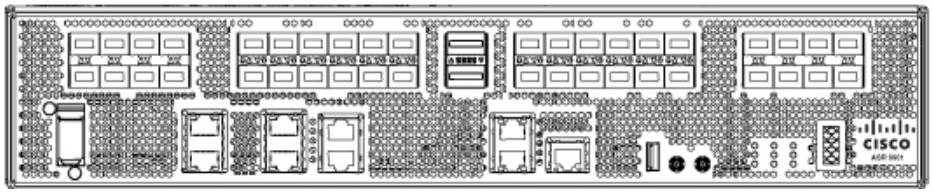
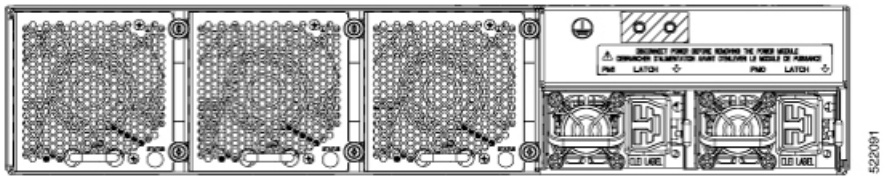


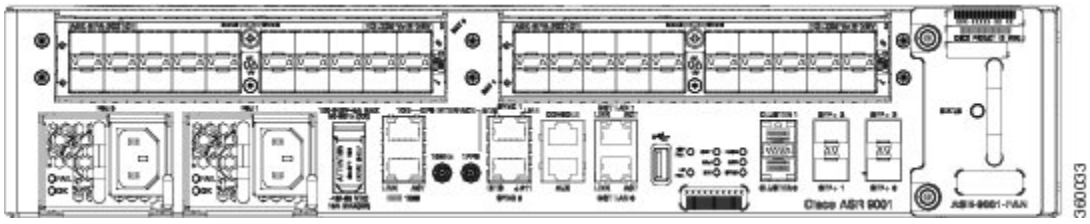
Figure 6: Back Panel of the Cisco ASR 9901 Router



Cisco ASR 9001 Router

The Cisco ASR 9001 Router is a compact high-capacity provider edge (PE) router that delivers 120 Gbps of non-blocking, full-duplex fabric capacity in a two-rack-unit (2RU) form factor. Similar to other routers in the Cisco ASR 9000 Series, running Cisco IOS XR software images, the Cisco ASR 9001 Router delivers the features and services found on the ASR 9000 Series platforms, allowing customers to standardize on the same Cisco IOS XR image. The Cisco ASR 9001 Router has an integrated route processor (RP) and two modular bays that support 1 GE, 10 GE and 40 GE modular port adapters (MPAs). The base chassis has four integrated 10 GE enhanced small form-factor pluggable (SFP+) ports, a GPS input for stratum-1 clocking, building integrated timing supply (BITS) ports, and management ports. The following figure shows the front panel of the Cisco ASR 9001 Router.

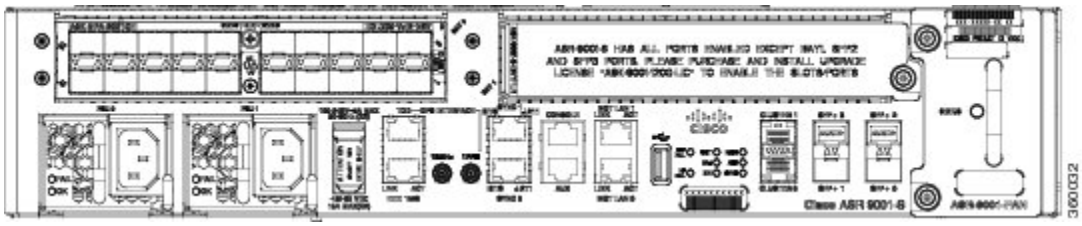
Figure 7: Front Panel of the Cisco ASR 9001 Router



Cisco ASR 9001-S Router

The Cisco ASR 9001-S Router is a 60 Gbps variant of the Cisco ASR 9001 Router. Similar to other routers in the Cisco ASR 9000 Series, running Cisco IOS XR software images, the Cisco ASR 9001-S Router delivers the features and services found on the ASR 9000 Series platforms, allowing customers to standardize on the same Cisco IOS XR image. The Cisco ASR 9001-S Router comes standard with one modular bay (BAY 0) that supports either a 1 GE, 10 GE, or 40 GE modular port adapters (MPAs). The chassis also comes usable with two fixed SFP+ ports (SFP+0 and SFP+1). The second MPA slot (BAY 1) and other two SFP+ ports (SFP+2 and SFP+3) are disabled and covered with dust caps by default. It supports the same set of features and scaling for each NPU as does the Cisco ASR 9001 Router. The following figure shows the front panel of the Cisco ASR 9001-S Router.

Figure 8: Front Panel of the Cisco ASR 9001-S Router



In order to achieve the full bandwidth of 120 Gbps and to enable the disabled ports, a Cisco license can be obtained. Once the license is obtained and installed, the Cisco ASR 9001-S Router must be reloaded to bring up the full 120 Gbps capacity. For information on configuring the Cisco license for Cisco ASR 9001-S Router, see the Cisco ASR 9001-S 120G Upgrade License Configuration Guide.

Note The Cisco ASR 9001-S Router follows the same hardware installation procedure as the procedure for the Cisco ASR 9001 Router, described in this document.

Safety Guidelines

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

Note that this section contains *guidelines,* and do not include every potentially hazardous situation. When you install a router, always use caution and common sense.

General Safety Guidelines

- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always disconnect the power source and unplug all power cables before lifting, moving, or working on the router.
- Keep the work area clear and dust free during and after installation.
- Keep tools and router components away from walkways and equipment rack aisles.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the router.
- Fasten your tie or scarf and sleeves.
- Operate Cisco equipment safely by using it in accordance with its electrical ratings and product usage instructions.
- Do not work alone if potentially hazardous conditions exist.
- Always unplug power cables when performing maintenance or working on the router, unless the replacement part is hot swappable and designed for online insertion and removal (OIR).
- Ensure that the installation of the router is in compliance with national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.

Compliance and Safety Information

The Cisco ASR 9901, ASR 9001, and ASR 9901-S Routers are designed to meet the regulatory compliance and safety approval requirements. See the Regulatory Compliance and Safety Information - Cisco ASR 9000 Series Aggregation Router.

Warning

Statement 1071—Warning Definition

IMPORTANT SAFETY INSTRUCTIONS

Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Read the installation instructions before using, installing, or connecting the system to the power source. Use the statement number at the beginning of each warning statement to locate its translation in the translated safety warnings for this device.

SAVE THESE INSTRUCTIONS

Laser Safety

The fixed-configuration ports on the Cisco ASR 9901 and the line card ports on the Cisco ASR 9001 Router are equipped with lasers. The lasers emit invisible radiation. *Do not* stare into open ports. Observe this warning to prevent eye injury:

Warning **Statement 1051—**Laser Radiation

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

Energy Hazard

The Cisco ASR 9901 and Cisco ASR 9001 Router can be configured for a DC power source. Do not touch terminals while they are live. Observe this warning to prevent injury.

Warning **Statement 1086—**Replace Cover on Power Terminals

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.

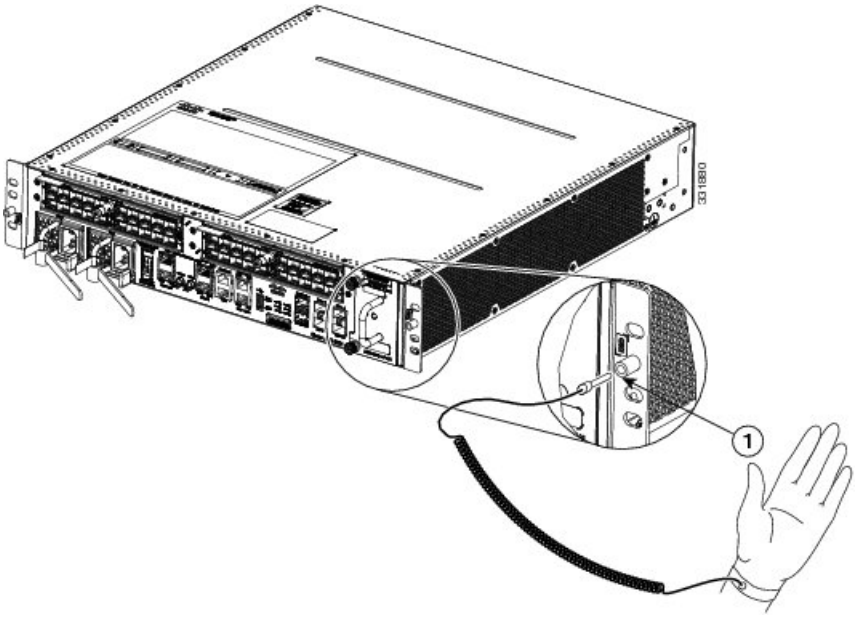
Preventing Electrostatic Discharge Damage

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 good skin contact.

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

Before you perform any procedure in this guide, attach an ESD-preventive strap to your wrist and connect the leash to the chassis as shown in the figure below.

Figure 9: Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9001 Router Chassis



1	Location of chassis socket for ESD strap on the Cisco ASR 9001 Router

Lifting Guidelines

A fully-configured Cisco ASR 9903 can weigh as much as 70 pounds (31.75 kg.)A fully-configured Cisco ASR 9901 can weigh as much as 55.97 pounds (25.4 kg). A fully-configured Cisco ASR 9001 Router can weigh as much as 37.91 pounds (17.2 kg). These systems are not intended to be moved frequently. Before you install the router, ensure that you have planned the installation and migration of the router into your network so that you can avoid having to move the router later to accommodate power sources and network connections.

Use these lifting guidelines to avoid injury to yourself or damage to the equipment:

- Do not lift equipment alone; have another person help you to lift the equipment.
- Ensure that your footing is solid; balance the weight of the object between your feet.
- Lift the equipment slowly; never move suddenly or twist your body as you lift.
- Keep your back straight and lift with your legs, not your back. When bending down to lift equipment, bend at the knees (not at the waist), to reduce the strain on your lower back muscles.

Warning

Statement 1032—Lifting the Chassis

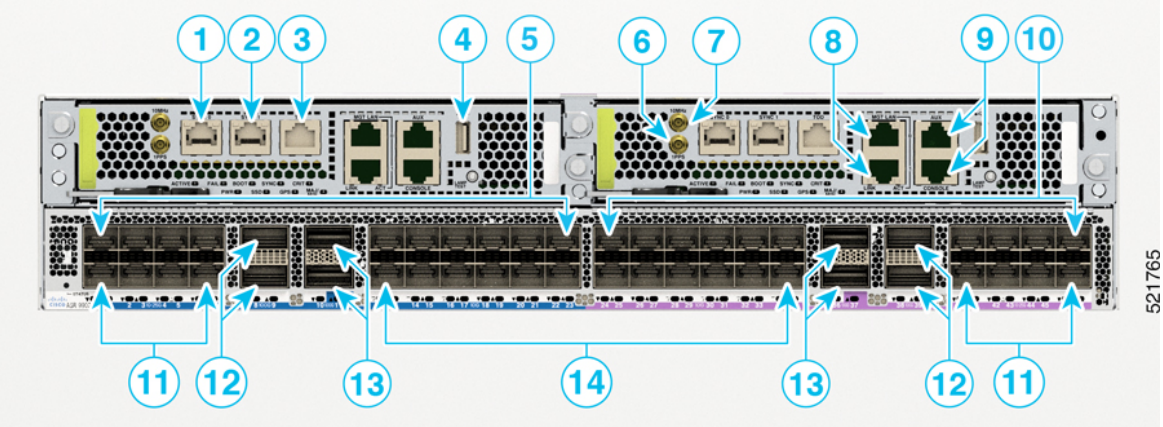
To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules, such as power supplies, fans, or cards. These types of handles are not designed to support the weight of the unit.

Port Connection Guidelines

This section contains interfaces, ports and signal information available on the RP. It also provides information for Ethernet routing and equipment.

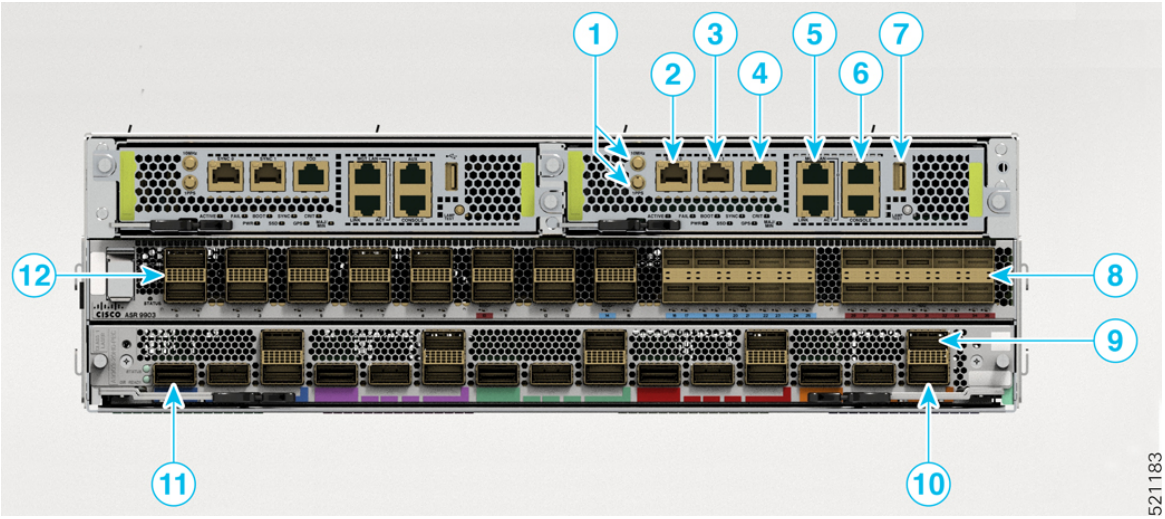
Caution Ports labeled Ethernet, SYNC, CONSOLE, and AUX are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits.

Figure 10: Cisco ASR 9902 Router Front Panel Ports



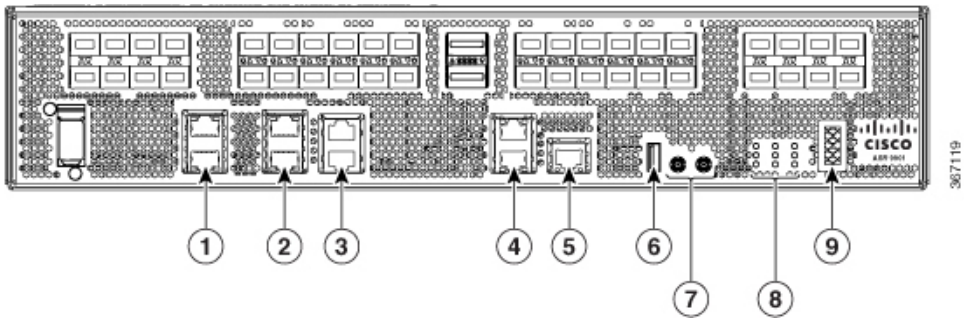
1	SYNC 0 port	8	Management port
2	SYNC 1 port	9	AUX and CONSOLE ports
3	TOD port	10	Slice 1
4	USB port	11	25GE/10GE SFP28 ports; eight on ea
5	Slice 0	12	100GE/40GE QSFP28 ports
6	1 PPS port	13	100GE/40GE ports Top ports support QSFP-DD transceiv QSFP28 transceiver
7	10MHz port	14	10GE SFP+ with OTN ports; twelve

Figure 11: Cisco ASR 9903 Router Front Panel Ports



1	10MHz and 1PPS ports Eight discrete LED indicators	7	External USB port
2	SYNC BITS RJ45 ports	8	SFP+ ports
3	SYNC BITS RJ45 ports	9	QSFP28 ports
4	ToD ports	10	QSFP28 ports
5	Management LAN ports	11	QSFP-DD ports
6	AUX ports	12	QSFP28 ports

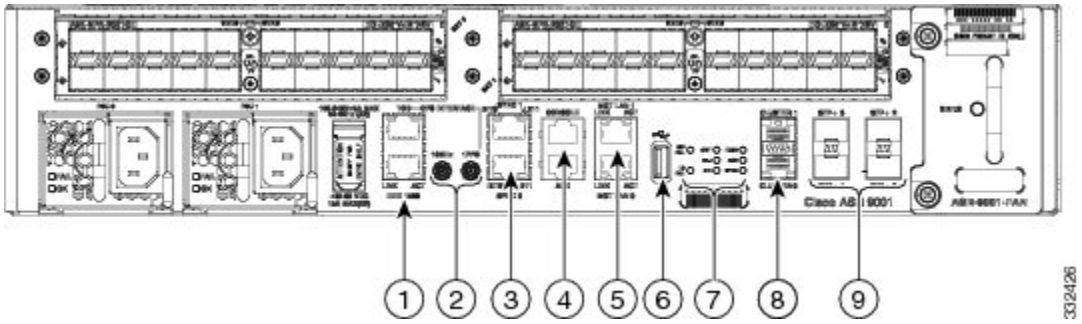
Figure 12: Cisco ASR 9901 Router Front Panel Ports



1	SYNC (BITS/J.211) ports	6	External USB port
2	Service LAN and ToD ports	7	10MHz and 1PPS ports
3	CONSOLE and AUX ports	8	Nine discrete LED indicators
4	Management LAN ports	9	LED matrix display

5	Connectivity Management Processor (CMP) port		

Figure 13: Cisco ASR 9001 Router Front Panel Ports



1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS ports	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports
4	CONSOLE and AUX ports	9	Fixed SFP+ ports
5	Management LAN ports		

Note In Cisco ASR 9001-S Router, two 10 GE fixed SFP+ ports (SFP+2 and SFP+3) are disabled by default, and can be enabled by a license upgrade.

The following table lists the Cisco ASR 9901 and Cisco ASR 9001 Router front panel ports description.

Table 4: Cisco ASR 9901 and Cisco ASR 9001 Router Front Panel Ports Description

Port Name	Connector Type	Description
TOD Port	RJ45	Time of Day Input/Output Port along with 1PPS Signal. Signal type is RS422.
Service LAN Port (IEEE 1588)	RJ45	A 10/100Mbps Ethernet Port for IEEE1588 Grand Master Connection through CAT5 cable. Signal type is MLT3.
10MHz Connector	DIN 1.0/2.3	10MHz Input or Output for GPS Synchronization. This signal can provide 10MHz output as well from Cisco ASR 9001 Router. Signal type is sinusoidal.
1PPS Connector	DIN 1.0/2.3	1PPS Input or Output for GPS Synchronization. This signal can provide output as well from Cisco ASR 9001 Router. Signal type is square wave.

Port Name	Connector Type	Description
SYNC Ports (SYNC 0/SYNC 1)	RJ45	Used as BITS or DTI (one at a time) Input/Output Port based on the configuration used. CAT5 Ethernet cable can be used for DTI. In DTI mode link resembles an Ethernet (802.3) 10BaseT link. Signal type depends on the mode such as B8ZS for T1, HDB3 for E1, Manchester Coded Data for DTI, Sinusoidal for 6.3128 Out.
CONSOLE Port	RJ45	Local Craft Terminal for connecting the box with terminal. Used to command the CPU and to collect CPU log. This console port operates at default 115200 baud rate. Signal type is RS232.
AUX Port	RJ45	Local Craft Terminal with modem handshaking signals. This port operates at default 115200 baud rate. Signal type is RS232.
Management LAN Ports (MGT LAN 0/1)	RJ45	Management Port. It is a tri speed (10/100/1000 Mbps) Ethernet port with auto negotiation enabled. Connection through CAT5E cable. Signal type is 8B/10B for 1G, MLT3 for 100 Mbps, Manchester coded for 10 Mbps.
USB Port	USB TYPE-A Receptacle	For connecting USB Device. This port can be used to upload installable modules, temporary binaries, scripts etc through USB disk. Also, it can be used to transfer router log from the internal eUSB to the external memory stick. Signal type is NRZI.
CLUSTER Ports (0/1) (Cisco ASR 9001 Router only)	SFP	For Cascading two Cisco ASR 9001 Router systems. The pinout and signal level is as per the SFP standard. This supports copper/optical SFP modules.

Console Port and Auxiliary Port Connection Guidelines

The RP has two EIA/TIA-232 (formerly RS232) serial RJ-45 connection ports:

- Console port—RJ-45 interface for connecting a data terminal device to the router, which you need to perform the initial configuration of the router.
- Auxiliary port—RJ-45 interface for connecting a modem.

Note The console and auxiliary ports are asynchronous serial ports. Ensure that devices connected to these ports are capable of asynchronous transmission.

Console Port Signals

The *RP console port* is an RJ-45 interface for connecting a terminal to the router. The console port does not support modem control or hardware flow control and requires a straight-through RJ-45 cable.

Before connecting a terminal to the console port, check the terminal setting for the data transmission rate, in bits per second (bps). The terminal transmission rate setting must match the default rate of the RP console port, which is 115200 bps. Set the terminal to these operational values: 115200 bps, 8 data bits, no parity, 1 stop bits (115200 8N1).

The following table lists the signals used on the RP console port.

Table 5: RP Console Port Signals

Console Port Pin	Signal	Input/Output	Description
1	RTS	Output	Request to Send
2	—	—	(Not connected)
3	TxD	Output	Transmit data
4	GND	—	Signal ground
5	GND	—	Signal ground
6	RxD	Input	Receive data
7	—	—	(Not connected)
8	CTS	Input	Clear to Send

Auxiliary Port Signals

The *RP Auxiliary (AUX) port* is a RJ-45 interface for connecting a modem or other data communication equipment (DCE) device (such as another router) to the RP. The AUX port supports hardware flow control and modem control.

The following table lists the signals used on the Auxiliary port.

Table 6: RP AUX Port Signals

AUX Port Pin	Signal	Input/Output	Description
1	RTS	Output	Request to send
2	DTR	Output	Data terminal ready
3	TxD	Output	Transmit data
4	GND	—	Signal ground
5	GND	—	Signal ground
6	RxD	Input	Receive data

AUX Port Pin	Signal	Input/Output	Description
7	DSR	Input	Data set ready
8	CTS	Input	Clear to send

Management LAN Ports Connection Guidelines

The RP has two RJ45 media-dependent interface (MDI) Ethernet management LAN ports: MGT LAN 0 and MGT LAN 1.

These ports are used for IEEE 802.3 10BASE-T (10 Mbps), IEEE 802.3u 100BASE-TX (100 Mbps), or 1000BASE-T (1000 Mbps) Ethernet connections.

The transmission speed of the management LAN ports is not user-configurable. The transmission speed is set through an auto-sensing scheme on the RP; the speed is determined by the network to which that the Ethernet port is connected. The combined total input rate of both MGT LAN 0 and MGT LAN 1 is about 12 Mbps.

Note In 32-bit IOS XR OS, the management interfaces are available from XR VM. In 64-bit IOS XR OS, the Management ports on the RP/RSP are available as follows:

- MGT LAN 0 is available in XR VM.
- MGT LAN 1 is available in Admin VM.

Management port characteristics are:

- Maximum transmission unit (MTU) is fixed at 1514 and cannot be configured.
- Flow control is disabled and cannot be configured.
- Input unicast packets with an unknown destination address are filtered and dropped.
- Autonegotiation of port speed (10/100/1000) and duplex (full/half) is supported. Autonegotiation cannot be disabled.

The following table lists the signals used on the Management LAN ports.

Table 7: RP Management LAN Port Signals

MGT LAN Port Pin	10Base-T, 100Base-TX Signal	1000Base-T Signal
1	Transmit+	BI_DA+
2	Transmit–	BI_DA–
3	Receive+	BI_DB+
4	—	BI_DC+
5	—	BI_DC–
6	Receive–	BI_DB–

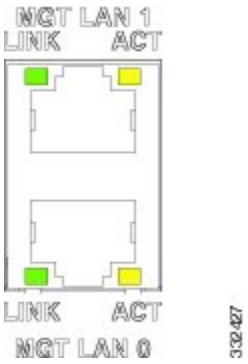
7	—	BI_DD+
8	—	BI_DD–

Management LAN Port LED Indicators

The Management LAN connectors have integral LED indicators (see the following figure). When lit, these LEDs indicate:

- Green (LINK)—Connection is alive.
- Amber (ACT)—Connection is active.

Figure 14: RP Management LAN Port LED Indicators



Management LAN RJ-45 Cabling

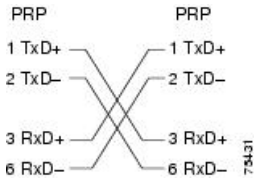
When connecting the RJ-45 port to a hub, repeater, or switch, use the straight-through cable pinout shown in the following figure.

Note To comply with the intra-building lightning surge requirements of Telecordia GR-1089-CORE, Issue II, Revision 01, February 1999, you must use a shielded cable when connecting the management LAN ports on the RP card. The shielded cable is terminated by shielded connectors on both ends, with the cable shield material tied to both connectors.

Figure 15: Straight-Through Cable Pinout to a Hub, Repeater or Switch

When connecting to a router, use the crossover cable pinout shown in the figure below.

Figure 16: Crossover Cable Pinout Between RP



Sync Ports Connection Guidelines

The SYNC 0 and SYNC 1 ports are timing synchronization ports. They can be configured as Building Integrated Timing Supply (BITS) ports or J.211 ports.

Note Both ports must be configured to be in the same mode. It is not possible to use external BITS and J.211 sources at the same time.

When configured as BITS ports, they provide connections for an external synchronization source. Such connections are for establishing precise frequency control at multiple network nodes, if required for your application. The RP card contains a synchronous equipment timing source (SETS) that can receive a frequency reference from an external BITS timing interface or from a clock signal recovered from any incoming Gigabit Ethernet or 10-Gigabit Ethernet interface. The RP SETS circuit filters the received timing signal and uses it to drive outgoing Ethernet interfaces.

The BITS input can be T1, E1 or 64K 4/. The BITS output can be T1, E1 or 6.312M 5/.

When configured as J.211 ports, they can be used as Universal Timing Interface (UTI) ports to synchronize timing across multiple routers by connecting to an external timing source.

SYNC Port LED Indicators

The SYNC port connector has integral LED indicators (see the following figure). When lit, these LEDs indicate:

- in BITS mode:
  - Green — Connection is alive.
  - Amber — A fault has occurred.
- in J.211 mode:
  - Green — DTI is operating in normal mode.
  - Amber — DTI is operating in fast mode.

Figure 17: SYNC Port Connector

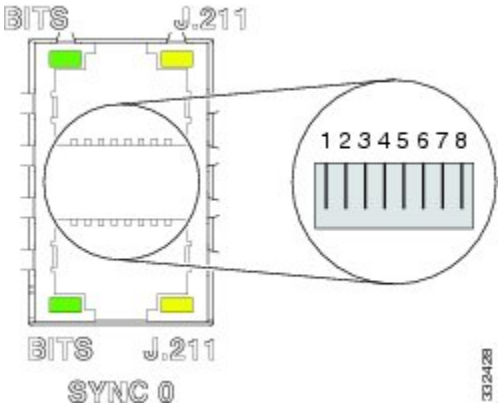


Table 8: BITS/J.211 Connector Pinout

Pin	Signal	Note
1	DTI_P/BITS_RX_P	Bi-direction for DTI, T1/E1/64K Input
2	DTI_P/BITS_RX_N	Bi-direction for DTI, T1/E1/64K Input
3	—	—
4	BITS_TX_P*	T1/E1/6.321M Output
5	BITS_TX_N*	T1/E1/6.321M Output
6	—	—
7	—	—
8	—	—

RP External USB Port

The router has an external USB Type A slot accessible on the front panel. The front panel USB slot accepts widely available USB thumb drives. The only restriction on devices you can plug into the front panel external USB slot is that they need to be USB 2.0 devices. These devices can be formatted with FAT16, FAT32 or QNX4 file systems.

The mount point /disk1: is reserved for the front panel USB device.

Note Do not connect a USB hub device to the front panel USB port.

Site Requirement Guidelines

These sections contain the site requirement guidelines that you should be familiar with before installing the router:

Site Layout and Equipment Dimensions

To help maintain trouble-free operation, adhere to these precautions and guidelines when planning your rack installation:

- Install the system in a restrictive access location with means for a permanent grounding.
- Ensure the site of the rack includes provisions for source AC or DC power, grounding, and network interface cables.
- Allow sufficient space to work around the rack during the installation. You need at least 3 feet (91.44 cm) adjacent to the rack to move, align, and insert the chassis.
- Maintain at least 24 inches (61 cm) of clearance in front of, and behind the chassis for maintenance after installation.
- To mount the router between two posts or rails, the usable aperture (the width between the *inner* edges of the two mounting flanges) must be at least:
  - 17.75 inches (45.09 cm) for the Cisco ASR 9902 Router
  - 17.7 inches (45 cm) for the Cisco ASR 9001 Router
  - 17.75 inches (45.09 cm) for the Cisco ASR 9901 Router.
- Height of the:
  - Cisco ASR 9902 Router is 3.45 inches (8.77 cm)
  - Cisco ASR 9903 Router is 5.25 inches (13.34 cm)
  - Cisco ASR 9901 Router and Cisco ASR 9001 Router is 3.47 inches (8.8 cm)
- When fully populated with cards, the router can weigh as much as 37.91 pounds (17.2 kg), Cisco ASR 9902 Router can weigh as much as 42.19 pounds (19.14 kg). To maintain equipment rack stability and to ensure your safety, the rack is provided with stabilizing devices. Make sure you install the stabilizers before installing the router.
- If you use a telco-style rack, the weight of the chassis is cantilevered off the two rack posts. Make sure that:
  - Weight of the router does not make the frame unstable.
  - Frame is bolted to the floor and is secured to the building structure using either wall brackets or overhead brackets.
- When mounting the router in a telco-style rack or 4-post rack, be sure to use all the screws provided to secure the chassis to the rack posts.

- Install the cable-management brackets included with the router to keep cables organized. Be sure to use appropriate strain-relief methods to protect cables and equipment connections.
- To avoid noise interference in network interface cables, do not route them directly across or along power cables.

The following figures show the the chassis footprint and dimensions:

Figure 18: Cisco ASR 9902 Router Chassis Footprint and Dimensions—Top View

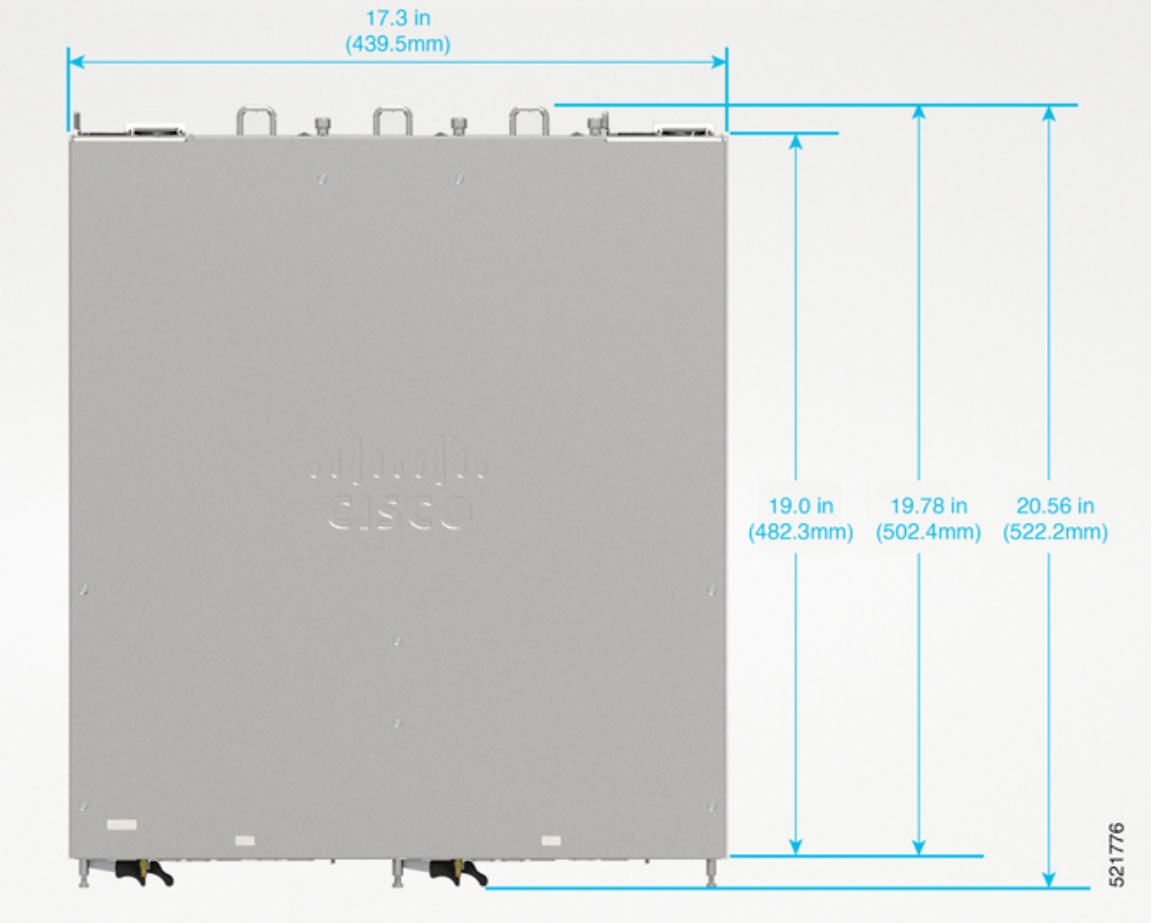


Figure 19: Cisco ASR 9903 Router Chassis Footprint and Dimensions—Top View

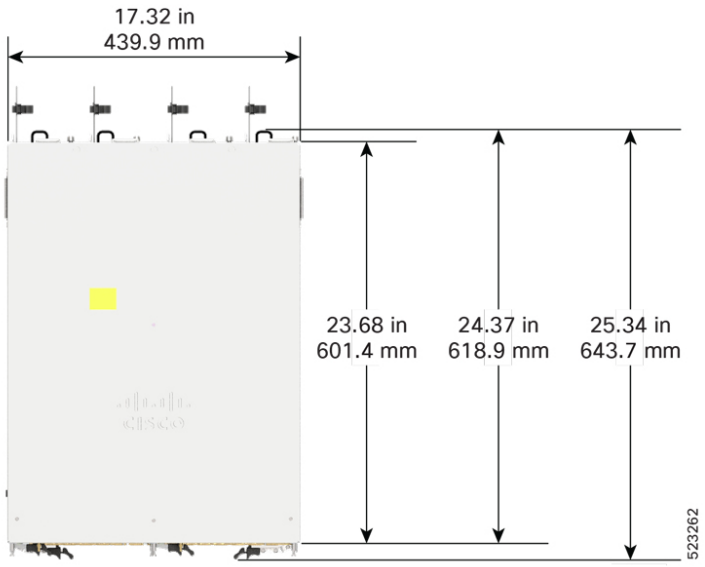


Figure 20: Cisco ASR 9901 Router Chassis Footprint and Dimensions—Top View

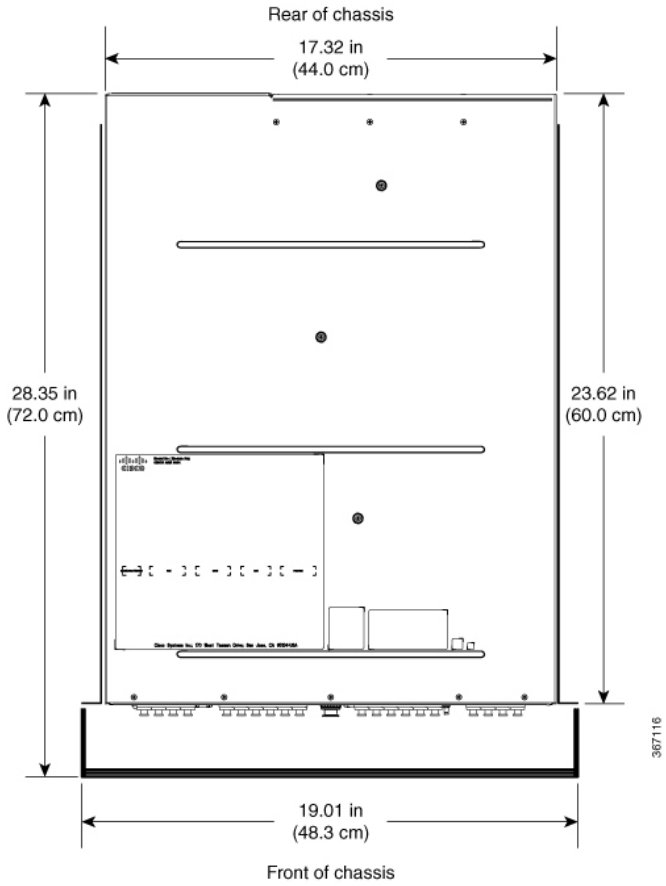
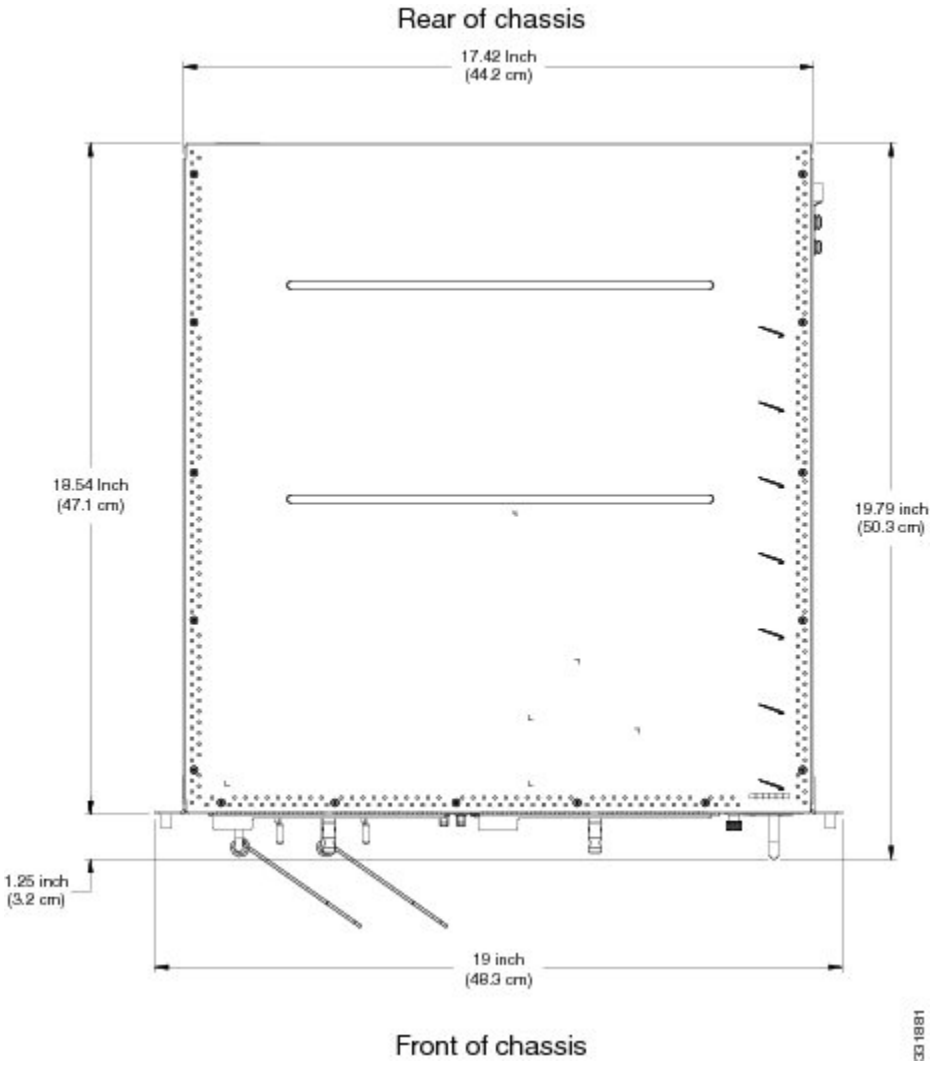


Figure 21: Cisco ASR 9001 Router Chassis Footprint and Dimensions—Top View



Site Wiring Guidelines

When planning the location of the router, consider distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility. If the wiring is run for any significant distance in an electromagnetic field, interference can occur between the field and the signals on the wires. Poor wiring can cause:

- Radio interference emanating from the wires.
- Strong EMI, especially when caused by lightning or radio transmitters. EMI can destroy the signal drivers and receivers in the router, and can even create an electrical hazard by conducting power surges through lines and into equipment.

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

Site wiring is unlikely to emit radio interference if you use twisted-pair cable with good distribution of grounding conductors. Use a high-quality twisted-pair cable with one ground conductor for each data signal, when applicable.

Give special consideration to the effect of lightning strikes in your vicinity, especially if the wiring exceeds recommended distances, or if it passes between buildings. The electromagnetic pulse (EMP) caused by lightning or other high-energy phenomena can easily induce enough energy into unshielded conductors, and destroy electronic devices. If you have experienced EMP problems in the past, you may want to consult experts in electrical surge suppression and shielding.

Most data centers cannot resolve infrequent, but potentially catastrophic, problems without pulse meters and other special equipment. In addition, these problems can take a great deal of time to identify and resolve. We recommend that you take the necessary precautions to avoid these problems by providing a properly grounded and shielded environment, with special attention to issues of electrical surge suppression.

Chassis Air Flow Guidelines

The fan trays located in the rear of a router circulate cool air from front-to-back through the router (Cisco ASR 9903, Cisco ASR 9902, and Cisco ASR 9901). However, the fan tray on Cisco ASR 9001 Router is located along the right side of the router and circulates cool air from right-to-left through the router.

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. Each power supply is also equipped with fans that draw cool air to cool the inner components.

Note Do not remove or insert fan trays in parallel. Allow the software to detect an insertion or removal event and wait for ten seconds between each event. If you do not wait between each event, you might cause the chassis to shut down.

The following images show air flow direction through Cisco ASR 9903, Cisco ASR 9902, Cisco ASR 9901, and Cisco ASR 9001 Router.

Figure 22: Air Flow Path through the Cisco ASR 9902 Router

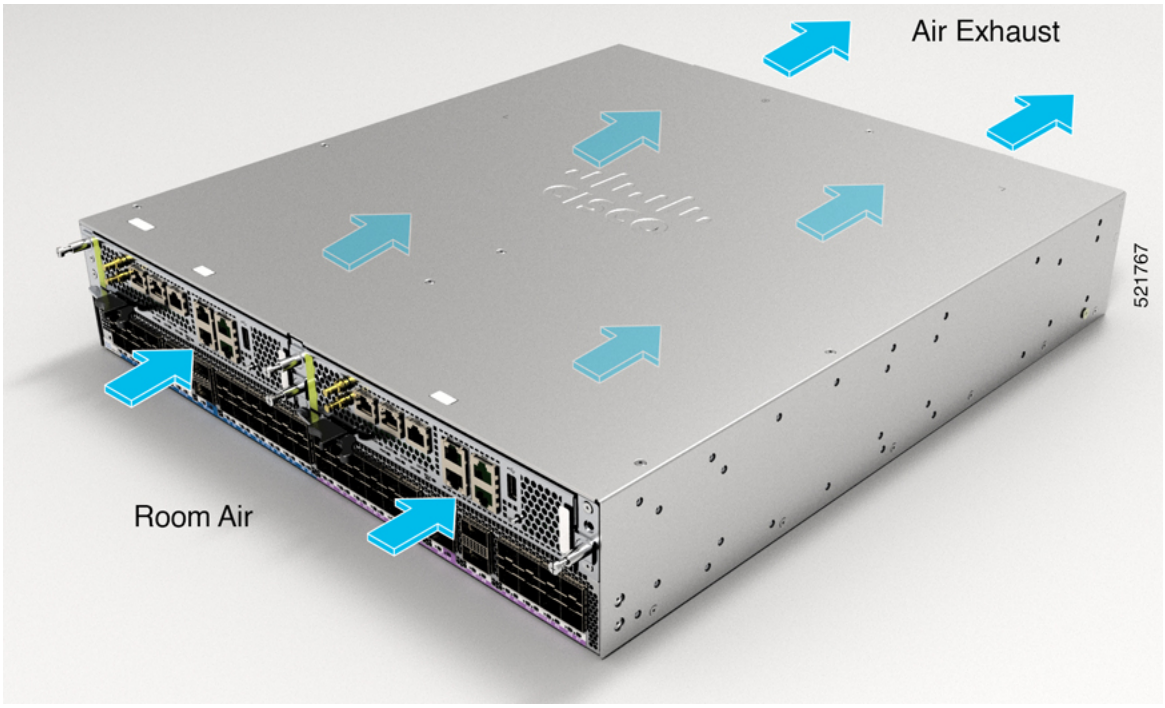


Figure 23: Air Flow Path through the Cisco ASR 9903 Router

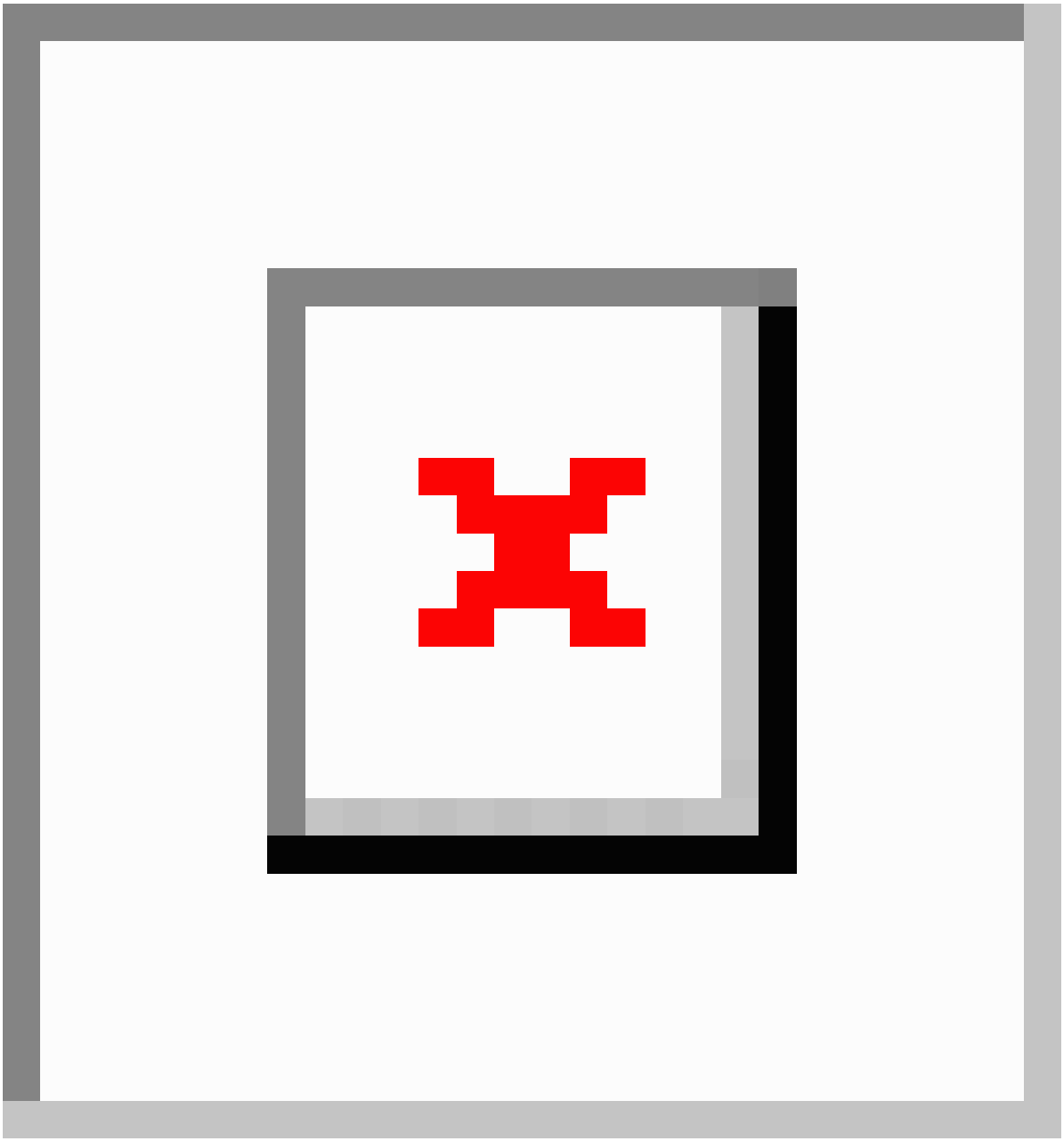


Figure 24: Air Flow Path through the Cisco ASR 9901 Router

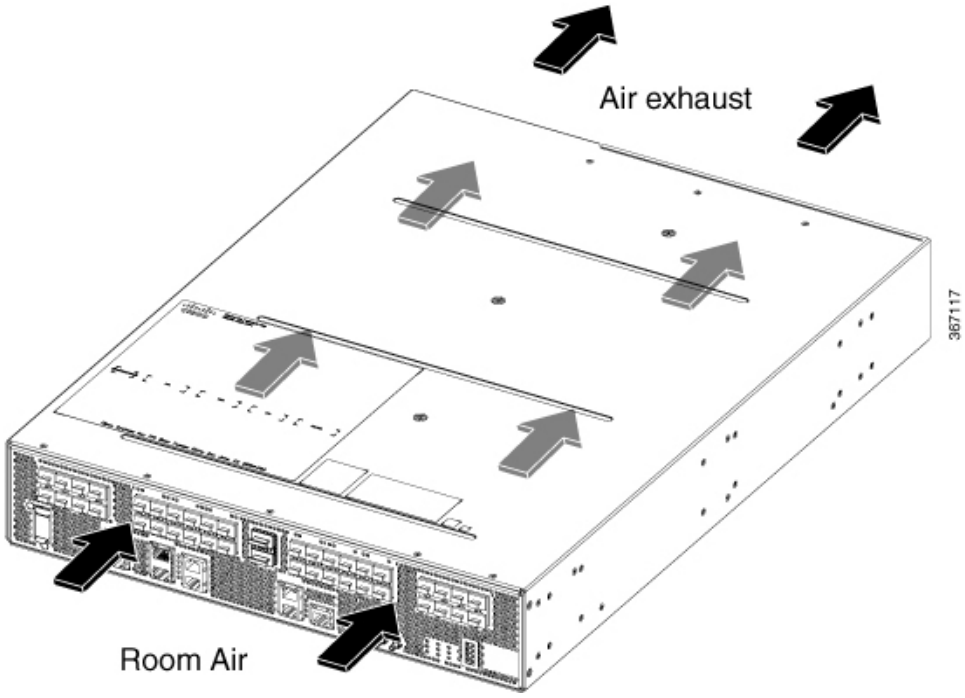
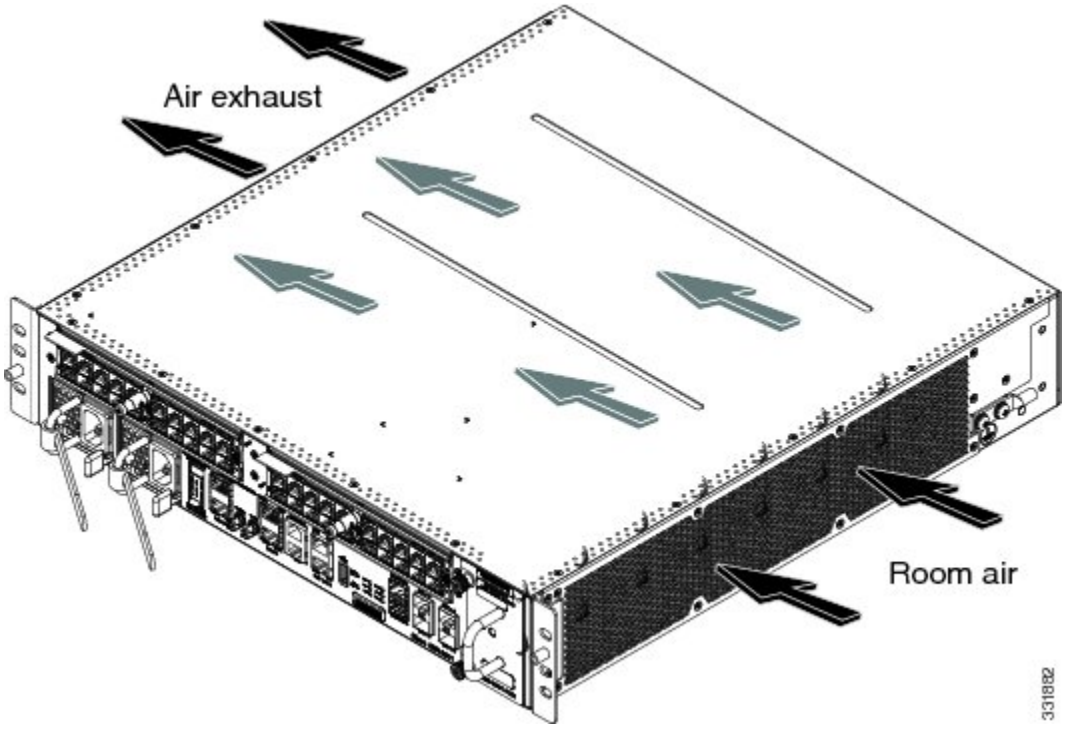


Figure 25: Air Flow Path through the Cisco ASR 9001 Router



When selecting a site to install the router, observe these guidelines:

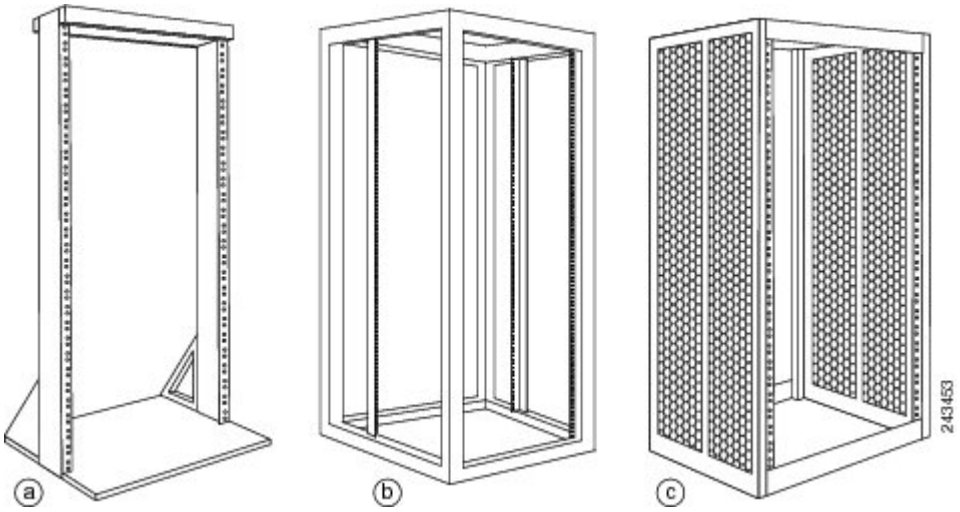
- Dust free area—Site should be as dust free as possible. Dusty environments can clog the power supply intake vents, reducing the cooling air flow through the router. Clogged filters and vents can cause an over-temperature condition in the router.
- Unrestricted air flow—Allow sufficient air flow by maintaining a minimum of 6 inches (15.24 cm) of clearance at both the inlet and exhaust openings on the chassis and the power modules. If the air flow is blocked or restricted, or if the inlet air is too warm, an over-temperature condition can occur within the router. Under extreme conditions, the environmental monitoring system powers off the router to protect the components.

Rack-Mounting and Air Flow Clearance Guidelines

The router can be mounted in most 2-post, 4-post, or telco-style 19-inch equipment racks that comply with the Electronics Industries Association (EIA) standard for equipment racks (EIA-310-D). The rack must have at least two posts with mounting flanges to mount the router chassis. 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 following figure shows examples of typical 2-post, 4-post, and telco-type equipment racks.

Figure 26: Equipment Rack Types



a	Telco-style rack	b	Free-standing, 4-post open rack with two mounting posts in the front, two mounting posts in the back or along each side	c	Free-star sides and

Telco 2-Post Rack

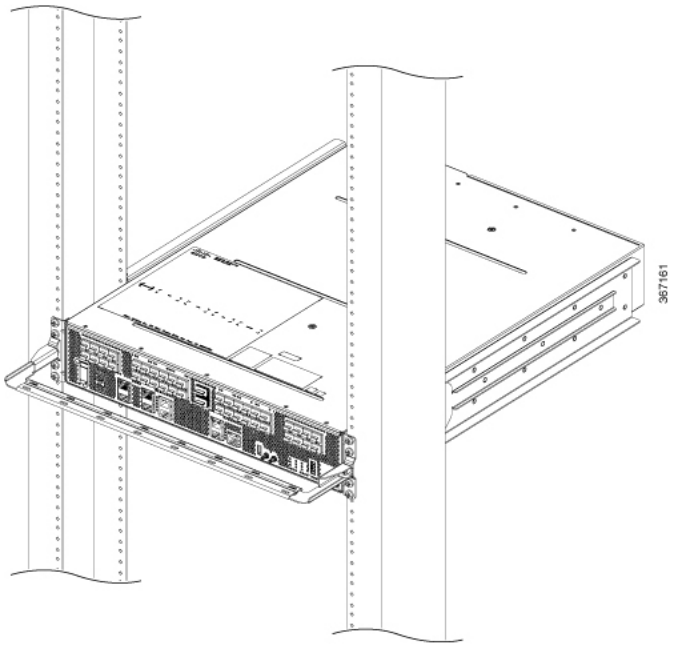
Item a in the above figure shows a telco-style rack. The *telco-style rack* is an open frame consisting of two posts tied together by a cross-bar at the top and a floor-stand at the bottom.

This type of rack is usually secured to the floor, and sometimes to an overhead structure or wall for additional stability. The router chassis can be installed in the telco-style rack only in a front-mounted position.

Cisco ASR 9901 and Cisco ASR 9902 Router

The Cisco ASR 9901 and Cisco ASR 9902 Router can be installed in 19-inch or 23-inch (with extension adapter plates) telco-style racks. The chassis is supported by slide rails that are installed on the rear of the rack posts. Mounting brackets are installed on the sides of the chassis and are inserted along the slide rails. The mounting brackets are then secured to the front of the rack posts (see the following figure).

Figure 27: Cisco ASR 9901 Router Mounted in a 2-Post Rack

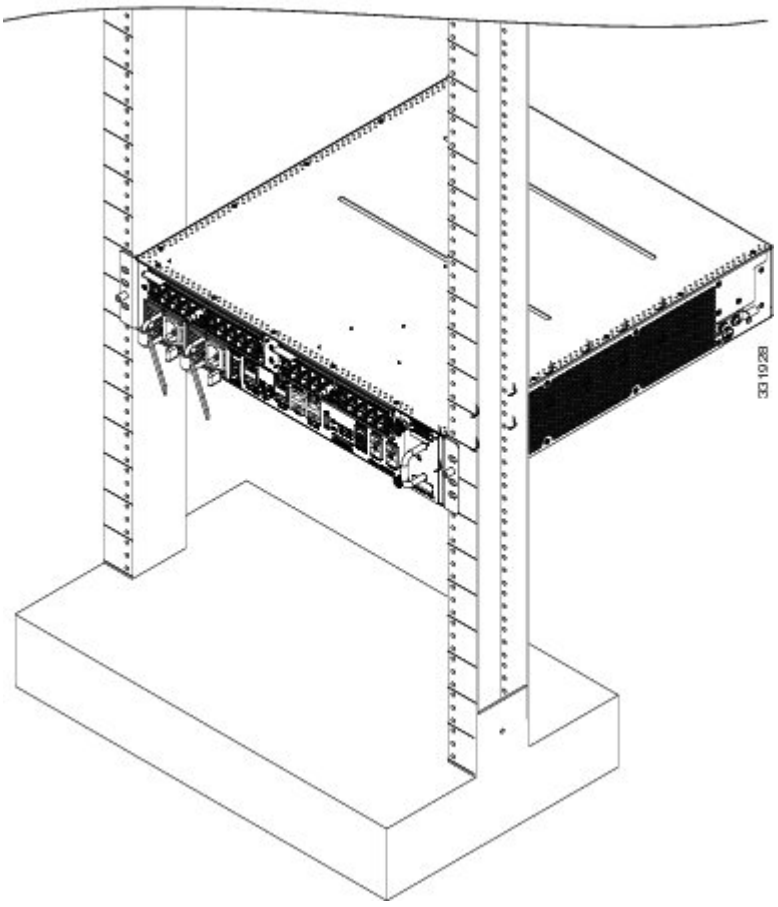


Cisco ASR 9001 Router

In the front-mounted position, you secure the chassis rack-mounting brackets directly to the rack posts (see the following figure).

Note The mounting brackets on the Cisco ASR 9001 Router chassis have a pair of holes at the top and bottom of each bracket and three slots (elongated holes). If the Cisco ASR 9001 Router is to be mounted in a 2-post 19-inch rack, you must first use the holes to locate and position the brackets on the rack. Insert screws through the bracket holes into the rack before inserting screws through the bracket slots.

Figure 28: Cisco ASR 9001 Router Mounted in a 2-Post Rack



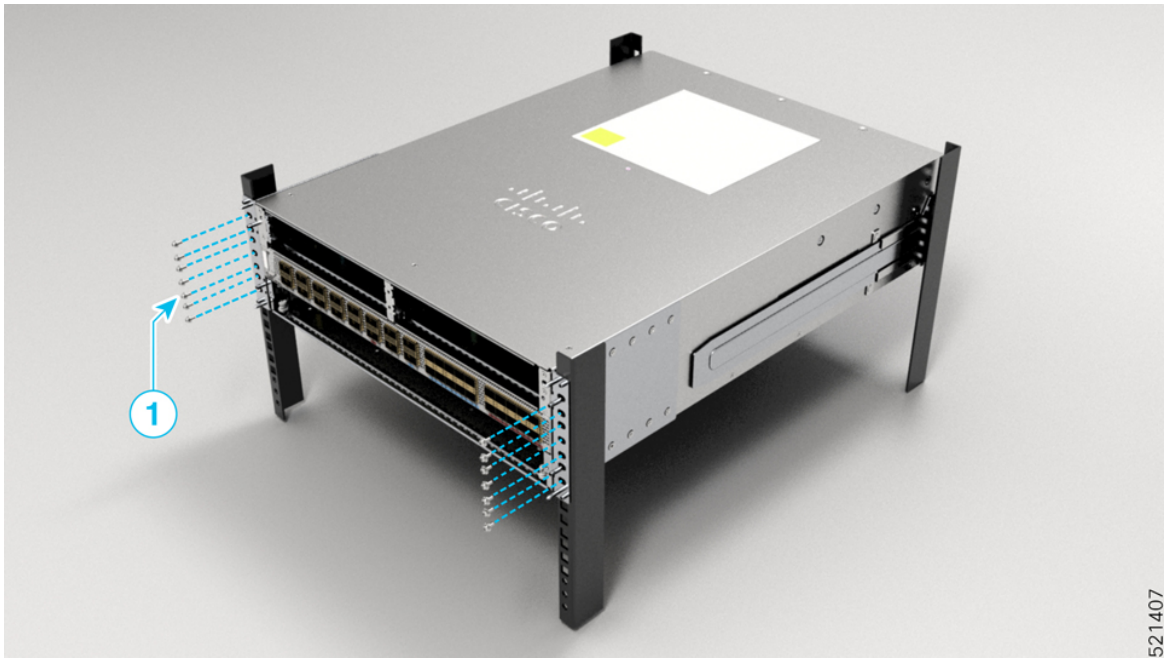
Open 4-Post Rack

Item b in Figure 26: Equipment Rack Types, on page 28 shows a free-standing, 4-post open rack with two mounting posts in the front and two mounting posts in the back or along the side. The mounting posts in this type of rack are often adjustable so that you can position the rack-mounted unit within the depth of the rack rather than flush-mount it with the front of the rack.

Two adjustable 4-post slide rails and two side-mounted guide brackets are provided for mounting the Cisco ASR 9901 Router in a 4-post rack. Two rear mounting brackets are provided for mounting the Cisco ASR 9001 Router in a 4-post rack.

You can install the Cisco ASR 9903 and Cisco ASR 9902 Router in 4-Post 19-inch (with extension adapter plates) telco-style racks. The chassis is supported by slide rails that are installed on the rear of the rack posts. Mounting brackets are installed on the sides of the chassis and are inserted along the slide rails. The mounting brackets are then secured to the front of the rack posts.

Figure 29: Cisco ASR 9903 Router Mounted in a 4-Post Rack



1	Screws on each side to attach the chassis to the rack

Item b in Figure 26: Equipment Rack Types, on page 28 shows a free-standing, 4-post open rack with two mounting posts in the front and two mounting posts in the back or along the side. The mounting posts in this type of rack are often adjustable so that you can position the rack-mounted unit within the depth of the rack rather than flush-mount it with the front of the rack. Two adjustable 4-post slide rails and two side-mounted guide brackets are provided for mounting the Cisco ASR 9903 router and Cisco ASR 9902 router.

Enclosed Rack with Perforated Sides

Item c in Figure 26: Equipment Rack Types, on page 28 shows a free-standing 4-post enclosed rack with perforated sides and two mounting posts in the front.

Caution The fan tray on the Cisco ASR 9001 Router is located on the side of the chassis. Therefore, do not install the router in any type of fully-enclosed rack that does not have the required perforated sides or doors. The router requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of fully-enclosed rack without proper perforation could disrupt the air flow, trap heat next to the chassis, and cause an over-temperature condition inside the router.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco ASR 9902, Cisco ASR 9903, Cisco ASR 9901, or Cisco ASR 9001 Router in an enclosed cabinet, you must remove the front and rear doors of the cabinet. You can also perforate front and rear doors with a minimum of 65% open area (70% for ETSI 800mm racks).

Cisco ASR 9902, and Cisco ASR 9903

If you are mounting the Cisco ASR 9902, or Cisco ASR 9903 chassis in a 4-post enclosed cabinet, ensure that you have a minimum of 6 inches (15.24 cm) of clearance at the front and the rear of the chassis.

The following figure shows the airflow clearance requirements for mounting the router in a 4-post enclosed rack.

Figure 30: Cisco ASR 9902 Clearance Requirements for an Enclosed Rack Installation

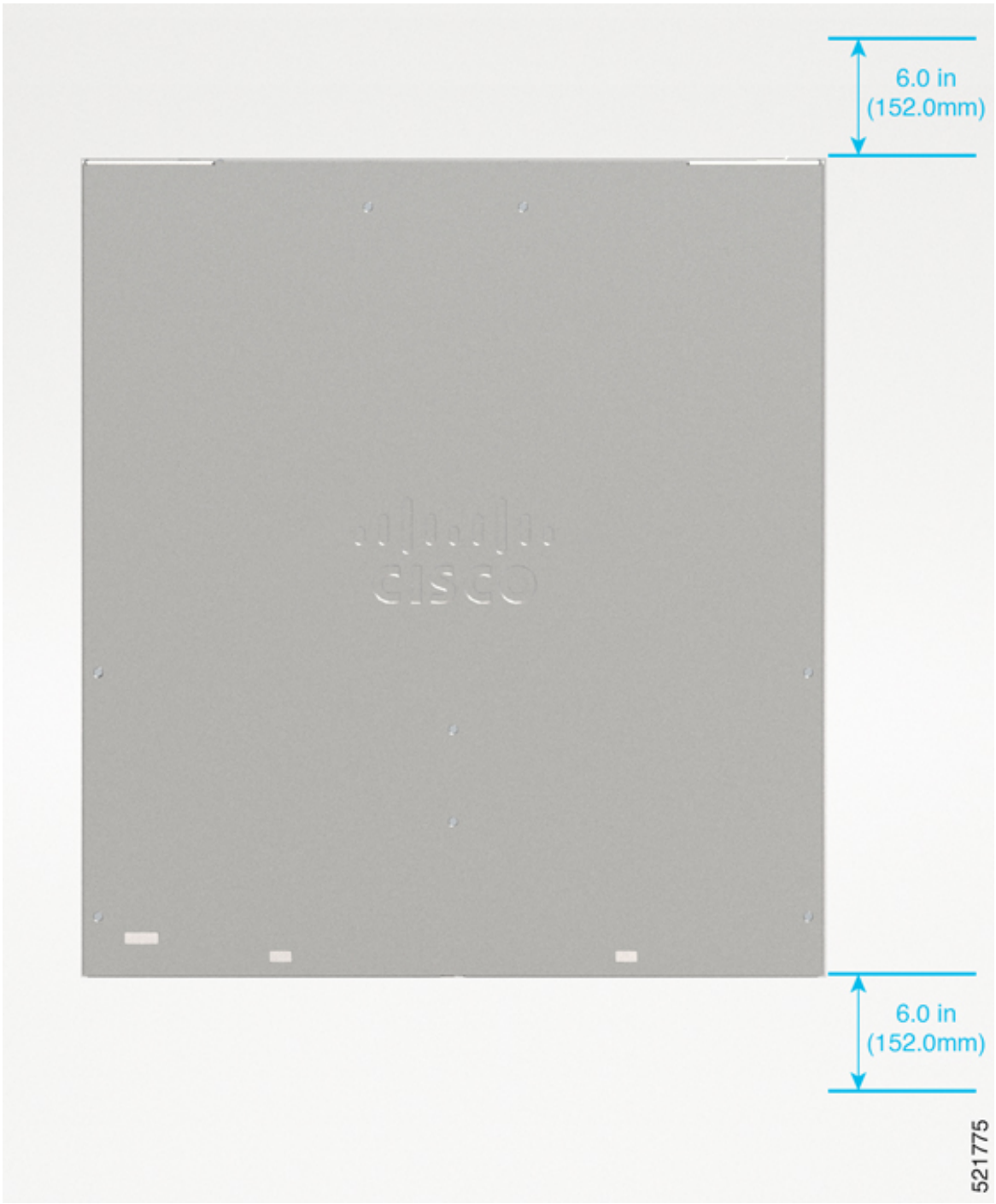
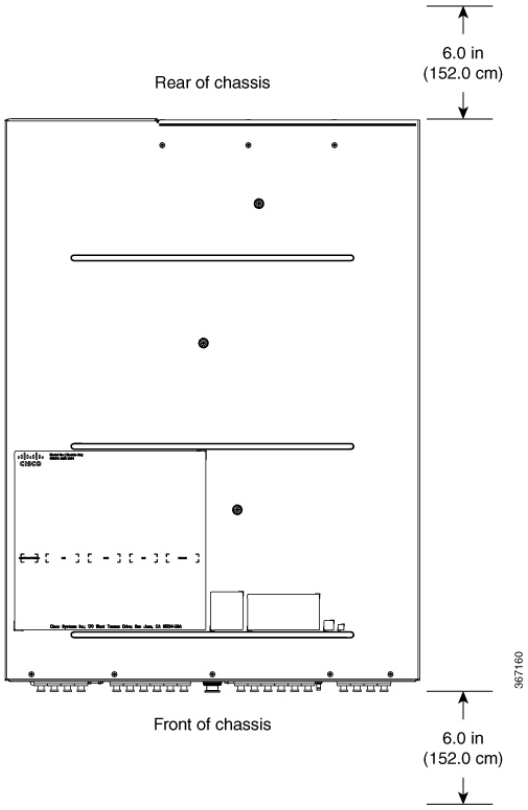


Figure 31: ASR 9903 Clearance Requirements for an Enclosed Rack Installation

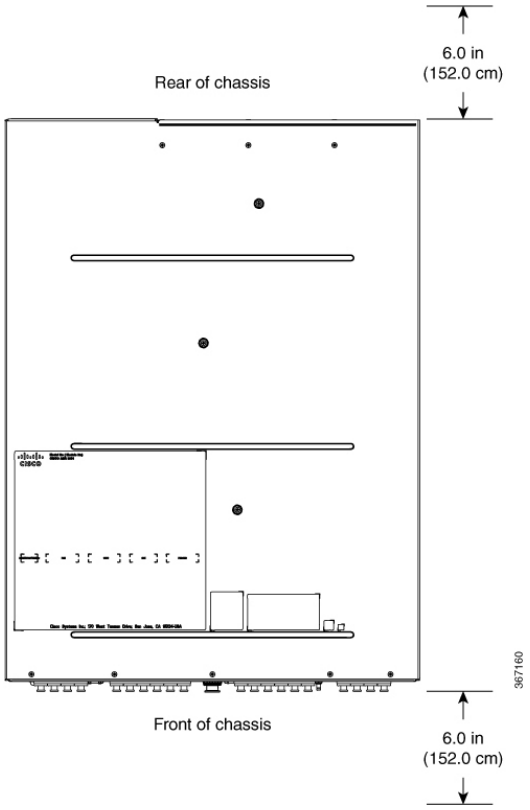


Cisco ASR 9901

If you are mounting the Cisco ASR 9901 chassis in a 2-post or 4-post enclosed cabinet, ensure that you have minimum of 6 inches (15.24 cm) of clearance in the front and rear of the chassis.

The following figure shows the airflow clearance requirements for mounting the Cisco ASR 9901 Router in a 2-post or 4-post enclosed rack.

Figure 32: ASR 9901 Clearance Requirements for an Enclosed Rack Installation



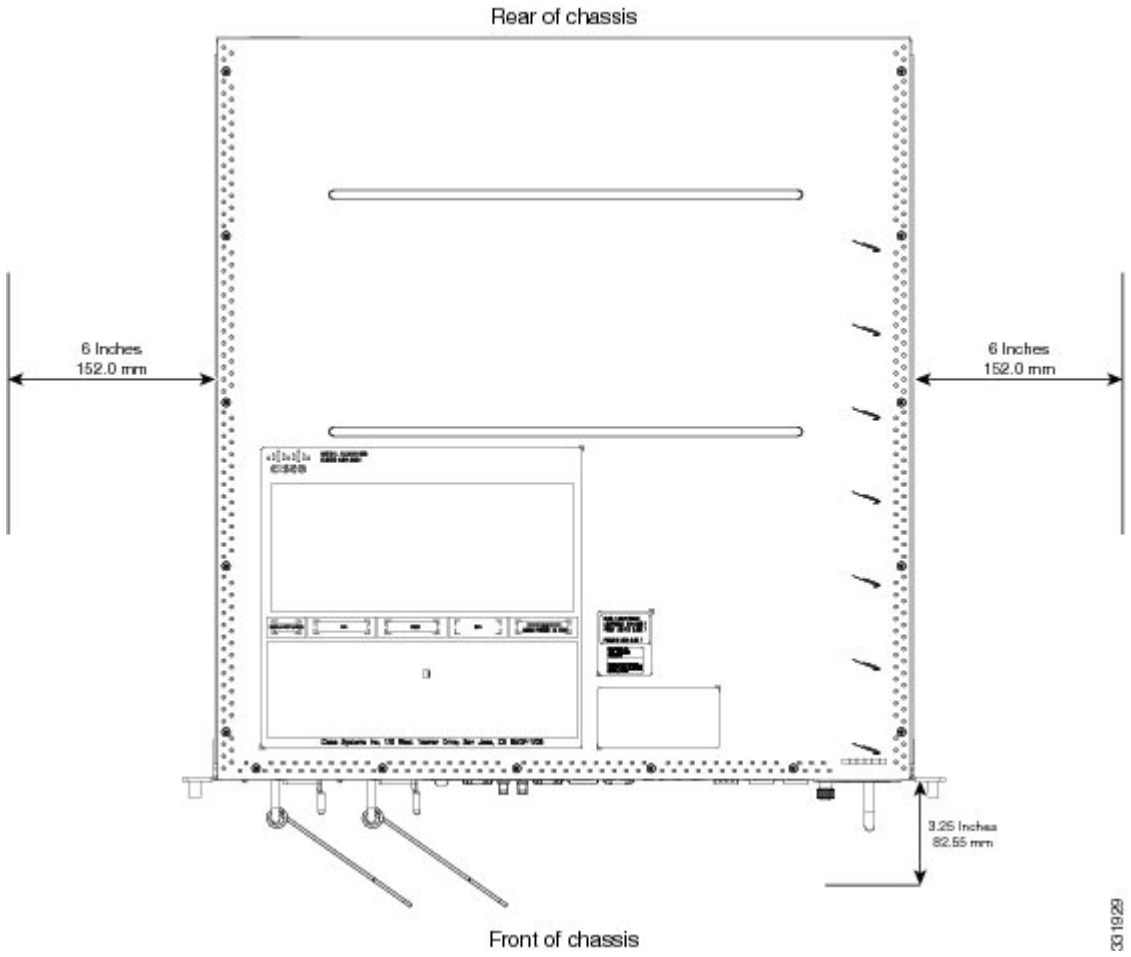
Cisco ASR 9001

If you are mounting the Cisco ASR 9001 chassis in a 4-post enclosed cabinet, ensure that you have the following clearances around the chassis:

- Rear: Minimum of 3.15 inches (8.00 cm) of clearance
- Sides: Minimum of 6 inches (15.24 cm) of clearance on each side of the chassis.

The following figure shows the side and rear chassis airflow clearance requirements for mounting the Cisco ASR 9001 Router in a 4-post enclosed rack.

Figure 33: ASR 9001 Clearance Requirements for an Enclosed 4-Post Rack Installation



Temperature and Humidity Guidelines

The operating and nonoperating environmental site requirements are listed in Environmental Specifications, on page 202. The router normally operates within the ranges listed in Environmental Specifications, on page 202; however, if a temperature measurement is approaching a minimum or maximum parameter, it indicates a potential problem. Maintain normal operation by anticipating and correcting environmental anomalies before they approach critical values, by properly planning and preparing your site before you install the router.

Power Connection Guidelines

You can configure the router with either an AC-input or DC-input power subsystem, so the site power source requirements differ depending on the power subsystem in your router. Ensure all power connection wiring conforms to the rules and regulations in the National Electrical Code (NEC) as well as local codes.

⚠

Caution Each Cisco ASR 9902, Cisco ASR 9903, Cisco ASR 9901, or Cisco ASR 9001 Router is powered by only one type of input: AC or DC. A hybrid (AC+DC) power configuration is not supported.

Caution Proper grounding is necessary to avoid damage from lightning and power surges. See NEBS Supplemental Unit Bonding and Grounding Guidelines, on page 58 for grounding requirements.

AC Powered Routers

Cisco ASR 9902 and Cisco ASR 9903

AC power modules operate within the following input range:

- High line rate: 200 V to 240 V
- Low line rate: 90 V to 130 V

Note The Cisco ASR 9903 Router's AC power supply can handle both low line voltage of 120V and high line voltage of 220V. Whenever there is a swap between the two voltage types, you must first remove the power supply from the chassis and apply the new voltage source.

The AC power module operates in 50 to 60 Hz and requires a minimum service of:

- 15 A for operation in North America and Japan
- 10 A for international operation
- 13 A for operation in the UK

Note

- A total of two AC or DC power supplies are allowed in the Cisco ASR 9902 chassis.
- A total of four AC or DC power supplies are allowed in the Cisco ASR 9903 chassis.

Each AC power inputs requires a separate dedicated branch circuit.

The following table lists the countries, part number, length of the power cords, and power cord ratings for the Cisco ASR 9903 AC-input power supply modules. For more information on Cisco product numbers (PIDs) and their detailed description of power cords, refer to Dynamic Configuration Tool.

Table 9: AC-Input Power Cord Options for Cisco ASR 9902 Router

Locale	Part Number	Length	Power Cord Rating
Argentina	CAB-TA-AR	14 ft (4.26 m)	10A, 250 VAC
Australia	CAB-TA-AP	14 ft (4.26 m)	10A, 250 VAC
North America	CAB-TA-NA	9 ft (2.50 m)	15A, 125 VAC

Locale	Part Number	Length	Power Cord Rating
China	CAB-TA-CN	14 ft (4.26 m)	10A, 250 VAC
Europe	CAB-TA-EU	14 ft (4.26 m)	10A, 250 VAC
India	CAB-TA-IN	14 ft (4.26 m)	10A, 250 VAC
Israel	CAB-TA-IS	14 ft (4.26 m)	10A, 250 VAC
Italy	CAB-TA-IT	14 ft (4.26 m)	10A, 250 VAC
Japan	CAB-TA-250V-JP	14 ft (4.26 m)	15A, 250 VAC
Japan Cabinet Jumper Power Cord	CAB-C15-CBN-JP	14 ft (4.26 m)	12A, 250 VAC
Switzerland	CAB-TA-SW	14 ft (4.26 m)	10A, 250 VAC
UK	CAB-TA-UK	14 ft (4.26 m)	10A, 250 VAC
Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	CAB-C15-CBN	14 ft (4.26 m)	13A, 250 VAC
C9600 AC IEC C15 to NEMA L6-20P cable	CAB-AC-2KW-CBL	14 ft (4.26 m)	13A, 250 VAC

Table 10: AC-Input Power Cord Options for Cisco ASR 9903 Router

Locale	Part Number	Length	Power Cord Rating
Argentina	CAB-TA-AR	14 ft (4.26 m)	10A, 250 VAC
Australia	CAB-TA-AP	14 ft (4.26 m)	10A, 250 VAC
China	CAB-TA-CN	14 ft (4.26 m)	10A, 250 VAC
Europe	CAB-TA-EU	14 ft (4.26 m)	10A, 250 VAC
India	CAB-TA-IN	14 ft (4.26 m)	10A, 250 VAC

Locale	Part Number	Length	Power Cord Rating
Israel	CAB-TA-IS	14 ft (4.26 m)	10A, 250 VAC
Italy	CAB-TA-IT	14 ft (4.26 m)	10A, 250 VAC
Japan	CAB-TA-250V-JP	14 ft (4.26 m)	15A, 250 VAC
Japan Cabinet Jumper Power Cord	CAB-C15-CBN-JP	14 ft (4.26 m)	12A, 250 VAC
Switzerland	CAB-TA-SW	14 ft (4.26 m)	10A, 250 VAC
UK	CAB-TA-UK	14 ft (4.26 m)	10A, 250 VAC
North America AC 2KW Power Cable, Right Angle	CAB-AC-2KW-RA-NA	14 ft (4.26 m)	13A, 250 VAC
Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	CAB-C15-CBN	14 ft (4.26 m)	13A, 250 VAC
C9600 AC IEC C15 to NEMA L6-20P cable	CAB-AC-2KW-CBL	14 ft (4.26 m)	13A, 250 VAC

Cisco ASR 9901

AC power modules operate in the input range of 100 VAC to 240 VAC, 50 to 60 Hz and require a minimum service of:

- 15 A for operation in North America and Japan
- 10 A for international operation
- 13 A for operation in the UK

Each of the AC power inputs requires a separate dedicated branch circuit. For a list of the nominal and acceptable value ranges for source AC power, see AC Input Voltage Range, on page 207.

The following table lists the AC-input power cord options, specifications, and Cisco product numbers for the Cisco ASR 9901 AC-input power supply modules. This table also references power cord illustrations. For more information on Cisco product numbers (PIDs) and their detailed description of power cords, refer to Dynamic Configuration Tool.

Table 11: AC-Input Power Cord Options for Cisco ASR 9901 Router

Locale	Part Number	Length	Power Cord Rating
Argentina	CAB-AC-16A-SG-AR	14 ft (4.26 m)	16A, 250 VAC

Locale	Part Number	Length	Power Cord Rating
Australia	CAB-AC-16A-SG-AZ	14 ft (4.26 m)	16A, 250 VAC
Brazil	CAB-AC-16A-SG-BR	14 ft (4.26 m)	16A, 250 VAC
China	CAB-AC-16A-SG-CH	14 ft (4.26 m)	16A, 250 VAC
Europe	CAB-AC-16A-SG-EU	14 ft (4.26 m)	16A, 250 VAC
India	CAB-AC-16A-SG-IND	14 ft (4.26 m)	16A, 250 VAC
International/UK	CAB-AC-16A-SG-IN	14 ft (4.26 m)	16A, 250 VAC
Israel	CAB-AC-16A-SG-IS	14 ft (4.26 m)	16A, 250 VAC
Italy	CAB-AC-16A-SG-IT	14 ft (4.26 m)	16A, 250 VAC
Japan	CAB-AC-16A-SG-JPN	14 ft (4.26 m)	16A, 250 VAC
South Africa	CAB-AC-16A-SG-SA	14 ft (4.26 m)	16A, 250 VAC
Switzerland	CAB-AC-16A-SG-SW	14 ft (4.26 m)	16A, 250 VAC
UK	CAB-AC-16A-SG-UK	14 ft (4.26 m)	16A, 250 VAC
North America (non locking) 110 VAC operation	CAB-AC-20A-SG-US	14 ft (4.26 m)	20A, 110 VAC
North America (locking) 125 VAC operation	CAB-AC-20A-SG-US1	14 ft (4.26 m)	20A, 125 VAC
North America (non locking) 200-240 VAC operation	CAB-AC-20A-SG-US2	14 ft (4.26 m)	20A, 250 VAC
North America (locking) 200-240 VAC operation	CAB-AC-20A-SG-US3	14 ft (4.26 m)	20A, 250 VAC
North America 277 VAC operation	CAB-AC-20A-SG-US4	14 ft (4.26 m)	20A, 277 VAC
North America Cabinet Jumper Power Distribution unit (PDU)	CAB-AC-20A-SG-C20	14 ft (4.26 m)	20A, 250 VAC

Locale	Part Number	Length	Power Cord Rating
North America, Ring Terminal source plug	CAB-HV-25A-SG-US2	14 ft (4.26 m)	20A, 300 VAC/500 VDC
International IEC/EU, Ring Terminal source plug	CAB-HV-25A-SG-IN2	14 ft (4.26 m)	20A, 300 VAC/500 VDC
International IEC/EU	CAB-HV-25A-SG-IN3	14 ft (4.26 m)	20A, 300 VAC

AC Power Cord Illustrations for Cisco ASR 9901 Router

This section contains the AC power cord illustrations, as described in the above table. Note that an AC power cord may be used with several power supplies.

Figure 34: CAB-AC-16A-SG-AR Power Cord

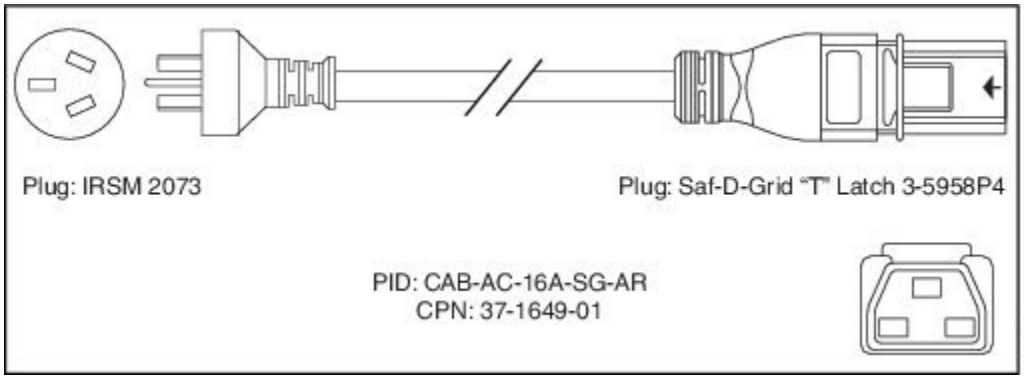


Figure 35: CAB-AC-16A-SG-AZ Power Cord

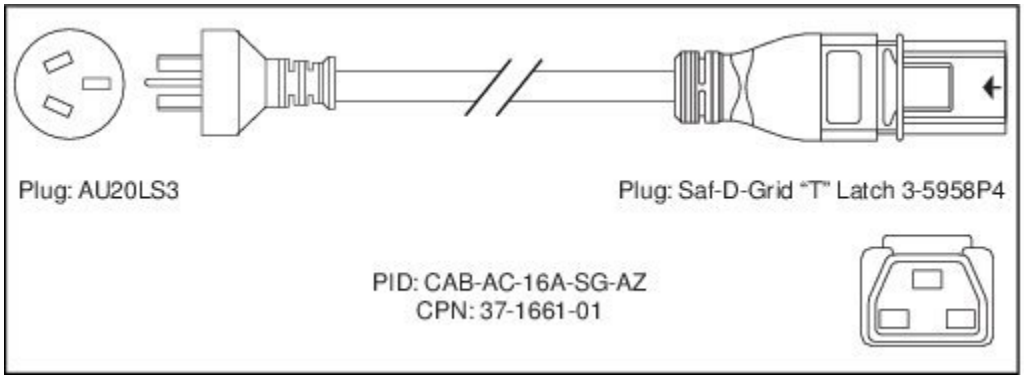


Figure 36: CAB-AC-16A-SG-BR Power Cord

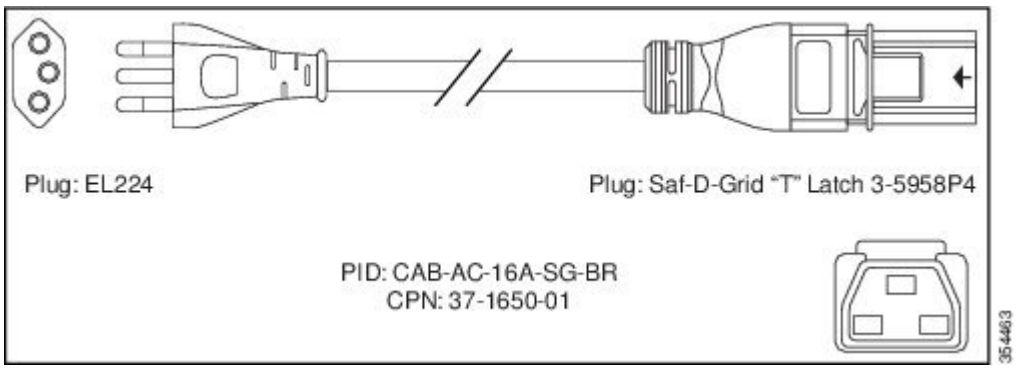


Figure 37: CAB-AC-16A-SG-CH Power Cord

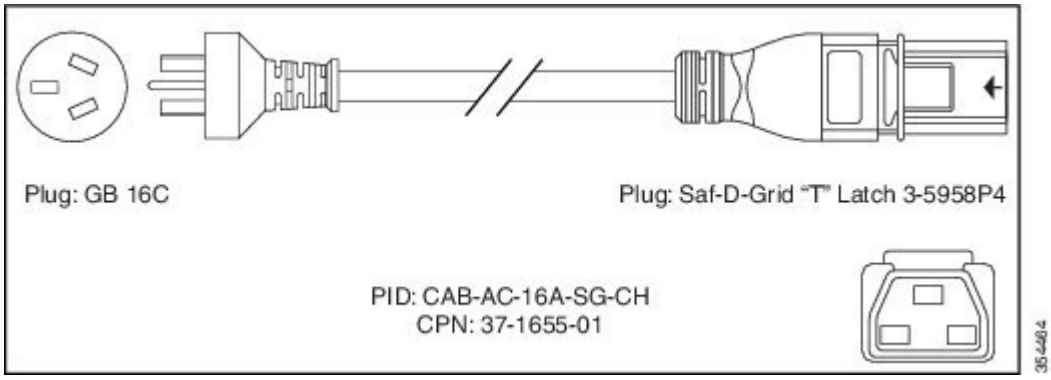


Figure 38: CAB-AC-16A-SG-EU Power Cord

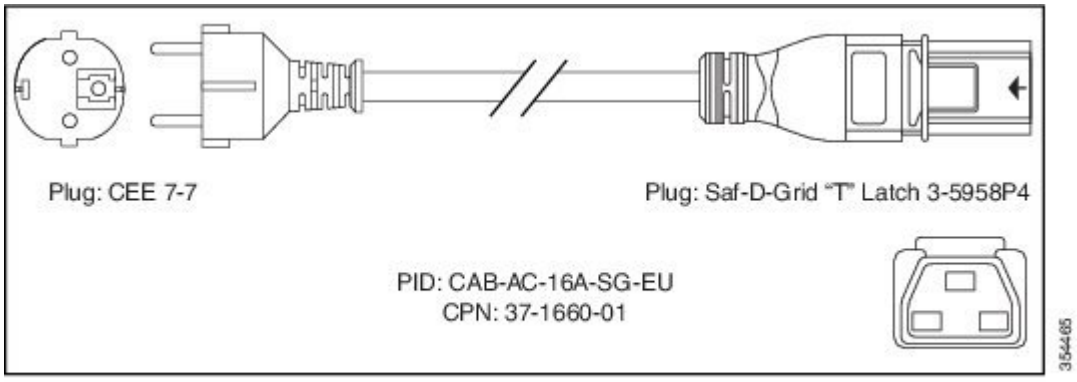


Figure 39: CAB-AC-16A-SG-IND Power Cord

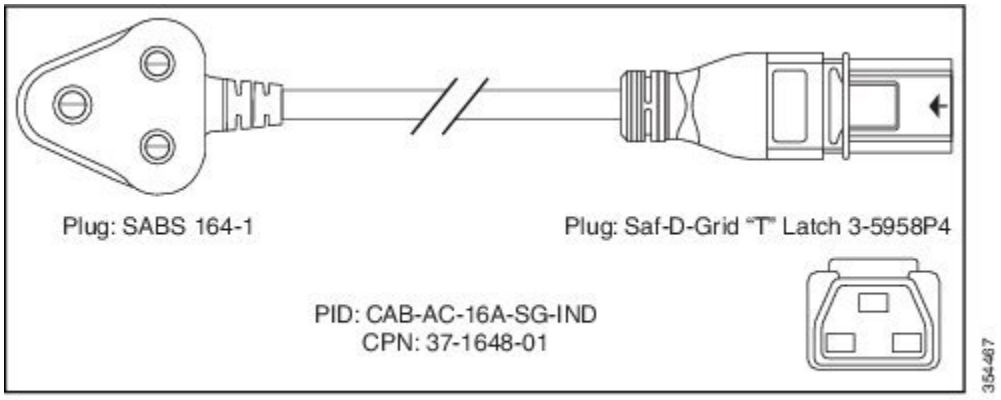


Figure 40: CAB-AC-16A-SG-IN Power Cord

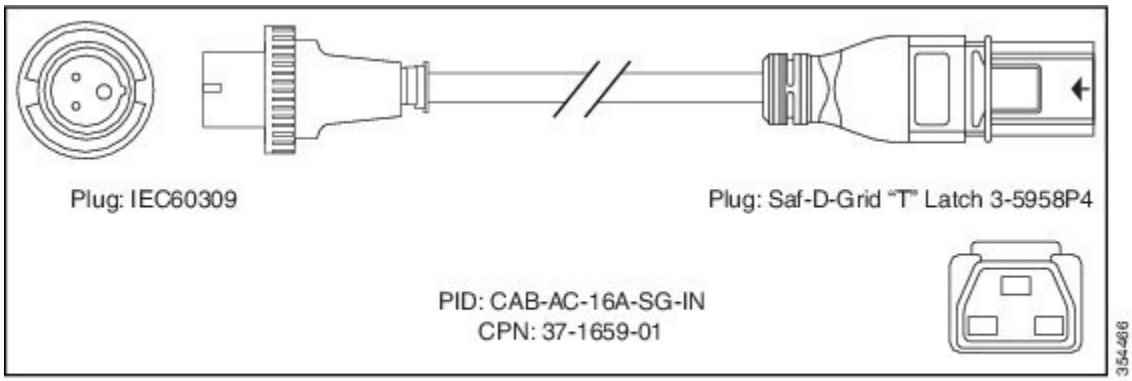


Figure 41: CAB-AC-16A-SG-IS Power Cord

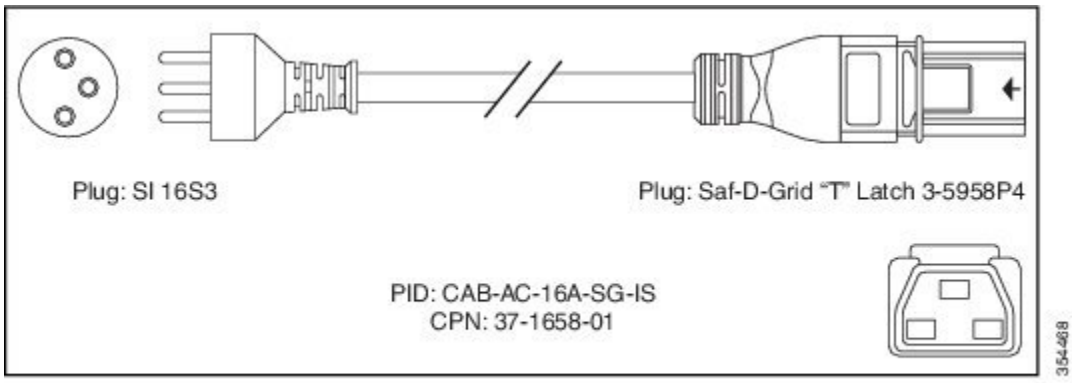


Figure 42: CAB-AC-16A-SG-IT Power Cord

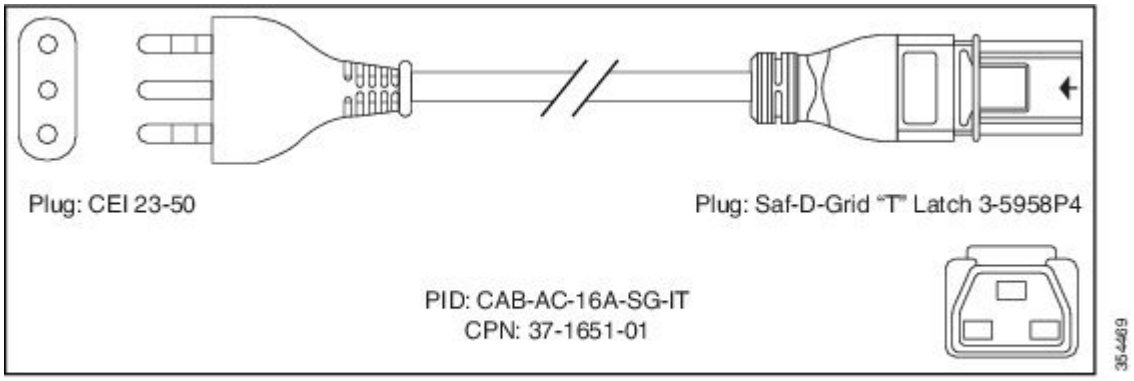


Figure 43: CAB-AC-16A-SG-JPN Power Cord

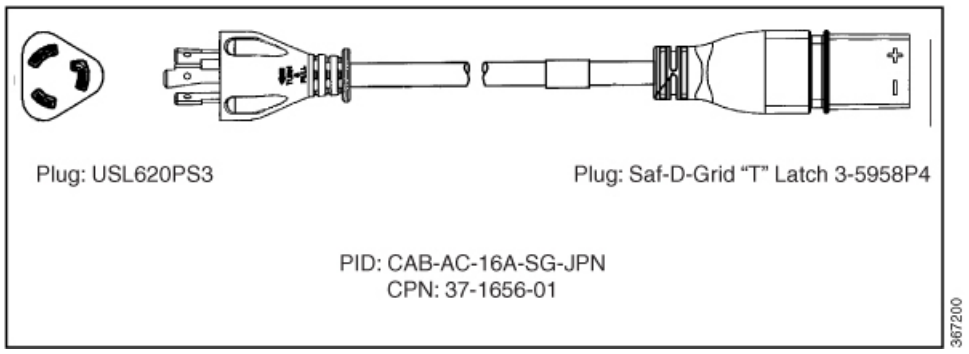


Figure 44: CAB-AC-16A-SG-SA Power Cord

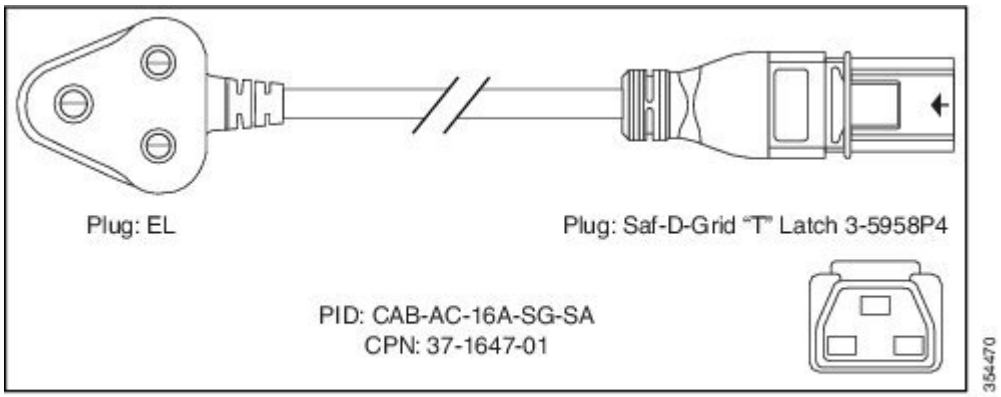


Figure 45: CAB-AC-16A-SG-SW Power Cord

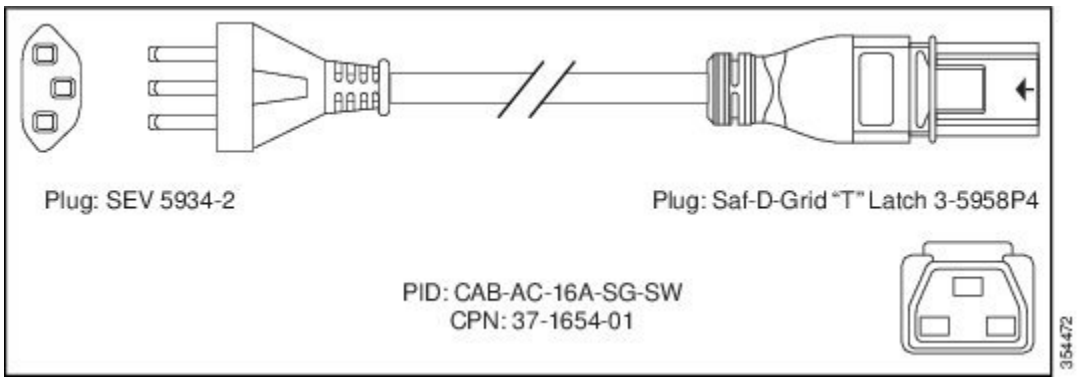


Figure 46: CAB-AC-16A-SG-UK Power Cord

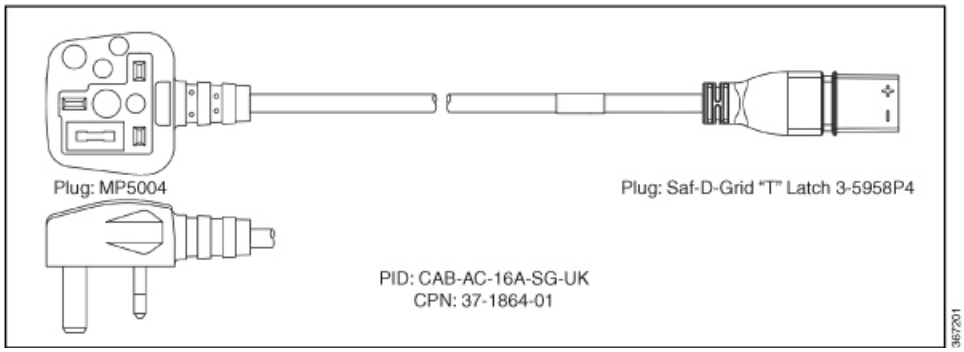


Figure 47: CAB-AC-20A-SG-US Power Cord

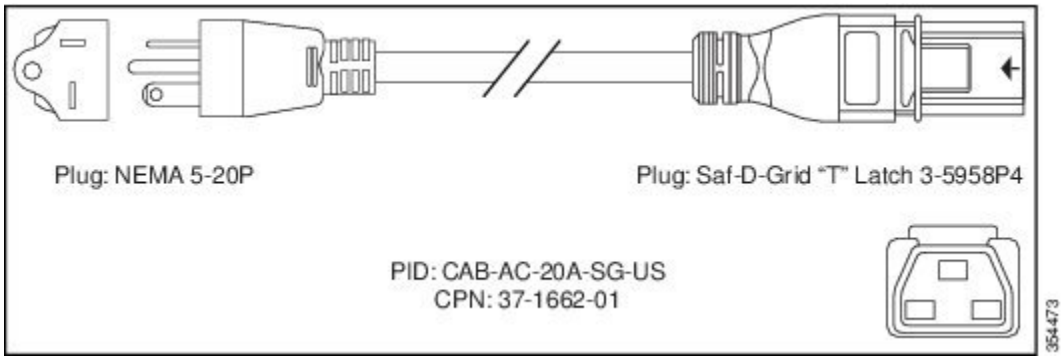


Figure 48: CAB-AC-20A-SG-US1 Power Cord

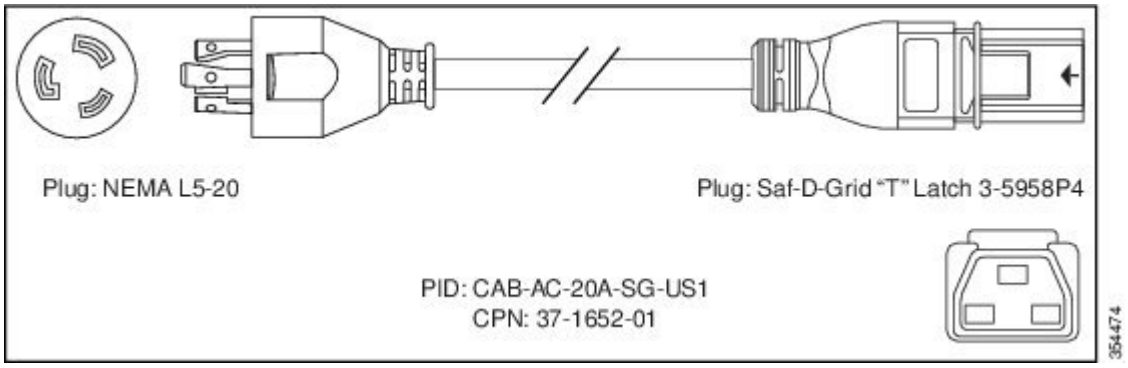


Figure 49: CAB-AC-20A-SG-US2 Power Cord

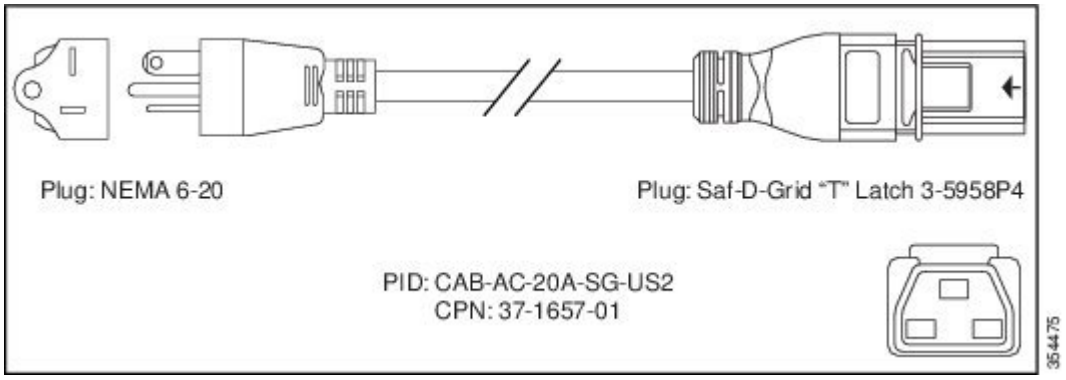


Figure 50: CAB-AC-20A-SG-US3 Power Cord

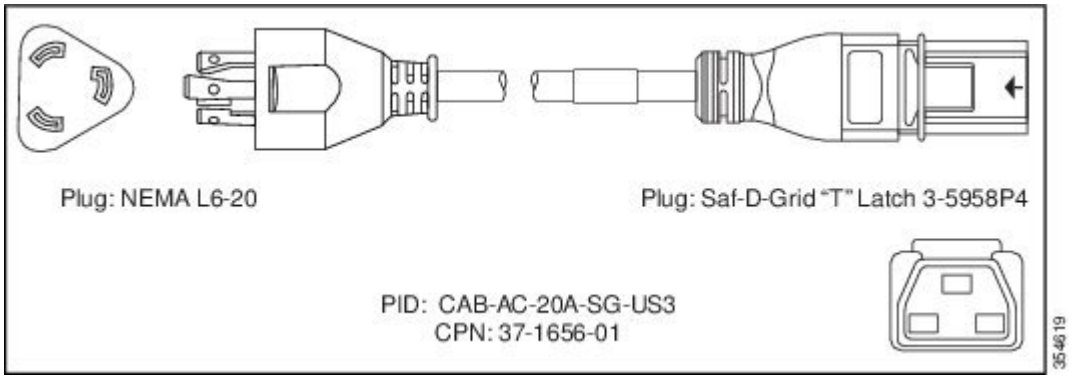


Figure 51: CAB-AC-20A-SG-US4 Power Cord

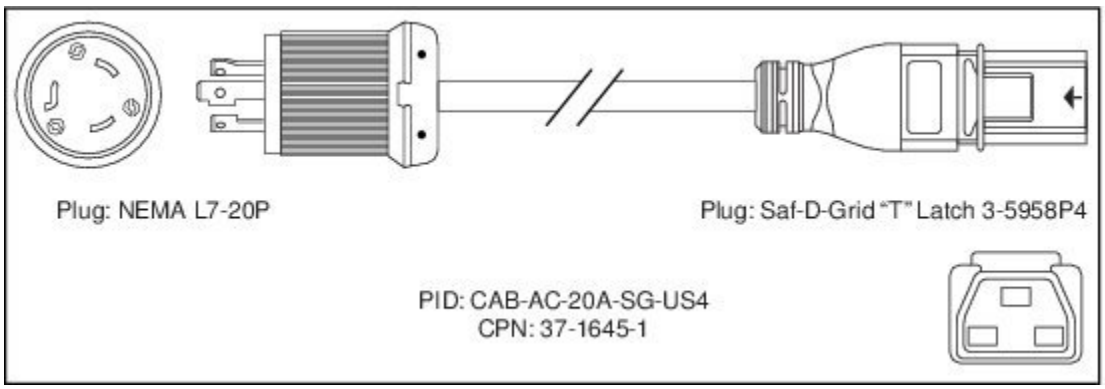


Figure 52: CAB-AC-20A-SG-C20 Power Cord

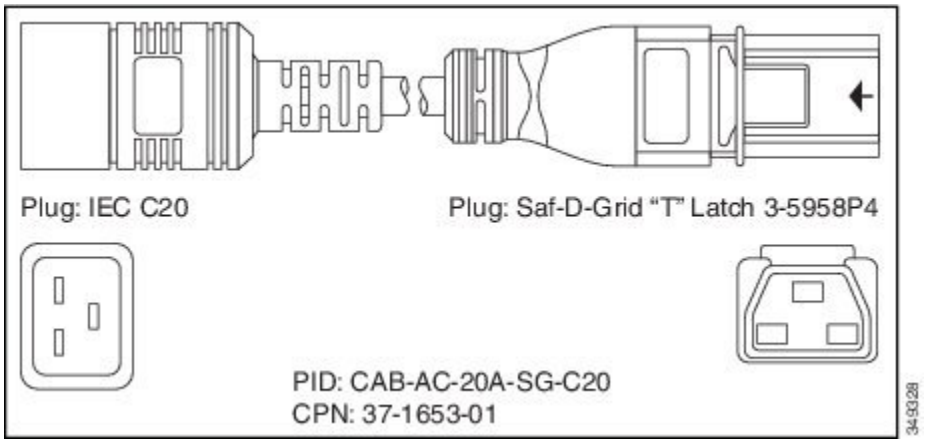


Figure 53: CAB-HV-25A-SG-US2 Power Cord

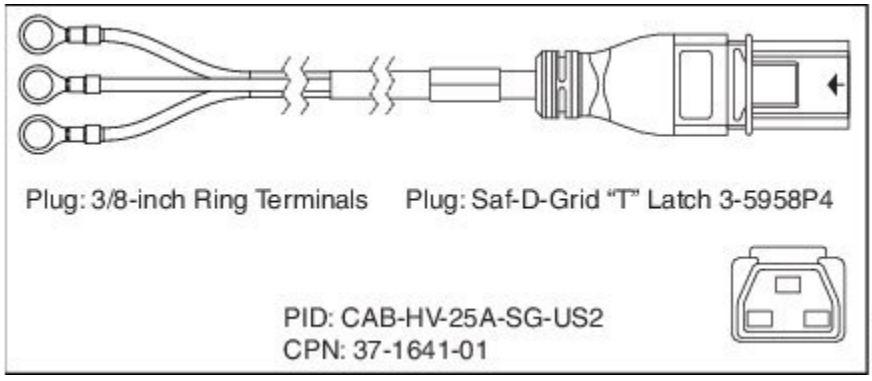


Figure 54: CAB-HV-25A-SG-IN2 Power Cord

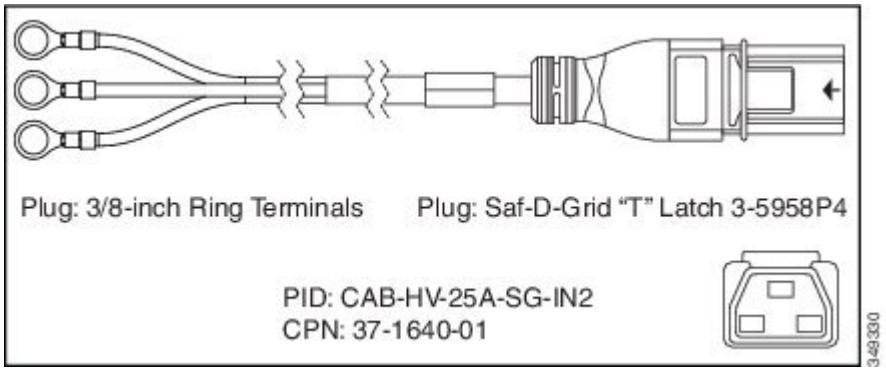
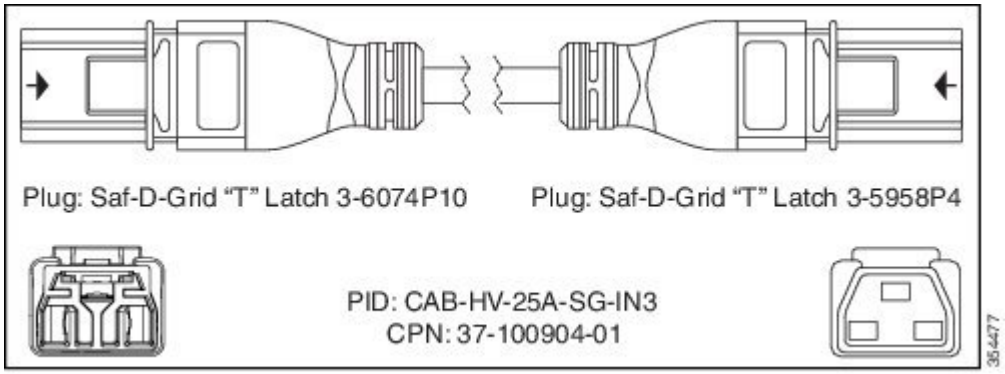


Figure 55: CAB-HV-25A-SG-IN3 Power Cord



Cisco ASR 9001

AC power modules operate in the input range of 100 VAC to 240 VAC, 50 to 60 Hz and require a minimum service of:

- 15 A for operation in North America and Japan
- 10 A for international operation
- 13 A for operation in the UK

Each of the AC power inputs requires a separate dedicated branch circuit. For a list of the nominal and acceptable value ranges for source AC power, see AC Input Voltage Range, on page 207.

The following table lists the AC-input power cord options, specifications, and Cisco product numbers for the Cisco ASR 9001 AC-input power supply modules. This table also references power cord illustrations. For more information on Cisco product numbers (PIDs) and their detailed description of power cords, refer to Dynamic Configuration Tool.

Table 12: AC-Input Power Cord Options for ASR 9001 Router

Locale	Part Number	Length	Power Cord Rating
USA	CAB-AC	8.2 feet (2.5 m)	15 A, 250 V

Locale	Part Number	Length	Power Cord Rating
Japan	CAB-L620P-C13-JPN	8.2 feet (2.5 m)	15 A, 250 V
Australia	CAB-ACA	8.2 feet (2.5 m)	10 A, 250 V
Italy	CAB-ACI	8.2 feet (2.5 m)	10 A, 250 V
Argentina	CAB-ACR	8.2 feet (2.5 m)	10 A, 250 V
Switzerland	CAB-ACS	8.2 feet (2.5 m)	10 A, 250 V
UK	CAB-ACU	8.2 feet (2.5 m)	13 A, 250 V
China	CAB-ACC	8.2 feet (2.5 m)	10 A, 250 V
South Africa/India	CAB-ACSA	8.2 feet (2.5 m)	10 A, 250 V
Europe	CAB-9K10A-EU	8.2 feet (2.5 m)	10 A, 250 V
Israel	SFS-250V-10A-IS	8.2 feet (2.5 m)	10 A, 250 V

AC Power Cord Illustrations for Cisco ASR 9001 Router

This section contains the AC power cord illustrations, as described in the above table. Note that an AC power cord may be used with several power supplies.

Figure 56: AC Power Cord CAB-AC

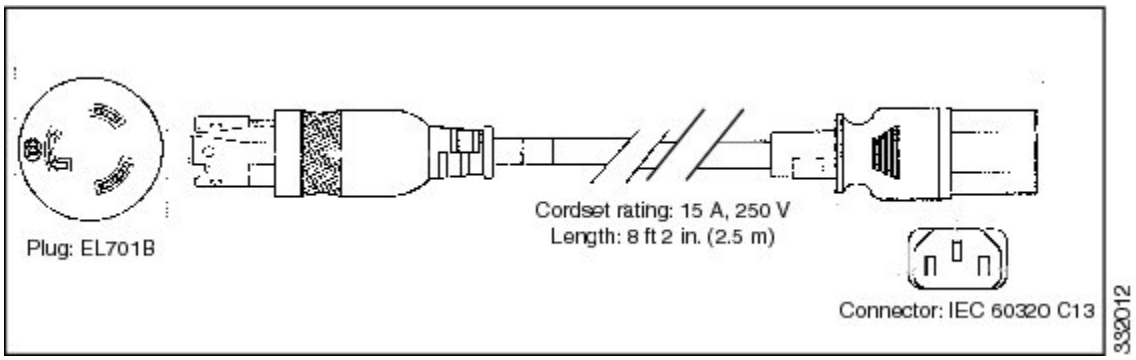


Figure 57: AC Power Cord CAB-L620P-C13-JPN

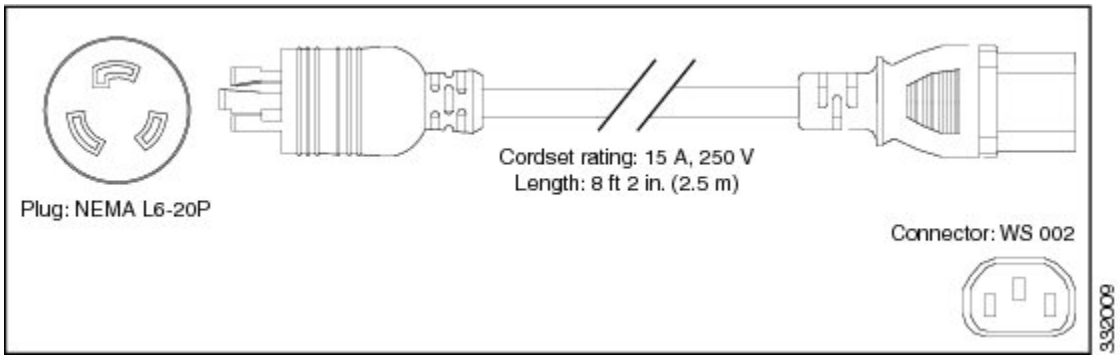


Figure 58: AC Power Cord CAB-ACA

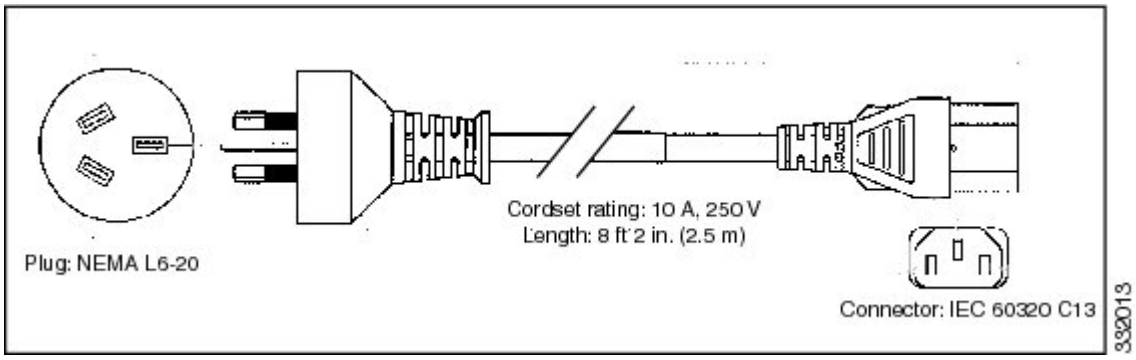


Figure 59: AC Power Cord CAB-ACI

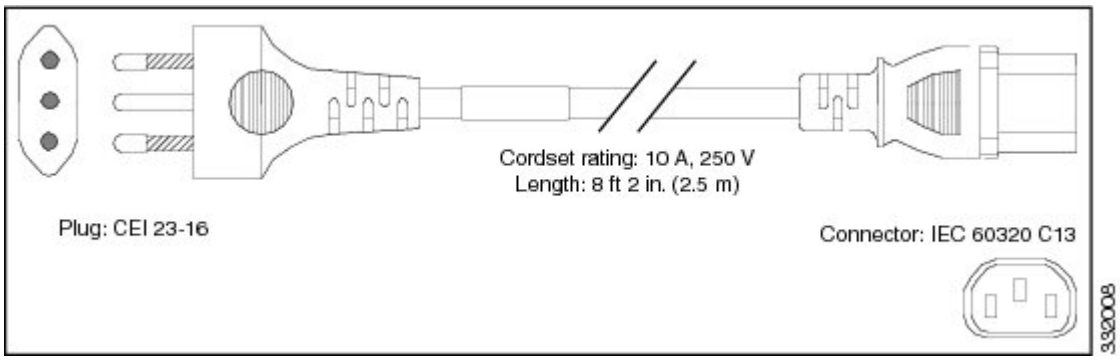


Figure 60: AC Power Cord CAB-ACR

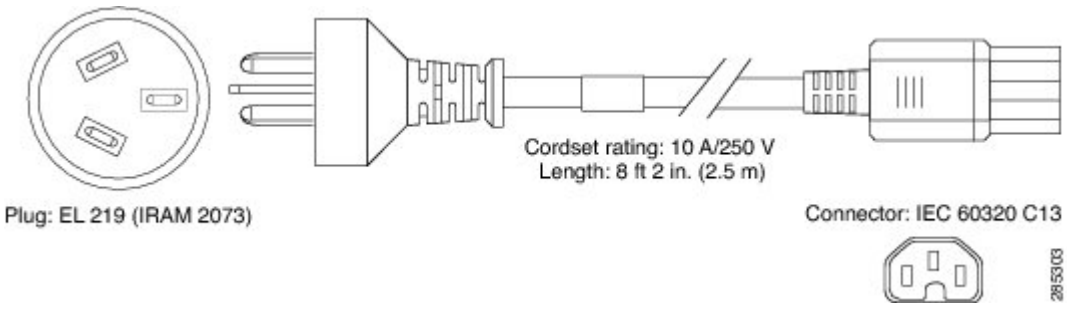


Figure 61: AC Power Cord CAB-ACS

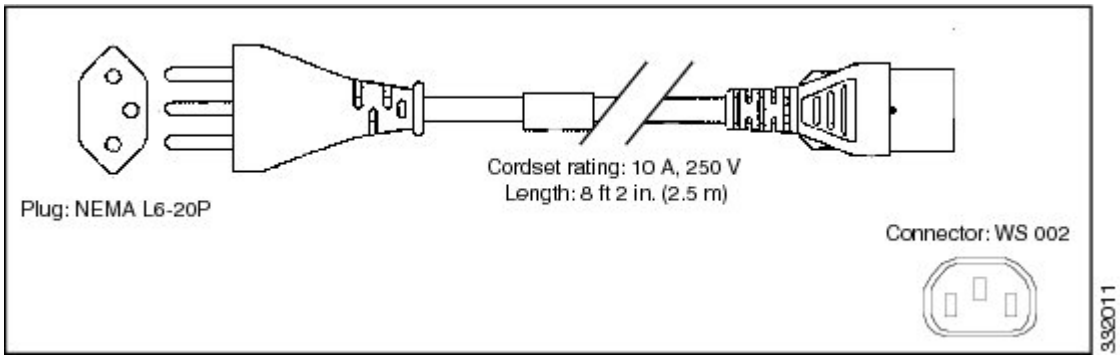


Figure 62: AC Power Cord CAB-ACU

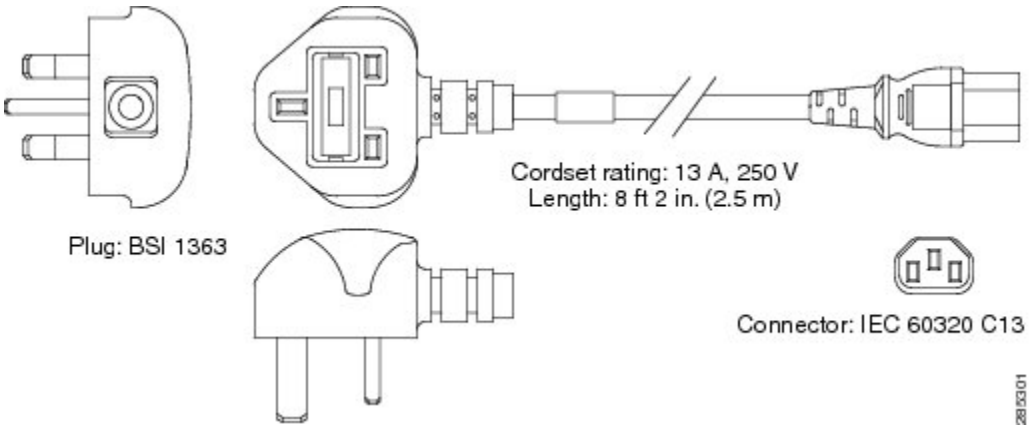


Figure 63: AC Power Cord CAB-ACC

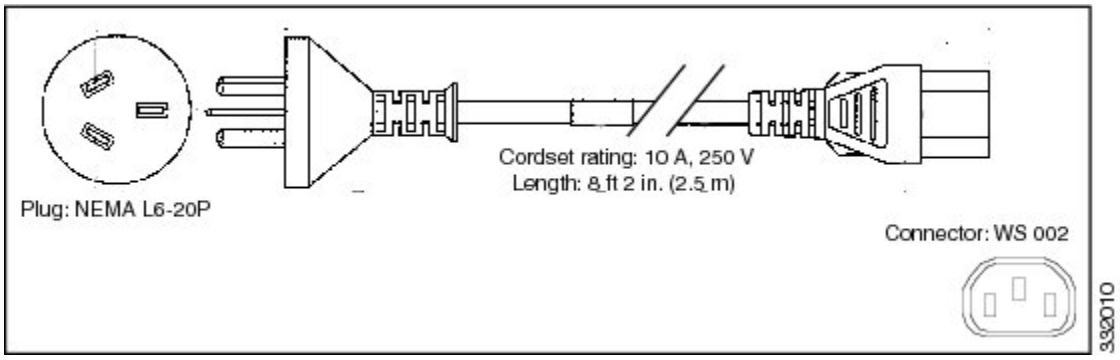


Figure 64: AC Power Cord CAB-ACSA

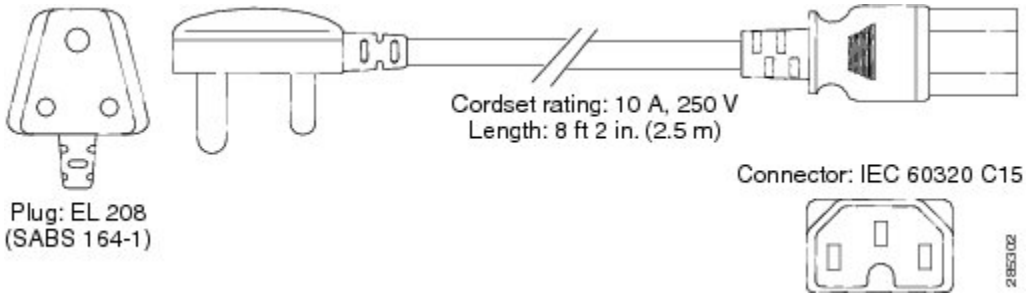


Figure 65: AC Power Cord CAB-9K10A-EU

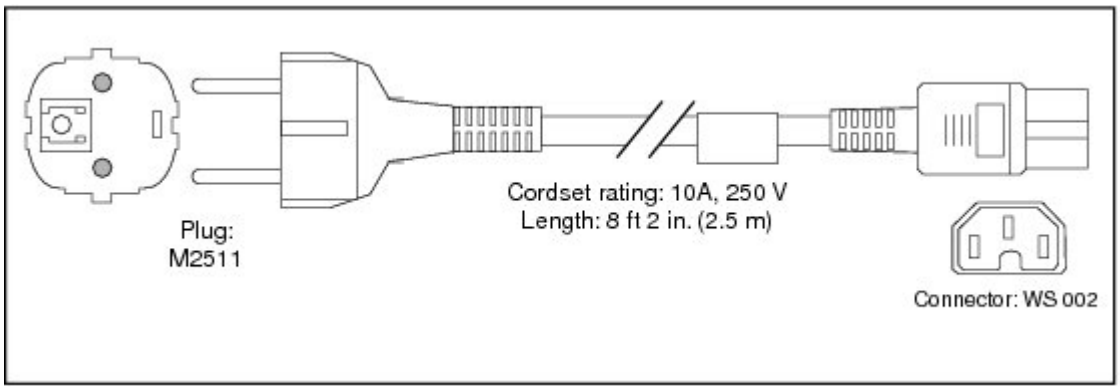
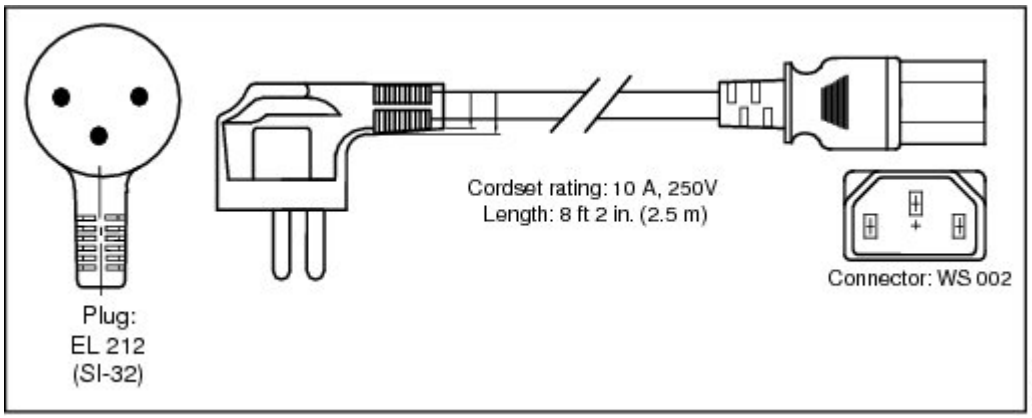


Figure 66: AC Power Cord SFS-250V-10A-IS



DC Powered Router

Connections to DC power modules are rated as follows:

- 20A maximum (ASR 9001)
- 40A maximum (ASR 9901, 9902, 9903)

The system accepts a nominal input voltage of –48 VDC with an operational tolerance range of –40.5 VDC to –72 VDC. One dedicated, commensurately rated DC power source is required for each power module connection.

Power connections to the each DC power module requires two cables: one source cable and one return cable.

For DC power cables, we recommend that you use 20-A-rated, high-strand-count copper wire cables.

The length of the cables depends on your router location from the source power.

Note DC power cables (NEBS-compliant and non-NEBS compliant) are available from Cisco, and from external commercial cable vendors.

The standard DC power cable PIDs are:

- PWR-DC-NEBS-CBL: 6AWG Amphenol connector Telco Flex 3 (NEBS compliant)
- PWR-2KW-DC-CBL: 6AWG Amphenol connector Ultra Flex

You must terminate DC power cables using terminal blocks. The terminal blocks are supplied along with the DC power supply modules from Cisco.

The figures below show the types of terminal blocks required for DC-input cable connectionsfor the Cisco ASR 9903 Router, Cisco ASR 9901 Router, and Cisco ASR 9001 Router.

Figure 67: Cisco ASR 9903 DC Power Cable Terminal Block

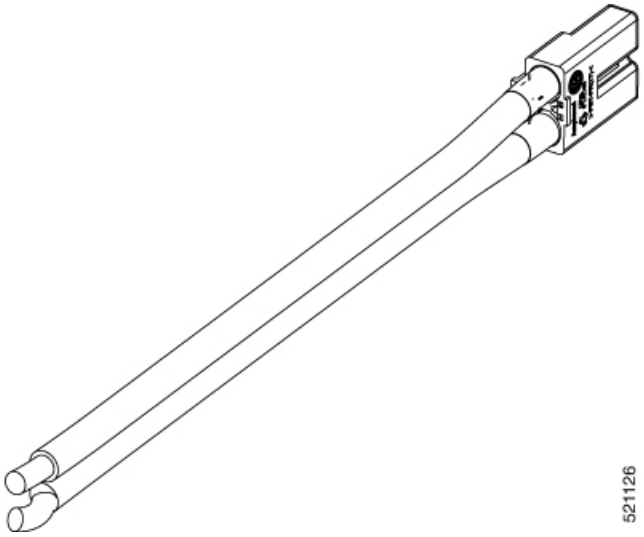


Figure 68: Cisco ASR 9901 DC Power Cable Terminal Block

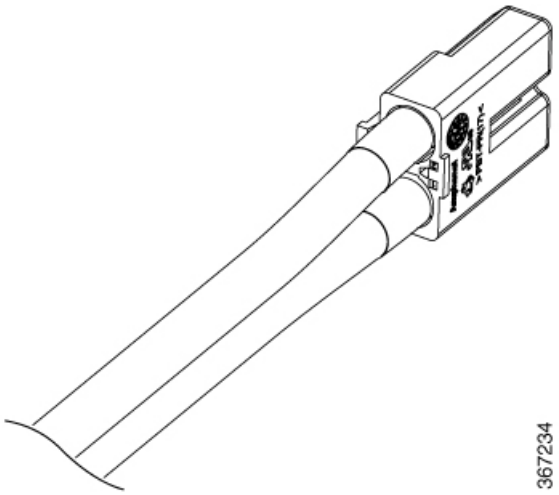
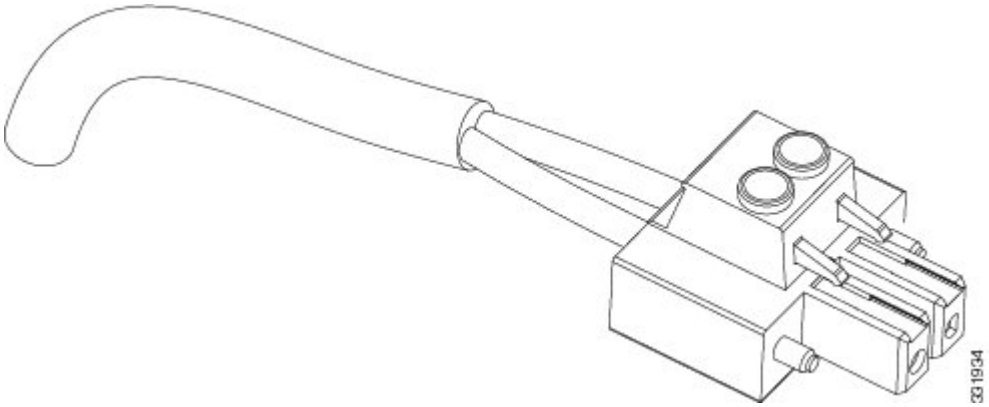


Figure 69: Cisco ASR 9001 DC Power Cable Terminal Block



The figure below shows DC power source cable connections for single DC power module.

Caution To avoid shock hazard, be sure to apply shrink wrap tubing around the wire entry area of the terminal block.

Warning **Statement 1086—**Replace Cover on Power Terminals

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.

Figure 70: Cisco ASR 9902 DC Power Source Cabling Scheme

Figure 71: Cisco ASR 9903 DC Power Source Cabling Scheme for a Single DC Power Module

Figure 72: Cisco ASR 9901 DC Power Source Cabling Scheme for a Single DC Power Module

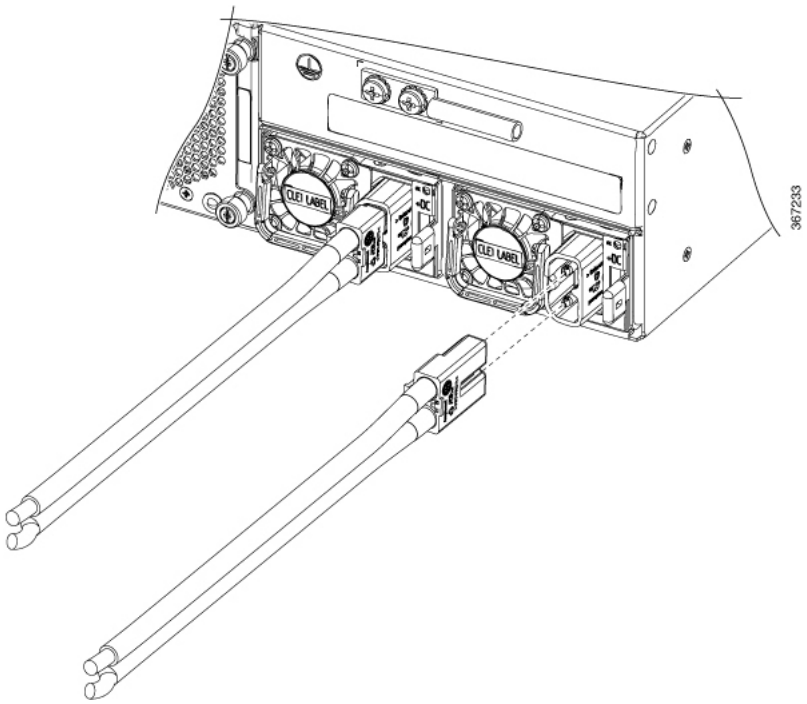
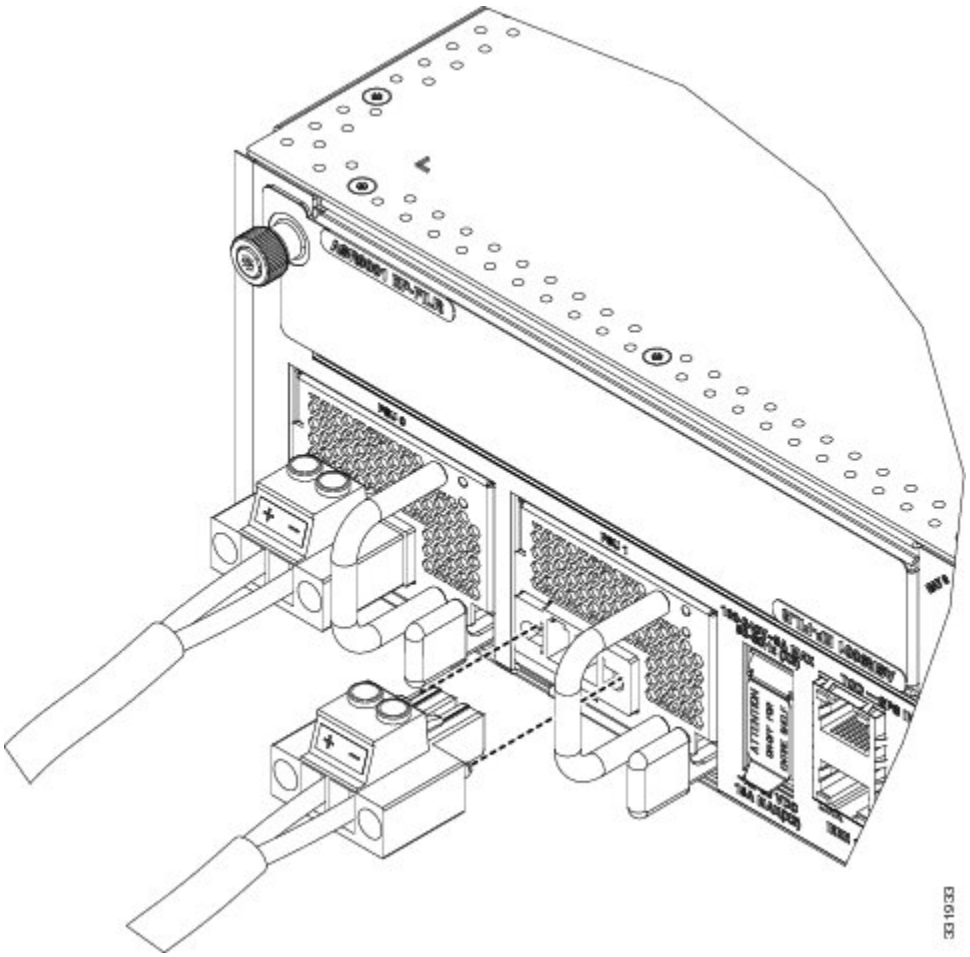


Figure 73: Cisco ASR 9001 DC Power Source Cabling Scheme for a Single DC Power Module



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

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

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

For a list of the nominal and acceptable value ranges for source DC power, see Power System DC Output Levels, on page 208.

NEBS Supplemental Unit Bonding and Grounding Guidelines

You must permanently connect the central office ground system or interior equipment grounding system to the supplemental bonding and grounding connection on the side of the router chassis to meet network equipment building system (NEBS) requirements as well as safety compliance requirements. These grounding points are referred to as the NEBS bonding and grounding points.

Note These bonding and grounding connections satisfy the Telcordia NEBS requirements for supplemental bonding and grounding connections. For an AC powered router, if you are not installing the router in a NEBS environment, you can choose to bypass these guidelines and rely on the safety earth ground connections to the AC power modules.

The following figures show the NEBS grounding locations on the respective routers:

Figure 74: NEBS Bonding and Grounding Points on the Cisco ASR 9902 Router

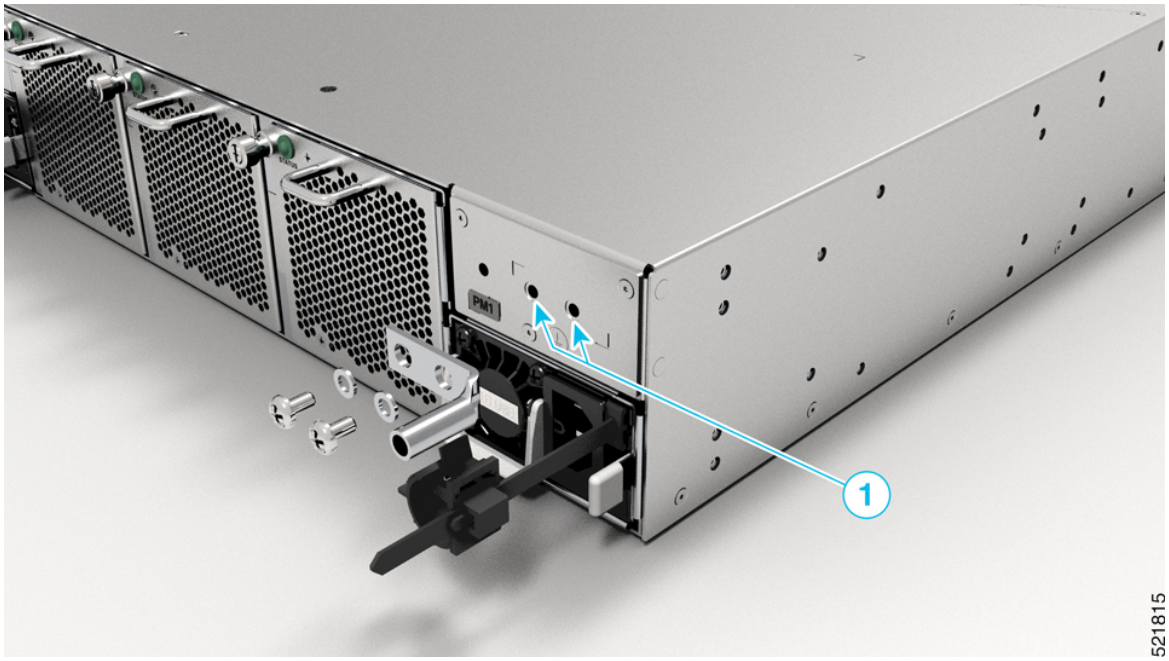


Figure 75: NEBS Bonding and Grounding Points on the Cisco ASR 9903 Router

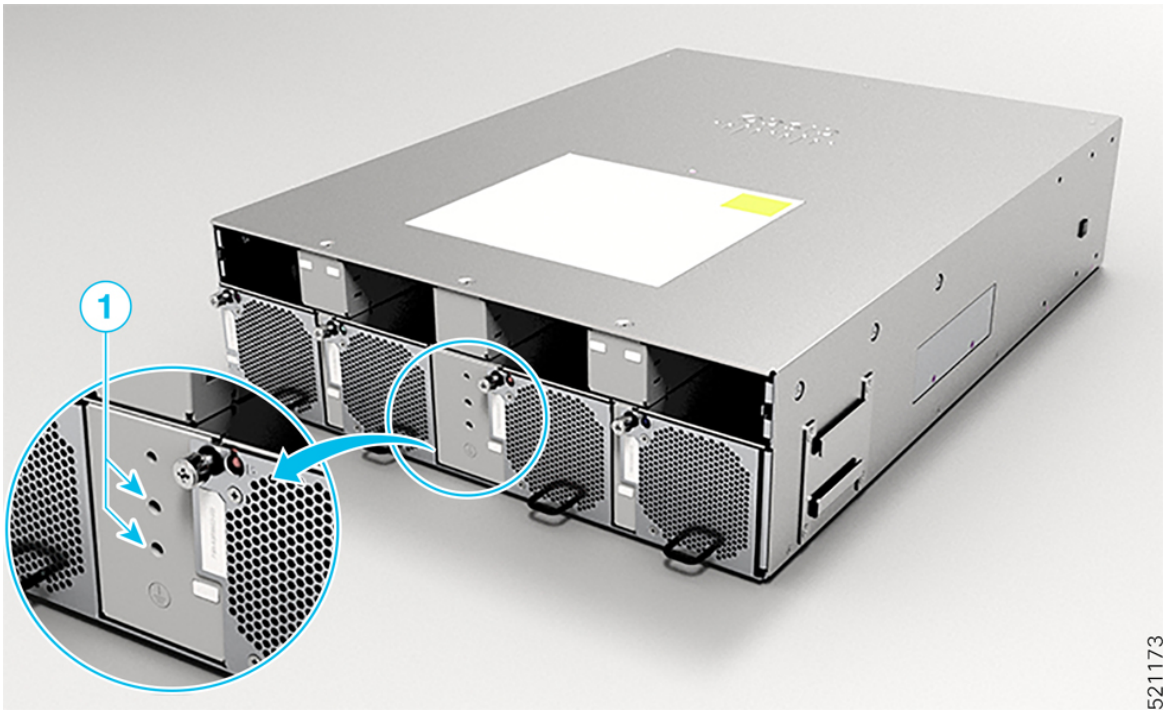


Figure 76: NEBS Bonding and Grounding Points on the Cisco ASR 9901 Router

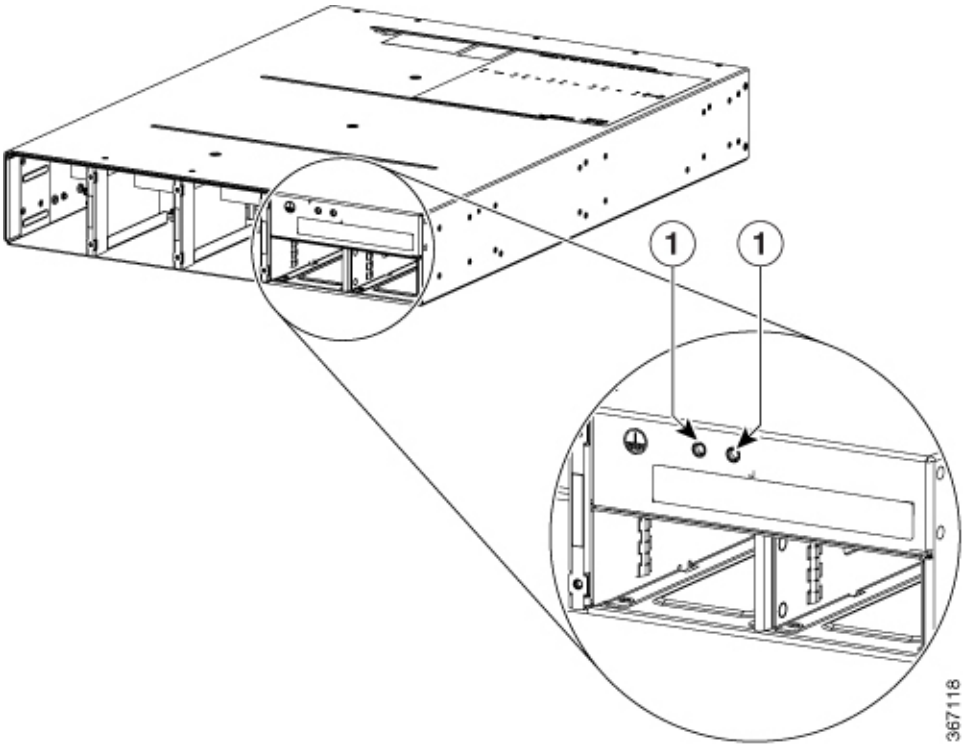
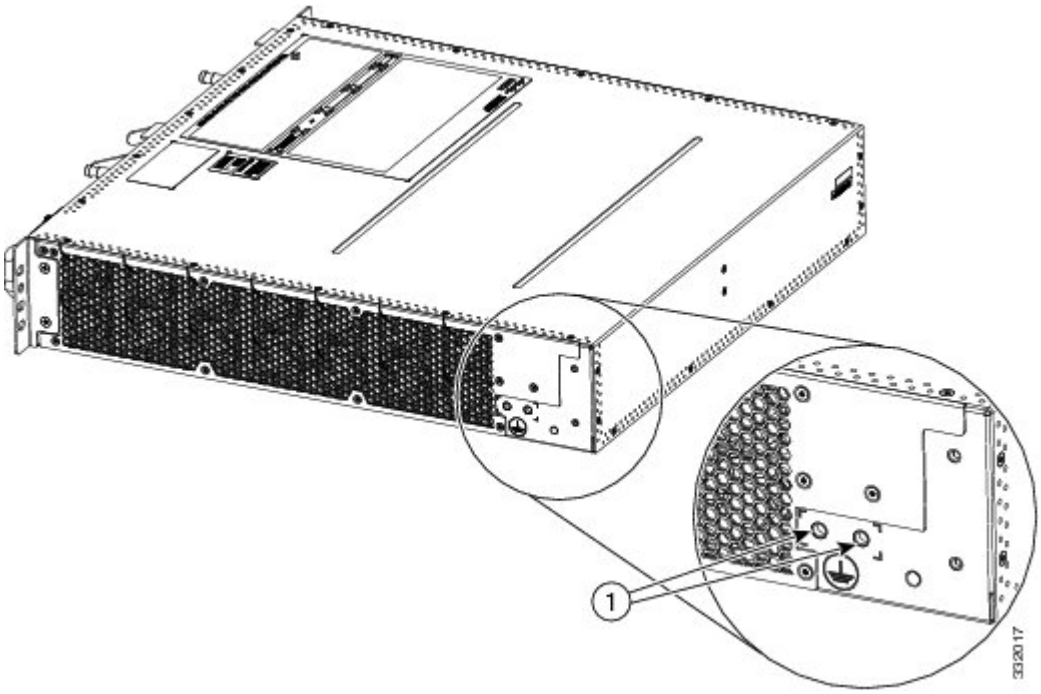


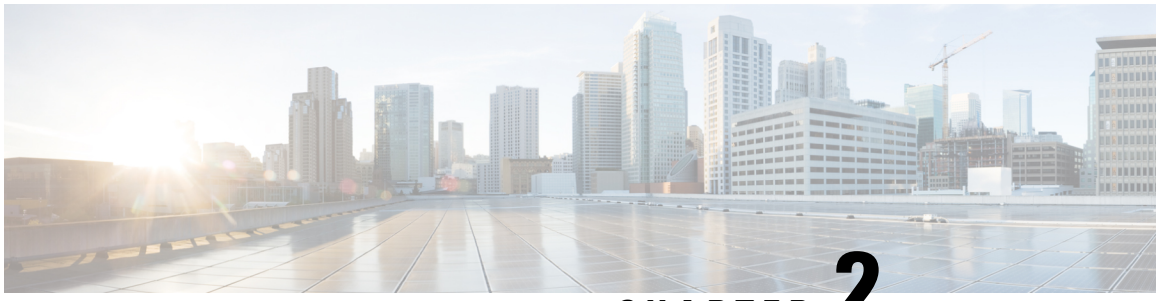
Figure 77: NEBS Bonding and Grounding Points on the Cisco ASR 9001 Router



1	NEBS grounding point on the chassis

To ensure a satisfactory supplemental ground connection to the router, use these parts:

- Cisco ASR 9902 and Cisco ASR 9903 Router - One grounding lug, which has two M5 bolt holes with 0.625- to 0.75-inch (15.86- to 19.05-mm) spacing between them, and a wire receptacle large enough to accept a six AWG or larger, multistrand copper wire. For four AWG cable, use Panduit part number LCD4-14AF-L; for six AWG, use Panduit part number LCD6-14AF-L.
-
- Cisco ASR 9901 Router and Cisco ASR 9001 Router - One grounding lug, which has two M6 bolt holes with 0.625- to 0.75-inch (15.86- to 19.05-mm) spacing between them, and a wire receptacle large enough to accept a six AWG or larger, multistrand copper wire. For four AWG cable, use Panduit part number LCD4-14AF-L; for six AWG, use Panduit part number LCD6-14AF-L.
- Two 10-32 round-head screws and two locking washers (nickel-plated brass is ideal).
- One grounding wire. Although we recommend at least six AWG multistrand copper wire, the wire diameter and length depend on your router location and site environment. This cable is not available from Cisco Systems; it is available from any commercial cable vendor.



CHAPTER 2

Unpacking and Installing the Chassis

This chapter contains the procedures for unpacking and installing the Cisco ASR 9001 Router. It includes these sections:

- Pre-Installation Considerations and Requirements, on page 61
- Unpacking the Router, on page 62
- Positioning the Router, on page 65
- Verifying Rack Dimensions, on page 65
- Installing the Cisco ASR 9902 and Cisco ASR 9903 Chassis, on page 65
- Installing the Cisco ASR 9901 Chassis, on page 77
- Installing the Cisco ASR 9001 Chassis, on page 85
- Supplemental Bonding and Grounding Connections, on page 89
- Installing the Optional Air Plenum Kit, on page 92

Pre-Installation Considerations and Requirements

Before you perform any procedures in this chapter, review these sections:

In particular, observe the guidelines for preventing electrostatic discharge (ESD) damage described in Preventing Electrostatic Discharge Damage, on page 9. Use the figure as a reference in locating and using the ESD sockets on the front of the router chassis.

For additional safety and compliance information, see the Regulatory Compliance and Safety Information for the Cisco ASR 9000 Series Aggregation Services Routers.

Note A fully-equipped ASR 9901 router with 2 power modules and 3 fans can weigh as much as 55.97 pounds (25.4 kg); an empty chassis weighs 47.62 pounds (21.6 kg). A fully-equipped ASR 9001 router with two power modules can weigh as much as 37.91 pounds (17.2 kg); an empty chassis weighs 24.69 pounds (11.2 kg). The chassis is designed to be lifted by two persons.

Caution The router is not designed to be installed as a shelf-mounted or a free-standing router. The router must be installed in a rack that is secured to the building structure. You must install the router in either a telco-style frame or a four-post equipment rack.

Unpacking the Router

Follow these steps as mentioned in the figures to unpack the Cisco ASR 9903 Router, Cisco ASR 9901 Router, or Cisco ASR 9001 Router from its shipping container.

Figure 78: Unpacking the Cisco ASR 9903 Router from the Shipping Container

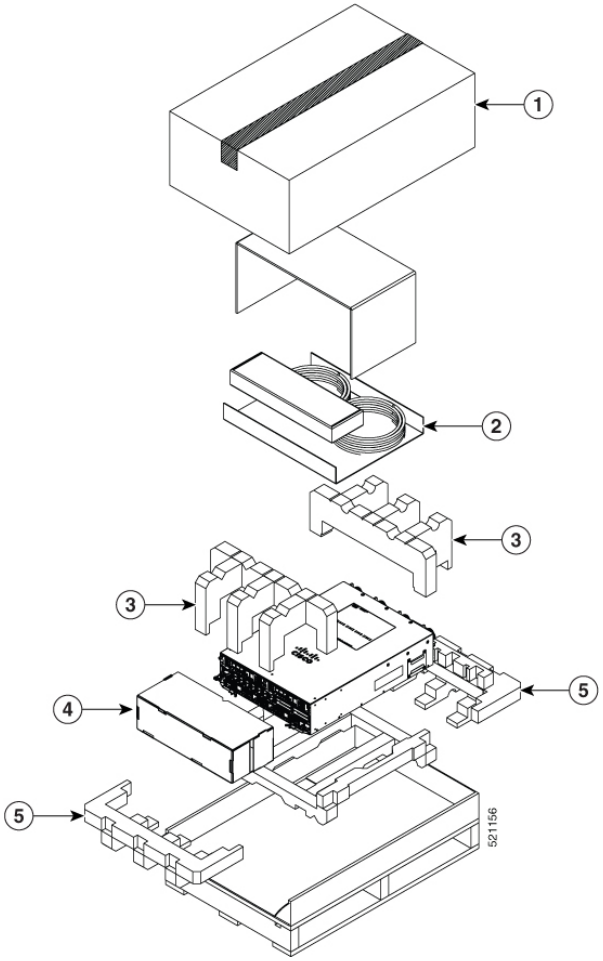


Figure 79: Unpacking the Cisco ASR 9901 Router from the Shipping Container

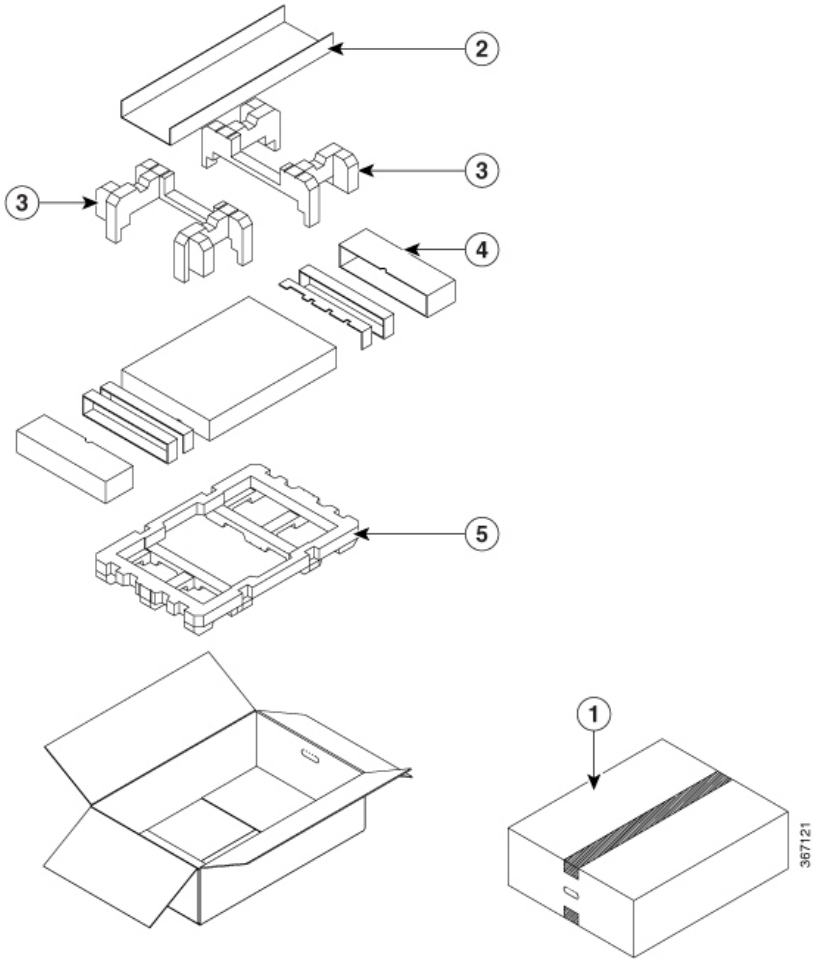
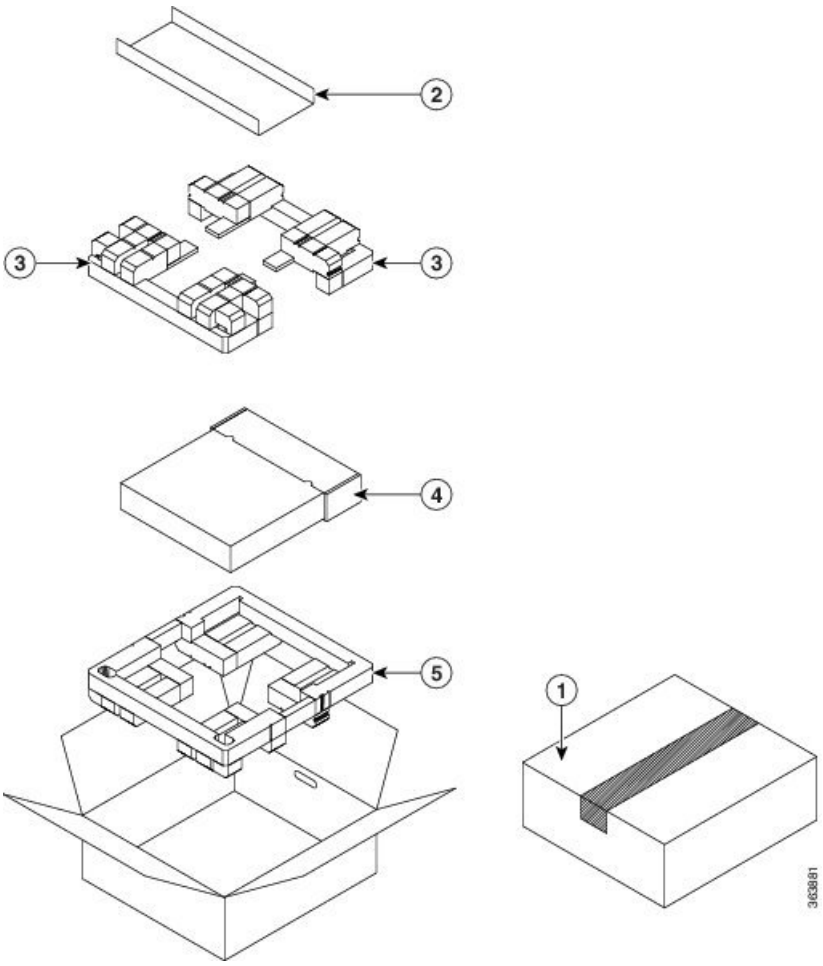


Figure 80: Unpacking the Cisco ASR 9001 Router from the Shipping Container



1	Cardboard packaging container	4	Cardboard cap
2	Accessory tray	5	Foam packaging material - bottom cap
3	Foam packaging material- top caps		

Procedure

Step 1 Cut the packaging tape and open the cardboard shipping container.

Step 2 Remove the accessory box.

Step 3 Remove the packaging material (see the below figure).

a) Remove the foam packaging material from the top of the router.

b) Remove the cardboard cap from the side of the router.

Step 4 Save the packaging materials in case the router needs repackaging or shipping.

Positioning the Router

Use a safety hand truck to move the router to the location where the router is being installed in a rack.

Verifying Rack Dimensions

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

Procedure

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

The distance should measure 18.31 inches ± 0.06 inches (46.5 cm ± 0.15 cm).

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

Step 2 Measure the space between the inner edges of the left front and right front mounting flanges on the equipment rack.

- **Cisco ASR 9903**—The space must be at least 17.75 inches (45.085 cm) to accommodate the width of the chassis with the mounting brackets and slide rails, and fits between the mounting posts on the rack.
- **Cisco ASR 9901**—The space must be at least 17.75 inches (45.085 cm) to accommodate the width of the chassis with the mounting brackets and slide rails, and fits between the mounting posts on the rack.
- **Cisco ASR 9001**—The space must be at least 17.7 inches (45 cm) to accommodate the chassis, which is approximately 17.45 in. (44.32 cm) wide, and fits between the mounting posts on the rack.

Installing the Cisco ASR 9902 and Cisco ASR 9903 Chassis

This section describes how to install:

- Cisco ASR 9902 and Cisco ASR 9903 chassis in a four-post rack.
- Cisco ASR 9902 chassis in a two-post rack.

Note Cisco ASR 9903 chassis doesn't support 2-post rack.

Installing the Cisco ASR 9902 and Cisco ASR 9903 Chassis in a 4-Post Rack

To install the chassis in a four-post open rack, follow these steps:

Before you begin

Before you install the chassis, ensure that you have the following tools and equipment:

- ESD-preventive wrist strap
- Number 1 and number 2 Phillips screw drivers
- 1/4 inch (6.35 mm) and 3/16 inch (4.5 mm) flat-blade screwdrivers
- Rack-mounting kits (provided by Cisco) - Cisco PID ASR-9903-4P-KIT for mounting the chassis in a 19 inch (482.6 mm) four-post rack
- Rack-mounting kits (provided by Cisco) - Cisco PID ASR-9902-4P-KIT for mounting the chassis in a 19 inch (482.6 mm) four-post rack
- Tape measure
- Level (optional)

Procedure

Step 1 Attach the mounting brackets of the front rack to the either sides of the chassis using six M4 flat-head screws each side.

Figure 81: Cisco ASR 9902: Attach the 19 inch 4-post Mounting Brackets to the Sides of the Chassis

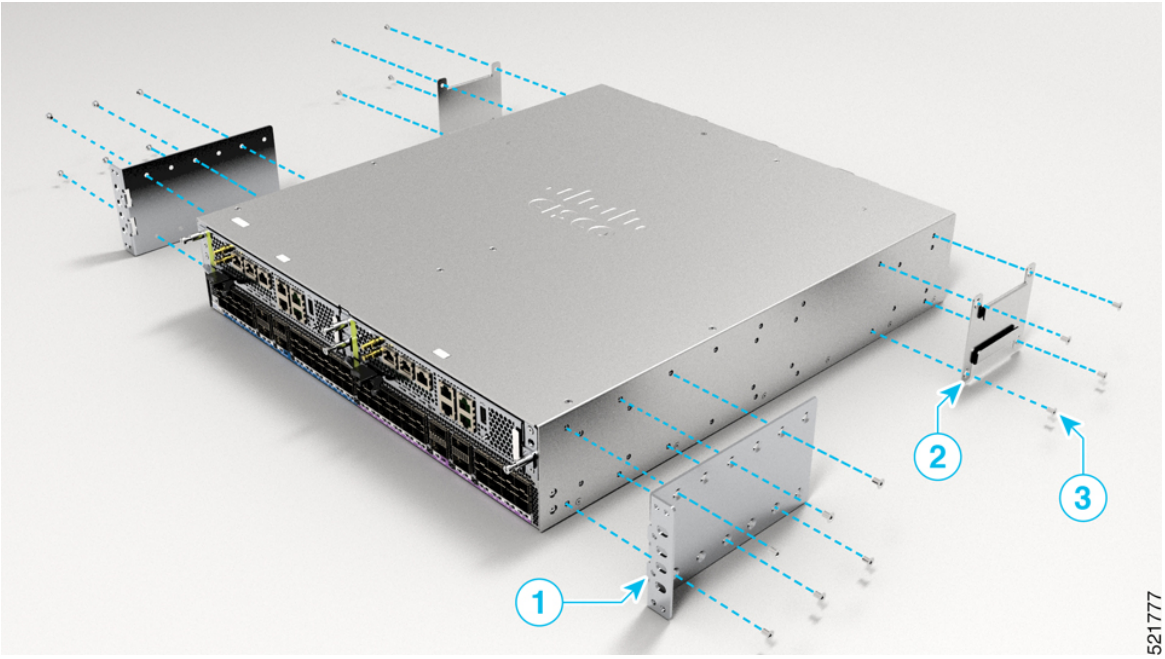
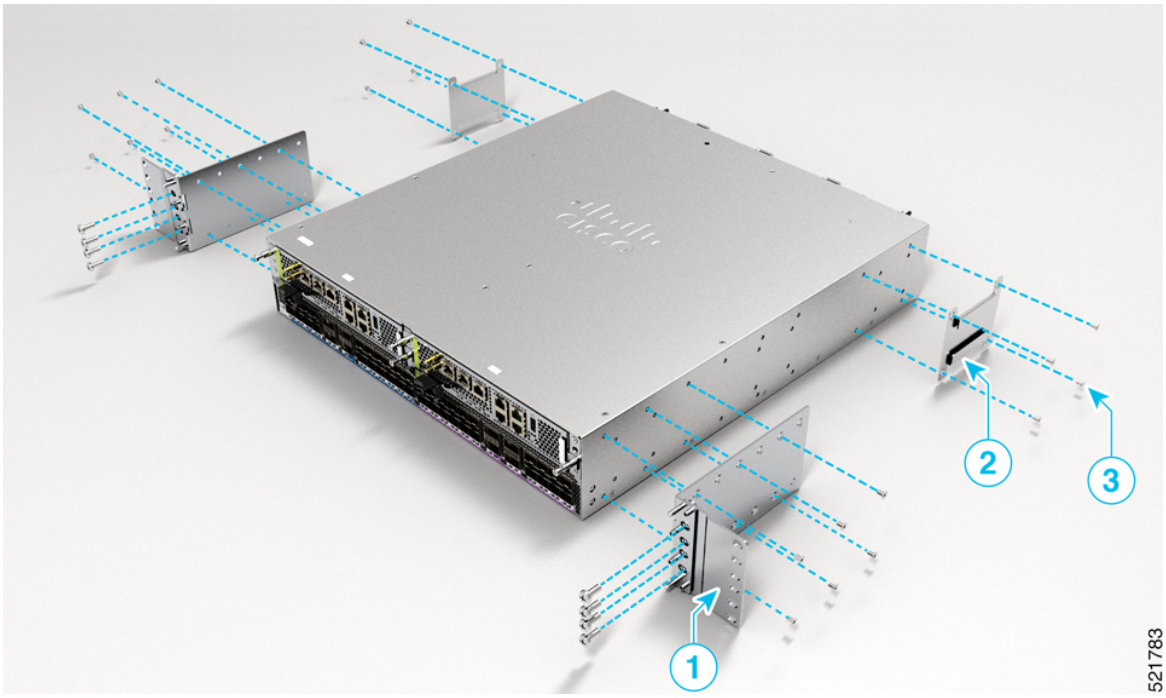
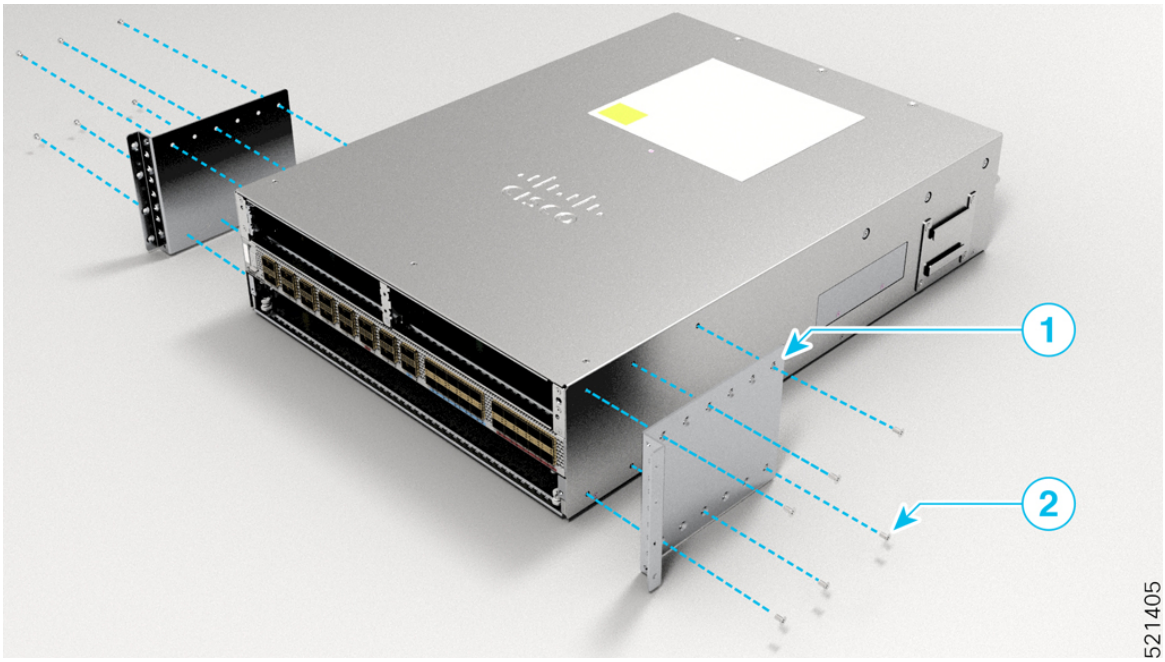


Figure 82: Cisco ASR 9902: Attach the 23 inch 4-post Mounting Brackets to the Sides of the Chassis



1	Front mounting bracket	3	M4 screws
2	Rear mounting bracket		

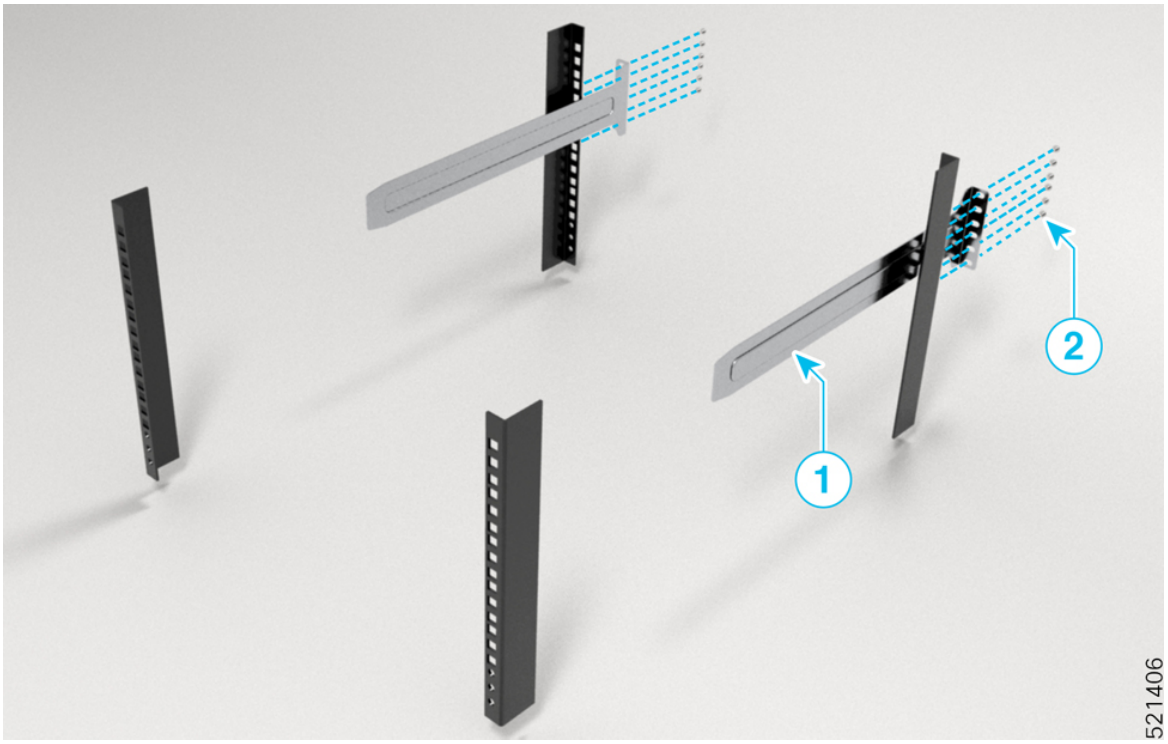
Figure 83: Cisco ASR 9903: Attach the Brackets to the Sides of the Chassis



1	Mounting bracket	2	M4 screws

Step 2 Attach the right and left slider rails to rear of the rack using rack mount screws. The recommended maximum torque is 31 in-lbs (3.5 N-m).

Figure 84: Attach the Slide Rail Assembly



1	Rear mounting bracket	2	M4 screws

Step 3 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis.

Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

Step 6 Hold the chassis in position against the mounting rails while a second person finger-tightens the screws to the rack rails on each side of the chassis. See figure below.

Figure 85: Cisco ASR 9902: Tighten the Screws to the Rack Rails (19 inch 4-post Rack)- Front View

Figure 86: Cisco ASR 9902: Tighten the Screws to the Rack Rails (19 inch 4-post Rack)- Rear View

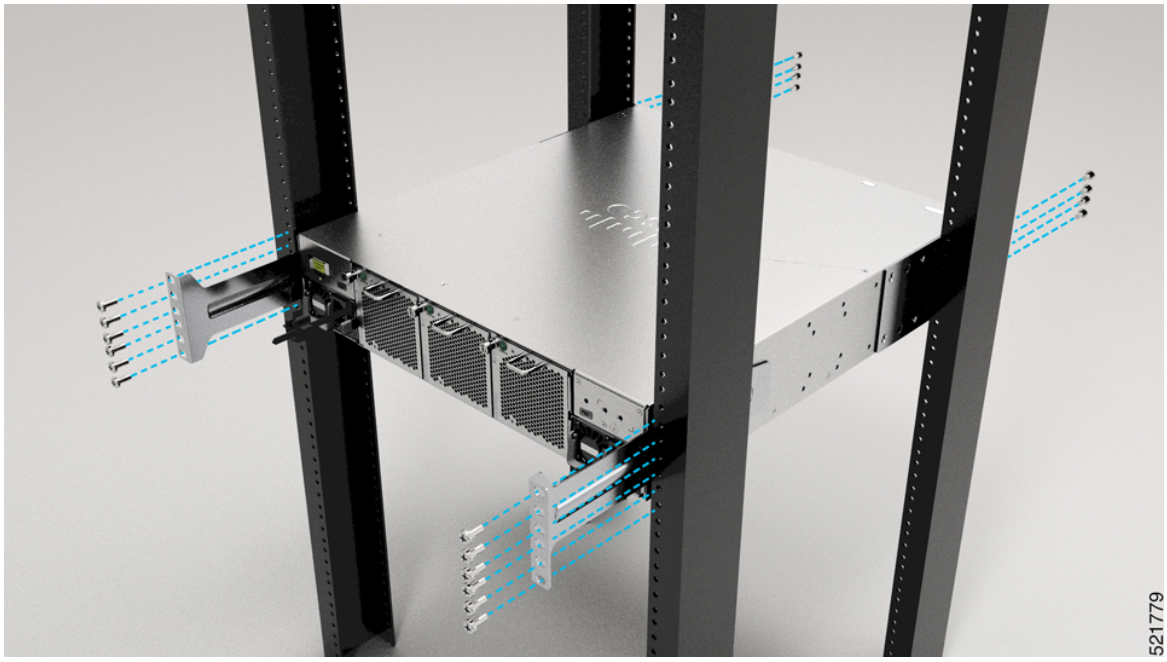


Figure 87: Cisco ASR 9902: Tighten the Screws to the Rack Rails (23 inch 4-post Rack)- Front View

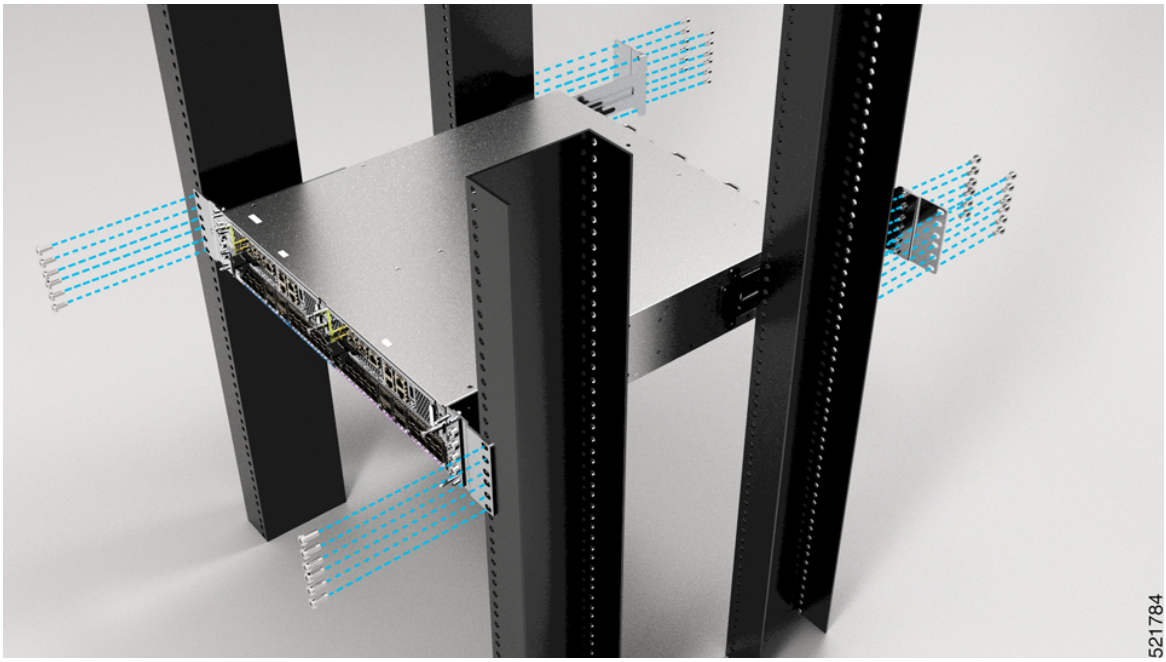


Figure 88: Cisco ASR 9902: Tighten the Screws to the Rack Rails (23 inch 4-post Rack)- Rear View

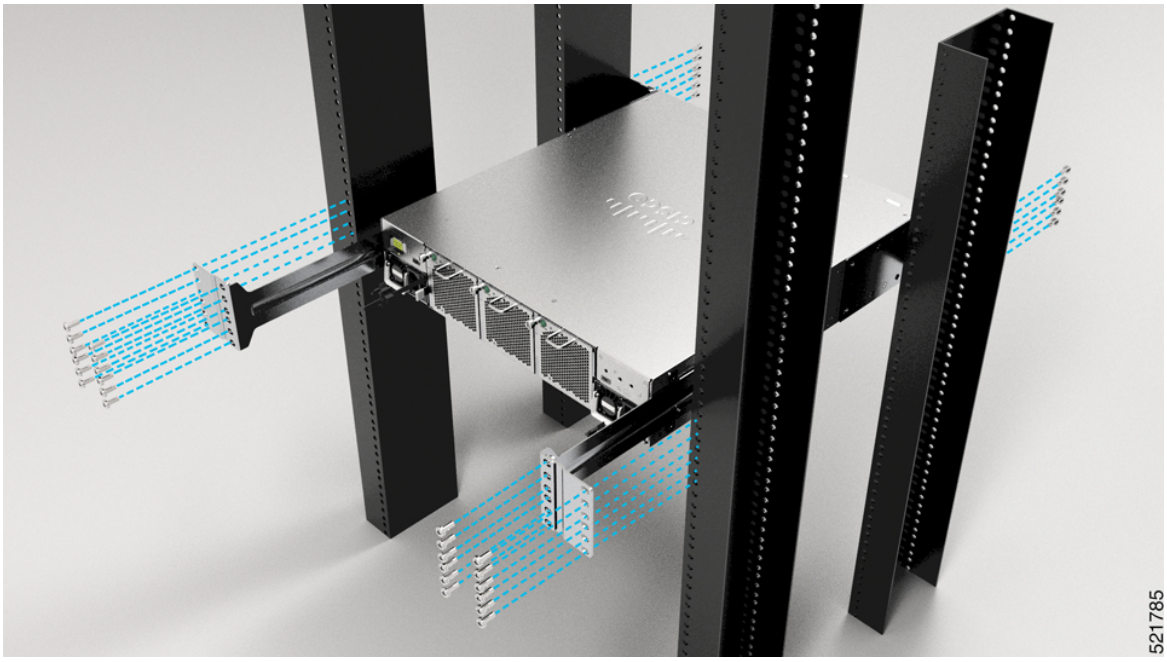
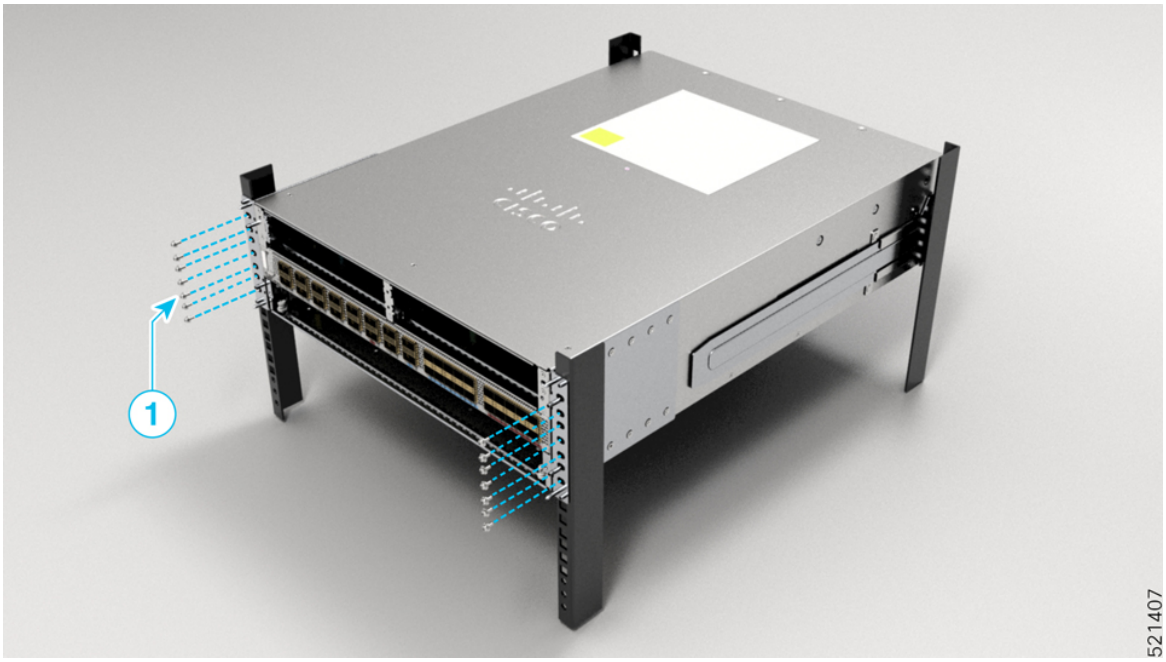


Figure 89: Cisco ASR 9903: Tighten the Screws to the Rack Rails



1	Screws on each side to attach the chassis to the rack

Step 7 Tighten all screws fully to secure the chassis to the rackrails. The recommended maximum torque is 31 in-lbs (3.5 N-m).

Installing the Cisco ASR 9902 Chassis in a 2-Post Rack

To install the chassis in a two-post rack, follow these steps:

Before you begin

Before you install the chassis, ensure that you have the following tools and equipment:

- ESD-preventive wrist strap
- Number 1 and number 2 Phillips screw drivers
- 1/4 inch (6.35 mm) and 3/16 inch (4.5 mm) flat-blade screwdrivers
- Rack-mounting kits (provided by Cisco) - ASR-9902-2P-KIT for mounting the chassis in a 19 inch and 23 inch two-post rack
- Tape measure
- Level (optional)

Procedure

Step 1 Attach the mounting brackets to the sides of the chassis using twelve M4 flat-head screws per side. The recommended maximum torque is 13.28 in.-lb (1.5 N-m).

Figure 90: Cisco ASR 9902: Attach 19 inch 2-post Rack Mounting Brackets

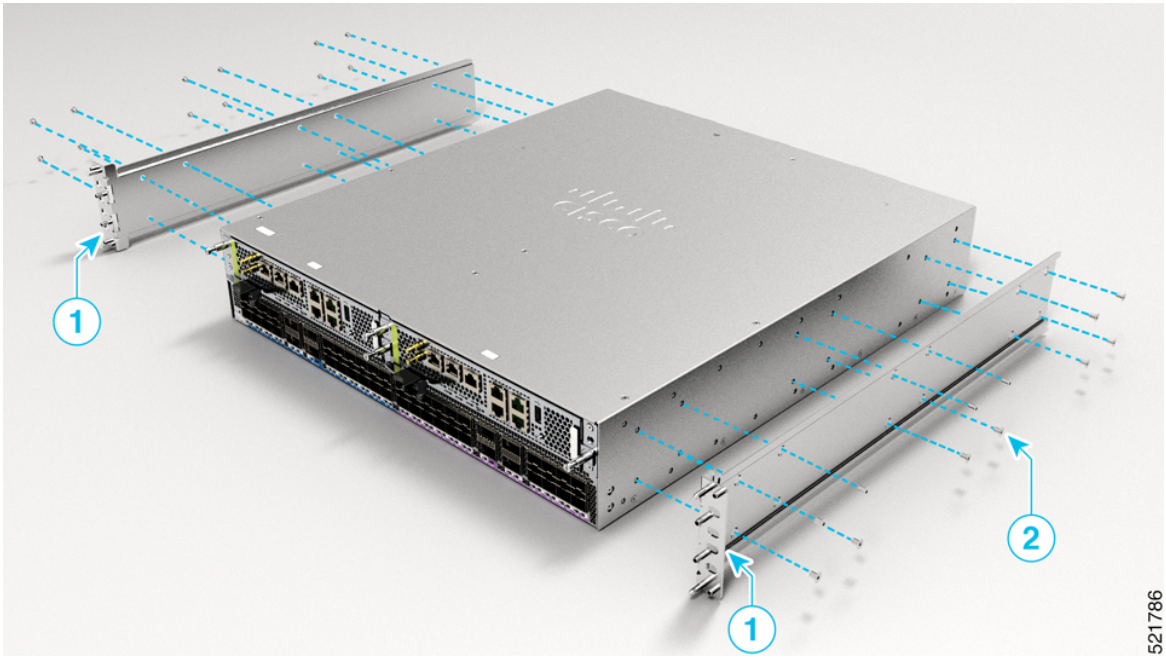
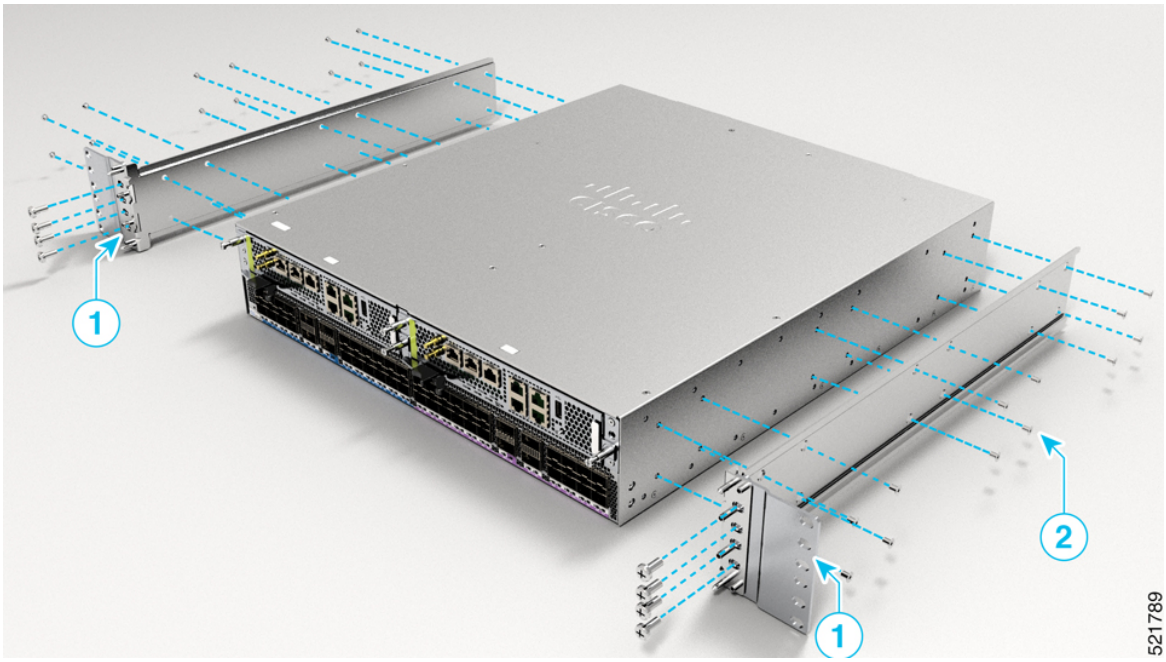
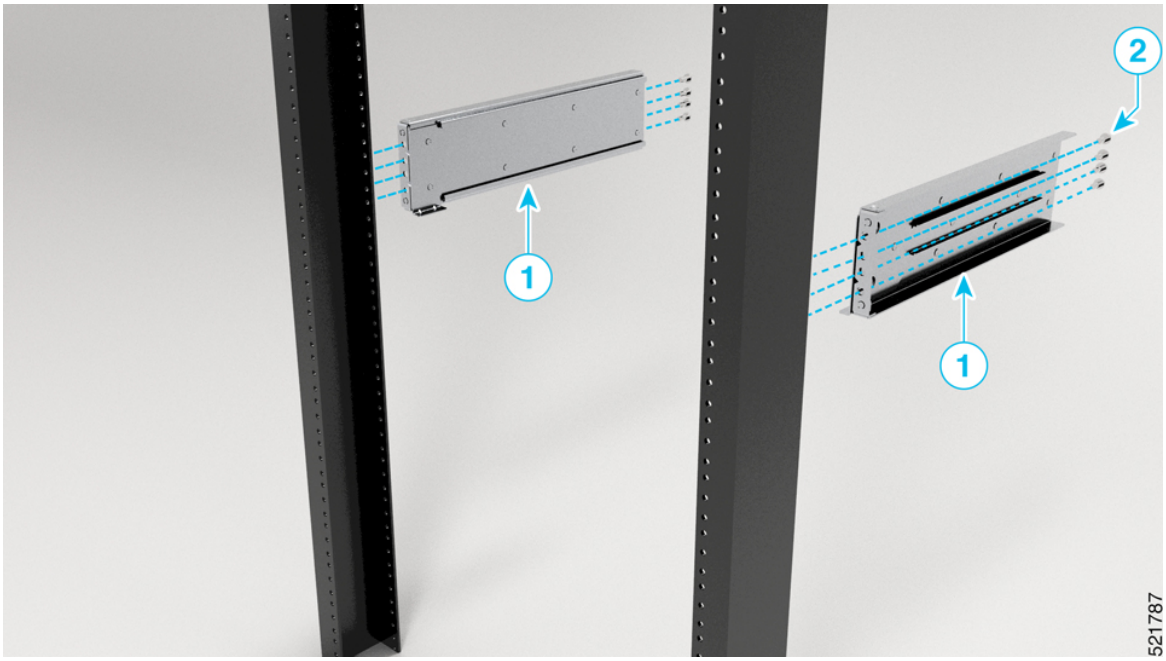


Figure 91: Cisco ASR 9902: Attach 23 inch 2-post Rack Mounting Brackets



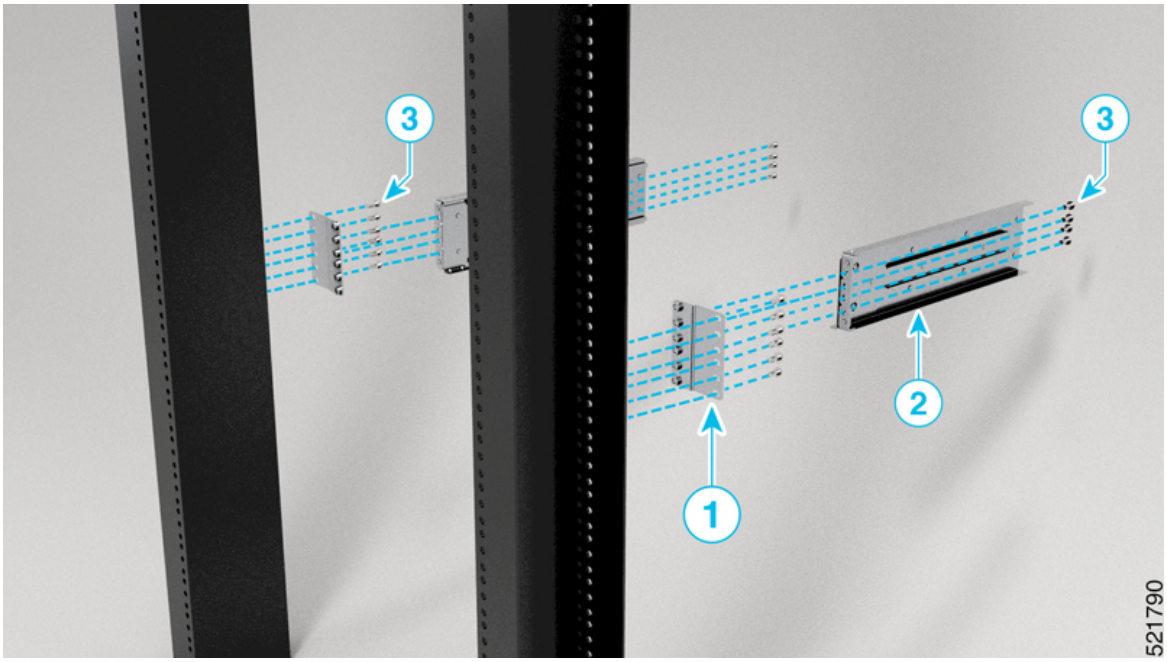
Step 2 Attach the left and right slide rail assemblies to the back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).

Figure 92: Cisco ASR 9902: Attach Slide Rail Assemblies on 19 inch 2-post Rack



To install the router in a 23-inch rack, attach extension plates to the front and back of the 2-post rack using six M5 pan head screws each. Use a level to make sure the plates are level. Attach the left and right slide rail assemblies to the extension plates on back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).

Figure 93: Cisco ASR 9902: Attach Slide Rail Assemblies on 23 inch 2-post Rack



Step 3 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis.

Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

Step 6 Hold the chassis in position against the mounting rails while the second person finger-tightens four screws to the rack rails on each side of the chassis (see the figure below).

Figure 94: Cisco ASR 9902: Secure the Chassis on a 19 inch 2-post Rack

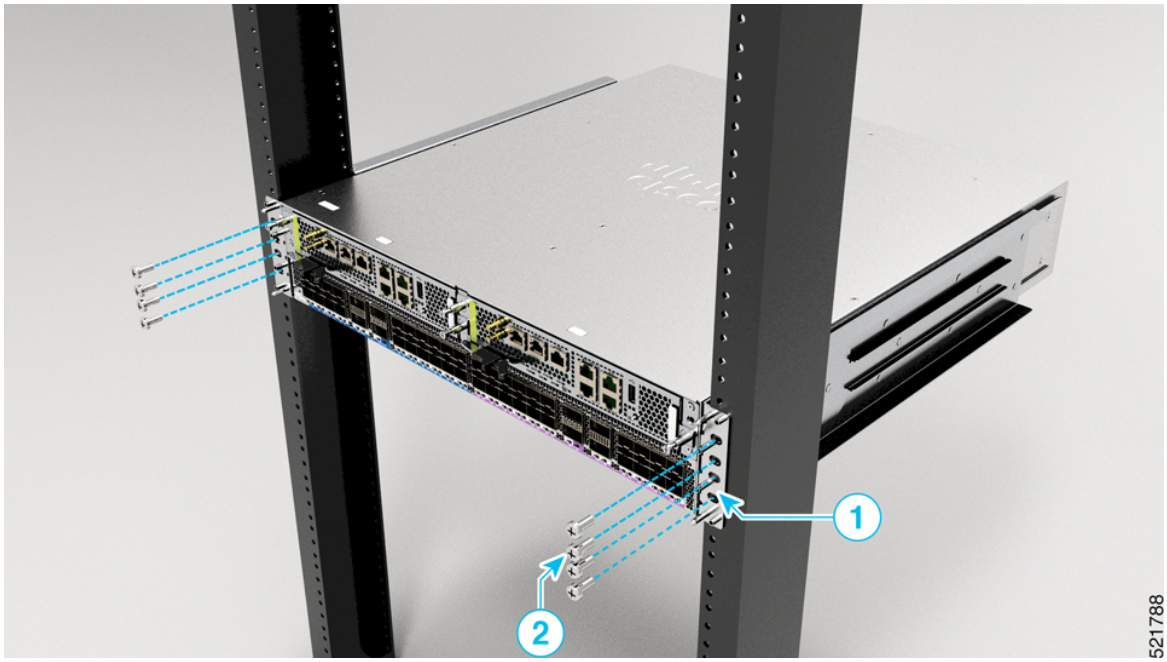
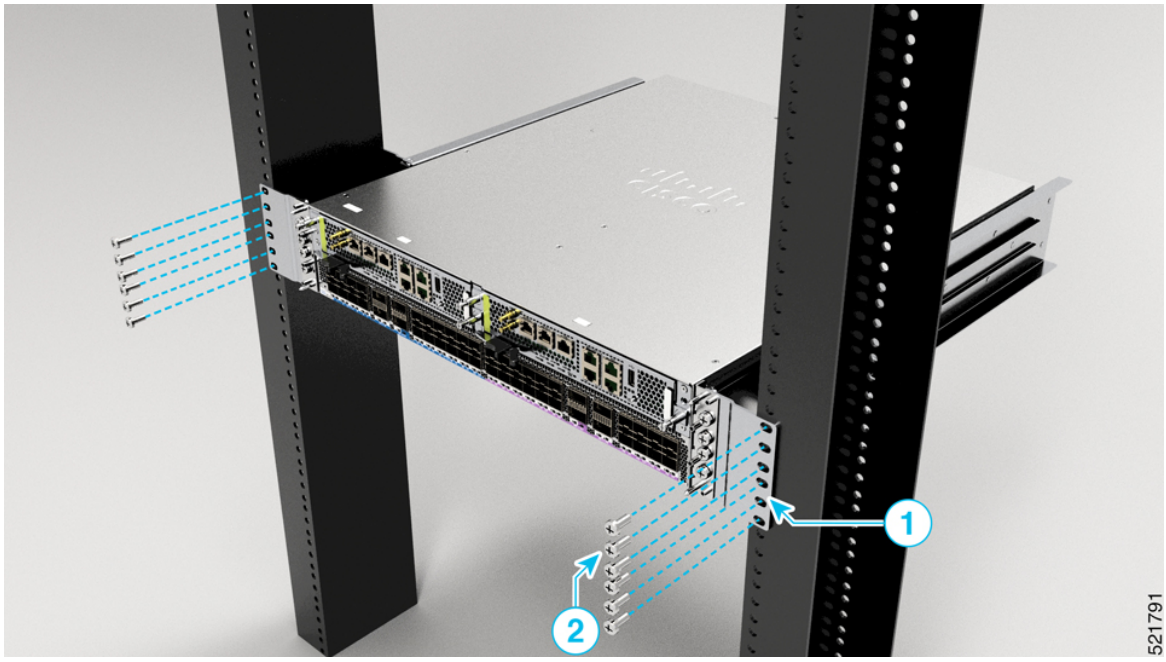


Figure 95: Cisco ASR 9902: Secure the Chassis on a 23 inch 2-post Rack

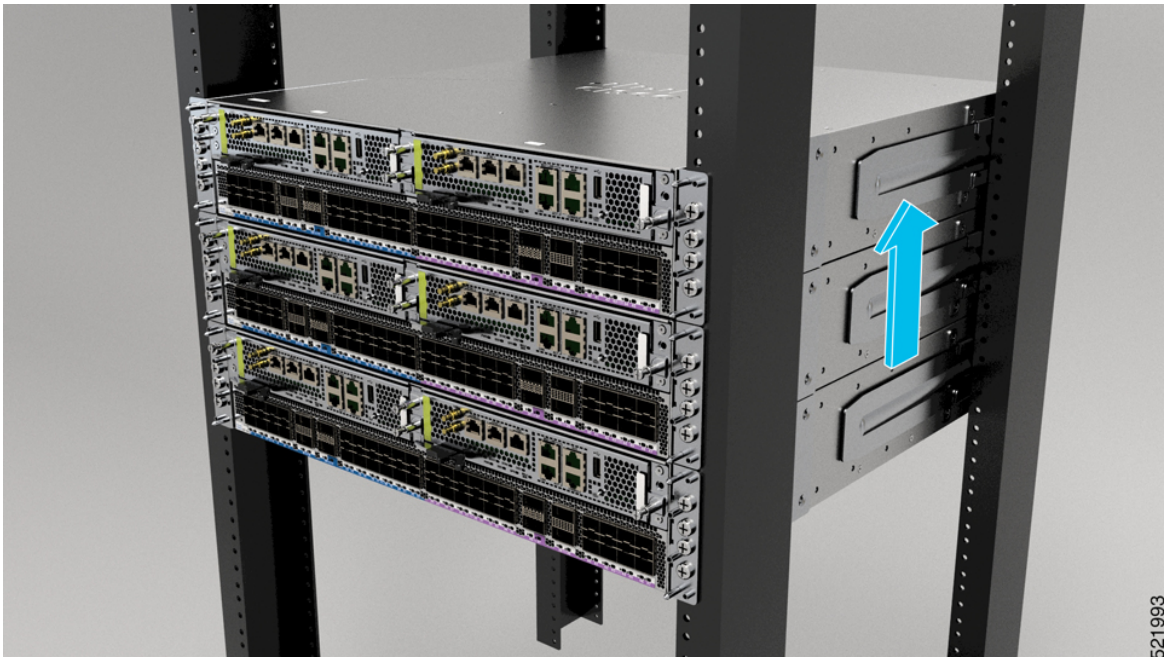


Step 7 Fully tighten all the screws to secure the chassis to the rack rails.

Stacking Cisco ASR 9902 Chassis

While stacking multiple Cisco ASR 9902 chassis in a rack, it is recommended to start at the bottom. Install the first chassis of the stack at the bottom and move upwards.

Figure 96: Stacking Multiple Cisco ASR 9902 Chassis



Installing the Cisco ASR 9901 Chassis

This section describes how to install a Cisco ASR 9901 chassis in a rack.

Before you Begin

Before you install the chassis, make sure that you have following tools and equipment:

- ESD-preventive wrist strap
- Number 1 and number 2 Phillips screwdrivers
- 1/4-inch (6.35-mm) and 3/16-inch (4.5-mm) flat-blade screwdrivers
- Tape measure
- Level (optional)
- One of the following rack-mounting kits for ASR 9901 (provided by Cisco):
  - ASR-9901-2P-KIT for mounting the chassis in a 19-inch or 23-inch two-post rack.
  - ASR-9901-4P-KIT for mounting the chassis in a 19-inch or 23-inch four-post rack.

Installing the Chassis in a Two-Post Rack

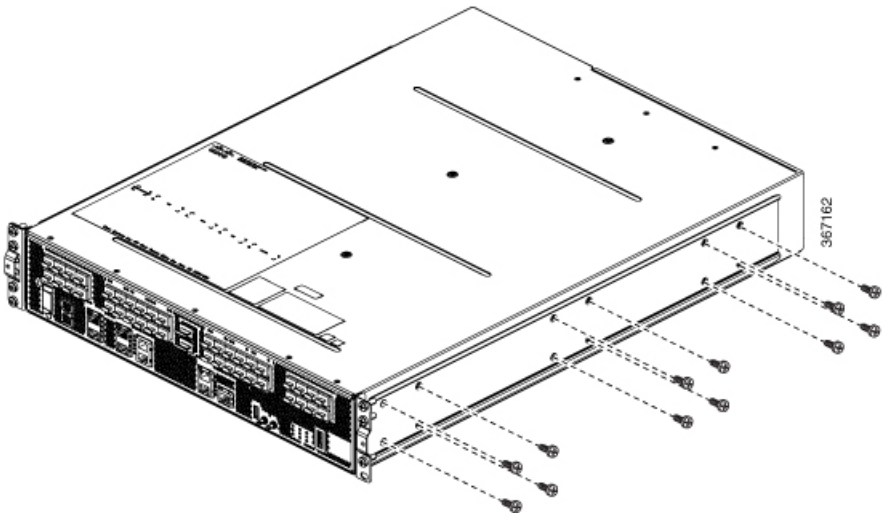
To install the chassis in a two-post rack, follow these steps:

Before you begin

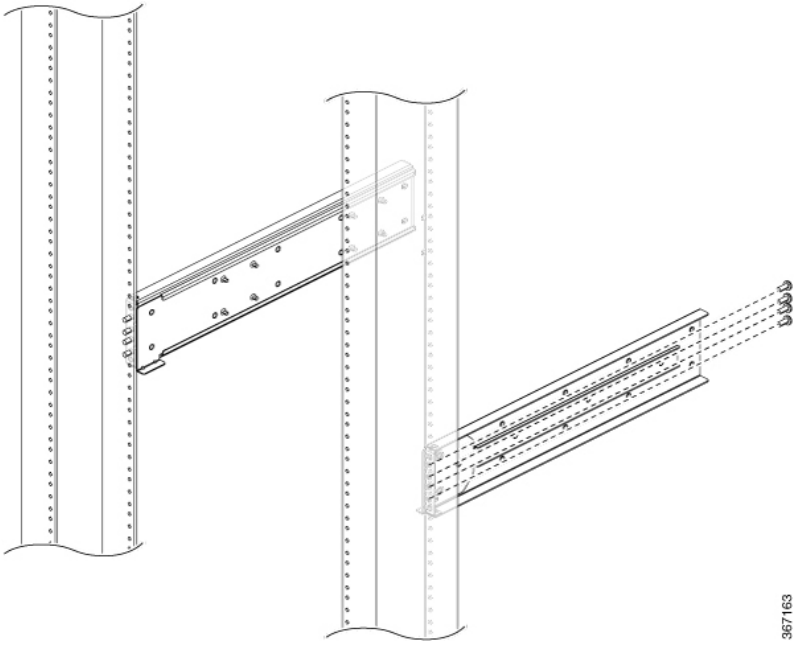
Before you install the chassis in the rack, make sure that you have the necessary tools and equipment (see Before you Begin, on page 77).

Procedure

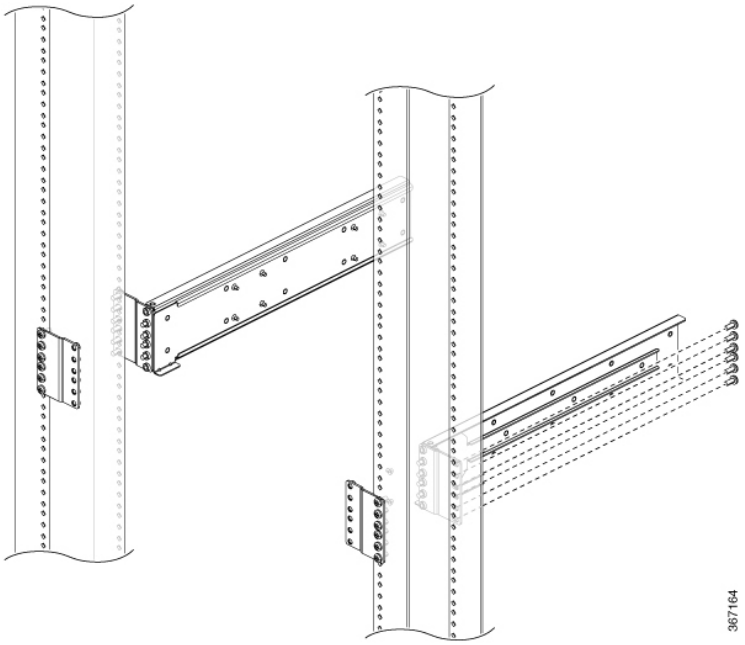
Step 1 Attach the mounting brackets to the sides of the chassis using twelve M4 flat-head screws per side. The recommended maximum torque is 15 in.-lb (1.7 N-m).



Step 2 Attach the left and right slide rail assemblies to the back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).

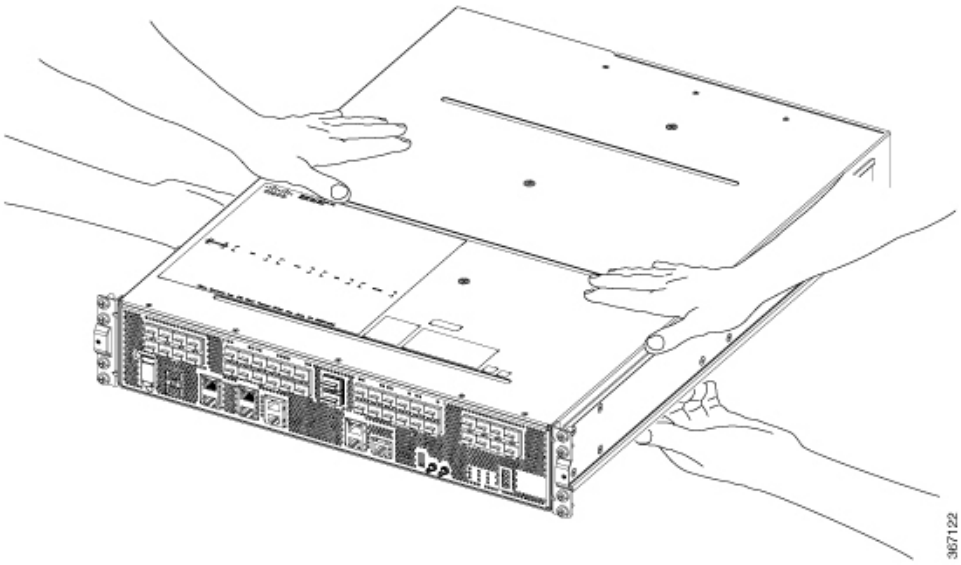


Note If you are installing the router in a 23-inch rack, attach extension plates to the front and back of the 2-post rack using six M5 pan head screws each. Use a level to make sure the plates are level. Attach the left and right slide rail assemblies to the extension plates on back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).



Step 3 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis.

Figure 97: Correct Lifting Positions



Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

Step 6 Hold the chassis in position against the mounting rails while the second person finger-tightens four screws to the rack rails on each side of the chassis (see the figure below).

Figure 98: 19-Inch Two-Post Rack

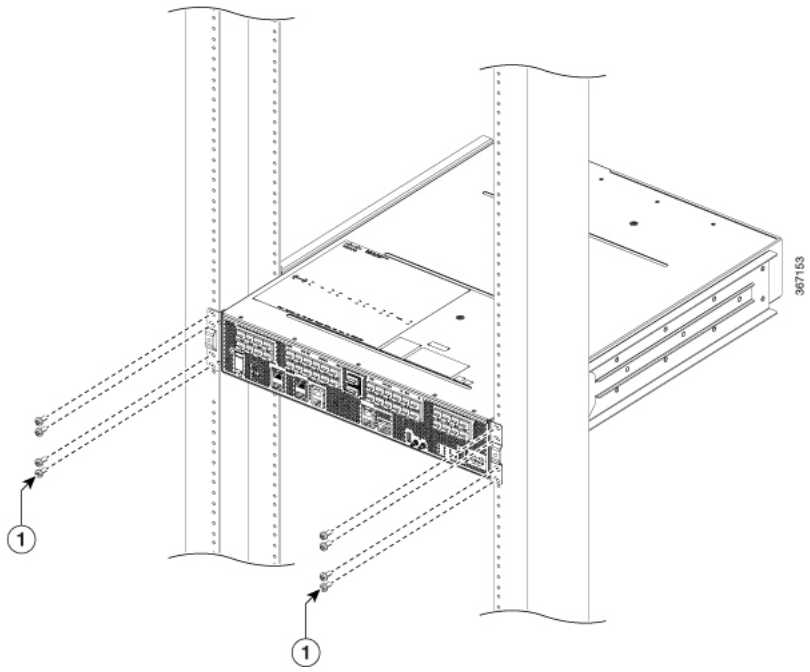
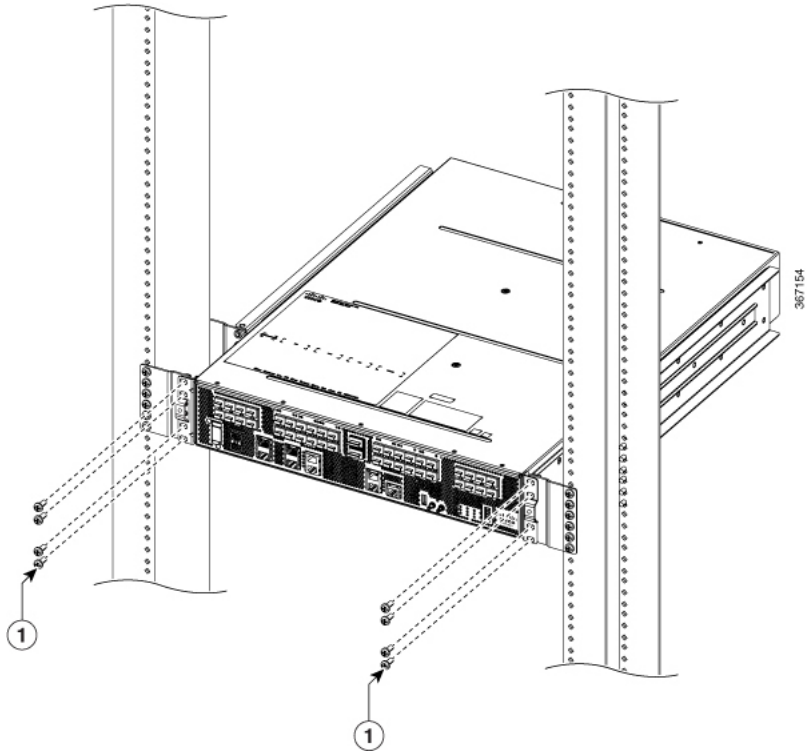


Figure 99: 23-Inch Two-Post Rack



1	Four screws on each side to attach the chassis to the rack

Step 7 Fully tighten all the screws to secure the chassis to the rack rails.

Installing the Chassis in a Four-Post Rack

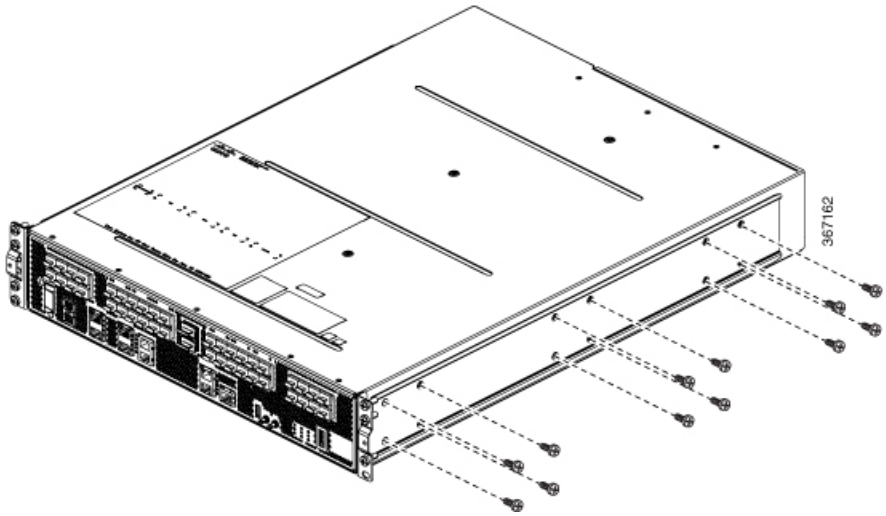
To install the chassis in a four-post open rack, follow these steps:

Before you begin

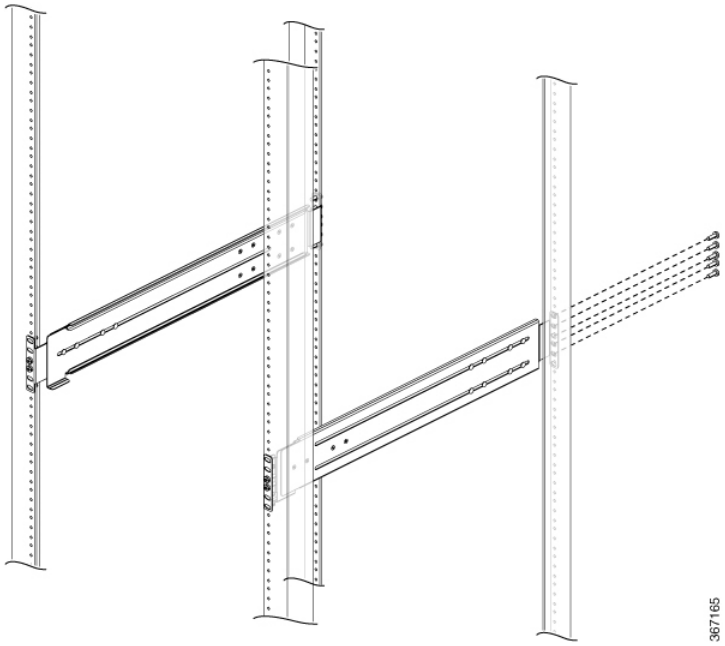
Before you install the chassis in the rack, make sure that you have the necessary tools and equipment (see Before you Begin, on page 77).

Procedure

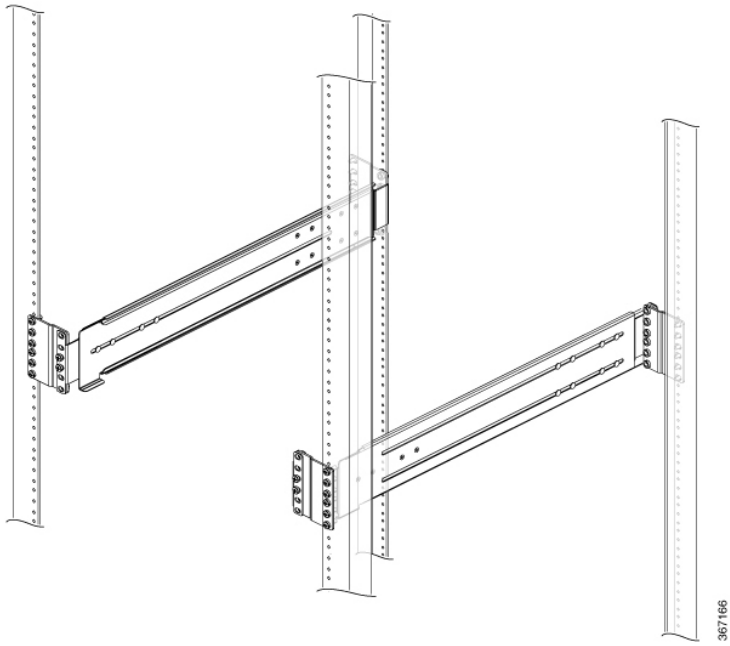
Step 1 Attach the mounting brackets to the sides of the chassis using twelve M4 flat-head screws per side. The recommended maximum torque is 15 in.-lb (1.7 N-m).



Step 2 Attach the right slide rail assembly to the right side of the rack. Use two M5 pan head screws in the center holes of the front bracket and four M5 pan head screws for the rear bracket. Repeat for the left slide rail assembly. The recommended maximum torque is 31 in.-lb (3.5 N-m).

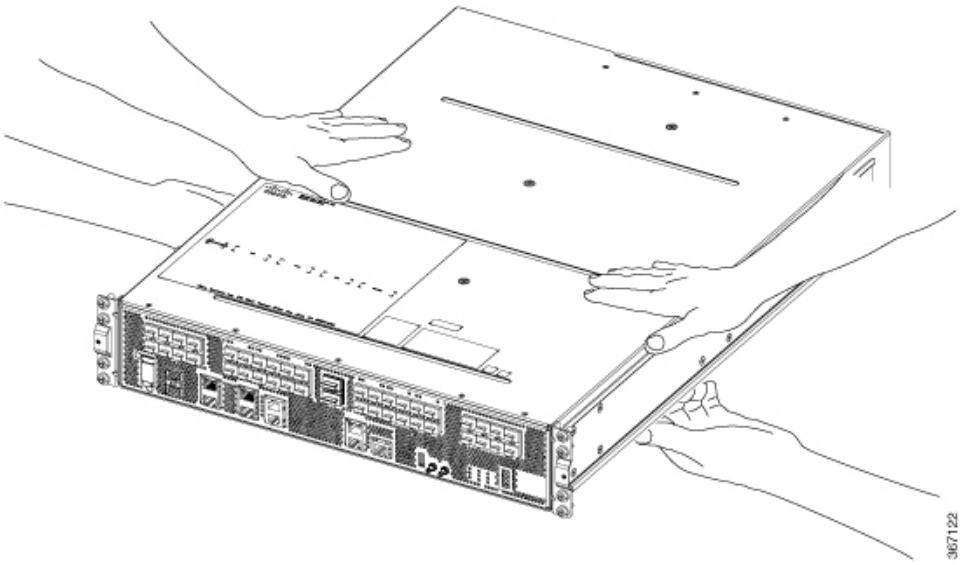


Note If you are installing the router in a 23-inch rack, attach extension plates to each post of the rack using six M5 pan head screws per plate. Use a level to make sure the plates are level. Attach the left and right slide rail assemblies to the extension plates on each post using two M5 pan head screws in the center holes of the front bracket and four M5 pan head screws for the rear bracket. The recommended maximum torque is 31 in.-lb (3.5 N-m).



Step 3 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis (see the figure below).

Figure 100: Correct Lifting Positions



Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

Step 6 Hold the chassis in position against the mounting rails while the second person finger-tightens four screws to the rack rails on each side of the chassis (see the figure below).

Figure 101: 19-Inch Four-Post Rack

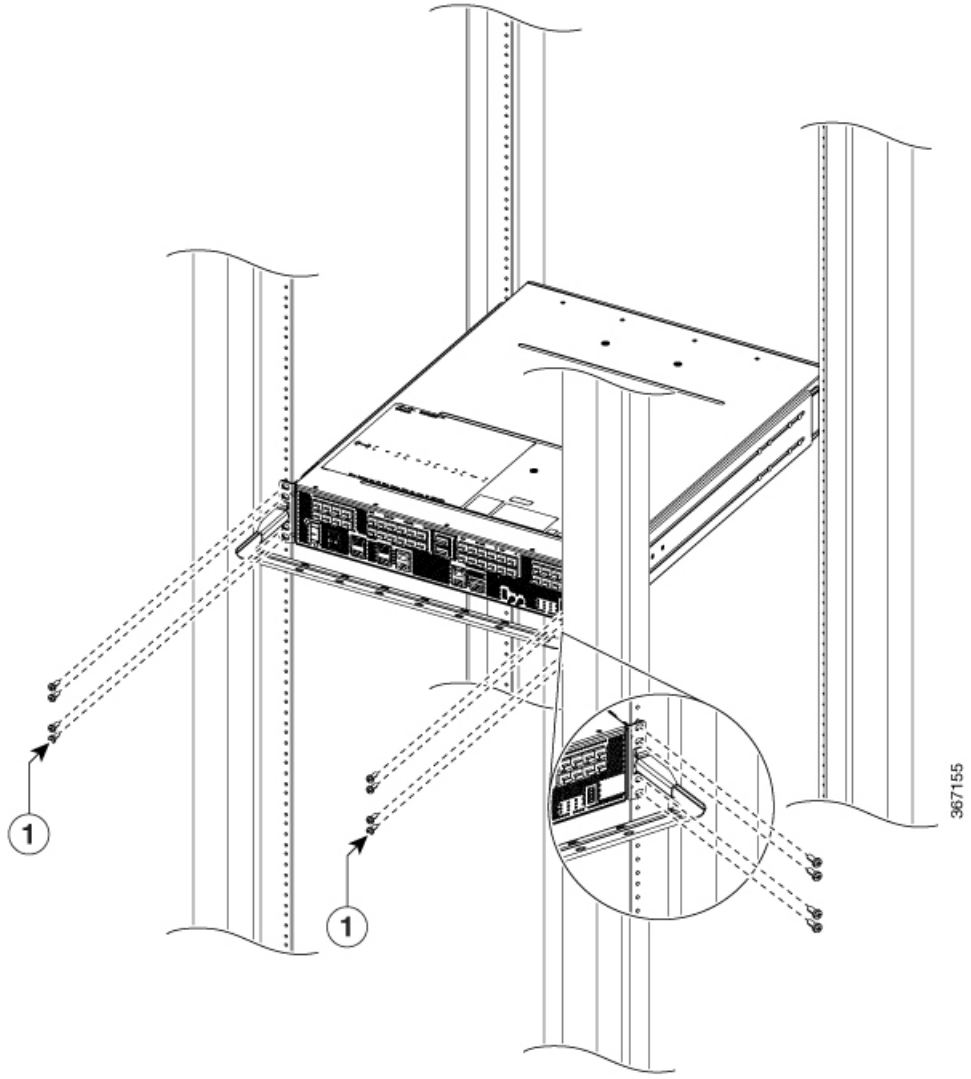
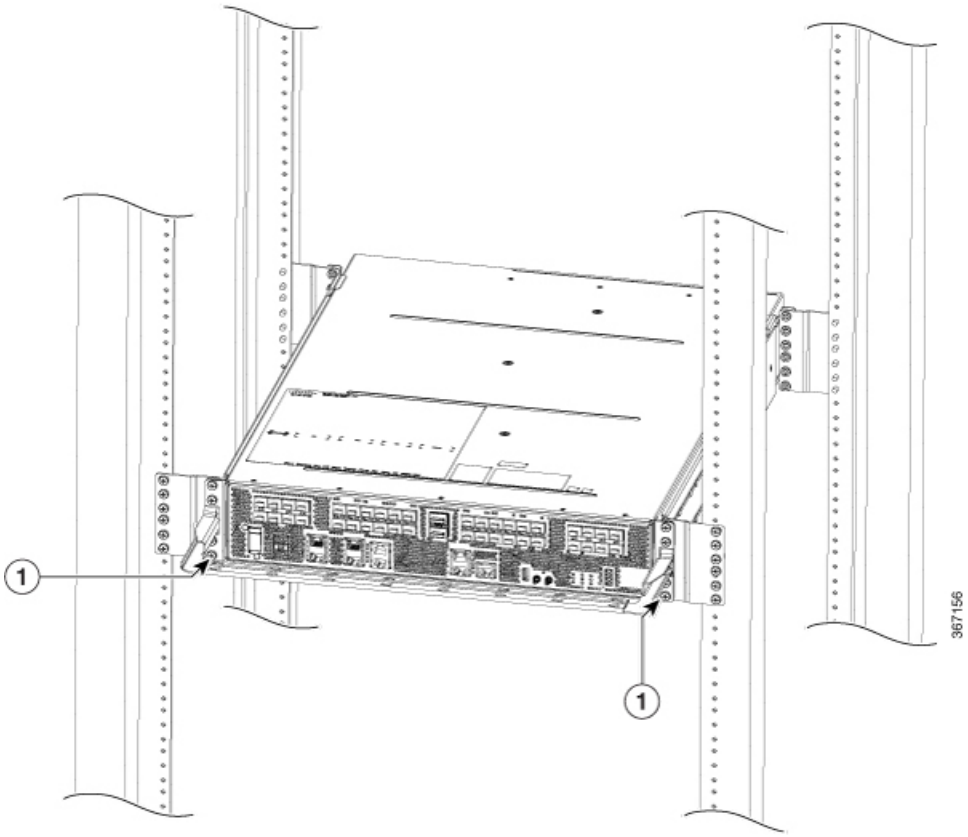


Figure 102: 23-Inch Four-Post Rack



1	Four screws on each side to attach the chassis to the rack

Step 7 Fully tighten all the screws to secure the chassis to the rack rails.

Installing the Cisco ASR 9001 Chassis

This chapter describes how to install a Cisco ASR 9001 chassis in a rack. It includes the following sections:

Before you Begin

Before you install the chassis, make sure that you have following tools and equipment:

- ESD-preventive wrist strap
- Number 1 and number 2 Phillips screwdrivers
- 1/4-inch (6.35-mm) and 3/16-inch (4.5-mm) flat-blade screwdrivers
- Tape measure
- Level (optional)

- Minimum of six binderhead screws (usually provided with the rack) to secure the chassis to the mounting flanges (also called *rails*) in the rack. Three screws should be installed on each side of the chassis.
- One of the following rack-mounting kits (provided by Cisco):
  - Cisco PID ASR-9001-2P-KIT= for mounting the chassis in a 19-inch two-post rack.
  - Cisco PID ASR-9001-2PL-KIT= for mounting the chassis in a 23-inch two-post rack.

Note Two rack-mounting kits are needed for four-post rack installations.

- (Optional) Cisco ASR 9001 Air Plenum Assembly Kit (Cisco PID ASR-9001-PLENUM=)

Rack-Mounting the Chassis

The chassis is installed in a front-mounted position, as shown in Figure 27: Cisco ASR 9901 Router Mounted in a 2-Post Rack. In a front-mounted position, the chassis rack-mounting flanges are secured directly to the rack posts.

Note Before you install the chassis in a rack, read the information in Rack-Mounting and Air Flow Clearance Guidelines, on page 28.

Installing the Chassis in a Two-Post Rack

Before you install the chassis in the rack, make sure that you have the necessary tools and equipment (see Before you Begin, on page 85).

Note Six mounting bracket screws (three per side) are provided to attach the chassis to the rack. If the bracket holes do not line up with the rack rails, make sure that you attach a minimum of four screws (two screws per bracket) on each side.

To install the chassis in a two-post rack, follow these steps:

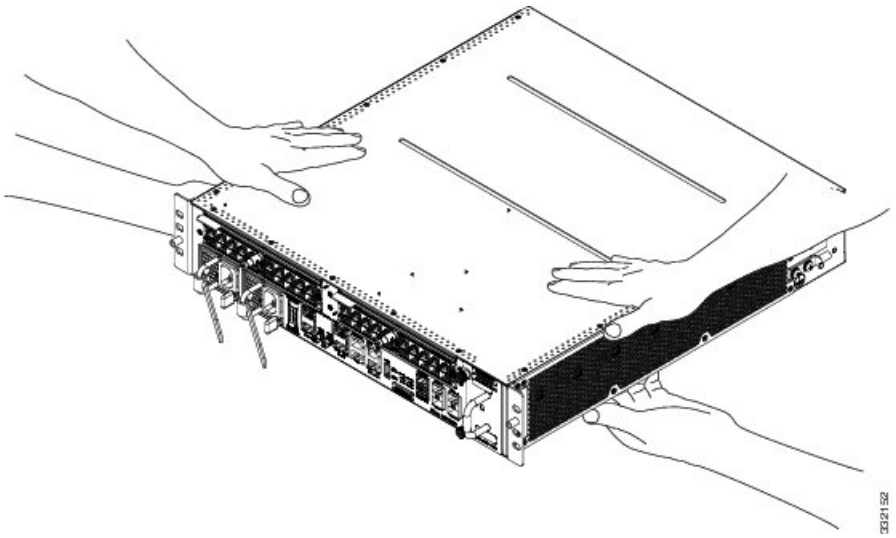
Procedure

Step 1 Attach the mounting flanges to the chassis by using the Cisco-supplied screws.

To accommodate racks with different hole patterns in their mounting flanges, the chassis rack-mounting flanges have three oblong screw holes on each side.

Step 2 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis (see the figure below).

Figure 103: Correct Lifting Positions



Caution Do not grasp air inlet or exhaust when lifting the router chassis.

Step 3 Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

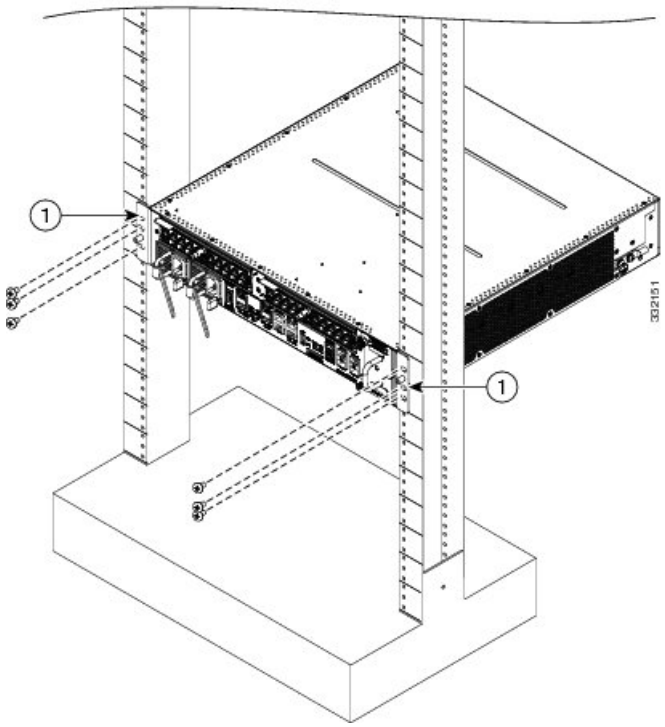
Step 4 Hold the chassis in position against the mounting rails while the second person finger-tightens a screw to the rack rails on each side of the chassis.

Step 5 Finger-tighten two more screws to the rack rails on each side of the chassis. Space the screws evenly between the top and bottom of the chassis (see the figure below).

Step 6 Fully tighten all the screws on the chassis mounting flanges and bracket flanges (each side) to secure the chassis to the rack rails.

What to do next

Figure 104: Installing the Cisco ASR 9001 Chassis in a Two-Post Rack



1	Three screws on each side (minimum two) to attach the chassis to the rack

Installing the Chassis in a Four-Post Rack

If you are installing the chassis without air plenum kit, you will need two side mounting brackets used to attach the chassis to the rear posts as shown in the figure below. See Before you Begin, on page 85 for mounting bracket information.

To install the chassis in a four-post open rack, follow these steps:

Procedure

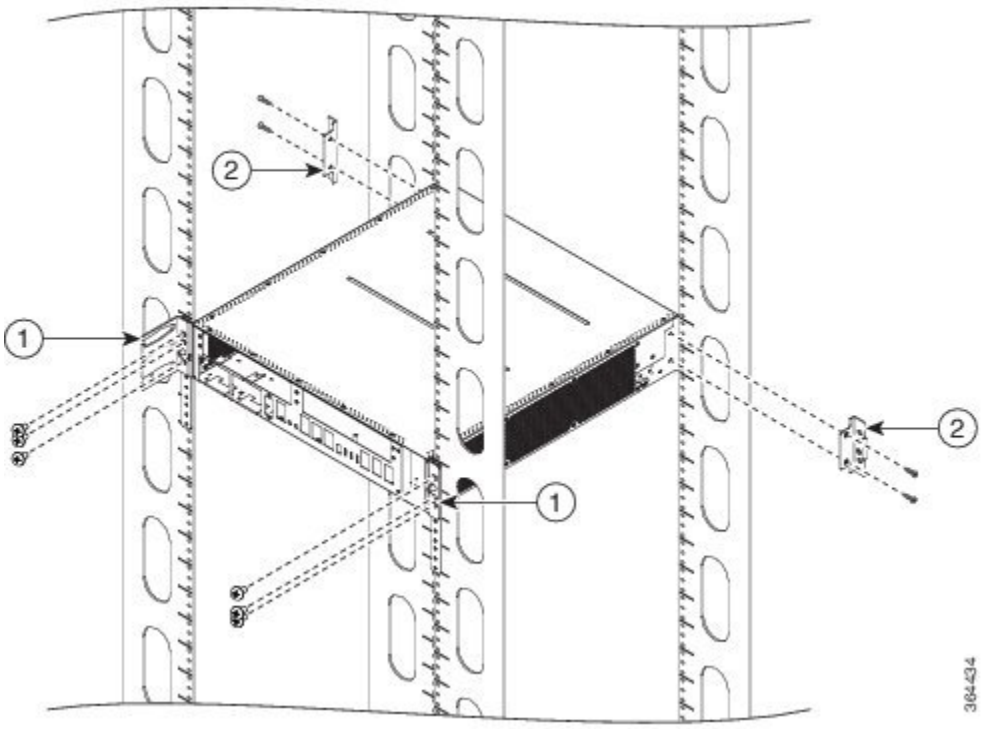
Step 1 Follow the steps in Installing the Chassis in a Two-Post Rack, on page 86 to secure the chassis to the front rack posts.

Step 2 For rear mounting, align each rear mounting bracket (see the figure below) with the screw holes on the chassis and the mounting holes in the rear rack posts.

Step 3 Fully tighten both screws to the chassis on each side to secure the chassis to the rear posts.

What to do next

Figure 105: Installing the Cisco ASR 9001 Router Chassis in a Four-Post Rack



1	Three screws on each side (minimum two) to attach the chassis to the rack.	2	Two rear mounting brackets on each side to attach the chassis to the rear rack posts.

Supplemental Bonding and Grounding Connections

Before you power on the router for the first time, we recommend that you connect the central office ground system or Network Equipment Building System (NEBS) to the threaded supplemental bonding and grounding receptacles on the router. For more information on supplemental bonding and grounding cable requirements, see NEBS Supplemental Unit Bonding and Grounding Guidelines, on page 58.

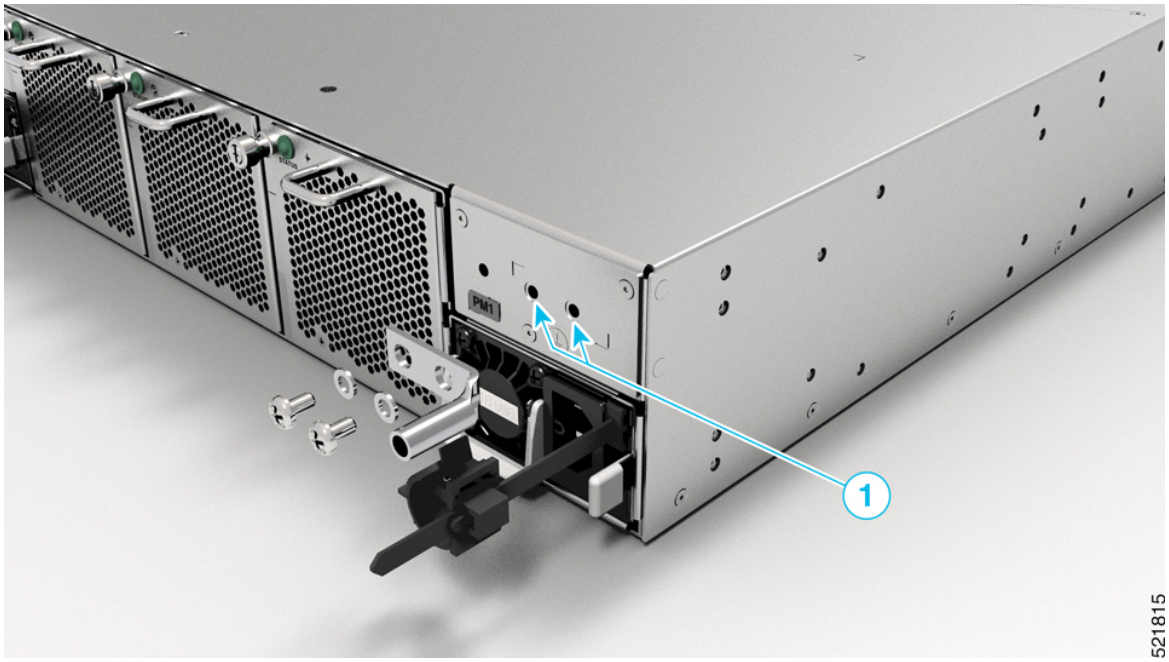
Use this procedure to attach a grounding cable lug to the router:

Procedure

Step 1 Insert the grounding screws through the locking washers, and into the threaded grounding receptacle on the chassis as shown in the following figures.

Note For Cisco ASR 9902 router, the grounding lug is shipped with the chassis in the shipping container, it will not be mounted in the chassis.

Figure 106: NEBS Bonding and Grounding for the Cisco ASR 9902 Router



1	Grounding points

Figure 107: NEBS Bonding and Grounding for the Cisco ASR 9903 Router

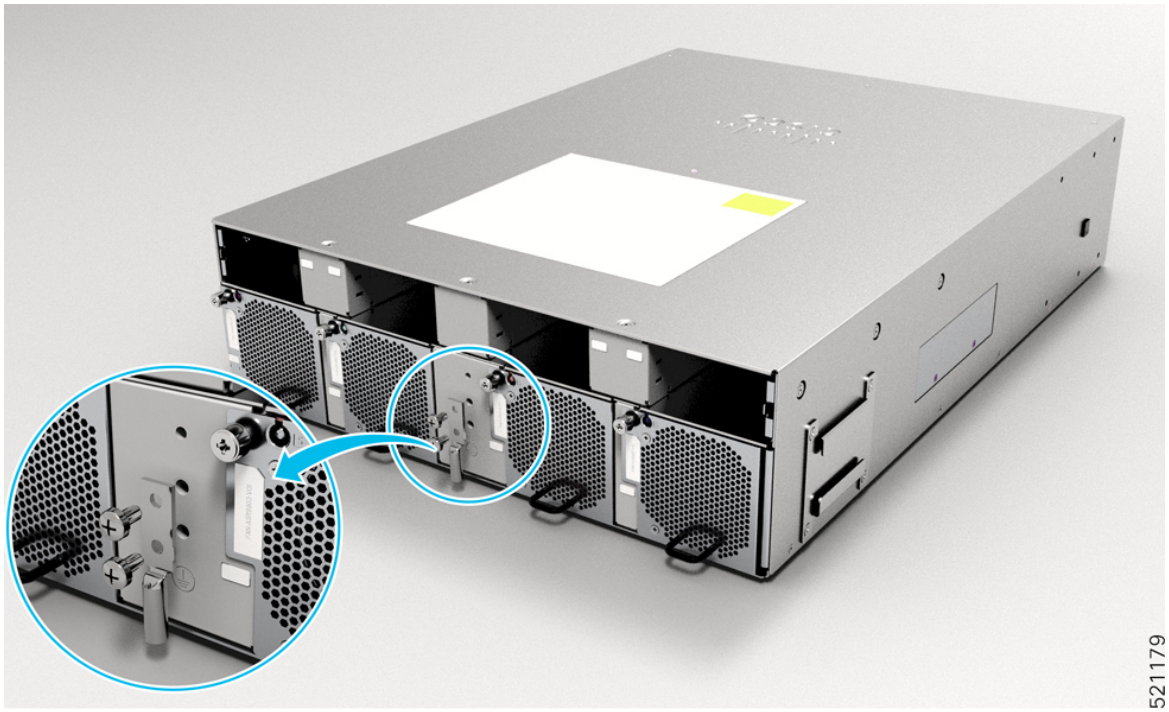


Figure 108: NEBS Bonding and Grounding for the Cisco ASR 9901 Router

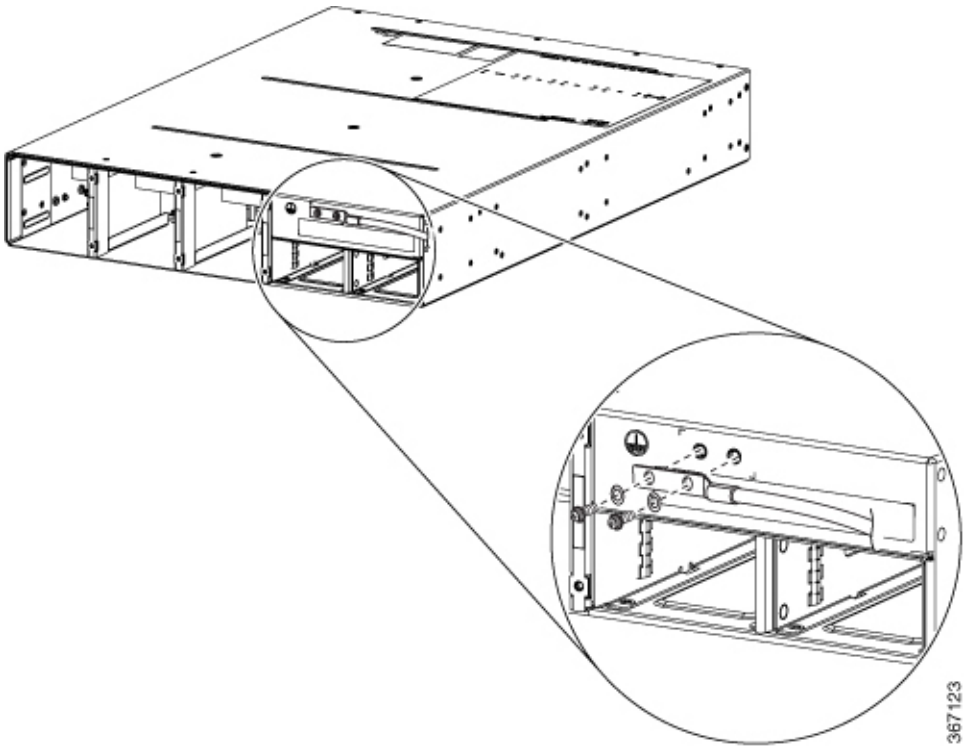
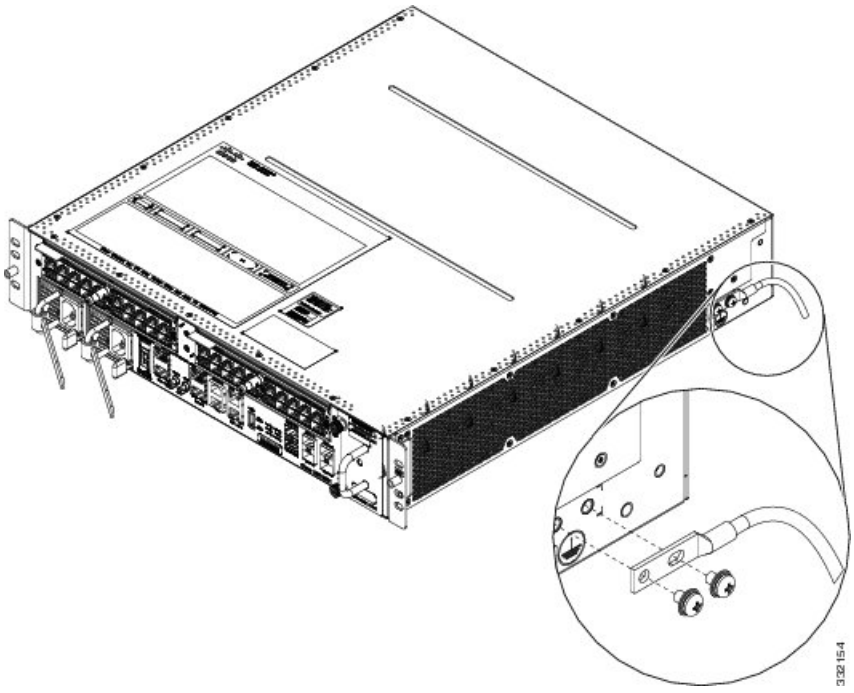


Figure 109: NEBS Bonding and Grounding for the Cisco ASR 9001 Router



Step 2 Tighten the grounding screws securely to the receptacles.

Step 3 Prepare the other end of the grounding wire, and connect it to the appropriate grounding point at your site to ensure an adequate earth ground.

Installing the Optional Air Plenum Kit

The Cisco ASR 9001 Router has an optional air plenum kit (PID ASR-9001-PLENUM=) that converts the chassis from side-to-side ventilation to front-to-back ventilation. This section describes how to install the air plenum kit in a rack.

- Air Plenum Kit Contents, on page 92
- Supported Rack Types and Adapter Plates, on page 92
- Installing the Air Plenum Kit, on page 93

Air Plenum Kit Contents

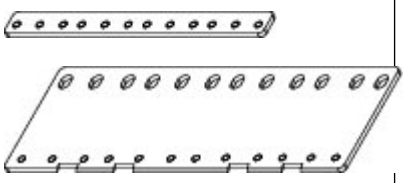
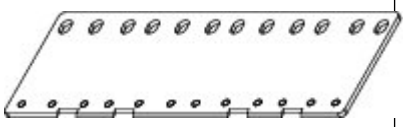
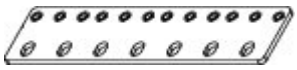
The Cisco ASR 9001 Plenum Kit includes:

- One plenum assembly
- Adapter plates (three types, depending on the rack-type)
- One cable management tray and cable guide
- One grounding bracket
- Two grounding lugs with four M4 screws (two screws per grounding lug)
- Two 10-32 UNC screws and two M4 screws (for attaching the grounding bracket the Cisco ASR 9001 chassis)

Supported Rack Types and Adapter Plates

The following table lists the racks that support the optional air plenum kit and adapter plates.

Table 13: Supported Rack Types and Adapter Plates

Rack Type	Rack Standard	Adapter Plates
19-inch and 23-inch rack, two-post or four-post, 600 mm depth	EIA standardFlat profile post	
23-inch cabinet, adjustable two-post or four-post, 600 mm depth	EIA Standard	
21-inch cabinet	ETSI	

Installing the Air Plenum Kit

The air plenum kit is mounted in the rack before the Cisco ASR 9001 Router is installed. The steps for mounting the air plenum kit in the rack are different, depending on the whether the kit is pre-assembled before mounting it in the rack or assembled after the plenum base is mounted in the rack.

- If the air plenum kit is pre-assembled before mounting it in the rack:

The side baffles, air filter assembly, and cable management tray are attached to the plenum base outside the rack. The plenum assembly is then installed from the rear of the 19-inch rack, or from the front or rear of the 23-inch rack.

- If the air plenum kit is assembled after the plenum is mounted in the rack:

The plenum base is first installed from the front (applicable to 19-inch rack). The side baffles, air filter assembly, and cable management tray are then installed in the plenum base after it has been mounted in the rack.

Note The cable guide is attached to the rack after the Cisco ASR 9001 Router is installed.

Installing the Air Plenum Kit in a 19-inch Rack

Note The air plenum kit is assembled and mounted in the rack before the Cisco ASR 9001 Router is installed.

To install the air plenum kit in a two-post or four-post 19-inch rack, follow these steps:

Procedure

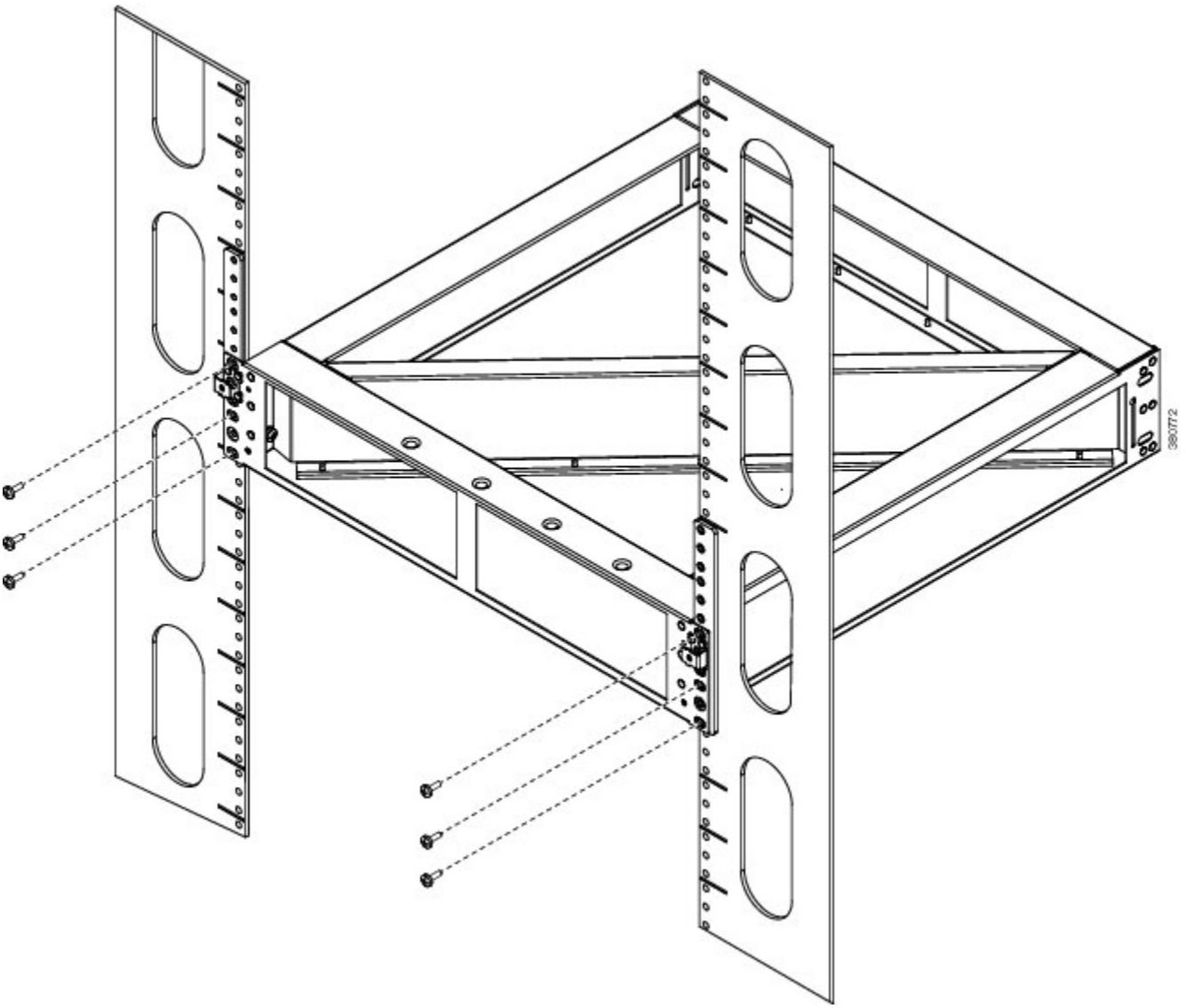
Step 1 Place the plenum base on a flat and stable surface. Secure the left and right adapter plates to the front of the plenum base using two customer-supplied rack-mounting screws in the top and bottom screw holes on the plenum base.

Step 2 Lift the plenum base to the desired position in the rack. Align the screw holes on the adapter plates on the plenum base with the mounting holes in the rack.

Step 3 Attach the plenum base to the left and right rack rails using six customer-supplied rack-mounting screws, three on each side. Torque the screws to the weight specified for your particular rack (see the following figure).

Note If the front to rear spacing for the cabinet is 18.4 inches, attach the rear adapter plates for additional support (see Step 7).

Figure 110: Installing the Plenum Base in a 19-inch Rack



Step 4 Attach the left and right air baffles to the plenum base using the Cisco supplied M5x10mm screws (four for each air baffle). The keyholes on each side of the plenum base will help to guide the air baffles into position (see *Attaching the Air Baffles to the Plenum Base* figure).

Step 5 Position the air filter at the front of the plenum assembly using the two key locators. Insert and hand-tighten the two captive screws to secure the air filter assembly to the plenum assembly (see *Attaching the Air Filter Assembly to the Plenum Assembly* figure).

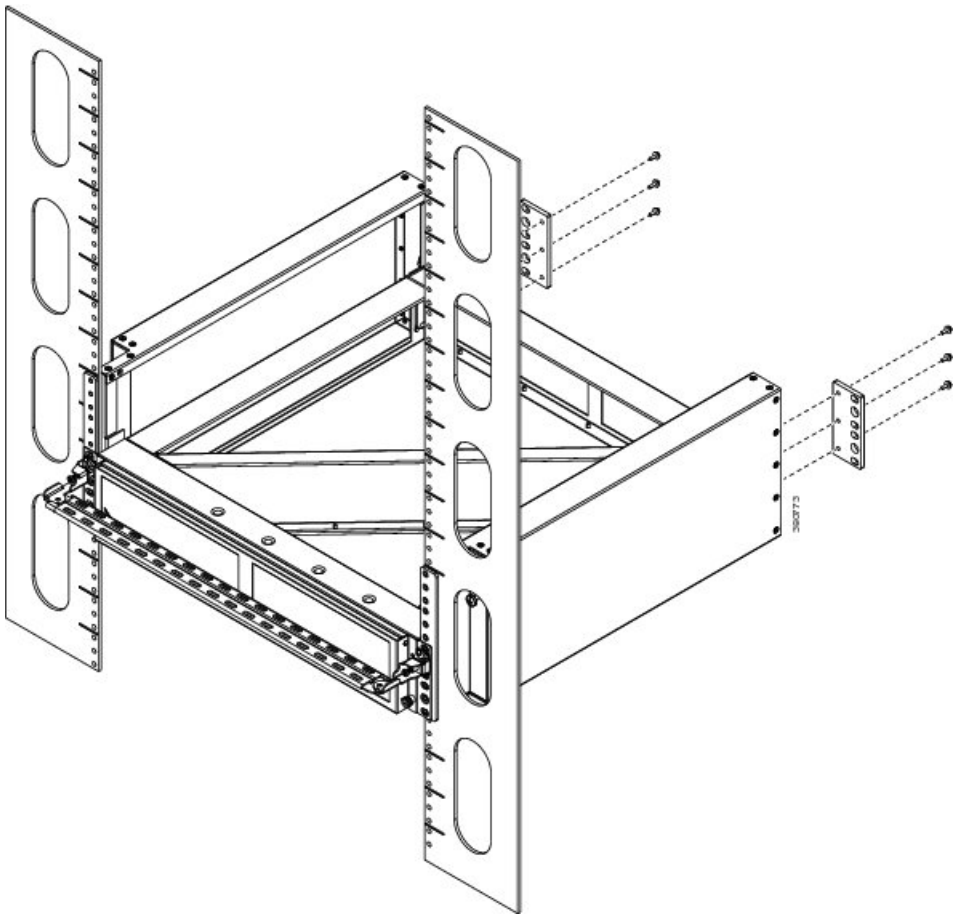
Step 6 Position the cable management tray at the front of the plenum assembly (see *Attaching the Cable Management Tray to the Plenum Assembly* figure). Insert and hand-tighten both captive screws to secure the cable management tray to the plenum assembly.

Step 7 If you are installing the air plenum kit to a four-post rack:

a) Attach the rear adapter plates to the rear side of the plenum assembly.

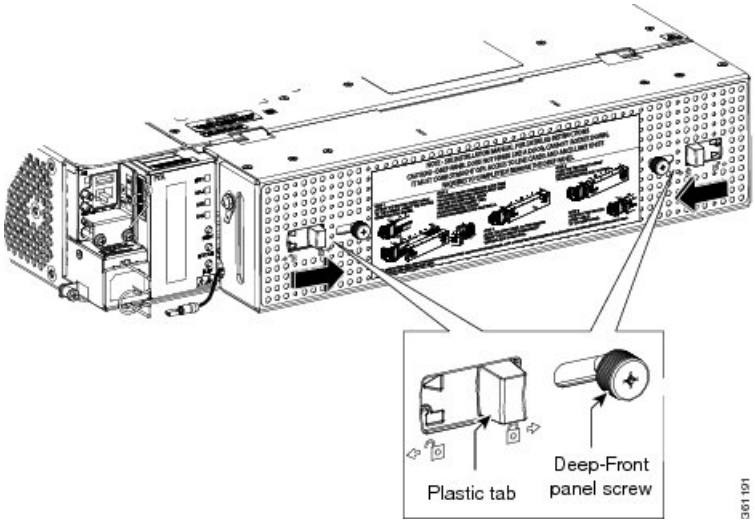
b) Fasten the rear adapter plates with M3 x 10mm screws, three on each side (see the figure below).

Figure 111: Attaching the Rear Adapter Plates (Four-Post Rack)



Step 8 Place the Cisco ASR 9001 Router on a flat and stable surface. Attach the rear grounding bracket (see the figure below).

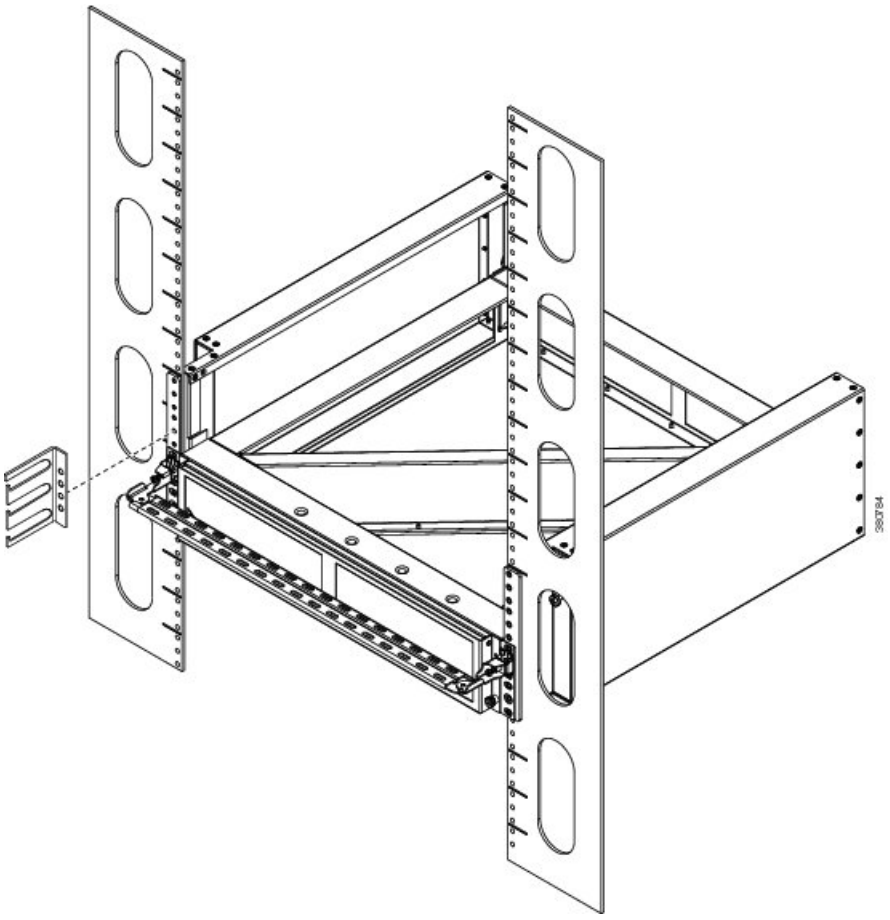
Figure 112: Rear Grounding Bracket



Step 9 Install the Cisco ASR 9001 Router in the plenum assembly in the rack (see Installing the Chassis in a Two-Post Rack, on page 86 or Installing the Chassis in a Four-Post Rack, on page 88).

Step 10 After the chassis is installed, attach the cable guide to the front left side post of the rack. Fasten the cable guide with one customer-supplied rack-mounting screw (see the figure below).

Figure 113: Attaching the Cable Guide



Installing the Air Plenum Kit in an ETSI Two-Post to Four-Post Rack

Note The air plenum kit is assembled and mounted in the rack before the Cisco ASR 9001 Router is installed.

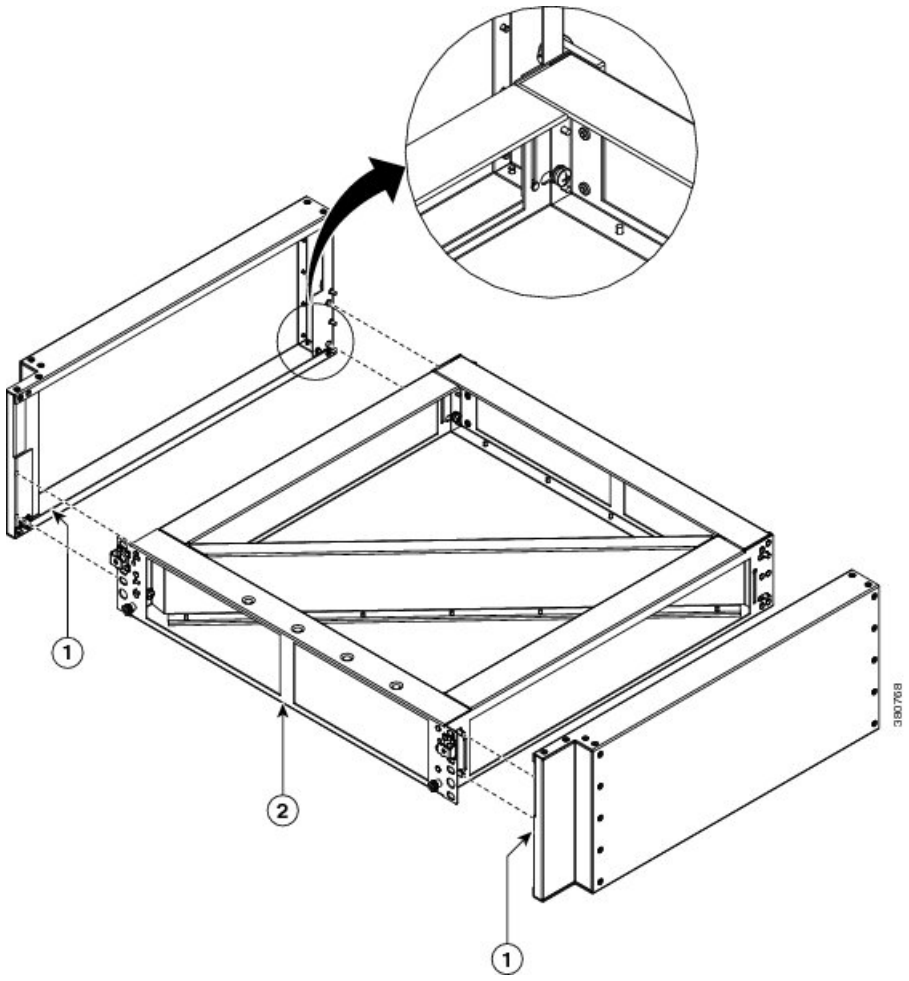
To install the air plenum kit in an ETSI four-post open rack, follow these steps:

Procedure

Step 1 Place the plenum base on a flat and stable surface. Secure the left and right adapter plates to the front of the plenum base using two Cisco supplied M5x10mm screws rack-mounting screws in the top and bottom screw holes on the plenum base.

Step 2 Attach the left and right air baffles to the plenum base using the Cisco supplied M5x10mm screws (four for each air baffle). The keyholes on each side of the plenum base will help to guide the air baffles into position (see the figure below).

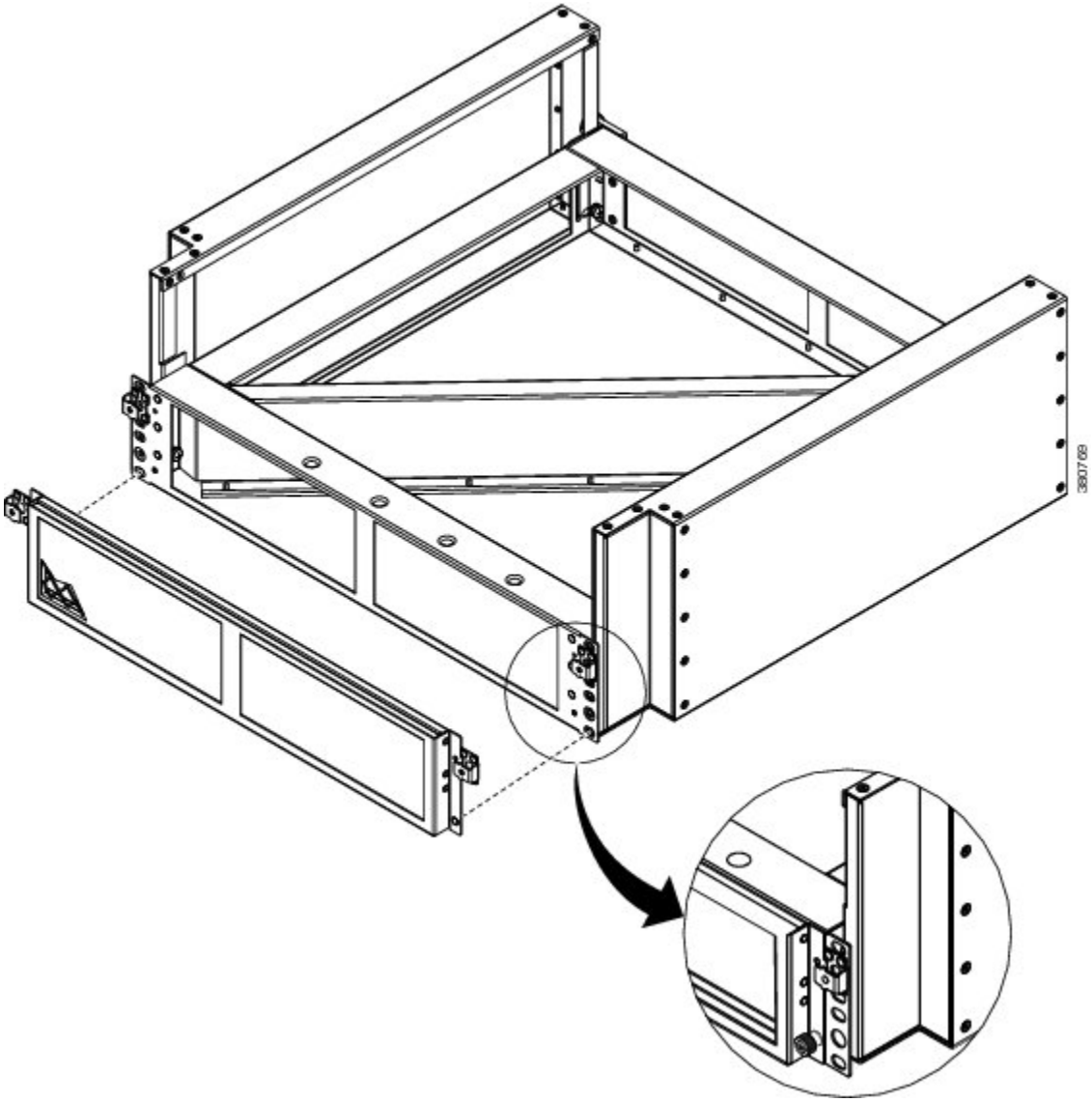
Figure 114: Attaching the Air Baffles to the Plenum Base



1	Air Baffle	2	Plenum base

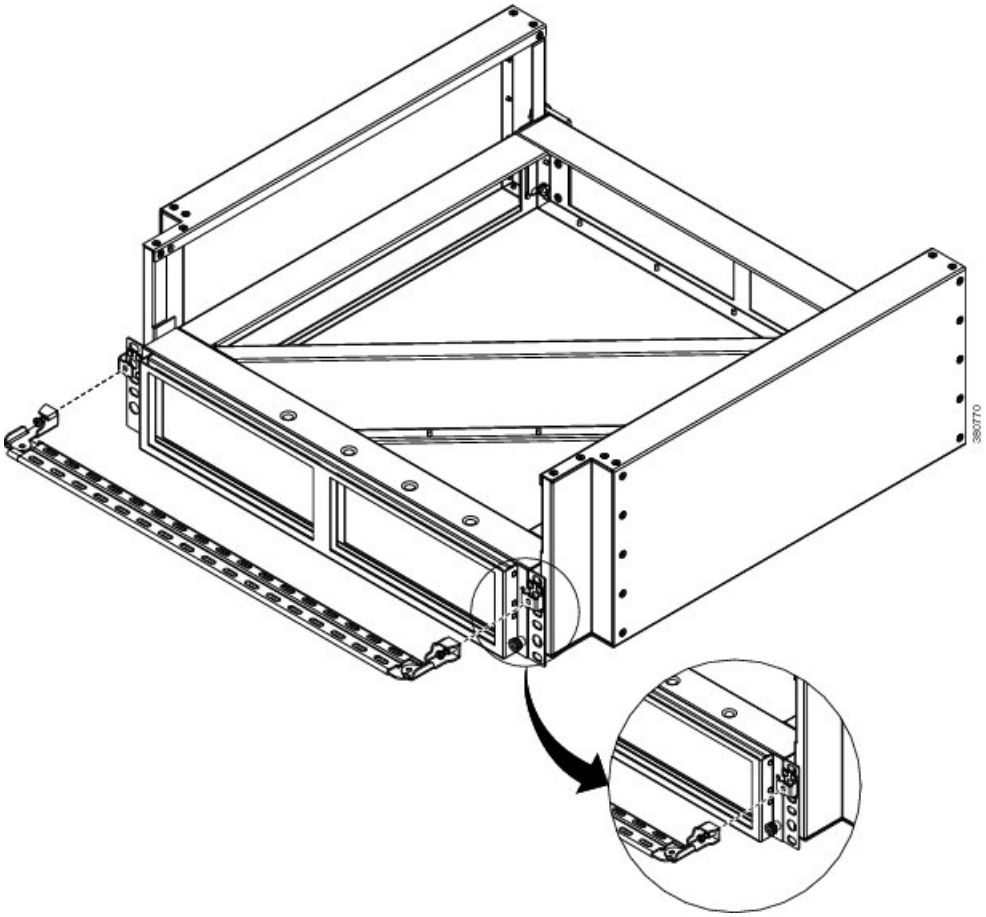
Step 3 Position the air filter assembly at the front of the plenum assembly using the two key locators. Insert and hand-tighten the two captive screws to secure the air filter assembly to the plenum assembly (see the figure below).

Figure 115: Attaching the Air Filter Assembly to the Plenum Assembly



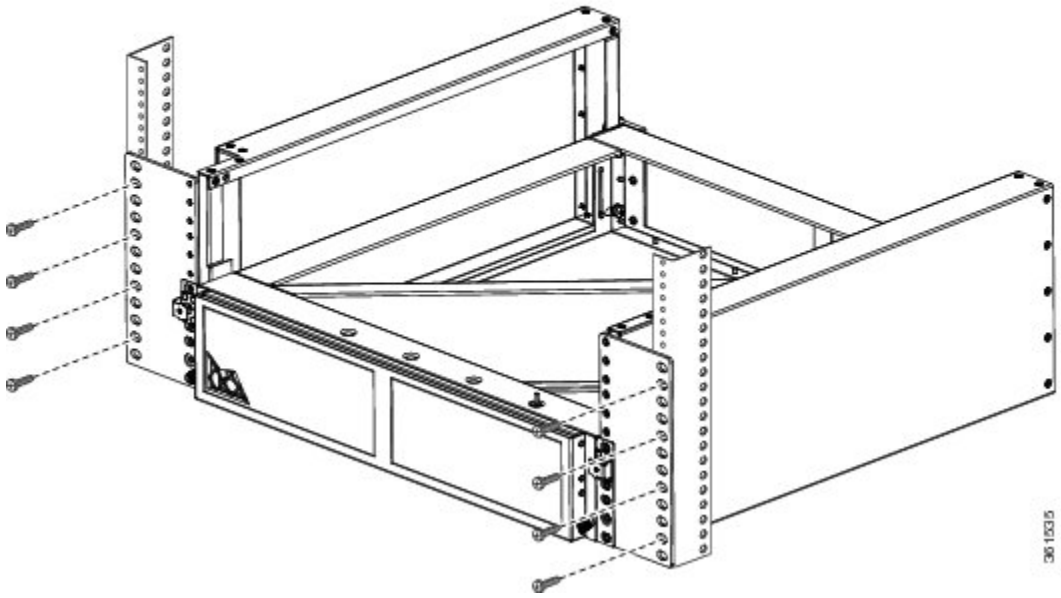
Step 4 Position the cable management tray at the front of the plenum assembly (the figure below). Insert and hand-tighten both captive screws (one on each side) to secure the cable management tray to the plenum assembly.

Figure 116: Attaching the Cable Management Tray to the Plenum Assembly



Step 5 Lift the plenum assembly to the desired position in the rack. Align the screw holes on the adapter plates of the plenum assembly with the mounting holes in the rack.

Figure 117: Installing the Plenum Assembly in a Rack

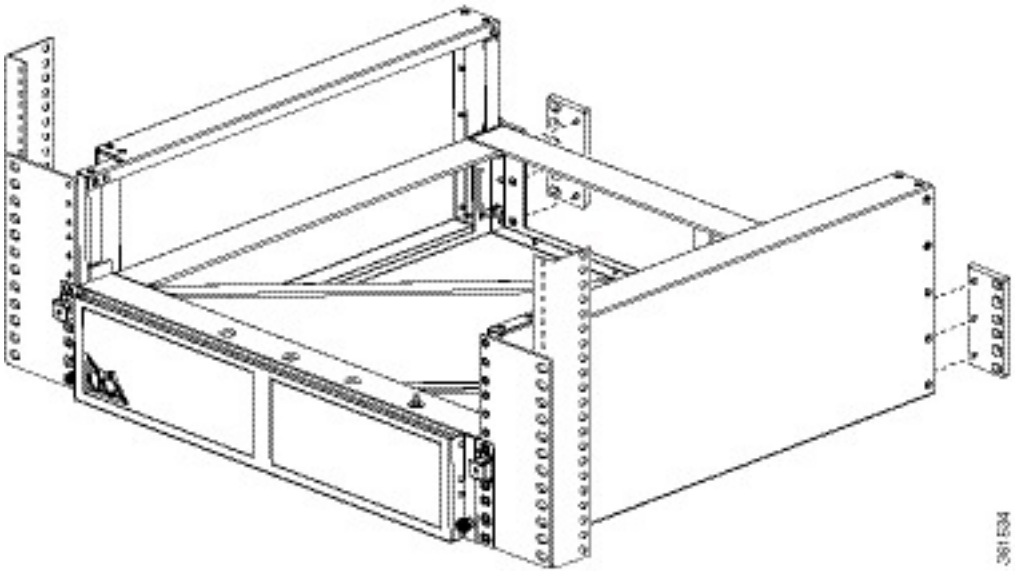


Step 6 Attach the plenum assembly to the left and right rack rails using customer-supplied rack-mounting screws. We recommend a minimum of four screws per side. These screws can vary in size and type depending on the rack that you use. Torque the screws to the weight specified for your particular rack.

Step 7 Attach the rear adapter plates to the rear side of the plenum assembly. Fasten the rear adapter plates with M3 x 10mm screws, three on each side (see the figure below).

Note If the front to rear spacing for the cabinet is 18.4 inches, attach rear adapter plates for support.

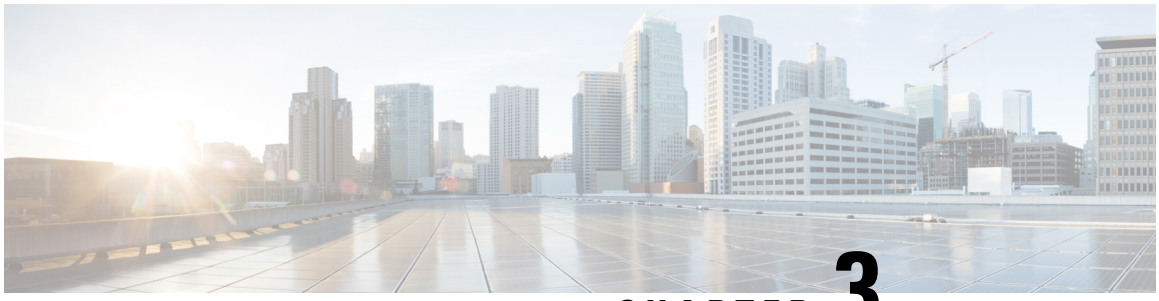
Figure 118: Attaching the Rear Adapter Plates



Step 8 Place the Cisco ASR 9001 Router on a flat and stable surface. Attach the rear grounding bracket (*Rear Grounding Bracket* figure).

Step 9 Install the Cisco ASR 9001 Router in the plenum assembly in the rack (see Installing the Chassis in a Two-Post Rack, on page 86 or Installing the Chassis in a Four-Post Rack, on page 88).

Step 10 After the chassis is installed in the rack, attach the cable guide to the front left post of the rack at the same location as shown in *Attaching the Cable Guide* figure. Secure the cable guide to the rack post with one customer-supplied rack-mounting screw.



CHAPTER 3

Installing Modules and Cables in the Chassis

This chapter contains the procedures for installing cards and modules into the chassis, after it has been installed in a rack. It also describes how to connect cables to the ports and RP.

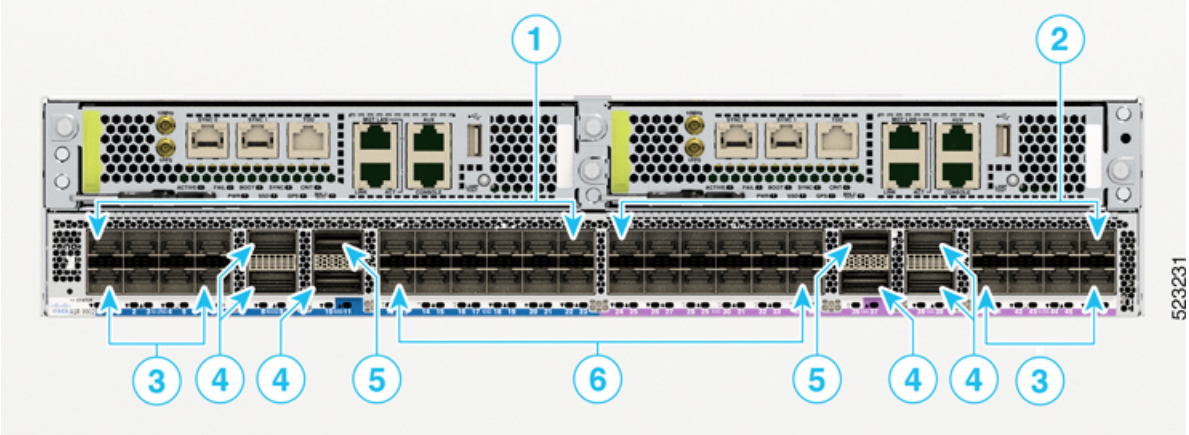
- Cisco ASR 9902 Router Fixed Ports, on page 103
- Cisco ASR 9903 Router Fixed Ports, on page 104
- Cisco ASR 9901 Router Fixed Ports, on page 105
- Online Insertion and Removal, on page 106
- Cisco ASR 9001 Router Fixed Ports and Modular Port Adapters, on page 108
- Installing and Removing Transceiver Modules, on page 117
- Cable Management, on page 117
- Connecting Route Processor Cables, on page 127
- Installing Route Processor Cards into the Cisco ASR 9903 and Cisco ASR 9902 Chassis, on page 129
- ASR 9903 Port Expansion Cards, on page 135
- Connecting Power to the Router, on page 140
- Powering on the Router, on page 145

Cisco ASR 9902 Router Fixed Ports

The Cisco ASR 9902 router has 48 ports that are grouped into slice 0 and slice 1. The slice 0 is color coded in blue, and slice 1 in purple:

- 2 ports that support QSFP-DD-based 100GE pluggables
- 6 ports that support QSFP28-based 100GE pluggables
- 16 ports that support SFP28-based 25GE/10GE dual-rate pluggables
- 24 ports that support SFP+- based LAN/WAN (OTN) pluggables

Figure 119: Cisco ASR 9902 Fixed Ports



1	Slice 0	4	QSFP28 ports; three on each slice.
2	Slice 1	5	QSFP-DD ports; one on each slice.
3	SFP28 ports; eight on each slice.	6	SFP+ ports; twelve on each slice.

Port Mode Configurations

The Cisco ASR 9902 router has 48 ports with maximum of 800G data bandwidth capacity. By default, these ports are in 10GE mode. You can configure the 48 ports in various port modes (100GE, 25GE, and 10GE) using the **hw-module location <node> slice <number> config-mode** command.

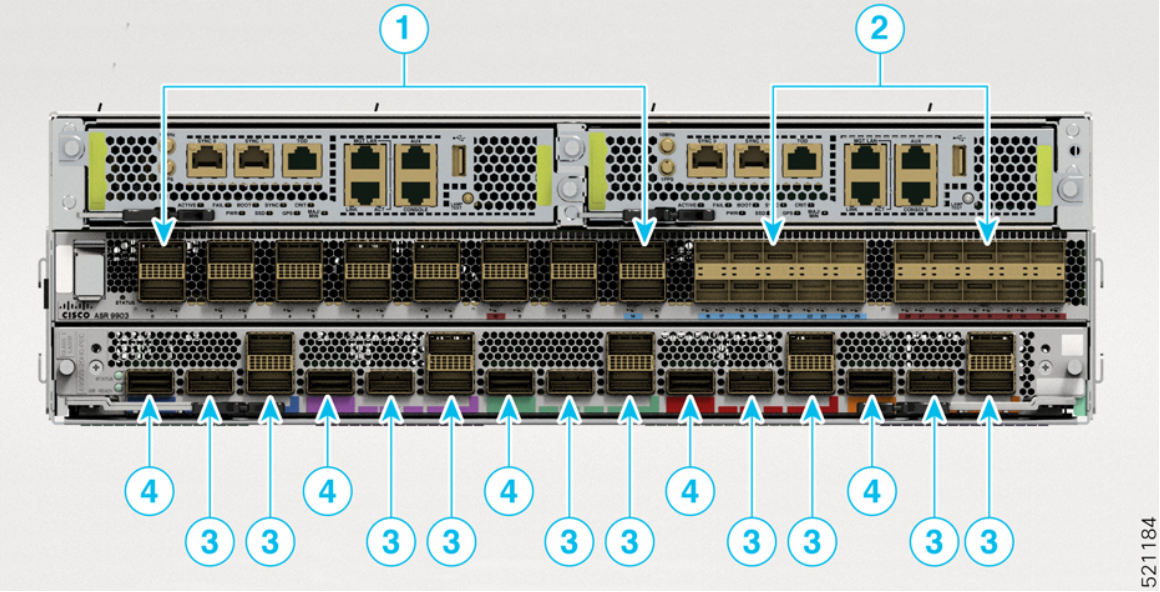
For more information, see *Configuring Port Modes in Cisco ASR 9902 Router* in *System Management Configuration Guide for Cisco ASR 9000 Series Routers*.

Cisco ASR 9903 Router Fixed Ports

The Cisco ASR 9903 Router has fixed-configuration ports that support the following transceivers:

- 16x100GE QSFP28
- 20x10GE SFP+

Figure 120: Cisco ASR 9903 Fixed Ports



1	QSFP28 ports (0-15)	3	QSFP28 ports
2	SFP+ ports (16-35)	4	QSFP-DD ports (0,4,8,12,16)

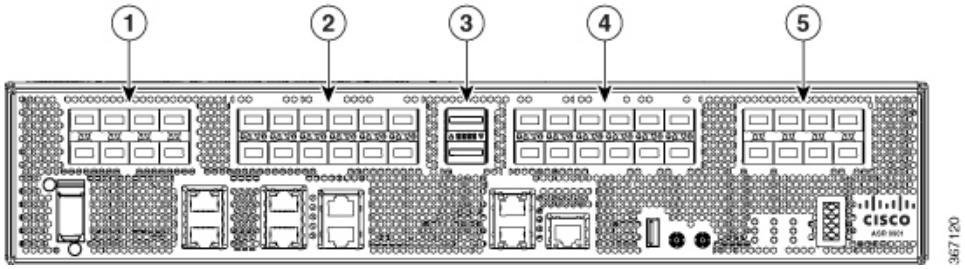
Note Due to the orientation of the QSFP28 ports (20 and 21), you might not be able to disconnect fiber optic cables while the QSFP28 transceiver module is installed in the port. To disconnect fiber optic cables from the QSFP28 ports, we recommend that you first remove the QSFP28 transceiver module from the port, and then remove the cable.

Cisco ASR 9901 Router Fixed Ports

The Cisco ASR 9901 Router has 42 fixed-configuration ports that support the following transceivers:

- 16 SFP ports
- 24 SFP+ ports (supports SFP or SFP+)
- 2 QSFP28 ports

Figure 121: Cisco ASR 9901 Fixed Ports



1	SFP ports (0-7)	4	SFP/SFP+ ports (22-33)
2	SFP/SFP+ ports (8-19)	5	SFP ports (34-41)
3	QSFP28 ports (20-21)		

Note Due to the orientation of the QSFP28 ports (20 and 21), you might not be able to disconnect fiber optic cables while the QSFP28 transceiver module is installed in the port. To disconnect fiber optic cables from the QSFP28 ports, we recommend that you first remove the QSFP28 transceiver module from the port, then remove the cable.

Online Insertion and Removal

Note Installing an MPA in the Cisco ASR 9001 router will cause brief traffic interruption on the fixed ports due to the network processor (NP) initializing.

The Modular Port Adapters (MPAs) on Cisco ASR 9001 router support online insertion and removal (OIR).

Cisco ASR 9903 800G Multirate Port Expansion Card supports online insertion and removal (OIR).

Modular port adapters (MPAs) support three types of OIR(s):

- Soft OIR
- Managed OIR
- Hard OIR

The 2T or 0.8T Port Expansion Cards (PECs) on the Cisco ASR 9903 chassis support managed OIR.

For more information on how to install or remove a PEC, see Install the Port Expansion Card or Remove the Port Expansion Card. To replace a PEC with another PEC, use the managed OIR procedure.

Limitation:

- During online insertion and removal of MPA on the Cisco ASR 9001 router, the field-programmable gate array (FPGA) turns off and the physical interface (PHY) is unavailable to inhibit the clock. As a result, you will observe a SyncE jump of 80 - 120 ns on downstream nodes.

Soft OIR

Soft OIR uses the IOS XR **hw-module subslot 0/0/1 reload**, **hw-module subslot 0/0/1 shutdown**, and **no hw-module subslot 0/0/1 shutdown** commands to complete online insertion and removal. Refer to the Hardware Redundancy and Node Administration Commands on the Cisco ASR 9000 Series Router chapter of the Cisco ASR 9000 Series Aggregation Services Router System Management Command Reference online for command syntax.

Managed OIR

A managed online insertion and removal of Modular port adapters (MPAs) or Port Expansion Card (PEC) is comprised of these steps:

1. Shut down the MPA or PEC with the **hw-module subslot 0/0/1 shutdown** command.
2. Confirm that the LEDs have gone from green to off.
3. Execute the **do show plat** command to verify that the MPA or PEC to be removed is in the disabled state.
4. Physically remove the MPA or PEC to be replaced.
5. Physically insert the replacement MPA or PEC.
6. Return the MPA or PEC to the up state with the **no hw-module subslot 0/0/1 shutdown** command.

Hard OIR

Hard OIR is the physical online insertion and removal of Modular port adapters (MPAs) without software commands. Four types of hard OIR are supported:

- If the bay is empty when the Cisco ASR 9001 router modular line card (MLC) boots you can do the following:
  - Insert a 20 GE MPA
  - Remove and then insert a replacement 20 GE MPA
- If the MLC boots with a 20 GE MPA in the bay you can remove and then insert a replacement 20 GE MPA
- If the MLC boots with a 4 10-GE MPA in the bay you can remove and then insert a replacement 4 10-GE MPA
- If the MLC boots with a 2 10-GE MPA in the bay you can remove and then insert a replacement 2 10-GE MPA

Note Only replacement with same types of MPA is supported by Managed OIR and Hard OIR. To replace with a different MPA type, reload the router. An empty bay during the Cisco ASR 9001 Router modular line card (MLC) bootup defaults to 20 GE MPA mode.

Cisco ASR 9001 Router Fixed Ports and Modular Port Adapters

This section describes the fixed ports and modular port adapters on the Cisco ASR 9001 Router.

Fixed 4x10-Gigabit Ethernet Ports

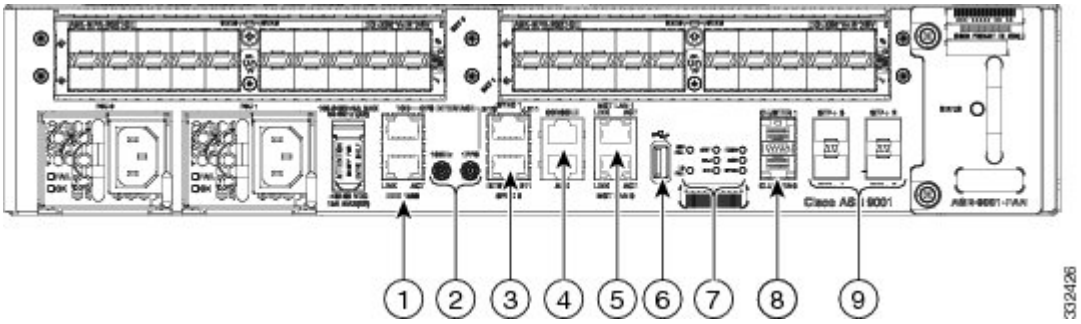
The Cisco ASR 9001 Router has four integrated 10 GE small form-factor pluggable (SFP+) ports that operate at a rate of 10 Gbps.

Each fixed SFP+ port has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated SFP+ port.

Note In Cisco ASR 9001-S Router, two 10 GE fixed SFP+ ports (SFP+2 and SFP+3) are disabled by default, and can be enabled by a license upgrade.

The following figure shows the front panel of the chassis and connectors of the fixed 4x10-Gigabit Ethernet ports.

Figure 122: 4x10-Gigabit Ethernet SFP+ Ports



1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS indicators	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports
4	CONSOLE and AUX ports	9	Fixed SFP+ ports
5	Management LAN ports		

Modular Port Adapters

The Cisco ASR 9001 Router has two bays that support the following Modular Port Adapters (MPAs):

- 20-Port Gigabit Ethernet Modular Port Adapter, on page 109
- 4-Port 10 Gigabit Ethernet Modular Port Adapter, on page 110
- 2-Port 10 Gigabit Ethernet Modular Port Adapter, on page 111

- 1-Port 40 Gigabit Ethernet Modular Port Adapter, on page 112

Note In the Cisco ASR 9001-S Router, one bay (MPA1) is disabled by default, and can be enabled by a license upgrade.

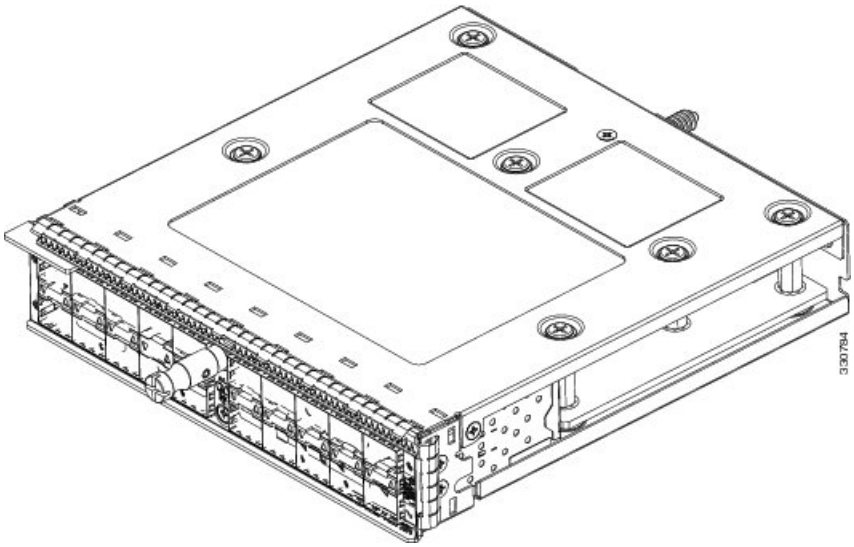
20-Port Gigabit Ethernet Modular Port Adapter

The 20-Port Gigabit Ethernet modular port adapter provides 10 double-stacked SFP (20 total) cages that support either fiber-optic or copper Gigabit Ethernet transceivers.

Each SFP cage on the Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated SFP port, as described in Status LEDs, on page 173 section.

The following figure shows an example of the 20-Port Gigabit Ethernet Modular Port Adapter.

Figure 123: 20-Port Gigabit Ethernet Modular Port Adapter



The following table describes the 20-Port Gigabit Ethernet modular port adapter LEDs.

Table 14: 20-Port Gigabit Ethernet Modular Port Adapter LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up. The MPA A/L LED will blink green when there is traffic activity.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	Modular port adapter power is off.
	Green	On	Modular port adapter is ready and operational.

LED Label	Color	State	Meaning
	Amber	On	Modular port adapter power is on and good, and modular port adapter is being configured.

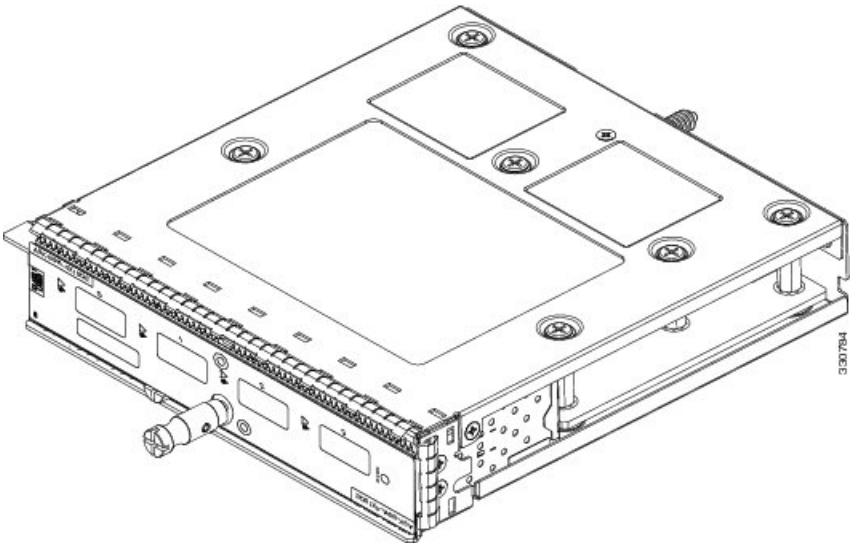
4-Port 10 Gigabit Ethernet Modular Port Adapter

The 4-Port 10 Gigabit Ethernet modular port adapter provides four cages for XFP Ethernet optical interface modules that operate at a rate of 10 Gbps. The four XFP modules can be 10-Gigabit Ethernet multimode or single mode connections.

Each XFP cage on the 4-Port 10 Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated XFP port, as described in Status LEDs, on page 173 section.

The following figure shows an example of the 4-Port 10 Gigabit Ethernet modular port adapter.

Figure 124: 4-Port 10 Gigabit Ethernet Modular Port Adapter



The following table describes the 4-Port 10 Gigabit Ethernet modular port adapter LEDs.

Table 15: 4-Port 10 Gigabit Ethernet Modular Port Adapter LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up. The MPA A/L LED will blink green when there is traffic activity.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	Modular port adapter power is off.
	Green	On	Modular port adapter is ready and operational.

LED Label	Color	State	Meaning
	Amber	On	Modular port adapter power is on and good, and the modular port adapter is being configured.

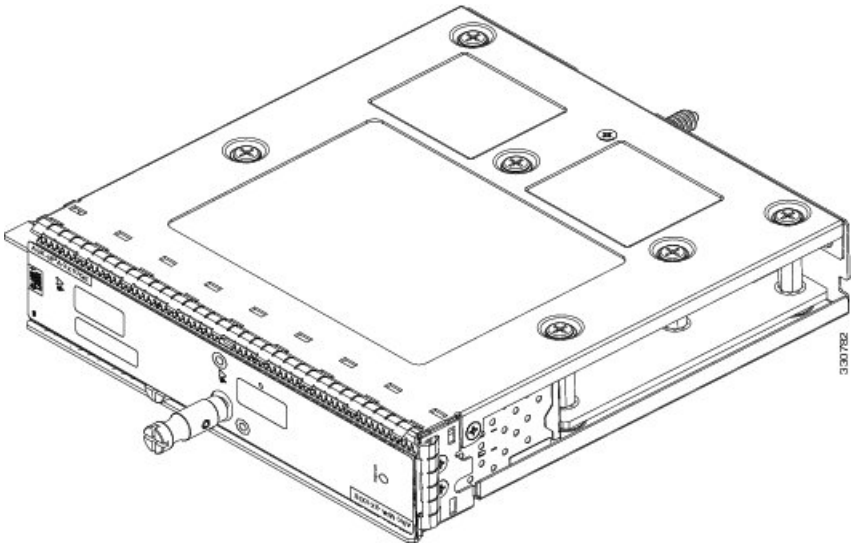
2-Port 10 Gigabit Ethernet Modular Port Adapter

The 2-Port 10 Gigabit Ethernet modular port adapter provides two cages for XFP Ethernet optical interface modules that operate at a rate of 10 Gbps. The two XFP modules can be 10-Gigabit Ethernet multimode or single mode connections.

Each XFP cage on the 2-Port 10 Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated XFP port, as described in Status LEDs, on page 173 section.

The following figure shows an example of the 2-Port 10 Gigabit Ethernet modular port adapter.

Figure 125: 2-Port 10 Gigabit Ethernet Modular Port Adapter



The following table describes the 2-Port 10 Gigabit Ethernet modular port adapter LEDs.

Table 16: 2-Port 10 Gigabit Ethernet Modular Port Adapter LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up. The MPA A/L LED will blink green when there is traffic activity.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	Modular port adapter power is off.
	Green	On	Modular port adapter is ready and operational.

LED Label	Color	State	Meaning
	Amber	On	Modular port adapter power is on and good, and the modular port adapter is being configured.

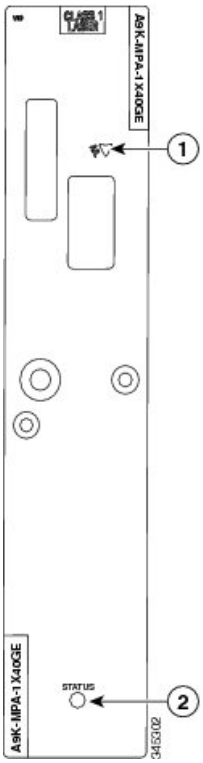
1-Port 40 Gigabit Ethernet Modular Port Adapter

The 1-Port 40 Gigabit Ethernet modular port adapter provides a cage for a QSFP+ Ethernet optical interface module that operates at a rate of 40 Gbps.

The QSFP cage on the 1-Port 40 Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated QSFP port, as described in Status LEDs, on page 173 section.

The following figure shows an example of the front panel of the 1-Port 40 Gigabit Ethernet modular port adapter.

Figure 126: 1-Port 40 Gigabit Ethernet Modular Port Adapter



1	A/L (Active/Link) LED	2	STATUS LED

The following table describes the 1-Port 40 Gigabit Ethernet modular port adapter LEDs.

Table 17: 1-Port 40 Gigabit Ethernet Modular Port Adapter LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.

LED Label	Color	State	Meaning
	Green	On	Port is enabled and the link is up.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	Modular port adapter power is off.
	Green	On	Modular port adapter is ready and operational.
	Amber	On	Modular port adapter power is on and good, and the modular port adapter is being configured.

Installing and Removing Modular Port Adapters

These sections describe how to install or remove modular port adapters (MPAs) on the Cisco ASR 9001 Router.

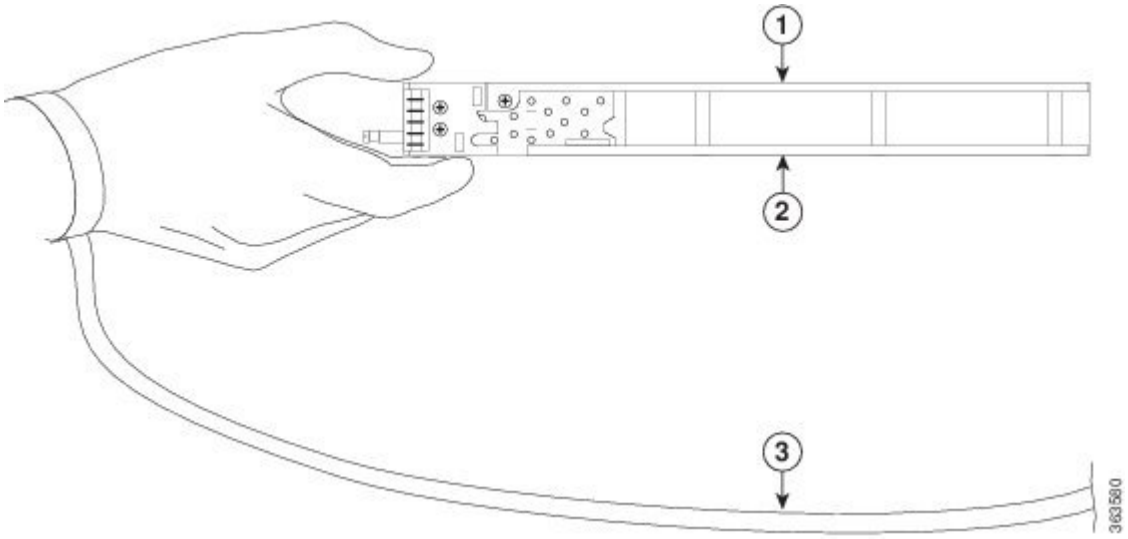
Handling Modular Port Adapters (MPAs)

Each modular port adapter (MPA) circuit board is mounted on a metal carrier, and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, refer to the Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide for a list of parts and tools required for installation.

Caution Always handle the modular port adapter (MPA) by the carrier edges and handle; never touch the modular port adapter (MPA) components or connector pins. (see the following figure.)

When a bay is not in use, a blank ASR 9000 MPA Slot Filler (A9K-MPA-FILR) must fill the empty bay to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a modular port adapter (MPA) in a bay that is not in use, you must first remove the blank.

Figure 127: Handling a Modular Port Adapter (MPA)



Modular Port Adapter (MPA) Installation and Removal

This section provides step-by-step instructions for removing and installing a modular port adapter (MPA).

Caution When performing these procedures, wear a grounding wrist strap to avoid ESD damage to the modular port adapter (MPA). Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

To remove and install a modular port adapter (MPA), perform these steps:

Procedure

Step 1 To insert the MPA, carefully slide the MPA all the way until it stops.

Note The modular port adapter (MPA) will slide easily into the slot if it is properly aligned on the tracks. If MPA does not slide easily, do NOT force it. Remove the MPA and reposition it, paying close attention to engaging it on the tracks.

Step 2 To fully seat the MPA, use a number 2 Phillips screwdriver to tighten the jackscrew on the MPA.

Note Avoid over torquing the modular port adapter (MPA) jackscrew when installing the MPA. Tighten the jackscrew on the MPA to a torque of 17 +/-1 inch-pound. Do not use a power screwdriver to tighten the MPA jackscrew.

Step 3 To remove the MPA, use a number 2 Phillips screwdriver to loosen the lock screw on the MPA. Make sure that the cables are disconnected from the MPA first.

Step 4 Grasp the MPA and pull the MPA from the slot.

Optical Device Installation and Removal

Any contamination of the fiber connection can cause failure of the component or failure of the whole system. A particle that partially or completely blocks the core generates strong back reflections, which can cause instability in the laser system. Inspection, cleaning, and reinspection are critical steps to take before making fiber-optic connections.

Cleaning Optical Devices

See the Inspection and Cleaning Procedures for Fiber-Optic Connections document for information on cleaning optical devices.

Checking the Installation

This section describes the procedures you can use to verify the modular port adapter (MPA) installation, and includes information on these topics:

Verifying the Installation

This section describes how to verify the modular port adapter (MPA) installation by observing the MPA LED states.

When the system has reinitialized all interfaces, the MPA STATUS LEDs should be on (green). The port LEDs (C/A and A/L) may be on (green), depending on your connections and configuration.

To verify that a MPA is installed correctly:

Procedure

Step 1 Observe the console display messages and verify that the system discovers the modular line card (MLC), while the system reinitializes each interface, thus:

- As the MPA is initialized, the STATUS LED will first be amber, indicating that power is on. When the modular port adapter card (MPA) is active, the STATUS LED will illuminate green.

Step 2 When the MPA STATUS LEDs are green, all associated interfaces are configurable.

- If a MPA is replaced with a module of the same type (as in an OIR or hardware swap), the previous configuration is reinstated when the MPA becomes active.
- If a MPA was not previously installed in the same slot or subslot, then the configuration for all associated interfaces is empty.

Note New interfaces are not made available until you configure them.

Step 3 If the modular port adapters (MPAs) do not become active within three minutes, refer to the system console messages. If there is no indication that a field-programmable device (FPD) upgrade is underway, see Troubleshooting the Installation, on page 149 section.

Using show Commands to Verify Modular Port Adapter (MPA) Status

This procedure uses **show** commands to verify that the new modular port adapters (MPAs) are configured and operating correctly.

To verify the MPA status:

Procedure

Step 1 Use the **show running-config** command to display the system configuration. Verify that the configuration includes the new MPA interfaces.

Step 2 Use the **show diag** command to display information about the installed modular line cards (MLCs).

Step 3 Use the **show hw-module fpd location** <*rack/slot/subslot*> command to verify the FPD version information of the MPAs installed in the system.

Note If a modular port adapter (MPA) does not meet the minimum version required, the FPD may need to be updated. See the Cisco ASR 9000 Series Aggregation Services Router System Management Configuration Guide for instructions. If the update fails, the failing module is powered down and an error message displays on the system console

Step 4 Use the **show platform** command to check the state of all boards in the chassis, including the MLC and the MPAs.

The MPA state should be "OK" and the MLC state should be "IOS XR RUN" in the **show platform** command output.

Step 5 Use the **show version** command to obtain software version information for the installed MLCs as well as interfaces available.

Using show Commands to Display Modular Port Adapter (MPA) Information

The following table describes the show commands you can use to display modular port adapter (MPA) information.

Table 18: show Commands to Display Modular Port Adapter (MPA) Information

Command	Type of Information Provided
show running-config	Router's running configuration and interfaces available in the system.
show platform	Router's installed linecard and modular port adapter (MPA) type, slot, and state information.
show diag	Modular port adapter (MPA) type in that slot, number of ports, hardware revision, part number, and EEPROM contents.
show hw-module fpd location <*rack/slot/subslot*>	FPD version information of modular port adapters (MPAs) in the system.
show version	Cisco IOS XR software version, names and sources of configuration files, and boot images.

Table 19: show Commands to Display Modular Port Adapter (MPA) Information

Command	Type of Information Provided	Example
show controllers *type rack/slot/subslot/port*	Network link status, register contents, and controller chip errors.	**show controllers GigabitEthernet 0/0/1/1**

Command	Type of Information Provided	Example
show interfaces *type rack/slot/subslot/port*	Line status and data link protocol status for a particular modular port adapter (MPA) port. Statistics about data traffic sent and received by the port.	**show interfaces GigabitEthernet 0/0/1/1**
show diag *rack/slot/subslot/*	Modular port adapter (MPA) type in that slot, number of ports, hardware revision, part number, and EEPROM contents.	**show diag 0/0/1**
show version	Cisco IOS XR software version and boot images.	**show version**

Using the ping Command to Verify Network Connectivity

The **ping** command allows you to verify whether a modular port adapter (MPA) port is functioning properly and to check the path between a specific port and connected devices at various locations on the network.

After you verify that the system and the modular line card (MLC) have booted successfully and are operational, you can use the **ping** command to verify the status of the MPA ports. See the Cisco ASR 9000 Series Aggregation Services Router Getting Started Guide and the Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide for more information on bringing up and configuring the Cisco ASR 9000 Series Router and the Cisco ASR 9000 A9K-MOD80G-H.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

This is an example of a successful **ping** command to a remote server with the IP address 10.1.1.60:

```
Router# ping 10.1.1.60
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.1.1.60, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination device and that the destination device is active (powered on), and then repeat the **ping** command.

Installing and Removing Transceiver Modules

For information on installing and removing transceiver modules, see the Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide.

Cable Management

The Cisco ASR 9902 Router, Cisco ASR 9903 Router, Cisco ASR 9901 Router, and Cisco ASR 9001 Router includes a cable-management system that organizes the interface cables entering and exiting the router, keeping them out of the way, and free of sharp bends.

Caution Excessive bending of interface cables can damage the cables.

The cable-management system consists of these separate components:

- A cable-management bracket—Cisco ASR 9902, Cisco ASR 9901, and Cisco ASR 9001.
- A cable-management bracket—Cisco ASR 9903. You can also connect a filter to the cable-management.
- A cable-management tray—Cisco ASR 9001

Cable Management Bracket - Cisco ASR 9903 and Cisco ASR 9902 Router

A cable management bracket is attached to the rack mount bracket on the Cisco ASR 9903 and Cisco ASR 9902 Router.

Note When shipped, the cable management bracket is not attached to the router chassis. Attach the cable-management bracket to the chassis before you insert the cables into the ports.

Installing a Cable Management Bracket

To install a cable-management bracket, follow these steps:

This procedure is applicable for Cisco ASR 9903 and Cisco ASR 9902 Routers.

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap, and follow its instructions for use.

Step 2 Position the cable management bracket over the center holes of the chassis rack mount brackets. See the following figure.

Figure 128: Cable-Management Bracket Installation and Removal-Cisco ASR 9903 Router

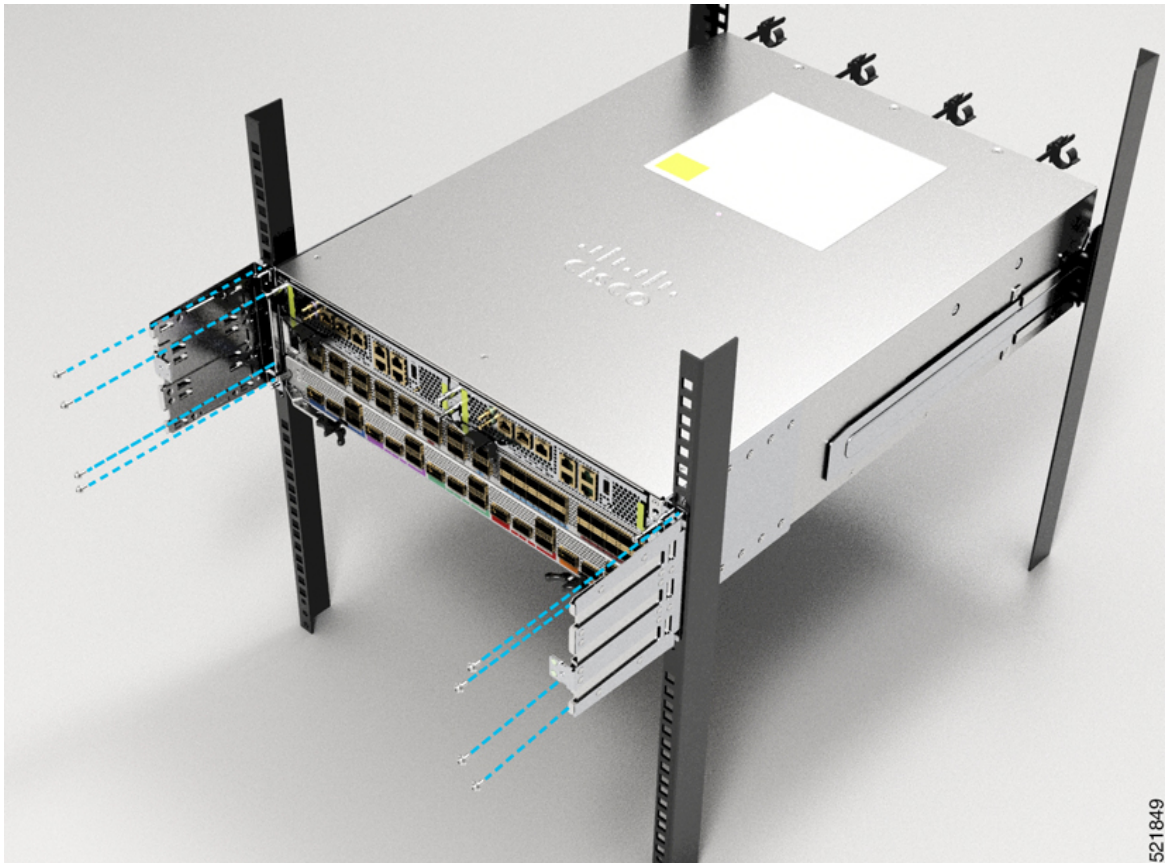
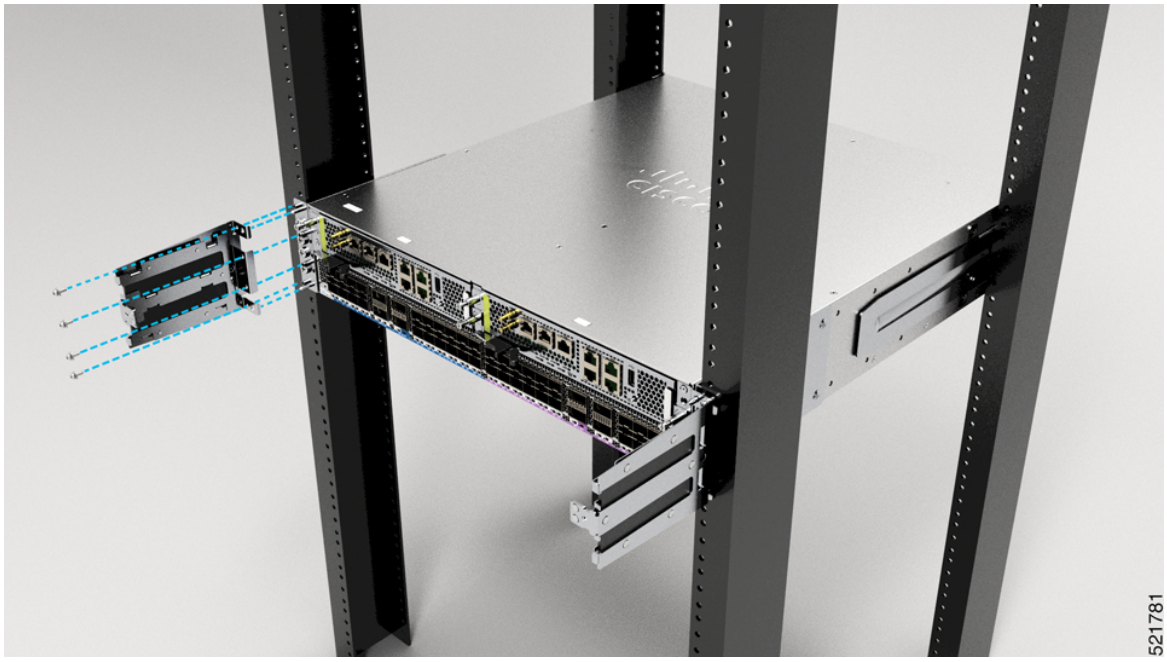


Figure 129: Cable-Management Bracket Installation and Removal-Cisco ASR 9902 Router



Step 3 Insert and tighten the provided screws to secure the bracket.

Step 4 Install pluggables and fiber connectors, and connect all the cables to the intended ports.

Step 5 Attach cables and fibers to the cable management bracket in an organized manner.

Caution Ensure the interface cables do not have any kinks or sharp bends. This can destroy or degrade the ability of the optical fiber to propagate the signal-encoded beam of light accurately from one end of the cable to the other. Always allow adequate strain relief for the interface cable.

Step 6 Install the air filter if required. See Removing and Replacing the Air Filter for Cisco ASR 9903 and Cisco ASR 9902, on page 189

Removing a Cable-Management Bracket

To remove a cable-management bracket, follow these steps:

This procedure is applicable for Cisco ASR 9903 and Cisco ASR 9902 Routers.

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap, and follow its instructions for use.

Step 2 Remove the air filter if installed. See Removing and Replacing the Air Filter for Cisco ASR 9903 and Cisco ASR 9902, on page 189

Step 3 Note the current interface cable connections to the ports on the RP.

Step 4 Starting with the interface cable for the bottom port on the RP, disconnect the cable from the RP interface.

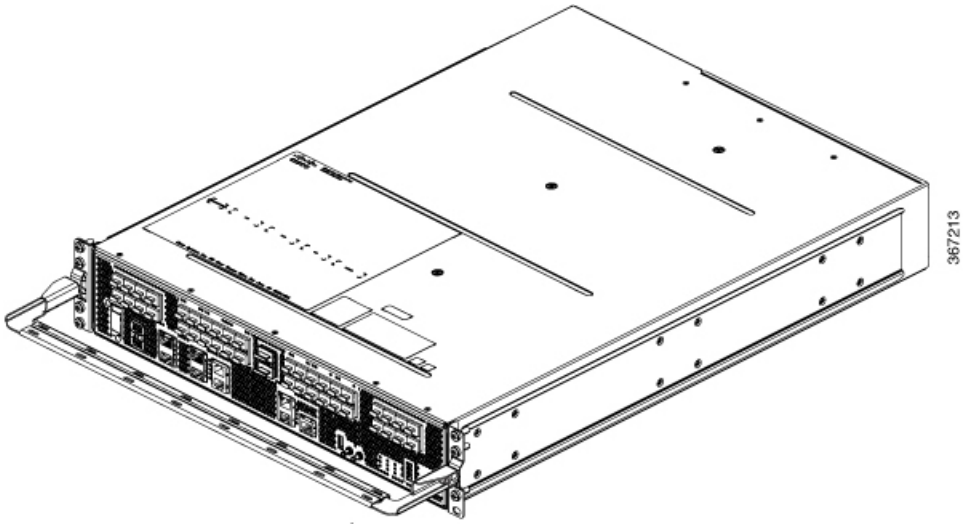
Step 5 Repeat Step 4 for all remaining interface cables, proceeding upwards from the bottom ports.

Step 6 Loosen the installation screws on each end of the cable-management bracket, and remove the bracket from the chassis.

Cable Management Bracket—Cisco ASR 9901

A cable management bracket is attached to the rack mount bracket on the Cisco ASR 9901 Router.

Figure 130: Cisco ASR 9901 Router Cable Management Bracket



Note When shipped, the cable-management bracket is not attached to the router chassis. You must attach the cable-management bracket to the chassis before you insert the cables into the ports.

Installing a Cable Management Bracket

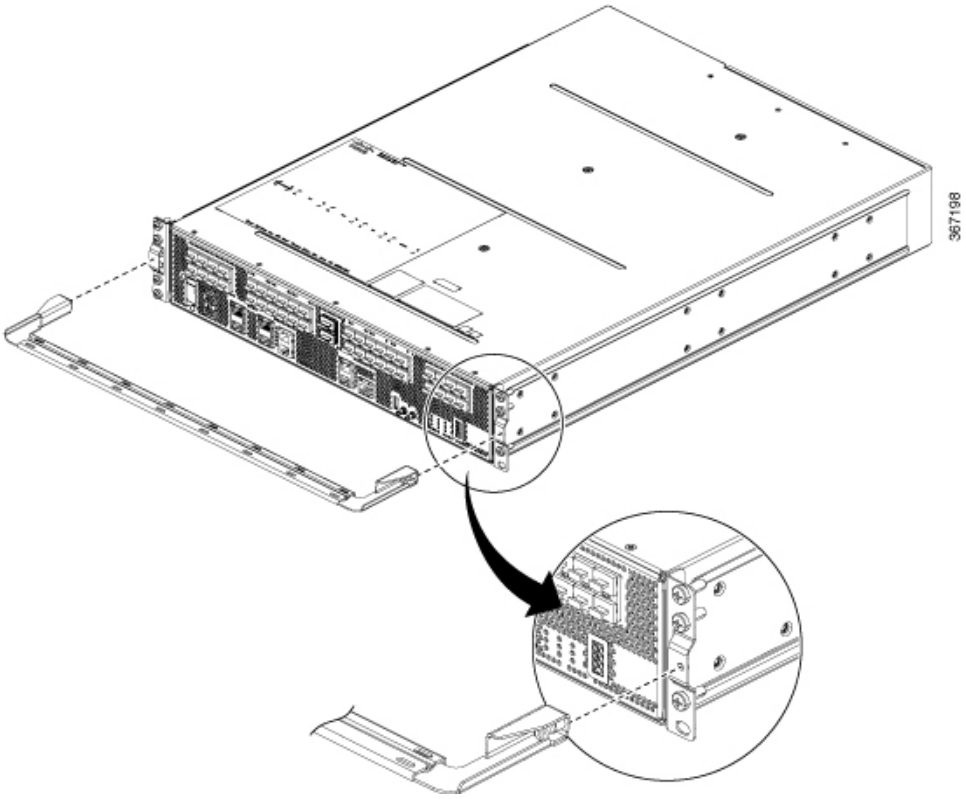
To install a cable-management bracket, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Position the cable management bracket over the center holes of the chassis rack mount brackets (see the following figure).

Figure 131: Cable-Management Bracket Installation and Removal



Step 3 Insert and tighten the provided screws to secure the bracket.

Step 4 Install pluggables and fiber connectors, and connect all the cables to intended ports.

Step 5 Attach cables and fibers to the cable management bracket in an organized manner.

Caution Make sure the interface cables do not have any kinks or sharp bends, which can destroy or degrade the ability of the optical fiber to propagate the signal-encoded beam of light accurately from one end of the cable to the other. Always allow adequate strain relief in the interface cable.

Removing a Cable-Management Bracket

To remove a cable-management bracket, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Note the current interface cable connections to the ports on the RP.

Step 3 Starting with the interface cable for the bottom port on the RP, disconnect the cable from the RP interface.

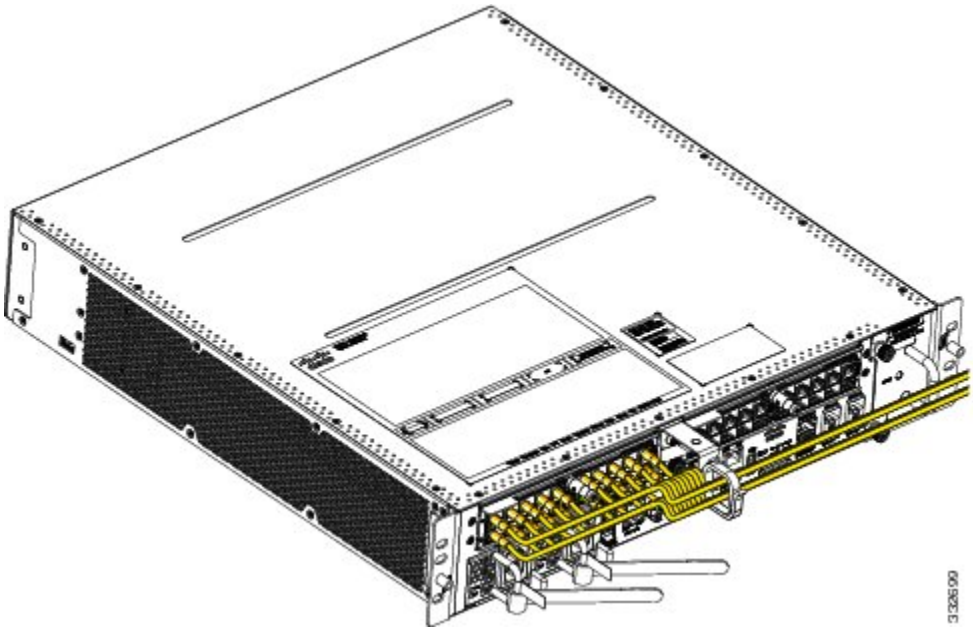
Step 4 Repeat Step 3 for all remaining interface cables, proceeding from the bottom ports upward, then proceed to Step 5.

Step 5 Loosen the installation screws on each end of the cable-management bracket and remove the bracket from the chassis (see the above figure).

Cable Management Bracket—Cisco ASR 9001

The Cisco ASR 9001 Router provides a cable management bracket at the middle of the router chassis. The following figure shows a typical cable routing for the Cisco ASR 9001 Router.

Figure 132: Example Cable Routing through Cisco ASR 9001 Router Cable Management Brackets



Note When shipped, the cable-management bracket is not attached to the router chassis. You must attach the cable-management bracket to the chassis before you insert the cables into the ports.

Installing a Cable Management Bracket

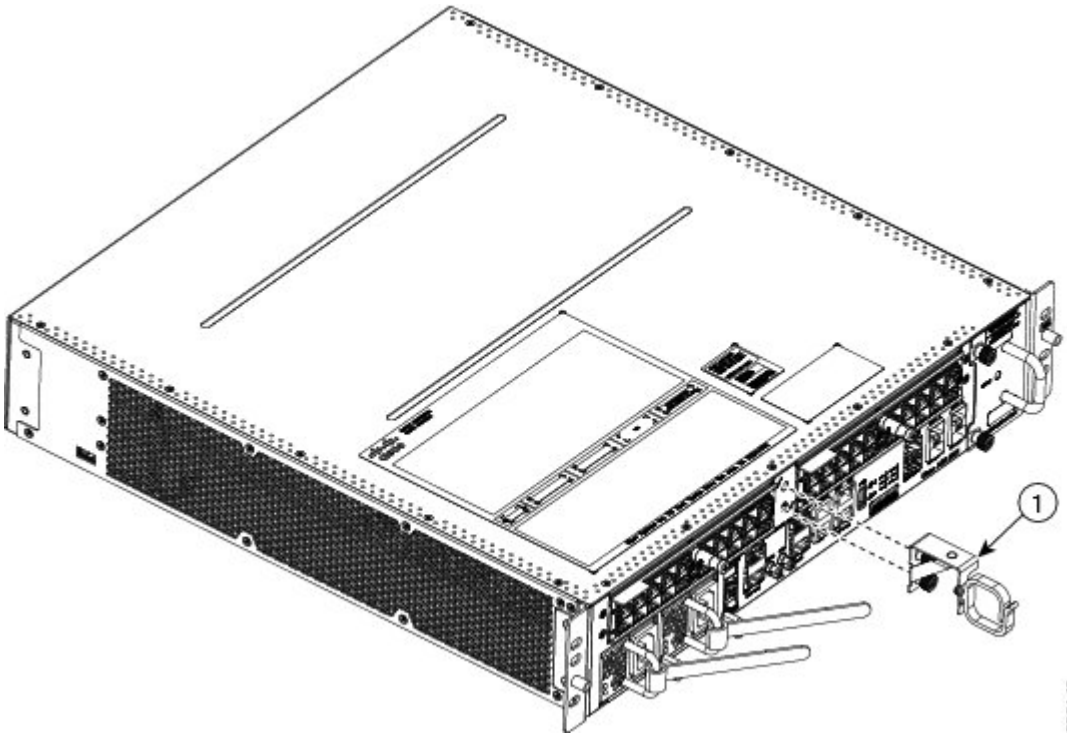
To install a cable-management bracket, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Position the cable-management bracket over the front of the chassis front panel.

Figure 133: Cable-Management Bracket Installation and Removal



1	Cable-Management Bracket

Step 3 Insert and tighten the captive screw(s) to secure the bracket.

Step 4 Connect all the cables to the intended ports and pass them through the cable management bracket in an organized manner.

Removing a Cable-Management Bracket

To remove a cable-management bracket, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Note the current interface cable connections to the ports on the RP.

Step 3 Starting with the interface cable for the bottom port on the RP, disconnect the cable from the RP interface.

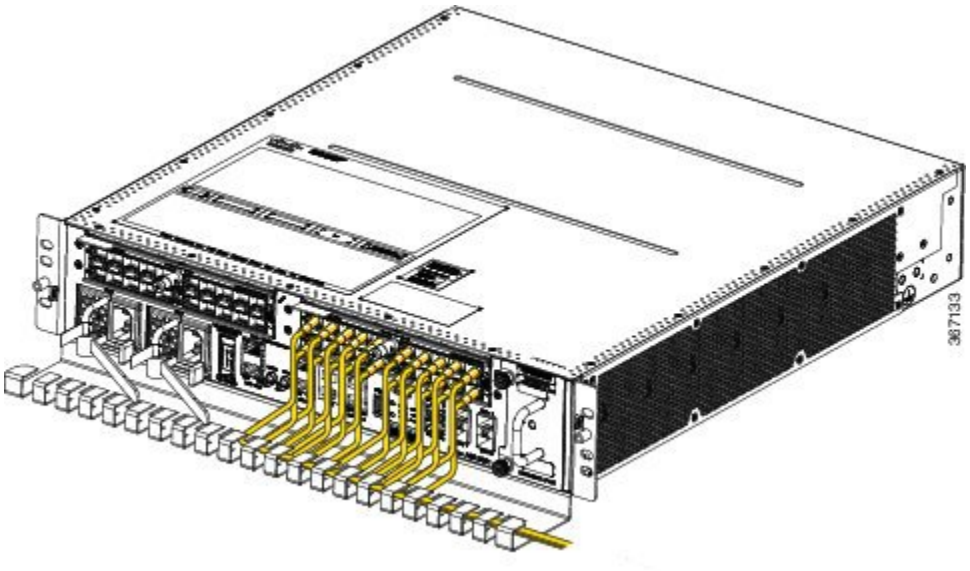
Step 4 Repeat Step 3 for all remaining interface cables, proceeding from the bottom ports upward, then proceed to Step 5.

Step 5 Loosen the captive installation screw on the cable-management bracket and remove the bracket from the chassis (see the above figure).

Cable Management Tray—Cisco ASR 9001

A cable-management tray is mounted at the bottom of the Cisco ASR 9001 Router chassis for routing interface cables to the RP. The following figure shows a typical cable routing through the cable-management tray.

Figure 134: Example Cable Routing through the Cisco ASR 9001 Router Cable Management Tray



Installing a Cable Management Tray

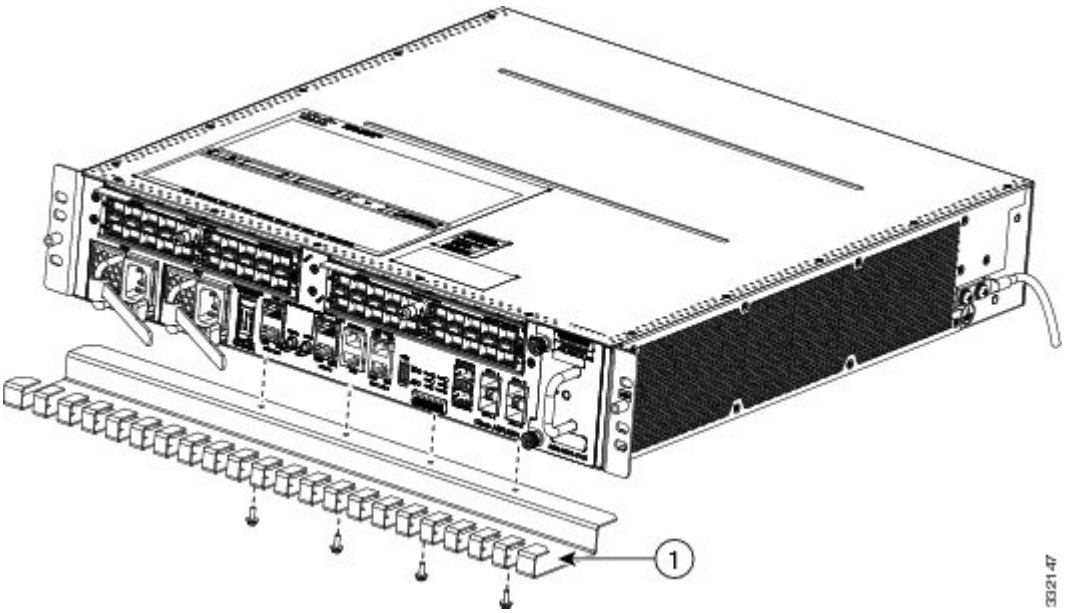
To install a cable-management tray, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Position the cable-management tray at the bottom of the chassis front panel.

Figure 135: Cable-Management Tray Installation and Removal



a. Cable-Management Tray

Step 3 Insert and tighten the captive screw(s) to secure the tray.

Step 4 Connect all the cables to the intended ports and pass them through the cable management tray in an organized manner.

Removing a Cable-Management Tray

To remove a cable-management tray, follow these steps:

Procedure

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Note the current interface cable connections to the ports on the RP.

Step 3 Starting with the interface cable for the bottom port on the RP, disconnect the cable from the RP interface.

Step 4 Repeat Step 3 for all remaining interface cables, proceeding from the bottom ports upward, then proceed to Step 5.

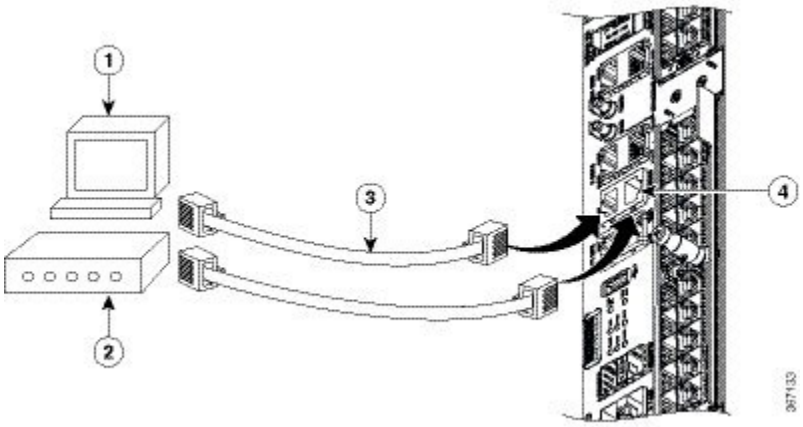
Step 5 Loosen the captive installation screw on the cable-management tray and remove the tray from the chassis (see the above figure).

Connecting Route Processor Cables

This section describes how to connect cables to the console, auxiliary, and Ethernet ports on the RP. The console and auxiliary ports are both asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. Most modems are asynchronous devices.

The following figure shows an example of an RP with data terminal and modem connections called out.

Figure 136: RP Console and Auxiliary Port Connections



1	Console terminal	3	RJ-45 cables
2	Modem	4	Console and Auxiliary port

Caution The ports labeled Ethernet, Console, and AUX are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits.

Note RP cables are not available from Cisco, but they are available from external commercial cable vendors.

Note To comply with the intra-building lightning surge requirements of Telecordia GR-1089-CORE, Issue 6, you must use a shielded cable when connecting to the Ethernet ports. The shielded cable is terminated by shielded connectors on both ends, with the cable shield material tied to both connectors.

Connecting to the RP Console Port

The system console port on the RP is an RJ-45 receptacle for connecting a data terminal to perform the initial configuration of the router. Depending on the cabling pinout on the terminal server end, the console port will

require either a crossover cable or a straight-through RJ-45 cable. See Port Connection Guidelines, on page 11 for additional information about the console port.

See the previous and follow these steps to connect a data terminal to the RP console port:

Procedure

Step 1 Set your terminal to these operational values: 115200 bps, 8 data bits, no parity, 1 stop bits (115200 8N1).

Step 2 Attach the terminal end of the cable to the interface port on the data terminal.

Step 3 Attach the other end of the cable to the RP console port.

Step 4 Power on the data terminal.

Connecting to the RP Auxiliary Port

The auxiliary port on the RP is a RJ-45 receptacle for connecting a modem or other data communication equipment (DCE) device (such as another router) to the RP. The asynchronous auxiliary port supports hardware flow control and modem control. See Port Connection Guidelines, on page 11 for additional information about the auxiliary port.

See the previous figure and follow these steps to connect an asynchronous serial device to the RP auxiliary port:

Procedure

Step 1 Power off the asynchronous serial device.

Step 2 Attach the device end of the cable to the interface port on the asynchronous serial device.

Step 3 Attach the other end of the cable to the RP auxiliary port.

Step 4 Power on the asynchronous serial device.

Connecting to the RP Ethernet Management Ports

To connect cables to the RP management ports, attach STP (Shielded Twisted Pair) cables directly to the MGT LAN 0 and MGT LAN 1 RJ-45 receptacles on the RP. STP cables are required to meet NEBS requirements. See Management LAN Ports Connection Guidelines, on page 16 for additional information about the Ethernet management LAN ports.

Note RJ-45 cables are not available from Cisco Systems; they are available from external commercial cable vendors. Use cables that comply with EIA/TIA-568 standards.

Caution Ethernet management ports are primarily used as Telnet ports into the Cisco ASR 9001, and for booting or accessing Cisco software images over a network to which an Ethernet port is directly connected. We strongly caution you to consider the security implications of enabling routing functions on these ports.

Note The Ethernet interfaces on the RP are end-station devices only, not repeaters.

Use this procedure to connect an Ethernet cable to the RP RJ-45 Ethernet receptacle:

Procedure

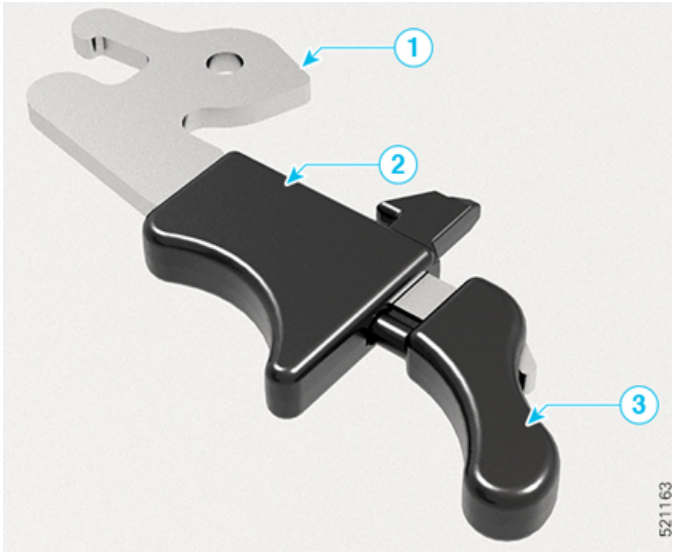
Step 1 Plug the cable directly into the RJ-45 receptacle.

Step 2 Connect the network end of your RJ-45 cable to a switch, hub, repeater, or other external equipment.

Installing Route Processor Cards into the Cisco ASR 9903 and Cisco ASR 9902 Chassis

This section describes how to install the Route Processor (RP) cards into the Cisco ASR 9903 and Cisco ASR 9902 chassis.

Figure 137: Ejector Parts



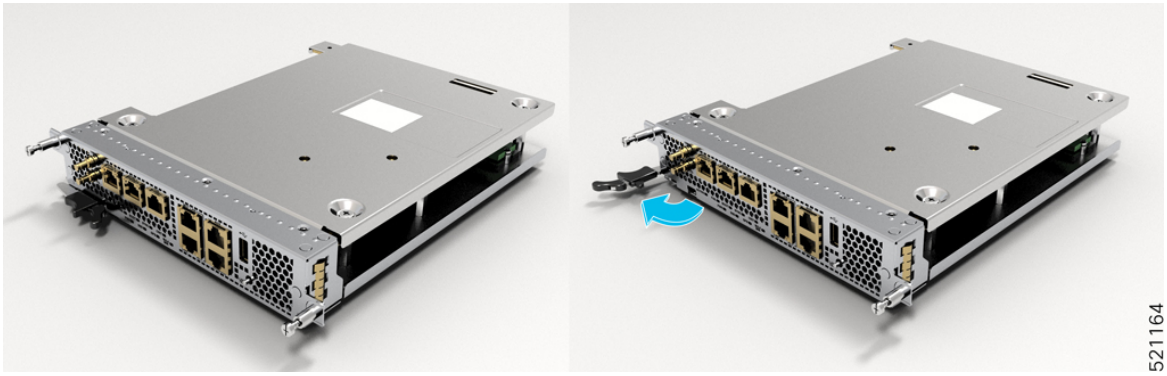
1	Lever
2	Catch

3	Handle

Prerequisite: After removing the RP card from its packaging, check for any damage and check whether the ejector has any bend.

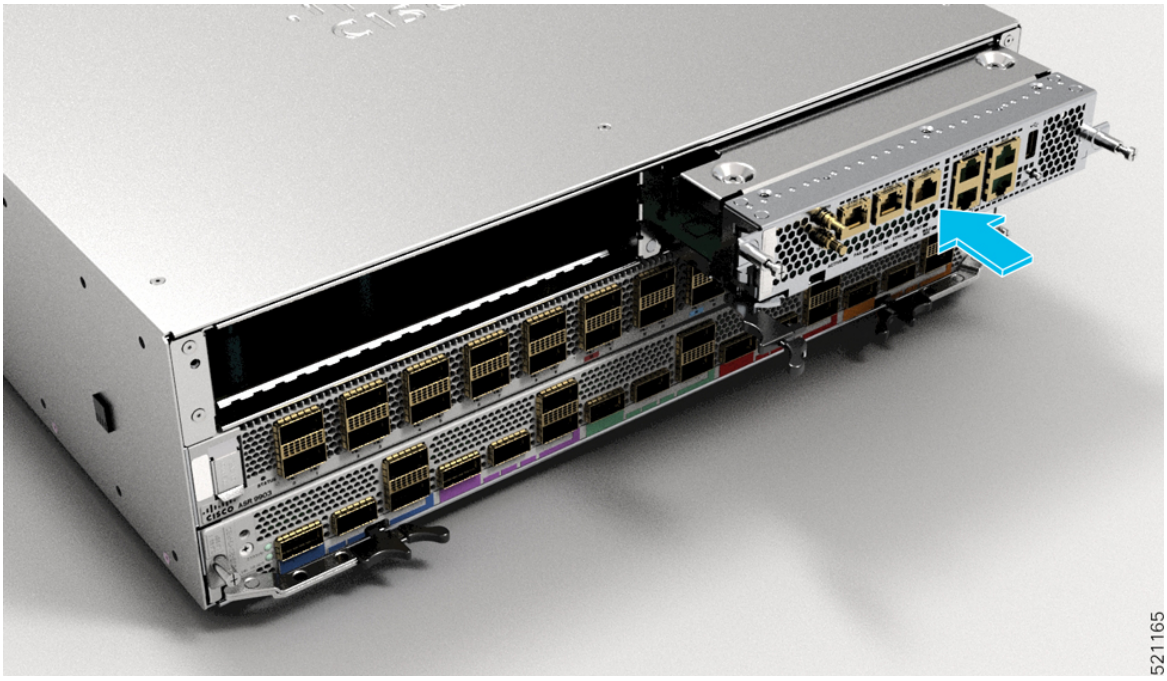
1. Pull the ejector by sliding the catch towards your right using your thumb. The ejector handle starts rotating.
2. Pull the ejector handle until it stops rotating.

Figure 138: Slide the Catch Towards the Right-Side and Pull the Ejector



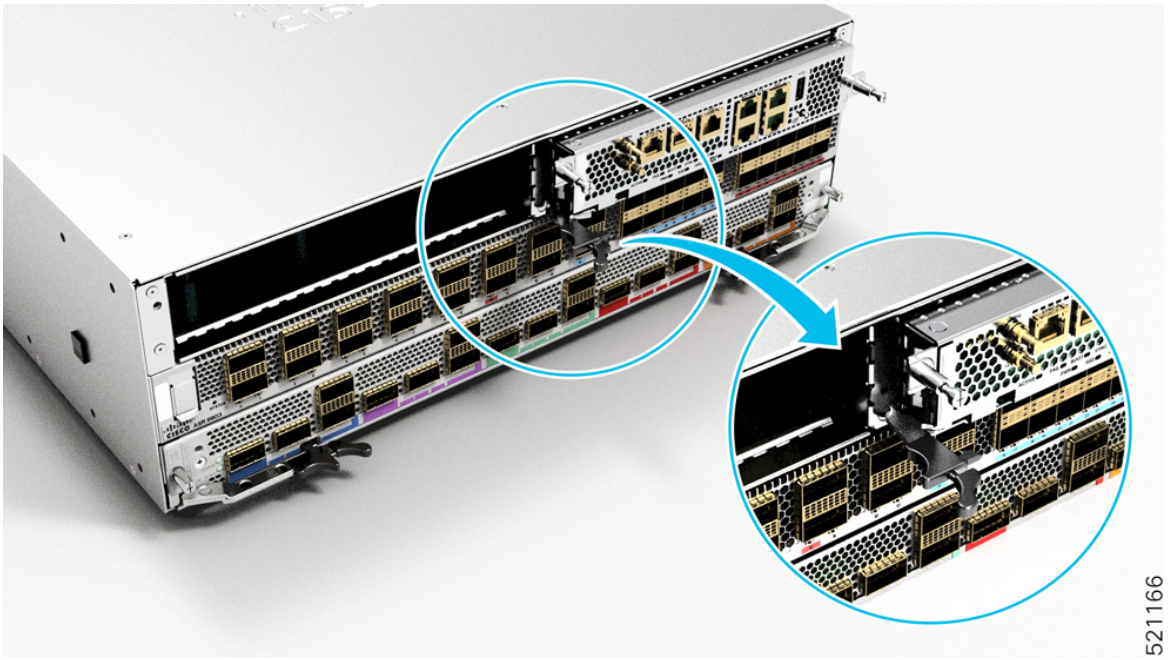
3. Insert the RP card into chassis with ejector in a fully-open position.

Figure 139: Insert RP Card into the Chassis



When you push the RP card further inside, the ejector meets the chassis as shown in the following figure:

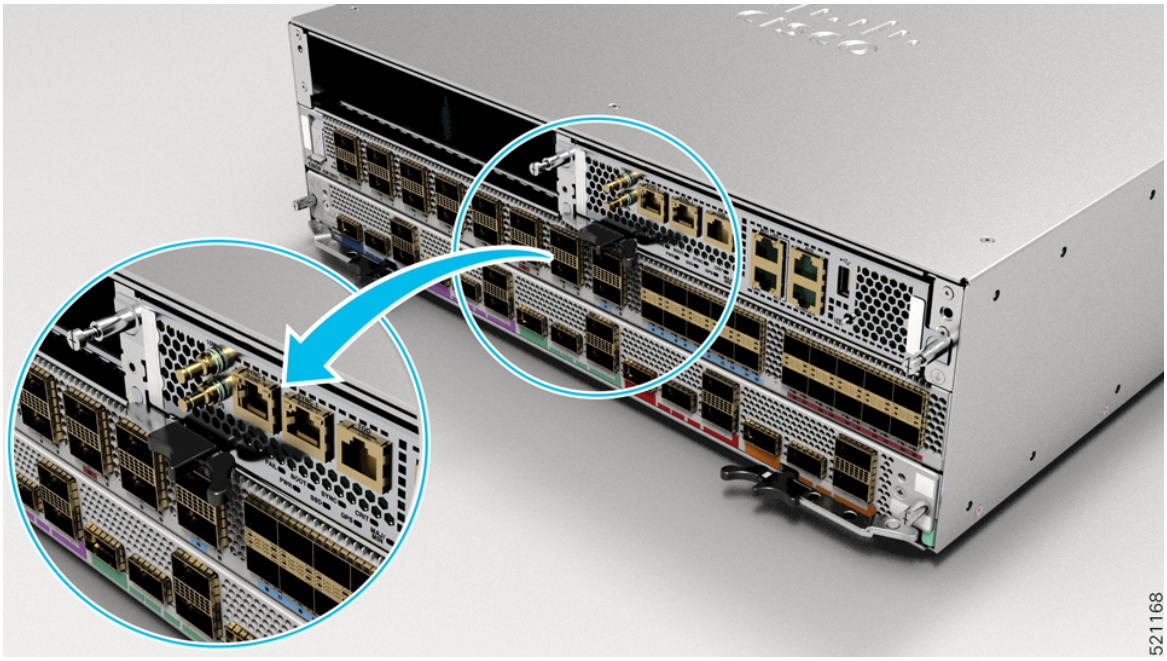
Figure 140: Ejector Meets the Chassis



4. In the condition when the ejector meets the chassis, slowly rotate the ejector so that it grabs the chassis, and push the RP card further into the chassis.

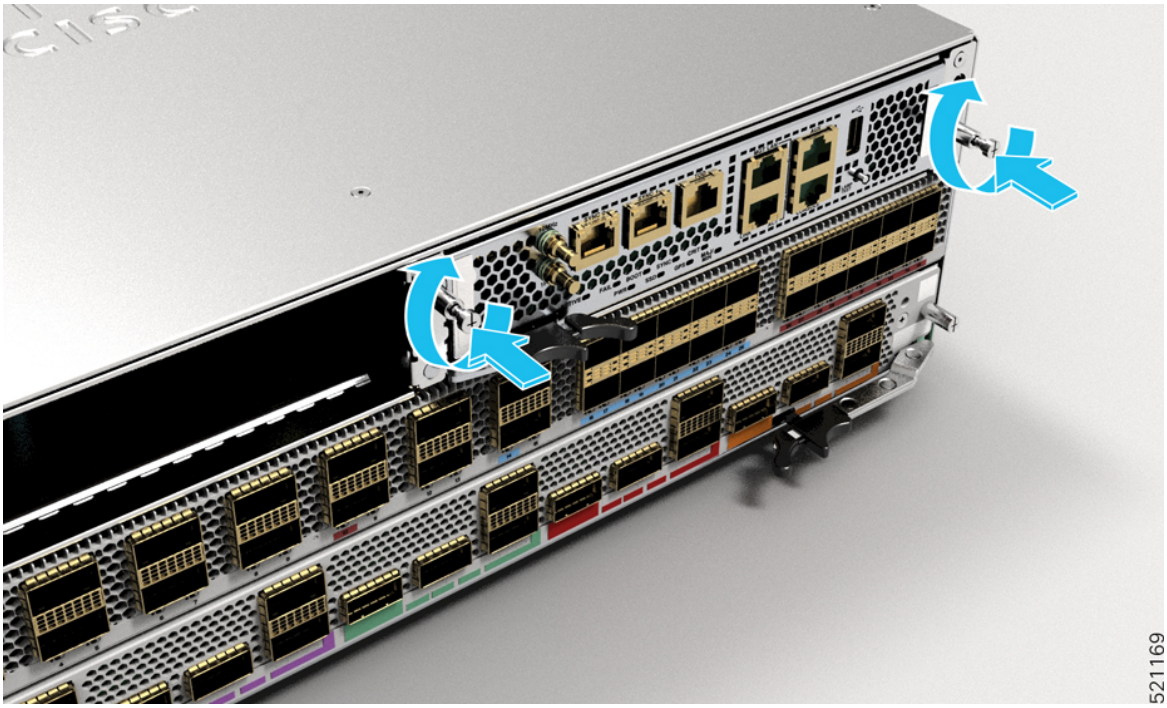
Note Operate the ejector only by pushing the handle. Ensure the catch is fully moved and seated in its correct position.

Figure 141: Push the Handle



5. Tighten the captive screws fully to secure the RP inside the chassis.

Figure 142: Tighten the Captive Screws

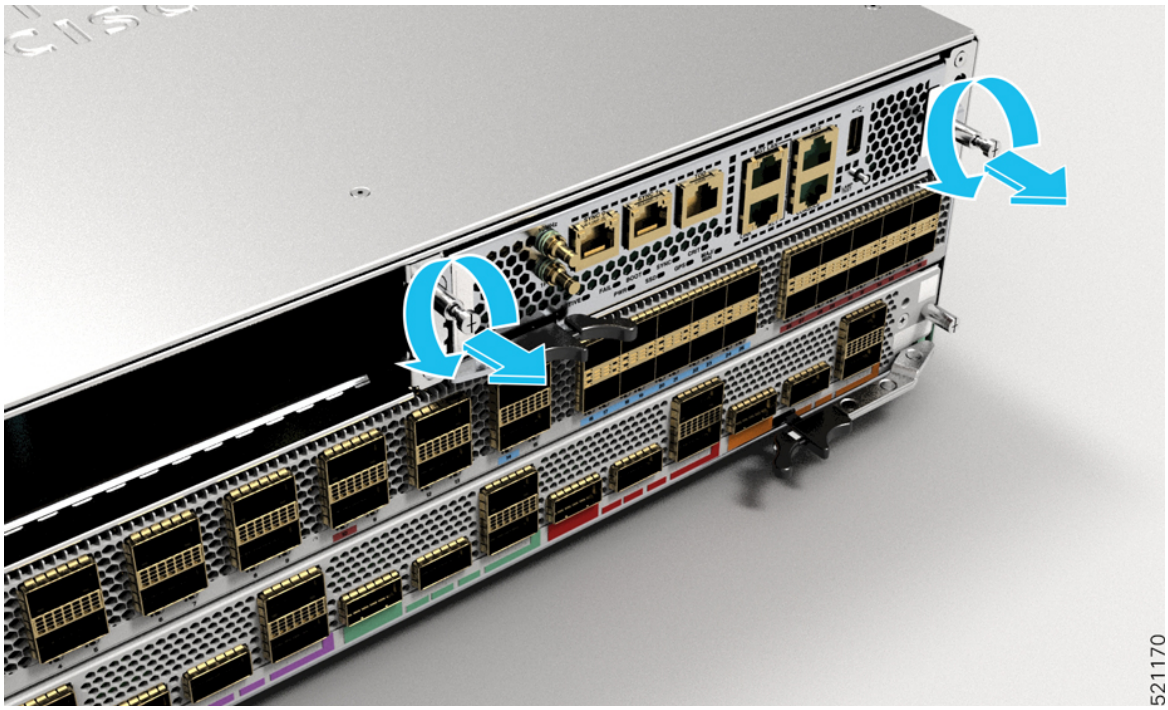


Removing the Route Processor Card from the Cisco ASR 9903 and Cisco ASR 9902 Chassis

This section describes how to remove the RP cards from the Cisco ASR 9903 and Cisco ASR 9902 chassis.

1. Unscrew the captive screws.

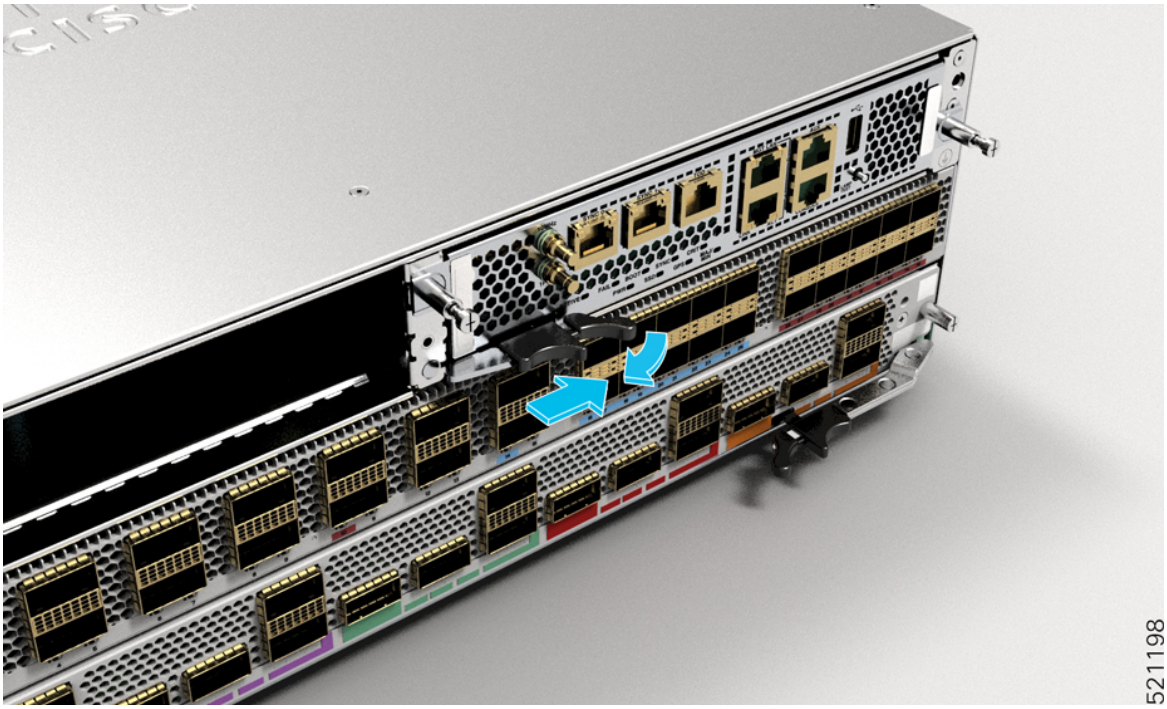
Figure 143: Unscrew the Captive Screw



2. Push the catch towards your right using thumb and pull the handle of the ejector.

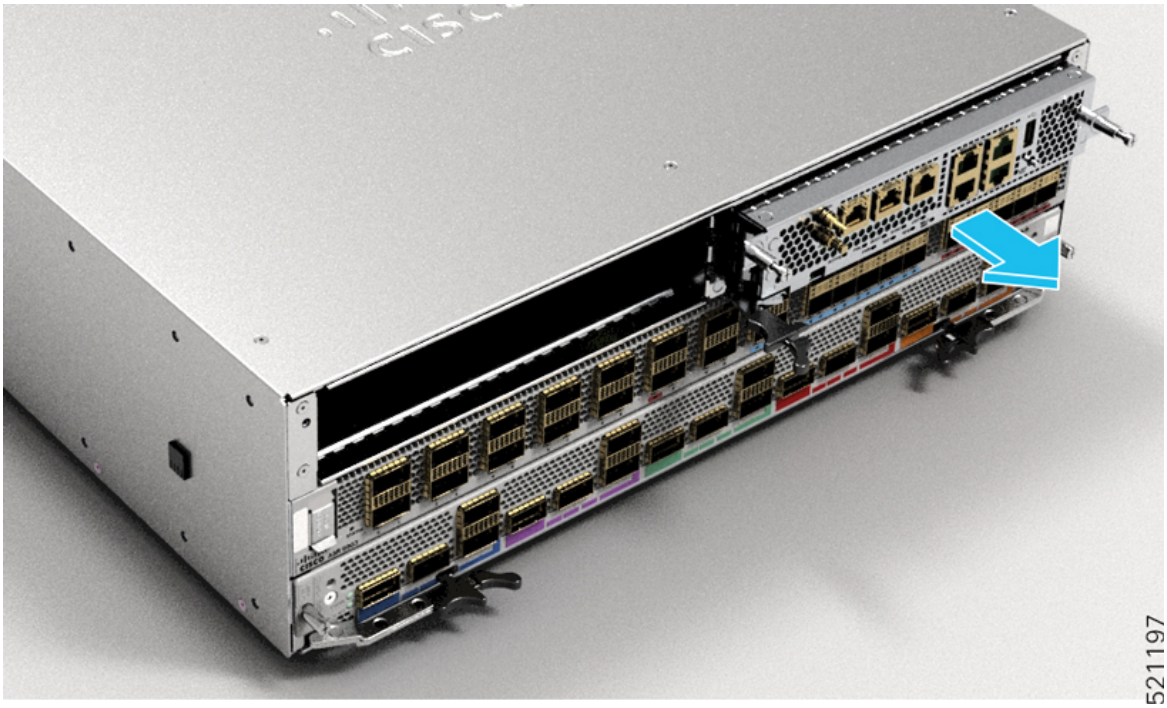
   The RP card slowly comes out of the chassis.

Figure 144: Pull Ejector Handle



3. Pull the handle until the ejector stops rotating and take the RP card out from the chassis.

Figure 145: Take RP Card Out



ASR 9903 Port Expansion Cards

The Cisco ASR 9903 router supports an optional 2T or 0.8T Port Expansion Card (PEC). These PECs are removable modules, and you can install a new PEC, replace a PEC, or remove a PEC in your router.

Here are some of the scenarios when you'd perform the installation, replacement, or removal of the PECs:

- Replacing a PEC with the same PEC - perform the Online Insertion and Removal procedure.
- Inserting a PEC for the first time - perform the Install the Port Expansion Card procedure.
- Removing a PEC - perform the Remove the Port Expansion Card procedure.

800G or 0.8T Port Expansion Card

Table 20: Feature History Table

Hardware	Release Information	Description
Online Insertion and Removal Support on Cisco ASR 9903 Series 800G Port Expansion Card	Release 7.8.1	From this release, you can perform the Online Insertion and Removal (OIR) of the Cisco ASR 9903 Series 800G Port Expansion Card (A9903-8HG-PEC or 0.8T PEC). OIR enables users to replace a defective module without interrupting router operations. It is now possible to replace the 0.8T PEC in the Cisco ASR 9903 router without any traffic disruption. For more information on: • OIR, see Online Insertion and Removal. • 0.8T PEC, see Cisco ASR 9903 Compact High-Performance Router Data Sheet

The Cisco A9903-8HG-PEC is an optional removable module that offers 48 physical ports with maximum 800G data bandwidth capacity. Here are few physical features of this module:

- It offers two sets of port combinations:
  - forty-eight 10GE SFP+
  - thirty-two 25GE SFP28 ports
- The ports are grouped in slice 4 and slice 5. These slices are marked in blue and purple as shown in the following image.

Note A slice is a logical grouping of physical ports.

- You can configure both slices in:

- 10GE mode or 25GE mode. For example, slice 4 and slice 5 in 25GE mode.
- a mix of 10GE and 25GE mode. For example, slice 4 in 10GE and slice 5 in 25GE mode.

- By default, all 48 ports are in 10GE mode. To change the port-mode to 25GE mode, use **hw-module location <*node*> slice <*number*> config-mode** command. For more information, see *Configuring Port Modes in 0.8T PEC*.
- It supports line-rate MACSec on 10GE and 25GE.

Figure 146: Cisco ASR 9903 Series 800G Port Expansion Card – Port Layout

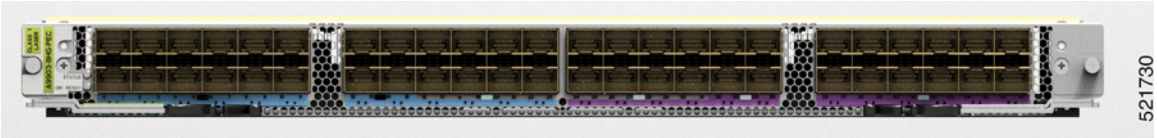


Figure 147: Cisco ASR 9903 Series 800G Port Expansion Card – Top View

2T Port Expansion Card

- The 2T Port Expansion Card has five 400GE QSFP-DD ports and fifteen 100GE QSFP28 ports.
- The 2T PEC can provide up to 2-Tbps throughput.
- You can group the ports into five groups of four ports each. Each group includes one QSFP-DD port and three QSFP28 ports. You can configure the QSFP-DD port with 400GE port rate in which case the other three physical ports in that port group are unused.
- Each QSFP28 port is capable of supporting 100GE and 40GE. It can also breakout into a 4x25GE or 4x10GE.

- All of the QSFP-DD and QSFP28 physical ports support 1x100GE, 1x40GE, 4x25GE, and 4x10GE.

Figure 148: ASR 9903 2T Port Expansion Card – Port Layout

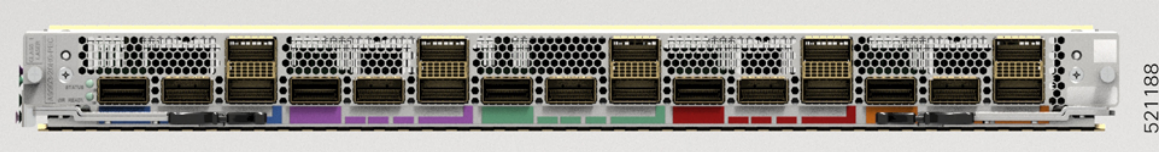


Figure 149: ASR 9903 2T Port Expansion Card – Top View

Note You cannot insert line cards from other ASR 9000 Series Routers into the Cisco ASR 9903 chassis.

Install the Port Expansion Card

This section describes how to install the 2T or 0.8T PEC into the Cisco ASR 9903 chassis.

Note Conduct a visual inspection of back plane connectors.

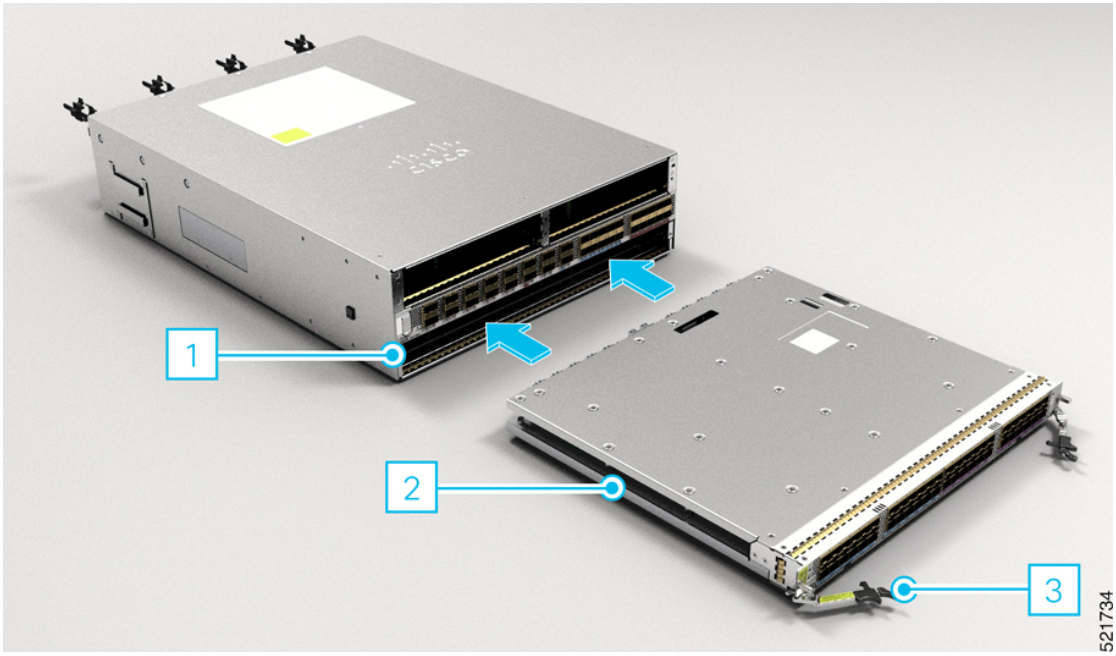
Note

- From Release 7.8.1 onwards, support for managed OIR is introduced on 0.8T PEC(A9903-8HG-PEC).
- From Release 7.3.2 onwards, support for managed OIR is introduced on 2T PEC(A9903-20HG-PEC).

For more information on managed OIR, see Online Insertion and Removal.

1. Shut down the line card (LC0) using the **hw-module shutdown location** command from EXEC mode.
2. Gently insert the PEC into the chassis in proper orientation.

Figure 150: Install PEC into Chassis



1	Port expansion card slot on the chassis
2	Alignment guide on the PEC
3	Ejector handle

3. Use the ejector handle to leverage final seating of connectors and then lock the ejector handle.
4. Tighten the card securing screws on both ends with the torque of 0.6 N-m.

Note

- If you do not completely tighten the screws, the card will not power ON.
- Do not exceed the torque value while tightening the screws to prevent damage.

5. Reload the router using the **hw-module location all reload** command in admin mode.

6. Wait for the status LED to turn from blinking amber color to green color.

Remove the Port Expansion Card

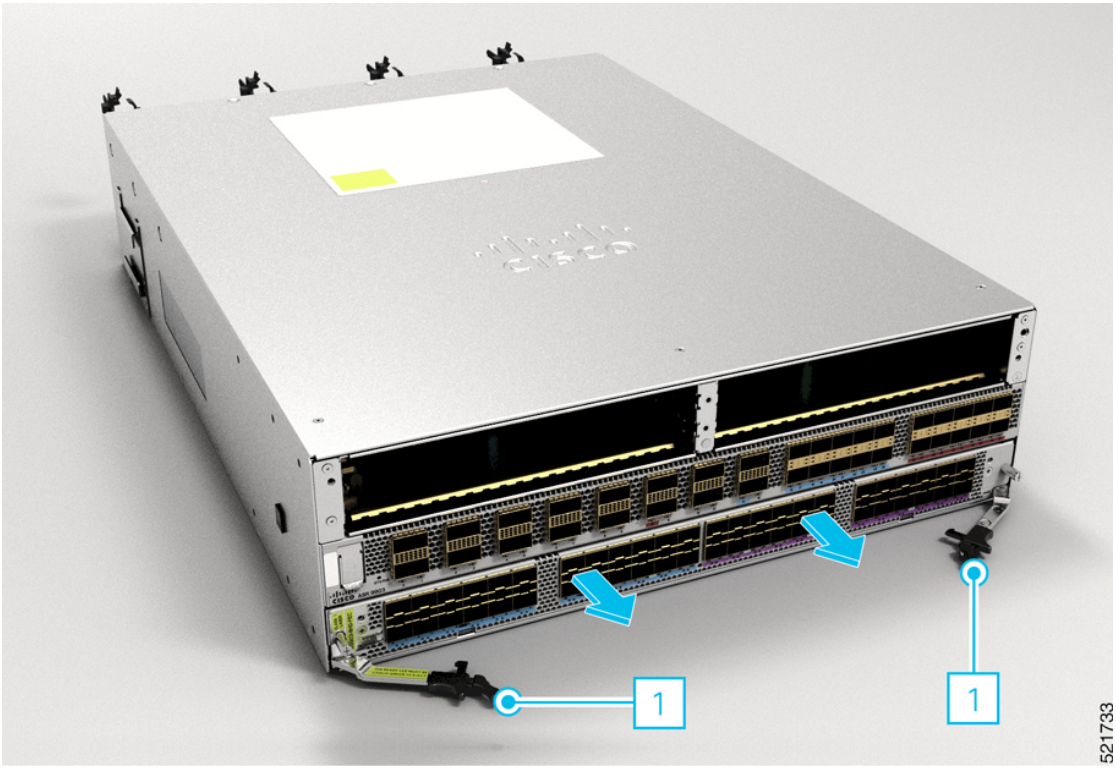
This section describes how to remove the 2T or 0.8T PEC from the Cisco ASR 9903 chassis.

Note

- From Release 7.8.1 onwards, support for managed OIR is introduced on 0.8T PEC(A9903-8HG-PEC).
- From Release 7.3.2 onwards, support for managed OIR is introduced on 2T PEC(A9903-20HG-PEC).

1. Shut down the line card (LC0) using the **hw-module shutdown location** command from EXEC mode.
2. Unscrew port expansion card securing screws on either ends, one after the other.
3. Wait for the status LED to turn from green color to red color.
4. Unlatch ejector handle and use it as a lever to carefully eject the card.

Figure 151: Remove PEC from Chassis



1	Ejector handle

5. Gently pull the card out of the chassis.
6. Inspect the backplane connectors for any signs of damage.

7. Reload the router using the **hw-module location all reload** command in admin mode.

Connecting Power to the Router

Use one of these procedures to connect power to your router.

Note On the Cisco ASR 9902 router you must first install the PSUs and then follow any of the below procedures to connect power to the router

Caution A router must be operated with all its power modules installed at all times for electromagnetic compatibility (EMC).

Connecting Power to an AC-Powered Router

Use this procedure to connect the AC power cords to the router.

Note Connect each AC power supply to a dedicated power source (branch circuit). Each AC-input power supply operates at a nominal input level of 100 to 240 VAC and requires at least a 15 A service for use in North America and Japan, or a 10 A service for international use. For more information on AC power input levels, see Power Connection Guidelines, on page 36.

Procedure

Step 1 Check that the power switch at the front (or at the rear for Cisco ASR 9902) of the chassis is set to the OFF position.

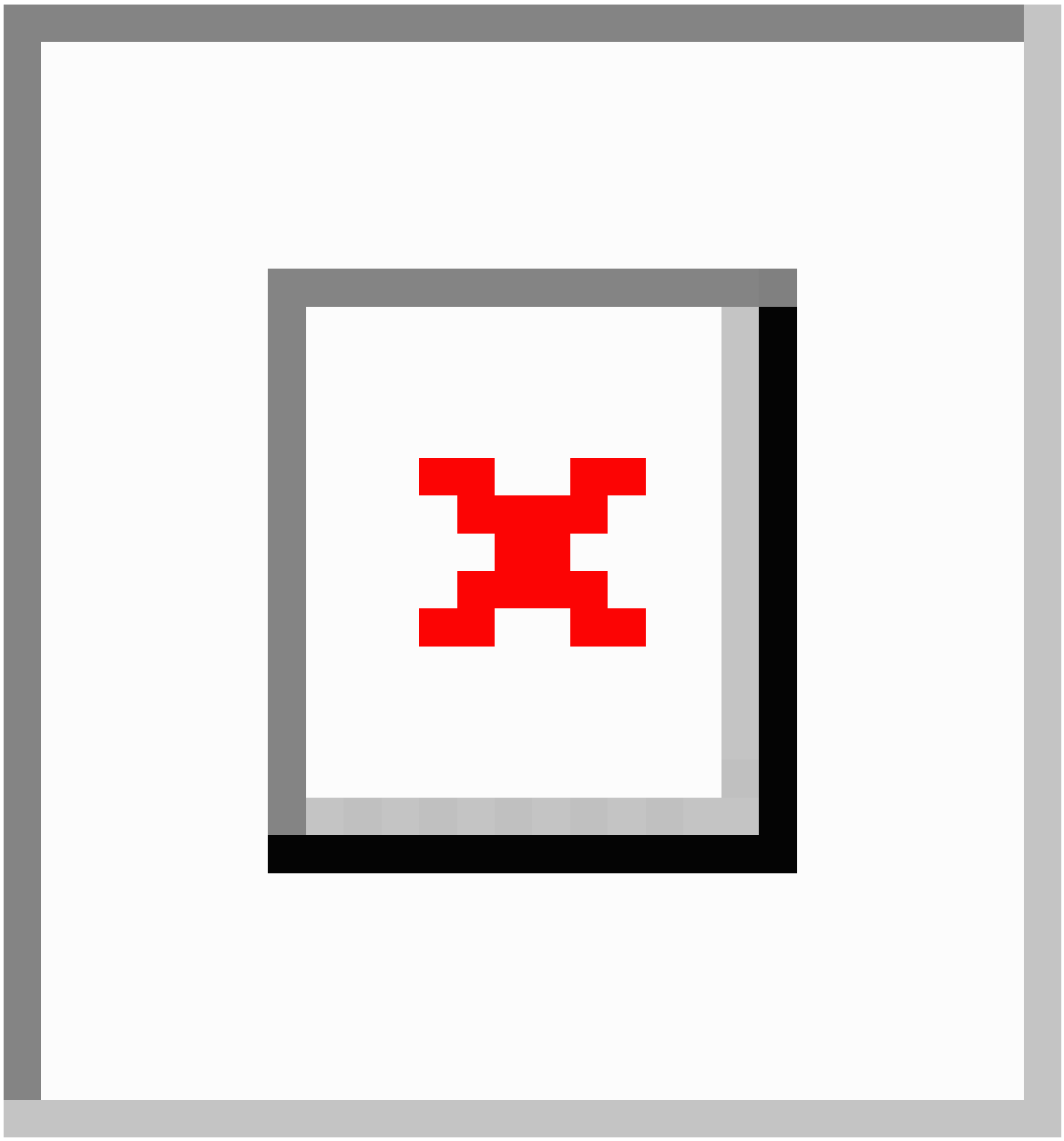
Step 2 Check that the circuit breaker assigned to the AC power source you are connecting is set to OFF.

Step 3 Connect the permanent ground connection (central office grounding system) to the NEBS grounding location on the router chassis.

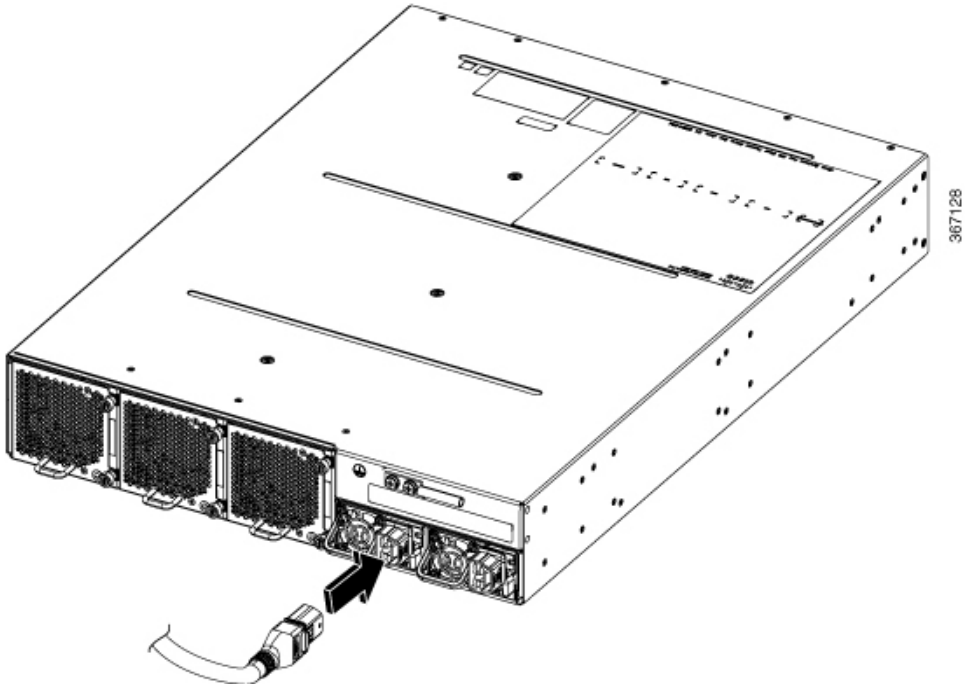
Note To ensure that power remains off while you are performing this procedure, turn the circuit breaker switch in the off (0) position until you are ready to turn it on.

Step 4 Do one of the following:

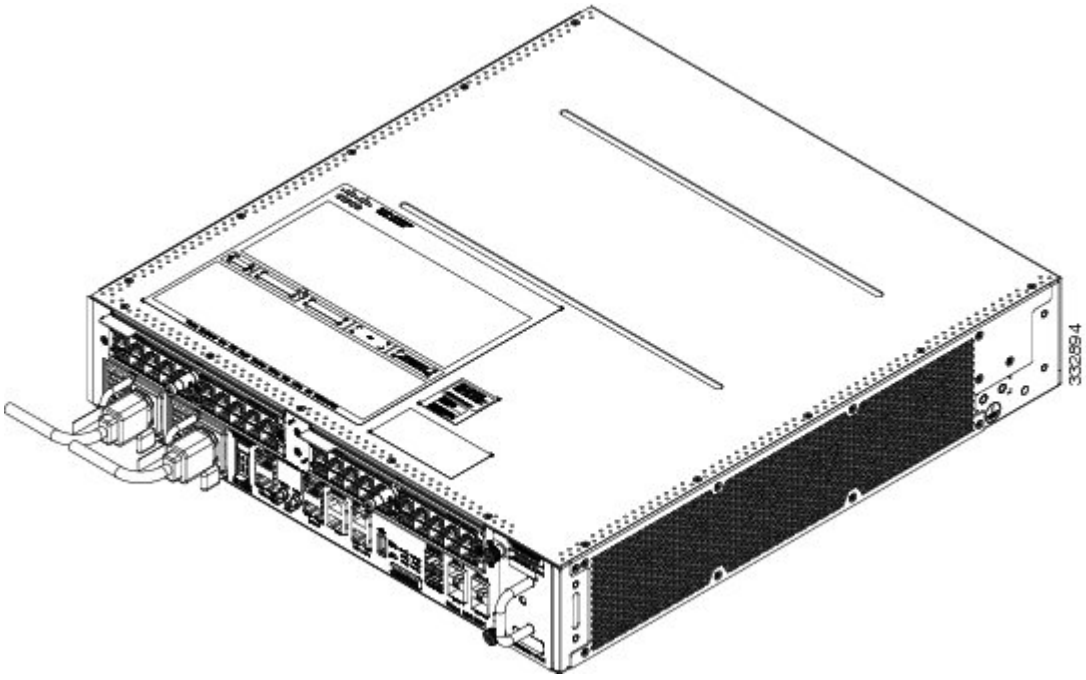
- **Cisco ASR 9903**: Plug the AC power cord into the receptacle at the rear of the chassis (see the following figure).



- **Cisco ASR 9901**: Plug the AC power cord into the receptacle at the rear of the chassis (see the following figure).



- **Cisco ASR 9001**: Plug the AC power cord into the receptacle at the front of the chassis (see the following figure).



Step 5 Close the cable wrap to secure the AC power cord plug to the power module receptacle.

Step 6 Plug the other end of the AC power cord into the AC source receptacle.

Step 7 Proceed to Powering on the Router, on page 145.

Connecting Power to a DC-Powered Router

This section contains the procedures to connect the DC source power cables to a DC-powered router.

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

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

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

Note The length of the cables depends on the location of your router in relation to the source of DC power. These cables are not available from Cisco Systems. They are available from external commercial cable vendors. For more information on site power and source DC cable requirements, see Power Connection Guidelines, on page 36.

Note To ensure that power remains off while you are performing this procedure, follow proper lockout /tagout procedures as defined by your company in accordance with local and national laws.

Use this procedure to connect the DC source power cables to a DC power module:

Procedure

Step 1 Verify that the power switch is set to the OFF position.

Step 2 Connect the DC power cables in the following order (see the figure below):

a. Positive cables first.

b. Negative cable last.

Step 3 Repeat Step 2 for the other power modules installed in the chassis.

Caution To prevent injury and damage to the equipment, always attach the ground and source DC power cable to power module terminals in the following order: (1) ground to ground, (2) positive (+) to positive (+), (3) negative (–) to negative (–).

Figure 152: Cisco ASR 9901: Typical Power Connections for a Single DC Power Module

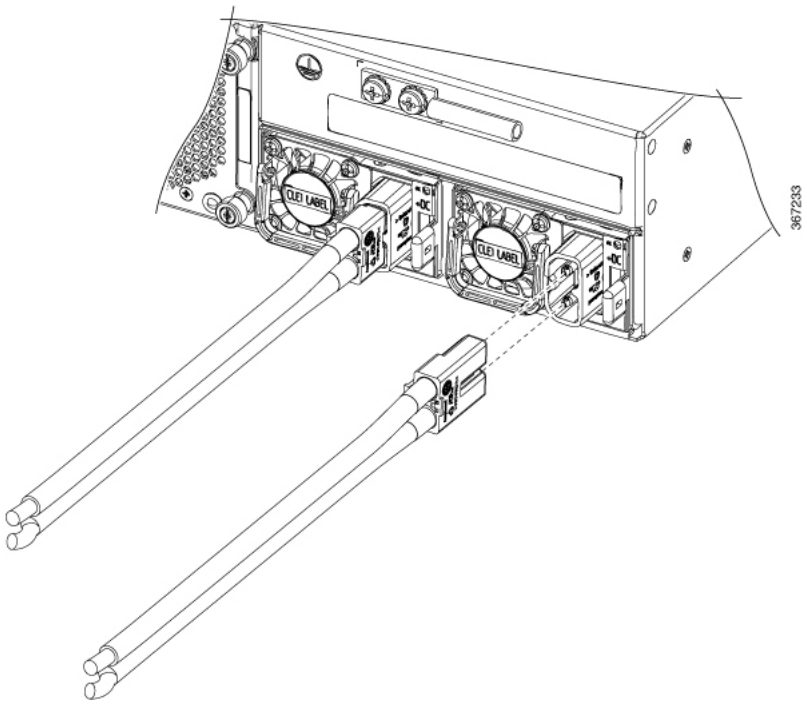
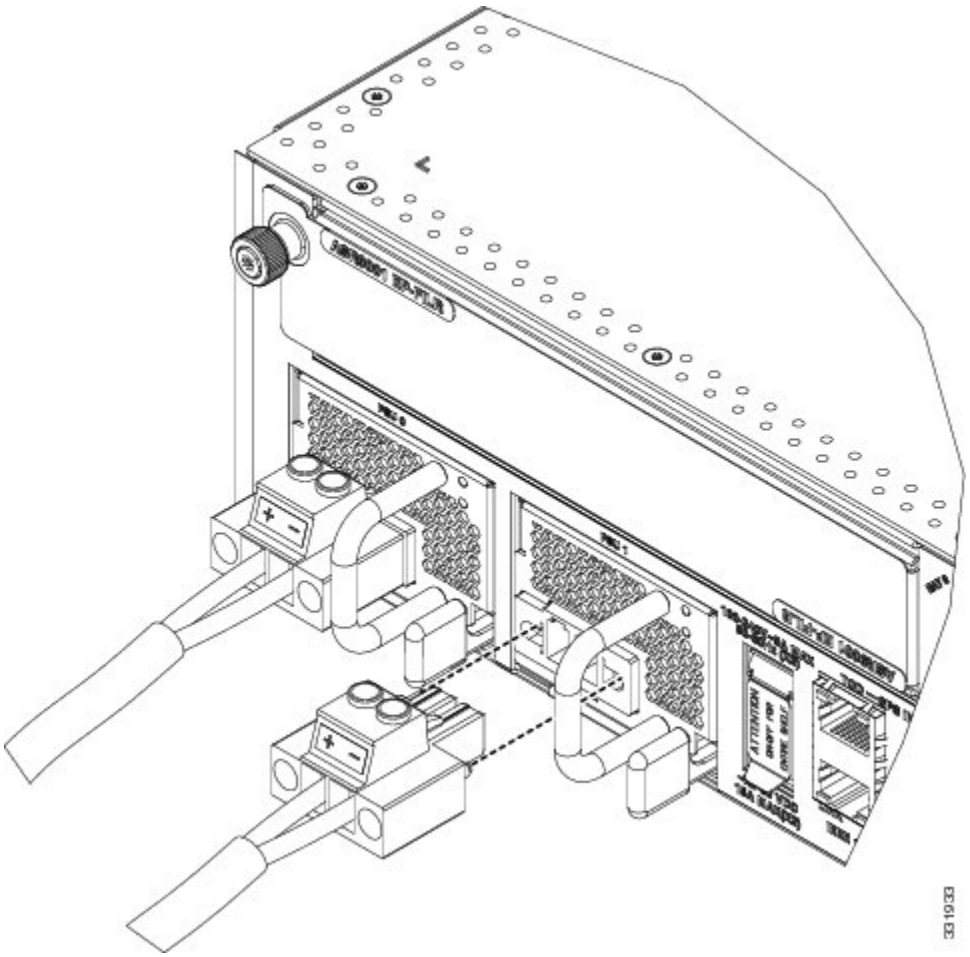


Figure 153: Cisco ASR 9001: Typical Power Connections for a Single DC Power Module



Step 4 Proceed to the next section.

Powering on the Router

Note This equipment is designed to boot up in less than 30 minutes, depending on its neighboring devices be fully up and running.

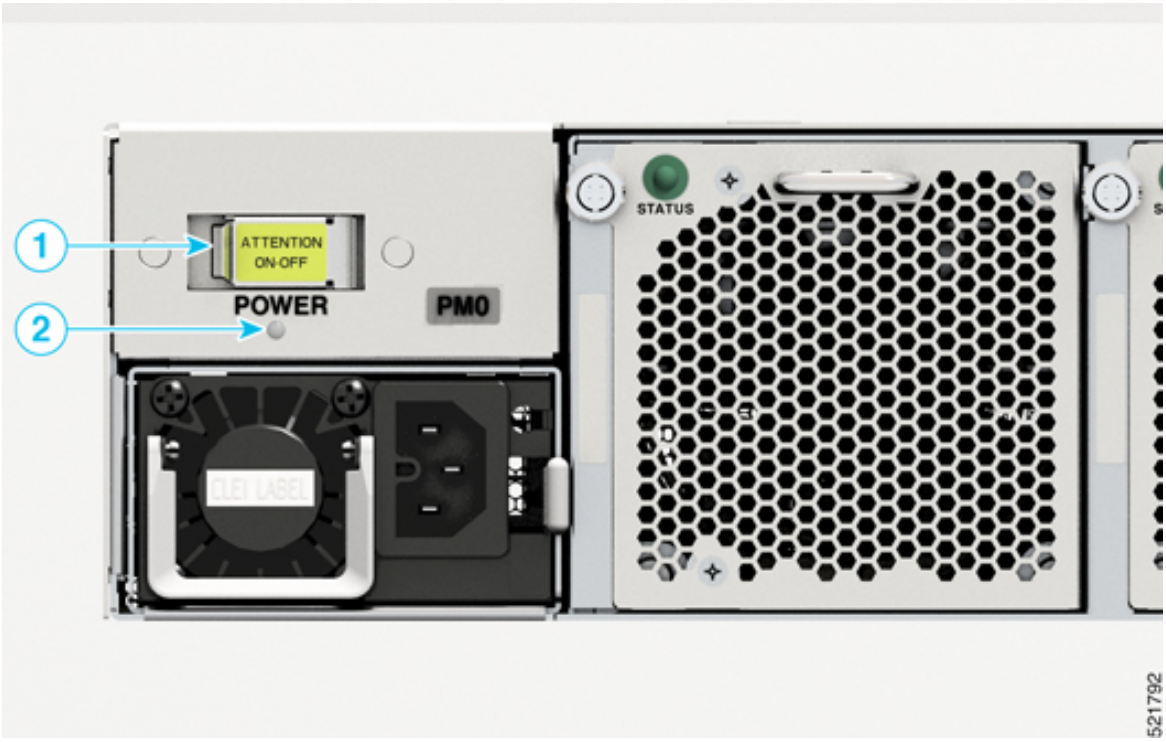
Follow these steps to turn on power to either an AC-powered or DC-powered router:

Procedure

Step 1 Switch on the circuit breaker to your power sources.

Step 2 Set the power switch to the ON position. The chassis power LED turns Red.

- *Figure 154: Power Switch on the Cisco ASR 9902 Router*

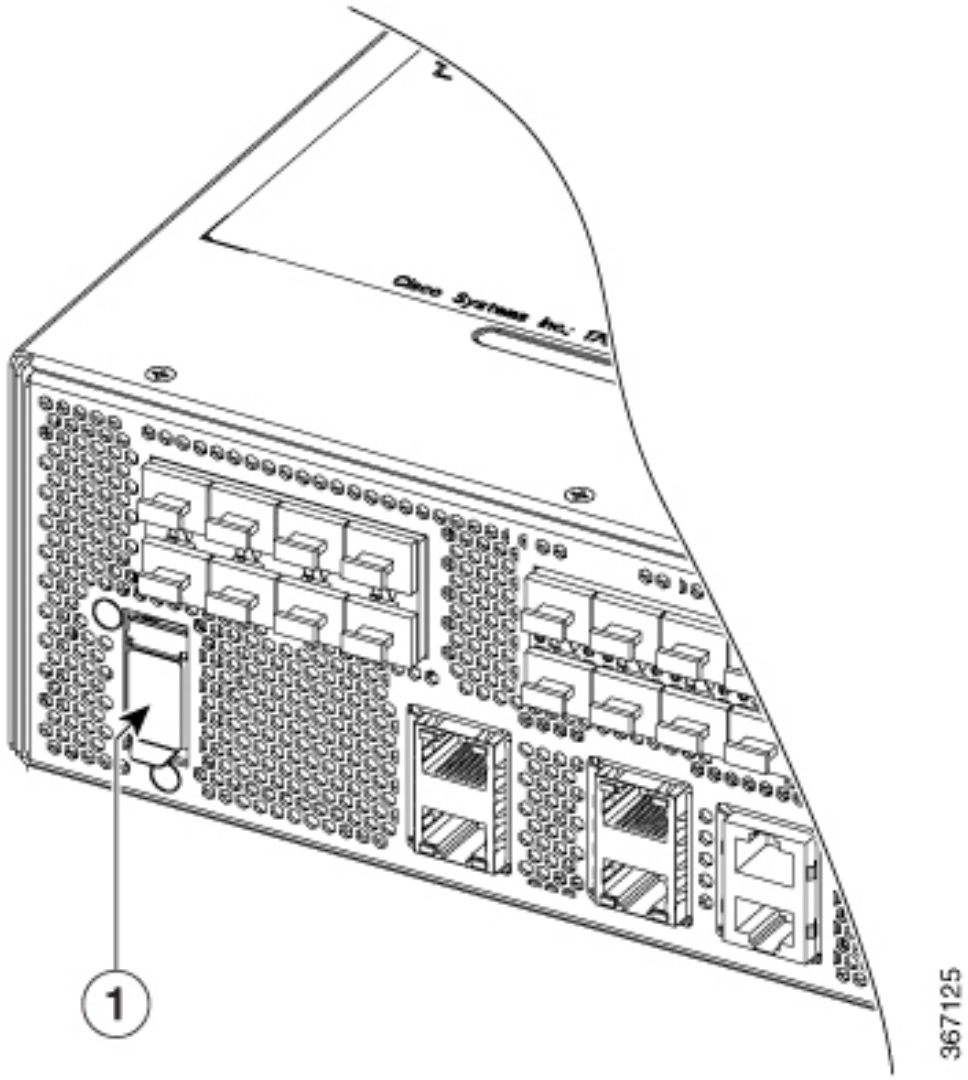


1	Power Switch
2	Power Status

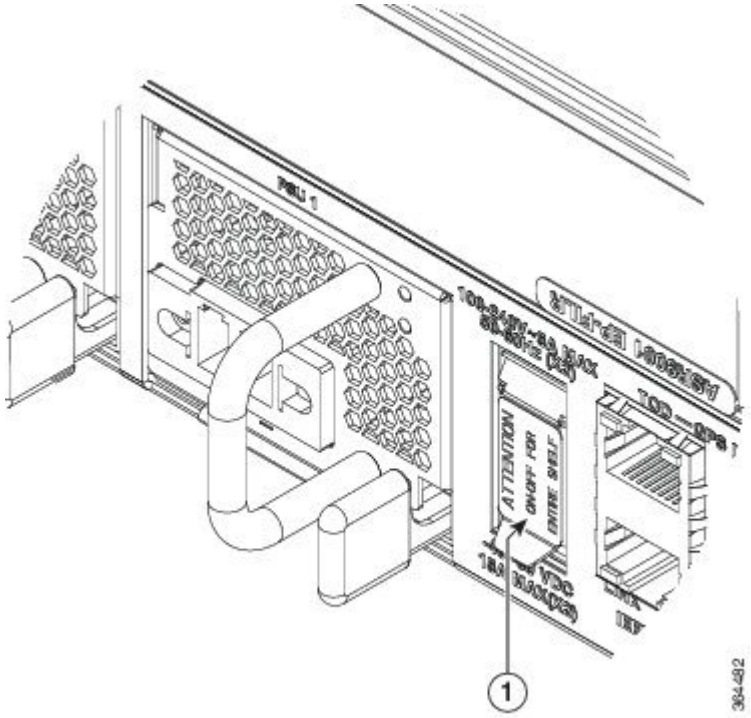
- *Figure 155: Power Switch on the Cisco ASR 9903*

Note There is no power switch available on the AC and DC PSUs for the Cisco ASR 9903 routers as they are plug-and-play devices. The power LED is available on the front-side of the router.

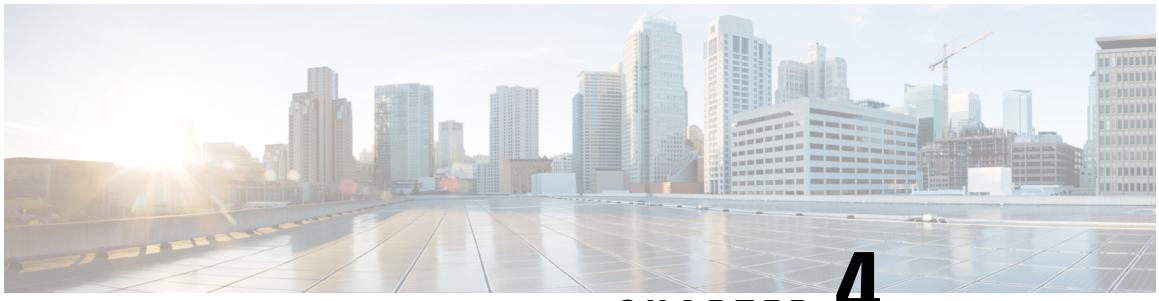
- *Figure 156: Power Switch on the Cisco ASR 9901*



- *Figure 157: Power Switch on the Cisco ASR 9001*



Step 3 Verify that the Power LED on each power module is lit Green.



CHAPTER 4

Troubleshooting the Installation

This chapter contains general troubleshooting information to help isolate the cause of any difficulties you might encounter during the installation and initial startup of the system.

Although an over-temperature condition is unlikely at initial startup, environmental monitoring functions are included in this chapter because these too monitor internal voltages.

- Troubleshooting Overview, on page 149
- Troubleshooting the Power Subsystem, on page 151
- Troubleshooting the Route Processor Subsystem, on page 165
- Troubleshooting the Line Card, on page 173
- Troubleshooting the Cooling Subsystem, on page 178

Troubleshooting Overview

This section describes the methods used in troubleshooting the router. The troubleshooting methods are organized according to the major subsystems in the router.

If you are unable to solve a problem on your own, you can contact a Cisco customer service representative for assistance. When you call, have this information ready:

- Date you received the router and the chassis serial number (located on a label on the back of the chassis).
- Installed line card and Cisco software release number:
  - Use the **show version** command to determine the Cisco software release number.
- Brief description of the symptoms and steps you have taken to isolate and solve the issue.
- Maintenance agreement or warranty information.

Troubleshooting Using a Subsystem Approach

To solve a system problem, try to isolate the problem to a specific subsystem. Compare the current router behavior with the expected router behavior. Because a startup issue is usually attributable to one component, it is most efficient to examine each subsystem, rather than trying to troubleshoot each router component.

For troubleshooting purposes in this chapter, the router consists of these subsystems:

- Power subsystem—Router chassis is shipped with up to two AC-input or DC-input power supply modules installed in the chassis.

Note The Cisco ASR 9902 router is not shipped with power supply modules installed in the chassis. However, the power modules are packed along with the chassis.

- Chassis backplane power distribution—System transfers +12 VDC power from the power modules to the chassis backplane and distributes it to all the cards through the backplane connectors. The fan tray receives power from the chassis backplane and communicate to the RP CAN Bus controller.
- Processor subsystem—Includes the active Route Processor (RP) card with line card. The RP is equipped with onboard processors. The RP downloads a copy of the Cisco software image to the line card processor.
- Cooling subsystem—The fan trays circulate cooling air through the chassis.
  - Cisco ASR 9001 Router has one fan tray (with 14 fans).
  - Cisco ASR 9901 Router has three fan trays.
  - Cisco ASR 9903 Router has four fan trays.
  - Cisco ASR 9902 Router has three fan trays.

Normal Router Startup Sequence

You can generally determine when and where the router failed during the startup sequence by checking the status LEDs on the power modules and RP.

In a normal router startup sequence, this sequence of events and conditions occur:

Procedure

Step 1 The fan in each power module receives power and begins drawing air through the power supply.
The power module input power and output power indicators are on.

Step 2 The fans in the fan tray receive power and begin drawing air through the chassis.
The fan tray OK indicator is on.

Step 3 As the power-on and boot process progresses for the RP, the status of the RP appears on the front panel of the card.

Identifying Startup Issues

The following table shows the LED states on the power modules (AC or DC), RP, and the fan tray after a successful system startup.

Table 21: LEDs at System Startup

Component	Type of Indicator	Display Contents/LED Status and Meaning
Line Card	Status LED	Green: The line card is enabled and ready for use.
AC Power Modules	Power status LEDs	Green (ON): Input AC power OK. Amber (OFF): No fault is present. The correct power module voltages are present and no faults have been detected.
DC Power Modules	Power status LEDs	Green (ON): Input DC power OK. Amber (OFF): No fault is present. The correct power module voltages are present and no faults have been detected.
Fan Tray	Fan tray status LED	Green (ON): Fan Tray OK. The fan tray fans are operating correctly.

Troubleshooting the Power Subsystem

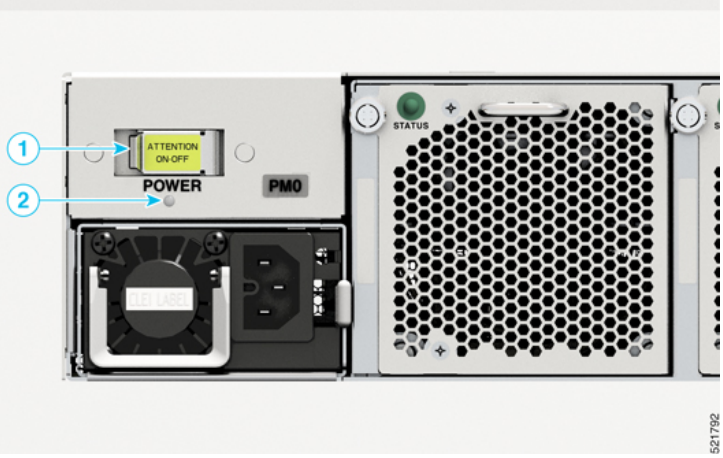
Note For the RP card to communicate properly to a power module, input power to at least one of the two power modules should be present.

Troubleshooting the AC-Input Power Subsystem

Power supply modules monitor their internal temperature, voltage, and current load, and share the status with the RP. Based on the status the RP generates alarms, and logs the appropriate warning messages on the console.

The following figure shows the status indicators for the power module.

Figure 158: Cisco ASR 9902 AC-Input Power Module Status Indicators

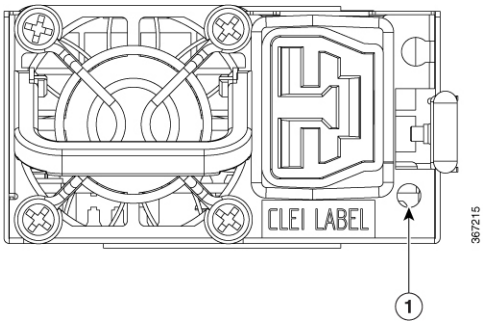


1	Power status LED
2	FAN LED

Figure 159: Cisco ASR 9903 AC-Input Power Module Status Indicators

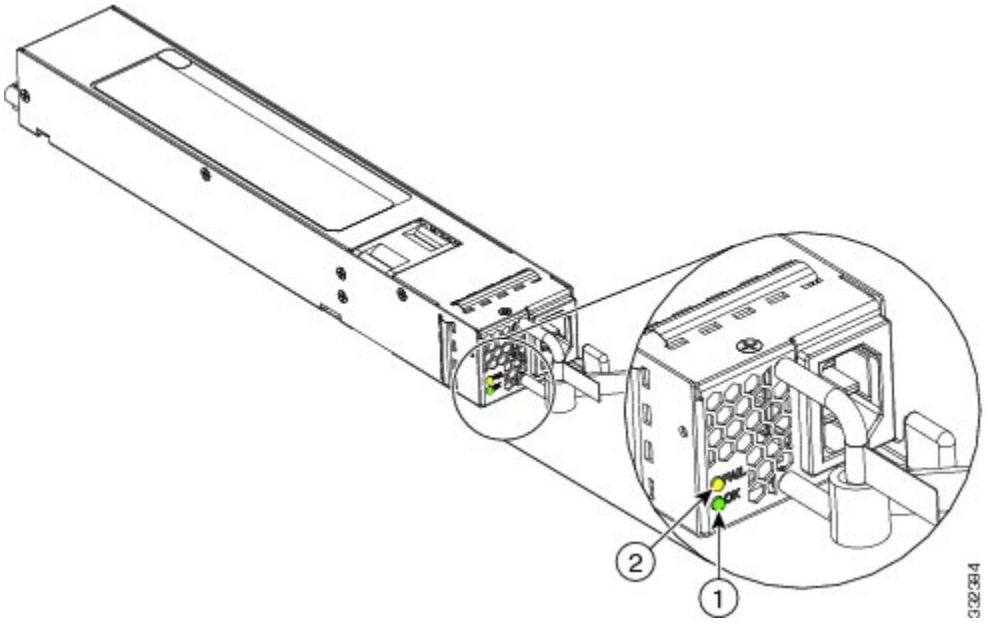
Note There is no power switch available on the AC PSUs for Cisco ASR 9903 routers as they are plug-and-play devices. These devices are directly plugged the PSU slots of the router and do not require any configuration for them to work. The power LED (PWR) is available on the front-side of the router.

Figure 160: Cisco ASR 9901 AC-Input Power Module Status Indicators



LED	Color	Status
OK (Cisco ASR 9901) STATUS (Cisco ASR 9903 and Cisco ASR 9902)	Solid Green	Power supply is on and outputting power
	Flashing Green	Power supply is connected to input power or FPD upgrade in progress.
	Amber	Power supply failure, due to one of the fo • Over voltage • Over current • Over Temperature • Fan failure
	Flashing Amber	Power supply is operating but a warning following conditions: • High temperature • High power • Slow fan
	Off	Power supply is not receiving power.

Figure 161: Cisco ASR 9001 AC-Input Power Module Status Indicators



1	OK (Green) Power LED	ON when the power supply is ON and OK BLINKING when the input AC power voltage is present OFF when no input voltage is present
2	FAIL (Amber) LED	ON when power supply failure occurs (due to over voltage, over current, ov temperature, and fan failure) BLINKING when alarm condition or power supply warning events occur, w power supply continues to operate (due to high temperature, high power, or OFF when no power supply failure has occurred

If the AC power module is not operating properly, follow these steps:

Procedure

Step 1 Make sure the power module is seated properly by ejecting and reseating the power module. Verify that:

- Latch on the ejector lever is locked securely.
- Power switch on the front panel is set to the ON position.

Step 2 Make sure the router is powered on and that all power cords are connected properly. Verify that:

- Power cables are securely attached to their power module terminal studs.
- Power cords at the power source end are securely plugged into their own AC power outlets.
- Source AC circuit breaker is switched on.

Step 3 Check the power supply status LED indicators:

- **Cisco ASR 9902 and Cisco ASR 9903:**
  - Power Supply Unit LED—Indicates that the input AC power is OK, or indicates a power supply failure (includes over voltage, over current, over temperature and fan failure conditions).
  - Solid green LED indicates AC power input is operating normally, and the source AC input voltage of 100 to 240 VAC is within the nominal operating range.
  - Blinking green LED indicates the power supply is connected to input power source but not outputting power to the router.
  - Blinking amber LED indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cord is connected to a dedicated AC power source. Verify that each AC power source is operating in the nominal range of 100 to 240 VAC and is supplying a minimum service of 15 A, North America (or 10 A, international).
  - Solid amber LED indicates a power supply failure due to over voltage, over current, over temperature, or a fan failure.
- **Cisco ASR 9901:**

Note The Cisco ASR 9901 also has a front panel LC status/input OK LED. See RP Front Panel Indicators.

- OK Power LED—Indicates that the input AC power is OK, or indicates a power supply failure (includes over voltage, over current, over temperature and fan failure conditions).

  Solid green LED indicates AC power input is operating normally, and the source AC input voltage of 100 to 240 VAC is within the nominal operating range.

  Blinking green LED indicates the power supply is connected to input power source but not outputting power to the router.

  Blinking amber LED indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cord is connected to a dedicated AC power source. Verify that each AC power source is operating in the nominal range of 100 to 240 VAC and is supplying a minimum service of 15 A, North America (or 10 A, international).

  Solid amber LED indicates a power supply failure due to over voltage, over current, over temperature, or a fan failure.

- **Cisco ASR 9001:**
  - OK (green) Power LED—Indicates that the input AC power is OK.

    If the OK LED is blinking, AC power input is operating normally, and the source AC input voltage of 100 to 240 VAC is within the nominal operating range.

  - FAIL (amber) LED—Indicates the power supply failure, includes over voltage, over current, over temperature and fan failure conditions.

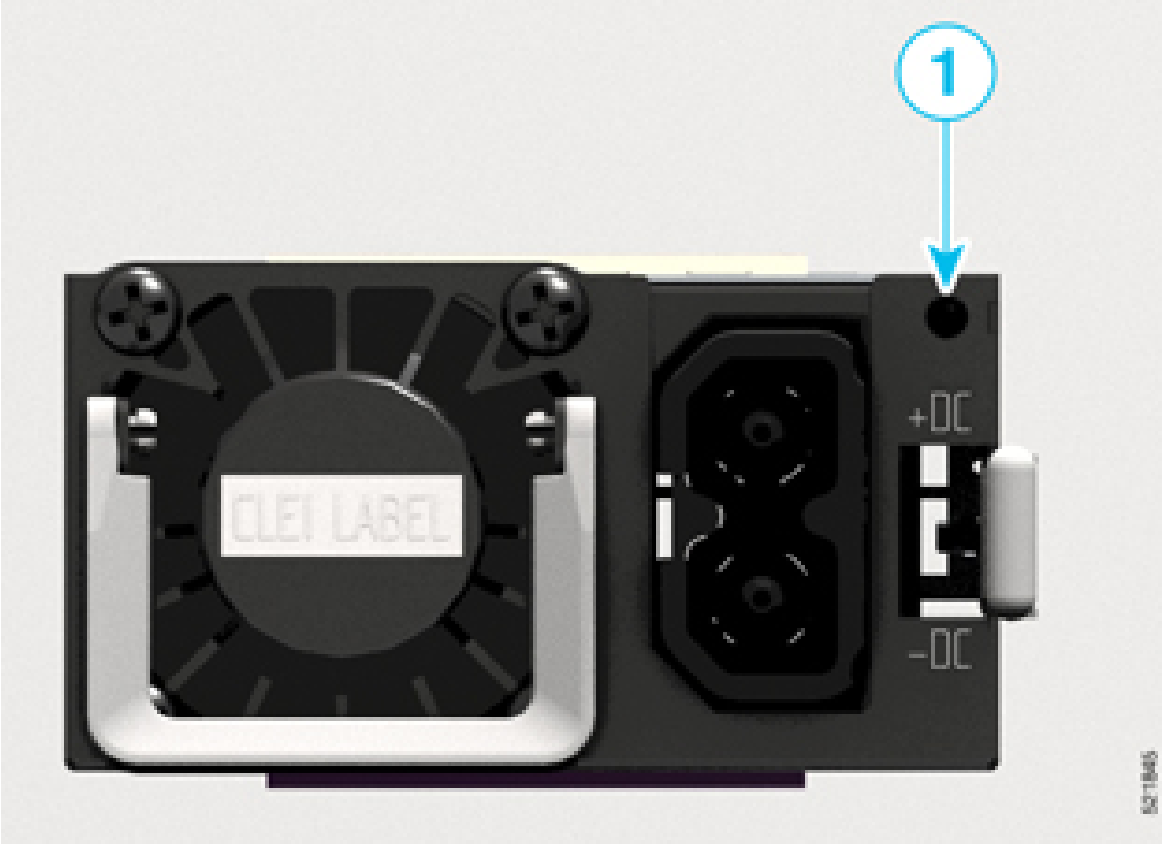
    If the FAIL LED is blinking, it indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cord is connected to a dedicated AC power source. Verify that each AC power source is operating in the nominal range of 100 to 240 VAC and is supplying a minimum service of 15 A, North America (or 10 A, international).

Troubleshooting the DC-Input Power Subsystem

Power supply modules monitor their internal temperature, voltage, and current load and share the status with the RP. Based on the status the RP generates an alarm and logs the appropriate warning messages on the console.

The following figure shows the status indicators for the power module.

Figure 162: Cisco ASR 9902 DC PSU



1	Power status LED

Figure 163: Cisco ASR 9901 DC PSU

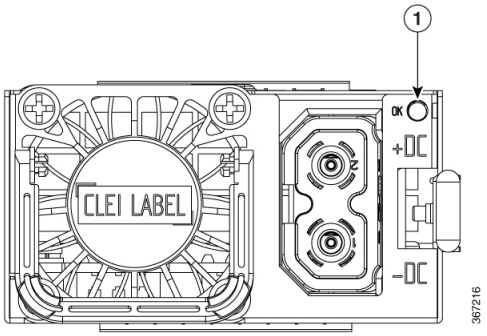
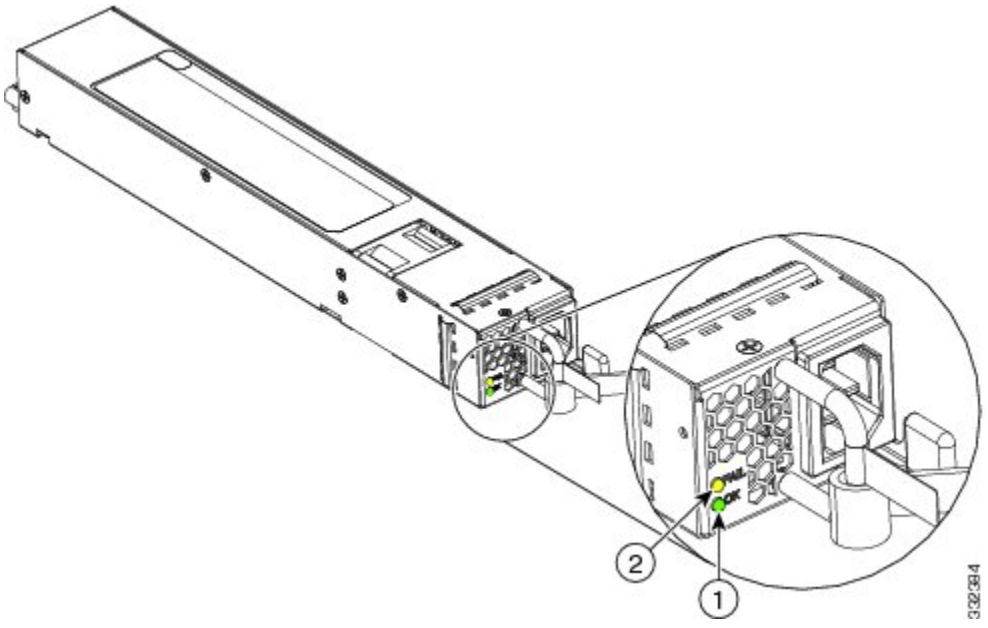


Table 22: Cisco ASR 9901, 9902, and 9903 DC-Input Power Module Status Indicators

LED	Color	Status
OK	Solid Green	Power supply is on and outputting power
	Flashing Green	Power supply is connected to input power or FPD upgrade in progress.
	Amber	Power supply failure, due to one of the fo • Over voltage • Over current • Over Temperature • Fan failure
	Flashing Amber	Power supply is operating but a warning following conditions: • High temperature • High power • Slow fan
	Off	Power supply is not receiving power.

Figure 164: Cisco ASR 9001 DC-Input Power Module Status Indicators



1	OK (Green) Power LED	ON when the power supply is ON and OK BLINKING when the input AC power voltage is present OFF when no input voltage is present
2	FAIL (Amber) LED	ON when power supply failure occurs (due to over voltage, over current, ov temperature, and fan failure) BLINKING when alarm condition or power supply warning events occur, w power supply continues to operate (due to high temperature, high power, or OFF when no power supply failure has occurred

If a DC power module if it is not operating properly, follow these steps:

Procedure

Step 1 Make sure the power module is seated properly by ejecting and reseating the power module. Verify that:

- Latch on the ejector lever is locked securely.
- Power switch on the front panel is set to the ON position.

Step 2 Make sure the router is powered on and that all power cords are connected properly. Verify that:

- Power cables are securely attached to their power module terminal studs.
- Power cables are securely attached at the DC source end.
- Source DC circuit breaker is switched on.

Step 3 Check the power supply status LED indicators:

- **Cisco ASR 9902:**
  - Power Supply Module LED—Indicates that the input DC power is OK, or indicates a power supply failure (includes over voltage, over current, over temperature and fan failure conditions).
  - Solid green LED indicates DC power input is operating normally, and the source DC input voltage of –40 to –72 VDC is within the nominal operating range.
  - Blinking green LED indicates the power supply is connected to input power source but not outputting power to the router.
  - Blinking amber LED indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cable is connected to a dedicated DC power source. Verify that each DC power source is operating in the nominal range of –40 to –72 VDC
  - Solid amber LED indicates a power supply failure due to over voltage, over current, over temperature, or a fan failure.
- **Cisco ASR 9901:**

Note The Cisco ASR 9901 also has a front panel LC status/input OK LED. See RP Front Panel Indicators.

- OK Power LED—Indicates that the input DC power is OK, or indicates a power supply failure (includes over voltage, over current, over temperature and fan failure conditions).

  Solid green LED indicates DC power input is operating normally, and the source DC input voltage of –40 to –72 VDC is within the nominal operating range.

  Blinking green LED indicates the power supply is connected to input power source but not outputting power to the router.

  Blinking amber LED indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cable is connected to a dedicated DC power source. Verify that each DC power source is operating in the nominal range of –40 to –72 VDC

  Solid amber LED indicates a power supply failure due to over voltage, over current, over temperature, or a fan failure.

- **Cisco ASR 9001:**
  - OK (green) Power LED—Indicates that the input DC power is OK.

    If the OK LED is blinking, DC power input is operating normally, and the source DC input voltage of –40 to –72 VDC is within the nominal operating range.

  - FAIL (amber) LED —Indicates the power supply failure, includes over voltage, over current, over temperature and fan failure conditions.

    If the FAIL LED is blinking, it indicates alarm condition or power supply warning events, while the power supply continues to operate; this includes high temperature, high power, or slow fan conditions. Make sure that each power cable is connected to a dedicated DC power source. Verify that each DC power source is operating in the nominal range of –40 to –72 VDC.

Additional Power Subsystem Troubleshooting Information

This section contains additional troubleshooting information to help you isolate the cause of a power problem.

Hardware and Software Identification

The power modules have software IDs that differ from the hardware ID labels on the chassis. This following table is for converting power module hardware IDs to software IDs.

Table 23: Power Module Hardware and Software IDs

Hardware ID	Software ID
PS0 M0	PM0
PS0 M1	PM1

Use the **show inventory power** command in the admin mode to display power modules installed on a router.

This sample command output is from Cisco ASR 9903 router:

```
sadmin-vm:0_RP0# show inventory power
Wed Jan  13 19:43:16.801 UTC+00:00

 Name: 0/PT0                 Descr: Simulated Power Tray IDPROM

 PID: ASR-9900-AC-PEM        VID: V03                   SN: FOT1981P81A

 Name: 0/PT0-PM0             Descr: 1.6kW-AC Power Module

 PID: A9903-1600W-AC         VID: V01                   SN: POG2351D018

 Name: 0/PT0-PM1             Descr: 1.6kW-AC Power Module

 PID: A9903-1600W-AC         VID: V01                   SN: POG2351D027

 Name: 0/PT0-PM2             Descr: 1.6kW-AC Power Module

 PID: A9903-1600W-AC         VID: V01                   SN: POG2338D01U

 Name: 0/PT0-PM3             Descr: 1.6kW-AC Power Module

 PID: A9903-1600W-AC         VID: V01                   SN: POG2351D06H
```

The command output shows physical power modules (PM0, PM1, PM2, and PM3) and a simulated power tray.

The power trays on a fixed-port routers do not have an IDPROM (identification programmable read-only memory). Cisco IOS XR software creates a simulated, or virtual power tray with IDPROM that represents the power trays depending on the type of the power modules used in the system. The following PIDs are used as simulated power trays:

- ASR-9900-AC-PEM – for ASR 9902 and ASR 9903 AC
- ASR-9900-DC-PEM – for ASR 9902 and ASR 9903 DC
- A9K-AC-PEM – for ASR 9001 and 9901 AC
- A9K-DC-PEM – for ASR 9001 and 9901 DC

Obtaining Temperature and Environmental Information

If both the RP and the fan tray are operating, all internal correct DC voltages are present.

Enter the **show environment** command at the router admin prompt to display temperature and voltage information for each installed card, fan tray, and power module as shown in this example:

```
sysadmin-vm:0_RP1# show environment
Mon Jul  12 17:57:01.784 UTC+00:00
================================================================================
Location  TEMPERATURE                Value   Crit Major Minor Minor Major  Crit
          Sensor                   (deg C)   (Lo) (Lo)  (Lo)  (Hi)  (Hi)   (Hi)
--------------------------------------------------------------------------------
0/0
          Inlet                       31    -10    -5     0    60    65    70
          MB_AIR_Inlet                34    -10    -5     0    60    65    70
         MB_AIR_Outlet_0              38    -10    -5     0    70    75    80
          MB_AIR_Outlet_1             38    -10    -5     0    70    75    80
          MB_Hotspot_0                41    -10    -5     0    70    75    80
          MB_Hotspot_1                41    -10    -5     0    70    75    80
          DIE_CPU                     35    -10    -5     0    80    89   104
```

```
          DIE_DIMM0                      36    -10    -5     0    87    90    95
          DIE_DIMM1                      36    -10    -5     0    87    90    95
          DIE_Aldrin                     40    -10    -5     0   102   105   110
          DIE_PHY0                       52    -10    -5     0   110   120   125
          DIE_PHY1                       50    -10    -5     0   110   120   125
          DIE_SKB0                       44    -10    -5     0   115   120   125
          DIE_TOR                        44    -10    -5     0   115   120   125
          DIE_LSD0                       46    -10    -5     0   105   110   115
          DIE_LSD0_HBM0                  40    -10    -5     0    95   100   105
          DIE_LSD0_HBM1                  42    -10    -5     0    95   100   105
          DIE_LSD1                       46    -10    -5     0   105   110   115
          DIE_LSD1_HBM0                  40    -10    -5     0    95   100   105
          DIE_LSD1_HBM1                  42    -10    -5     0    95   100   105
          DIE_X24_L                      41    -10    -5     0   110   120   125
          DIE_X24_H                      42    -10    -5     0   110   120   125
          DB_AIR_Inlet_0                 32    -10    -5     0    60    65    70
          DB_AIR_Inlet_1                 31    -10    -5     0    60    65    70
          DB_AIR_Outlet_0                34    -10    -5     0    75    80    85
          DB_AIR_Outlet_1                30    -10    -5     0    75    80    85
          DB_AIR_Outlet_2                33    -10    -5     0    75    80    85
0/RP0
          DIE_CPU                        33    -10    -5     0    80    89   104
          DIE_DIMM0                      32    -10    -5     0    85    95   110
          DIE_DIMM1                      32    -10    -5     0    85    95   110
          Inlet                          27    -10    -5     0    65    75    90
          DIE_Aldrin                     36    -10    -5     0    95   105   115
          AIR_Outlet                     31    -10    -5     0    85    95   110
          Hotspot                        35    -10    -5     0    85    95   110
0/RP1
          DIE_CPU                        30    -10    -5     0    80    89   104
          DIE_DIMM0                      28    -10    -5     0    85    95   110
          DIE_DIMM1                      28    -10    -5     0    85    95   110
          Inlet                          26    -10    -5     0    65    75    90
          DIE_Aldrin                     38    -10    -5     0    95   105   115
          AIR_Outlet                     31    -10    -5     0    85    95   110
          Hotspot                        33    -10    -5     0    85    95   110
0/PT0-PM0
          PM0-Inlet Temperature          30    -10    -5     0    70    75    80
          PM0-Outlet Temperature         37    -10    -5     0    80    85    90
          PM0-Heat Sink Temperature      38    -10    -5     0   100   105   110
0/PT0-PM1
          PM1-Inlet Temperature          30    -10    -5     0    70    75    80
          PM1-Outlet Temperature         39    -10    -5     0    80    85    90
          PM1-Heat Sink Temperature      39    -10    -5     0   100   105   110
==============================================================================
Location  VOLTAGE                    Value   Crit Minor Minor  Crit
          Sensor                     (mV)    (Lo) (Lo)  (Hi)   (Hi)
------------------------------------------------------------------------------
0/0
          VP1P8_CPU_VCCIN             1790   1547  1562  1982  2002
          VP1P7_CPU                   1699   1530  1545  1851  1870
          VP1P05_CPU_VCCSCUS          1050    945   954  1143  1155
          VP1P2_CPU                   1196    960   970  1425  1440
          VP1P05_CPU                  1051    945   954  1143  1155
          VP3P3_CPU                   3298   2970  3000  3594  3630
          VP1P3_CPU                   1300   1170  1182  1416  1430
          VP3P3_RTC                   3286   2970  3000  3594  3630
          VP0P85_IPU_MGT               849    765   773   926   935
          VP1P5_CPU                   1499   1350  1364  1634  1650
          VP0P8_PHY_AVDD               829    747   754   904   913
          VP1P0_FPGA                   999    900   909  1089  1100
          VP1P8_PHY_AVDD              1800   1620  1636  1960  1980
          VP7P0                       6999   6300  6363  7623  7700
          VP5P0                       5000   4500  4545  5445  5500
```

```
                VP0P6_VTT                     597    540   555   645   660
                VP3P3_CAN                    3300   2970  3000  3594  3630
                VP1P5                        1500   1350  1364  1634  1650
                VP0P85_IPU_CORE               849    765   773   926   935
                VP1P2                        1199   1080  1091  1307  1320
                VP1P2_IPU_DDR4               1199   1080  1091  1307  1320
                VP1P8_IPU_MGT                1800   1620  1636  1960  1980
                VP3P3                        3299   2970  3000  3594  3630
                VP1P8                        1800   1620  1636  1960  1980
                VP3P3_QP_VDD_1               3300   2970  3000  3594  3630
                VP3P3_QP_VDD_2               3300   2970  3000  3594  3630
                VP0P9_PEX                     900    810   818   980   990
                VP2P5                        2500   2250  2273  2723  2750
                VP3P3_SUPR                   3299   2970  3000  3594  3630
                VP0P85_TOR_AVS_VDD            889    756   764  1022  1032
                VP0P7_LSD0_CORE               718    646   652   782   790
                VP0P75_LSD0_RTVDD             750    675   682   817   825
                VP0P8_LSD0_AVDDL              799    720   727   871   880
                VP0P9_LSD0_AVDDH              899    810   818   980   990
                VP1P2_LSD0_HBM               1199   1080  1091  1307  1320
                VP0P75_LSD0_PLLVDD            749    675   682   817   825
                VP0P8_LSD0_PLLVDD             800    720   727   871   880
                VP0P8_PHY0_VDD                779    702   709   849   858
                VP0P7_LSD1_CORE               718    646   652   782   790
                VP0P75_LSD1_RTVDD             750    675   682   817   825
                VP0P8_LSD1_AVDDL              800    720   727   871   880
                VP0P9_LSD1_AVDDH              900    810   818   980   990
                VP1P2_LSD1_HBM               1199   1080  1091  1307  1320
                VP0P75_LSD1_PLLVDD            750    675   682   817   825
                VP0P8_LSD1_PLLVDL             800    720   727   871   880
                VP0P8_PHY1_VDD                779    702   710   849   858
                VP1P2_LSD0_TVDDH             1199   1080  1091  1307  1320
                VP1P5_LSD0_CPLLVDD_PG        2439   2250  2273  2970  3000
                VP1P5_LSD0_VDDH              1499   1350  1364  1634  1650
                VP2P5_LSD0_HBM               2424   2250  2273  2723  2750
                VP1P2_LSD1_TVDDH             1199   1080  1091  1307  1320
                VP1P5_LSD1_CPLLVDD_PG        2449   2250  2273  2970  3000
                VP1P5_LSD1_VDDH              1500   1350  1364  1634  1650
                VP2P5_LSD1_HBM               2425   2250  2273  2723  2750
                VP0P9_CORE_X24                900    810   818   980   990
                VP0P9_ANA_X24                 900    810   818   980   990
                VP1P5_AVDD_X24               1500   1350  1364  1634  1650
                VP1P2_AVDD_X25               1199   1080  1091  1307  1320
                VP1P8_X24                    1799   1620  1636  1960  1980
                VP1P1_TOR                    1099    990  1017  1182  1210
                VP0P85_TOR_VDDA               849    765   773   926   935
                VP0P8_SKB0_VDD                724    632   638   871   880
                VP0P9_SKB0_AVDD               899    810   818   980   990
                VP1P5_SKB0_VDDH              1499   1350  1364  1634  1650
                VP2P5_SKB0_VDDH              2497   2250  2273  2723  2750
                VP0P9_SKB0_PLLAVDD            900    810   818   980   990
                VP2P5_1                      2500   2250  2273  2723  2750
                VP0P9_SKB0_PLLVDD             900    810   818   980   990
                VP3P3_1                      3300   2970  3000  3594  3630
                VP1P0_XGE                     982    720   729  1267  1280
                VP1P0_XGE_SD_AVDD            1000    900   909  1089  1100
                VP1P8_1                      1800   1620  1636  1960  1980
                VP1P8_XGE                    1798   1620  1636  1960  1980
                VP5P0_1                      5001   4500  4545  5445  5500
                VP7P0_1                      7000   6300  6363  7623  7700
                VP1P2_PHY                    1200   1080  1091  1307  1320
                VP1P1_SKB0_AVDDH             1100    990  1017  1182  1210
                Hot Swap VS                 12075  10800 10908 14256 14400
0/RP0
```

```
                VP1P8_CPU_VCCIN             1790   1547  1562  1982  2002
                VP1P7_CPU                   1700   1530  1545  1851  1870
                VP1P05_CPU_VCCSCUS          1053    945   954  1143  1155
                VP1P2_CPU                   1201    960   970  1426  1440
                VP1P05_CPU                  1048    945   954  1143  1155
                VP3P3_CPU                   3290   2970  3000  3594  3630
                VP1P3_CPU                   1300   1170  1182  1416  1430
                VP3P3_RTC                   2982   2400  2424  3594  3630
                VP1P0_ALD_SDAVDD            1000    900   909  1089  1100
                VP1P2_MGTAVTT               1200   1080  1091  1307  1320
                VP1P0_MGTAVCC               1000    900   909  1089  1100
                VP1P0_LH                    1000    900   909  1089  1100
                VP1P0_ALD_CORE              1000    900   909  1089  1100
                VP3P3                       3300   2970  3000  3594  3630
                VP5P0                       5000   4500  4545  5445  5500
                VP3P3_AUX                   3300   2970  3000  3594  3630
                VP1P5_CPU                   1500   1350  1364  1634  1650
                VP0P6_CPU                    601    540   545   653   660
                P12V_STBY                  11895  10801 10909 13067 13199
                VP2P5                       2500   2250  2273  2723  2750
                VP1P8                       1799   1620  1636  1960  1980
                VP1P2                       1199   1080  1091  1307  1320
                VP1P5_I210                  1500   1350  1364  1634  1650
                VP0P9_I210                   900    810   818   981   990
                VP3P3_MB_DB                 3200   2970  3000  3594  3630
                VP5P0_DB                    5000   4500  4545  5445  5500
                VP7P0_DB                    6650   6300  6363  7623  7700
                VP1P0_DB                    1000    900   909  1089  1100
                VP1P8_DB                    1800   1620  1636  1960  1980
                VP1P0_MGT_DB                 999    900   909  1089  1100
                VP1P2_MGT_DB                1198   1080  1091  1307  1320
                VP3P3_DB                    3299   2970  3000  3594  3630
                VP1P8_PLL_DB                1799   1620  1636  1960  1980
                VP2P5_DB                    2500   2250  2275  2725  2750
                Hot Swap VS                12057  10800 10908 14256 14400
0/RP1
                VP1P8_CPU_VCCIN             1787   1547  1562  1982  2002
                VP1P7_CPU                   1700   1530  1545  1851  1870
                VP1P05_CPU_VCCSCUS          1050    945   954  1143  1155
                VP1P2_CPU                   1199    960   970  1426  1440
                VP1P05_CPU                  1045    945   954  1143  1155
                VP3P3_CPU                   3289   2970  3000  3594  3630
                VP1P3_CPU                   1300   1170  1182  1416  1430
                VP3P3_RTC                   2974   2400  2424  3594  3630
                VP1P0_ALD_SDAVDD             999    900   909  1089  1100
                VP1P2_MGTAVTT               1199   1080  1091  1307  1320
                VP1P0_MGTAVCC                999    900   909  1089  1100
                VP1P0_LH                    1000    900   909  1089  1100
                VP1P0_ALD_CORE               999    900   909  1089  1100
                VP3P3                       3300   2970  3000  3594  3630
                VP5P0                       5000   4500  4545  5445  5500
                VP3P3_AUX                   3300   2970  3000  3594  3630
                VP1P5_CPU                   1499   1350  1364  1634  1650
                VP0P6_CPU                    599    540   545   653   660
                P12V_STBY                  11896  10801 10909 13067 13199
                VP2P5                       2500   2250  2273  2723  2750
                VP1P8                       1800   1620  1636  1960  1980
                VP1P2                       1199   1080  1091  1307  1320
                VP1P5_I210                  1499   1350  1364  1634  1650
                VP0P9_I210                   899    810   818   981   990
                VP3P3_MB_DB                 3300   2970  3000  3594  3630
                VP5P0_DB                    4999   4500  4545  5445  5500
                VP7P0_DB                    6998   6300  6363  7623  7700
                VP1P0_DB                    1000    900   909  1089  1100
```

```
          VP1P8_DB                     1800   1620  1636  1960  1980
          VP1P0_MGT_DB                  998    900   909  1089  1100
          VP1P2_MGT_DB                 1197   1080  1091  1307  1320
          VP3P3_DB                     3300   2970  3000  3594  3630
          VP1P8_PLL_DB                 1799   1620  1636  1960  1980
          VP2P5_DB                     2499   2250  2275  2725  2750
          Hot Swap VS                 12093  10800 10908 14256 14400
0/FT0
          Hot Swap VS                 12025  10800 10908 13068 13200
0/FT1
          Hot Swap VS                 12050  10800 10908 13068 13200
0/FT2
          Hot Swap VS                 12050  10800 10908 13068 13200
==============================================================================
Location  CURRENT                     Value
          Sensor                      (mA)
------------------------------------------------------------------------------
0/0
          Hot Swap CS                 23611
0/RP0
          Hot Swap CS                  3611
0/RP1
          Hot Swap CS                  3630
0/FT0
          Hot Swap CS                   600
0/FT1
          Hot Swap CS                   620
0/FT2
          Hot Swap CS                   620
==========================================
                        Fan speed (rpm)
Location     FRU Type           FAN_0   FAN_1
------------------------------------------
0/FT0        ASR-9902-FAN        6960
0/FT1        ASR-9902-FAN        7110
0/FT2        ASR-9902-FAN        6930

0/PT0-PM0    PWR-1.6KW-AC       10176    9984
0/PT0-PM1    PWR-1.6KW-AC       10560    9952
==============================================================================
CHASSIS LEVEL POWER INFO: 0
==============================================================================
   Total output power capacity (N + 1)             :    1600W +    1600W
   Total output power required                     :    1034W
   Total power input                               :     512W
   Total power output                              :     404W

Power Shelf 0:
==============================================================================
   Power       Supply     ------Input----   ------Output---      Status
   Module      Type        Volts     Amps    Volts     Amps
==============================================================================
   0/PT0-PM0   1.6KW-AC    213.5      1.1     12.1     15.2    OK
   0/PT0-PM1   1.6KW-AC    213.0      1.3     12.1     18.2    OK

Total of Power Shelf 0:        512W/  2.4A       404W/ 33.4A

==============================================================================
   Location     Card Type            Power       Power       Status
                                     Allocated   Used
                                     Watts       Watts
==============================================================================
   0/0          ASR-9902-LC            614         283       ON
   0/RP0        A99-RP-F               102          43       ON
```

```
   0/RP1        A99-RP-F              102          44       ON
   0/FT0        ASR-9902-FAN           72           7       ON
   0/FT1        ASR-9902-FAN           72           7       ON
   0/FT2        ASR-9902-FAN           72           7       ON
==============================================================================
   Location      Altitude Value (Meters)     Source
------------------------------------------------------------------------------
   0             2                           sensor
```

Troubleshooting the Power Distribution System

The power distribution system consists of:

- AC or DC power modules that supply +12 VDC to the backplane.
- Chassis backplane that carries voltage to chassis components.
- DC-to-DC converters that convert +12 VDC from the backplane to the correct voltages required by the line card.

Use this procedure to troubleshoot the power distribution system:

Procedure

Step 1 Check each power module to make sure that:

- Power module is fully inserted and properly secured by its latch.
- Green LED is on.
- Amber LED is off.

If the power modules meet the above criteria, then the correct source power is present and within tolerance, and output DC power is present. The power modules are functioning properly.

Step 2 Make sure the fan tray is operating:

- If the fan tray is functioning, then the +12 VDC from the chassis backplane to the fan tray is functioning properly.
- If the fan tray is still not operating, there could be a problem with either the fan tray or with the +12 VDC distribution through backplane.
- Contact your Cisco representative if replacing the fan tray does not fix the problem.

Troubleshooting the Route Processor Subsystem

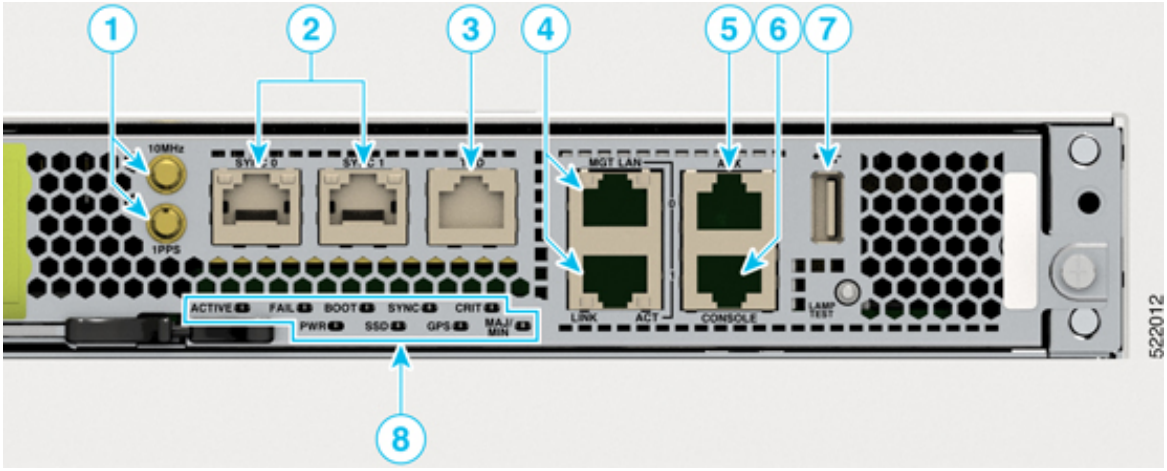
The router processor subsystem consists of the route processor located on the RP card. The RP and the line card each has the same onboard CPU serving as the main processor. The Controller Area Network (CAN) microcontroller processor monitors the environment and controls the onboard DC-to-DC converters.

Route Processor Overview

The CPU on the RP card provides chassis control and management, boot media functionality, telecom timing and precision clock synchronization, communication to the line card through the backplane Ethernet network, and power control through the CAN bus. In addition, the CPU on the RP card also runs the routing protocols.

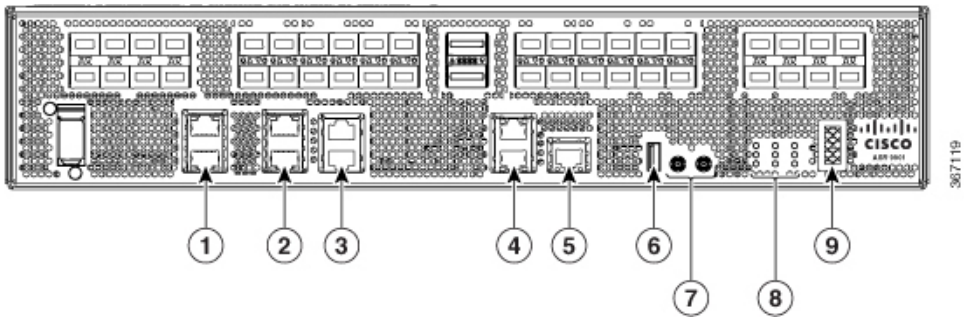
The following figure identifies the slots, ports, and LEDs on the RP card front panel.

Figure 165: Cisco ASR 9902 Router Chassis Front Panel



1	10MHz and 1PPS ports	6	Console port
2	SYNC (BITS/J.211) ports	7	External USB port
3	ToD port	8	Nine discrete LED indicators
4	Management LAN ports		
5	AUX port		

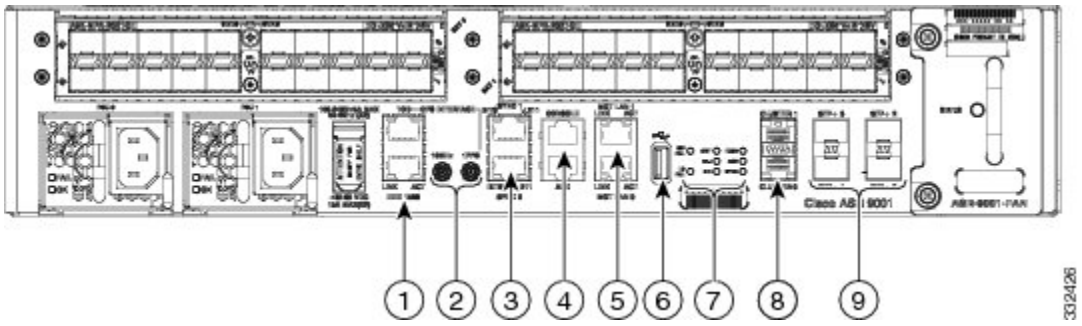
Figure 166: Cisco ASR 9901 Router Chassis Front Panel



1	SYNC (BITS/J.211) ports	6	External USB port
2	Service LAN and ToD ports	7	10MHz and 1PPS ports
3	CONSOLE and AUX ports	8	Nine discrete LED indicators

4	Management LAN ports	9	LED matrix display
5	Connectivity Management Processor (CMP) port		

Figure 167: Cisco ASR 9001 Router Chassis Front Panel



1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS ports	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports
4	CONSOLE and AUX ports	9	Line Card SFP+ ports
5	Management LAN ports		

RP Front Panel Indicators

The RP has LED indicators to display system information. The number of LED indicators varies depending on the router:

- Cisco ASR 9903, Cisco ASR 9902, and Cisco ASR 9901 have 9 discrete LED indicators
- Cisco ASR 9001 has 8 discrete LED indicators

The following table lists the display definitions of the discrete LEDs on the RP front panel as well as the normal LED states on the power modules (AC or DC) and the fan tray after a successful system startup.

Table 24: RP Discrete LED Display Definitions

LED	Value	Color	Meaning
RSP FAIL	Bi-color	Red	RSP in initializing or failed state.
		Green	RSP is up and running.
		OFF	RSP is normal.
LC FAIL (Cisco ASR 9001 only)	Bi-color	Red	LC in initializing or failed state.
		Green	LC is up and running.
		OFF	LC is normal.

LED	Value	Color	Meaning
LC STAT/INPUT OK (Cisco ASR 9901 only)	Bi-color	Red	LC in initializing or failed state. **Note:** When power is connected to the chassis but the chassis power switch is set to the OFF position, the LED is red and all other LEDs are OFF.
		Green	LC is up and running.
		OFF	LC is powered off. The LED might turn off momentarily when switching between the states described above, although the LC has not powered off.
Critical Alarm (CRIT)	Single color	Red	Critical Alarm LED. A critical alarm has occurred.
		OFF (Default after reset)	No critical alarm has occurred.
Major Alarm (MAJ)	Single color	Red	Major alarm LED. A major alarm has occurred.
		OFF (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Single color	Amber	Minor alarm LED. A minor alarm has occurred.
		OFF (Default after reset)	No minor alarm has occurred.
External USB 2.0 (EUSB) (Cisco ASR 9001 only)	Single color	Green	External USB is busy/active. The LED is driven by the USB controller.
		OFF (Default after reset)	External USB is not busy/active.
Internal Solid State Hard Disk Drive (SSD) (Cisco ASR 9903, ASR 9902, and ASR 9901 only)	Single color	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD/SAS controller.
		OFF	Internal Solid State Hard Disk Drive is not busy/active.
Alarm Cutoff (ACO) (Cisco ASR 9001 only)	Single color	OFF	Alarm Cutoff is not enabled. **Note:** ACO LED is not in use and will always be OFF.
Synchronization (SYNC)	Bi-color	Green	Sync - Time core is synchronized to an external source (either GPS or IEEE1588).
		Amber	Not used.
		OFF (Default after reset)	Time core clock synchronization is either disabled OR Time core is synchronized with external source excluding GPS and IEEE1588

LED	Value	Color	Meaning
GPS (Cisco ASR 9901 only)	Single color	Green	GPS interface provisioned and ports are turned on. ToD, 1 PPS, 10 Mhz are all valid.
		OFF (Default after reset)	Either the interface is not provisioned, or the ports are not turned on. ToD, 1 PPS, 10 Mhz are not valid.
Fan fault (FAN FLT) (Cisco ASR 9901 only)	Single color	Red	One (or more) fan tray does not have set speed, is experiencing power fault, or is not inserted.
		OFF	All fan trays performing normally without speed variations.
Power Module			
FAIL/OK (ASR 9001 Power Module)	Bi-color	Green	See Figure 161: Cisco ASR 9001 AC-Input Power Module Status Indicators and Figure 164: Cisco ASR 9001 DC-Input Power Module Status Indicators for detailed description
		Amber	
OK (ASR 9901 Power Module)	Bi-color	Green (solid or flashing)	See Figure 160: Cisco ASR 9901 AC-Input Power Module Status Indicators and Figure 163: Cisco ASR 9901 DC PSU for detailed description
		Amber (solid or flashing)	
Fan Tray			
STATUS (Fan tray)	Bi-color	Amber	Fan tray power ON state.
		Green	Fan tray fully functional.
		Red	Fan failure condition.
	Single color (Cisco ASR 9902 only)	Green	Fan tray fully functional.
		OFF (Cisco ASR 9902 only)	Fan failure condition. **Note** During an OIR process, all fan trays' LEDs turn OFF to indicate the onset of a five-minute period for a fan tray replacement. The LEDs turn green after the fan tray replacement is complete.

LED Matrix Display

The LED matrix displays one row of four characters. The matrix becomes active when the CPU powers on and displays the stages of the boot process, as well as displaying runtime information during normal operation. If there are CAN Bus Controller problems, error messages are displayed.

LED Matrix Boot Stage and Runtime Display

The following tables describe the boot process and runtime display information for the RSP.

Not all of these messages are seen during a successful boot up process because the screen is updated too quickly for the message to be visible. A failure detected during the boot up process results in the message remaining visible indicating the stage where the boot up process stopped. When possible, the RSP logs the failure information and reboots.

Table 25: RSP Boot Stages and Runtime Displays

LED Matrix Display	Description
INIT	Card is inserted and microcontroller is initialized.
BOOT	Card is powered on and CPU is booting.
IMEM	Starting initialization of memory.
IGEN	Starting initialization of card.
ICBC	Initializing communication with the microcontroller.
SCPI	Board is not plugged in properly.
STID	CBC was unable to read slot ID pins correctly.
PSEQ	CBC detected power sequencer failure.
DBPO	CBC detected an issue during board power up.
KPWR	CBC detected an issue during board power up.
LGNP	CBC detected an issue during board power up.
LGNI	CBC detected an issue during board power up.
IPNP	CBC detected an issue during board power up.
IPNI	CBC detected an issue during board power up.
RMN	All tests finished and ROMMON is ready for commands.
LOAD	Downloading Minimum Boot Image (MBI) image to CPU.
RRST	ROMMON rebooting board after MBI validation timeout.
MVB	ROMMON trying MBI validation boot.
MBI	Starting execution of MBI.
IOXR	Cisco IOS XR Software is starting execution.
LDG	The RSP/RP is loading (MBI started and card preparing for activity).
INCP	The software or configuration is incompatible with the RSP/RP.

LED Matrix Display	Description
OOSM	The RSP is in Out of Service, Maintenance mode.
ACT	The RSP is active (IOS-XR completely up and ready for traffic)
AUTH	The RSP failed anti-counterfeiting authentication and rebooted. If authentication continues to fail, the RSP will be in a continuous reboot loop.

LED Matrix CAN Bus Controller Error Display

The following table shows the error messages the LED matrix displays if the RSP card fails one of the power on self tests.

Table 26: RSP LED Matrix CAN Bus Controller Status Display

LED Matrix Display	Description
PST1	Failed DDR RAM memory test
PST2	Failed FPGA image cyclic redundancy checking (CRC) check
PST3	Failed card type and slot ID verification

Ethernet Ports and Status LEDs

The RP has two 8-pin media-dependent interface (MDI) RJ-45 Management LAN ports for 10 Mbps, 100 Mbps, and 1000Mbps Ethernet connections. These ports are labeled MGT LAN 0 and MGT LAN 1.

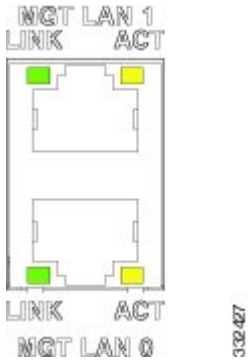
The transmission speed of the Ethernet port is not user-configurable. You set the speed through an auto-sensing scheme on the RP, the speed is determined by the network to which the Ethernet port is connected. However, even at an auto-sensed data transmission rate of 100 Mbps, the Ethernet port can only provide a usable bandwidth of substantially less than 100 Mbps. You can expect a maximum usable bandwidth of approximately 12 Mbps when using an Ethernet connection.

These LEDs on the front panel indicate traffic status and port selection (see the following figure):

- LINK—Indicates link activity.
- ACT—Indicates which Ethernet port is selected (ETH 0 or ETH 1).

Note Because both ports are supported on the RP card, MGT LAN 0 is always on. MGT LAN 0 lights when it is selected.

Figure 168: Management LAN Port Activity LEDs



Auxiliary and Console Ports

The auxiliary and console ports on the RP are EIA/TIA-232 (also known as RS-232) asynchronous serial ports connect external devices to monitor and manage the system:

- Auxiliary port—RJ45 interface that supports flow control and is often used to connect a modem, a channel service unit (CSU), or other optional equipment for Telnet management.
- Console port—Receptacle (female) that provides a RJ45 interface for connecting a console terminal.

Monitoring Critical, Major, and Minor Alarm Status

Alarms warn of:

- Overtemperature condition on a component in the card
- Fan failure in the fan tray
- Overcurrent condition in a power supply
- Out-of-tolerance voltage on the card

The alarm LEDs are controlled by the CAN microcontoller software, which sets the threshold levels for triggering the different stages of alarms.

The RP card continuously polls the system for temperature, voltage, current, and fan speed values. If a threshold value is exceeded, the RP sets the appropriate alarm severity level on the alarm card, which lights the corresponding LED, and energizes the appropriate alarm display relays to activate any external audible or visual alarms wired to the alarm display. The RP also logs a message about the threshold violation on the system console.

Note If one or more of the alarm LEDs is on, check the system console for messages describing the alarm.

Troubleshooting the Line Card

Initial Boot Process

During a typical line card boot process, these events occur:

1. The line card receives power and begins executing initialization software.
2. The line card performs internal checks, and prepares to accept the Cisco IOS XR software from the RP.
3. The RP loads the line card with its Cisco IOS XR software.

To verify that the line card is working properly:

Procedure

Step 1 Check that the LC FAIL LED is ON (green) to verify that the card is operating normally.

Step 2 Check that the Port Status LED for the port of interest is on (green or blinking) to verify that the port is active. If the Port Status LED is not on, verify that the associated interface is not shut down.

Step 3 If one of the conditions above is not met, see Advanced Line Card Troubleshooting, on page 177 to identify any possible problems.

Status LEDs

You can use the Port Status and LC FAIL LEDs on the RP card front panel to verify proper operation or troubleshoot a failure.

Table 27: Port Status and LC FAIL LEDs

Port Status LEDs (one per port)	
Green	Port state is up and a valid physical layer link is established.
Blinking	Line activity is occurring. The LED blinks green-amber-green.
Red	Port state is up, but there is a link loss or SFP/QSFP failure.
Off	Port is administratively shut down.
LC FAIL LED	
Green	Line card has booted properly, and is ready to pass or is passing traffic.
Amber	Line card is booting or is in an alarm state.
Red	Line card has encountered a hardware error, and is not passing traffic.

Port Status LEDs (one per port)	
Off	Line card is powered off. The LED might turn off momentarily when switching between the states described above, although the line card has not powered off.

Configuring and Troubleshooting Line Card Interfaces

After the person who installed the hardware verifies that the line card is working properly by examining the LEDs, the network administrator can configure the new interface. These sections provide information on configuring and troubleshooting the line card:

Configuration Parameters

The following table lists the default interface configuration parameters that are present when an interface is enabled on a 10-Gigabit Ethernet line card. See Cisco IOS XR software documentation for complete information about these parameters.

Table 28: Line Card Configuration Default Values

Parameter	Configuration File Entry	Default Value
Flow control	flow-control	egress oningress off
MTU	mtu	1514 bytes for normal frames 1518 bytes for IEEE 802.1Q tagged frames 1522 bytes for Q-in-Q frames
MAC address	mac address	Hardware burned-in address (BIA)

Line Card Interface Address

A router identifies an interface address by its rack number, line card slot number, instance number, and port number, in the format *rack*/*slot* /*instance*/*port*. The rack parameter is reserved for multirack systems; so, the *rack* parameter is always 0 (zero) for the Cisco ASR 9000 Fixed-port Routers.

The Cisco ASR 9001 Router line card slot is numbered 0 with three subslots. The subslots on the line card are numbered 0, 1, and 2. 0 and 1 are reserved for EP ports and 2 is for native ports on the line card. Even if the line card contains only one port, you must use the *rack*/*slot* /*instance*/*port* notation.

Using Configuration Commands

The command line interface (CLI) for Cisco IOS XR software is divided into different command modes. To configure a line card, you enter the correct mode and then enter the commands you need.

When you first log in, you are automatically in EXEC mode. Next, enter the configure command to access configuration mode. Then, enter the interface command to enter interface configuration mode and specify the interface. You are now in the command mode where you can configure the new interface. Be prepared with the information you will need, such as the interface IP address.

Basic Line Card Configuration

This procedure is for creating a basic configuration—enabling an interface and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration.

This example shows one way to configure the basic parameters of a line card:

Procedure

Step 1 Enter EXEC mode:

```
Username: username
Password: password
RP/0/RSP0/CPU0:router#
```

Step 2 Check the status of each port by entering the **show interface** command:

```
RP/0/RSP0/CPU0:router# show interface
```

Step 3 Enter global configuration mode and specify that the console terminal will be the source of the configuration commands:

```
RP/0/RSP0/CPU0:router# configure terminal
```

Step 4 At the prompt, specify the new interface to configure by entering the **interface** command, followed by the *type* (for example, **gigabitethernet** or tengige) and rack/*slot* /instance/*port* (line card rack, slot number, subslot number, port number). Remember that Cisco ASR 9001 Router rack and subslot values are always 0 (zero). For example, to configure port 4 on bay 0 of the line card:

```
RP/0/RSP0/CPU0:router# interface tengige 0/0/0/3
```

Step 5 Assign an IP address and subnet mask to the interface with the **ipv4 address** configuration subcommand, as in the following example:

```
RP/0/RSP0/CPU0:router(config-if)# ipv4 address 10.1.2.3 255.255.255.0
```

Step 6 Use the **no shutdown** command to enable the interface:

```
RP/0/RSP0/CPU0:router(config-if)# no shutdown
```

The **no shutdown** command passes an **enable** command to the line card. It also causes the line card to configure itself based on the most recent configuration commands received by the line card.

Step 7 If you want to disable the Cisco Discovery Protocol (CDP), which is not required, use this command:

```
RP/0/RSP0/CPU0:router(config-if)# no cdp
```

Step 8 Add any other configuration subcommands required to enable routing protocols and adjust the interface characteristics. Examples of such subcommands are:

```
RP/0/RSP0/CPU0:router(config-if)# flow-control ingress
RP/0/RSP0/CPU0:router(config-if)# mtu 1448
RP/0/RSP0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
```

Step 9 When you have included all the configuration subcommands to complete the configuration, enter the **commit command to commit all changes you made to the running configuration.**

```
RP/0/RSP0/CPU0:router(config-if)# commit
```

Step 10 **Enter Ctrl-Z** to exit configuration mode. If you did not enter the commit command, you will be prompted to do so:

```
RP/0/RSP0/CPU0:router(config-if)#
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:
Answer yes to commit, no to exit without a commit, or cancel to cancel the exit (default).
```

Step 11 Write the new configuration to memory:

```
RP/0/RSP0/CPU0:router# copy run disk0:/config/running/alternate_cfg :/router.cfg
Destination file name (control-c to abort): [/router.cfg]?
The destination file already exists. Do you want to overwrite? [no]: yes
Building configuration.
223 lines built in 1 second
[OK]
```

The system displays an OK message when the configuration has been stored.

Verifying the Transceiver Modules

Use the **show inventory all** command to display SFP or XFP module information for all transceiver modules currently installed in the router. To display SFP or XFP module information for a particular module, you can use the **show inventory location <slot ID> command.**

The output of these commands lists such information as the slot ID, transceiver type, description, product ID, version, and serial number.

For example, to list module information for all modules in the router:

```
RP/0/RSP0/CPU0:router# show inventory all
Mon Mar 26 13:08:28.805 UTC
NAME: "module 0/RSP0/CPU0", DESCR: "ASR9001CHASSIS"
PID: ASR-9001, VID: V00, SN: FOC154682GG
NAME: "module 0/0/CPU0", DESCR: "ASR9001CHASSIS"
PID: ASR-9001, VID: V00, SN: FOC1547809S
NAME: "module 0/0/0", DESCR: "ASR 9000 4-port 10GE Modular Port Adapter"
PID: A9K-MA-4X10GE, VID: V01, SN: FOC1539862S
NAME: "module mau 0/0/0/0", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V02 , SN: ONT1535101F
NAME: "module mau 0/0/0/1", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V01 , SN: ONT15011038
```

```
NAME: "module mau 0/0/0/2", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V02 , SN: ONT1535103K
NAME: "module mau 0/0/0/3", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V01 , SN: ONT150111N5
NAME: "module 0/0/1", DESCR: "ASR 9000 20-port 1GE Modular Port Adapter"
PID: A9K-MPA-20X1GE, VID: V01, SN: FOC155181Q7
NAME: "module mau 0/0/1/0", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501BQS
NAME: "module mau 0/0/1/1", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: AGM1501P2VN
NAME: "module mau 0/0/1/2", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501BDQ
NAME: "module mau 0/0/1/3", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501YHS
NAME: "module mau 0/0/1/4", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501YJA
NAME: "module mau 0/0/1/5", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJD
NAME: "module mau 0/0/1/6", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501SPE
NAME: "module mau 0/0/1/7", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AHA
NAME: "module mau 0/0/1/8", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AGX
NAME: "module mau 0/0/1/9", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AKF
NAME: "module mau 0/0/1/10", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501BDT
NAME: "module mau 0/0/1/11", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501BET
NAME: "module mau 0/0/1/12", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AKX
NAME: "module mau 0/0/1/13", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJ5
NAME: "module mau 0/0/1/14", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AK4
NAME: "module mau 0/0/1/15", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS155009QS
NAME: "module mau 0/0/1/16", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJX
NAME: "module mau 0/0/1/17", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS155009TE
NAME: "module mau 0/0/1/18", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS155009TR
NAME: "module mau 0/0/1/19", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJQ
NAME: "module mau 0/0/2/0", DESCR: "SFP"
PID: SFP-10G-SR          , VID: V03 , SN: SPC1503050L
NAME: "module mau 0/0/2/1", DESCR: "SFP"
PID: SFP-10G-SR          , VID: V03 , SN: FNS15210Q2K
NAME: "module mau 0/0/2/2", DESCR: "SFP"
PID: SFP-10G-SR          , VID: V03 , SN: SPC150305MD
NAME: "module mau 0/0/2/3", DESCR: "SFP"
PID: SFP-10G-LR          , VID: V02 , SN: ECL150200Y9
```

Advanced Line Card Troubleshooting

This section briefly describes advanced troubleshooting commands that can be used if a line card fails.

Note This section assumes that you possess basic proficiency in the use of Cisco IOS XR software commands.

By using the commands listed in this section, you should be able to determine the nature of the problems you are having with your line card. The first step is to identify the cause of the line card failure or console errors that you are seeing.

To discover which card may be at fault, it is essential to collect the output from these commands:

- **show logging**
- show diag slot
- show context location slot

Along with these show commands, you should also gather the following information:

- Console Logs and Syslog Information—This information is crucial if multiple symptoms are occurring. If the router is configured to send logs to a Syslog server, you may see some information on what has occurred. For console logs, it is best to be directly connected to the router on the console port with logging enabled.
- Additional Data—The show tech-support command is a compilation of many different commands, including show version, show running-config, **show tech ethernet**, **show tech pfi**, and show stacks. This information is required when working on issues with the Cisco Technical Assistance Center (Cisco TAC).

For examples of how to use these commands and the resulting output, see the Cisco ASR 9000 Series Troubleshooting Guide.

Note It is important to collect the show tech-support command data before doing a reload or power cycle. Failure to do so can cause all information about the problem to be lost. Output from these commands varies slightly depending on which line card you are using, but the basic information is the same.

Troubleshooting the Cooling Subsystem

You may need to troubleshoot the cooling subsystem if an over-temperature condition occurs. The cooling subsystem of the router consists of a fan tray in the chassis and a fan in each of the power supplies. The fan tray and the power supply fans circulate air to maintain acceptable operating temperatures within the router.

Fan Tray Operation

The fan tray maintains acceptable operating temperatures for the internal components by drawing cooling air into the system chassis. The fan tray receives power from the chassis backplane.

The Cisco ASR 9901 uses 3 individual fan trays. The Cisco ASR 9001 uses a single fan tray that contains 14 fans. Each fan tray has a controller card and one front panel STATUS LED indicator:

- Green—Fan tray is functioning properly.
- Red—There is a fault detected in the fan tray.

Note The Cisco ASR 9901 also has a front panel fan fault LED. See RP Front Panel Indicators.

If the air temperature inside the chassis rises, blower speed increases to provide additional cooling air to the internal components. If the internal air temperature continues to rise beyond the specified threshold, the system environmental monitor shuts down all internal power to prevent equipment damage because of excessive heat.

If the system detects that one or more of the fans in the fan tray has failed, it displays a warning message on the system console. In addition, the remaining fans go to full speed to compensate for the loss of the failed fan.

Power Module Fans

Each AC or DC power module is equipped with one fan that draws cooling air in through the front of the power module and force warm air out through the air exhaust of the chassis:

- If the power source is within the required voltage range, the power supply fan remains on.
- If a fan fails:
  - Power module detects an internal over-temperature condition.
  - Fault and Temp indicators light.
  - Power module sends an over-temperature warning to the system.

For additional power supply troubleshooting information, see Troubleshooting the Power Subsystem, on page 151.

Over-temperature Conditions

This console error message indicates that the system has detected an over-temperature condition or out-of-tolerance power value inside the system:

```
Queued messages:
%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
```

The preceding message could also indicate a faulty component or temperature sensor. Enter the **show environment** command or the **show environment all** command at the user EXEC prompt to display information about the internal system environment. The information generated by these commands includes:

- Voltage measurements on each card from the DC-to-DC converter
- The +5 VDC for the I2C module
- Operating voltage for the fan tray
- Temperature measurements received by all sensors of RP and LC module as well as temperature measurements from sensors located in each power module

If an environmental shutdown results from an over-temperature or out-of-tolerance condition, the Fault indicator on the power supply lights before the system shuts down.

Although an over-temperature condition is unlikely at initial system startup, make sure that:

- Heated exhaust air from other equipment in the immediate environment is not entering the chassis card cage vents.

- You allow sufficient air flow by maintaining a minimum of 6 inches (15.24 cm) of clearance at both the inlet and exhaust openings on the chassis and the power modules to allow cool air to enter freely and hot air to be expelled from the chassis.

Isolating Cooling Subsystem Problems

Use this procedure to isolate a problem with the chassis cooling system if you have an over-temperature condition:

Procedure

Step 1 Make sure the fan tray is operating properly when you power on the system. To determine if the fan tray is operating, check the LED indicator on the fan tray front panel:

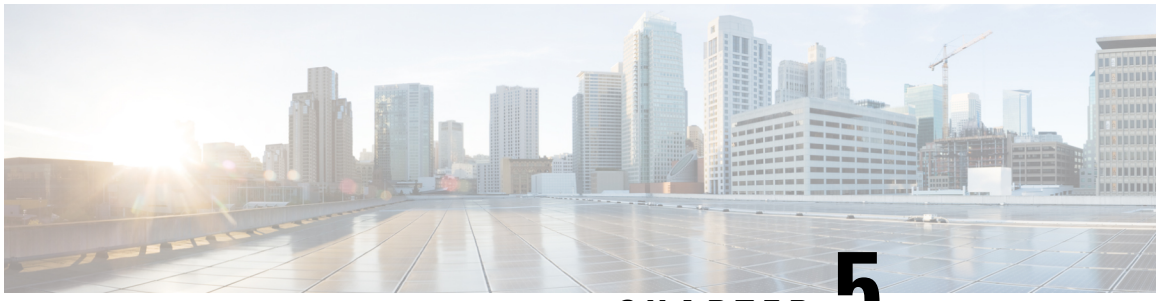
- OK (green)—Fan tray is functioning properly and receiving +12 VDC power, indicating that the cables from the chassis backplane to the fan tray are good.
- Fail (red)—Fault is detected in the fan tray. Replace the fan tray. For Cisco ASR 9902 the LED indicator will be OFF.
- If neither indicator is on and the blower is not operating, there may be a problem with either the fan tray or the +12 VDC power supplied to the fan tray. Go to Step 2.

Step 2 Eject and reseat the fan tray making sure the captive screws are securely tightened to a torque of 10 +/–1 in-lb.

If the fan tray still does not function, go to Step 3.

Step 3 Check for +12 VDC power by looking at the LED indicators on each power module:

- If the Pwr OK indicator is on and the Fault indicator is off on each power module, it indicates that the fan tray is receiving +12 VDC:
  - If the fan tray is still not functioning, there could be a problem with the fan tray controller card or an undetected problem in the fan tray cable. Replace the fan tray.
  - If the new fan tray does not function, contact a Cisco customer service representative for assistance.
- If the Fault indicator is on, the power supply is faulty. Replace the power supply.
- If the Temp and Fault indicators are on, an over-temperature condition exists:
  - Verify that the power supply fan is operating properly.
  - If the fan is not operating, replace the power supply.
  - Contact your Cisco representative if replacing the power supply does not fix the problem.



CHAPTER 5

Replacing Router Components

The router is equipped as ordered and is ready for installation and startup when it is shipped. As network requirements change, you may need to upgrade the system by adding or changing components. This chapter describes how to maintain router components.

Procedures for maintaining the router are described in these sections:

- Prerequisites and Preparation, on page 181
- Removing and Replacing the Fan Tray, on page 185
- Removing and Replacing the Air Filter on Cisco ASR 9001 Router, on page 188
- Removing and Replacing the Air Filter for Cisco ASR 9903 and Cisco ASR 9902, on page 189
- Replace the Port Expansion Card, on page 192
- Removing and Replacing AC or DC Power System Components, on page 194
- Removing a Chassis from the Equipment Rack, on page 199
- Installing a Replacement Chassis in the Equipment Rack, on page 200
- Packing a Chassis for Shipment, on page 200

Prerequisites and Preparation

Before you perform any of the procedures in this chapter, be sure that you:

- Review the Safety Guidelines, on page 7.
- Read the safety and ESD-prevention guidelines described in the Compliance and Safety Information, on page 8, and the Regulatory Compliance and Safety Information for the Cisco ASR 9000 Aggregation Services Router.
- Ensure that you have all the necessary tools and equipment before beginning the procedure.

Field Replaceable Units

These components are field replaceable units (FRUs):

- Chassis
- Route Processor cards (Cisco ASR 9903 and Cisco ASR 9902 Router)
- Power modules
- Fan tray

- Transceiver modules
- Modular port adapters (Cisco ASR 9001 Router)
- Port Expansion Cards (PECs)

Online Insertion and Removal

Some field-replaceable units (FRUs) for the Cisco ASR 9000 Series Routers can be removed and replaced with the power on and the system operating. This facility is known as online insertion and removal (OIR). Unless otherwise noted, the maintenance tasks described in this chapter can be performed while the router remains powered on.

The following table displays the supported line cards, ports, and OIR duration for QDD-400G-ZR-S and QDD-400G-ZRP-S optical modules:

Table 29: Supported Line Cards, Ports, and OIR Duration for QDD-400G-ZR-S and QDD-400G-ZRP-S Optical Modules

Line card	Supported front panel ports	Maximum supported OIR duration at mean sea level (MSL) with QDD-400G-ZR-S and QDD-400G-ZRP-S optical modules
A9K-20HG-FLEX-SE/A9K-20HG-FLEX-TR	0, 7, 8, 12, 19	1 minute at 30°C (or 86°F)
A9K-8HG-FLEX-SE/A9K-8HG-FLEX-TR	0, 7	3 minutes at 30°C (or 86°F)
A99-10X400GE-X-SE/A99-10X400GE-X-TR	3, 5, 6, 7, 9	1 minute at 30°C (or 86°F)
A9903-20HG-PEC	0, 4, 8, 12, 16	45 seconds at 30°C (or 86°F)

Powering Off the Router

Caution Do not turn off the switch on the power tray to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

If it becomes necessary to turn all power off to the router, follow these steps:

Procedure

Step 1 Set the power switch on the chassis to the off (0) position.

Figure 169: Power Switch on the Cisco ASR 9902

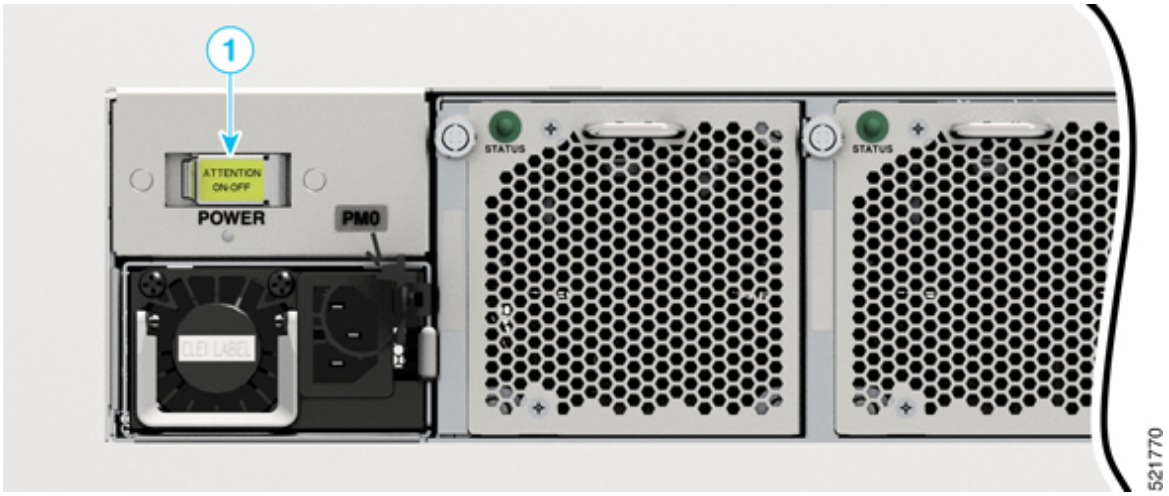


Figure 170: Power Switch on the Cisco ASR 9901

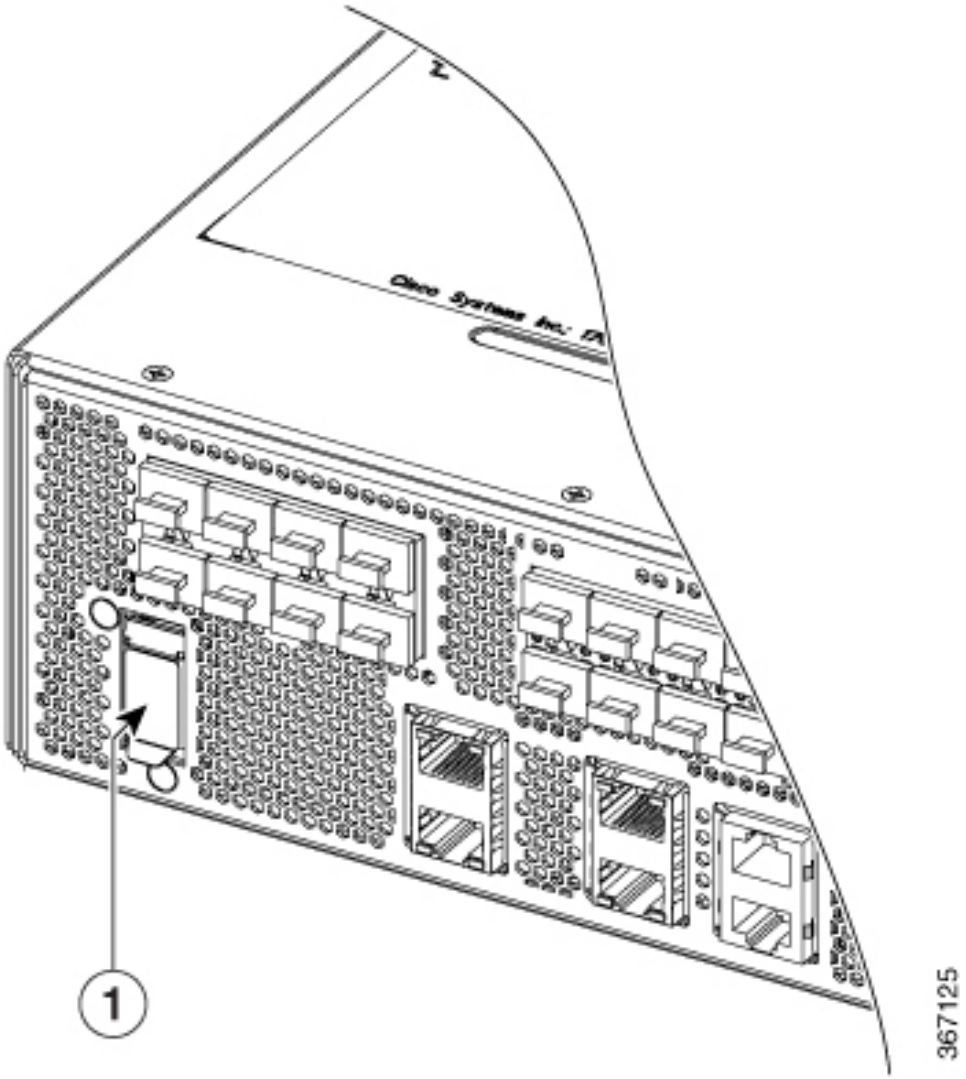
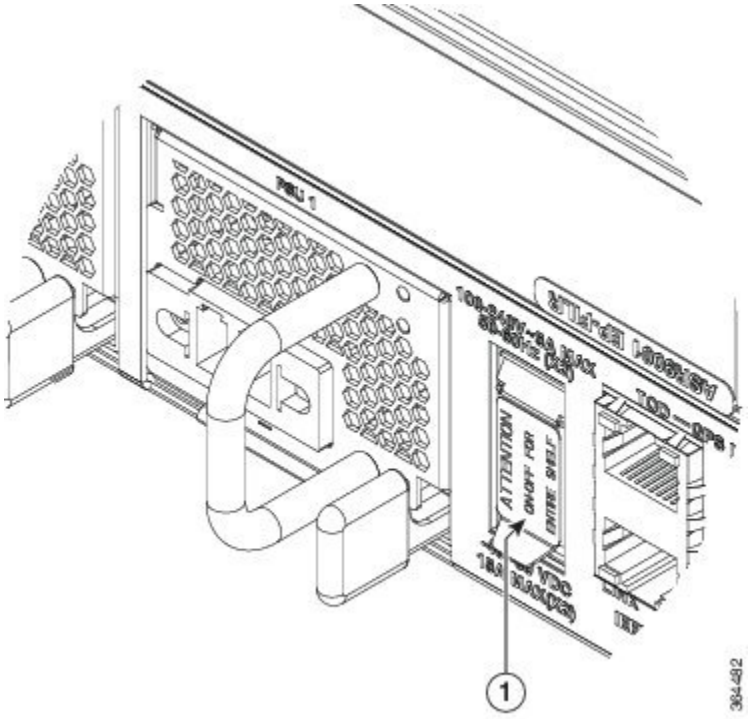


Figure 171: Power Switch on the Cisco ASR 9001



1	Power Switch

Step 2 Power off all circuit breakers for the source power lines connected to the power trays.

Step 3 Verify that the Pwr OK indicator on each power module is off.

Step 4 Verify that the OK indicator on the fan tray is off.

Removing and Replacing the Fan Tray

Note Fan tray OIR (Online Insertion and Removal) is supported from Cisco IOS XR Release 4.2.3.

The fan tray can be removed and replaced while the router is operating.

Cisco ASR 9901 and Cisco ASR 9902—We recommend that you replace a fan tray within 5 minutes at 30°C operating temperature.

Cisco ASR 9001—We recommend that you replace the fan tray within the following times to ensure that the router does not overheat:

- 3.1 minutes at 25°C operating temperature
- 2 minutes at 40°C operating temperature

- 42 seconds at 55°C operating temperature

Caution Be sure that the fans have stopped running before removing the fan tray. The fans can take from 3 to 5 seconds to completely stop running after disengaging the fan tray latch. Handling the fan tray before the fans have stopped running could cause fingertip injury.

Removing and Replacing a Fan Tray

Caution Each Cisco ASR 9901, ASR 9902 Router fan tray weighs approximately 1.1 pounds (0.5 kg). The Cisco ASR 9001 Router fan tray weighs approximately 2.6 pounds (1.2 kg). Use both hands when handling the fan tray.

To remove and replace a fan tray from the chassis:

Procedure

Step 1 Loosen the captive screw(s) that secure the fan tray.

Step 2 Use the handle on the fan tray front panel to pull the fan tray halfway out of the module bay (see the following figure).

Step 3 Slide out the fan tray completely from the chassis while supporting it with your other hand.

On Cisco ASR 9902 and 9901 router, before reinstalling the fan tray, wait for other fan LEDs to turn OFF (aprox 30 seconds). This indicates the onset of the a five-minute period for the fan tray replacement. The LEDs turn green after the fan tray replacement is complete.

Note If you miss the five-minute window, other fan LEDs would turn ON. You should slide in the fan tray back to its original position and then repeat the Step 3.

Step 4 To reinstall the fan tray, lift the fan tray (with two hands) and slide it halfway into the module bay (see the following figure).

On Cisco ASR 9902 and 9901 router, we recommend that you replace a fan tray within 5 minutes.

Note

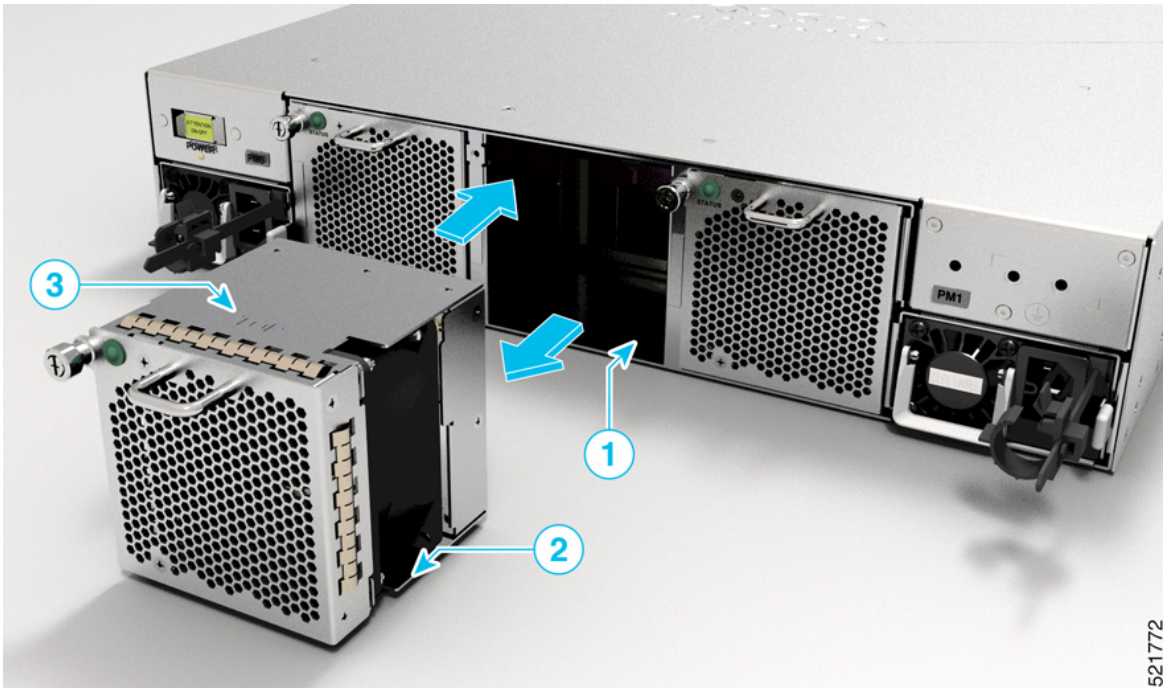
Step 5 Slowly push the fan tray into the chassis until it mates with the backplane connector at the back of the module bay.

Caution To prevent damage to the connectors, do not use excessive force when inserting the fan tray into the chassis.

Step 6 Tighten the captive screw(s) on the fan tray to a torque of 10 +/–1 in-lb to secure it to the chassis.

Step 7 Verify that the (green) OK status indicator on the front of the fan tray goes on. If the OK indicator does not light, see Troubleshooting the Cooling Subsystem, on page 178 section.

Figure 172: Removing or Installing the Fan Tray on the Cisco ASR 9902 Router Chassis



1	Module bay	3	Fan Tray
2	Guide rail		

Figure 173: Removing or Installing the Fan Tray on the Cisco ASR 9901 Router Chassis

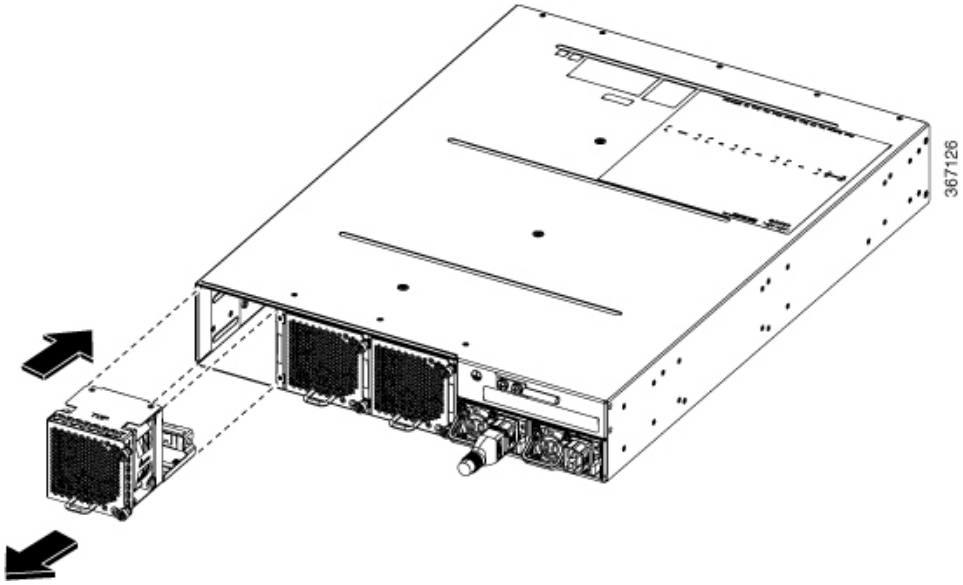
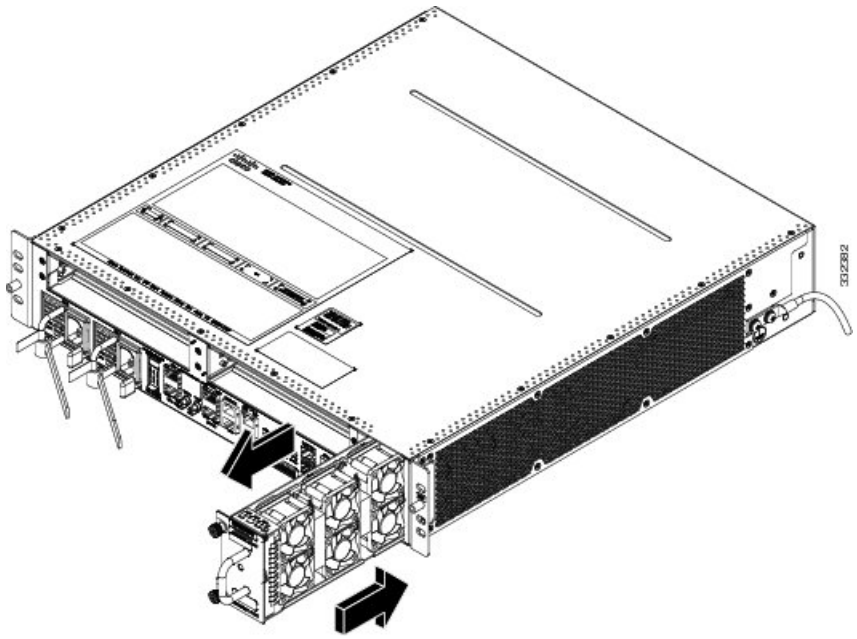


Figure 174: Removing or Installing the Fan Tray on the Cisco ASR 9001 Router Chassis



Removing and Replacing the Air Filter on Cisco ASR 9001 Router

The Cisco ASR 9001 Series Router, when used with the air plenum, has a serviceable air filter (Cisco PID ASR-9001-PLNMFLTR=) that is accessible from the top of the of the air filter assembly (see the following figure). The air filter removes dust from the room air drawn into the chassis by the fan trays.

Regularly check the air filter at least every three months. If used in a dusty environment, check the air filter once a month. Replace it if it appears excessively dirty or damaged. Failure to replace a compromised air filter can result in insufficient air circulation through the chassis.

Note To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployments, the air filter must be replaced.

Note The air filter can be removed from the air plenum assembly without removing the cables or the fan tray.

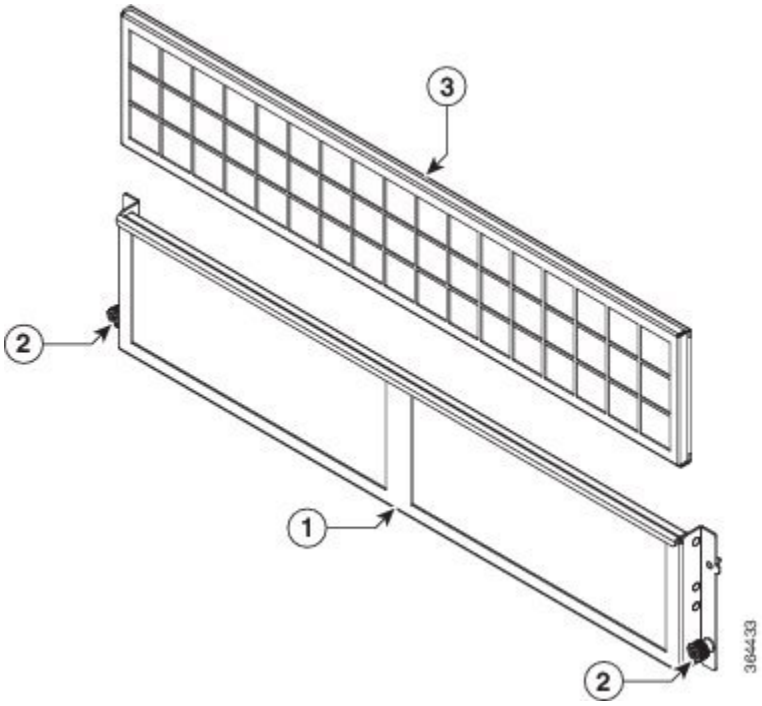
To replace the air filter, follow these steps:

Procedure

Step 1 Loosen the two captive screws on the air filter cover and remove it from the chassis.

Step 2 Grasp the pull tab in the center of the air filter, and slide it out from the slot.

Figure 175: Replacing the Air Filter



1	Air filter cover	2	Two captive screws
3	Air filter		

Step 3 Install the replacement air filter.

Note Verify the air flow direction when installing the new air filter. An air flow direction arrow is stamped on the air filter frame and should be pointing towards the chassis and be visible when installed in the air filter cover.

a) Slide the new air filter into the slot.
b) Tighten the two captive screws on the front of the air filter cover.

Removing and Replacing the Air Filter for Cisco ASR 9903 and Cisco ASR 9902

The Cisco ASR 9903 and Cisco ASR 9902 Router have a serviceable air filter (Cisco PID: ASR-9903-FILTER and ASR-9902-FILTER). The air filter is a single component. It removes dust from the room air drawn into the chassis by the fan trays.

Regularly check the air filter at least every three months. If used in a dusty environment, check the air filter once a month. Replace it if it appears excessively dirty or damaged. Failure to replace a compromised air filter can result in insufficient air circulation through the chassis.

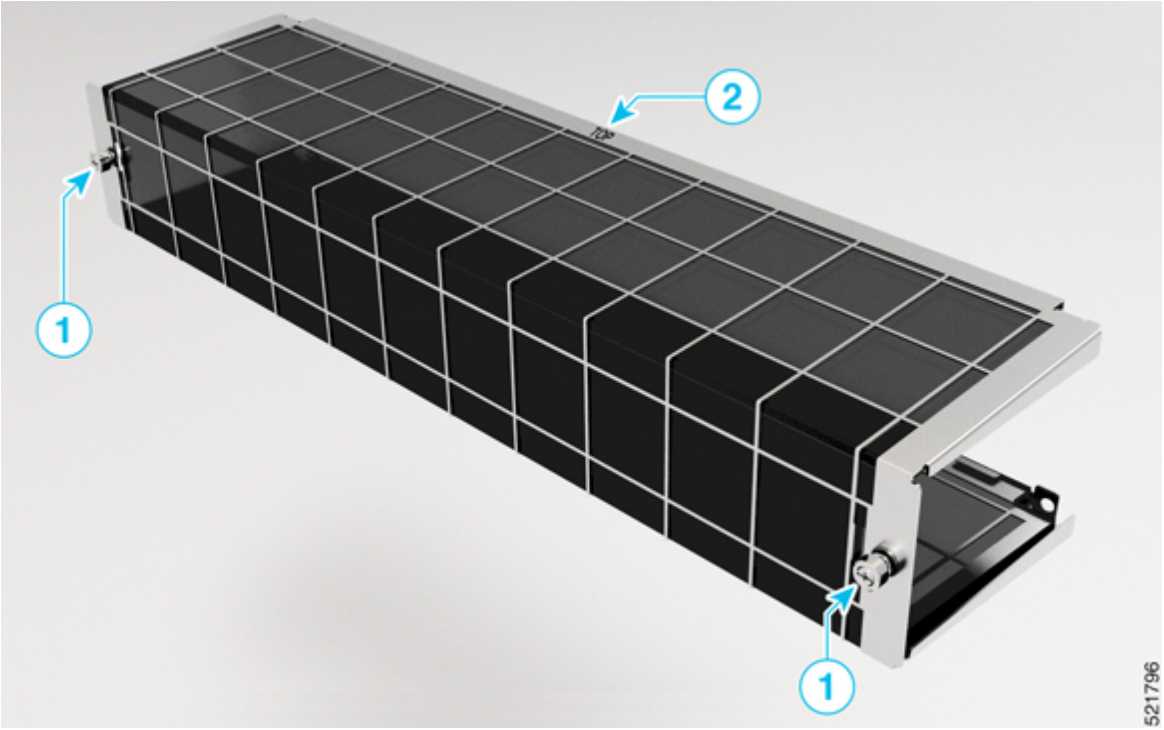
To replace the air filter, follow these steps:

Note To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployments, the air filter must be replaced.

Procedure

Step 1 Loosen the two captive screws on the air filter and remove it from the cable management bracket.

Figure 176: Remove Air Filter

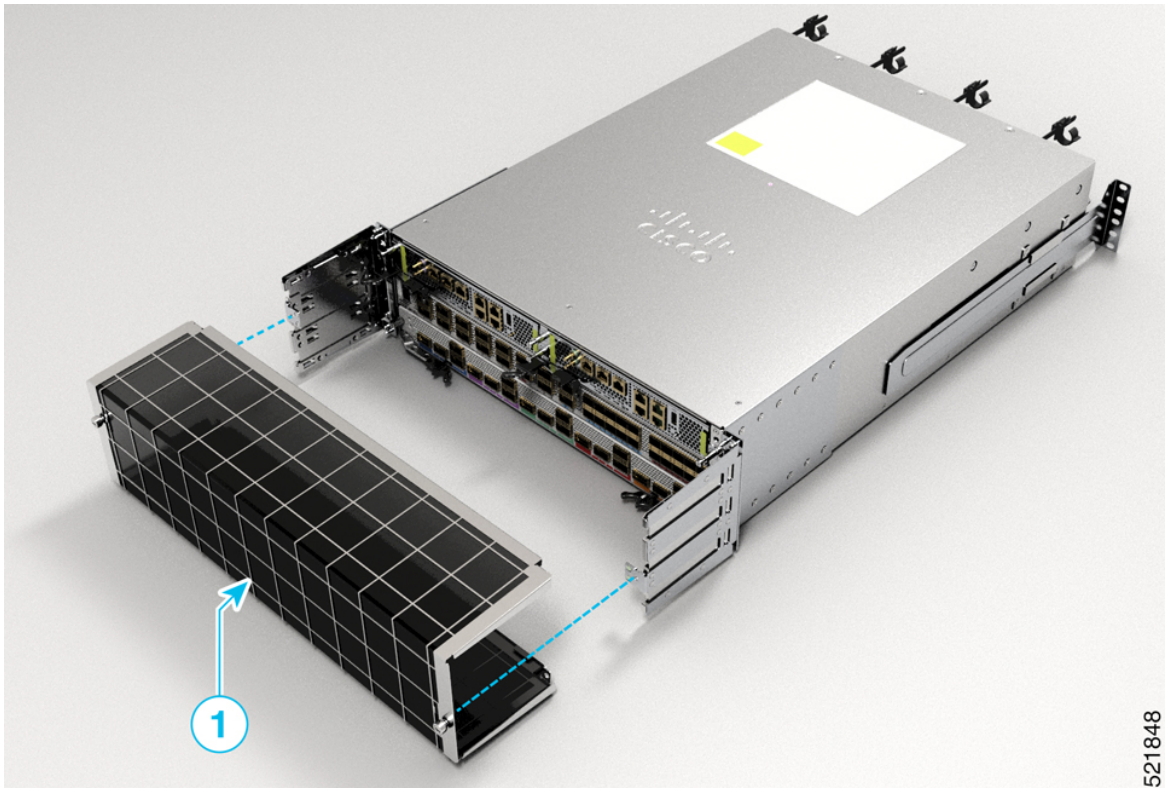


1	Two captive screws	2	TOP marking on the air filter

Step 2 Install the replacement air filter.

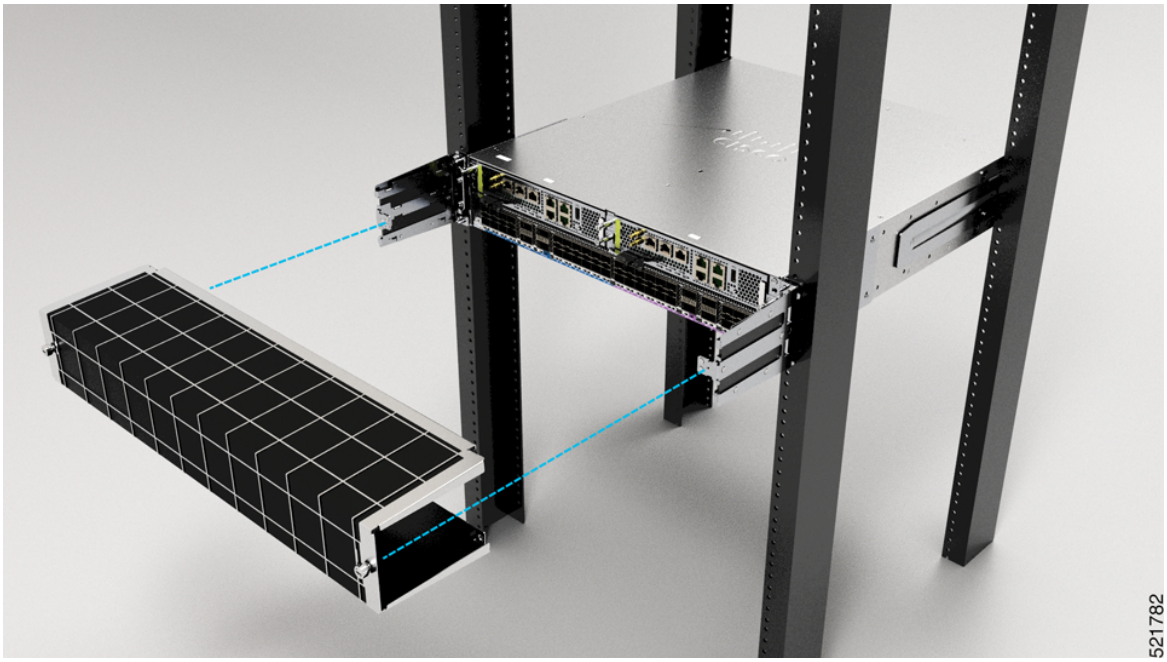
a) Place the air filter as shown in the below figure.
b) Insert and tighten the two screws to secure the air filter.

Figure 177: Install Air Filter-Cisco ASR 9903



1	Air filter

Figure 178: Install Air Filter-Cisco ASR 9902



Replace the Port Expansion Card

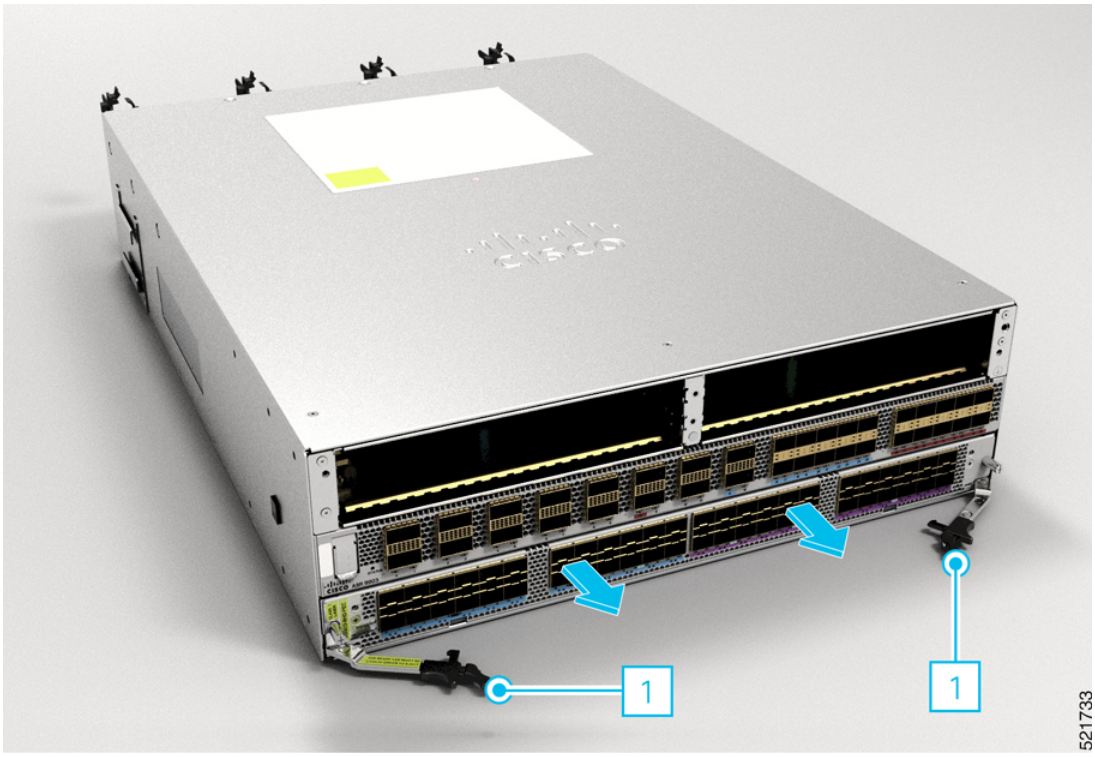
This section describes how to replace the 2T or 0.8T PEC with another PEC from the Cisco ASR 9903 chassis.

Note

- From Release 7.8.1 onwards, support for managed OIR is introduced on 0.8T PEC(A9903-8HG-PEC).
- From Release 7.3.2 onwards, support for managed OIR is introduced on 2T PEC(A9903-20HG-PEC).

1. Shut down the line card (LC0) using the **hw-module shutdown location** command from EXEC mode.
2. Unscrew port expansion card securing screws on either ends, one after the other.
3. Wait for the status LED to turn from green color to red color.
4. Unlatch ejector handle and use it as a lever to carefully eject the card.

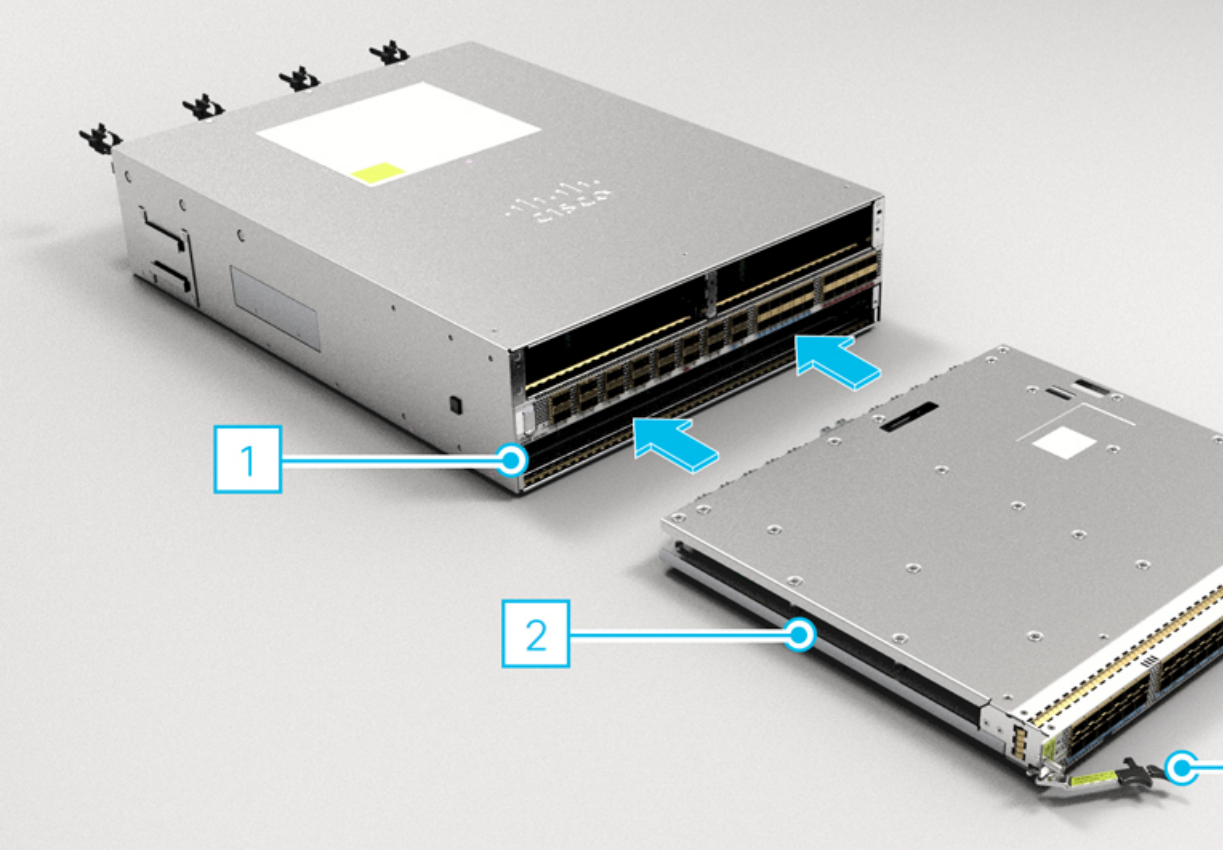
Figure 179: Remove PEC from Chassis



1	Ejector handle

5. Gently pull the card out of the chassis.
6. Gently insert a different PEC into the chassis in proper orientation.

Figure 180: Insert a PEC into the Chassis



7. Use the ejector handle to leverage final seating of connectors and then lock the ejector handle.

1	Port expansion card slot on the chassis
2	Alignment guide on the PEC
3	Ejector handle

8. Tighten the card securing screws on both ends with the torque of 0.6 N-m.
9. Reload the router using the **hw-module location all reload** command in admin mode.
10. Wait for the status LED to turn from blinking amber color to green color.

Removing and Replacing AC or DC Power System Components

This section contains removal and replacement procedures for the AC and DC power systems used in the Cisco ASR 9000 Fixed-port Router.

Power Module Replacement Guidelines

The Cisco ASR 9000 Series Routers support online insertion and removal (OIR) for power modules. If you are replacing a redundant power module, you can remove and install the power module while the system remains powered on without causing an electrical hazard or damage to the system. This feature enables you to replace a power module while the system maintains all routing information and ensures session preservation.

However, to maintain operational redundancy and proper cooling, and to meet EMI compliance standards, you must have at least one working power module installed. When you remove a failed power module with the router in operation, perform the replacement as soon as possible. Make sure you have the replacement power module ready before beginning the removal and installation procedure.

Removing and Replacing an AC or DC Power Module

This section contains the procedure to remove and replace an AC or DC power module from the chassis.

Note It is not necessary to turn off the switch on the unit to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

Removing an AC or DC Power Module

To remove an AC or DC power module from the chassis:

Procedure

Step 1 Disconnect the power cabling from the power module before removing it from the chassis.

Step 2 Pull the keying lever towards the left side to unlock the module from the chassis.

Step 3 Slide the power module out of its bay while supporting it with your other hand.

Figure 181: Removing or Installing an AC or DC Power Module (Cisco ASR 9902 AC power shown)

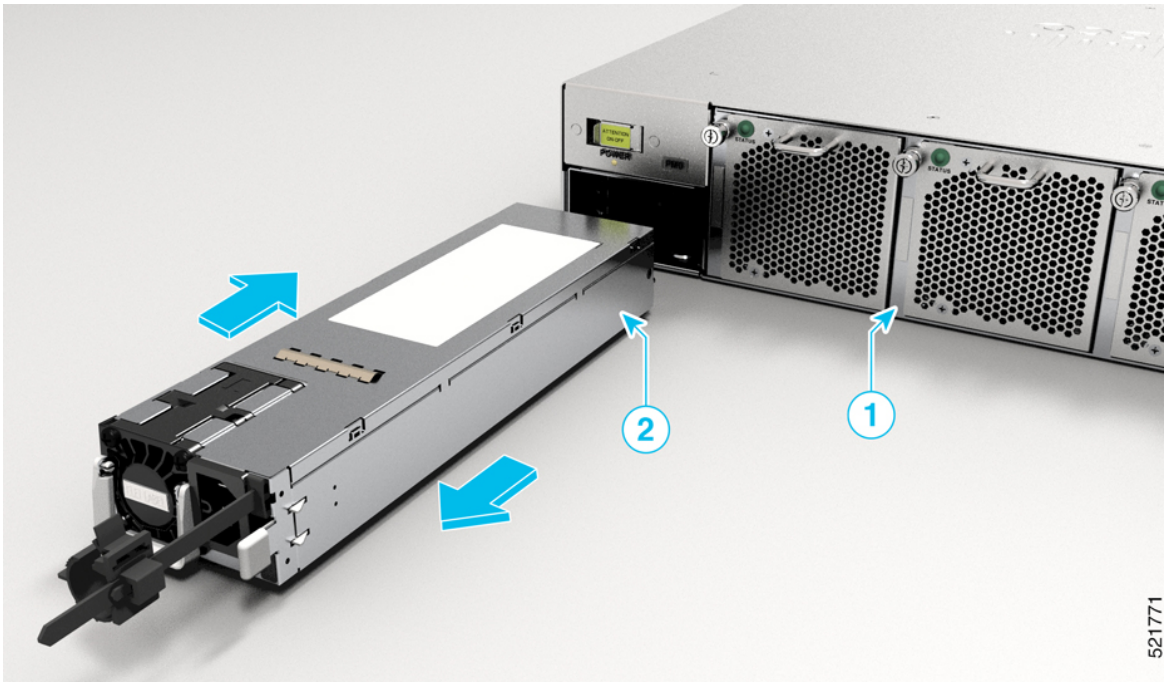


Figure 182: Removing or Installing an AC or DC Power Module (Cisco ASR 9903 AC power shown)

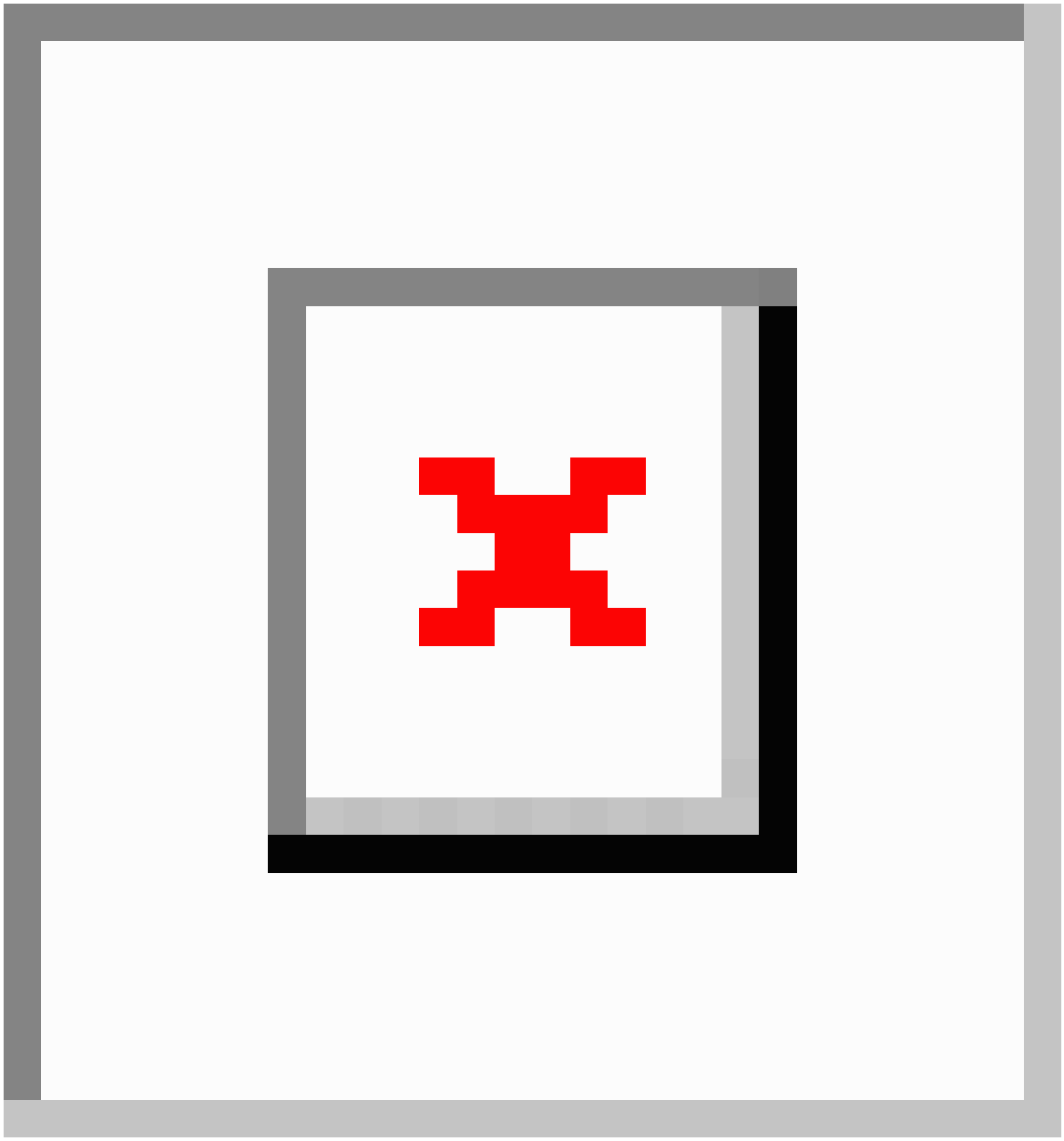


Figure 183: Removing or Installing an AC or DC Power Module (Cisco ASR 9901 AC power shown)

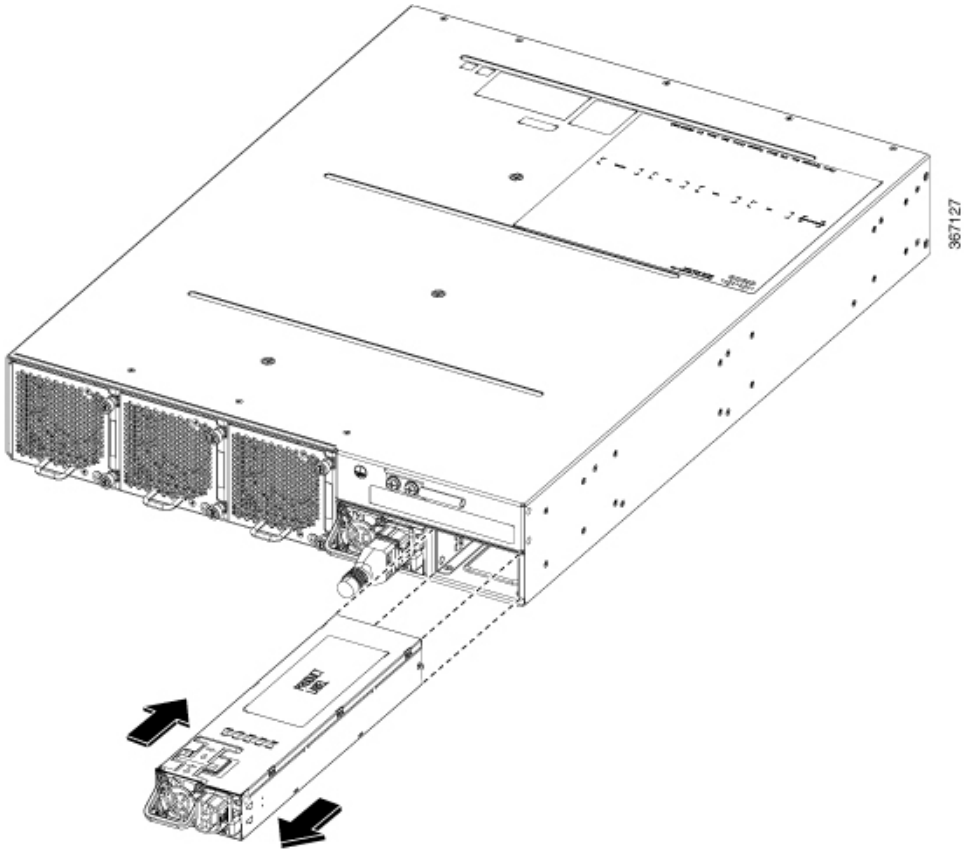
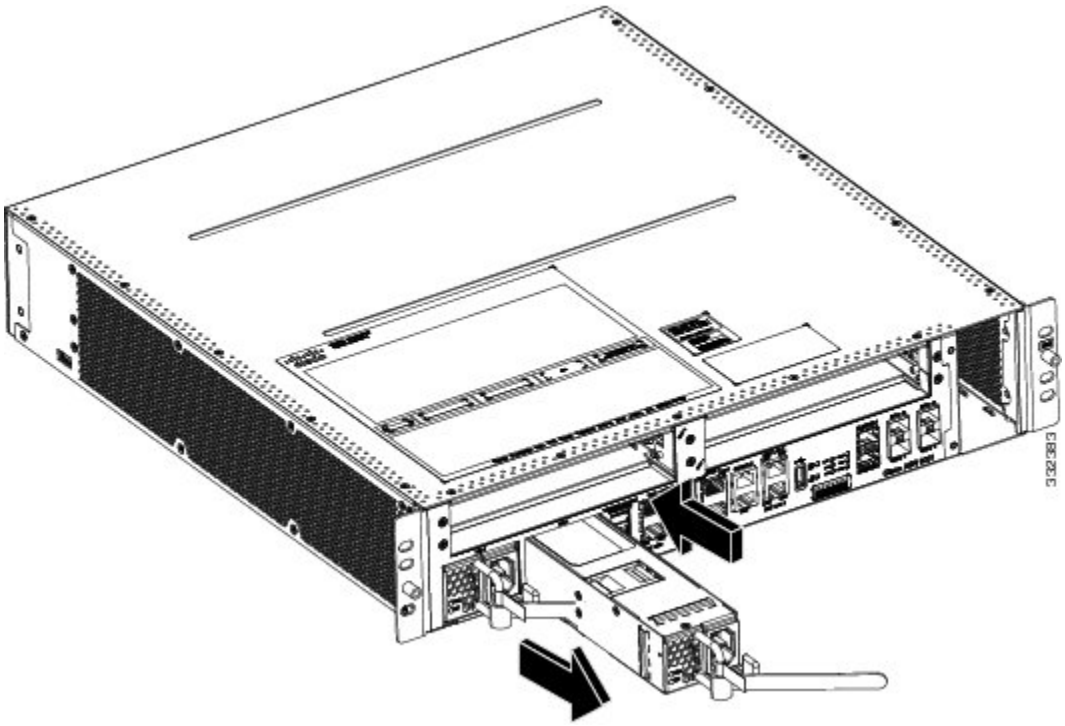


Figure 184: Removing or Installing an AC or DC Power Module (Cisco ASR 9001 AC power shown)



Installing an AC or DC Power Module

To install an AC or DC power module (see the above figure):

Procedure

Step 1 Slide the power module into the open bay until it mates with its backplane connector. Make sure that keying lever locks with the chassis.

Step 2 Attach the power cabling to the power module.

Step 3 Verify that the OK (green) power indicator on the front of the power module comes ON. If the indicator does not light up, see Troubleshooting the Power Subsystem, on page 151 section.

Removing a Chassis from the Equipment Rack

Use this procedure to remove the chassis and its components from the equipment rack:

⚠

Caution You must use two people to remove the chassis from the equipment rack safely. An empty chassis can weigh up to approximately 24.69 pounds (11.2 kg).

Procedure

Step 1 Power off the router (see Powering Off the Router, on page 182).

Step 2 Power off the circuit breakers to the power supplies.

Step 3 Disconnect the power from the power modules on the front of the chassis:

Step 4 Disconnect RP cables connected to the console port, auxiliary port, or either of the management Ethernet ports.

Be sure to label each of the RP cables before you disconnect the cables.

Step 5 Disconnect the line card interface cables.

Step 6 Disconnect the supplemental bonding and grounding connection from the chassis (see Supplemental Bonding and Grounding Connections, on page 89).

Step 7 Remove the chassis from the rack.

a) Remove the screws that attach the chassis rack mount flanges and the side rack mount brackets to the rack posts.

b) Carefully lift the chassis out of the rack and set it aside.

Installing a Replacement Chassis in the Equipment Rack

Use this procedure to install the replacement chassis and components in the equipment rack:

Procedure

Step 1 Install the new chassis in the rack (see Rack-Mounting the Chassis, on page 86).

Step 2 Connect the supplemental bonding and grounding connection (if there is one) to the chassis (see Supplemental Bonding and Grounding Connections, on page 89).

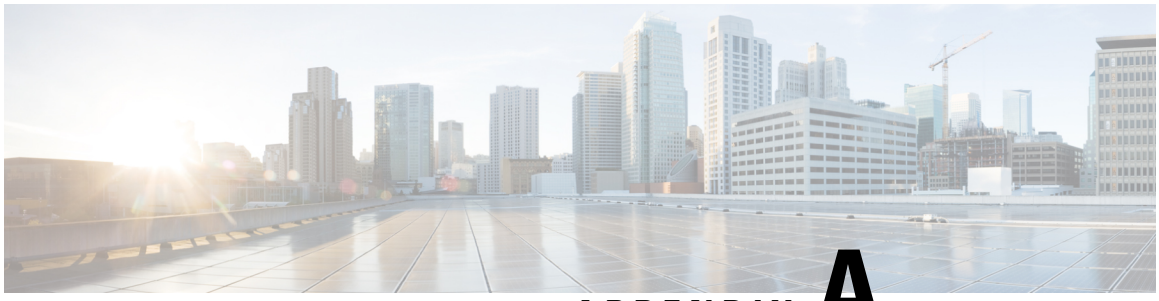
Step 3 Connect all line card and interface cables (see Connecting Route Processor Cables, on page 127).

Step 4 Connect power to the power modules on the front of the chassis.

Step 5 To turn on power to the router, see Powering on the Router, on page 145.

Packing a Chassis for Shipment

Use the packaging that came with the replacement chassis to repack and ship the chassis being replaced.



APPENDIX A

Technical Specifications

This appendix lists certain technical specifications for the Cisco ASR 9000 Series Fixed-Port Routers.

- Physical Specifications, on page 201
- Environmental Specifications, on page 202
- AC Electrical Specifications, on page 203
- DC Electrical Specifications , on page 206
- AC Input Voltage Range, on page 207
- DC Input Voltage Range, on page 207
- Power System DC Output Levels, on page 208
- RP Port Specifications, on page 208
- Power Consumption Specifications, on page 209
- Transceiver Modules, on page 209

Physical Specifications

Table 30: Physical Specifications

Description	Value
Chassis height	ASR 9902: 3.45 in (8.763 cm) ASR 9903: 5.18 in (13.157 cm) ASR 9901: 3.43 in. (8.7 cm) ASR 9001: 3.46 in. (8.79 cm)
Chassis width	ASR 9902: 17.30 in (43.94 cm) ASR 9903: 17.475 in (44.386 cm) ASR 9901: 17.32 in. (44.0 cm) ASR 9001: 17.42 in. (44.2 cm)

Description	Value
Chassis depth	ASR 9902: 19.00 in (48.26 cm) ASR 9903: 30 in (76.2 cm) ASR 9901: 23.62 in. (60.0 cm) ASR 9001: 18.5 in. (47.0 cm)
Chassis weight	ASR 9902 • Fully configured AC powered chassis: 47.80 lbs (18.96 kg) **Note** Fully configured includes two power modules and three fan trays. • Fully configured DC powered chassis: 42.196 lbs (19.14 kg) ACR 9903 • Fully configured AC or DC powered chassis: 81.57 lbs (37 kg) **Note** Fully configured chassis includes two route processors, four power modules, and four fan trays. ASR 9901 • Chassis only: 47.62 lb (21.6kg) **Note** Chassis only does not include power modules, fan trays, or chassis accessories. • Fully configured chassis: 55.97 lb (25.4 kg) **Note** Fully configured includes two power modules and three fan trays. ASR 9001 • Chassis only: 24.69 pounds (11.2 kg) **Note** Chassis only does not include cards, power modules, fan tray, or chassis accessories. • Fully configured chassis: 37.91 pounds (17.2 kg) **Note** Fully configured includes two MPAs, two power modules, and one fan tray.

Environmental Specifications

Table 31: Environmental Specifications

Description	Value
Operating Temperature (Nominal):	41° to 104°F (5° to 40°C)

Description	Value
Operating Temperature(Short term): **Note** Short-term refers to a period of not more than 96 consecutive hours, and a total of no more than 15 days in a year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.)	23° to 131° F (–5° to 55°C)
Humidity	Operating: 10 to 85 percent noncondensing Nonoperating: 5 to 95 percent noncondensing
Altitude	Operating: 0 to 13,000 ft (0 to 4,000 m) Nonoperating: 0 to 15,000 ft (0 to 4,570 m)
Power Dissipation	Cisco 9901—1100 W maximum Cisco 9001—750 W maximum
Acoustic noise	70 dB at 80.6°F (27°C) maximum
Shock	Operating (halfsine): 21 in/sec (0.53 m/sec) Nonoperating (trapezoidal pulse): 20 G, 52 in/sec (1.32 m/sec) **Note** G is a value of acceleration, where 1G equals 32.17 ft/sec2 (9.81 m/sec2).
Vibration	Operating: 0.35 Grms from 3 to 500 Hz **Note** Grms is the root mean square value of acceleration. Nonoperating: 1.0 Grms from 3 to 500 Hz

AC Electrical Specifications

Caution Be sure that the chassis configuration complies with the required power budgets. Failure to properly verify the configuration may result in an unpredictable state if one of the power units fails. Contact your local sales representative for assistance.

Cisco ASR 9902 AC Electrical Specifications

Description	Value
Total AC input power	1200 VA (volt-amps) per AC power supply (up to two AC power supply modules per system)

Description	Value
Rated input voltage **Note** For each AC power supply module.	100–240 VAC nominal (range: 90 to 264 VAC) 220–240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	10 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). AC powered systems are 1+1 protected.

Cisco ASR 9903 AC Electrical Specifications

Description	Value
Power modules per system	Up to four AC power modules per system
Total AC input power	AC high line (200-240V): 2+2 redundancy AC low line (90-130V): 3+1 redundancy
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	10 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc).

Cisco ASR 9901 AC Electrical Specifications

Description	Value
Power modules per system	Up to two AC power modules per system
Total AC input power	1633 VA (volt-amps) per AC power supply (up to two AC power supply modules per system)

Description	Value
Rated input voltage **Note** For each AC power supply module.	100–240 VAC nominal (range: 90 to 264 VAC) 220–240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	14 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). AC powered systems are 1+1 protected.

Cisco ASR 9001 AC Electrical Specifications

Description	Value
Power modules per system	Up to two AC power modules per system
Total AC input power	765 VA (volt-amps) per AC power supply (up to two AC power supply modules per system)
Rated input voltage **Note** For each AC power supply module.	100–240 VAC nominal (range: 90 to 264 VAC) 220–240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	15 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). AC and DC powered systems are N+1 protected.

DC Electrical Specifications

Cisco ASR 9903, 9902, and 9901 DC Electrical Specifications

Description	Value
Power modules per system	• ASR 9901 and 9902—Up to two DC power modules per system • ASR 9903—Up to four DC power modules per system
Total DC input power per power module	1600 W
Rated input voltage per power module	–48 VDC nominal in North America –60 VDC nominal in the European Community (range: –40.5 to –72 VDC [–75 VDC for 5 ms])
Input current rating **Note** For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.	45 A maximum at –48 VDC nominal 35 A maximum at –60 VDC nominal
Source DC service requirement[1]	Sufficient to supply the rated input current. Local codes apply.
Redundancy	DC powered systems are 1+1 protected.

[1] For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.

Cisco ASR 9001 DC Electrical Specifications

Description	Value
Power modules per system	Up to two DC power modules per system
Total DC input power per power module	750 W
Rated input voltage per power module	–48 VDC nominal in North America –60 VDC nominal in the European Community (range: –40.5 to –72 VDC [–75 VDC for 5 ms])

Description	Value
Input current rating **Note** For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.	15 A maximum at –48 VDC nominal 15 A maximum at –60 VDC nominal
Source DC service requirement[2]	Sufficient to supply the rated input current. Local codes apply.
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). DC powered systems are N+1 protected.

[2] For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.

AC Input Voltage Range

AC Input Voltage Range (Single-Phase Power Source)

Range	Minimum	Minimum Nominal	Nominal	Maximum Nominal	Maximum
Input Voltage	90 VAC	100 VAC	220 VAC	240 VAC	264 VAC
Line Frequency	47 Hz	50 Hz	50/60 Hz	60 Hz	63 Hz

DC Input Voltage Range

Table 32: DC Input Voltage Range

Range	Minimum	Nominal	Maximum
Input Voltage	–40 VDC	–48 VDC	–72 VDC

Power System DC Output Levels

Table 33: DC Output Levels for AC or DC Power System

Parameter	Value
Voltage	
Maximum	12.6 VDC
Nominal	12 VDC
Minimum	11.4 VDC
Power	
Minimum (one power module)	Cisco ASR 9903, and Cisco ASR 9902—1200 W Cisco ASR 9001—750 W Cisco ASR 9901—1600 W
Maximum (two power modules)	Cisco ASR 9903, and Cisco ASR 9902—2400 W Cisco ASR 9001—1500 W Cisco ASR 9901—3200 W

RP Port Specifications

Table 34: RP Port Specifications

Description	Value
Console port	EIA/TIA-232 RJ-45 interface, 115200 Baud, 8 data, no parity, 1 stop bit with software handshake (default)
Auxiliary port	EIA/TIA-232 RJ-45 interface, 115200 Baud, 8 data, no parity, 1 stop bit with software handshake (default)
Management ports (0, 1)	Triple-speed (10M/100M/1000M) RJ-45
Sync ports (0, 1)	Can be configured as one of the following: • BITS (Building Integrated Timing System) port • J.211 or UTI (Universal Timing Interface) port

Power Consumption Specifications

The following table lists the power consumption specifications for a fully configured chassis.

Caution Be sure that the chassis configuration complies with the required power budgets. Failure to properly verify the configuration may result in an unpredictable state if one of the power units fails. Contact your local sales representative for assistance.

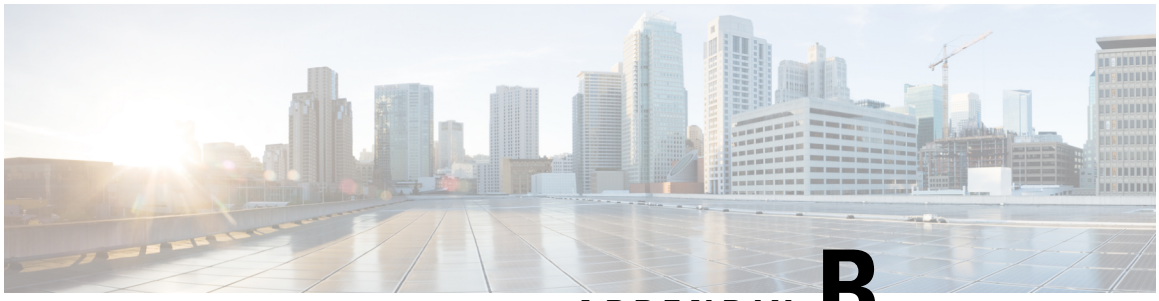
Table 35: Power Consumption Specifications

Cisco ASR 9901	Cisco ASR 9001	Cisco ASR 9902	Cisco ASR 9903 (1.6T)	Cisco ASR 9903 (3.6T)	Cisco ASR 9903 (2.4T)
750 W at 77°F (25°C)	400 W at 77°F (25°C)	760 W at 77°F (25°C)	1188 W at 77°F (25°C)	2024 W at 77°F (25°C)	1742 W at 77°F (25°C)
800 W at 104°F (40°C)	425 W at 104°F (40°C)	900 W at 104°F (40°C)	1360 W at 104°F (40°C)	2231 W at 104°F (40°C)	1938 W at 104°F (40°C)
900 W at 131°F (55°C)	450 W at 131°F (55°C)	990 W at 131°F (55°C)	1576 W at 131°F (55°C)	2546 W at 131°F (55°C)	2166 W at 131°F (55°C)

Transceiver Modules

Refer to the *Cisco Transceiver Compatibility Information* page for information on supported transceiver modules on the Cisco ASR 9901 Router and Cisco ASR 9001 Router.

Refer to the Data Sheets for transceiver specifications.



APPENDIX B

Site Log

The site log provides a historical record of all operation and maintenance actions performed on the router. Keep your site log at a convenient place near the router where it can be easily accessed.

- Site Log, on page 211

Site Log

The site log might include these entries:

- Installation progress—Make entries in the site log to record installation progress. Note any difficulties and remedies during the installation process.
- Upgrades or removal and replacement procedures—Use the site log as a record of router maintenance and expansion history.

Each time a procedure is performed on the router, update the site log to record these:

-
  - Any field replaceable unit (FRU) that is installed, removed, or replaced
  - Any router configuration changes
  - Software upgrades
  - Corrective or preventive maintenance procedures performed
  - Intermittent problems
  - Related comments

A sample site log format is provided in the next page. You can make copies of the sample, or design your own site log page to meet the customized needs of your site and equipment.

Date	Description of Action Performed or Symptoms Observed	Initials

Site Log