Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide

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CHAPTER 4   **Troubleshooting the Installation**   **4-1**

Preface

This guide describes how to install a Cisco ASR 9000 Series Aggregation Services Router and its components.

Audience

This guide is written for hardware installers and system administrators of Cisco routers.

This publication assumes that the user has a substantial background in installing and configuring router and switch-based hardware. The reader should also be familiar with electronic circuitry and wiring practices, and have experience as an electronic or electromechanical technician.

Document Conventions

Note Means *take note*. Notes contain helpful suggestions or references to materials not contained in this manual.

Timesaver Means that the *described action saves time*. You can save time by performing the action described in the paragraph.

Caution Means *be careful*. You are capable of doing something that might result in equipment damage or loss of data.

> **Warning** This warning symbol means *danger.* You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, see the *Regulatory Compliance and Safety Information* document that accompanied this device. Statement 1071

Related Documentation

For more information on the Cisco ASR 9000 Series Aggregation Services Router, refer to additional documents found at:

http://www.cisco.com/c/en/us/support/routers/asr-9000-series-aggregation-services-routers/products-installation-guides-list.html

Changes to This Document

Table 1 lists the technical changes made to this document since it was first created.

Table 1 Changes to This Document

Date	Change Summary
January 2015	Added new route processor cards RSP-440 Lite and RSP-880, FC2 fabric card, Cisco ASR 9222 support for the version 2 air filter, support for the version 3 power system, and supported optics for Cisco IOS XR software release 5.3.0.
October 2014	Information added for Cisco ASR 9922 version 2 fan tray.
June 2014	Information added about installing optional air baffles on the Cisco ASR 9006 Aggregation Services Router.
September 2013	Information added about the Cisco ASR 9904 Aggregation Services Router.
August 2013	Information added about the Cisco ASR 9912 Aggregation Services Router.
May 2013	Information added about the Cisco ASR 9000v satellite shelf adding support for the Cisco CRS Line Card Chassis in either the 8-slot or 16-slot variation.
February 2013	Updates and corrections made to various portions of the document.
December 2012	Information added about the Cisco ASR 9000v satellite shelf adding support for the Cisco ASR 9922 Aggregation Services Router and the Cisco ASR 9001 Aggregation Services Router. Also, information added about the Cisco ASR 901 Series Aggregation Services Router as a satellite shelf and the Cisco ASR 903 Series Aggregation Services Router as a satellite shelf.

Table 1 Changes to This Document (continued)

Date	Change Summary
September 2012	Information added about the new 1-port 40GE Modular Port Adapter (MPA), 36-port 10GE line card, 1-port 100GE line card, Cisco ASR 9922 Aggregation Services Router, RP card, FC card, and Cisco ASR 9000v satellite shelf (adding support for the A9K-36X10GE-TR [36-port 10GE line card, Packet Transport Optimized] and A9K-36X10GE-SE [36-port 10GE line card, Service Edge Optimized]).
May 2012	Information added about the new Cisco ASR 9000v (a satellite system with the Cisco ASR 9000).
	The Cisco ASR 9000v satellite shelf provides 44 1GE SFP ports and 4 10GE SFP+ ports.
December 2011	Information added about the new RSP-440 Route Processor card, the new 24-port 10GE fixed line card, the 2-port 100GE fixed line card, and the modular line card supporting the 20-port 1GE MPA, the 4-port 10GE MPA, and the 2-port 10GE MPA.
	Information added about the new version 2 power system. The Cisco ASR 9006 Router and Cisco ASR 9010 Router now support version 1 and version 2 power systems.
May 2010	Added power consumption specifications for the new 16-port 10GE SFP+ line card. Updates and corrections made to various portions of the document.
December 2009	Updates and corrections made to various portions of the document.
March 2009	Initial release of this document.

Obtaining Additional Information and Support

For information on obtaining documentation, submitting a service request to obtain support, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed, and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service, and Cisco currently supports RSS Version 2.0.

Preparing for Installation

This chapter provides preinstallation information, such as recommendations and requirements you should be perform before installing your Cisco ASR 9000 Series Router.

The shipping package for the router is engineered to reduce the chances of product damage associated with routine material handling experienced during shipment:

- Always transport or store the router in its shipping package in the upright position.
- Keep the router in the shipping container until you have determined the installation site.

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

- Safety Guidelines, page 1-1
- Site Requirement Guidelines, page 1-8
- RSP and RP Port Connection Guidelines, page 1-55

Safety Guidelines

Before you perform any procedure in this guide, 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 common sense and caution.

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 the 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 the 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 9000 Series Routers are designed to meet the regulatory compliance and safety approval requirements. For detailed safety information, see:

Regulatory Compliance and Safety Information for the Cisco ASR 9000 Series Routers

Laser Safety

Single-mode Cisco ASR 9000 Series line cards are equipped with lasers. The lasers emit invisible radiation. Do not stare into open line card ports. Observe the following warning to prevent eye injury:

Warning   **Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures.** Statement 70

Energy Hazard

The Cisco ASR 9000 Series Routers can be configured for a DC power source. Do not touch terminals while they are live. Observe the following warning to prevent injury.

Warning   **Hazardous voltage or energy may be present on power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place.** Statement 1086

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 of the procedures in this guide, attach an ESD-preventive strap to your wrist and connect the leash to the chassis as shown in the figures below.

Figure 1-1   ***ESD Label Information on Router Chassis***

Figure 1-2   ***Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9010 Router Chassis***
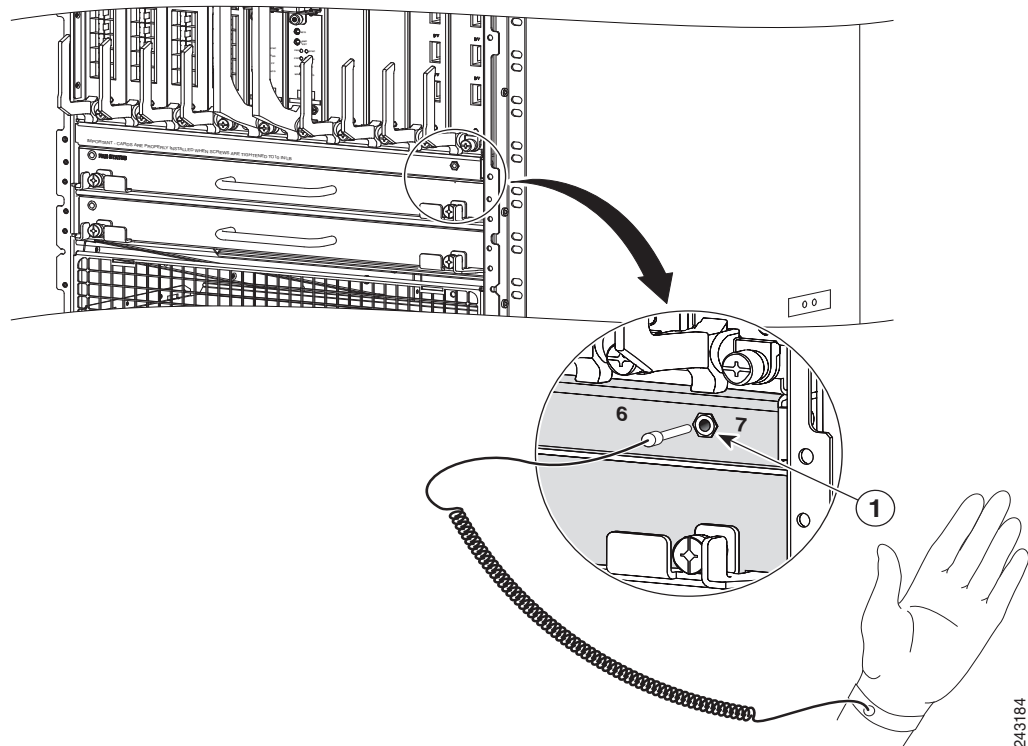
1	Location of chassis socket for ESD strap on the Cisco ASR 9010 Router chassis.

Figure 1-3   *Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9006 Router Chassis*
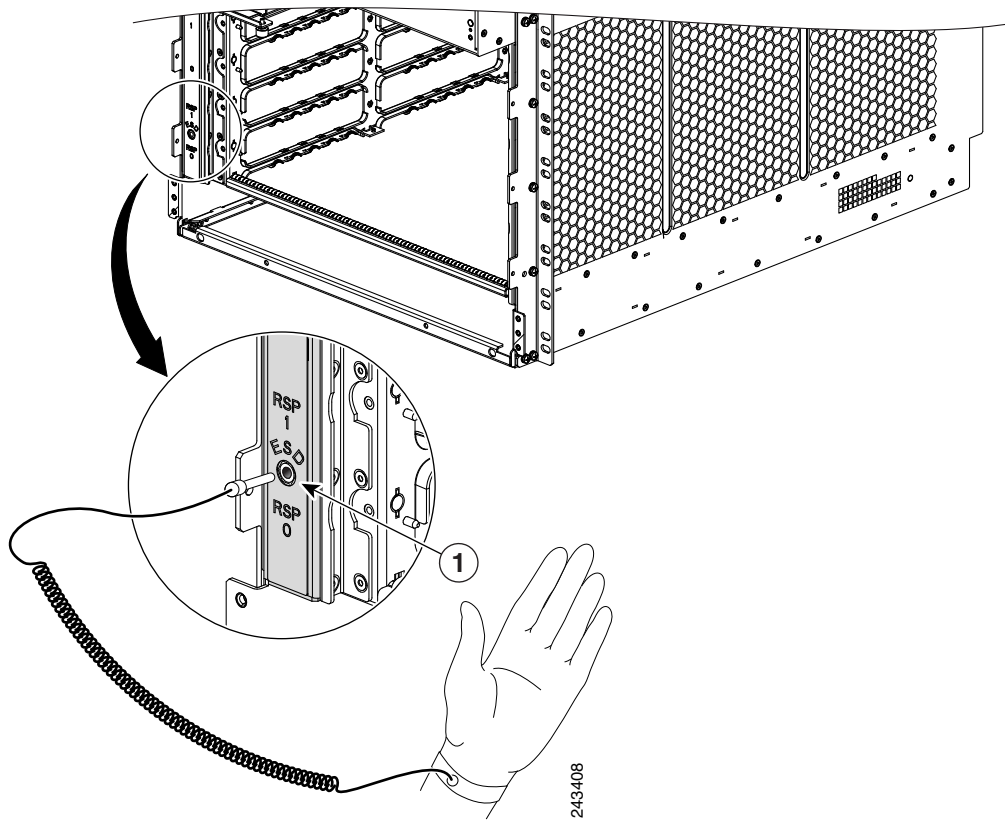
1	Location of chassis socket for ESD strap on the Cisco ASR 9006 Router chassis.

Figure 1-4   *Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9904 Router Chassis*
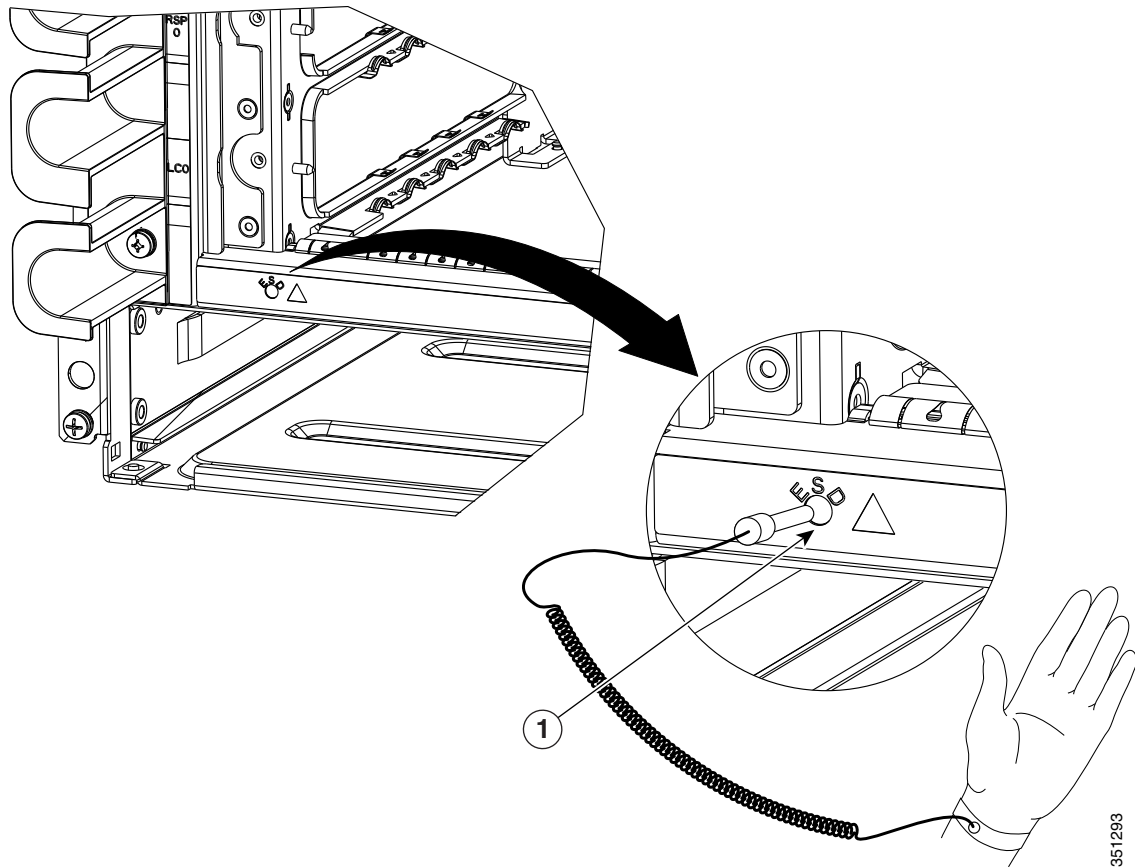
1	Location of chassis socket for ESD strap on the Cisco ASR 9904 Router chassis.

Figure 1-5   Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9922 Router Chassis
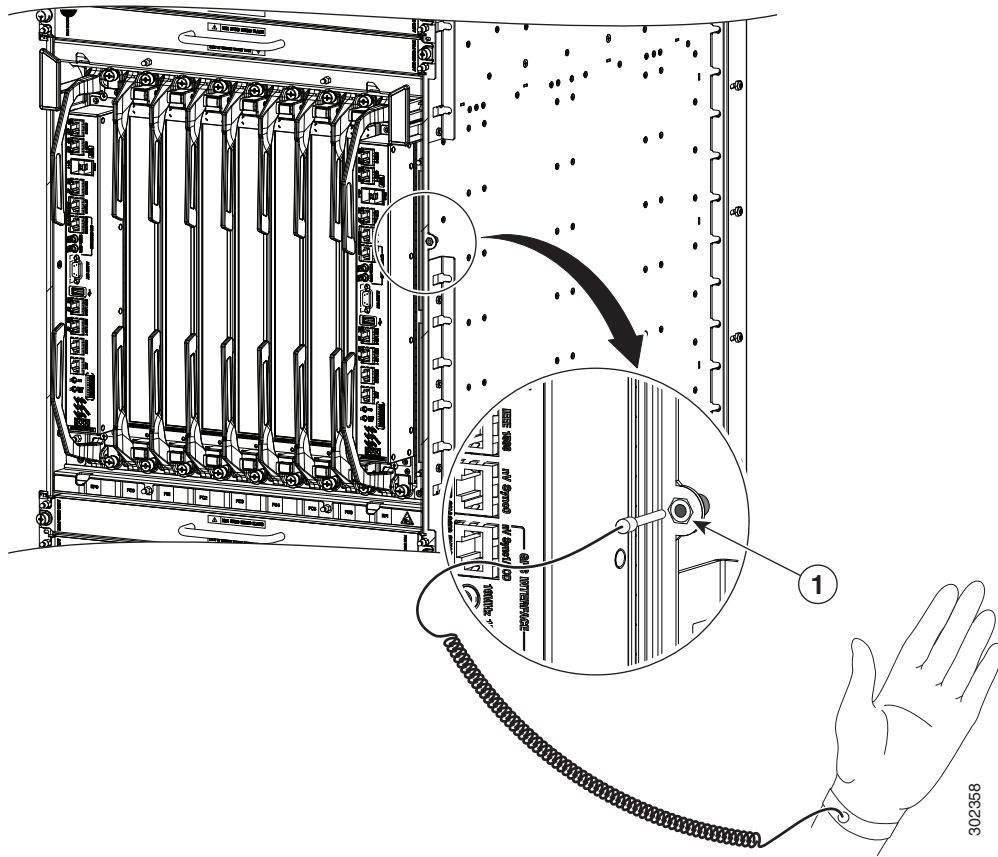
1	Location of chassis socket for ESD strap on the Cisco ASR 9922 Router chassis.

Figure 1-6   Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9912 Router Chassis
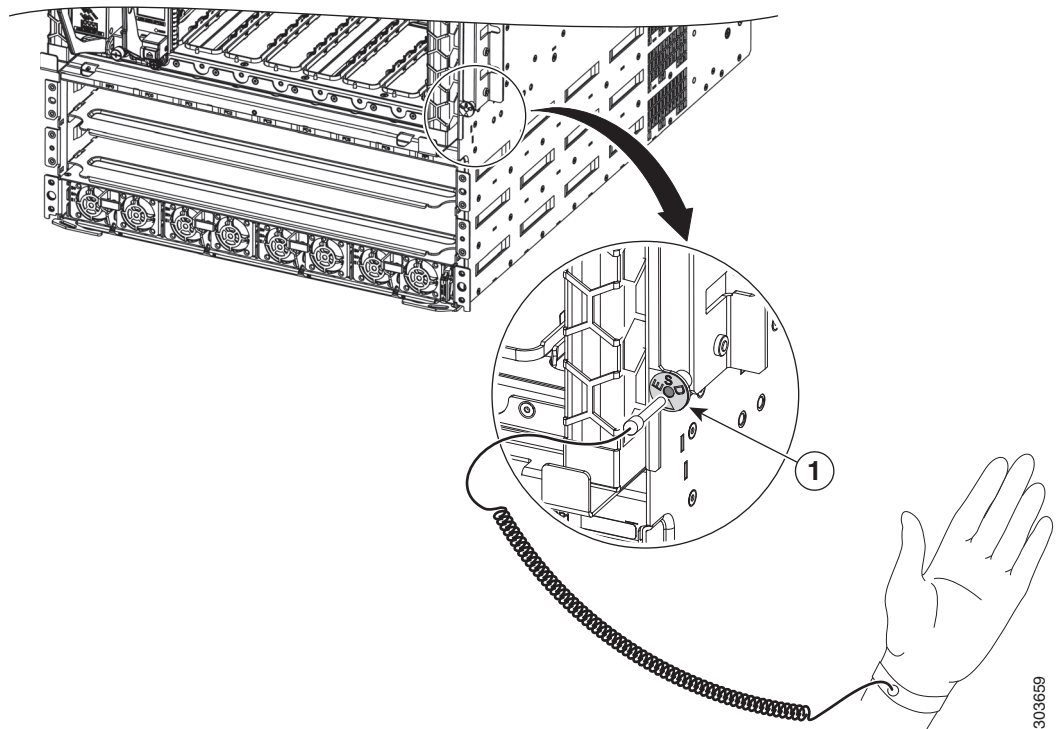
1	Location of chassis socket for ESD strap on the Cisco ASR 9912 Router chassis.

Lifting Guidelines

Fully configured Cisco ASR 9000 Series Routers can weigh as much as 1038 pounds (470.28 kg), and an empty chassis weighs up to 300 pounds (136 kg). These systems are not intended to be moved frequently. Before you install the router, ensure that your site is properly prepared to prevent moving the router later to accommodate power sources and network connections.

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

- Do not lift equipment alone; have another person help you to lift heavy 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   **To prevent injury and equipment damage, never attempt to lift or tilt the router chassis using the handles on the fan tray or on line cards. These handles do not support the weight of the chassis.**

Site Requirement Guidelines

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

- Site Wiring Guidelines, page 1-15
- Chassis Air Flow Guidelines, page 1-15
- Rack-Mounting and Air Flow Clearance Guidelines, page 1-20
- Temperature and Humidity Guidelines, page 1-36
- Power Connection Guidelines, page 1-36
- NEBS Supplemental Unit Bonding and Grounding Guidelines, page 1-52

Site Layout and Equipment Dimensions

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

- Install the system in a restrictive access location with means for a permanent ground.
- 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 ft (91.44 cm) adjacent to the rack to move, align, and insert the chassis.
  - At least 2 ft (60.96 cm) in front of the power tray to insert power modules.
- 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:
  - 17.50 inches (44.45 cm) for the Cisco ASR 9010 Router.
  - 17.75 inches (45.09 cm) for the Cisco ASR 9006 Router.
  - 4.74 inches (12.06 cm) for the Cisco ASR 9904 Router.
- To mount the router in a 4-post rack, 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 9922 Router or Cisco ASR 9912 Router.
- Height of the Cisco ASR 9010 Router is 37.00 inches (93.98 cm). Most racks accommodate two ASR 9010 routers.
- Height of the Cisco ASR 9006 Router is 17.50 inches (44.45 cm). Most racks accommodate four ASR 9006 routers,
- Height of the Cisco ASR 9904 Router is 10.38 inches (26.7 cm). Most racks accommodate four or more ASR 9904 routers.
- Height of the Cisco ASR 9922 Router is 77.00 inches (195.58 cm). Most racks accommodate one ASR 9912 router.
- Height of the Cisco ASR 9912 Router is 52.50 inches (133.35 cm). Most racks accommodate one ASR 9912 router.

- When fully populated with cards, the router can weigh up to 1038 pounds (470.28 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 of 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 of 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.

  - Make sure that cables from other equipment installed in the rack do not restrict access to the card cages.

- To avoid noise interference in network interface cables, do not route them directly across or along power cables.

Figure 1-7 shows the top-down view chassis dimensions of the Cisco ASR 9010 Router.

Figure 1-8 shows the top-down view chassis dimensions of the Cisco ASR 9006 Router.

Figure 1-9 shows the top-down view chassis dimensions of the Cisco ASR 9904 Router.

Figure 1-10 shows the top-down view chassis dimensions of the Cisco ASR 9922 Router.

Figure 1-11 shows the top-down view chassis dimensions of the Cisco ASR 9912 Router.

Figure 1-7   ***Cisco ASR 9010 Router Chassis Footprint and Dimensions—Top-Down View***

Rear of chassis

17.38 in
(44.15 cm)

28.93 in
(73.48 cm)

23.21 in
(58.95 cm)

5.04 in
(12.80 cm)

18.92 in
(48.06 cm)

243432

Front of chassis
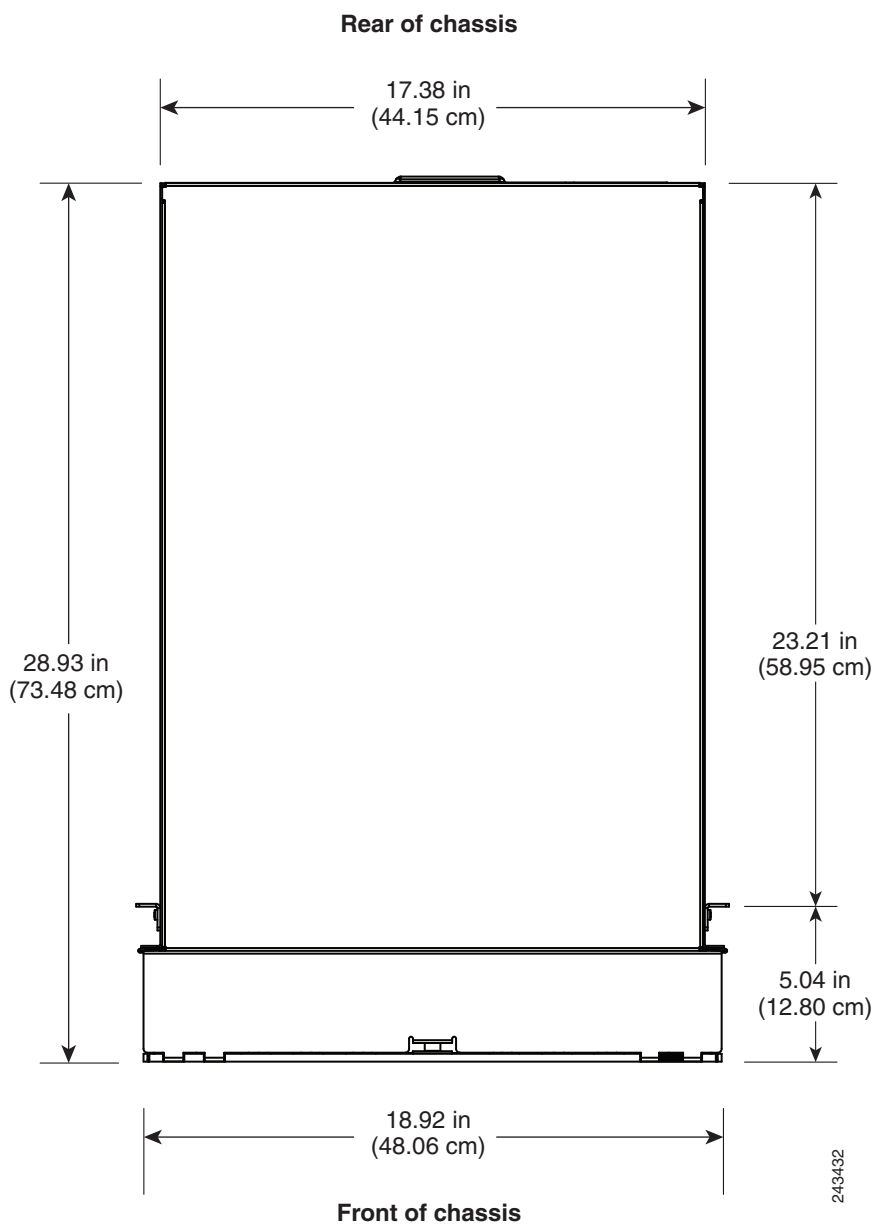
Figure 1-8   Cisco ASR 9006 Router Chassis Footprint and Dimensions—Top-Down View

Rear of chassis

17.38 in
(44.15 cm)

28.93 in
(73.48 cm)

Rack
mounting
surface

5.73 in
(14.55 cm)

243430

Front of chassis
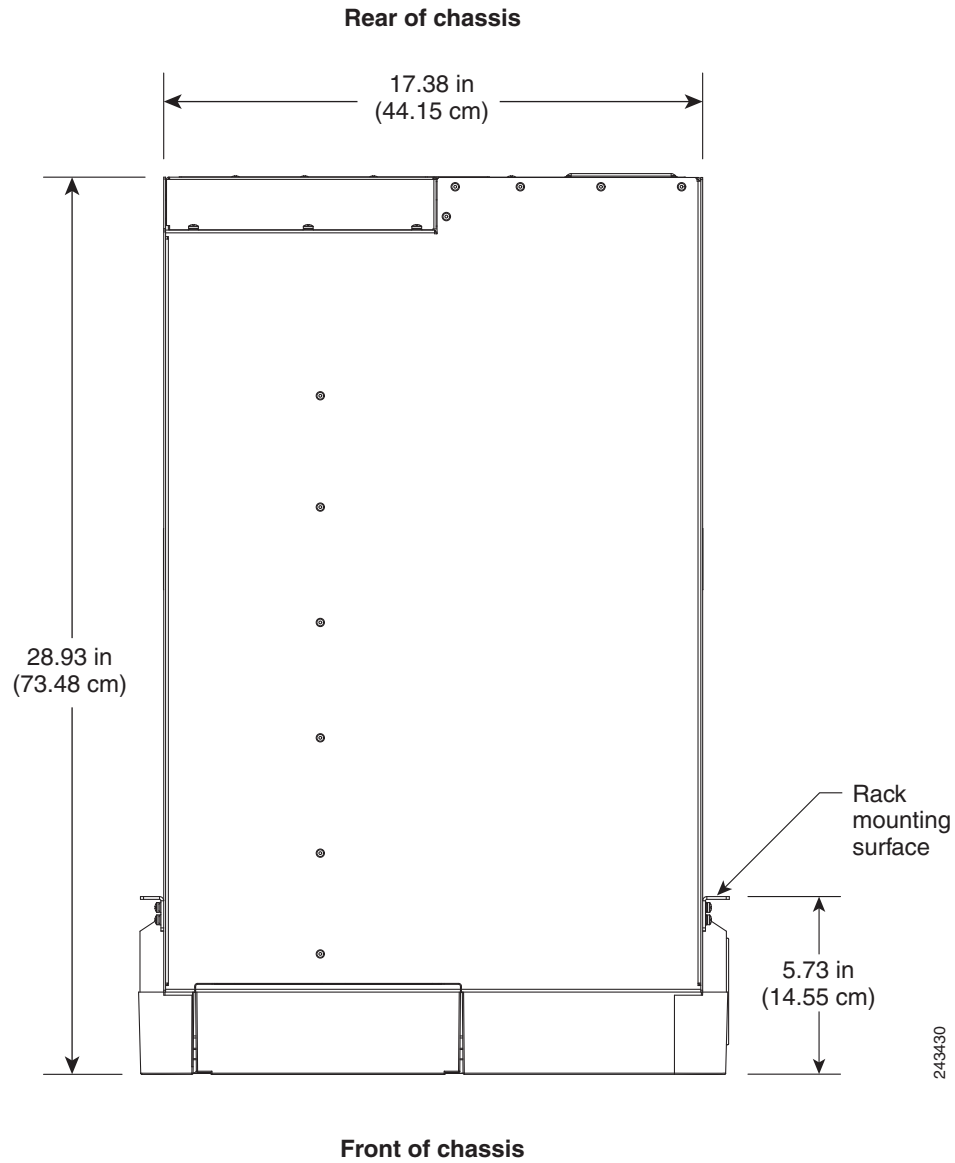
Figure 1-9   *Cisco ASR 9904 Router Chassis Footprint and Dimensions—Top-Down View*

Rear of chassis

2.45 in
(6.22 cm)

17.57 in
(44.64 cm)

25.02 in
(63.54 cm)

6.00 in
(15.24 cm)

6.00 in
(15.24 cm)

Rack
mounting
surface

2.45 in
(6.22 cm)

2.282 in
(5.79 cm)

18.97 in
(48.19 cm)

351294

Front of chassis
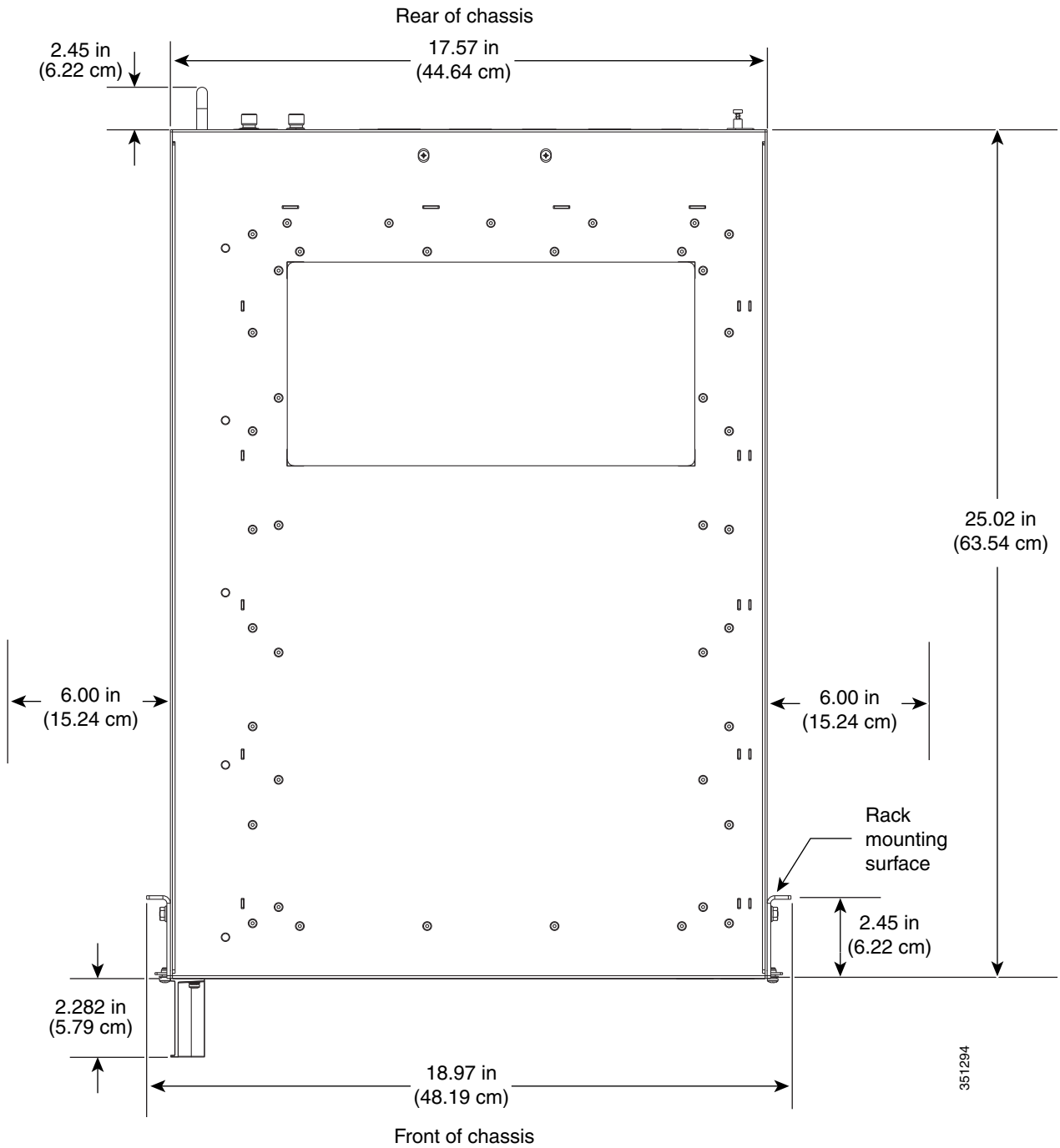
Figure 1-10   Cisco ASR 9922 Router Chassis Footprint and Dimensions—Top-Down View

Front of chassis
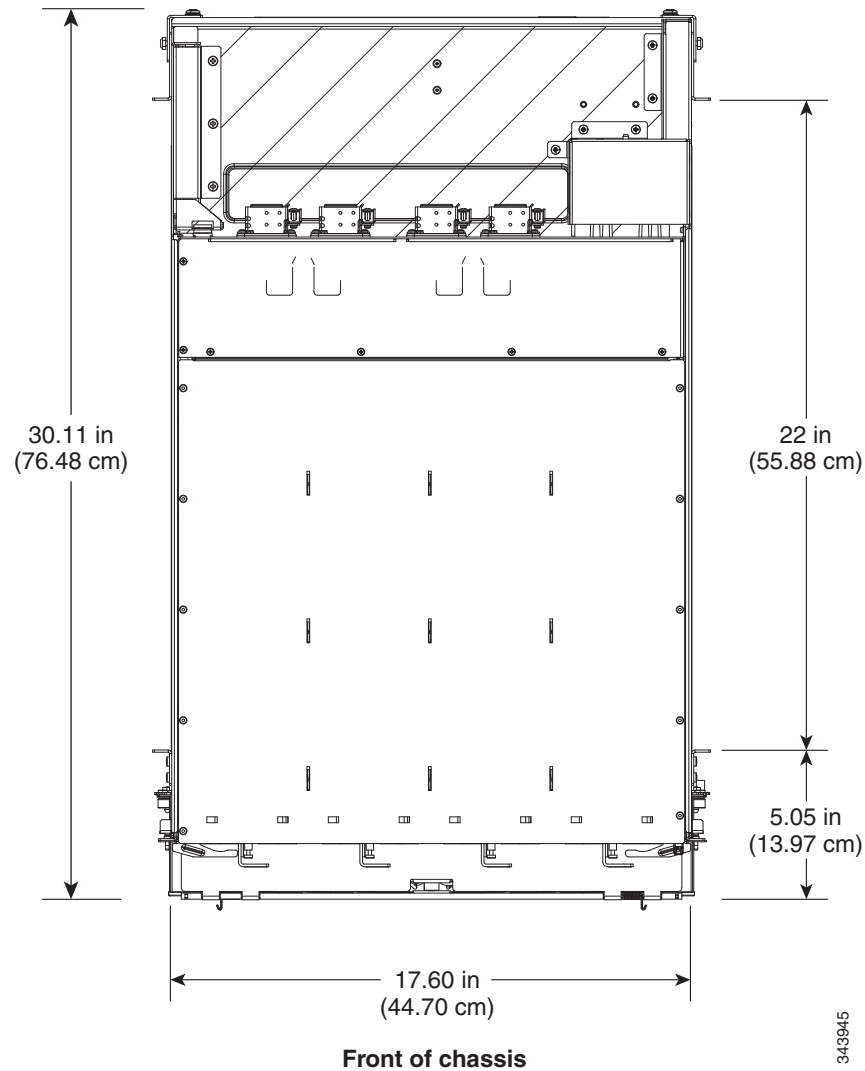
Figure 1-11   Cisco ASR 9912 Router Chassis Footprint and Dimensions—Top-Down View

Rear of chassis

18.97 in
(48.18 cm)

FAN TRAY 1 - LOWER

FAN TRAY 0 - UPPER

29.44 in
(74.78 cm)

22 in
(55.88 cm)

17.60 in
(44.70 cm)

303667

Front of chassis
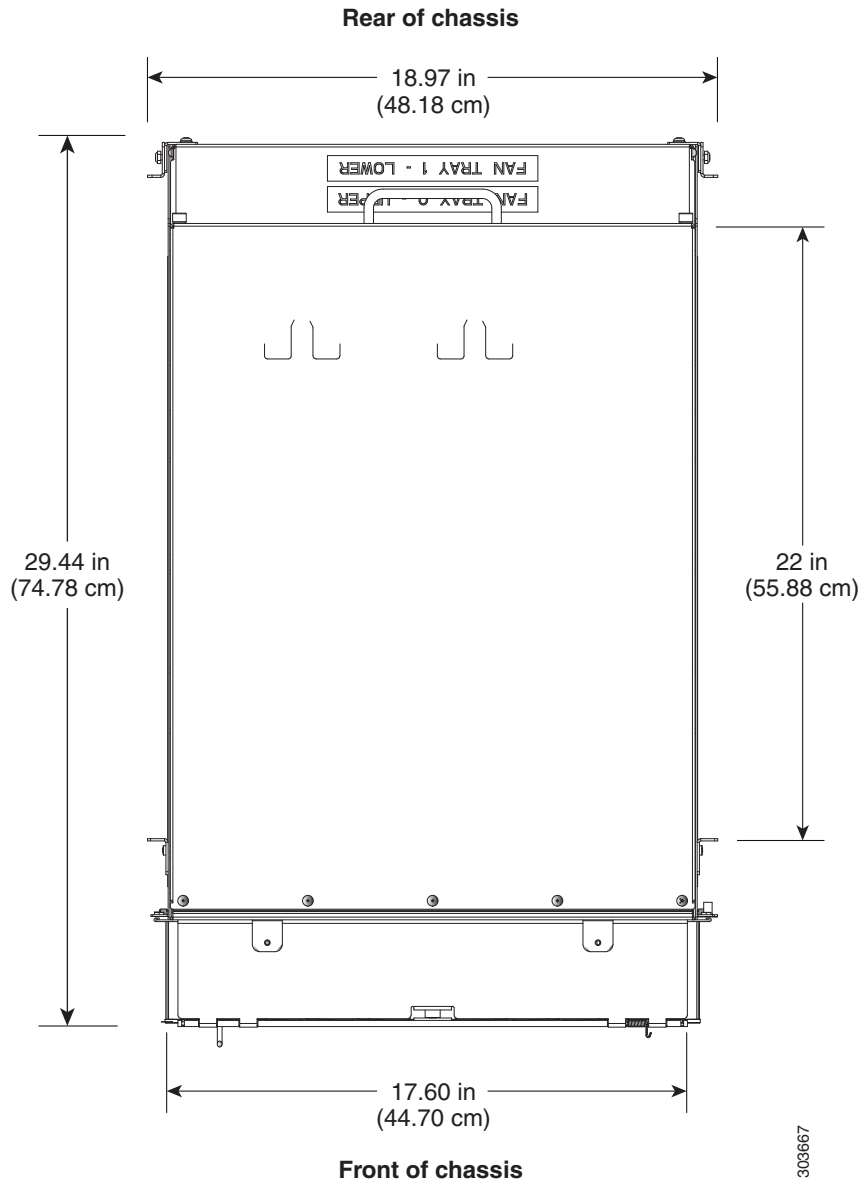
Site Wiring Guidelines

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 experts in radio frequency interference (RFI).

Site wiring is unlikely to emit radio interference if you use twisted-pair cable with a 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 a lightning strike in your vicinity, especially if the wiring exceeds the 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 to 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

Table 1-1 describes how cool air is circulated through the Cisco ASR 9000 Series Routers.

Table 1-1   Chassis Air Flow Guidelines

Router Type	Chassis Air Flow
Cisco ASR 9010	Air is circulated by two fan trays located underneath the Route Switch Processor (RSP) and line cards as shown in Figure 1-12.
Cisco ASR 9006	Air is circulated by two fan trays located along the top left side above the RSP and line cards as shown in Figure 1-13.
Cisco ASR 9904	Air is circulated side-to-side by a single fan tray located along the left side of the chassis as shown in Figure 1-14. If the router is installed in a 2-post 23-inch rack, air flow is circulated front-to-back. Optionally, you can install air baffles on the chassis to help isolate the exhaust air from the intake air. For more information, see Installing Optional Air Baffles on the Cisco ASR 9904 Router, page 2-82.

Table 1-1   Chassis Air Flow Guidelines (continued)

Router Type	Chassis Air Flow
Cisco ASR 9922	Air circulated by four fan trays as shown in Figure 1-15. Two fan trays are located between the line cards in the top cage and the RP and Switch Fabric Cards (FCs) in the middle cage. Another two fan trays are located between the middle cage and the line cards in the bottom cage.
Cisco ASR 9912	Air is circulated by two fan trays located above the line cards as shown in Figure 1-16.

The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the air filter, and circulating the air through the card cage. Each power supply is also equipped with fans that draw cooler air into the front of the power supply and force warmer air out of the back of the chassis. For information about the types of fan trays used in the chassis, see Power Module Fans, page 4-34.

Note   See Rack-Mounting and Air Flow Clearance Guidelines, page 1-20 for details on air-flow clearance requirements for installation in an enclosed 4-post rack.

Figure 1-12   Air Flow Path through the Cisco ASR 9010 Router—Side View
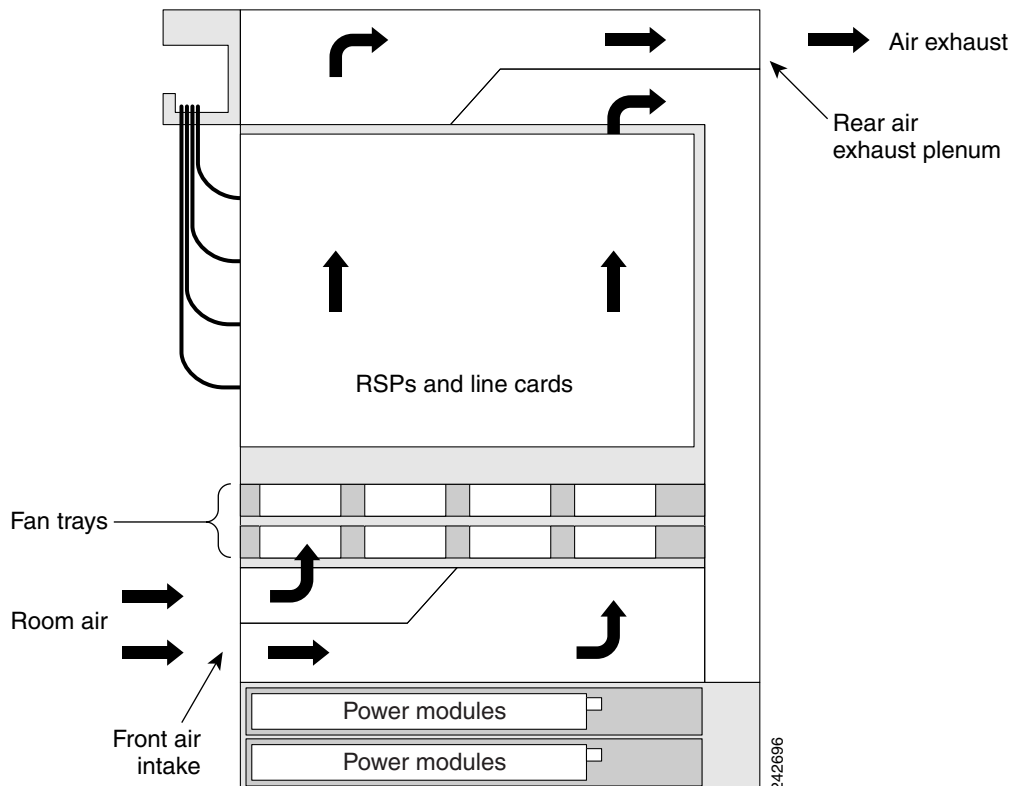
Figure 1-13   Air Flow Path through the Cisco ASR 9006 Router—Front View
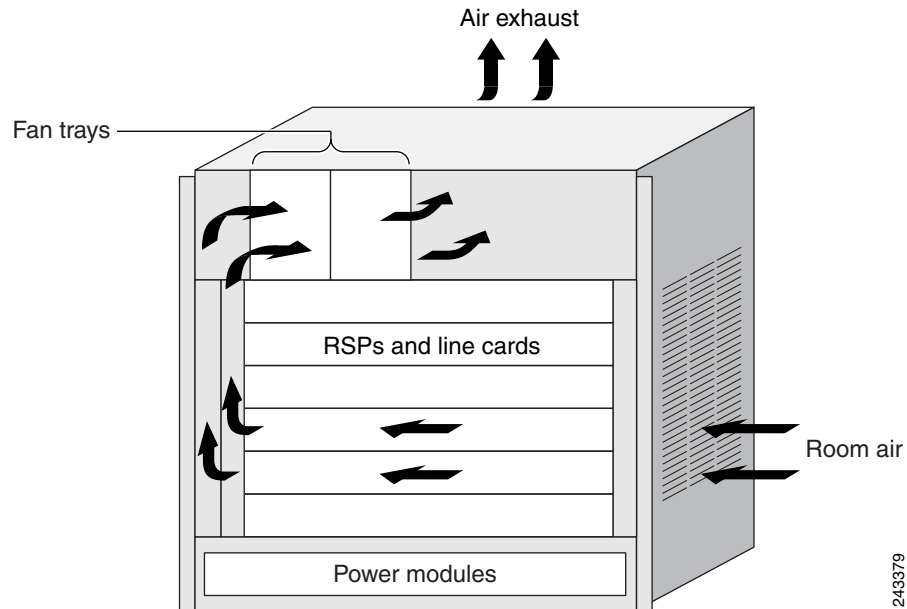
Figure 1-14   Air Flow Path through the Cisco ASR 9904 Router—Front View
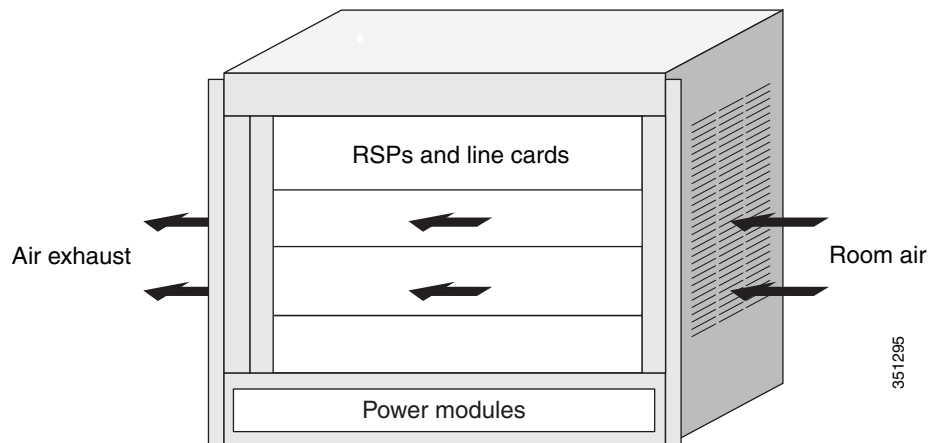
Figure 1-15   Air Flow Path through the Cisco ASR 9922 Router—Side View

Power modules

Air exhaust

Rear Air exhaust plenum

Line cards

Fan trays

RPs and FCs

RPs and FCs

Fan trays

Rear Air exhaust plenum

Line cards

Air exhaust
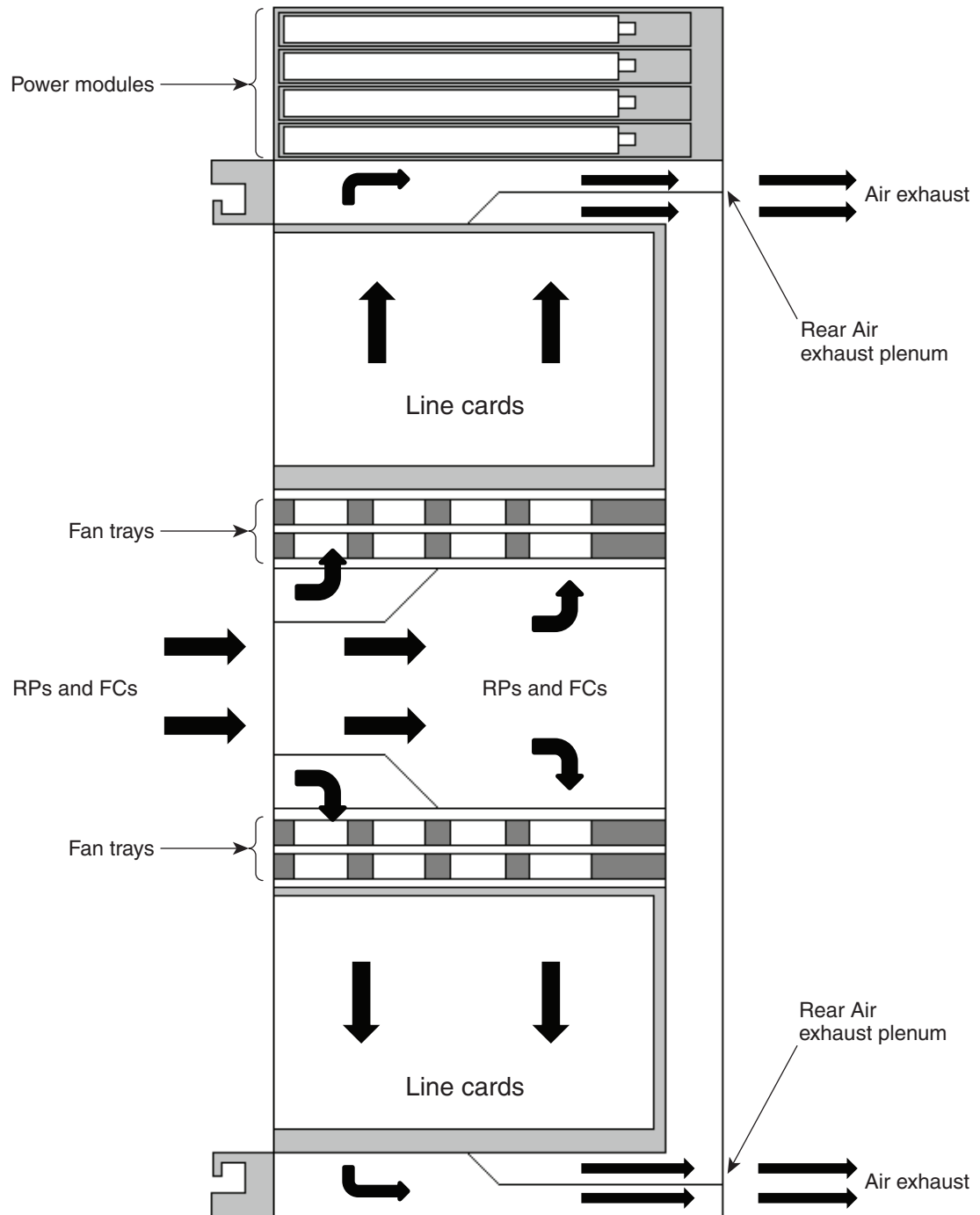
343957

Figure 1-16   Air Flow Path through the Cisco ASR 9912 Router—Side View
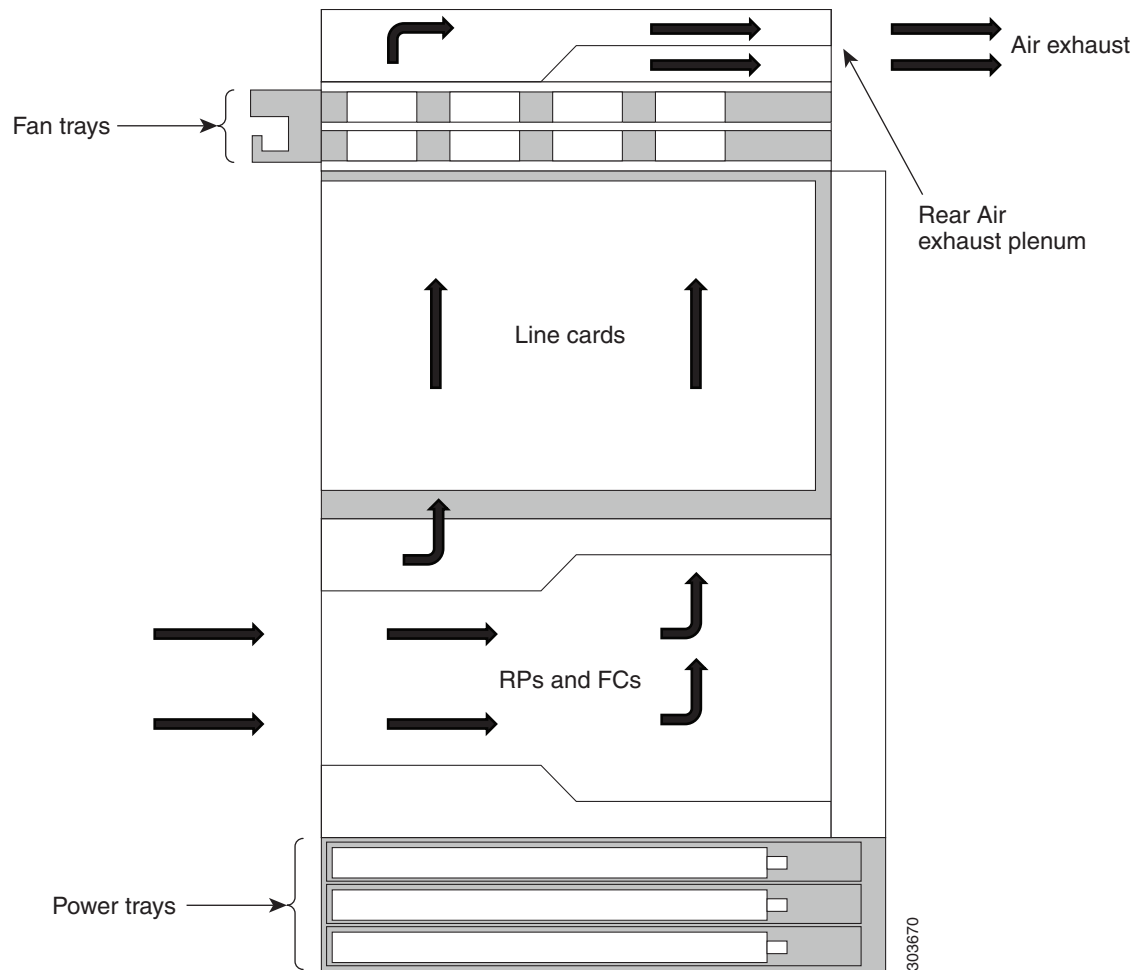
When selecting a site to install the router, observe the following guidelines:

- Dust-free area—The site should be as dust-free as possible. Dusty environments can clog the air filter or power supply intake vents, reducing the cooling air flow through the router. Clogged filters and vents can cause an overtemperature condition in the router.

- Unrestricted air-flow—Allow sufficient air-flow by maintaining a minimum of 6 in (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 overtemperature 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 Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router c an be installed 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).

Note   The Cisco ASR 9922 Router and Cisco ASR 9912 Router can be mounted only in a 4-post rack. 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).

Figure 1-17 shows an examples of typical 2-post and 4-post telco-type equipment racks.

Figure 1-17   Telco-Type Equipment Racks
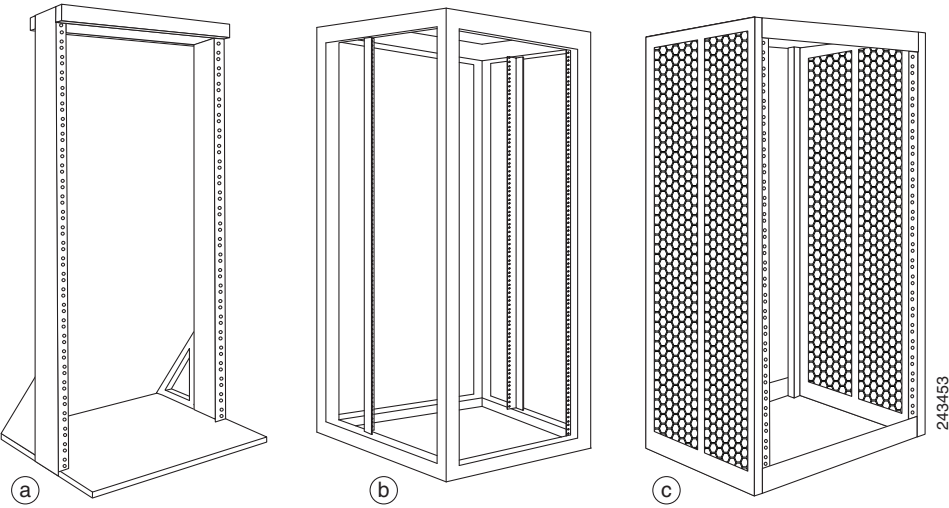
| **a** | Telco-style rack | **b** | Free-standing, 4-post open rack with two mounting posts in the front, two mounting posts in the back or along each side. | **c** | Free-standing enclosed rack with perforated sides and two mounting posts in the front. |

Telco 2-Post Rack

Item a in Figure 1-17 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.

In the front-mounted position, you secure the chassis rack-mounting brackets directly to the rack posts (see Figure 1-18 for the Cisco ASR 9010 Router, Figure 1-19 for the Cisco ASR 9006 Router, and Figure 1-20 for the Cisco ASR 9904 Router). Two rear mounting brackets are provided for mounting the Cisco ASR 9010 Router in a 2-post rack.

Note   The mounting brackets on the Cisco ASR 9006 Router chassis have a pair of holes at the top and bottom of each bracket; the remaining openings in the brackets are slots. When mounting the router in a 2-post rack, you must first use the holes to locate and position the brackets on the rack. Insert the screws through the bracket holes into the rack before inserting screws through the bracket slots.

Figure 1-18   Cisco ASR 9010 Router Mounted in a 2-Post Rack
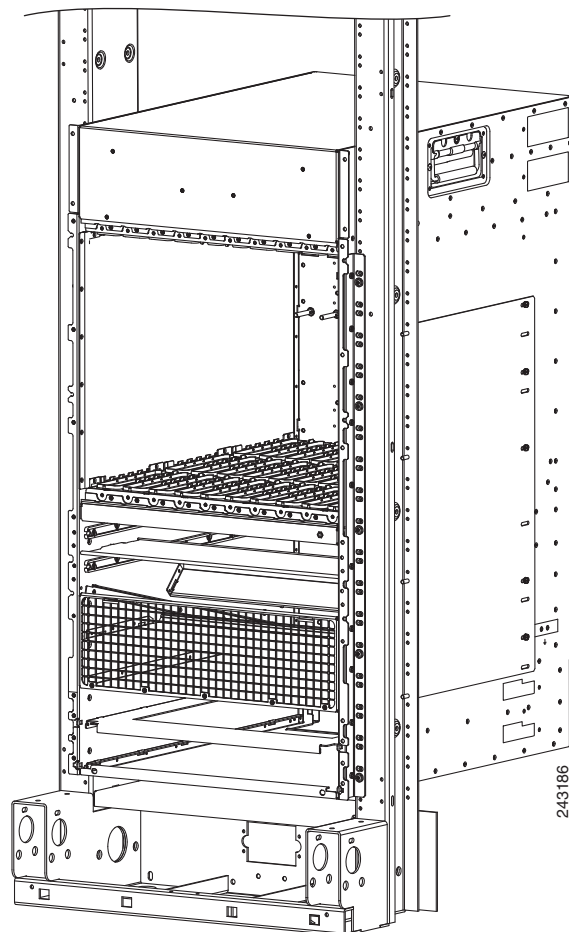
Figure 1-19   *Cisco ASR 9006 Router Mounted in a 2-Post Rack*
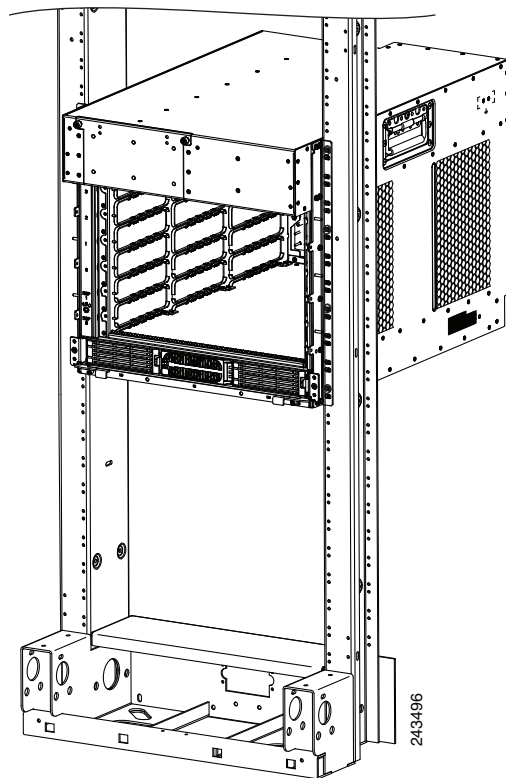
Figure 1-20   Cisco ASR 9904 Router Mounted in a 2-Post Rack
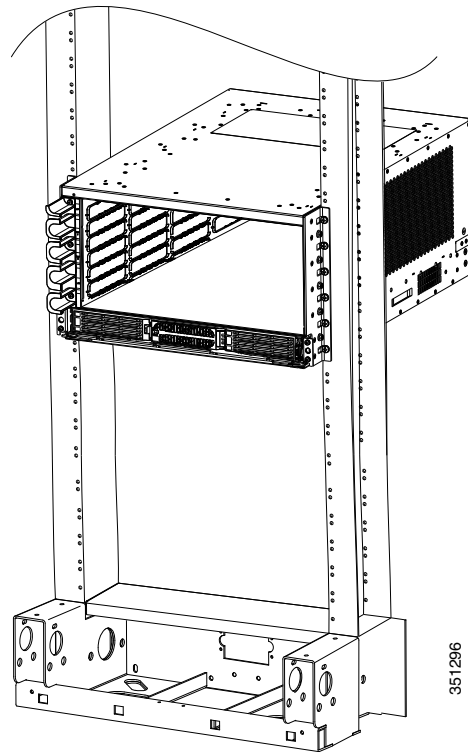
Open 4-Post Rack

Item b in Figure 1-17 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 rear mounting brackets are provided for mounting the Cisco ASR 9010 Router in a 4-post rack.
- Two rear mounting brackets and two bottom guide rails are provided for mounting the Cisco ASR 9922 Router (Figure 2-8) and Cisco ASR 9912 Router (Figure 2-12) in a 4-post rack.
- Rear brackets or are necklaces are not provided for mounting the Cisco ASR 9904 Router in a 4-post rack.

Figure 1-21   Cisco ASR 9912 Router Mounted in an Open 4-Post Rack
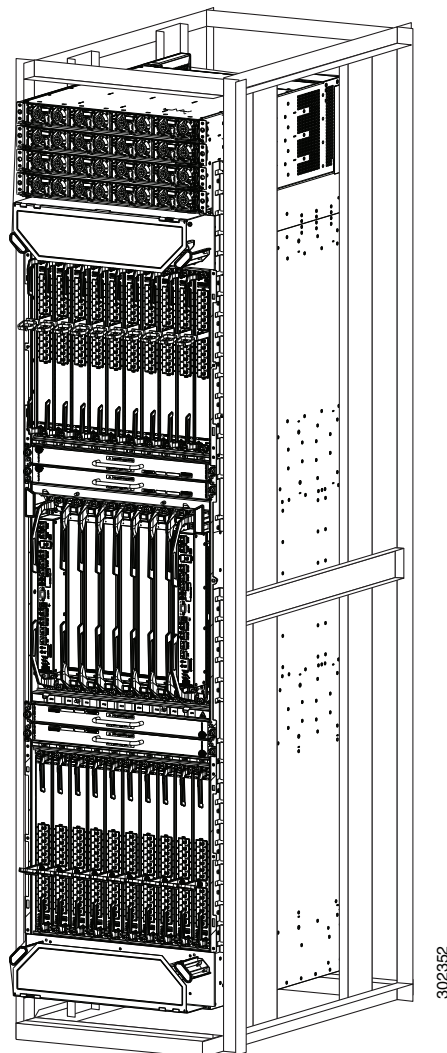
Figure 1-22   Cisco ASR 9912 Router Mounted in an Open 4-Post Rack
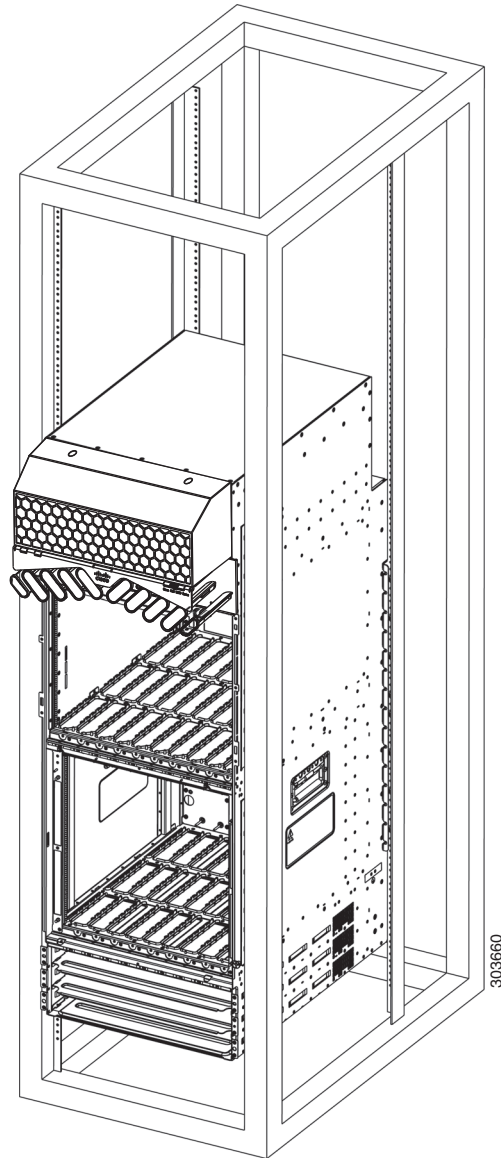
4-Post Enclosed Rack with Perforated Sides

Item c in Figure 1-17 shows a free-standing 4-post enclosed rack with perforated sides and two mounting posts in the front.

⚠

Caution   Do not install the Cisco ASR 9000 Series 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 overtemperature condition inside the router.

Air Flow Guidelines for Enclosed Rack Installation

Follow these guidelines when installing the Cisco ASR 9000 Series Routers in a 4-post enclosed rack.

Cisco ASR 9010 Router Clearance Requirements

To install a Cisco ASR 9010 Router in a 4-post enclosed cabinet:

- The front and rear doors of the cabinet must be removed or be perforated with a minimum open area of 65 percent (70 percent for ETSI 800-mm racks).
- Ensure that you have the following clearances around the chassis:
  - Rear: Minimum of 3.15 inches (8.00 cm) of clearance.
  - Sides: Minimum of 2.87 inches (7.28 cm) of clearance on each side of the chassis.

Figure 1-23 shows the side and rear chassis air-flow clearance requirements for mounting the Cisco ASR 9010 Router in a 4-post enclosed rack.

Figure 1-23   *Cisco ASR 9010 Router Clearance Requirements for an Enclosed 4-Post Rack Installation*

Rear of chassis

2.87 in
(7.28 cm)

3.15 in
(8.00 cm)

2.87 in
(7.28 cm)

ASR 9010

Rack
mounting
surface

5.04 in
(12.80 cm)

245629

Front of chassis
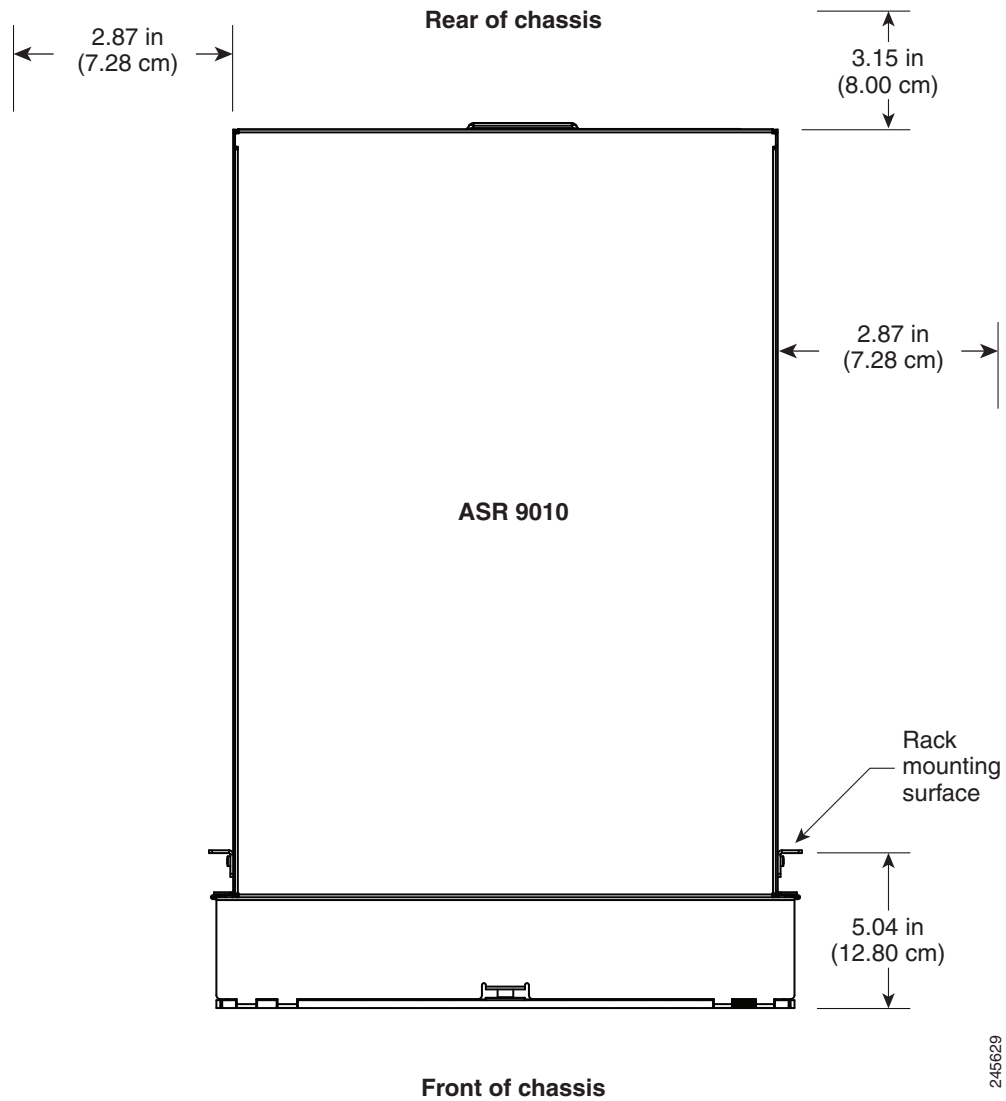
Cisco ASR 9006 Clearance Requirements

To install a Cisco ASR 9006 Router in a 4-post enclosed cabinet:

- The front and rear doors of the cabinet must be removed or be perforated with a minimum open area of 70 percent. In addition, the right side panel must be removed or perforated with a minimum of 65 percent open area (70 percent for ETSI 800-mm racks).

- There must be a minimum unobstructed space of 6 inches (15.24 cm) between the router's right side air inlet and the adjacent wall or cabinet side panel, and a minimum unobstructed space of 6 inches (15.24 cm) between adjacent cabinets. In addition, there should be no exhaust from any source blowing into the right side panel of the cabinet.

  - Rear chassis clearance: Minimum of 2.50 inches (6.40 cm) of clearance.

  - Sides chassis clearance: Minimum of 6 inches (15.24 cm) of clearance on the right side of the chassis (as viewed from the front). There is no clearance requirement for the left side of the chassis.

Figure 1-24 shows the side and rear chassis air-flow clearance requirements for mounting the Cisco ASR 9006 Router in a 4-post enclosed rack.

Figure 1-24   *Cisco ASR 9006 Router Clearance Requirements for an Enclosed 4-Post Rack Installation*

Rear of chassis

2.50 in
(6.40 cm)

No minimum clearance
requirement for left
side of chassis.

6.00 in
(15.20 cm)

ASR 9006

Rack
mounting
surface

5.73 in
(14.55 cm)

245630

Front of chassis
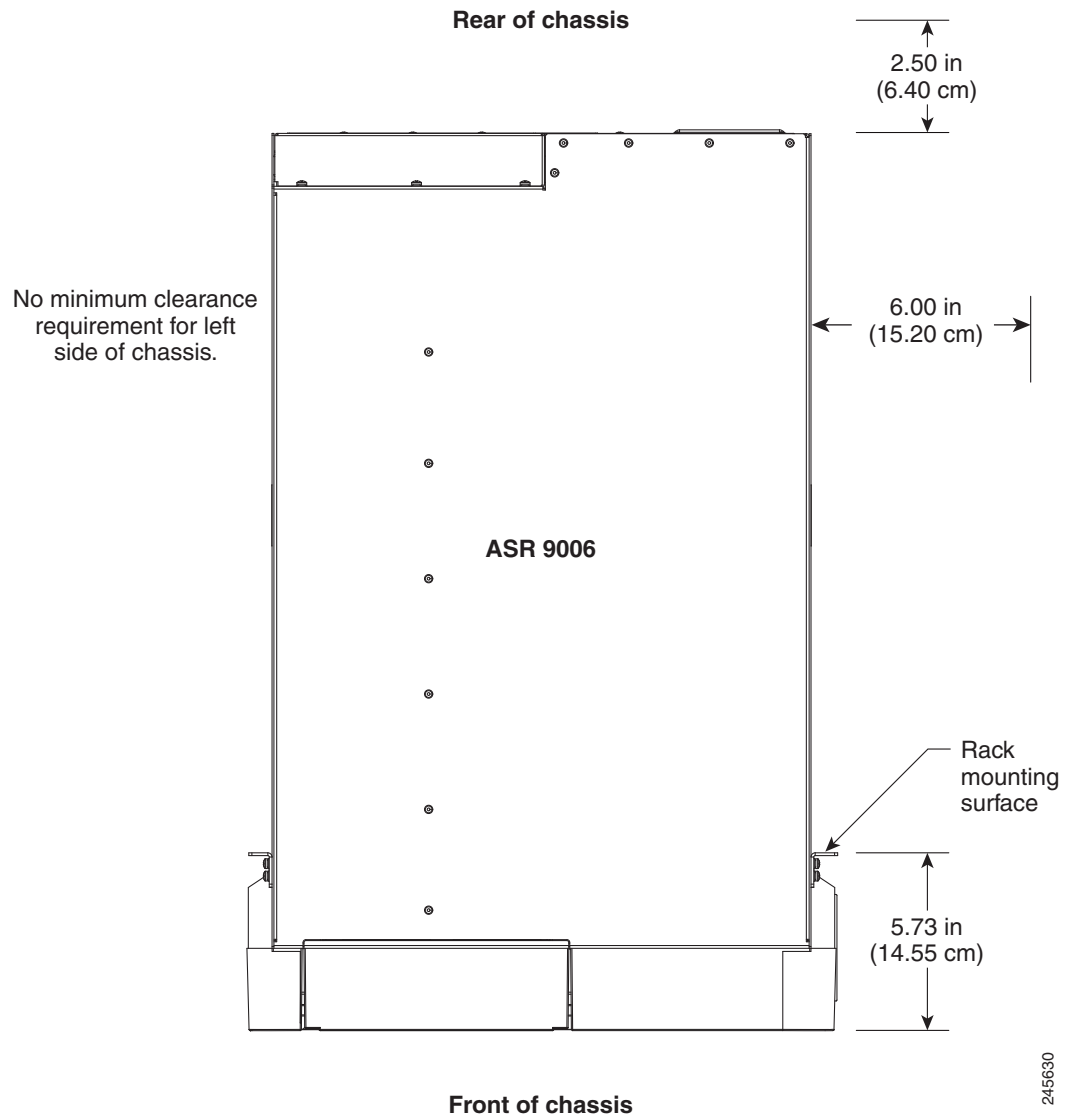
Cisco ASR 9904 Clearance Requirements

To install the Cisco ASR 9904 Router in a 4-post enclosed cabinet:

- Ensure that you have the following clearances around the chassis:
  - Rear: Minimum of 2.45 inches (62.2 cm) of clearance.
  - Sides: Minimum of 6.00 inches (152.4 cm) of clearance on each side of the chassis.

Figure 1-25 shows the side and rear chassis air-flow clearance requirements for mounting the Cisco ASR 9904 Router in a 4-post enclosed rack.

Figure 1-25   Cisco ASR 9904 Router Clearance Requirements in a 4-Post Rack Installation

Rear of chassis

2.45 in
(6.22 cm)

17.57 in
(44.64 cm)

25.02 in
(63.54 cm)

6.00 in
(15.24 cm)

6.00 in
(15.24 cm)

Rack
mounting
surface

2.45 in
(6.22 cm)

2.282 in
(5.79 cm)

18.97 in
(48.19 cm)

Front of chassis

351294
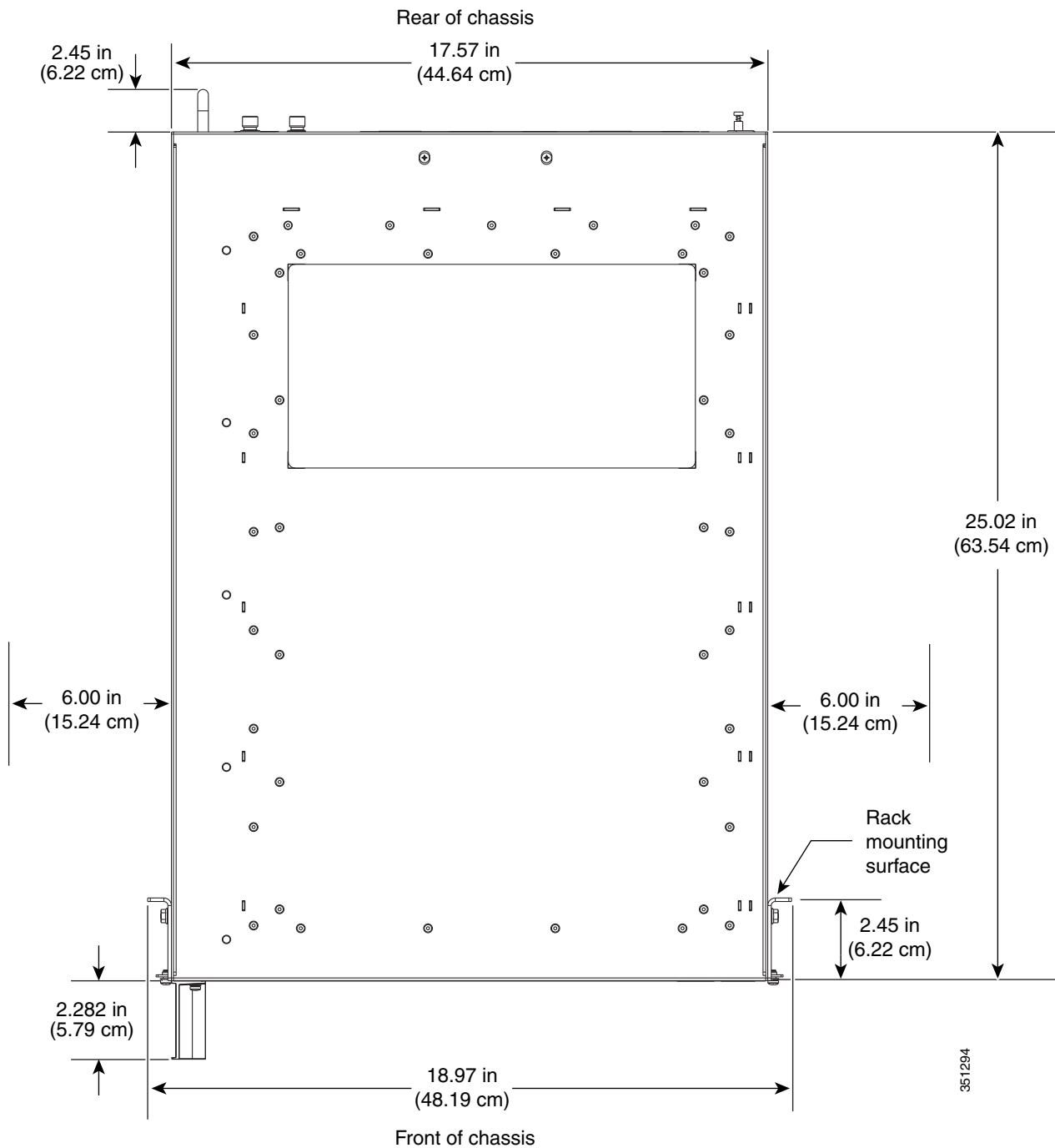
Cisco ASR 9922 Clearance Requirements

To install the Cisco ASR 9922 Router in a 4-post enclosed cabinet:

- The front and rear doors of the cabinet must be removed or be perforated with a minimum open area of 70 percent (80 percent for ETSI 800-mm racks).

- Ensure that you have the following clearances around the chassis:

  - Rear: Minimum of 10 inches (25.4 cm) of clearance.

  - Sides: Minimum of 2.87 inches (7.28 cm) clearance on each side of the chassis.

Figure 1-26 shows the clearance requirements for mounting the Cisco ASR 9922 Router in a 4-post enclosed rack.

Figure 1-26   *Cisco ASR 9922 Router Clearance Requirements in a 4-Post Rack Installation*
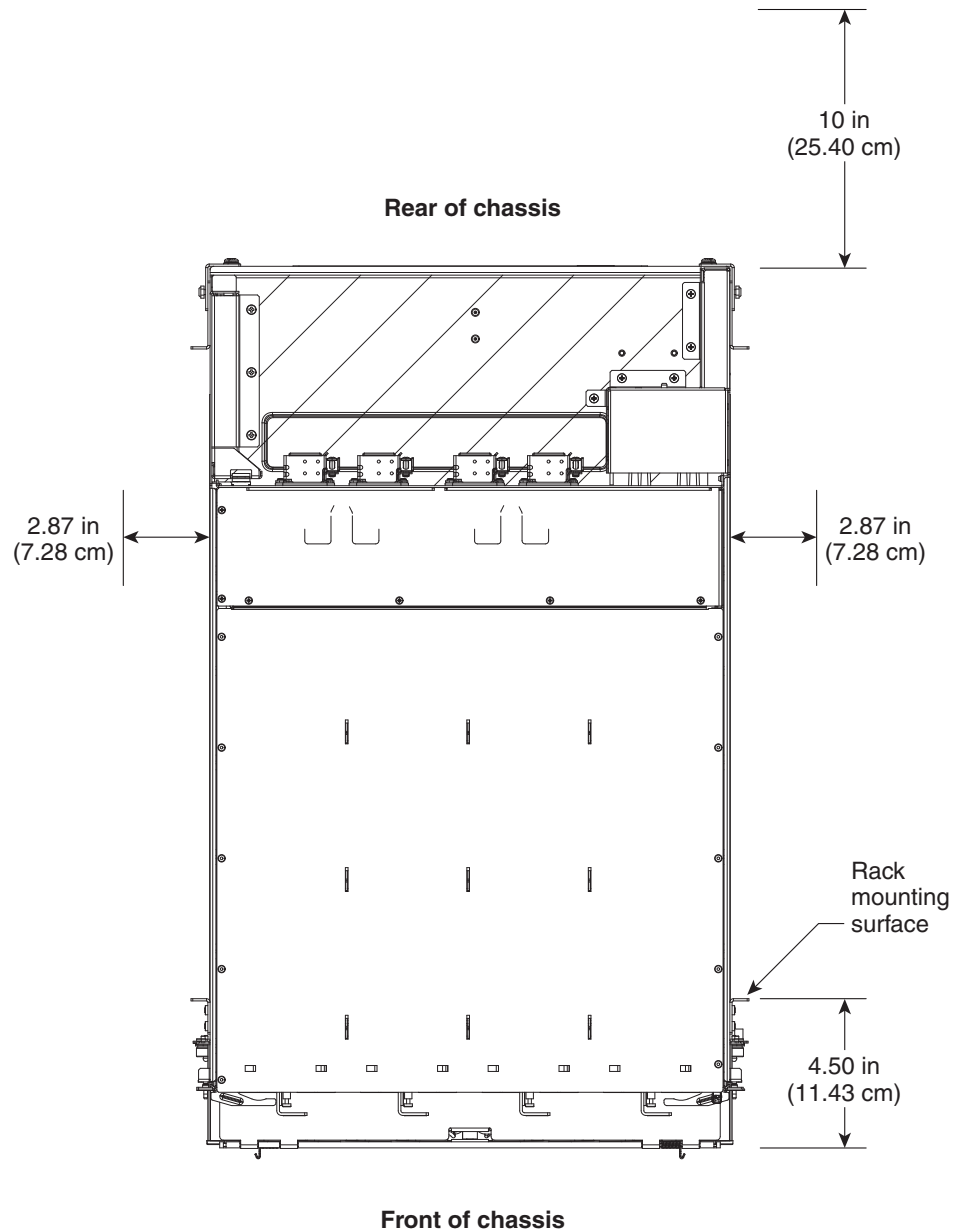
Cisco ASR 9912 Clearance Requirements

To install the Cisco ASR 9912 Router in a 4-post enclosed cabinet:

- The front and rear doors of the cabinet must be removed or be perforated with a minimum open area of 70 percent open area (80 percent for ETSI 800-mm racks).

- Ensure that you have the following clearances around the chassis:

  - Rear: Minimum of 10 inches (25.4 cm) of clearance.

  - Sides: Minimum of 2.87 inches (7.28 cm) of clearance on each side of the chassis.

Figure 1-27 shows the side and rear chassis air-flow clearance requirements for mounting the router in a 4-post enclosed rack.

Figure 1-27   *Cisco ASR 9912 Router Clearance Requirements in a 4-Post Rack Installation*
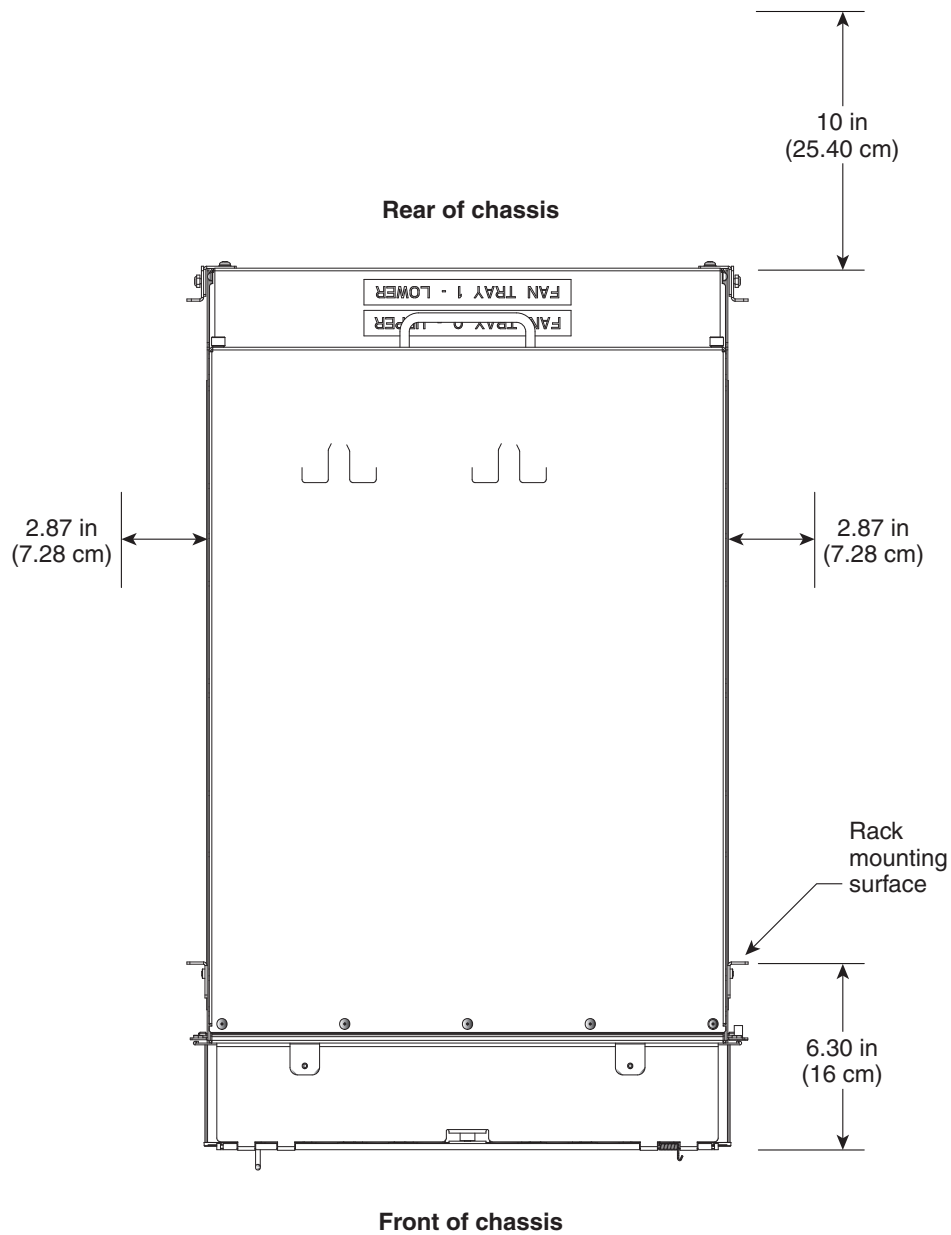
Temperature and Humidity Guidelines

The operating and nonoperating environmental site requirements are listed in Table A-2. The router normally operates within the ranges listed in the table; 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 9000 Series Router is powered by only one type of input: AC or DC. A hybrid (AC+DC) power configuration is not supported.

Table 1-2   Cisco ASR 9000 Series Routers Supported Power Systems

Router	Supported Power Systems
Cisco ASR 9006	Version 1: Supports up to three power modules in the power tray.
	Version 2: Supports up to four power modules in the power tray Compatible only with Cisco IOS XR Software Release 4 and later Cisco IOS XR software releases.
Cisco ASR 9010	Version 1: Supports up to three power modules in the power tray.
	Version 2: Supports up to four power modules in the power tray Compatible only with Cisco IOS XR Software Release 4 and later Cisco IOS XR software releases.
	Version 3: Supports up to four DC power modules in the DC power tray and up to three AC power modules in the AC power tray. Compatible only with Cisco IOS XR Software Release 5.3.0 and later Cisco IOS XR software releases.
Cisco ASR 9904	Version 2: Supports up to four power modules in the power tray. Compatible only with Cisco IOS XR Software Release 4 and later Cisco IOS XR software releases.
Cisco ASR 9922, Cisco ASR 9912	Version 2: Supports up to four power modules in the power tray.
	Version 3: Supports up to four DC power modules in the DC power tray and up to three AC power modules in the AC power tray. Compatible only with Cisco IOS XR Software Release 5.3.0 and later Cisco IOS XR software releases.

Caution   Proper grounding is necessary to avoid damage from lightning and power surges. See NEBS Supplemental Unit Bonding and Grounding Guidelines, page 1-52 for grounding requirements.

AC-Powered Routers

AC power modules operate in the input range of 180 VAC to 264 VAC, 47 to 63 Hz (nominal input level of 200 to 240 VAC). Refer to Table 1-3 and Table 1-4 for the minimum required AC service for version 1 and version 2 power modules.

Power redundancy requirements vary based on the system configuration (number and type of line cards, etc.). AC-powered systems are 2N protected. A minimum of two power supplies are required for redundant operation. Refer to the Cisco ASR 9000 Power Calculator at the following URL to determine actual redundancy requirements for any given configuration: http://tools.cisco.com/cpc/launch.jsp.

Each of the AC power inputs requires a separate dedicated branch circuit. Note that the circuit breaker and fuse lockout procedures should follow the rules and regulations in the National Electrical Code (NEC) and any local codes. For a list of the nominal and acceptable value ranges for source AC power, see Table A-5.

Table 1-3 lists the AC input power cord options, specifications, and Cisco product numbers for the AC input version 1 power supply modules. Table 1-4 lists the AC input power cord options, specifications, and Cisco product numbers for the AC input version 2 power supply modules.

Note   Before connecting AC input power cords to the power system, make sure that the power cords are not energized.

Table 1-3   AC Input Power Cord Options for Version 1 Power System

Locale	Part Number	Length	Plug Rating	Power Cord Reference Illustration
Australia, New Zealand	CAB-7513ACA=	14 ft (4.3 m)	15 A, 250 VAC	Figure 1-28
Australia, New Zealand	CAB-AC-16A-AUS=	14 ft (4.3 m)	16A, 250 VAC	Figure 1-29
China	CAB-AC16A-CH=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-30
Continental Europe	CAB-7513ACE=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-31
	CAB-2500W-EU=		16 A, 250 VAC	Figure 1-32
	CAB-AC-2500W-EU=		16 A, 250 VAC	Figure 1-33
International	CAB-AC-2500W-INT=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-34
Israel	CAB-AC-2500W-ISRL=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-35
Italy	CAB-7513ACI=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-36
Japan, North America (nonlocking plug) 200–240VAC operation	CAB-AC-2500W-US1=	14 ft (4.3 m)	20 A, 250 VAC	Figure 1-37
Japan, North America (locking plug) 200–240VAC operation	CAB-AC-C6K-TWLK=	14 ft (4.3 m)	20 A, 250 VAC	Figure 1-38

Table 1-3   AC Input Power Cord Options for Version 1 Power System

Locale	Part Number	Length	Plug Rating	Power Cord Reference Illustration
South Africa	CAB-7513ACSA=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-39
Switzerland	CAB-ACS-16=	14 ft (4.3 m)	16 A, 250 VAC	Figure 1-40

Table 1-4   AC Input Power Cord Options for Version 2 and Version 3 Power System

Locale	Part Number	Length	Plug Rating	Reference Illustration
China	PWR-CAB-AC-CHN=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-41
Europe	PWR-CAB-AC-EU=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-42
Israel	PWR-CAB-AC-ISRL=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-43
USA	PWR-CAB-AC-USA=	13.9 ft (4.3 m)	20 A, 250 V	Figure 1-44
Australia	PWR-CAB-AC-AUS=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-45
Italy	PWR-CAB-AC-ITA=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-46
Brazil	PWR-CAB-AC-BRA=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-47
South Africa	PWR-CAB-AC-SA=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-48
UK	PWR-CAB-AC-UK=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-49
Switzerland	PWR-CAB-AC-SUI=	13.9 ft (4.3 m)	16 A, 250 V	Figure 1-50
Japan	PWR-CAB-AC-JPN=	13.9 ft (4.3 m)	20 A, 250 V	Figure 1-51

AC Power Cord Illustrations (Version 1 Power)

This section contains the AC power cord illustrations for version 1 power, as described in Table 1-3. Note that an AC power cord may be used with several power supplies.

Figure 1-28   AC Power Cord CAB-7513ACA=

Plug: SAA AS 3112

Cordset rating: 15 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

113353
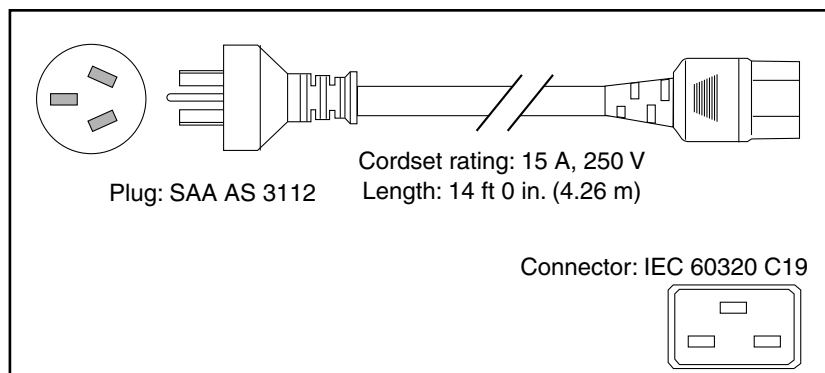
Figure 1-29   AC Power Cord CAB-AC-16A-AUS

Plug: AU20S3

Cordset rating: 16 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

140586
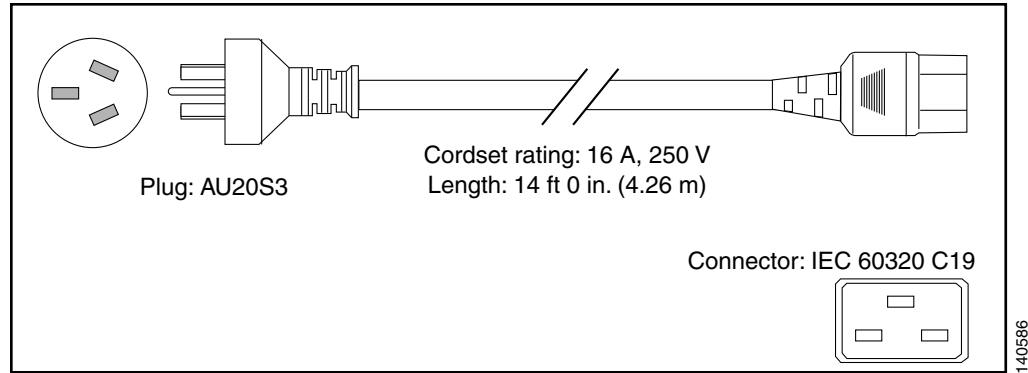
Figure 1-30   AC Power Cord CAB-AC16A-CH=

Plug: GB16C

Cordset rating: 16A, 250V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC
60320-1 C19

126792
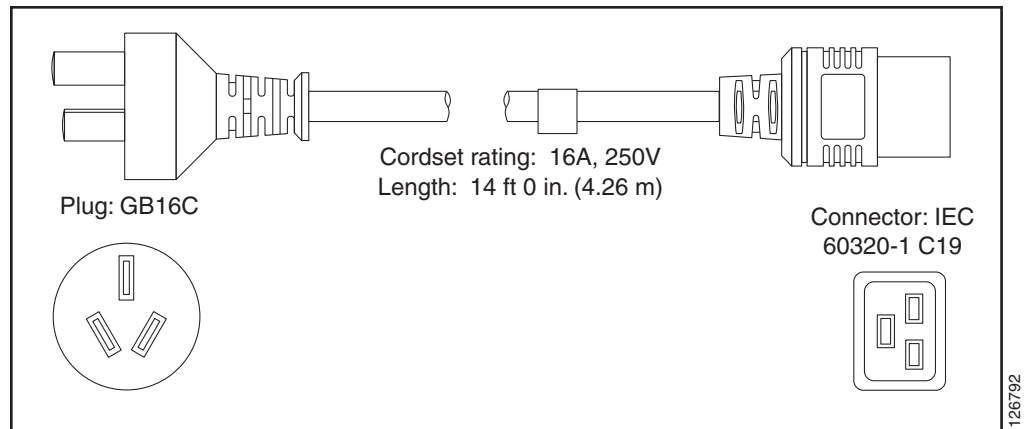
Figure 1-31   AC Power Cord CAB-7513ACE=

Plug: CEE 7/7

Cordset rating: 16 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

113354
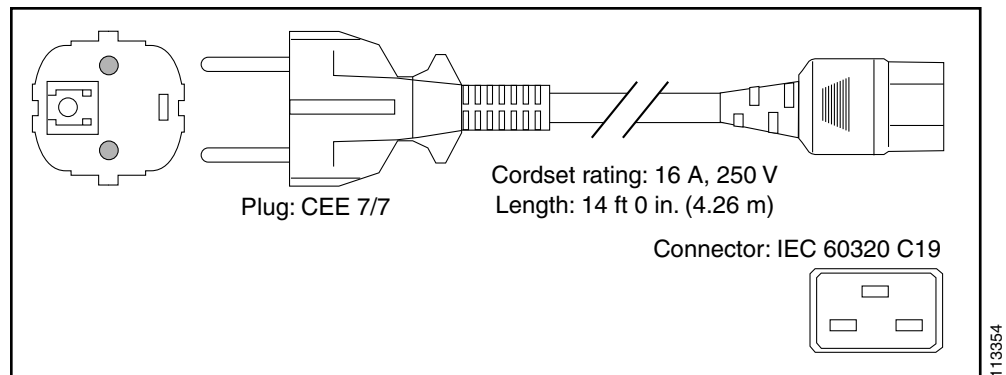
Figure 1-32   AC Power Cord CAB-2500W-EU=
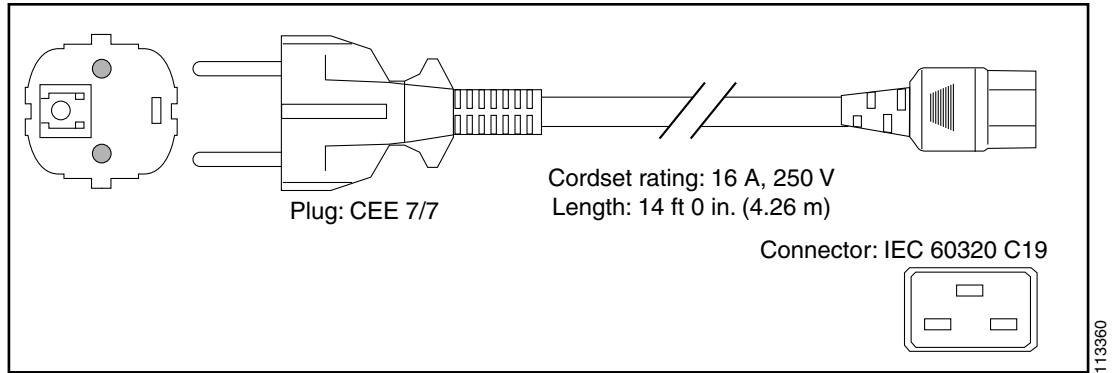
Figure 1-33   AC Power Cord CAB-AC-2500W-EU=
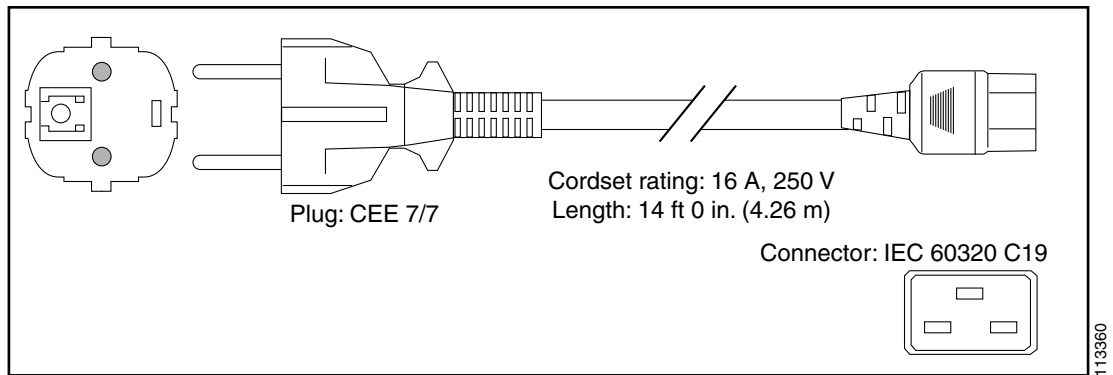
Figure 1-34   AC Power Cord CAB-AC-2500W-INT=
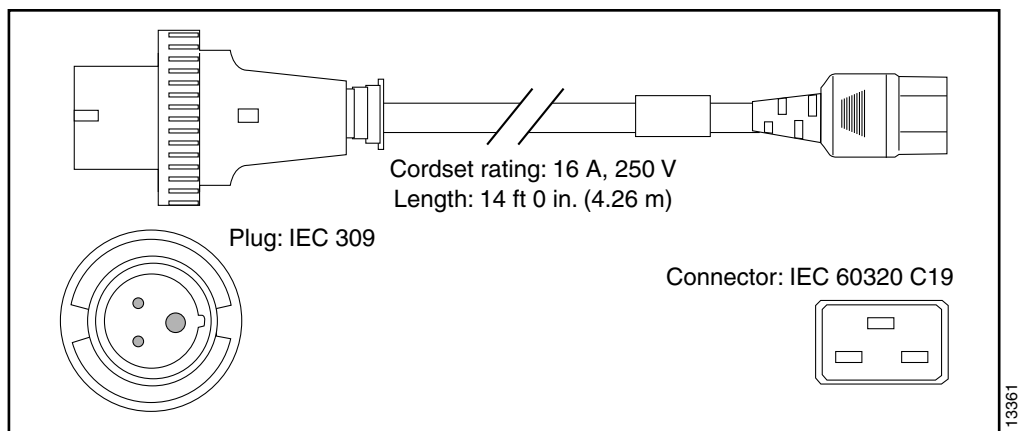
Figure 1-35   AC Power Cord CAB-AC-2500W-ISRL=

Plug: SI16S3

Cordset rating: 16 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

130113
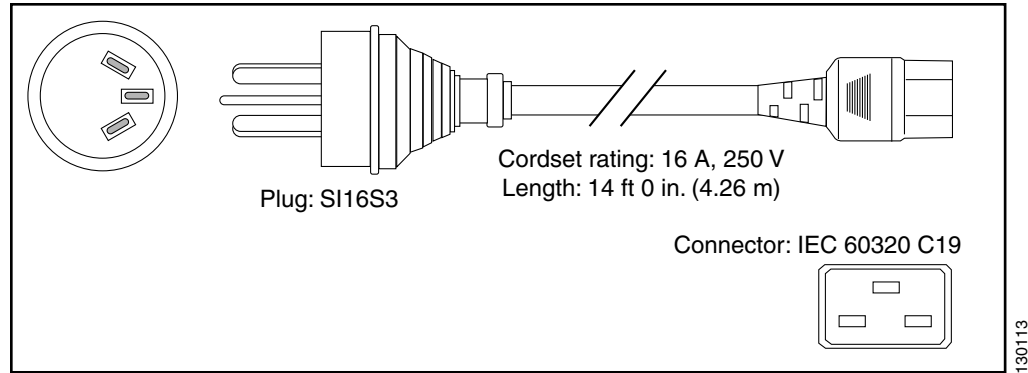
Figure 1-36   AC Power Cord CAB-7513ACI=

Plug: SAA AS 3112

Cordset rating: 15 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

113353
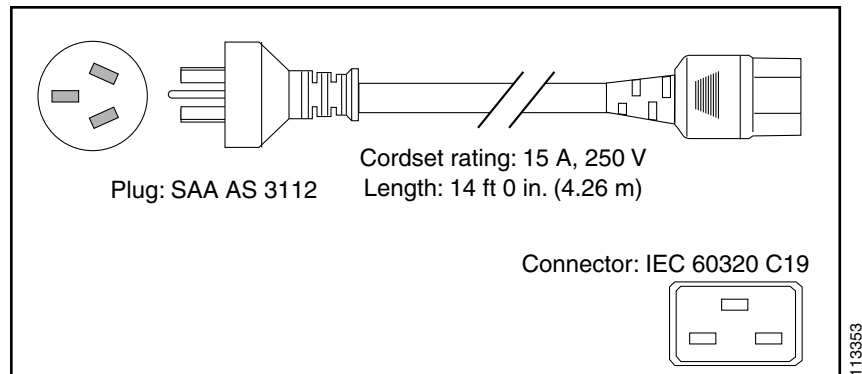
Figure 1-37   AC Power Cord CAB-AC-2500W-US1=

Plug: NEMA 6-20

Cordset rating: 20 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19

113362
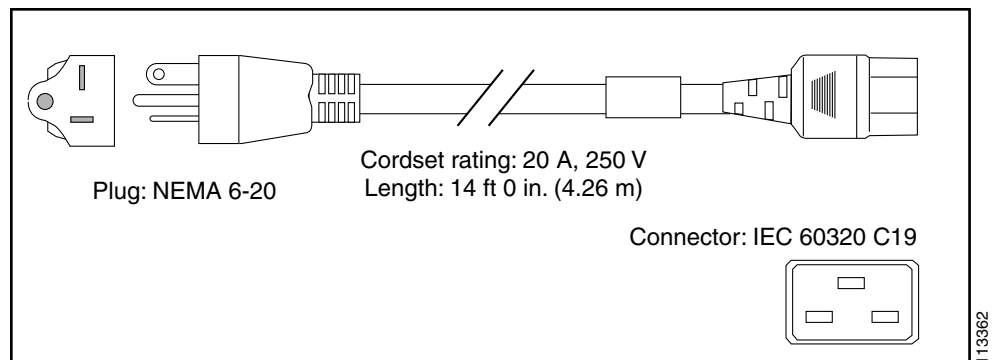
Figure 1-38   AC Power Cord CAB-AC-C6K-TWLK=

Plug: NEMA L6-20

Cordset rating: 20 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19
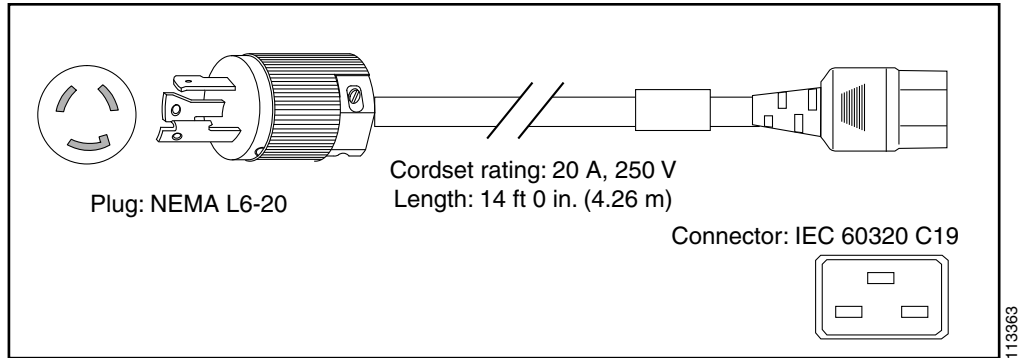
Figure 1-39   AC Power Cord CAB-7513ACSA=

Plug: IEC 884

Cordset rating: 16 A, 250 V
Length: 14 ft 0 in. (4.26 m)

Connector: IEC 60320 C19
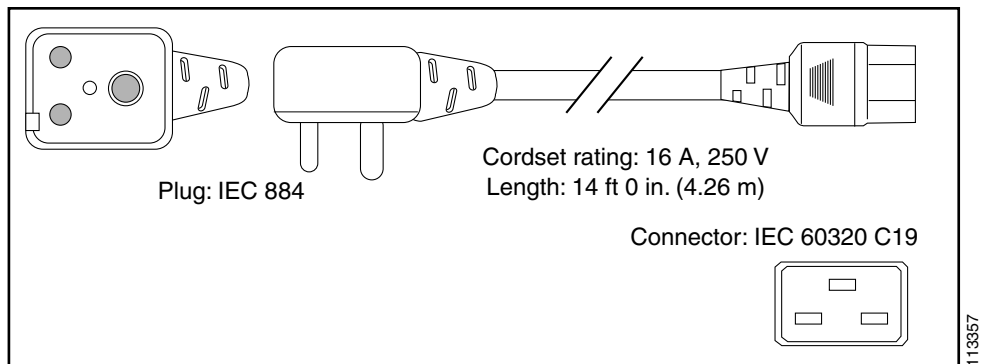
Figure 1-40   AC Power Cord CAB-ACS-16=

Plug: SEV 5934-2
Type 23

Cordset rating: 16 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: IEC 60320 C19
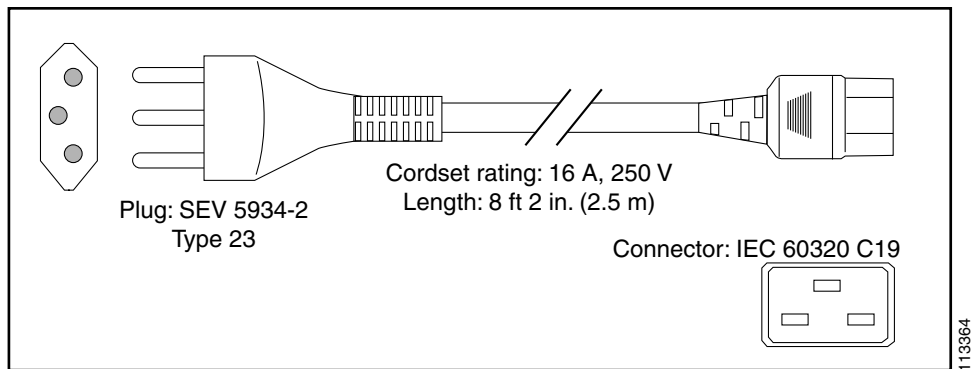
AC Power Cord Illustrations (Version 2 and Version 3 Power)

This section contains the AC power cord illustrations for version 2 power, as described in Table 1-4.

Figure 1-41   AC Power Cord PWR-CAB-AC-CHN=
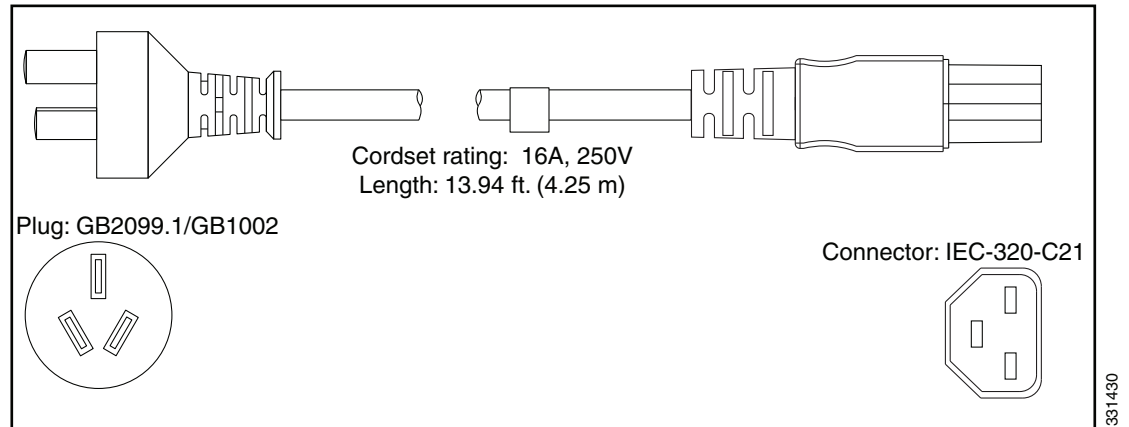
Figure 1-42   AC Power Cord PWR-CAB-AC-EU=
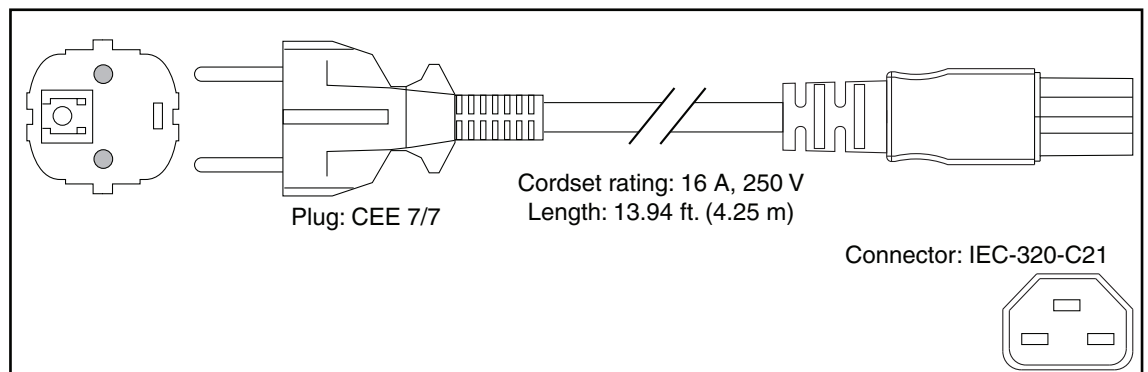
Figure 1-43   AC Power Cord PWR-CAB-AC-ISRL=
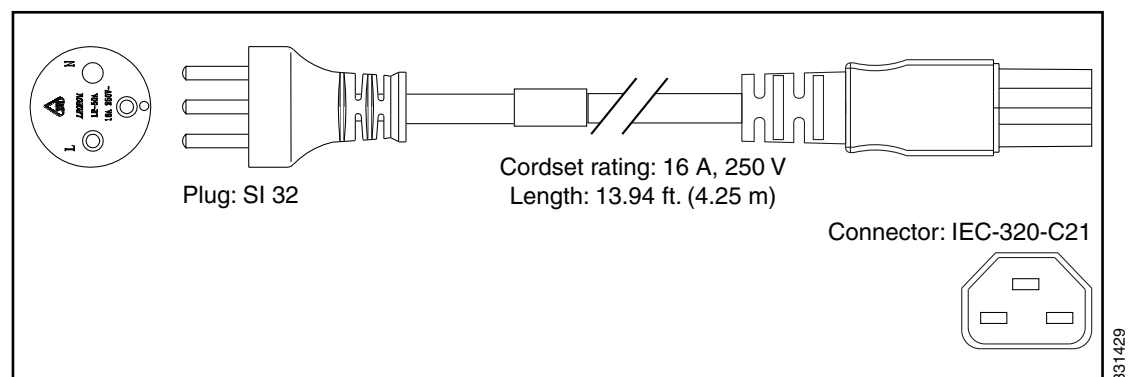
Figure 1-44   AC Power Cord PWR-CAB-AC-USA=

Plug: NEMA L6-20 P

Cordset rating: 20 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331422
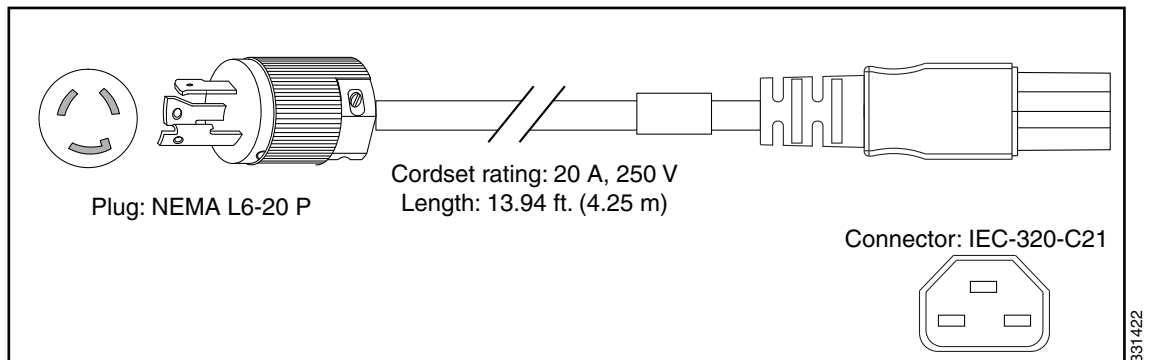
Figure 1-45   AC Power Cord PWR-CAB-AC-AUS=

Plug: AU20S3

Cordset rating: 15 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331423
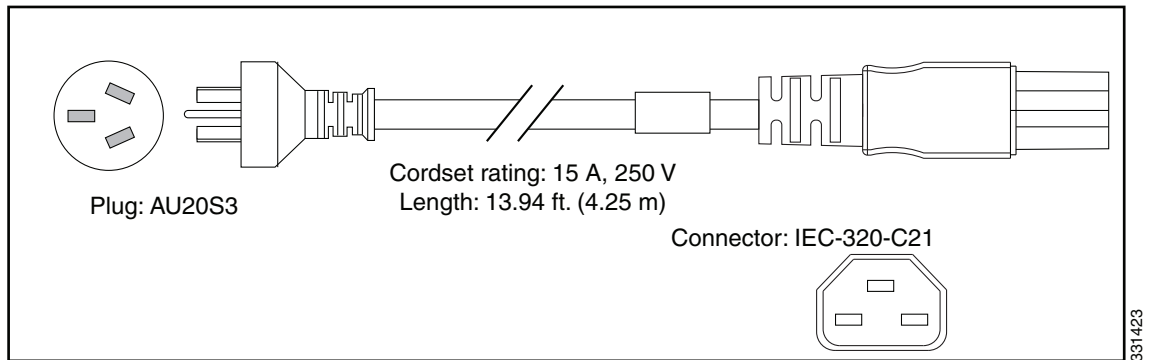
Figure 1-46   AC Power Cord PWR-CAB-AC-ITA=

Plug: CEI-23-50

Cordset rating: 16 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331425
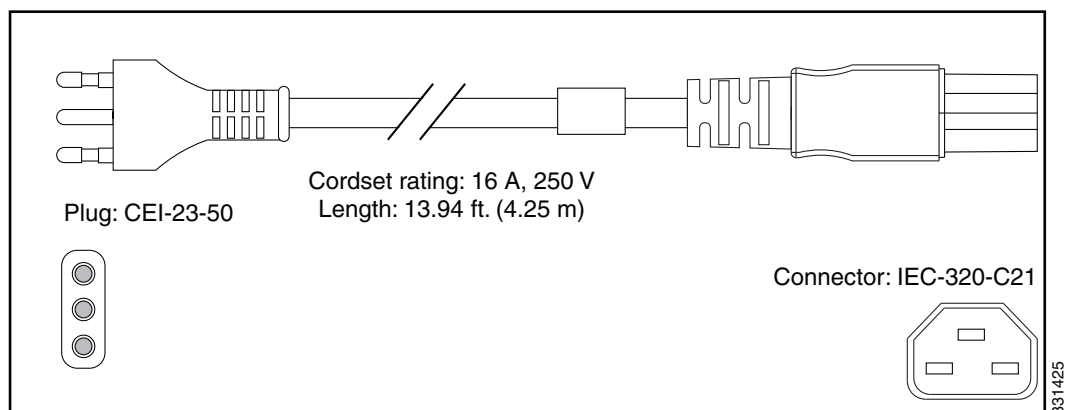
Figure 1-47   AC Power Cord PWR-CAB-AC-BRA=

Plug: NBR 14136

Cordset rating: 16 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331431
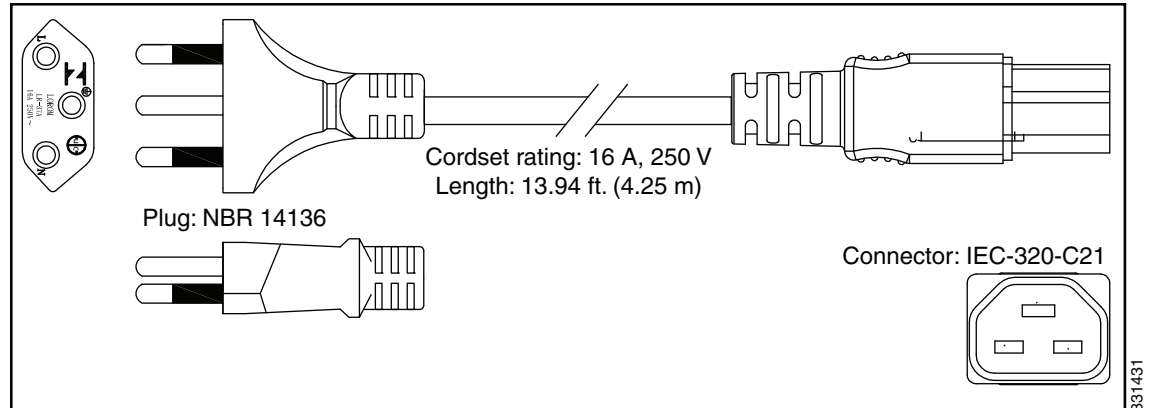
Figure 1-48   AC Power Cord PWR-CAB-AC-SA=

Plug: SABS 164

Cordset rating: 16 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331428
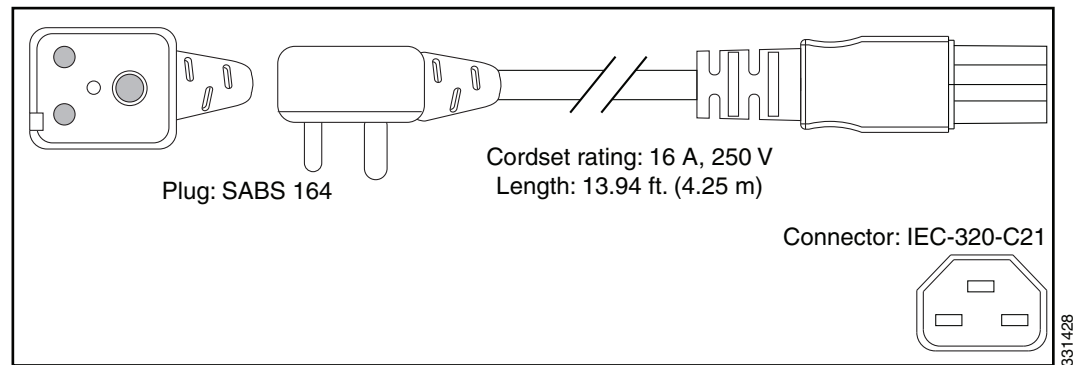
Figure 1-49   AC Power Cord PWR-CAB-AC-UK=

Plug: EN-60309-2

Cordset rating: 16 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331431
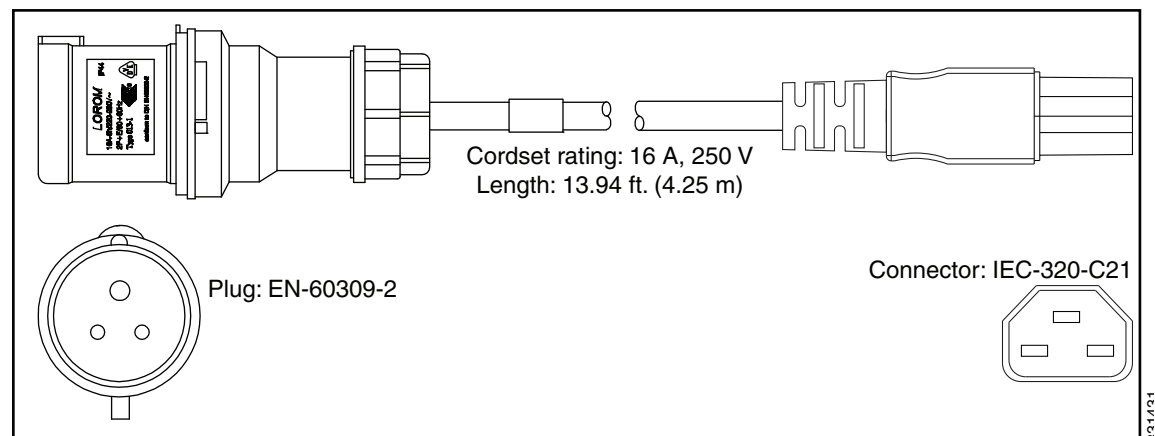
Figure 1-50   AC Power Cord PWR-CAB-AC-SUI=

Plug: SEV 5934

Cordset rating: 16 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331427
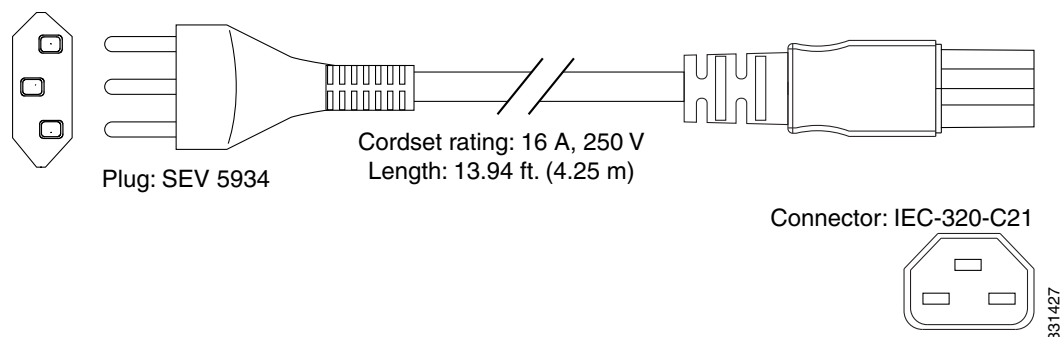
Figure 1-51   AC Power Cord PWR-CAB-AC-JPN=

Plug: JIS C8303

Cordset rating: 20 A, 250 V
Length: 13.94 ft. (4.25 m)

Connector: IEC-320-C21

331424
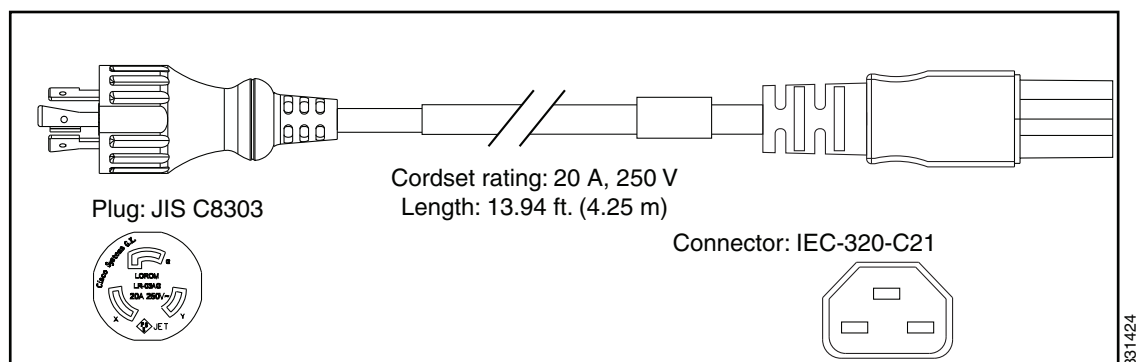
DC-Powered Router

Connections to DC power modules are rated at 60 A maximum. The system accepts a nominal input voltage of –48 VDC with an operational tolerance range of –40 VDC to –72 VDC. One dedicated, commensurately rated DC power source is required for each power module connection.

Power redundancy requirements vary based on the system configuration (number and type of line cards, etc.). DC-powered systems are N+1 protected. A minimum of two power supplies are required for redundant operation. Refer to the Cisco ASR 9000 Power Calculator to determine actual redundancy requirements for any given configuration. See: http://tools.cisco.com/cpc/launch.jsp.

Power connections to the power tray for each DC power module requires four cables: two source cables and two return cables. In addition, each DC power tray requires one earth ground, so the minimum number of cables for connecting a single DC power module in a power tray is five (two source, two return, one ground).

Note   A separate ground connection is not required for the version 2 and version 3 power systems. For more information see NEBS Supplemental Unit Bonding and Grounding Guidelines, page 1-52.

For DC power cables, we recommend that you use 60-A-rated, high-strand-count copper wire cables. The length of the cables depends on your router location from the source power. DC power cables are not available from Cisco, but they are available from any commercial cable vendor.

You must terminate DC power cables using cable lugs at the power tray end. Ensure that the lugs are dual-hole and that they fit over M6 terminal studs at 0.625-inch (15.88-mm) centers. For #4 AWG cable, use Panduit part number LCD4-14AF-L or equivalent; for #6 AWG, use Panduit part number LCD6-14AF-L or equivalent.

Warning   **Hazardous voltage or energy may be present on power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place.** Statement 1086

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

Note   Before connecting DC power cords to the power system, make sure that the input power cords are not energized.

Note   Ensure that there is a readily accessible disconnect device incorporated in the building's installation wiring.

Note   Circuit breaker and fuse lockout procedures should follow the rules and regulations in the National Electrical Code (NEC) and any local codes.

Figure 1-52 shows the lug type required for DC input cable connections.

Figure 1-52   Typical DC Power Cable Lug
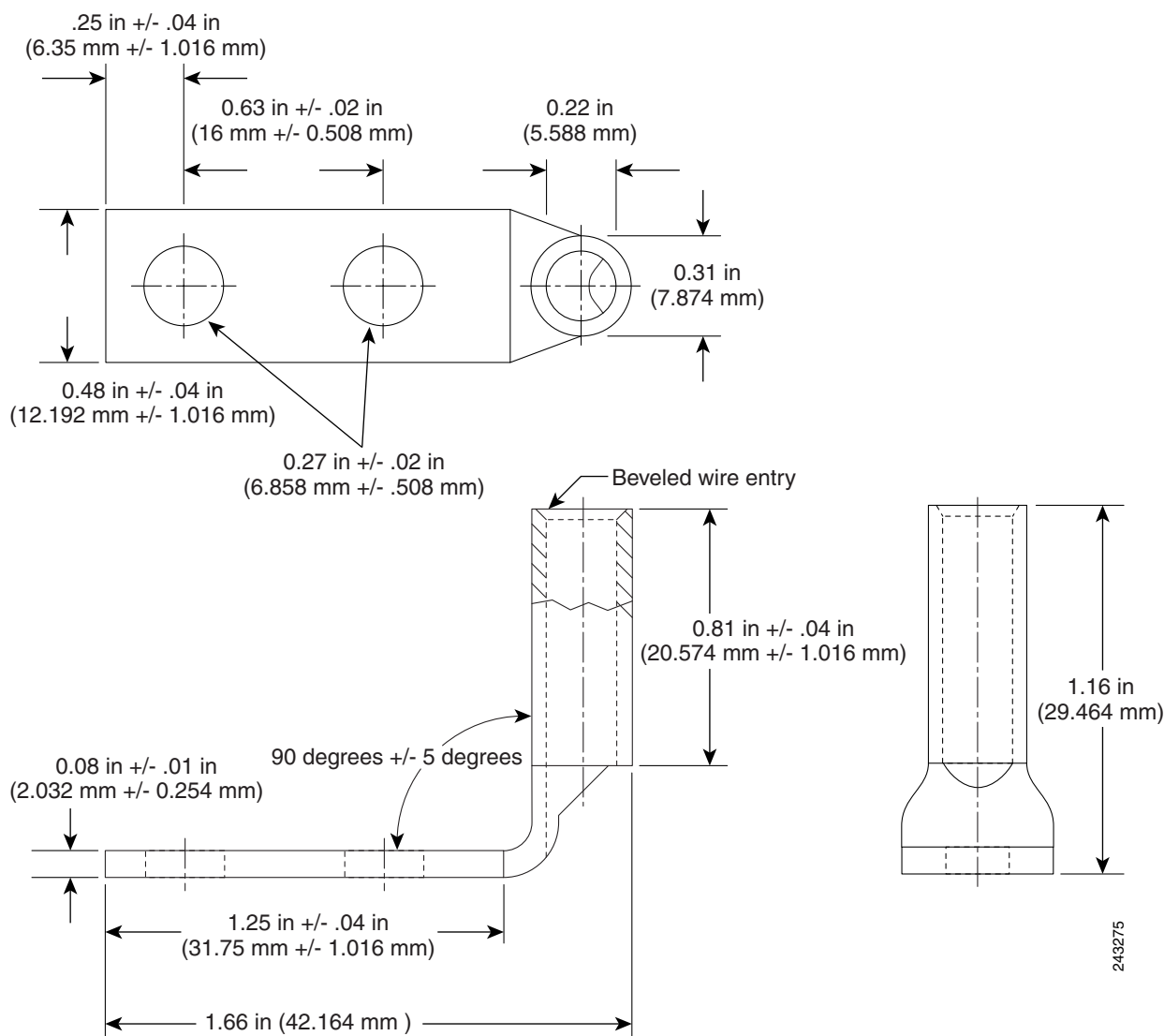
- Figure 1-53 shows typical DC power source cable connections for a version 1 single DC power module, in this case, a module installed in slot M2 of the power tray.

- Figure 1-54 shows typical DC power source cable connections for a version 2 single DC power module, in this case, a module installed in slot M3 of the power tray.

- Figure 1-55 shows the plastic safety cover for the version 2 and version 3 DC power tray connection terminals.

- Figure 1-56 shows typical DC power source cable connections for a version 3 single DC power module, in this case, a module installed in slot M3 of the power tray.

Note   The DC power trays and power modules for the Cisco ASR 9000 Series Routers are identical, so the examples shown in Figure 1-53, Figure 1-54, Figure 1-55 and Figure 1-55 apply to all of these routers.

⚠️ **Warning**   **To avoid shock hazard, be sure to apply shrink wrap tubing around the wire entry area of the lug.**

Figure 1-53   Typical Source DC Power Cabling Scheme for a Single DC Power Module—Version 1 Power System
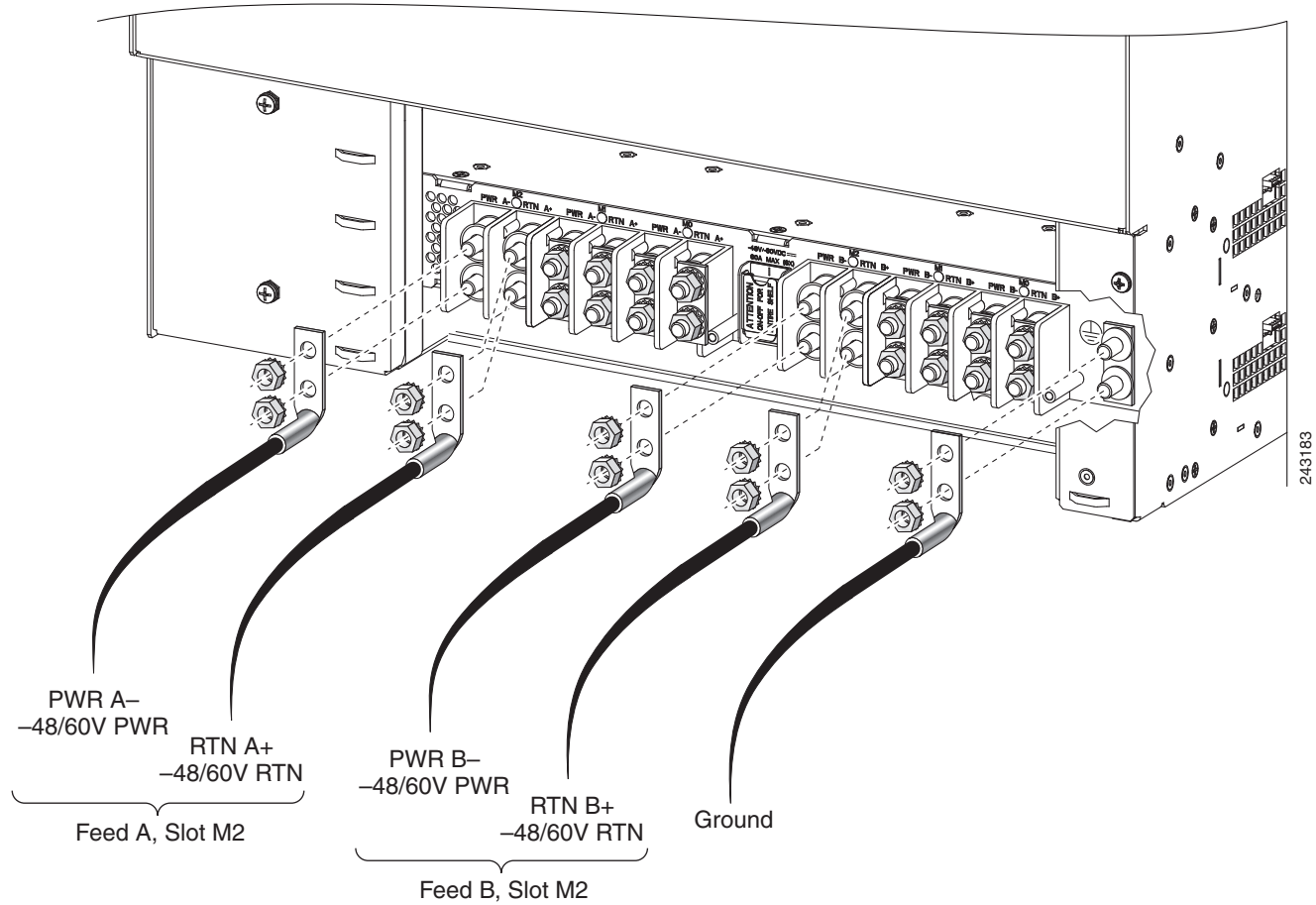
Figure 1-54   *Typical Source DC Power Cabling Scheme for a Single DC Power Module—Version 2 Power System*
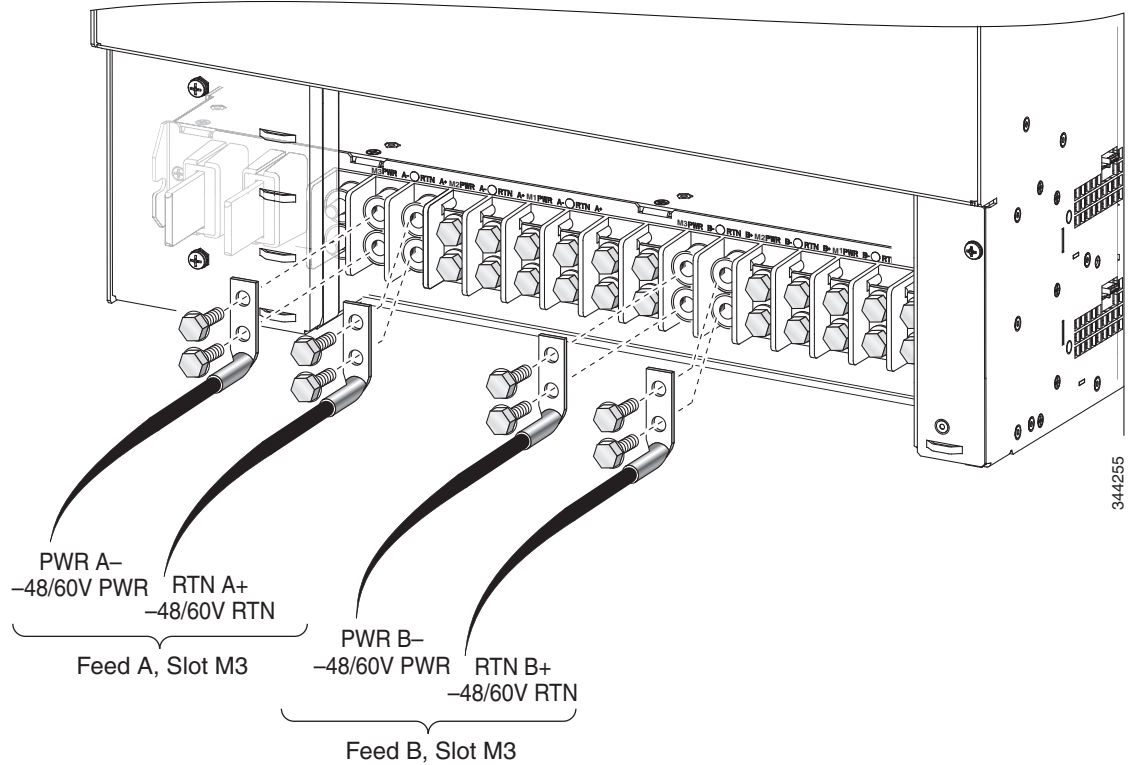
Figure 1-55   *Typical Plastic Safety Cover over the Power Tray Connection Terminals—Version 2 and Version 3 Power System*
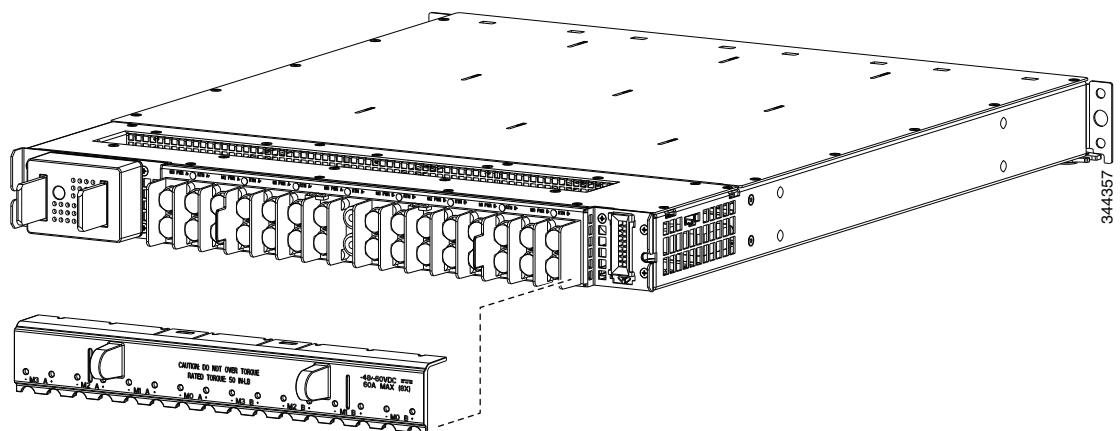
Figure 1-56   Typical Source DC Power Cabling Scheme for a Single DC Power Module—Version 3 Power System
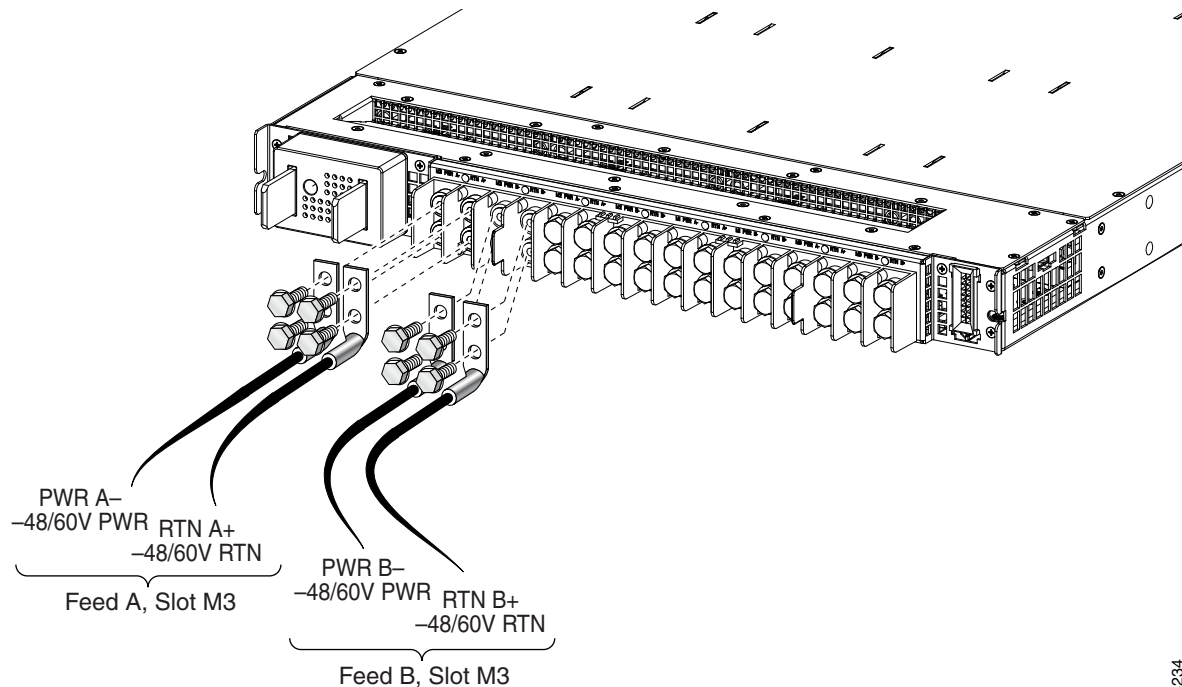
> **Note**   A separate ground connection is not required for the version 2 or version 3 power systems. For more information see the NEBS Supplemental Unit Bonding and Grounding Guidelines, page 1-52.

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, 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 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 "Appendix A."

NEBS Supplemental Unit Bonding and Grounding Guidelines

Although the router chassis requires a safety earth ground connection as part of the power cabling to power modules, you must permanently connect the central office ground system or interior equipment grounding system to one of the three supplemental bonding and grounding connections on the back or 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. 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 or DC power modules.

Figure 1-57   NEBS Bonding and Grounding Points on the Cisco ASR 9006 Router Chassis
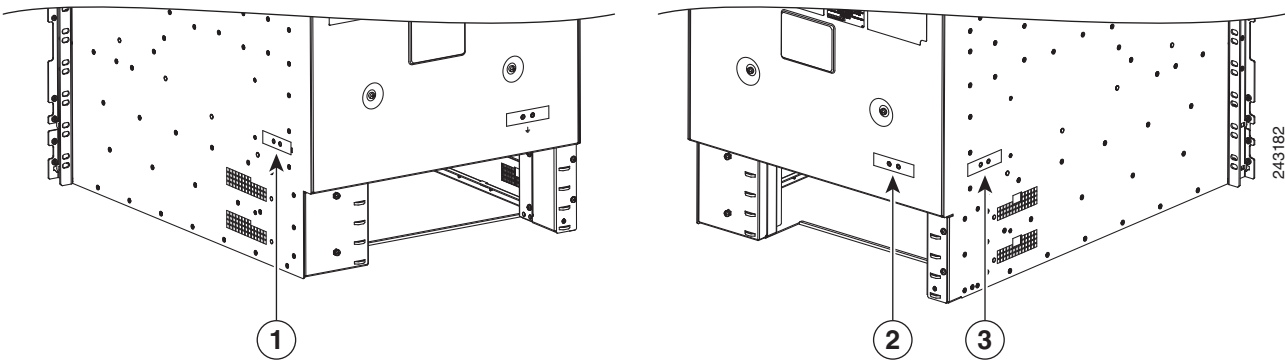
1	NEBS grounding point on right side of the chassis	2	NEBS grounding point on rear of the chassis	3	NEBS grounding point on left side of the chassis

Figure 1-58   NEBS Bonding and Grounding Point on the Cisco ASR 9006 Router Chassis

1	NEBS grounding point on right side of chassis	**2**	NEBS grounding point on rear of the chassis	**3**	NEBS grounding point on left side of the chassis
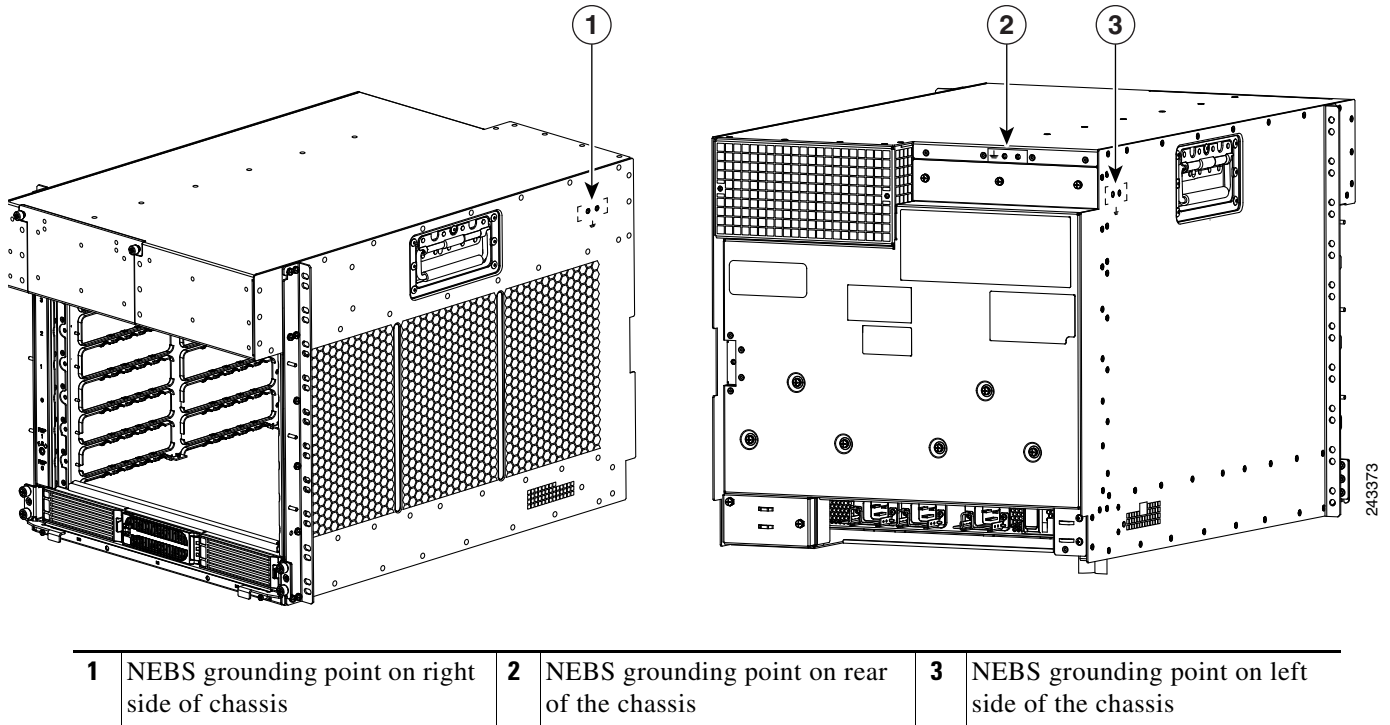
Figure 1-59   NEBS Bonding and Grounding Point on the Cisco ASR 9904 Router Chassis

1	NEBS grounding point on right side of chassis	**2**	NEBS grounding point on rear of the chassis
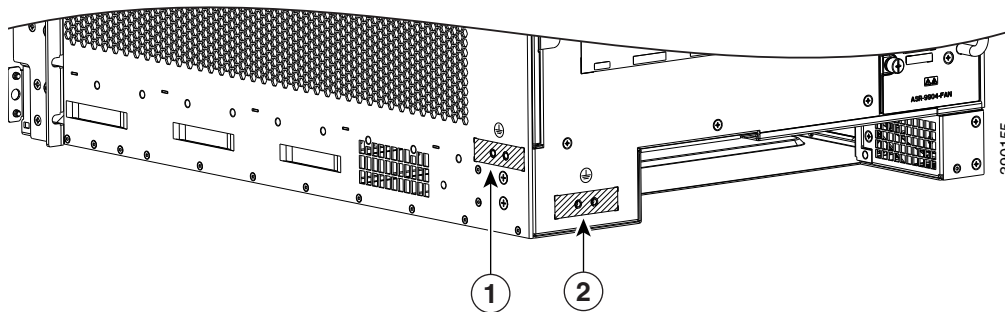
Figure 1-60   NEBS Bonding and Grounding Point on the Cisco ASR 9912 Router
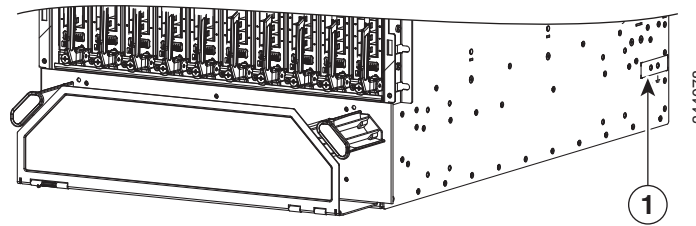
1	NEBS grounding point near bottom, rear, right side of the chassis

Figure 1-61   NEBS Bonding and Grounding Point on the Cisco ASR 9922 Router
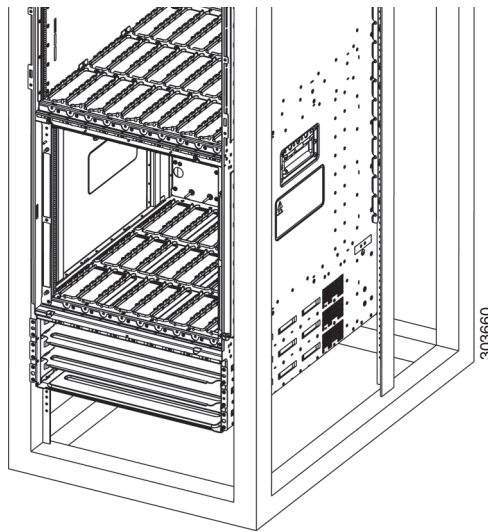
1	NEBS grounding point near bottom, rear, right side of the chassis

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

- 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 able to accept a 2-6 AWG or larger, multistrand copper wire. This lug is similar to those used for the DC input power supply leads (Figure 1-52).

- Two 10-32 round-head screws and two locking washers (nickel-plated brass is ideal).

- One grounding wire. Although we recommend at least 2-6 AWG multistrand copper wire, the wire diameter and length depend on your router location and site environment.

Note   These parts are not available from Cisco, but they are available from commercial vendors.

RSP and RP Port Connection Guidelines

This section contains detailed cabling and signal information for interface and port connections to the Route System Processor (RSP) or Route Processor (RP) cards. It also provides information for Ethernet routing and equipment.

Note   The generic term RSP card refers to the RSP-440, RSP-440 Lite, and RSP-880 cards, unless otherwise specified.

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.

Console Port and Auxiliary Port Connection Guidelines

Each RSP/RP card 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.

For the console and auxiliary port locations, see .

Console Port Signals

The *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 console port, which is 9600 bps. Set the terminal to these operational values: 9600 bps, 8 data bits, no parity, 2 stop bits (9600 8N2).

Table 1-5 lists the signals used on the console port.

Table 1-5   RSP/RP Console Port Signals

Console Port Pin	Signal	Input/Output	Description
1	—	—	—
2	DTR	Output	Data Terminal Ready
3	TxD	Output	Transmit data
4	GND	—	Signal ground
5	GND	—	Signal ground
6	RxD	Input	Receive data
7	DSR	Input	Data Set Ready
8	—	—	—

Auxiliary Port Signals

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

Table 1-6 lists the signals used on the auxiliary port.

Table 1-6   RSP/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
7	DSR	Input	Data set ready
8	CTS	Input	Clear to send

Management LAN Ports Connection Guidelines

Each RSP/RP card has two RJ-45 media-dependent interface (MDI) Ethernet management LAN ports: MGT LAN 0 and MGT LAN 1. These ports are used for IEEE 802.3u 100BASE-TX (100 Mbps), or 1000BASE-T (1000 Mbps) Ethernet connections. For the management port locations, see Route Processor Overview, page 4-19.

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

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 (100/1000) and duplex (full/half) is supported. Autonegotiation cannot be disabled.

Table 1-7 lists the signals used on the Management LAN ports.

Table 1-7   RSP/RP Management LAN Port Signals

MGT LAN Port Pin	100Base-TX Signal	1000Base-T Signal
1	Transmit+	BI_DA+
2	Transmit–	BI_DA–
3	Receive+	BI_DB+
4	Unused	BI_DC+
5	Unused	BI_DC–
6	Receive–	BI_DB–
7	Unused	BI_DD+
8	Unused	BI_DD–

Management LAN Port LED Indicators

The Management LAN connectors have integral LED indicators (Figure 1-62). When lit, these LEDs indicate:

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

Figure 1-62   **RSP/RP Management LAN Port LED Indicators**
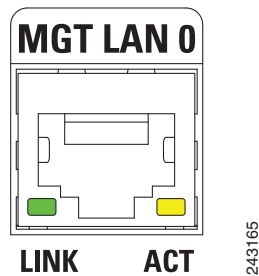
Management LAN RJ-45 Cabling

When connecting the RJ-45 port to a hub, repeater, or switch, use the straight-through cable pinout as shown in Figure 1-63.

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

Figure 1-63   **Straight-Through Cable Pinout to a Hub, Repeater or Switch**

MDI wiring   MDI-X wiring

    1 TxD+ ——————— 1 RxD+
    2 TxD– ——————— 2 RxD–

    3 RxD+ ——————— 3 TxD+
    6 RxD– ——————— 6 TxD–
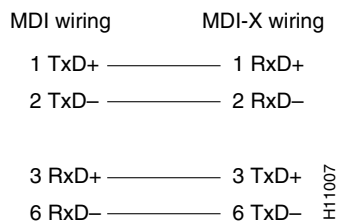
When connecting the RJ-45 port to a router, use the crossover cable pinout as shown in Figure 1-64.

Figure 1-64   **Crossover Cable Pinout Between RSPs/RPs**

    PRP   PRP
    1 TxD+   1 TxD+
    2 TxD–   2 TxD–

    3 RxD+   3 RxD+
    6 RxD–   6 RxD–
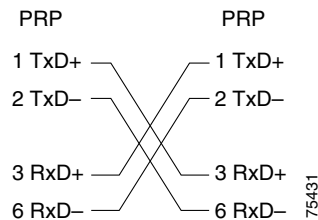
Alarm Connection Guidelines

The RSP/RP card has an alarm connector on its front panel. This 9-pin D-subconnectors (ALARM OUT) connects the router to an external site alarm maintenance system (Figure 1-65). When a critical, major, or minor alarm is generated, it energizes the alarm relays on the RSP/RP card to activate the external site alarm.

Figure 1-65   Alarm Connector on the RSP/RP Card Front Panel
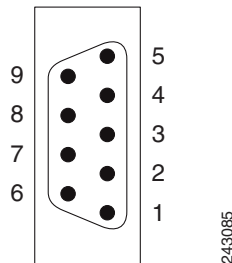
The alarm relay contacts on the RSP/RP card consist of standard common, normally open, and normally closed relay contacts that are wired to the pins on the connectors.

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Caution   Only safety extra-low voltage (SELV) circuits can be connected to the alarm connector. Maximum rating for the alarm circuit is 100 mA, 50 V.

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

Table 1-8 lists the pin-to-signal correspondence between the cable connector pins and the alarm connector relay contacts.

Table 1-8   Alarm Connector Pinout

Pin	Signal	Note
1	Critical alarm NC	NC (normally closed) connected to CM (common) when there is no Critical alarm
2	Critical alarm CM	Common
3	Critical alarm NO	NO (normally open) connected to CM (common) during a Critical alarm
4	Major alarm NC	NC (normally closed) connected to CM (common) when there is no Major alarm
5	Major alarm CM	Common
6	Major alarm NO	NO (normally open) connected to CM (common) during a Major alarm
7	Minor alarm NC	NC (normally closed) connected to CM (common) when there is no Minor alarm
8	Minor alarm CM	Common
9	Minor alarm NO	NO (normally open) connected to CM (common) during a Minor alarm

Sync Port 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 (Figure 1-66).

Note   Both ports must be configured to be 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 for establishing precise frequency control at multiple network nodes, if required for your application. The RSP/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 RSP/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.

When lit, these LEDs indicate for BITS:

- Green (LINK)—Connection is alive.
- Amber (FAULT)—A fault has occurred.

When lit, these LEDs indicate for UTI:

- Green (NORMAL)—UTI is operating in normal mode.
- Amber (FAST)—UTI is operating in fast mode.

Figure 1-66   SYNC Port Connector
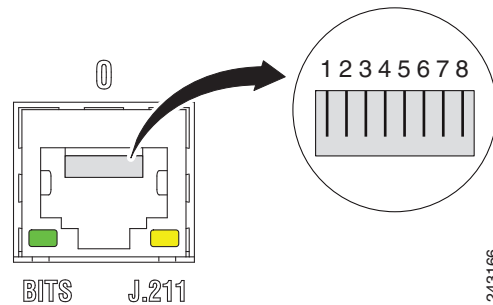
Table 1-9   BITS/J.211 Connector Pinout

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	—	—

SFP/SFP+ Port

The RSP-440 and RSP-440 Lite support two 10-GE Small Form-Factor Pluggable Plus (SFP+) virtualization cluster ports. The RSP-880 supports four 10-GE SFP+ ports that are used for external server connectivity capability.

GPS Interface

The RSP-440, RSP-440 Lite, and RSP-880 have a Time of Day (ToD) port, 10-MHz connector, and 1-PPS connector that allow you to configure input or output clocking with a GPS device.

Inter Chassis Synchronization Port

The nV Sync 0 and nV Sync 1 ports on the RSP-440, RSP-440 Lite, and RSP-880 are the RJ-45 inter-chassis synchronization clock interfaces for synchronizing frequency and time.

CMP Port

The Connectivity Management Processor (CMP) on the RSP-440, RSP-440 Lite, and RSP-880 card, is a secondary, lightweight processor that provides a second network interface to the system. Each CMP contains its own RAM, bootflash, and front panel management Ethernet port.

The CMP port provides the following functions:

- RSP4 ROMMON console access through the CMP port. This eliminates the need to use external terminal servers.
- SSH/telnet into a designated CMP port.

RSP Compact Flash Slot

The Cisco ASR 9000 Series Router RSP cards support a single ATA/IDE type I/II compact flash external slot accessible on the front panel. The compact flash slot has a door that can be closed whether a compact flash device is present or not. The file systems supported on compact flash are DOS/FAT or QNX4. The compact flash comes with a DOS format. The supported flash disk sizes and their Cisco part numbers are listed in Table 4-5.

The RSP-440, RSP-440 Lite, and RSP-880 cards do not have an ATA/IDE type I/II compact flash external slot.

USB Port

The RSP-440, RSP-440 Lite, RSP-880, and Cisco ASR 9922 Router RP cards have a single external Universal Serial Bus (USB) port. A USB flash memory device can be inserted to load and transfer software images and files. This memory device can be used to turboboot the system or as the installation source for Package Information Envelopes (PIE) and Software Maintenance Upgrades (SMU). This memory device can also be used for users' data files, core files, and configuration backups.

CHAPTER **2**

Unpacking and Installing the Chassis

This chapter describes how to unpack and install the chassis into a rack.

Pre-Installation Considerations and Requirements

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

Observe the guidelines for preventing electrostatic discharge (ESD) damage described in the "Preventing Electrostatic Discharge Damage" section on page 1-2.

See the *Regulatory Compliance and Safety Information for the Cisco ASR 9000 Series Router* document for additional safety and compliance information,

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Caution   This 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 4-post equipment rack.

Installation Overview

Figure 2-1 shows how the Cisco ASR 9010 Router is shipped and strapped to a shipping pallet.

Figure 2-1   *Cisco ASR 9010 Router Packaged on a Shipping Pallet*
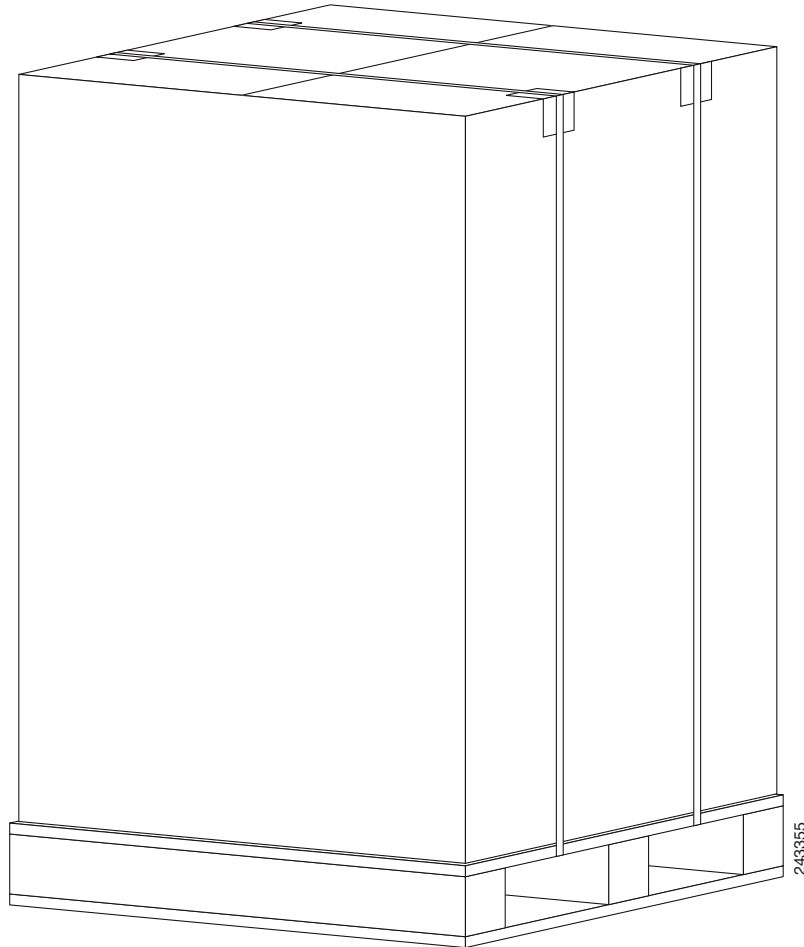
A fully equipped router with six power modules can weigh as much as 375 lbs (170.5 kg); an empty chassis weighs 150 lbs (67.8 kg). The chassis is designed to be lifted by two persons *after* you remove some of the components, such as line cards, power supplies, and the fan tray, to reduce the weight before lifting the chassis. See Removing Components Before Installing the Chassis, page 2-18 for procedures to remove these components.

Required Tools and Equipment

Before you begin the rack-mount installation, you must read and understand the information in the Rack-Mounting and Air Flow Clearance Guidelines, page 1-20, and have the 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 10 slotted binderhead screws (usually provided with the rack) to secure the chassis to the mounting flanges (also called *rails*) in the rack. Five screws should be installed on each side of the chassis.
- 11/16-inch (17.46-mm) wrench (for chassis hold-down bolts and pallet hold-down bracket bolts)
- 3/4-inch (19-mm) socket and ratchet wrench

Unpacking the Router

The following instructions describe how to unpack the Cisco ASR 9000 Series Router from its shipping container.

- Unpacking the Cisco ASR 9010 Router, page 2-3
- Unpacking the Cisco ASR 9006 Router, page 2-5
- Unpacking the Cisco ASR 9904 Router, page 2-7
- Unpacking the Cisco ASR 9922 Router, page 2-9
- Unpacking the Cisco ASR 9912 Router, page 2-13

Unpacking the Cisco ASR 9010 Router

Follow these steps to unpack the Cisco ASR 9010 Router from its shipping container.

Step 1   Cut the straps that secure the cardboard shipping container to the pallet.

Step 2   Remove the cardboard shipping container.

Step 3   Remove the packaging material (see Figure 2-2).

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

    b.   Remove all screws that secure the four hold-down brackets to the router chassis. The forward hold-down brackets are secured to the router mounting brackets by two screws. The rear hold-down brackets are secured to the chassis by four screws. Save these four screws used to hold the rear bracket to the chassis to use later to attach the ground strap.

Step 4   Remove two bolts per hold-down bracket that secure the brackets to the pallet.

Figure 2-2   Unpacking the Cisco ASR 9010 Router from the Shipping Container and Pallet
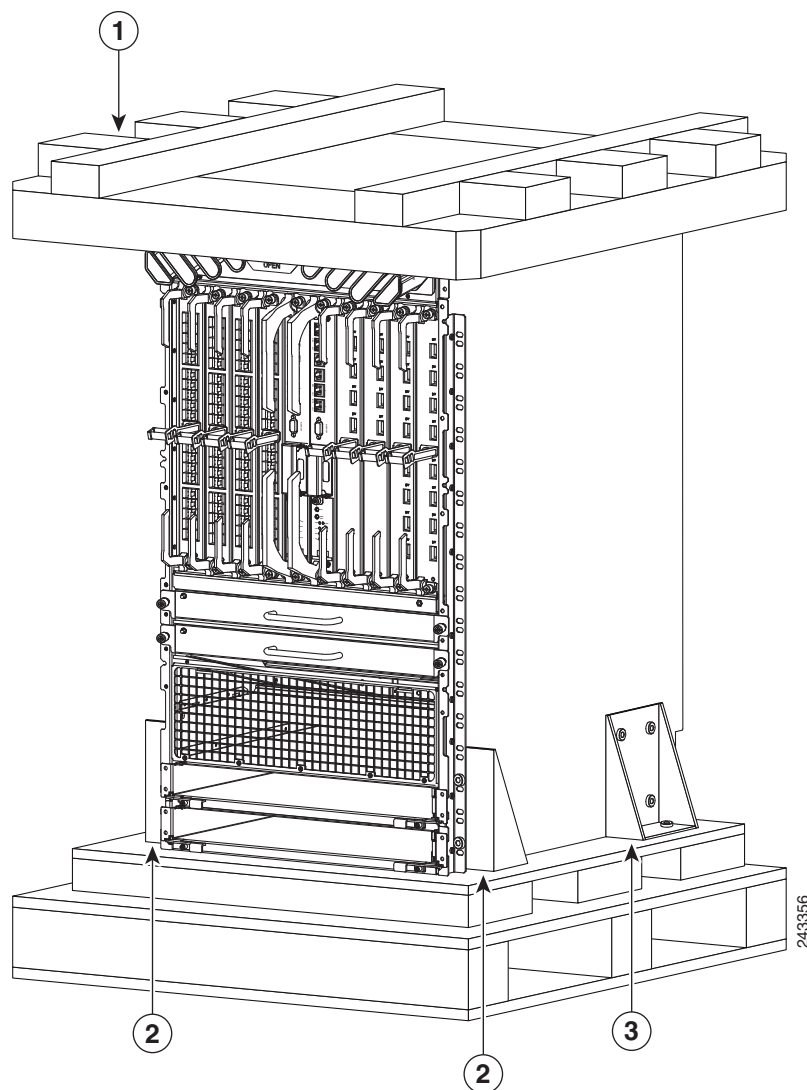
1	Foam packaging material-top cap	2	Front hold-down bracket secured by two screws to the chassis mounting brackets, and by two bolts to the pallet (two places)	3	Rear hold-down bracket secured by four screws to the chassis, and by two bolts to the pallet (two places)

Step 5   Remove components, such as line cards and the fan tray, to reduce the weight before lifting or moving the chassis. See the Removing Components Before Installing the Chassis, page 2-18 for more information.

Step 6   Save the packaging materials in case the router needs repackaging or shipping.

Unpacking the Cisco ASR 9006 Router

Follow these steps to unpack the Cisco ASR 9006 Router from its shipping container (Figure 2-3).

Step 1   Cut the straps that secure the cardboard shipping container to the pallet.

Step 2   Remove the cardboard shipping container.

Step 3   Remove the packaging material (Figure 2-3).

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

   b.   Remove all screws that secure the four hold-down brackets to the router chassis. The forward hold-down brackets are secured to the router mounting brackets by two screws. The rear hold-down brackets are secured to the chassis by four screws.

   c.   Remove two bolts per hold-down bracket that secure the brackets to the pallet.

Figure 2-3   *Unpacking the Cisco ASR 9006 Router from the Shipping Container and Pallet*
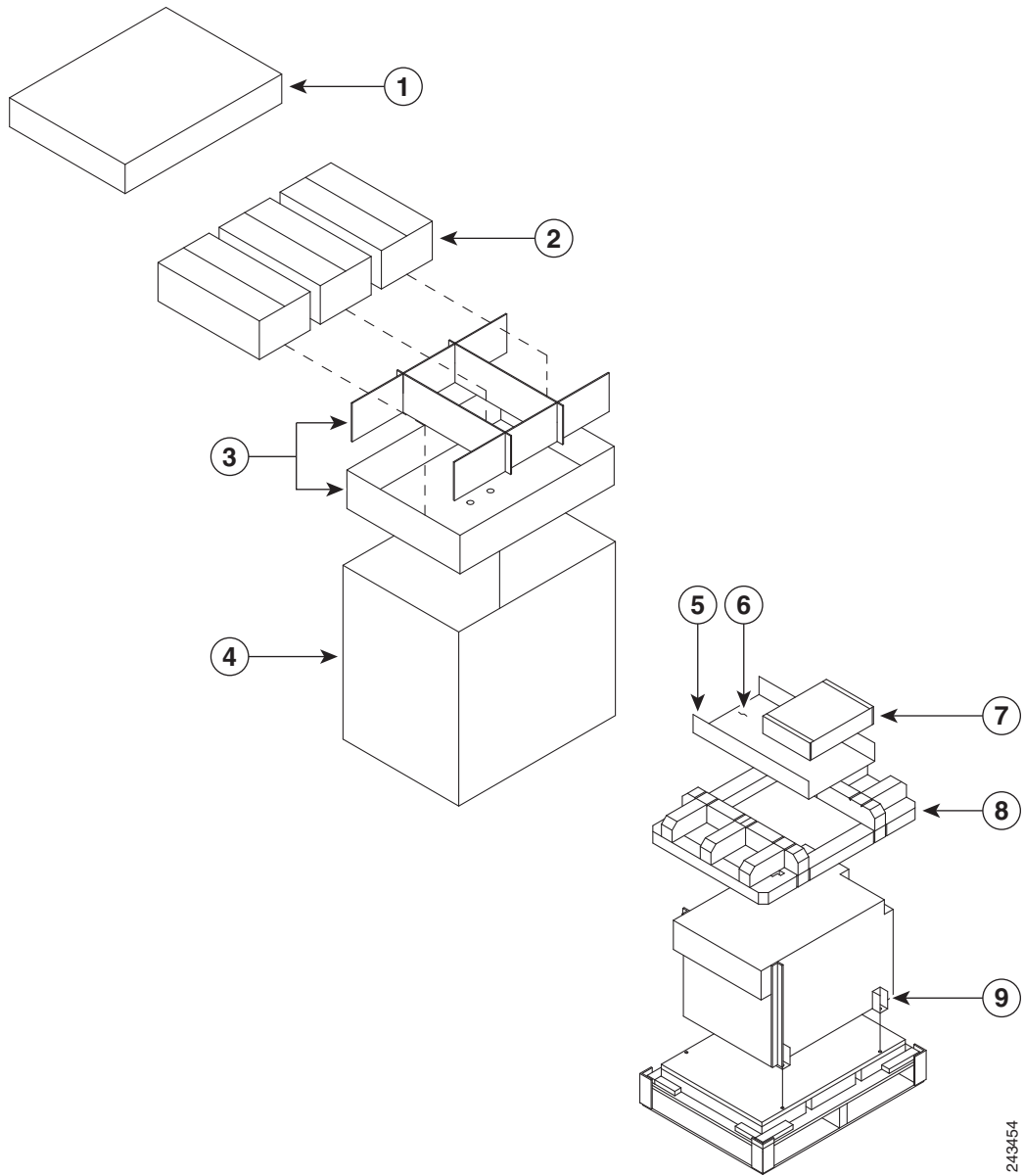
1	Top cardboard packaging cap	4	Cardboard packaging container	7	Chassis accessories
2	Three packaged power modules	5	Cardboard accessory tray	8	Foam packaging material-top cap
3	Cardboard packaging dividers	6	Accessories and power cables	9	Hold-down brackets (four places)

Step 4   Remove components, such as line cards, power supplies, and the fan tray, to reduce the weight before lifting or moving the chassis. See Removing Components Before Installing the Chassis, page 2-18 for more information.

Step 5   Save the packaging materials in case the router needs repackaging or shipping.

Unpacking the Cisco ASR 9904 Router

Follow these steps to unpack the Cisco ASR 9904 Router from its wooden shipping container.

Step 1   Cut the straps that secure the cardboard shipping container to the pallet.

Step 2   Remove the corrugated top shipping container.

Step 3   Remove the accessories and corrugated packing accessory tray.

Step 4   Remove the packing material (Figure 2-4).

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

   b.   Remove the plastic covering from the router and remove it from the bottom foam.

Figure 2-4   Unpacking the Cisco ASR 9904 Router from the Shipping Container and Pallet
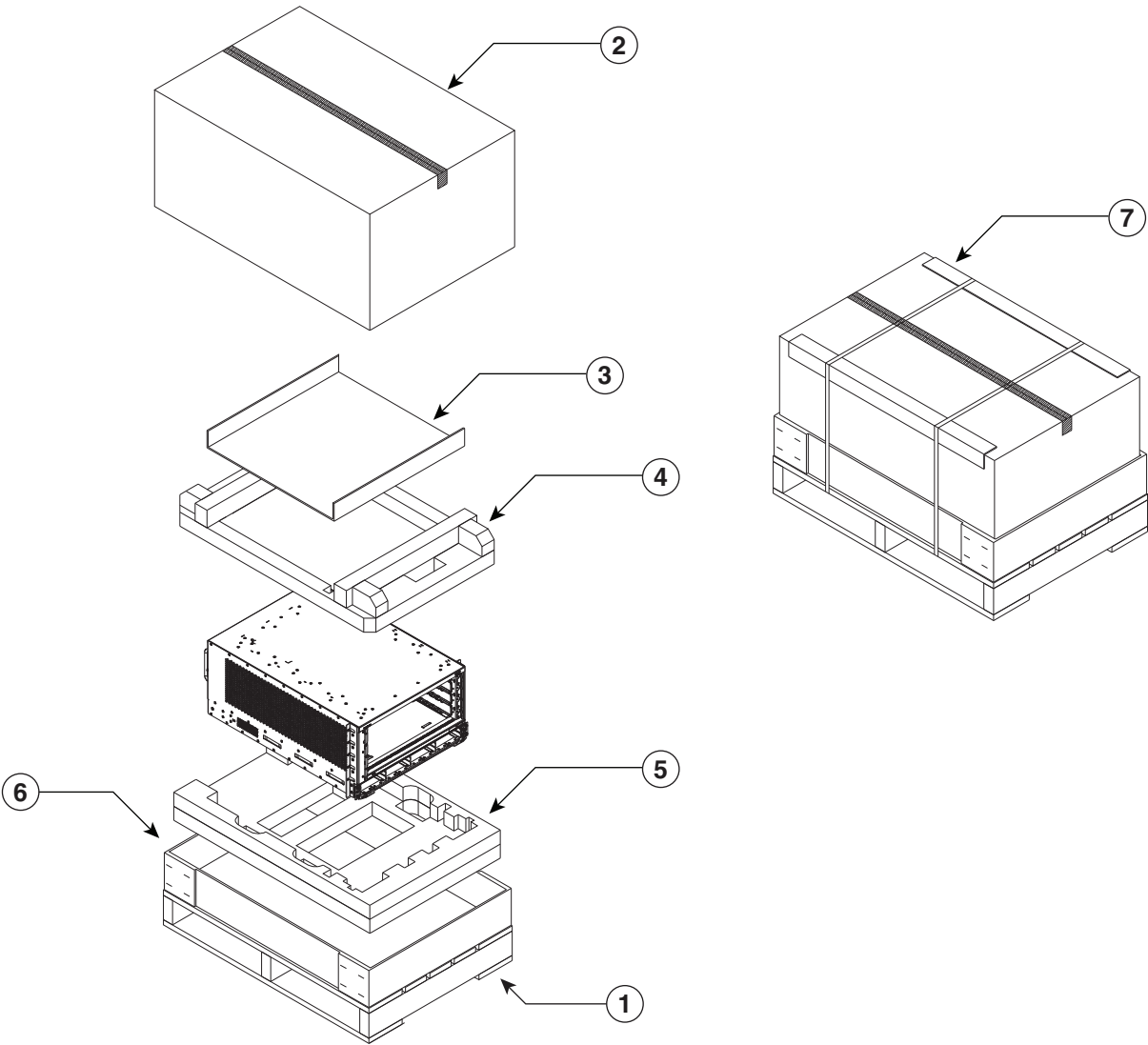
1	Shipping pallet	**4**	Foam packaging material (top cap)	**7**	Cardboard shipping container
2	Top corrugated packaging cap	**5**	Foam packaging material (bottom cap)		
3	Corrugated packaging accessory tray	**6**	Corrugated packaging (lower tray)		

Step 5   Remove components, such as line cards, power supplies, and the fan tray, to reduce the weight before lifting or moving the chassis. See Removing Components Before Installing the Chassis, page 2-18 for more information.

Step 6   Save the packaging materials in case the router needs repackaging or shipping.

Unpacking the Cisco ASR 9922 Router

Follow these steps to unpack the Cisco ASR 9922 Router from its wooden shipping container.

Step 1   Remove any strapping on the outside of the crate.

Step 2   Remove the crate cap door. Disengage the twist locks located along the bottom first. Then, disengage the twist locks located along the sides, working your way up from the bottom to the top. Refer to the right and middle figures in Figure 2-5.

Step 3   Remove the crate cap. Disengage the twist locks located around the bottom of the crate cap (Figure 2-5).

✎

Note   Two people are required to evenly slide the crate cap back off of the plastic pallet base.

Step 4   Remove the foam packaging material from the top of the router.

Figure 2-5   *Unpacking the Cisco ASR 9922 Router from the Shipping Container*
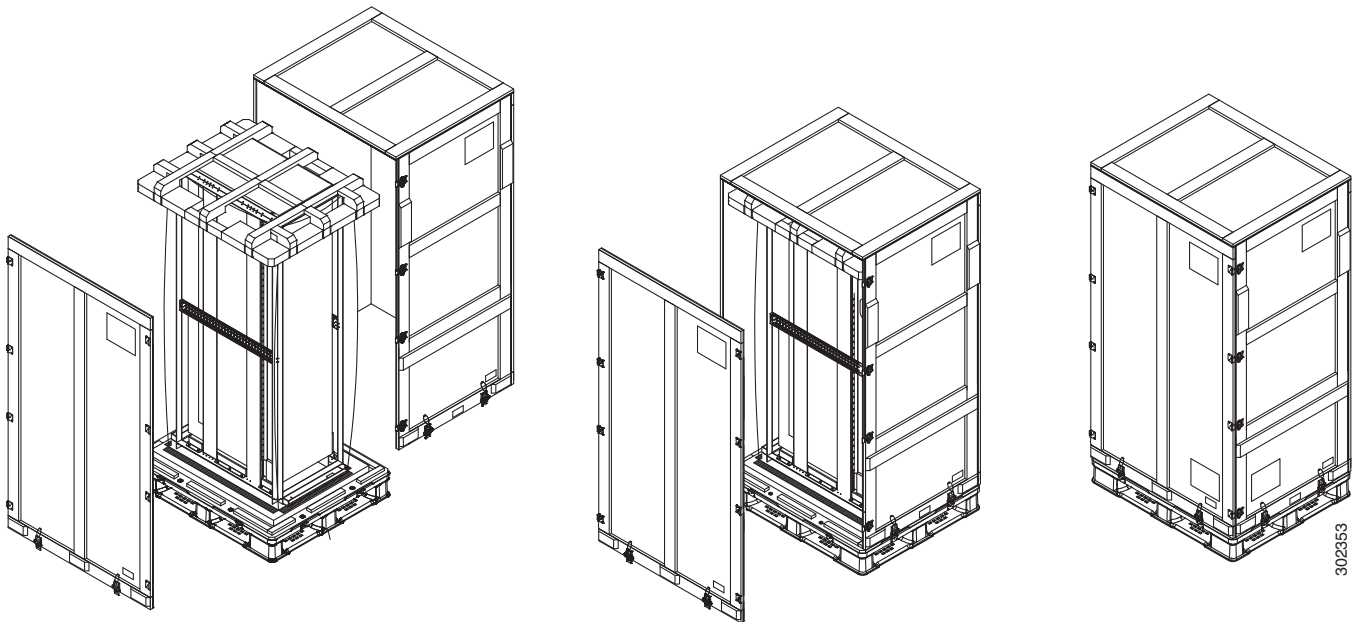
Step 5   Using a 5/16" wrench or ratchet, remove the four attachment bolts and cross-brace from the shipping rack (Figure 2-6).

Figure 2-6   Cross-brace and Attachment Bolts on the Shipping Rack
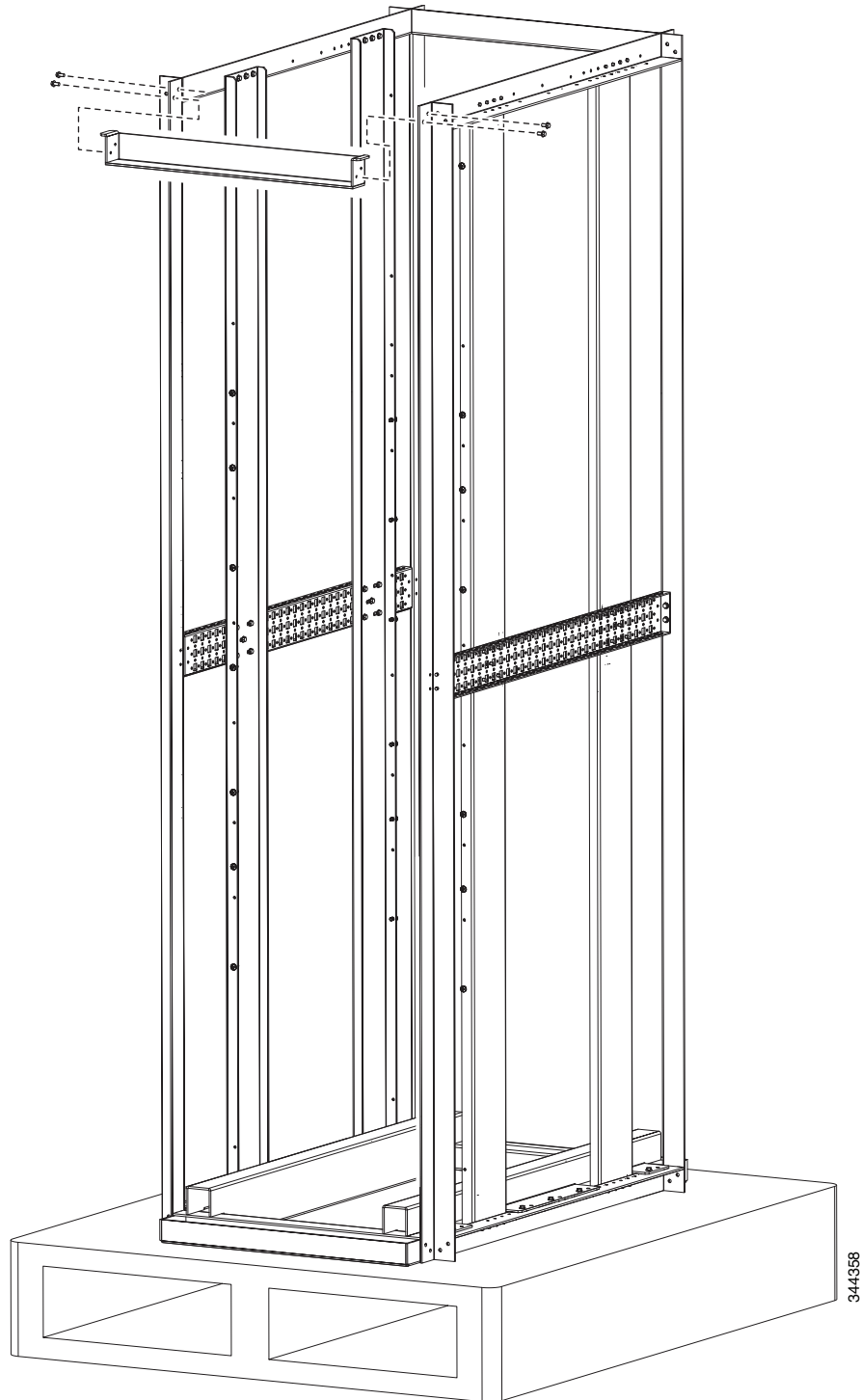
Step 6   Use a Phillips screwdriver to unscrew the rear mounting flange from the system and rack.

Step 7   Use a Phillips screwdriver to unscrew the front mounting flange from the rack.

Step 8   Remove two bolts per hold-down bracket that secure the brackets to the pallet (Figure 2-7).

Figure 2-7   Hold-Down Brackets on the Cisco ASR 9922 Router Shipping Pallet
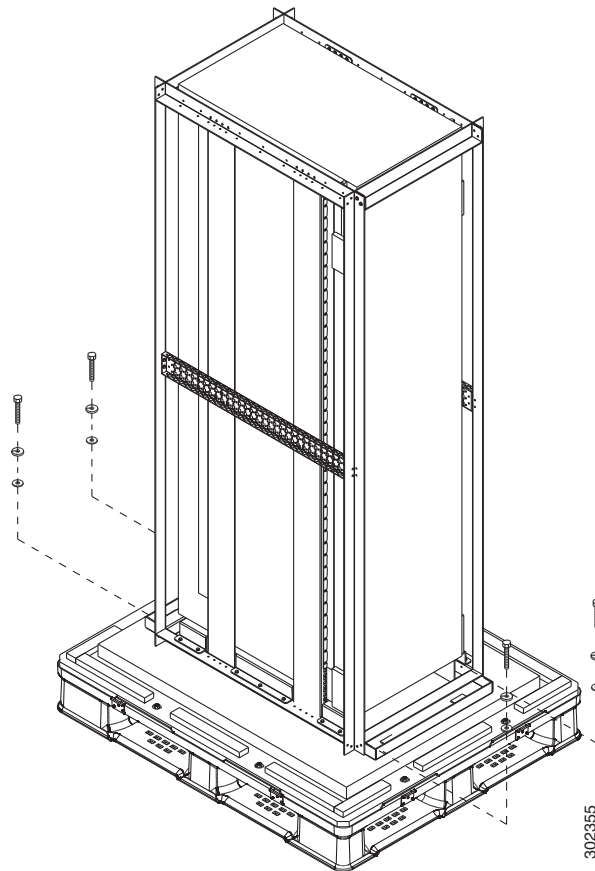
> **Note**   Do not unbolt the shipping rack from the pallet.

Step 9   Save the rear brackets and screws from the shipping packaging for reuse in rack mounting of the chassis (Figure 2-8).

> **Note**   The two guide rails at the bottom of the rack come in the ASR-9922-ACC-KIT accessory kit.

Figure 2-8   Rack Mount Installation Kit for the Cisco ASR 9922 Router
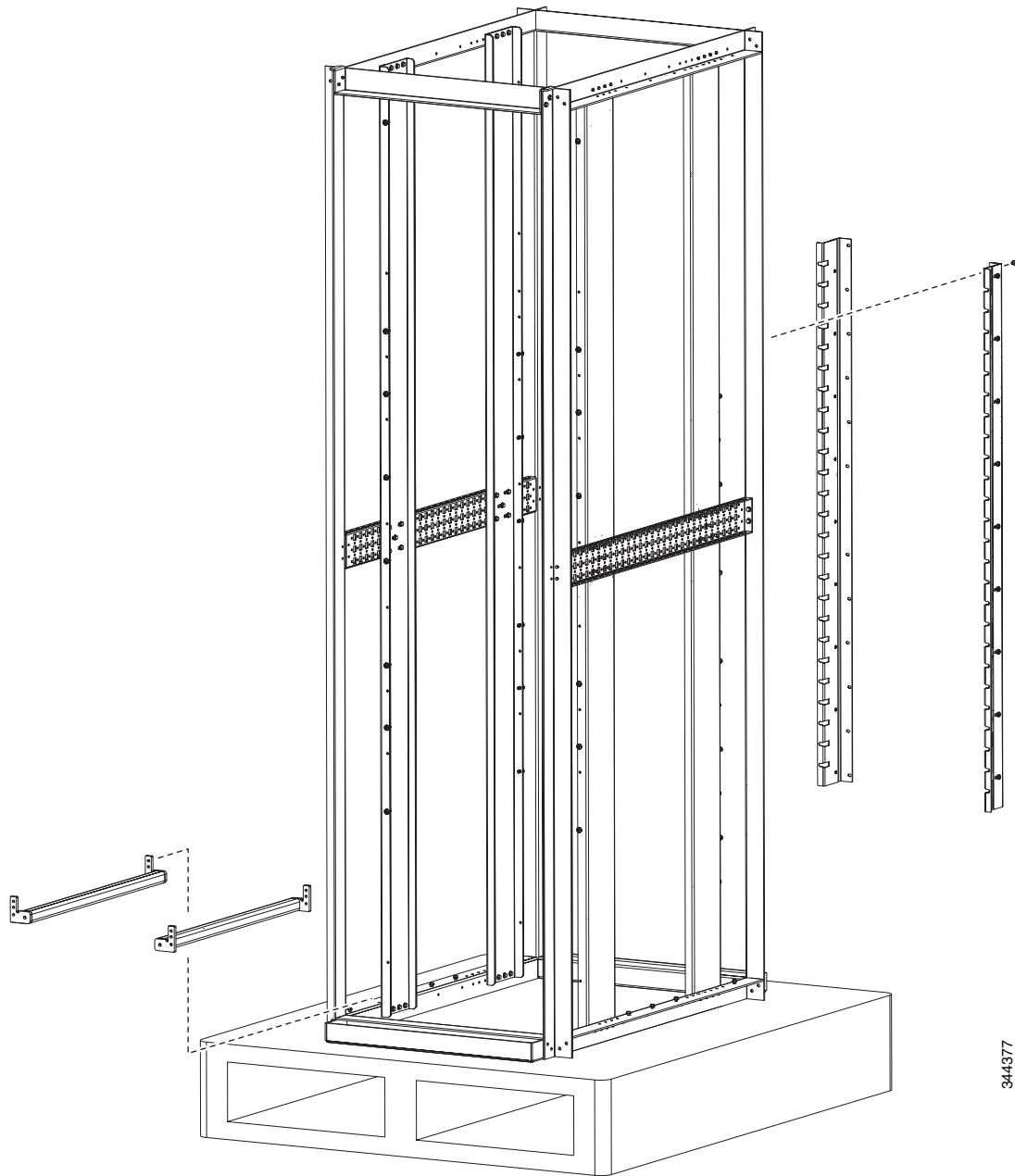
Step 10   Remove components, such as line cards and fan trays, to reduce the weight before lifting or moving the chassis. See Removing Components Before Installing the Chassis, page 2-18 for procedures showing how to remove these components.

Step 11   Save the packaging materials in case the router needs to be repackaged for shipping.

Unpacking the Cisco ASR 9912 Router

Follow these steps to unpack the Cisco ASR 9912 Router from its wooden shipping container.

Step 1   Remove any strapping on the outside of the crate.

Step 2   Remove the crate cap door. Disengage the twist locks located along the bottom first. Then, disengage the twist locks located along the sides, working your way up from the bottom to the top. Refer to the right and middle figures in Figure 2-9.

Step 3   Remove the crate cap. Disengage the twist locks located around the bottom of the crate cap (Figure 2-9).

✎
Note   Two people are required to evenly slide the crate cap back off of the plastic pallet base.

Step 4   Remove the foam packaging material from the top of the router.

Figure 2-9   *Unpacking the Cisco ASR 9912 Router from the Shipping Container*
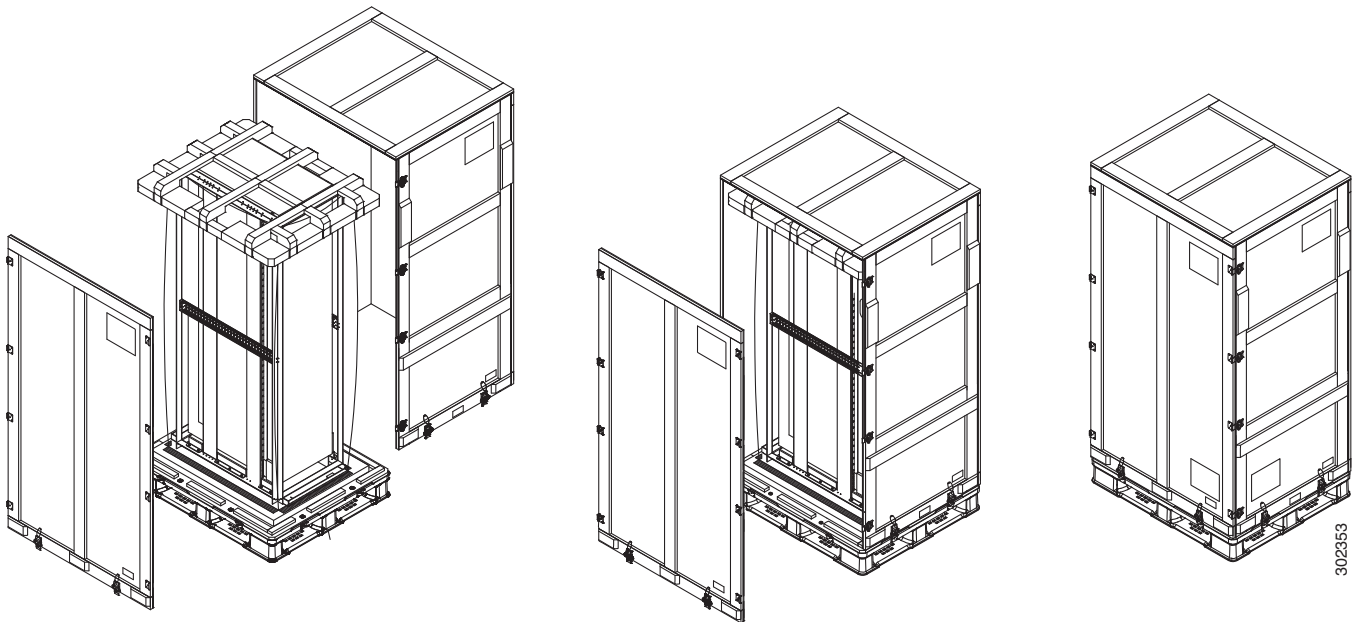
Step 5   Using a 5/16" wrench or ratchet, remove the four attachment bolts and cross-brace from the shipping rack (Figure 2-10).

Figure 2-10   Cross-brace and Attachment Bolts on the Shipping Rack
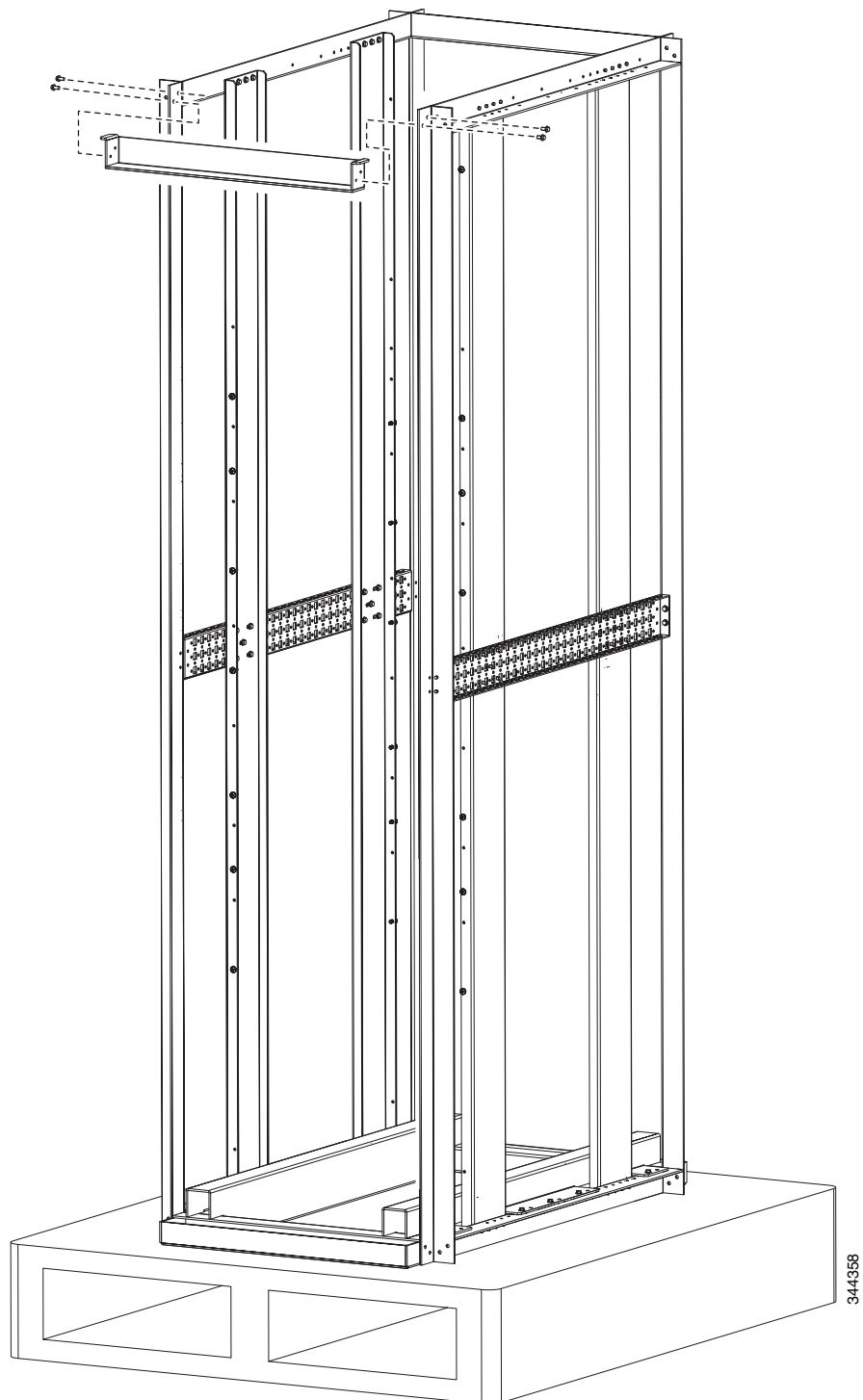
344358

Step 6   Use a Phillips screwdriver to unscrew the rear mounting flange from the system and rack.

Step 7   Use a Phillips screwdriver to unscrew the front mounting flange from the rack.

Step 8   Remove two bolts per hold-down bracket that secure the brackets to the pallet (Figure 2-11).

Figure 2-11   Hold-Down Brackets on the Cisco ASR 9912 Router Shipping Pallet
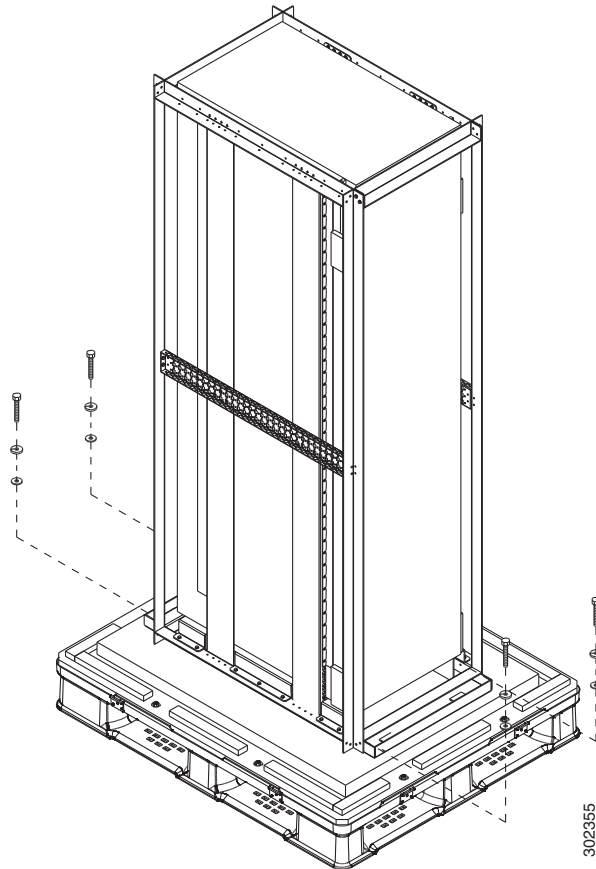
> **Note**   Do not unbolt the shipping rack from the pallet.

Step 9   Save the rear brackets and screws from the shipping packaging for reuse in rack mounting of the chassis (Figure 2-12).

> **Note**   The two guide rails at the bottom of the rack come in the ASR-9912-ACC-KIT accessory kit.

Figure 2-12   Rack Mount Installation Kit for the Cisco ASR 9912 Router
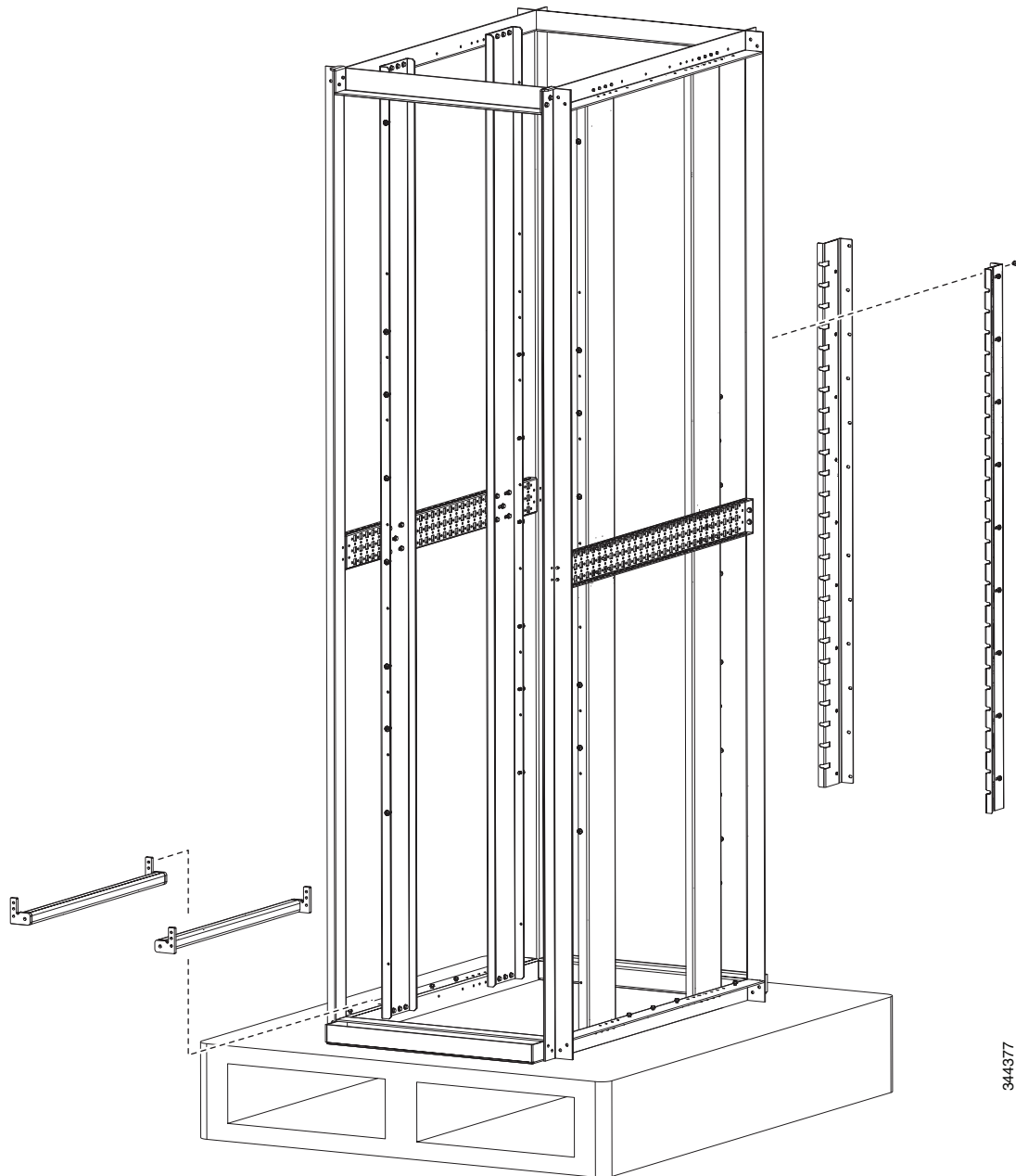
Step 10   Remove components, such as line cards and fan trays, to reduce the weight before lifting or moving the chassis. See Removing Components Before Installing the Chassis, page 2-18 for procedures showing how to remove these components.

Step 11   Save the packaging materials in case the router needs to be repackaged for shipping.

Positioning the Router

Positioning the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco 9904 Router

Use a safety hand truck to move the Cisco ASR 9010 Router, Cisco ASR 9006 Router, or Cisco ASR 9904 Router router to its final location for rack installation.

Positioning the and Cisco ASR 9922 Router and Cisco ASR 9912 Router

TheCisco ASR 9922 Router and Cisco ASR 9912 Router and each ship in a carton similar to the CRS-1 16-Slot shipping carton. Each chassis is installed in a shipping rack used only for shipping purposes. Remove the chassis from the shipping rack before installing it into the rack.

To prepare the 19-inch 45-RU rack:

Step 1   Install the two guide rails onto the bottom of the rack.

The guide rails are included with the ASR-9922-ACC-KIT and ASR-9912-ACC-KIT accessory kits. Each accessory kit ships with the chassis and includes the guide rails, grounding lug, associated hardware, and a warranty card.

Step 2   Use screws to fasten these two guide rails onto the front and rear rails of the rack.

The two guide rails at the bottom of the rack (Figure 2-8) have six holes (three per rail) that accommodate 12-24 or M6 screws. If you are using smaller 10-32 screws, you must use bushings to fit the larger holes (Figure 2-13).

Figure 2-13   *One 10-32 Screw with Bushings in Guide Rail Holes*
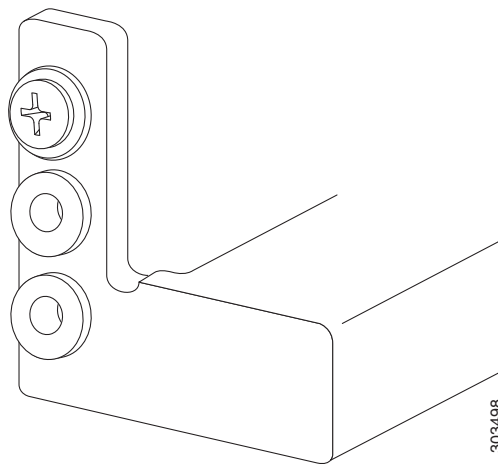
Note   Delrin bushings with part number 17234-D-1 can be obtained from ASM at www.accuratescrew.com.

Step 3   Remove the shipping carton, plastic covering, rear brackets, attachment screws and bolts, shipping rack bar, and any cosmetic accessories included with the chassis.

Step 4   Use a scissors jack to remove the chassis from the shipping rack. Place a pallet jack next to the chassis inside the shipping rack and push/pull the chassis onto the pallet jack for transport to the rack.

⚠

Caution   Tilt the chassis only when absolutely necessary. The chassis is large and heavy. If it were to fall, it could cause harm to itself and its surroundings. Before attempting to tilt the chassis, reduce the weight of the system by removing all of the components in the chassis. The chassis should then be tilted in a direction so that the rear of the chassis is facing downward. The distance the chassis travels without its packaging should be as short as possible.

Step 5   On the rear of the chassis is an integrated handle which is used to pull the chassis from the pallet jack into the rack where the chassis is to be installed. Position the chassis so that the rear handle is facing the front of the rack.

Step 6   From the rear of the rack, pull the chassis by the handle into the rack, making sure that the chassis sits on top of the guide rails in the rack.

Step 7   Once the chassis is pulled into the rack and sits on top of the guide rails, use screws to fasten the chassis to the rack.

Removing Components Before Installing the Chassis

The Cisco ASR 9000 Series Routers are designed to be lifted for mounting into a rack. To reduce the weight of the system, you must remove some of the components before attempting to mount it into the rack.

- Removing Power Modules, page 2-18
- Removing Fan Trays, page 2-18
- Removing Cards from the Chassis, page 2-23

Removing Power Modules

The power modules for the Cisco ASR 9000 Series Routers are shipped separately. If you need to remove an AC or DC power module at a later time, see Removing and Replacing Power System Components, page 5-12.

Removing Fan Trays

✎

Note   If an accessory grill or fan tray cover is installed on the front of the router, you must remove it first.

Removing a Fan Tray from the Cisco ASR 9010 Router, Cisco ASR 9922 Router, and Cisco ASR 9912 Router

Follow these steps to remove a fan tray from the Cisco ASR 9010 Router (Figure 2-14), Cisco ASR 9922 Router (Figure 2-15), or Cisco ASR 9912 Router (Figure 2-16).

Note   If an accessory grill is installed on the front of the Cisco ASR 9010 Router, remove the grill by pulling it towards you until it comes loose. See Installing Base Chassis Accessories on the Cisco ASR 9010 Router, page 2-61 and Figure 2-56 for information.

Note   If a fan tray cover is installed on the front of the Cisco ASR 9922 Router, remove the fan tray cover by pulling on the cover until it comes loose. See Installing Optional Chassis Accessories on the Cisco ASR 9922 Router, page 2-91 for more information.

Note   On the Cisco ASR 9922 Router, the third and fourth fan trays (under the middle cage) are installed *upside down* compared to the first and second fan trays (above the middle cage).

Step 1   Loosen the captive screw on each side of the fan tray.

Step 2   Using the handle on the front panel, pull the fan tray halfway out of the chassis.

Note   Wait a few seconds for all the fans to stop rotating before lifting the fan tray from the chassis.

Step 3   Slide out the fan tray completely from the chassis while supporting it with your other hand.

Caution   Use two hands when handling the fan tray. Each version 1 fan tray weighs about 16 pounds (7.27 kg). Each version 2 fan tray weighs about 18 pounds (8.18 kg).

Figure 2-14   Removing or Installing the Fan Tray on the Cisco ASR 9010 Router Chassis

243179
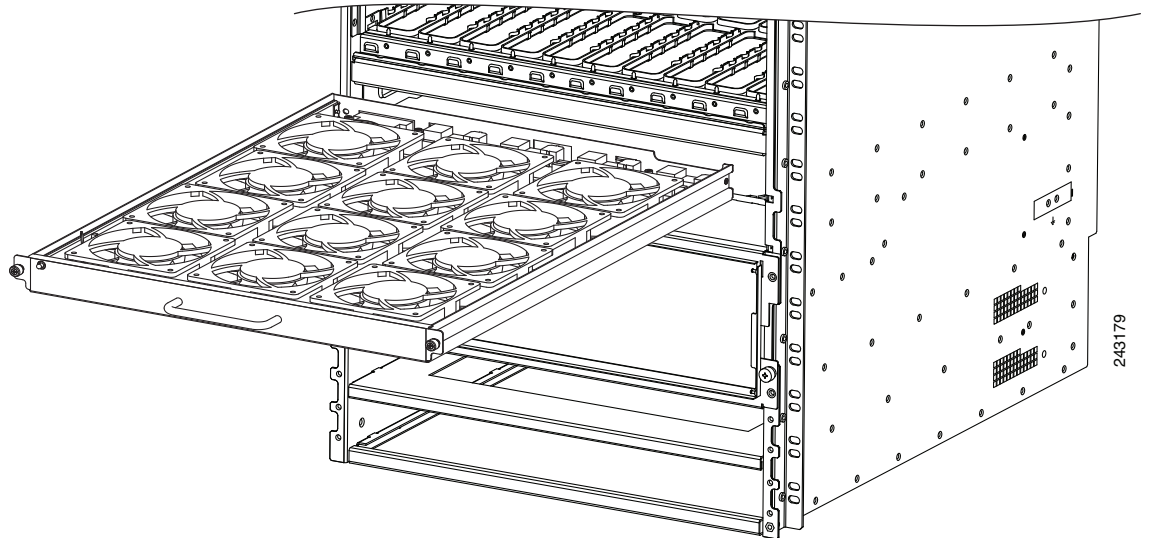
Figure 2-15   Removing or Installing the Fan Tray on the Cisco ASR 9922 Router Chassis
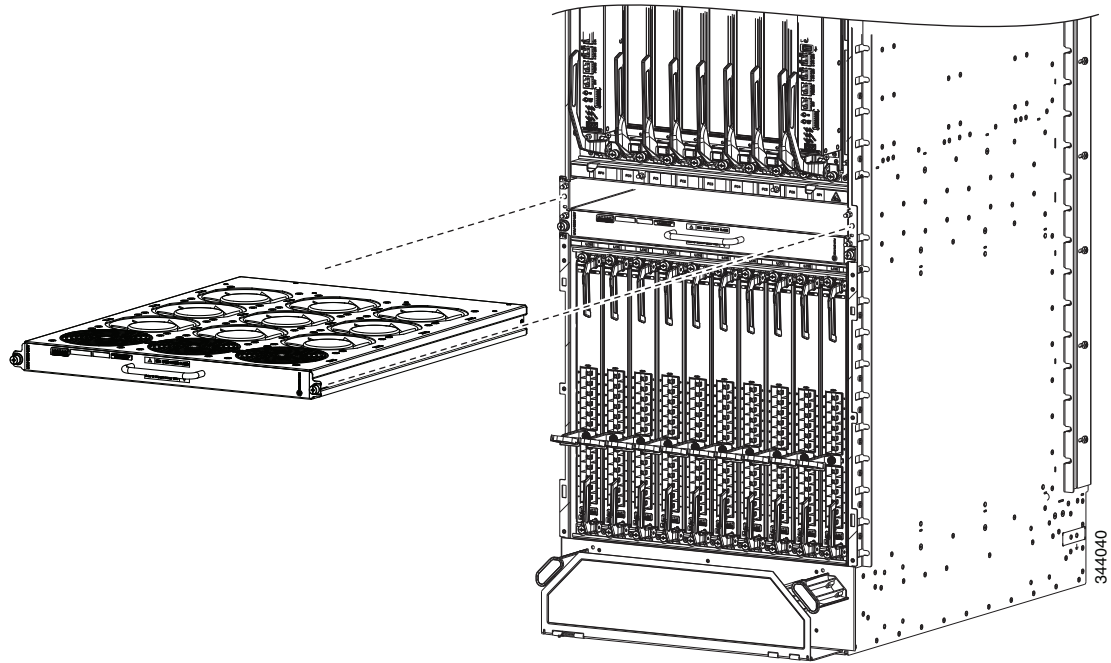
Figure 2-16   Removing or Installing the Fan Tray on the Cisco ASR 9912 Router Chassis
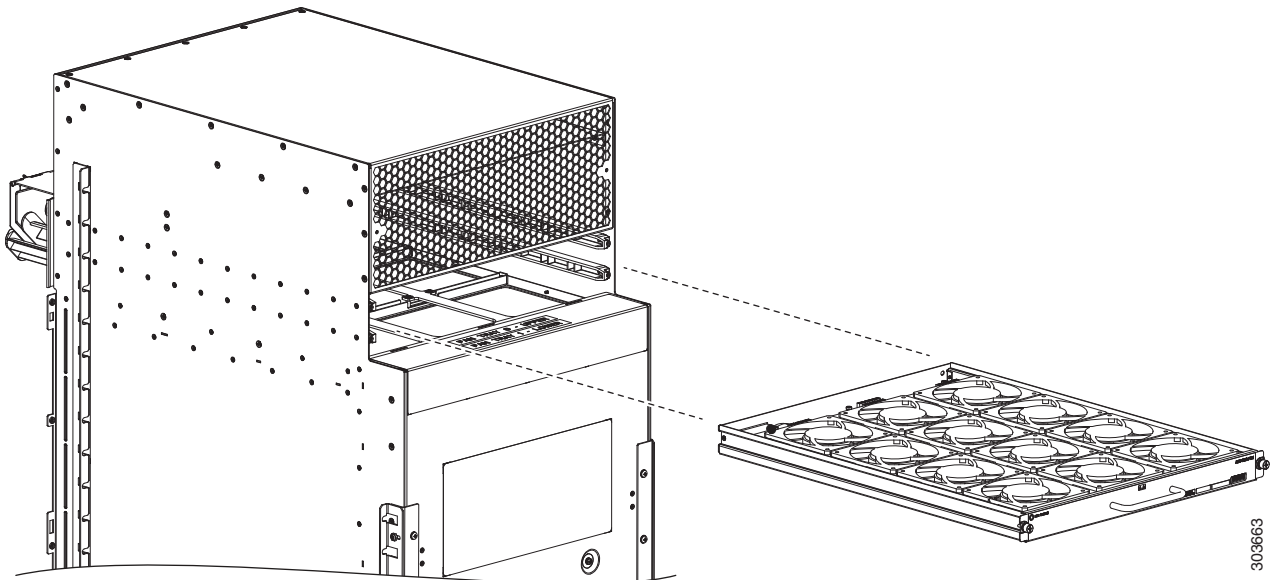
Removing a Fan Tray from the Cisco ASR 9006 Router

Follow these steps to remove a fan tray from the Cisco ASR 9006 Router (Figure 2-17).

Step 1   Loosen the captive screw that secures the fan tray door to the chassis and open the door.

Step 2   Loosen the captive installation screw on the front of the fan tray you want to remove.

Step 3   Using the handle on the front panel, pull the fan tray halfway out of the chassis.

✎
Note   Wait a few seconds for all the fans to stop rotating before lifting the fan tray from the chassis.

Step 4   Slide out the fan tray completely from the chassis while supporting it with your other hand.

⚠
Caution   Use two hands when handling the fan tray. The fan tray weighs about 7.6 pounds (3.45 kg).

Figure 2-17   Removing or Installing the Fan Tray on the Cisco ASR 9006 Router Chassis
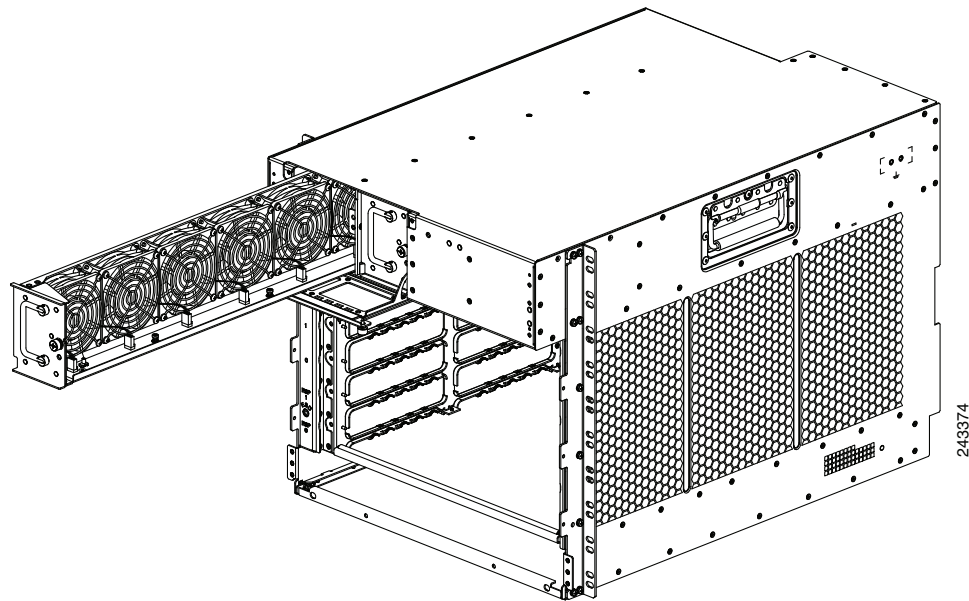
Removing a Fan Tray from the Cisco ASR 9904 Router

Follow these steps to remove a fan tray from the Cisco ASR 9904 Router (Figure 2-18).

Step 1   Loosen the three captive installation screws on the front of the fan tray.

Step 2   Using the handle on the front panel, pull the fan tray halfway out of the chassis.

Step 3   Wait a few seconds for all the fans to stop rotating before lifting the fan tray from the chassis.

Step 4   Slide out the fan tray completely from the chassis while supporting it with your other hand.

⚠

Caution   Use two hands when handling the fan tray. The fan tray weighs about 11.0 pounds (4.99 kg).

Figure 2-18   Removing or Installing the Fan Tray on the Cisco ASR 9904 Router Chassis
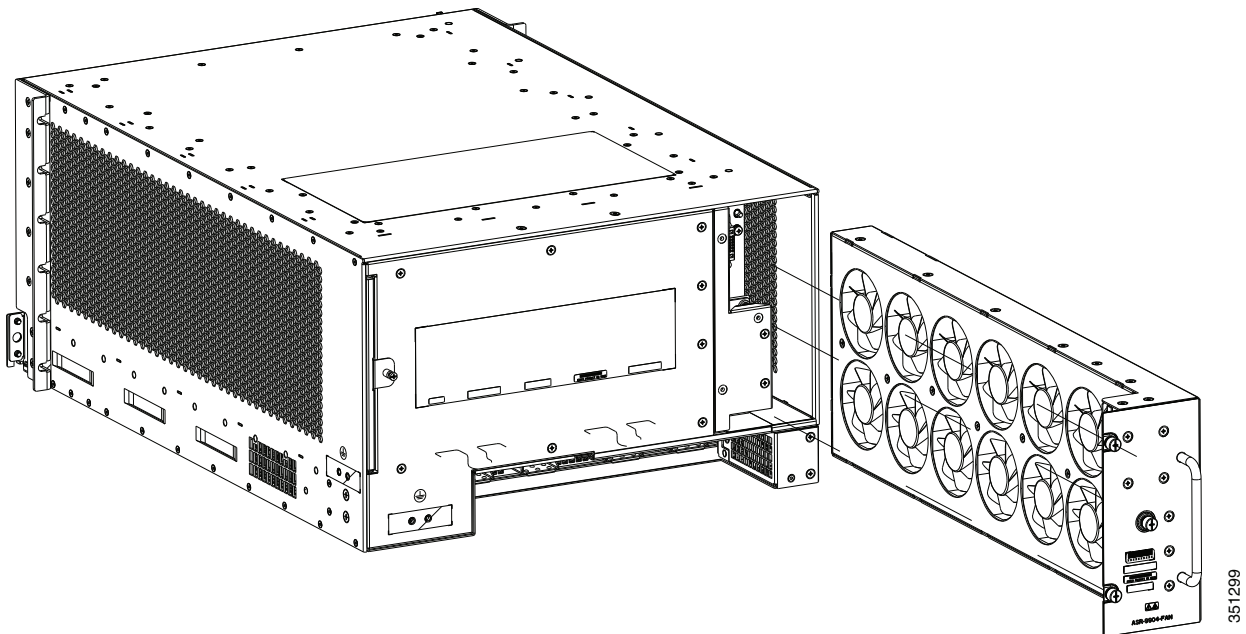
Removing Cards from the Chassis

To reduce additional weight from the chassis, you can remove all Route Switch Processor (RSP), Route Processor (RP), Switch Fabric Card (FC), shared port adapter (SPA), SPA interface processor (SIP), and line cards (LCs).

This section describes how to remove the RSP cards, RP cards, FCs, and LCs. For information about removing SPA and SIP cards, see:

Cisco ASR 9000 Series Aggregation Services Router SIP and SPA Hardware Installation Guide

⚠

Caution   Handle all cards by the metal card carrier edges only; avoid touching the board or any connector pins. After removing a card, carefully place it in an antistatic bag or similar environment to protect it from ESD and dust in the optic ports (fiber-optic line cards).

⚠

Caution   Be careful to avoid damaging the electromagnetic interference (EMI) gasket that runs along the full height of the card front panel edge. Damage to the EMI gasket can affect the ability of your system to meet EMI requirements.

⚠

Caution   To avoid damaging card mechanical components, never carry a card by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

Removing RSP Cards and Line Cards from the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router

This section describes how to remove RSP and line cards from the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router. Table 2-1 and Table 2-2 describe the router components and slot numbering for each router.

Table 2-1   ***Router Components and Slot Numbering for the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and***
Cisco ASR 9904 Router

Router Model Number	Router Components and Slot Numbering
Cisco ASR 9010 Router	• 10 slots. • Version 1 power system (Figure 2-19), Version 2 power system (Figure 2-20), or Version 3 power system (Figure 2-19 for AC and Figure 2-20 for DC). • Two RSP cards installed in the two center slots (labeled RSP0 and RSP1). • Four line cards installed in slots 0 through 3 to the left of the RSP card slots. • Four line cards installed in slots 4 though 7 to the right of the RSP card slots.
Cisco ASR 9006 Router	• 6 slots. • Version 1 power system (Figure 2-21) or Version 2 power system (Figure 2-22). • Two RSP cards installed in the two lowest slots (labeled RSP0 and RSP1) located above the power modules. • Four line cards installed in slots 2 through 5 above the RSP card slots.
Cisco ASR 9904 Router	• 4 slots. • Version 2 power system (Figure 2-21). • One line card installed in the top slot (labeled LC1). Two RSP cards installed in the middle two slots (labeled RSP1 and RSP0) located between the line cards (LC0 and LC1). • One line card installed in the lowest slot (LC0) located above the power modules.

Figure 2-19   *Cisco ASR 9010 Router Components and Slot Numbering with Version 1 Power System or Version 3 AC Power System*
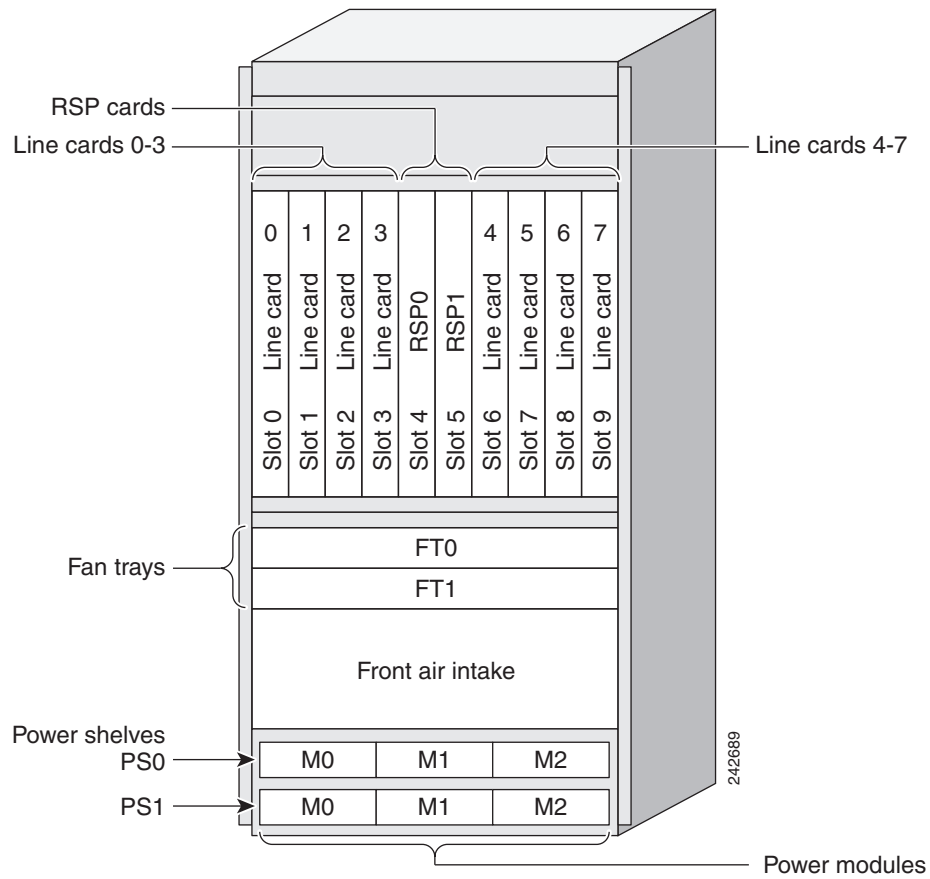
Figure 2-20   *Cisco ASR 9010 Router Components and Slot Numbering with Version 2 Power System or Version 3 DC Power System*

RSP cards

e cards 0-3

Line cards 4-7

0	1	2	3			4	5	6	7
Line card	Line card	Line card	Line card	RSP0	RSP1	Line card	Line card	Line card	Line card
Slot 0	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9

Fan trays

FT0

FT1

Front air intake

ver shelves

PS0 → | M0 | M1 | M2 | M3 |

PS1 → | M0 | M1 | M2 | M3 |

Power modules

284401
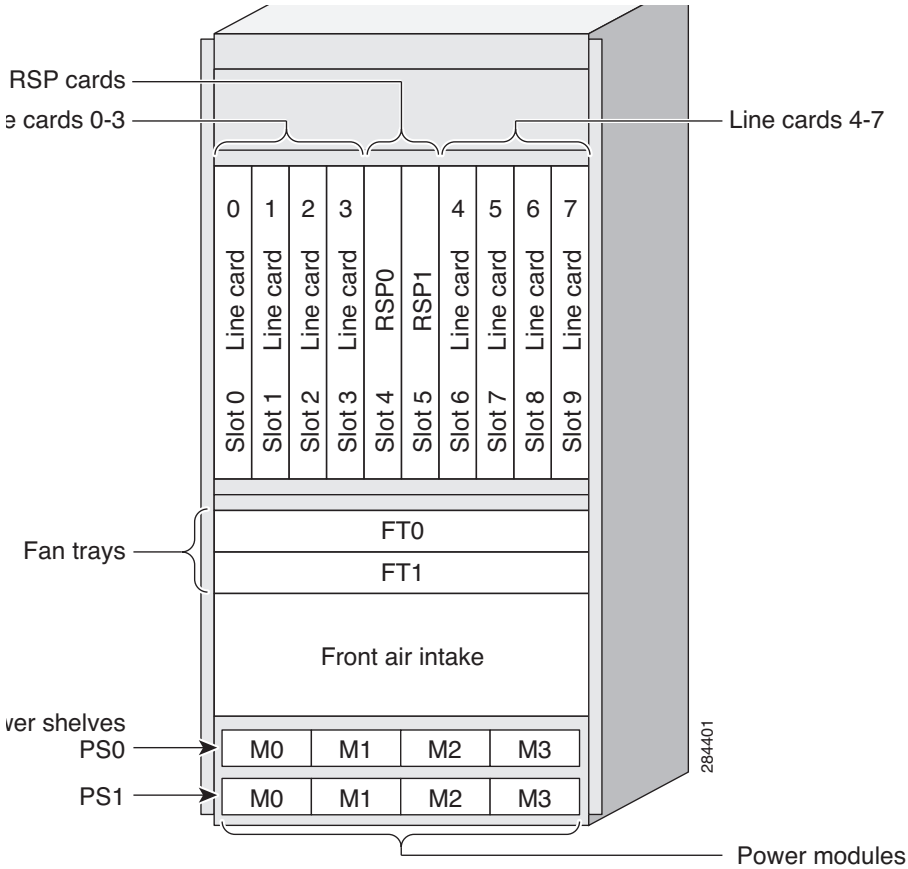
Figure 2-21   *Cisco ASR 9006 Router Components and Slot Numbering with Version 1 Power System*

Fan trays

FT0 FT1

Line cards

Slot 5	Line card 3
Slot 4	Line card 2
Slot 3	Line card 1
Slot 2	Line card 0

RSP cards

| Slot 1 | RSP1 |
| Slot 0 | RSP0 |

Power shelf → | M0 | M1 | M2 |

Power modules

243377
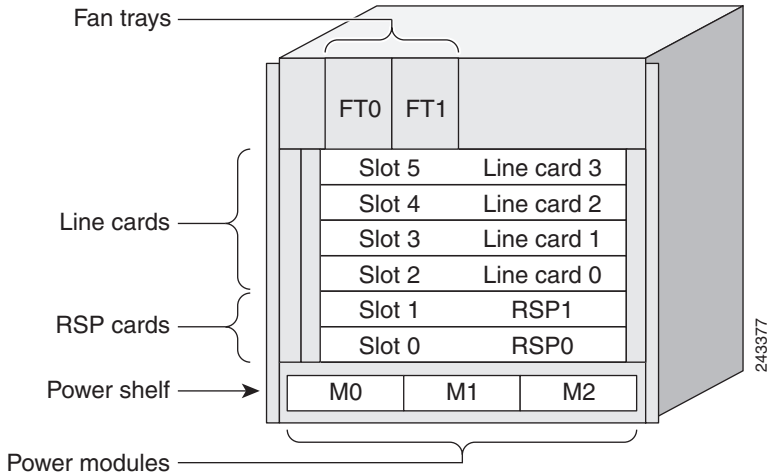
Figure 2-22   Cisco ASR 9006 Router Components and Slot Numbering with Version 2 Power System
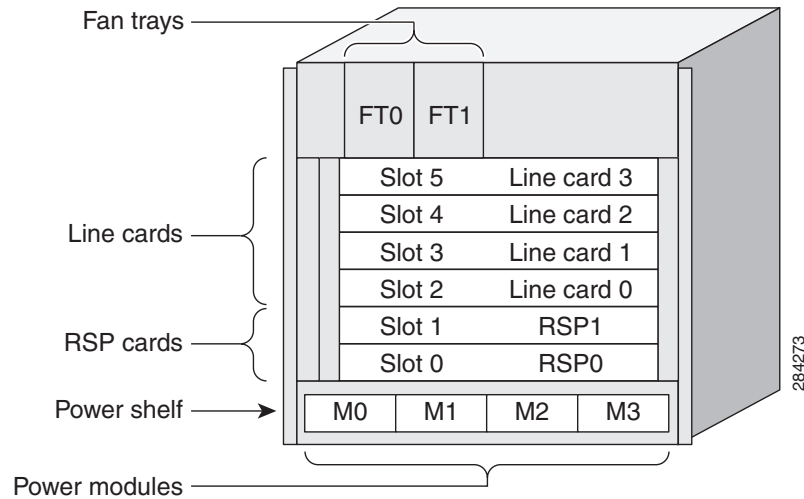
Figure 2-23   Cisco ASR 9904 Router Components and Slot Numbering with Version 2 Power System
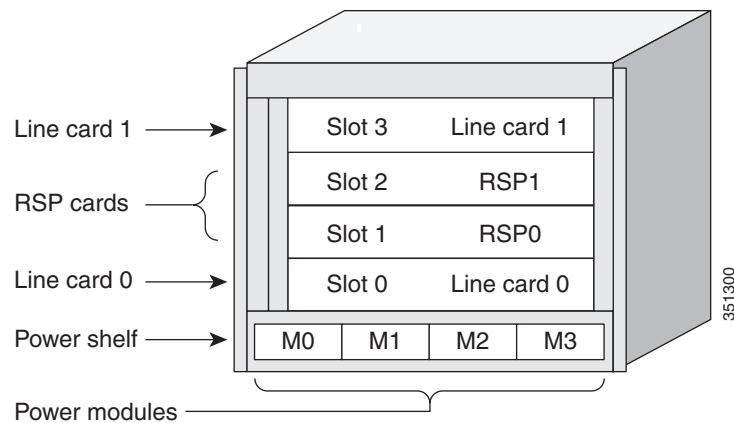
Follow these steps to remove RSP and line cards from the chassis.

Step 1   Use Figure 2-24, Figure 2-25, or Figure 2-26 to identify each card and write down the card type and slot number on a piece of paper. You will need this information when you reinstall the cards in the chassis to be sure you reinstall each card in its original slot.

Step 2   To remove a card starting at the lowest numbered slot:

a.   Use a screwdriver to loosen the captive screws at the ends of the line card front panel.

b.   Pivot the ejector levers to unseat the card from the backplane connector.

c.   Slide the card out of the slot and place it directly into an antistatic bag or other ESD-preventive container.

Figure 2-24   Removing a Line Card from the Cisco ASR 9010 Router Chassis

a	Loosen the captive screws.	**b**	Pivot the ejector levers to unseat the card from the backplane connector.	**c**	Slide the card out of the chassis.

Figure 2-25   Removing a Line Card from the Cisco ASR 9006 Router Chassis

a	Loosen the captive screws.	b	Pivot the ejector levers to unseat the card from the backplane connector.	c	Slide the card out of the chassis.

Figure 2-26   Removing a Line Card from the Cisco ASR 9904 Router Chassis

a	Loosen the captive screws.	b	Pivot the ejector levers to unseat the card from the backplane connector.	c	Slide the card out of the chassis.

Step 3   Repeat Step 2 for each RSP or line card.

Removing RP Cards, Fabric Cards, and Line Cards from the Cisco ASR 9922 Router and Cisco ASR 9912 Router

This section describes how to remove the Route Processor (RP) cards, Fabric Card (FC), and Line Cards (LCs) from the Cisco ASR 9922 Router and Cisco ASR 9912 Router. Table 2-2 describes the components and slot numbering for each router.

Table 2-2   Router Components and Slot Numbering for the Cisco ASR 9922 Router and Cisco ASR 9912 Router

Router Model Number	Router Components and Slot Numbering
Cisco ASR 9922 Router	• 22 slots.
	• Version 2 or version 3 power system. See Figure 2-27 for version 2 DC and Figure 2-28 for version 3 DC. See Figure 2-29 for version 2 AC and Figure 2-30 for version 3 AC.
	• Up to seven FC cards installed between the two RSP cards in the middle cage of the chassis.
	• Ten line cards installed in slots 0 through 9 in the top card cage.
	• Ten line cards installed *upside down* in slots 10 through 19 in the bottom card cage.
Cisco ASR 9912 Router	• 12 slots.
	• Version 2 or version 3 power system, See Figure 2-31 for version 2 DC or version 3 power systems (Figure 2-31 for DC and Figure 2-32 for AC).
	• Up to seven FC cards installed between the two RP cards above the power trays.
	• Ten line cards installed in slots 0 through 9 below the fan trays.

Figure 2-27   Cisco ASR 9922 Router Components and Slot Numbering with Version 2 DC Power System
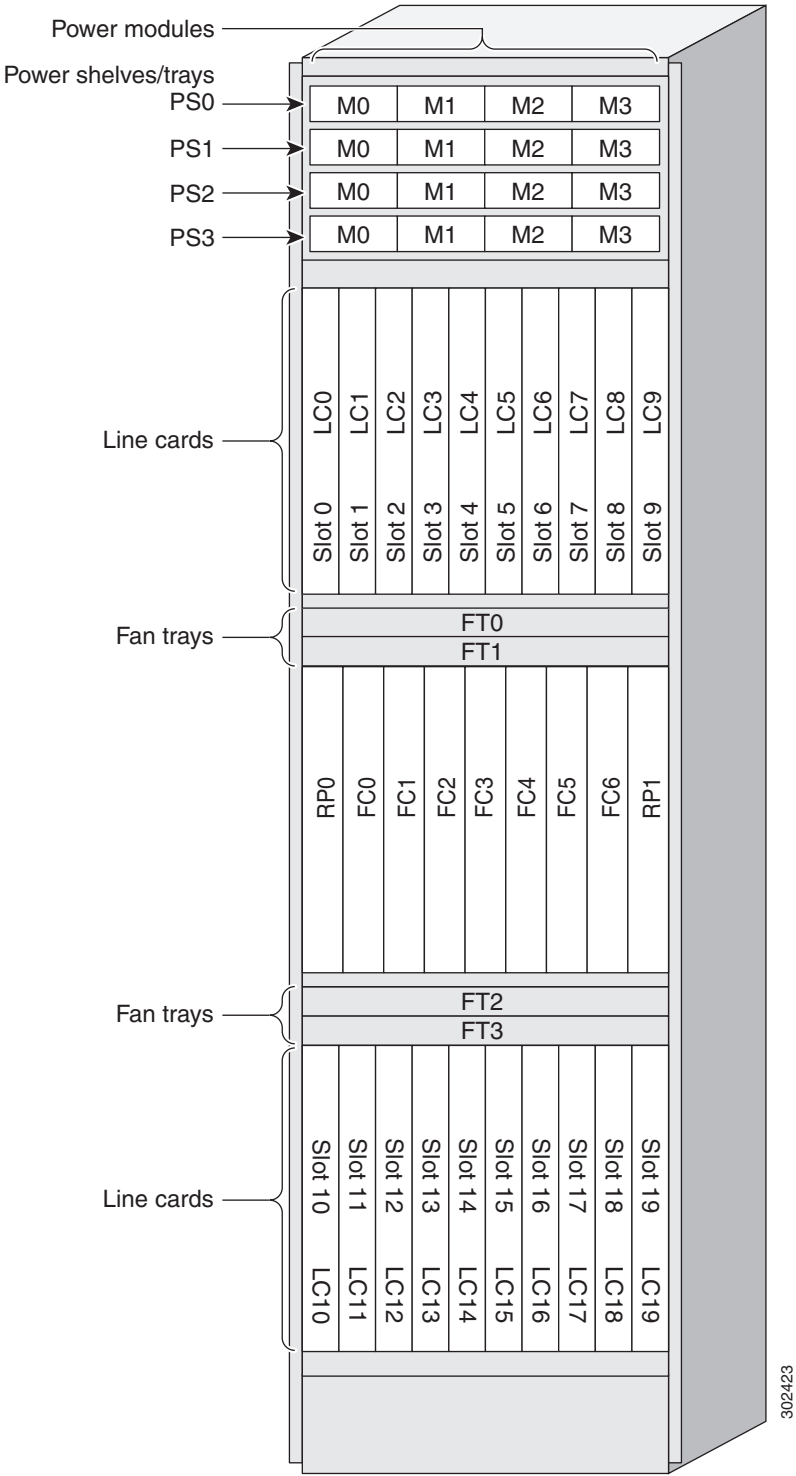
Figure 2-28   *Cisco ASR 9922 Router Components and Slot Numbering with Version 3 DC Power System*

Power modules

Power shelves/trays

PS0 — M0 | M1 | M2 | M3

PS1 — M0 | M1 | M2 | M3

PS2 — M0 | M1 | M2 | M3

PS3 — M0 | M1 | M2 | M3

Line cards

| LC0 | LC1 | LC2 | LC3 | LC4 | LC5 | LC6 | LC7 | LC8 | LC9 |
| Slot 0 | Slot 1 | Slot 2 | Slot 3 | Slot 4 | Slot 5 | Slot 6 | Slot 7 | Slot 8 | Slot 9 |

Fan trays — FT0 / FT1

RP0 | FC0 | FC1 | FC2 | FC3 | FC4 | FC5 | FC6 | RP1

Fan trays — FT2 / FT3

Line cards

| Slot 10 | Slot 11 | Slot 12 | Slot 13 | Slot 14 | Slot 15 | Slot 16 | Slot 17 | Slot 18 | Slot 19 |
| LC10 | LC11 | LC12 | LC13 | LC14 | LC15 | LC16 | LC17 | LC18 | LC19 |

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Figure 2-29   *Cisco ASR 9922 Router Components and Slot Numbering with Version 2 AC Power System*

Power modules

Power shelves/trays

PS0 →	M0	M1	M2
PS1 →	M0	M1	M2
PS2 →	M0	M1	M2
PS3 →	M0	M1	M2

Line cards

| LC0 | LC1 | LC2 | LC3 | LC4 | LC5 | LC6 | LC7 | LC8 | LC9 |
| Slot 0 | Slot 1 | Slot 2 | Slot 3 | Slot 4 | Slot 5 | Slot 6 | Slot 7 | Slot 8 | Slot 9 |

Fan trays

FT0
FT1

| RP0 | FC0 | FC1 | FC2 | FC3 | FC4 | FC5 | FC6 | RP1 |

Fan trays

FT2
FT3

Line cards

| Slot 10 | Slot 11 | Slot 12 | Slot 13 | Slot 14 | Slot 15 | Slot 16 | Slot 17 | Slot 18 | Slot 19 |
| LC10 | LC11 | LC12 | LC13 | LC14 | LC15 | LC16 | LC17 | LC18 | LC19 |

363713

Figure 2-30   *Cisco ASR 9922 Router Components and Slot Numbering with Version 3 AC Power System*
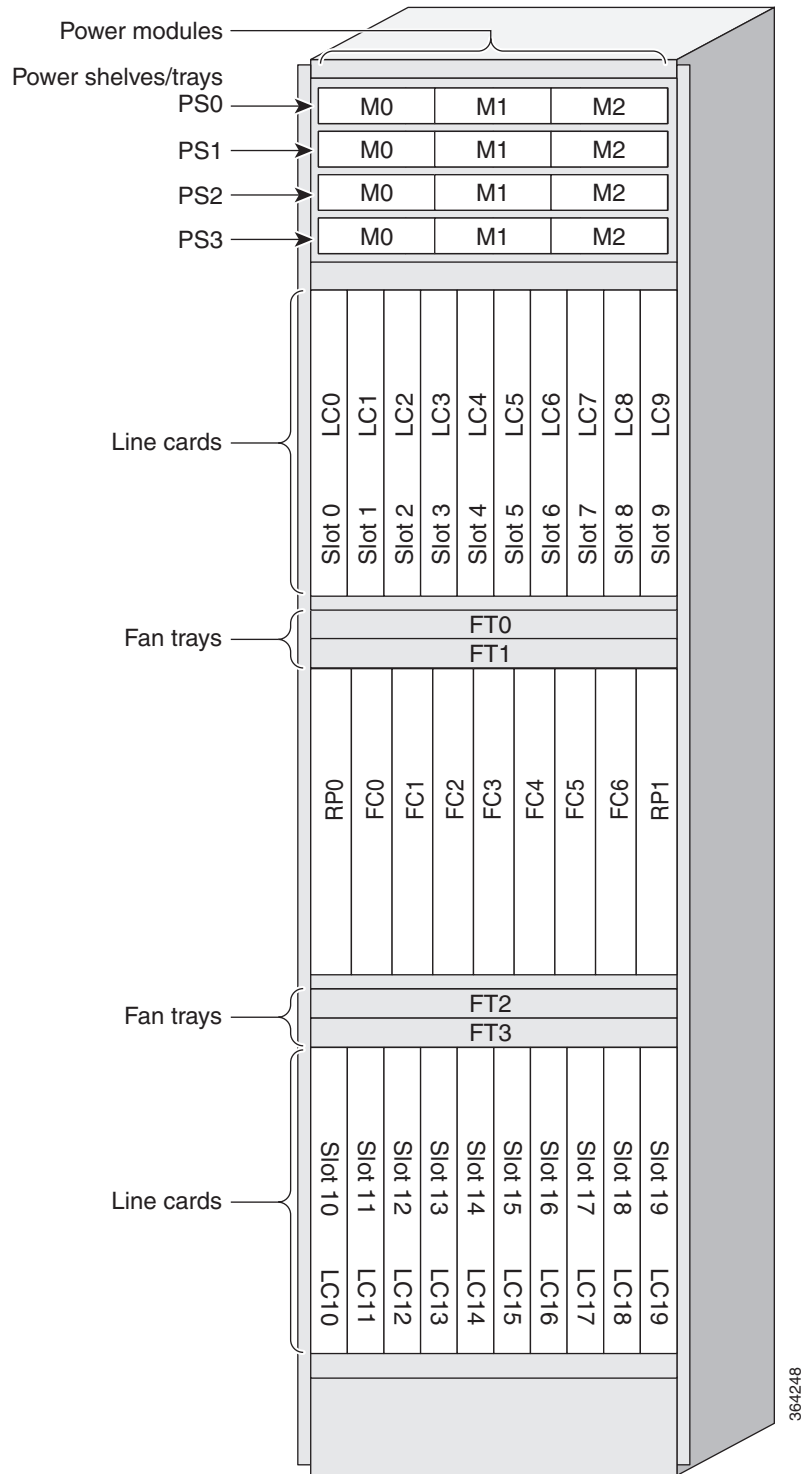
Figure 2-31   ***Cisco ASR 9912 Router Components and Slot Numbering with Version 2 DC Power System***
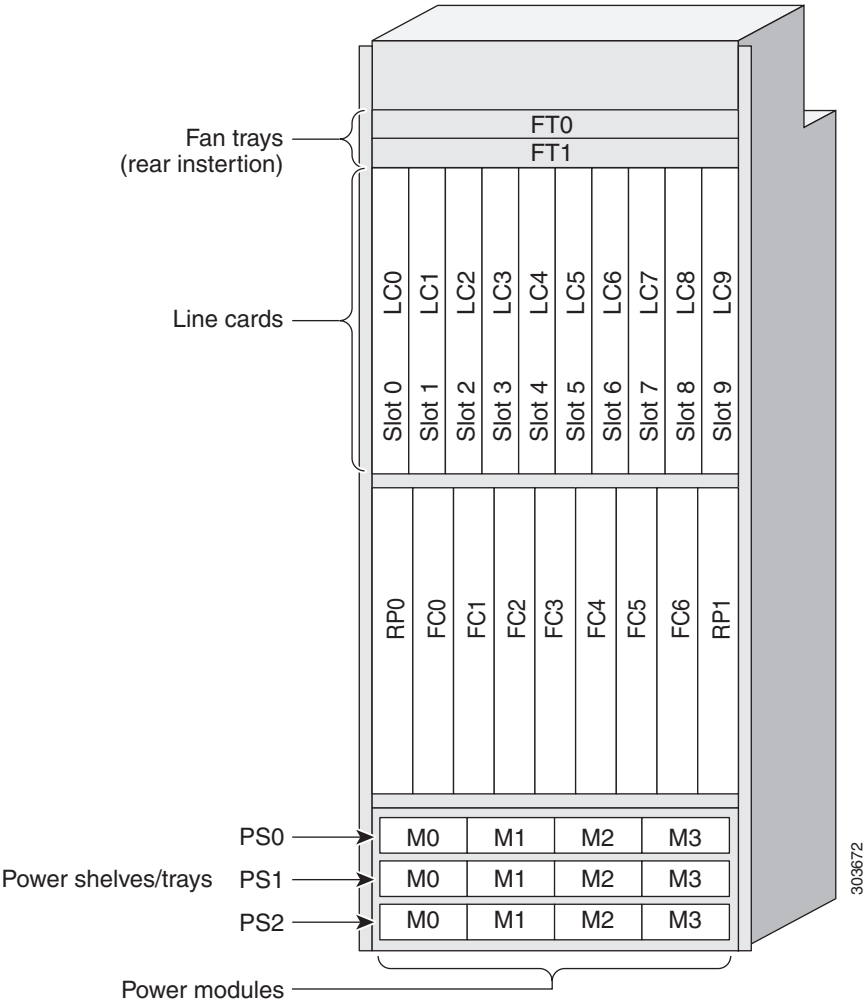
Figure 2-32   Cisco ASR 9912 Router Components and Slot Numbering with Version 3 AC Power System
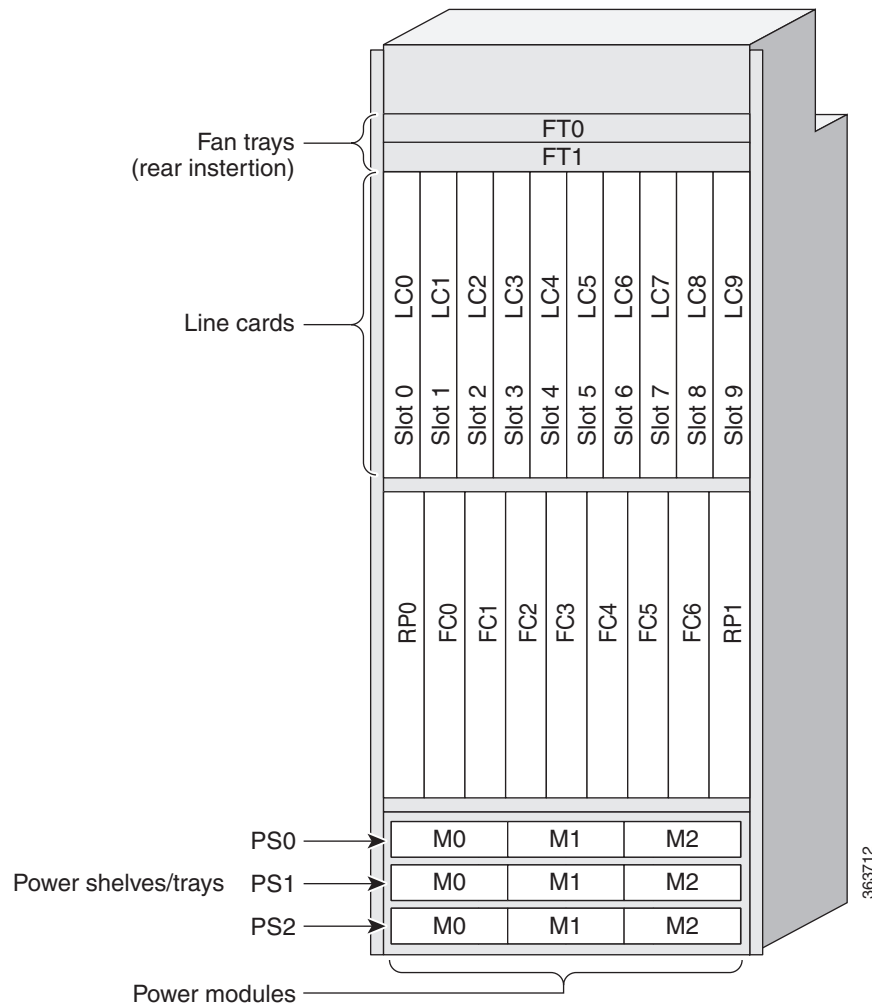
Follow these steps to remove RP cards, FCs, and LCs from the Cisco ASR 9922 Router and Cisco ASR 9912 Router chassis.

Step 1   Use Figure 2-27 or Figure 2-31 to identify each card and then write down the card type and slot number on a piece of paper. You will need this information when you reinstall the cards in the chassis to be sure you reinstall each card in its original slot.

Step 2   To remove a FC card (Figure 2-33 or Figure 2-34), starting at the lowest numbered slot:

   a.   Remove the air filter covering the front of the middle cage.

   b.   Use a screwdriver to loosen the captive screws at the ends of the FC front panel.

   c.   Push in both ejector lever release buttons.

   ✎
   Note   Once any ejector lever release button is pushed in, the FC must by physically removed and reinserted (OIR) to restart the FC.

   d.   Pivot the ejector levers to unseat the FC from the backplane connector.

e. Slide the FC out of the slot and place it directly into an antistatic bag or other ESD-preventive container.

Figure 2-33   Removing a Switch Fabric Card from the Cisco ASR 9922 Router Chassis
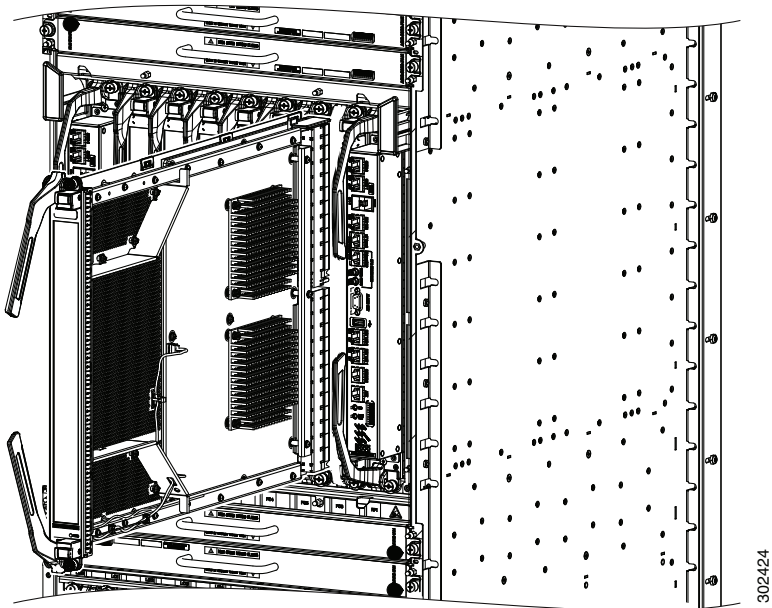
a	Loosen the captive screws.	c	Pivot the ejector levers outward to unseat the card from the backplane connector.
b	Push in both ejector lever release buttons.	d	Slide the card out of the chassis.

Figure 2-34   Removing a Switch Fabric Card from the Cisco ASR 9912 Router Chassis
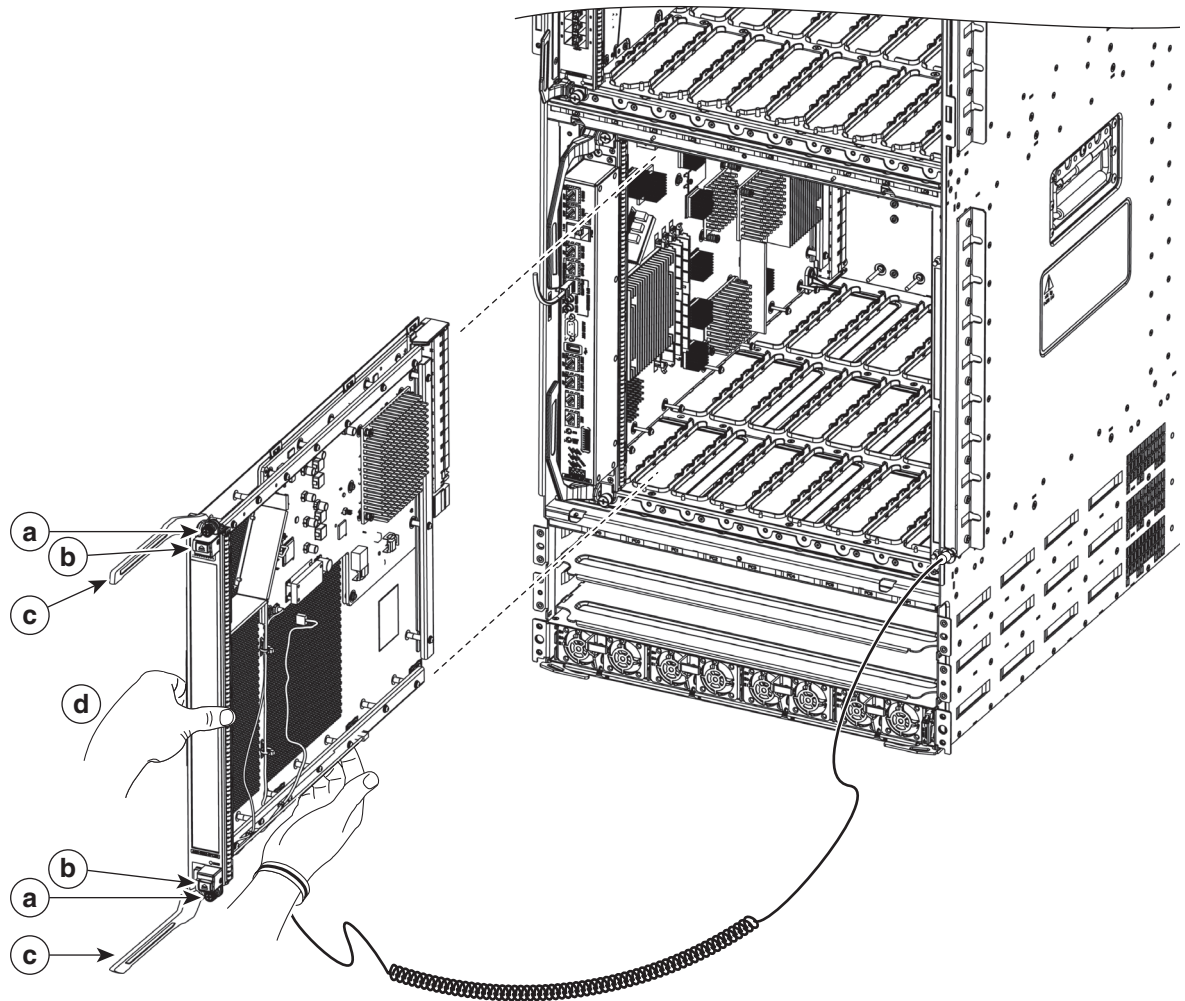
a	Loosen the captive screws.	c	Pivot the ejector levers outward to unseat the card from the backplane connector.
b	Push in both ejector lever release buttons.	d	Slide the card out of the chassis.

Step 3   To remove a RP or line card (Figure 2-35 or Figure 2-36), starting at the lowest numbered slot:

a. Use a screwdriver to loosen the captive screws at the ends of the line card front panel.

b. Pivot the ejector levers to unseat the card from the backplane connector.

c. Slide the card out of the slot and place it directly into an antistatic bag or other ESD-preventive container.

Figure 2-35   Removing a Line Card from the Cisco ASR 9922 Router Top Card Cage

a	Loosen the captive screws.	b	Pivot the ejector levers outward to unseat the card from the backplane connector.	c	Slide the card out of the chassis.

Figure 2-36   Removing a Line Card from the Cisco ASR 9912 Router Top Card Cage
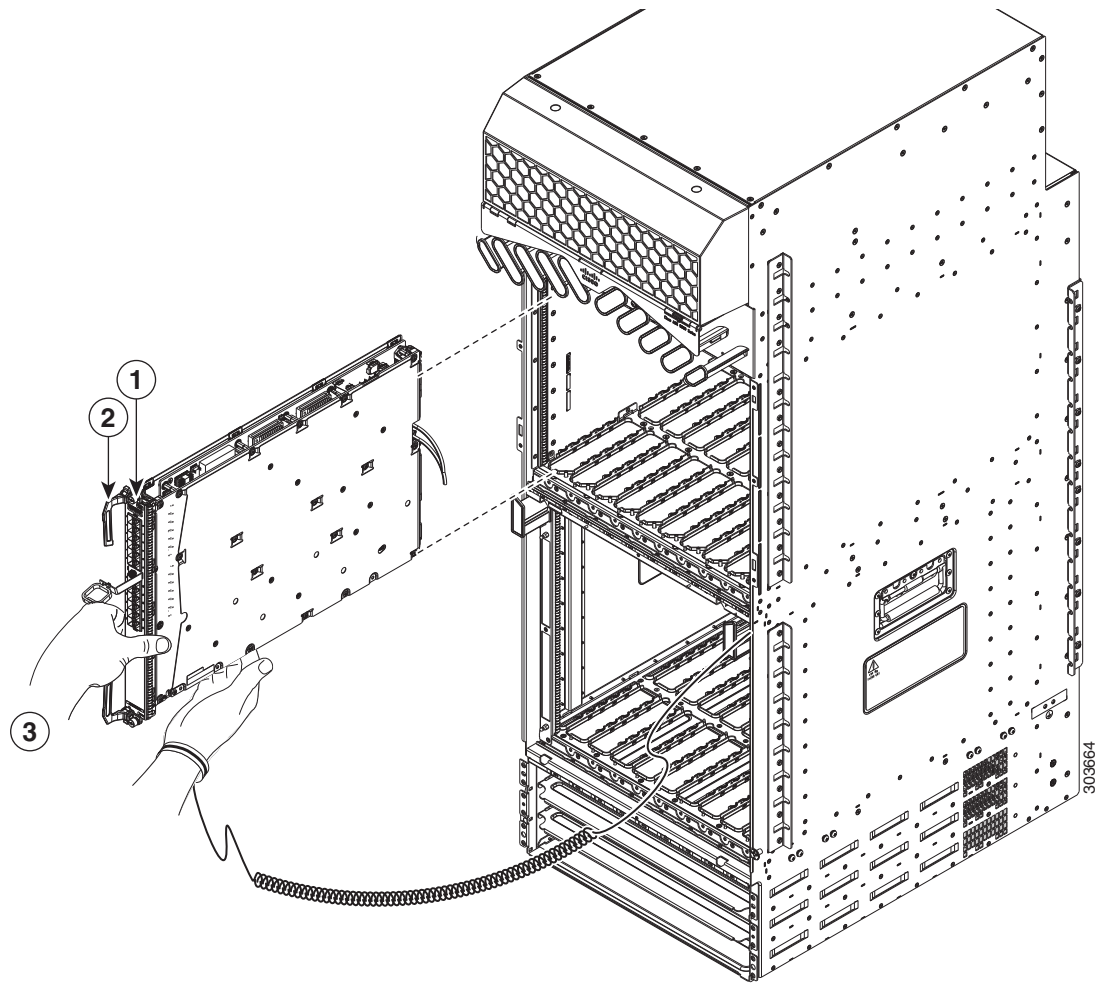
1	Loosen the captive screws.	2	Pivot the ejector levers outward to unseat the card from the backplane connector.	3	Slide the card out of the chassis.

Step 4   Repeat Step 2 or Step 3 for each FC, LC, and RP card.

Rack-Mounting the Router Chassis

The router chassis is installed in a front-mounted position, as shown in Figure 1-18 for the Cisco ASR 9010 Router, Figure 1-19 for the Cisco ASR 9006 Router, Figure 1-20 for the Cisco ASR 9904 Router, Figure 1-26 for the Cisco ASR 9922 Router, and Figure 1-27 for the Cisco ASR 9912 Router.

In a front-mounted position, the chassis rack-mounting flanges are secured directly to the rack posts.

Note   The Cisco ASR 9922 Router and Cisco ASR 9912 Router are designed to mount in only 4-post racks.

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 shown in Figure 2-37.

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 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.

The space must be at least 17.7 inches (45 cm) to accommodate the chassis, which is approximately 17.50 inches (44.45 cm) wide and fits between the mounting posts on the rack.

Figure 2-37   Verifying Equipment Rack Dimensions
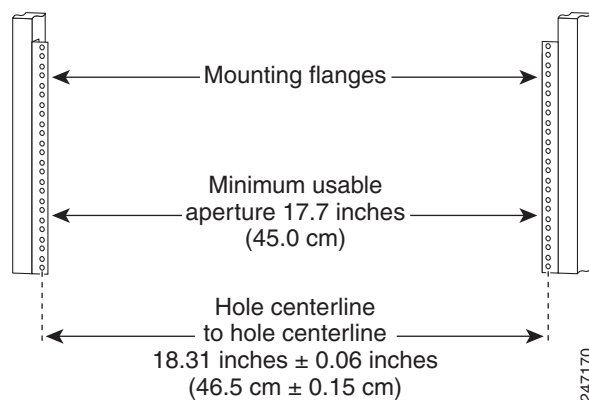
Installing the Chassis in a 2-Post Rack

This section describes how to install the chassis in a 2-post telco-style rack. Two people can lift an empty router chassis using the handles on the sides. To accommodate racks with different hole patterns in their mounting flanges, the chassis rack-mounting flanges have three groups of eight oblong screw holes on each side.

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Caution   An empty chassis weighs approximately 150 pounds (68 kg). You need two people to slide the chassis into the equipment rack safely.

Figure 2-38 shows the orientation of the Cisco ASR 9010 Router chassis to the rack posts (3" or 6" channel width) of an industry-standard 2-post rack and components used in the installation.

Figure 2-38   Installing the Cisco ASR 9010 Router Chassis in a Standard 2-Post Rack
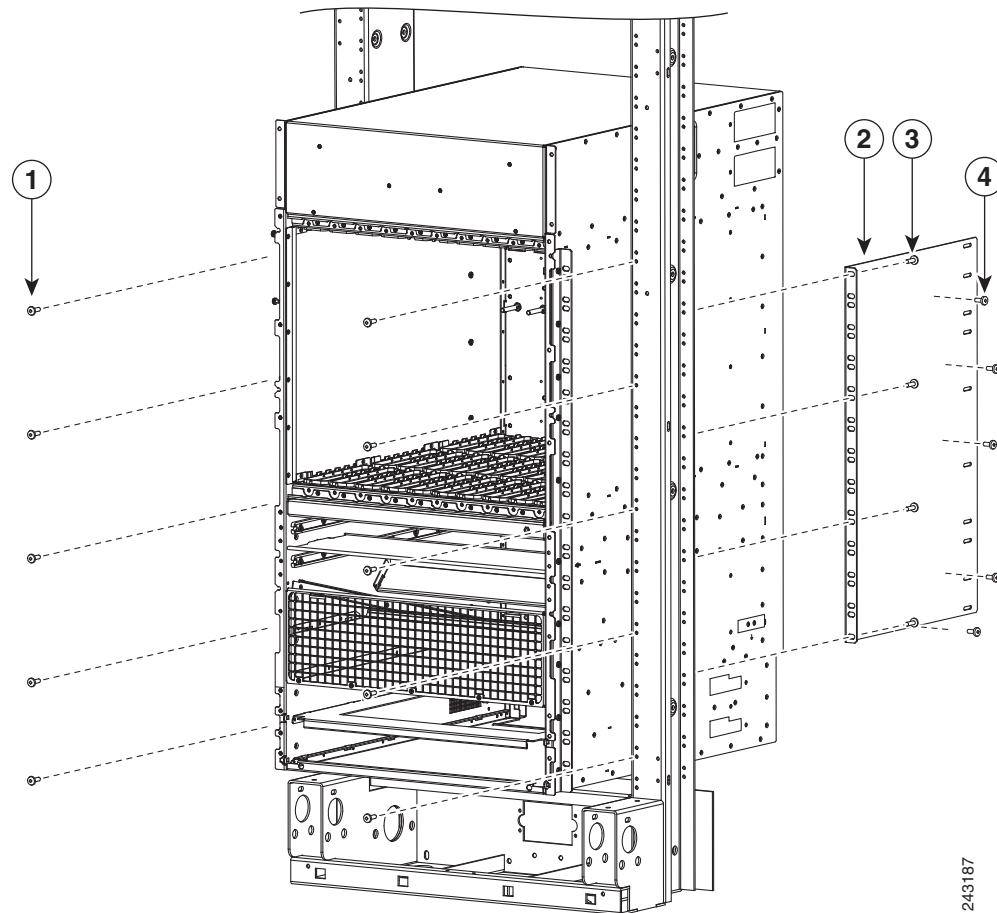
1	Five screws per side (minimum) to attach the router chassis to the rack

Note To install the Cisco ASR 9010 Router chassis in a Seismic 2-post rack for optional earthquake protection, two side brackets must be mounted to the chassis for attachment to the posts (5" channel width) of the GR-63 Zone 4 Seismic 2-post rack.

Figure 2-39 shows the orientation of the Cisco ASR 9010 Router chassis to the Seismic 2-post rack and components used in the installation.

Figure 2-39   Installing the Cisco ASR 9010 Router Chassis in a Seismic 2-Post Rack
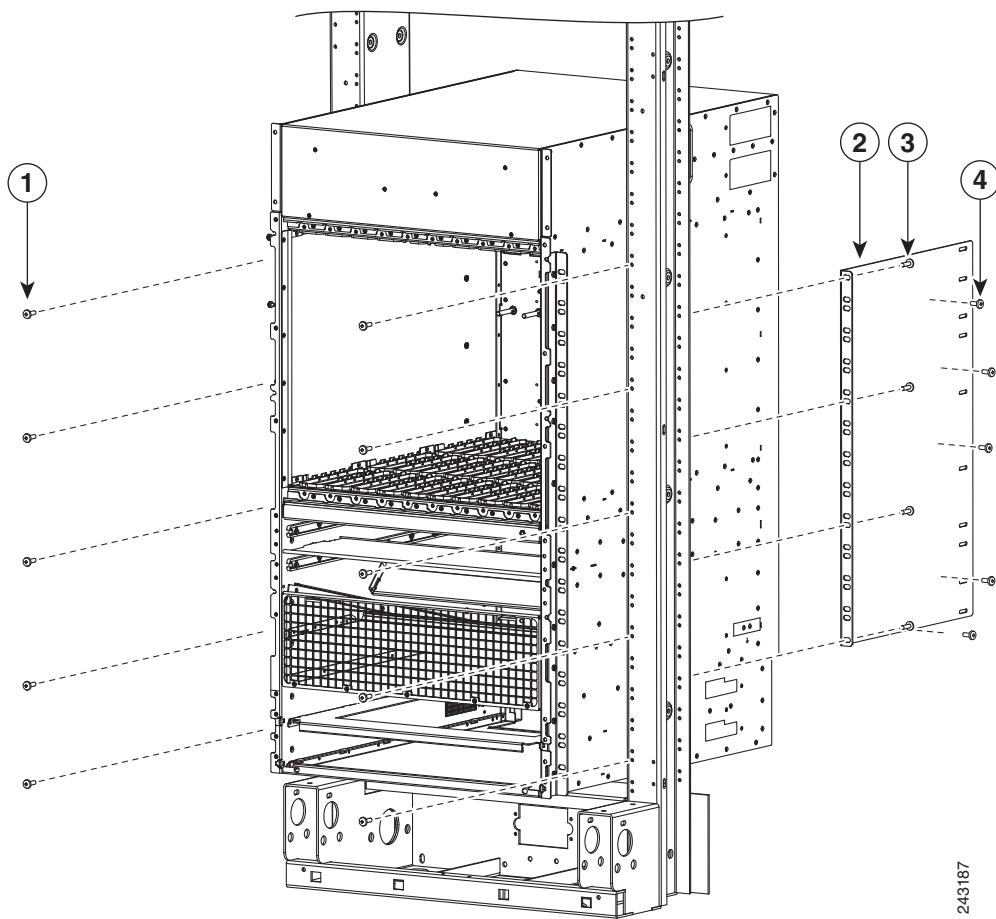
1	Five screws per side (minimum) to attach the router chassis to the rack	2	Four screws (minimum) to attach the rear mounting bracket to the rack	3	Rear mounting bracket	4	Five screws to attach the rear mounting bracket to the router chassis

Figure 2-40 shows the orientation of the Cisco ASR 9006 Router chassis to the rack posts and components used in the installation.

Figure 2-40   Installing the Cisco ASR 9006 Router Chassis in a Standard 2-Post Rack
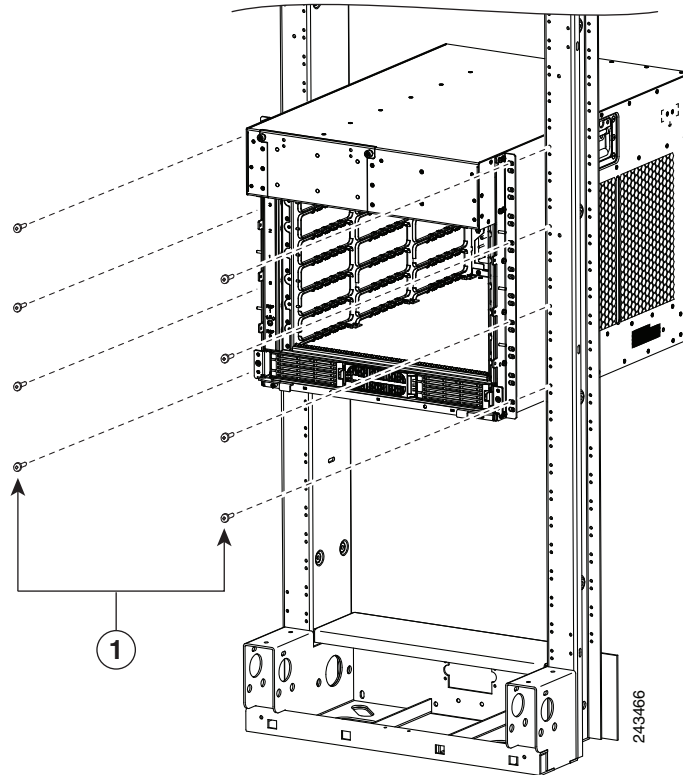
1	Four screws per side (minimum) to attach the router chassis to the rack.

Figure 2-41 shows the orientation of the Cisco ASR 9904 Router chassis to the rack posts and components used in the installation.

Figure 2-41   Installing the Cisco ASR 9904 Router Chassis in a Standard 2-Post Rack
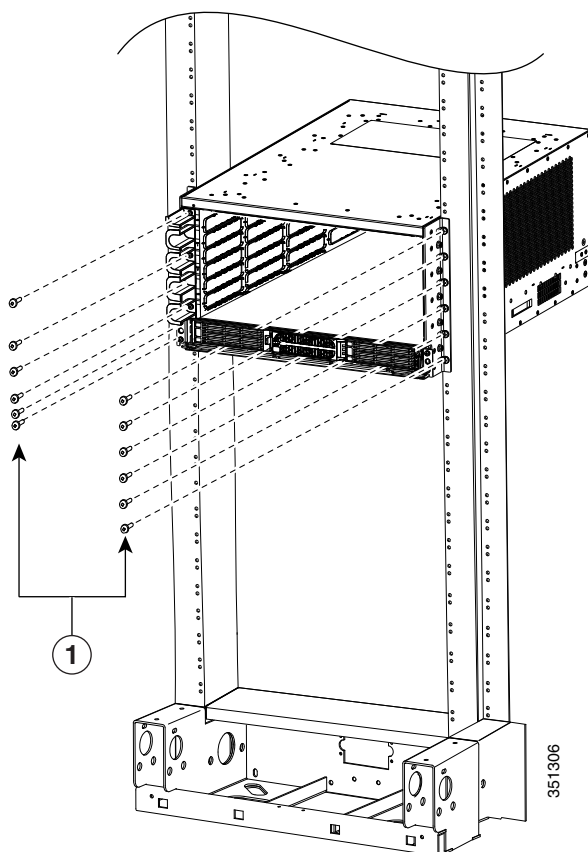
| 1 | Six screws per side (minimum) to attach the router chassis to the rack. |

Follow these steps to install the chassis in the equipment rack.

Step 1   Using two people, lift the chassis into the rack using the side handles and grasping underneath the power supply bays (Figure 2-42).

Figure 2-42   *Correct Lifting Positions*

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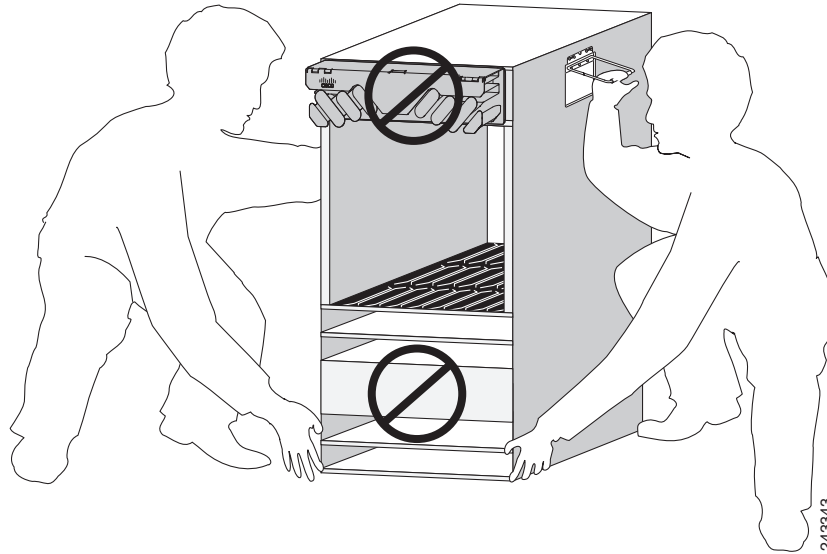
Caution   Do not grasp the card cage or the air inlet grill when lifting the router chassis (Figure 2-43).

Figure 2-43   Incorrect Lifting Handholds
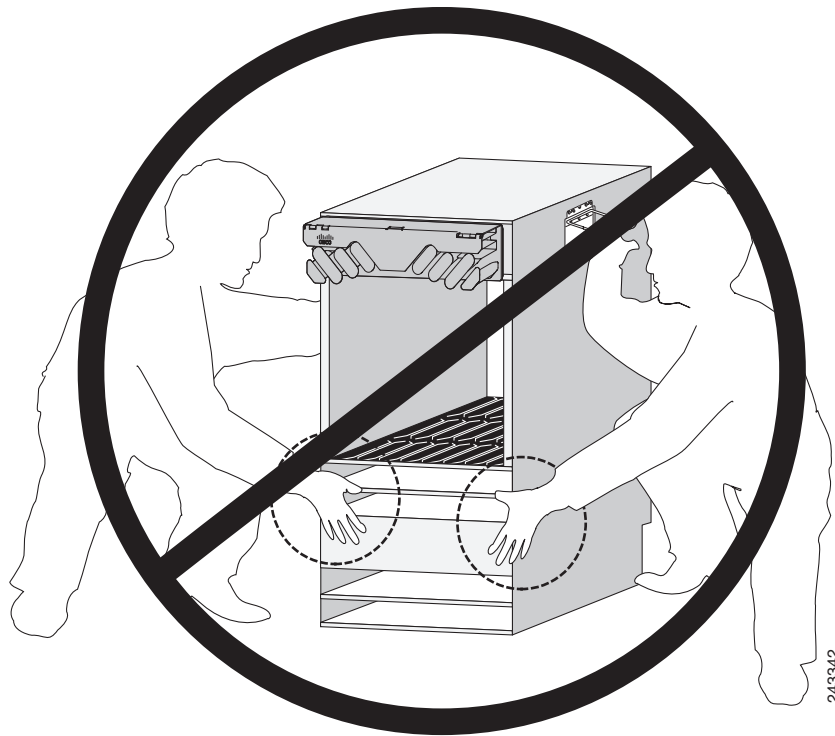
Step 2   Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

Step 3   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 4   Finger-tighten the screws to the rack rails on each side of the chassis. Space the screws evenly between the top and bottom of the chassis.

Step 5   (Optional) For optional earthquake protection for the Cisco ASR 9010 Router or Cisco ASR 9006 Router, two side brackets must be mounted to the chassis for attachment to the posts (5" channel width) of a GR-63 Zone 4 Seismic 2-post rack (Figure 2-39).

    a.   Attach the side brackets to the left and right side of the chassis by finger-tightening five screws through each bracket into the chassis.

    b.   Attach the side bracket front flanges to the rack posts by finger-tightening four screws through each bracket flange into the mounting rails of the rack.

    c.   Fully tighten the five screws on each side bracket to secure the brackets to the chassis.

    d.   Fully tighten the four screws on each side bracket flange to secure the brackets to the rack rails.

Step 6   Fully tighten all five screws on the chassis mounting flanges on each side to secure the chassis to the rack rails.

Installing the Chassis in a 4-post Open Rack

To mount the Cisco ASR 9010 Router, Cisco ASR 9922 Router or Cisco ASR 9912 Router chassis in a 4-post open rack, two side brackets must be attached to the chassis and the rear posts. See Figure 2-44 for the Cisco ASR 9010 Router and Figure 2-47 for the Cisco ASR 9922 Router and Cisco ASR 9912 Router.

To mount the Cisco ASR 9006 Router (Figure 2-45) or Cisco ASR 9904 Router (Figure 2-46) in a 4-post open rack, extra brackets are not required.

Preparing the 19 Inch 45-RU Rack

To prepare the 19 Inch 45-RU rack that will contain either the Cisco ASR 9922 Router chassis or Cisco ASR 9912 Router chassis:

Step 1   Install the two guide rails into the bottom of the rack (Figure 2-47).

The two guide rails at the bottom of the rack are included in the ASR-9922-ACC-KIT and ASR-9912-ACC-KIT accessory kits. Use screws to fasten these two guide rails into the front and rear rails of the rack.

The two guide rails have six holes (three per rail) that accommodate 12-24 or M6 screws. If you want to use smaller 10-32 screws, you must use them with bushings to fit the larger holes (Figure 2-13). The bottom rail is keyed to the EIA mounting hole pattern. Install the rails at the first RU location. The rear rack mount brackets are installed by aligning the bracket mounting holes to the holes on the rear cover of the chassis.

Step 2   Use a scissors jack to remove the chassis from the shipping rack. Place a pallet jack next to the chassis inside the shipping rack and push/pull the chassis onto the pallet jack for transport to the rack.

Step 3   On the rear of the Cisco ASR 9922 Router is an integrated handle that is used to pull the chassis from the pallet jack into the rack where the chassis is to be installed.

    a.   Position the chassis so that the rear handle is facing the front of the rack.

    b.   From the rear of the rack, pull the chassis by the handle into the rack, making sure that the chassis sits on top of the guide rails in the rack.

Step 4   On the Cisco ASR 9912 Router, the handles are on the sides of the chassis. Once the chassis is pulled into the rack and sits on top of the guide rails, use screws to fasten the chassis to the rack.

Figure 2-44   *Installing the Cisco ASR 9010 Router Chassis in a 4-Post Rack*
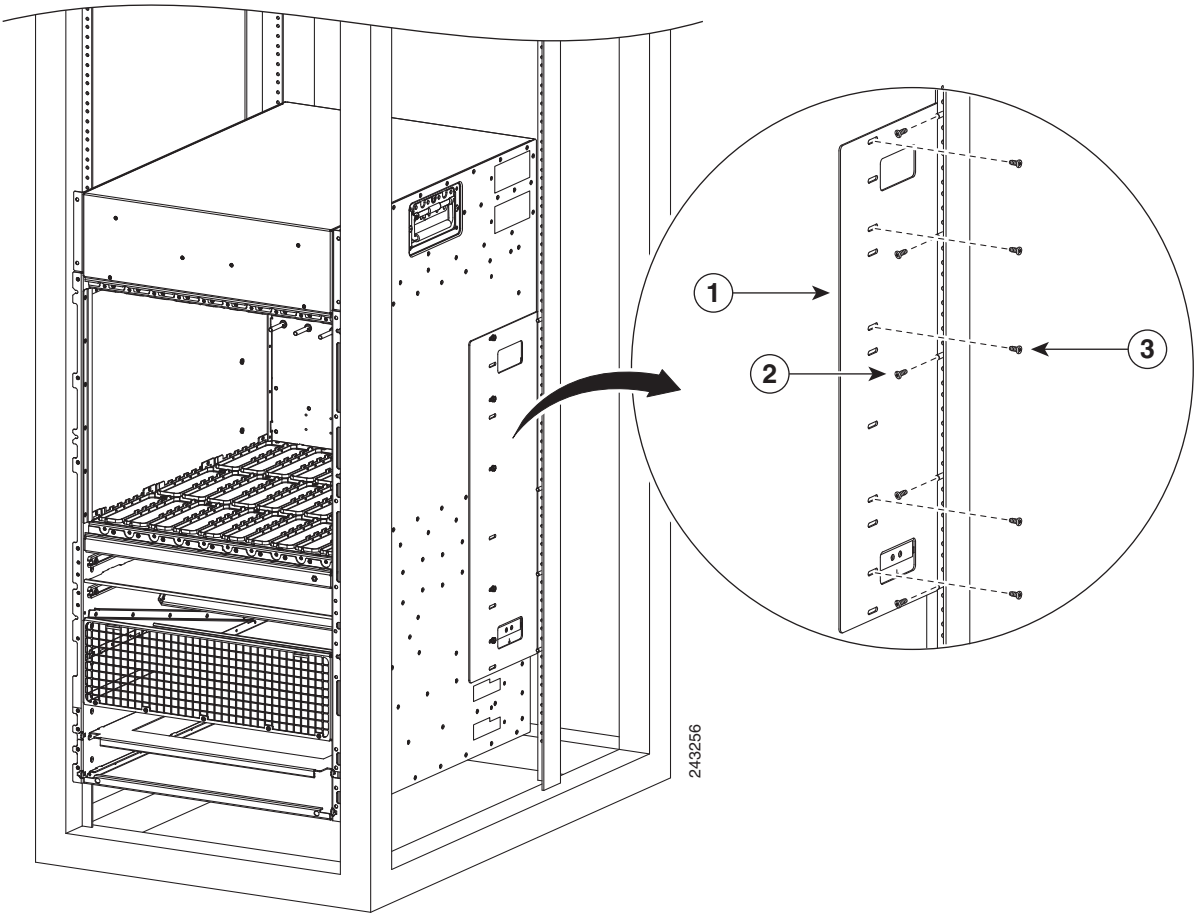
1	Rear mounting bracket	2	Five screws (minimum) to attach the rear mounting bracket to the rear post of the rack	3	Five screws (minimum) to attach the rear mounting bracket to the router chassis

Figure 2-45   Installing the Cisco ASR 9006 Router Chassis in a 4-Post Rack
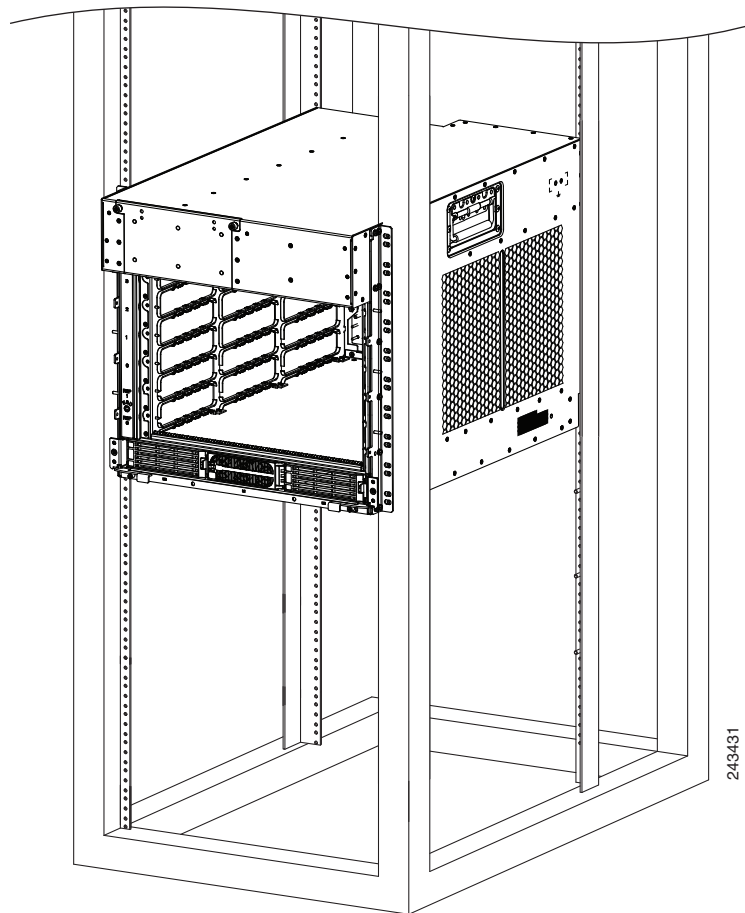
Figure 2-46   Installing the Cisco ASR 9904 Router Chassis in a 4-Post Rack
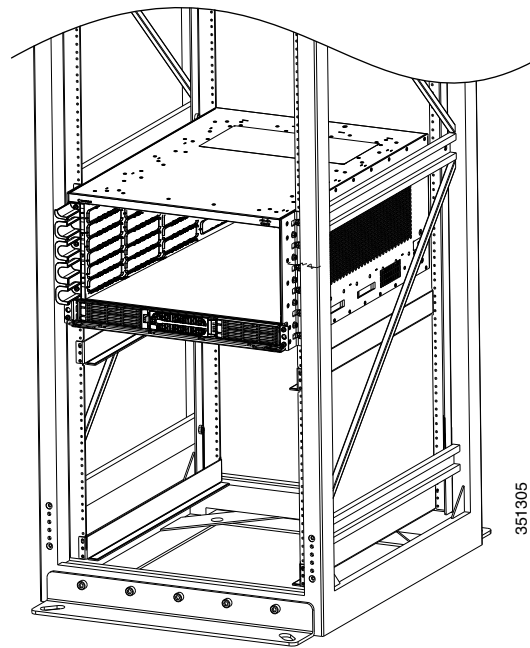
Figure 2-47   Rack Mount Installation Kit for the Cisco ASR 9922 Router and Cisco ASR 9912 Router
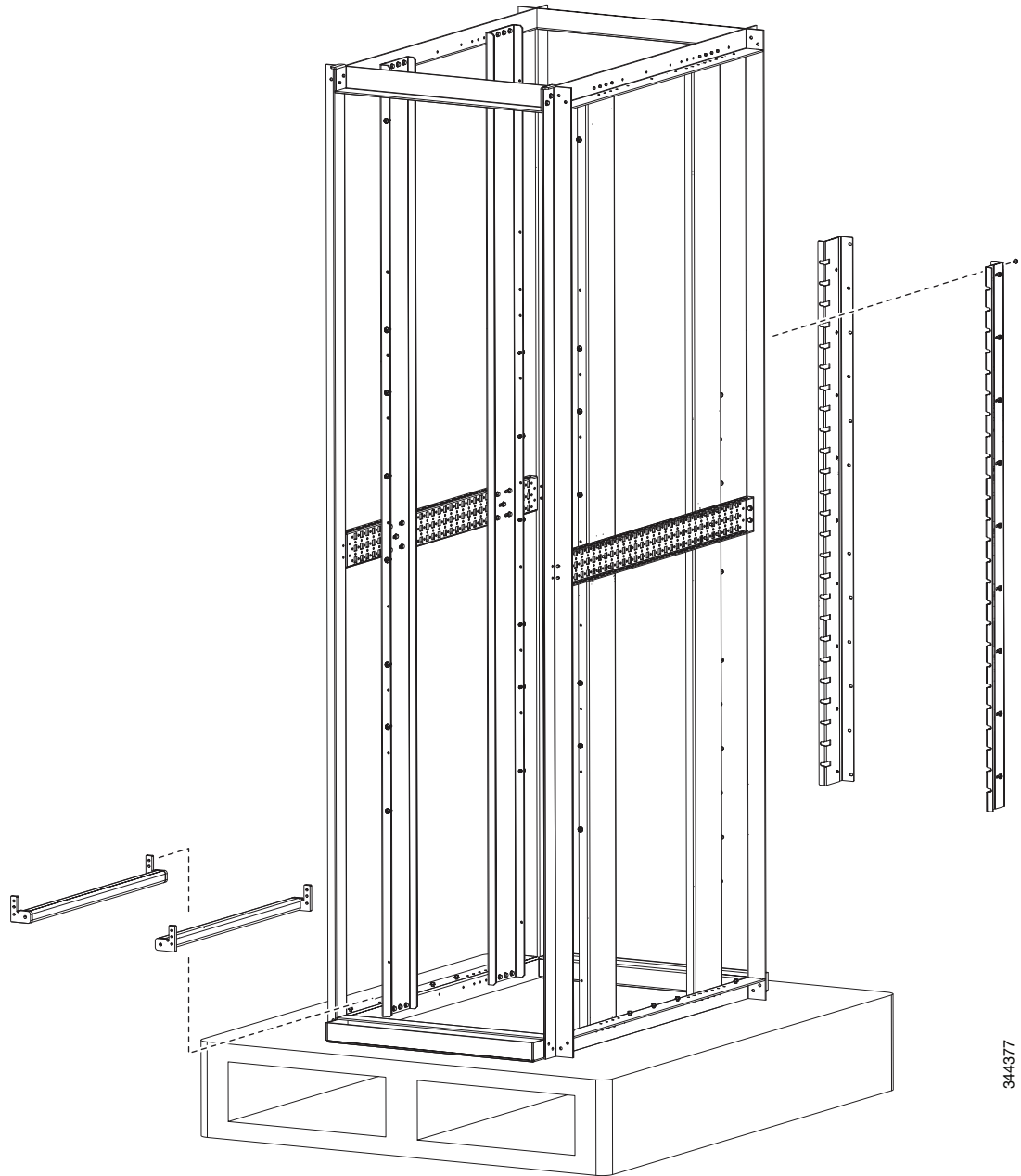
344377

Figure 2-48   *Installing the Cisco ASR 9922 Router Chassis in a 4-Post Rack*
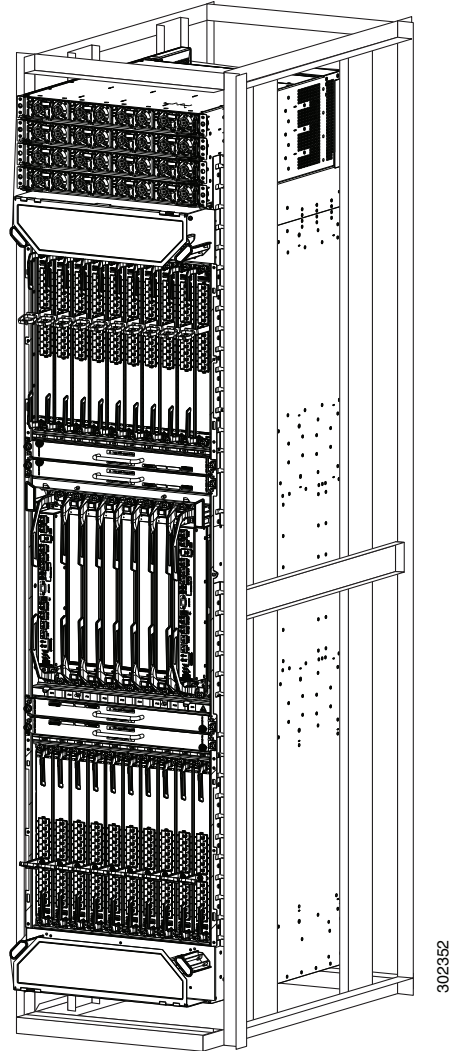
Figure 2-49   Installing the Cisco ASR 9912 Router Chassis in a 4-Post Rack

303660
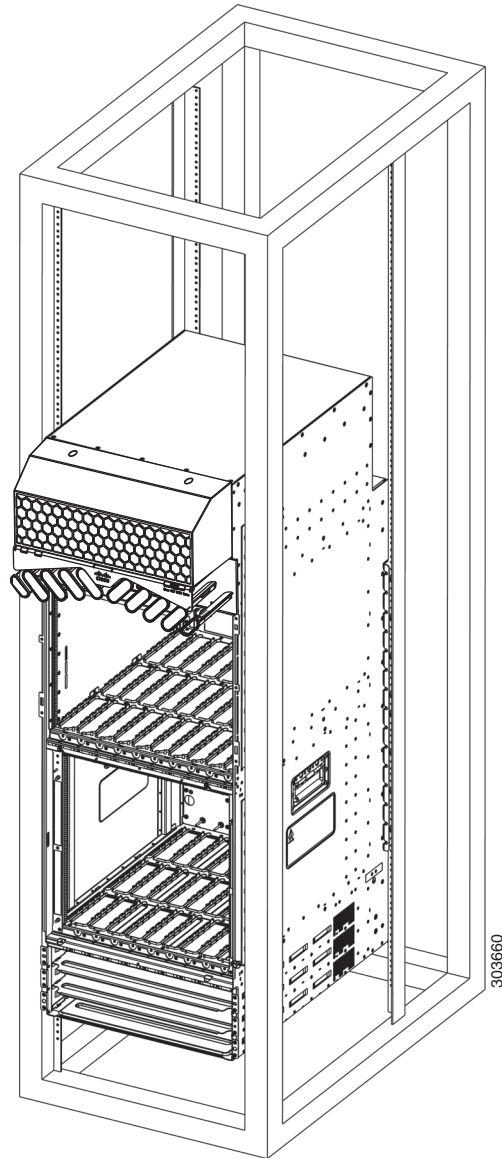
Supplemental Bonding and Grounding Connections

Before you connect power to the router, or 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, page 1-52.

Table 2-3 references the grounding receptacle locations for the Cisco ASR 9000 Series Routers.

Table 2-3   Grounding Receptacle Locations

Model Number	Grounding Receptacle Location
Cisco ASR 9010 Router	Bottom rear right side of the chassis (Figure 2-50).
Cisco ASR 9006 Router	Top rear right side of the chassis (Figure 2-51).
Cisco ASR 9904 Router	Bottom rear right side and rear left side of the chassis (Figure 2-52).
Cisco ASR 9922 Router	Top rear right side of the chassis (Figure 2-53).
Cisco ASR 9912 Router	Bottom rear right side of the chassis (Figure 2-54).

Follow these steps to attach a grounding cable lug to the router:

Step 1   Insert the grounding screws (10-32 round-head) through the locking washers (ideally nickel-plated brass) and into the threaded grounding receptacle (has two M6 bolt holes with 0.625 to 0.75 spacing between them). The wire receptacle is large enough to accept a #6 AWG or larger multi-strand copper wire.

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.

Figure 2-50   *NEBS Bonding and Grounding for the Cisco ASR 9010 Router*

243204
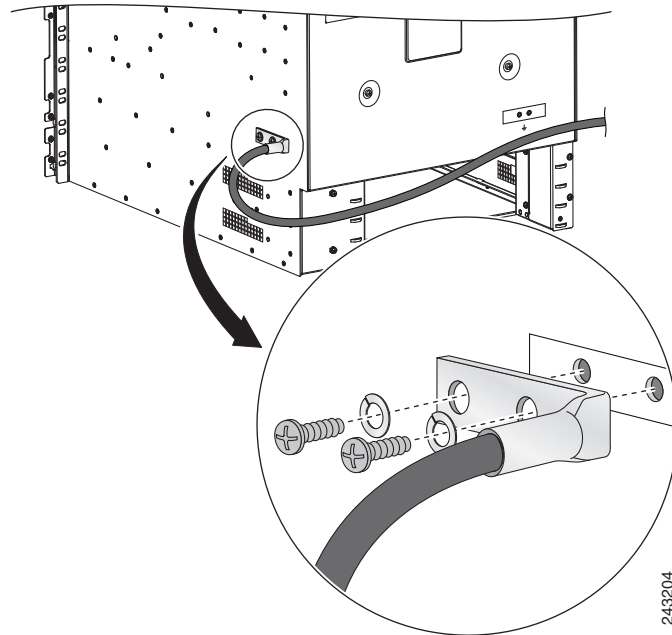
Figure 2-51   *NEBS Bonding and Grounding for the Cisco ASR 9006 Router*

243440
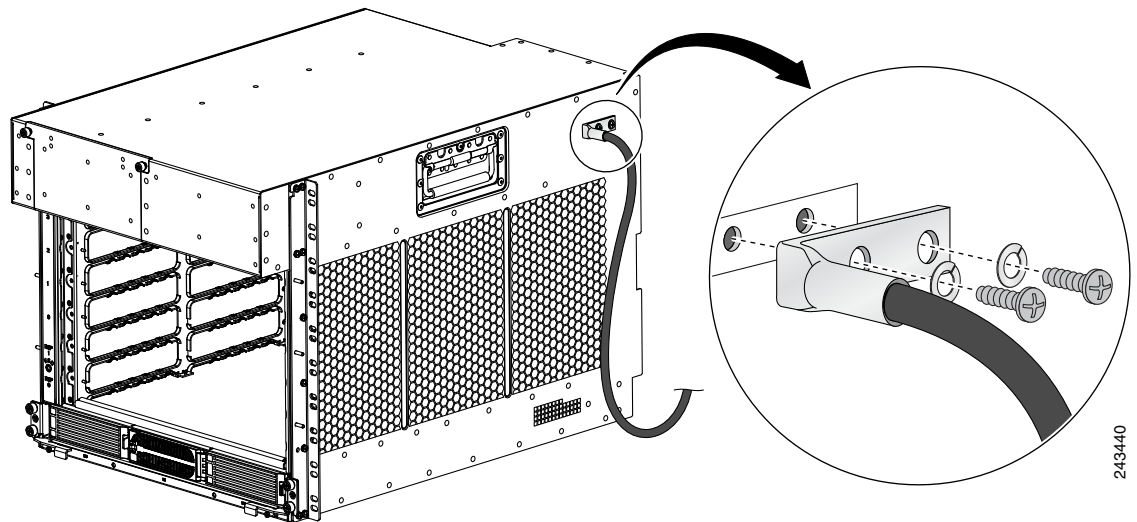
Figure 2-52   *NEBS Bonding and Grounding for the Cisco ASR 9904 Router*
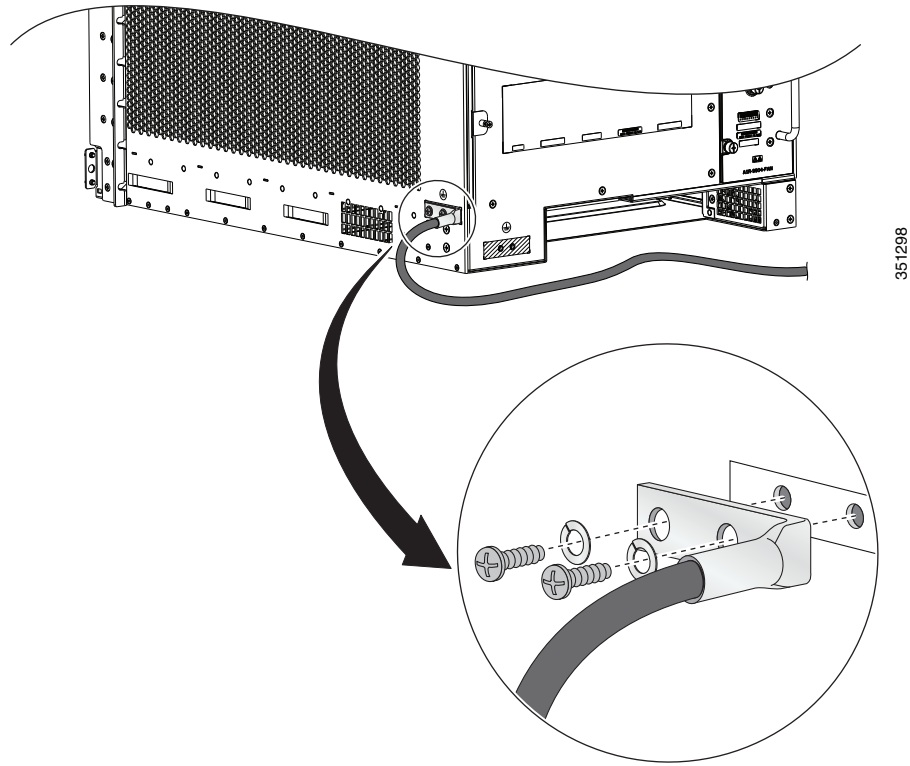
Figure 2-53   NEBS Bonding and Grounding for the Cisco ASR 9922 Router
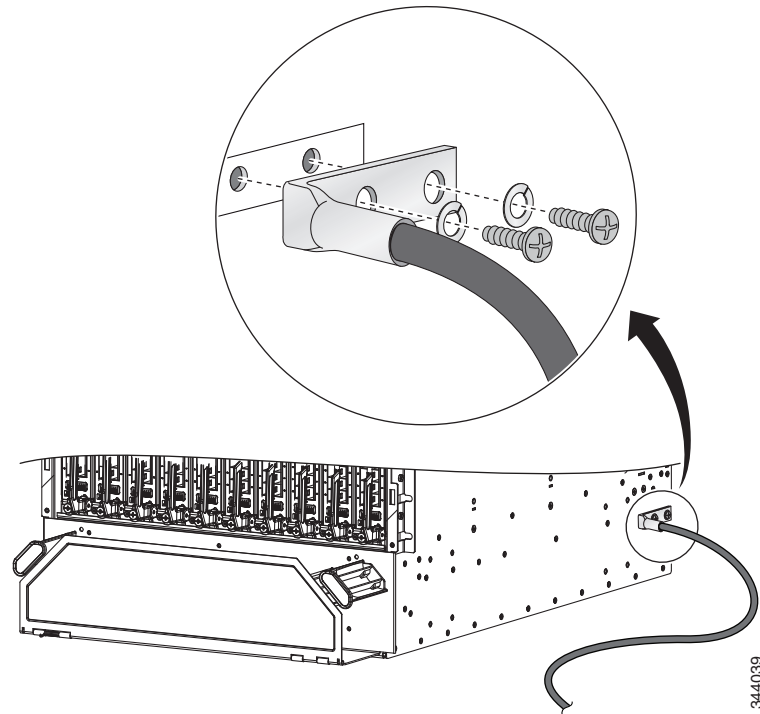
Figure 2-54   NEBS Bonding and Grounding for the Cisco ASR 9912 Router

303673
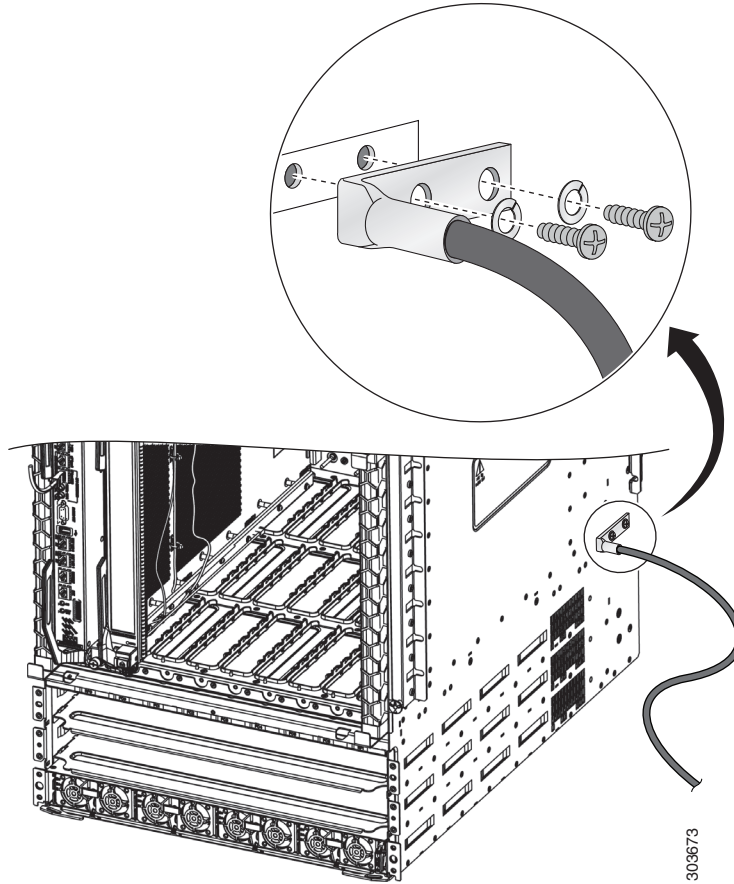
Installing Chassis Accessories

The Cisco ASR 9000 Series Routers ship with a base set of chassis accessories. To install the base accessories and optional accessories, see the appropriate installation procedure below for your router:

Base Accessories

- Installing Base Chassis Accessories on the Cisco ASR 9010 Router, page 2-61.
- Installing Base Chassis Accessories on the Cisco ASR 9006 Router, page 2-69
- Installing Base Chassis Accessories on the Cisco ASR 9912 Router, page 2-93.

Note The Cisco ASR 9904 Router does not include base chassis accessories.

Optional Accessories

- Installing Optional Chassis Accessories on the Cisco ASR 9010 Router, page 2-64.
- Installing Optional Chassis Accessories on the Cisco ASR 9006 Router, page 2-72
- Installing Optional Air Baffles on the Cisco ASR 9006 Router, page 2-75
- Installing Optional Air Baffles on the Cisco ASR 9904 Router, page 2-82.
- Installing Optional Chassis Accessories on the Cisco ASR 9922 Router, page 2-91.
- Installing Optional Chassis Accessories on the Cisco ASR 9912 Router, page 2-95

Installing Base Chassis Accessories on the Cisco ASR 9010 Router

The base chassis accessories for the Cisco ASR 9010 Router include:

- Two ball studs
- Two plastic side strips
- One accessory front grill

Note If you ordered the optional accessories set, see Installing Optional Chassis Accessories on the Cisco ASR 9010 Router, page 2-64 to install both the base and optional accessories.

If you did not order the optional accessory set, follow these steps to install the supplied base chassis accessories on the Cisco ASR 9010 Router:

Step 1 Install two ball studs (one per side) into the chassis front edge (Figure 2-55) near the top of the chassis grill. Tighten the ball studs to a torque of 8 in-lb (0.90 N-m).

Figure 2-55   *Installing Ball Studs: Version 1 Power Cisco ASR 9010 Router (Base Accessories Installation)*
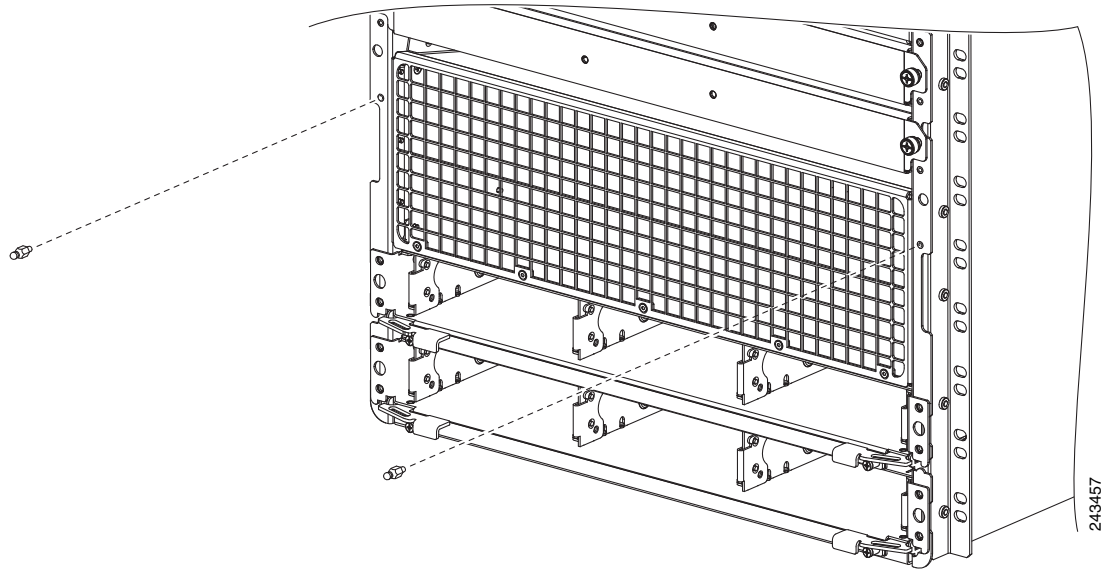
Step 2   Attach two plastic strips (one per side) along the chassis front edge. The bottom tab of each strip attaches to the hole about 2 inches above the ball stud locations (Figure 2-56).

Step 3   Attach the accessory grill to the chassis in front of the chassis grill. The top of the accessory grill attaches to the ball studs.

Note   You must install the lower fan tray before attaching the accessory grill. The lower fan tray slot is located behind the accessory grill. See Installing Fan Trays, page 3-4.

Figure 2-56   Installing Base Chassis Accessories on the Cisco ASR 9010 Router
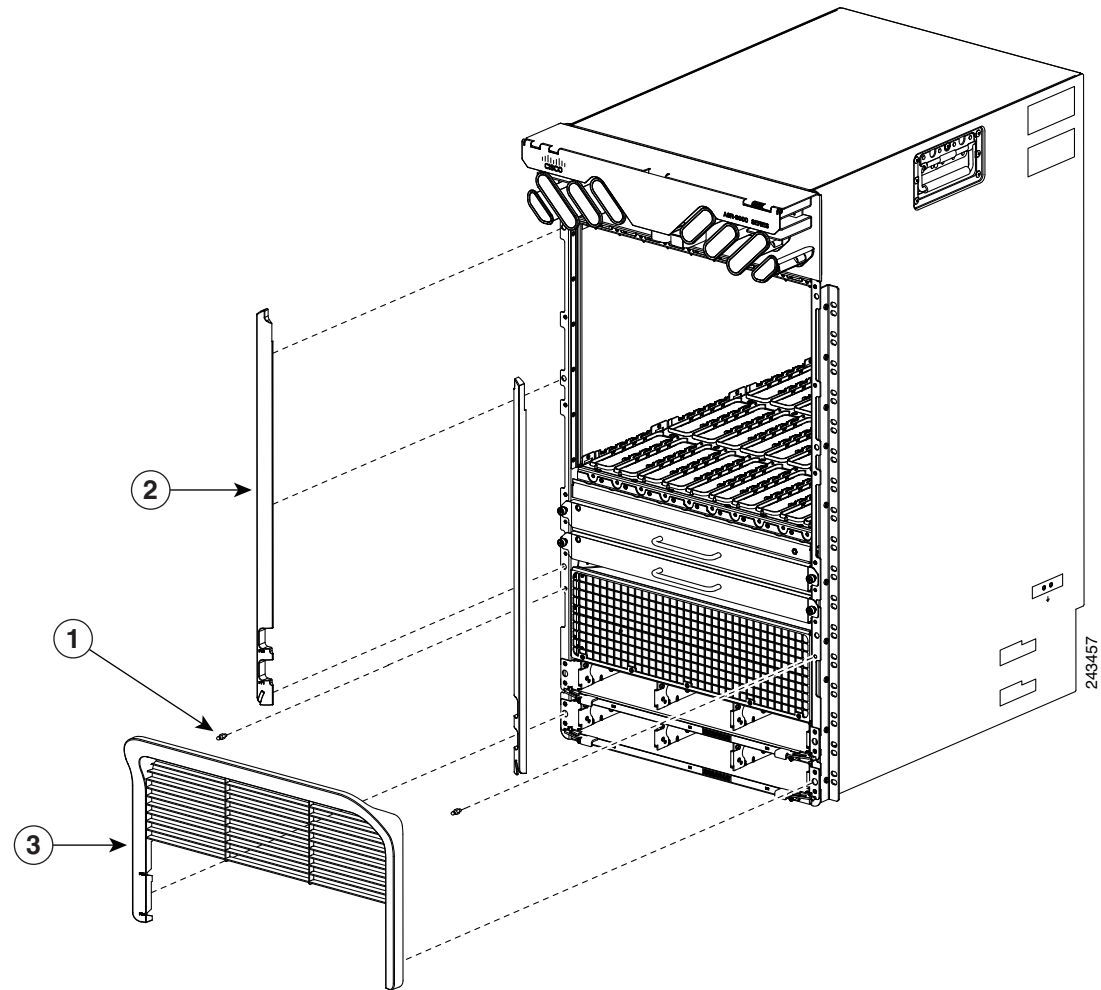
1	Two are ball studs inserted in front chassis edge threaded holes next to chassis grill	2	Two side strips attach to front chassis edge (one per side).	3	Accessory grill attaches to front chassis edge by attaching to ball studs.

Installing Optional Chassis Accessories on the Cisco ASR 9010 Router

The optional chassis accessories for the Cisco ASR 9010 Router include:

- Six ball studs
- Two L-shaped brackets
- Two hinge brackets (left and right side)
- Eight screws (plus one extra) for attaching the hinge brackets
- Four screws for attaching the L-shaped brackets
- Two doors (left and right side)
- One mid-cover with door lock

Note   Installation of the optional accessory pieces also includes the base accessory ball studs and front grill. The base accessory side strips are not used when installing the optional chassis accessories.

If you ordered the optional accessories set, follow these steps to install both the base and optional accessories (Figure 2-57):

Step 1   Attach the left L-shaped bracket (item 3 in Figure 2-57) to the left hinge bracket (item 2 in Figure 2-57) with two screws. Tighten the screws to a torque of 5 in-lb (0.55 N-m).

Step 2   Repeat Step 1 for the right hinge bracket and right L-shaped bracket.

Step 3   Remove the two screws that secure the bottom edge of the cable management tray to the chassis.

Step 4   Install six ball studs (three per side) into the chassis front edge (item 7 in Figure 2-57 and Figure 2-58). Tighten the ball studs to a torque of 8 in-lb (0.90 N-m).

Figure 2-57   *Optional Chassis Accessories for the Cisco ASR 9010 Router*
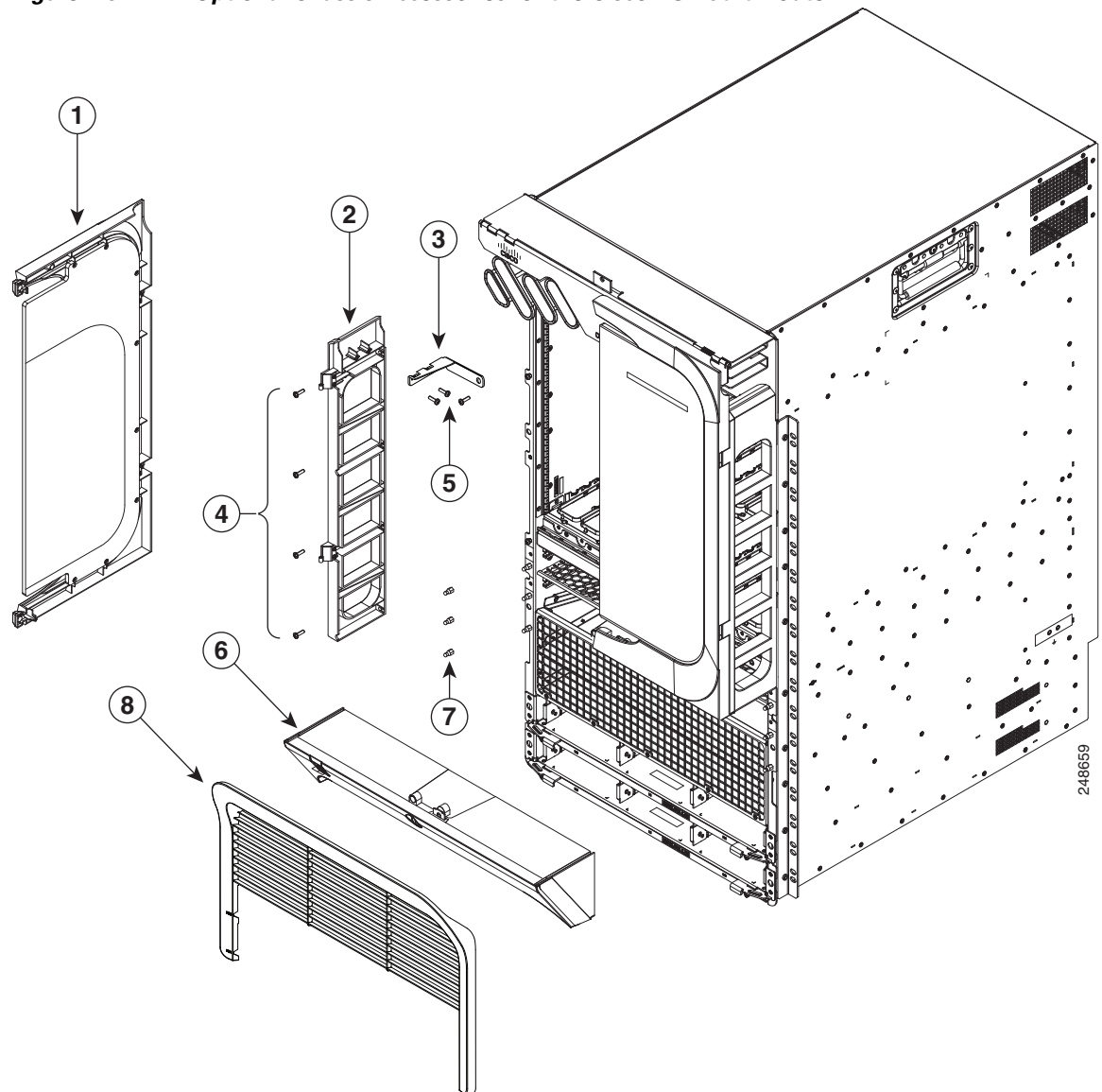
1	Door (one per side)	5	Screws for attaching the L-shaped bracket to the hinge bracket (one screw is removed and re-inserted to attach the L-shaped bracket to the cable management tray and chassis)
2	Hinge bracket (one per side)	6	Mid-cover with door lock
3	L-shaped bracket (one per side)	7	Balls studs (three per side)
4	Four screws for attaching each hinge bracket (eight screws total)	8	Front grill

Figure 2-58   Locations for the Six Ball Studs on the Cisco ASR 9010 Router
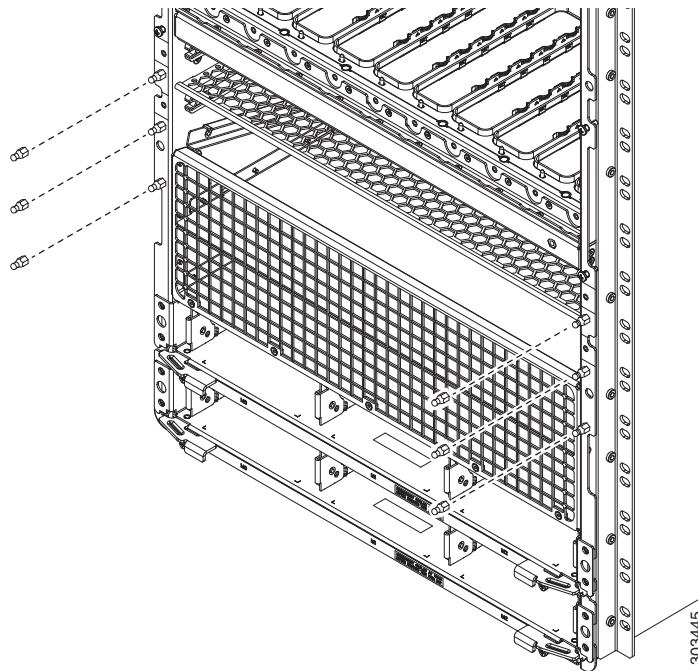
Step 5   Attach the left and right hinge brackets to the chassis using four screws for each bracket. Tighten the screws to a torque of 11 in-lb (1.20 N-m). The L-shaped brackets should align with the holes in the cable management tray from which you removed the screws.

Step 6   Secure the L-shaped brackets to the chassis and cable management tray by re-inserting and tightening the cable management tray screws you removed (Figure 2-59).

Figure 2-59   Installing the Hinge Brackets and L-Shaped Brackets on the Cisco ASR 9010 Router
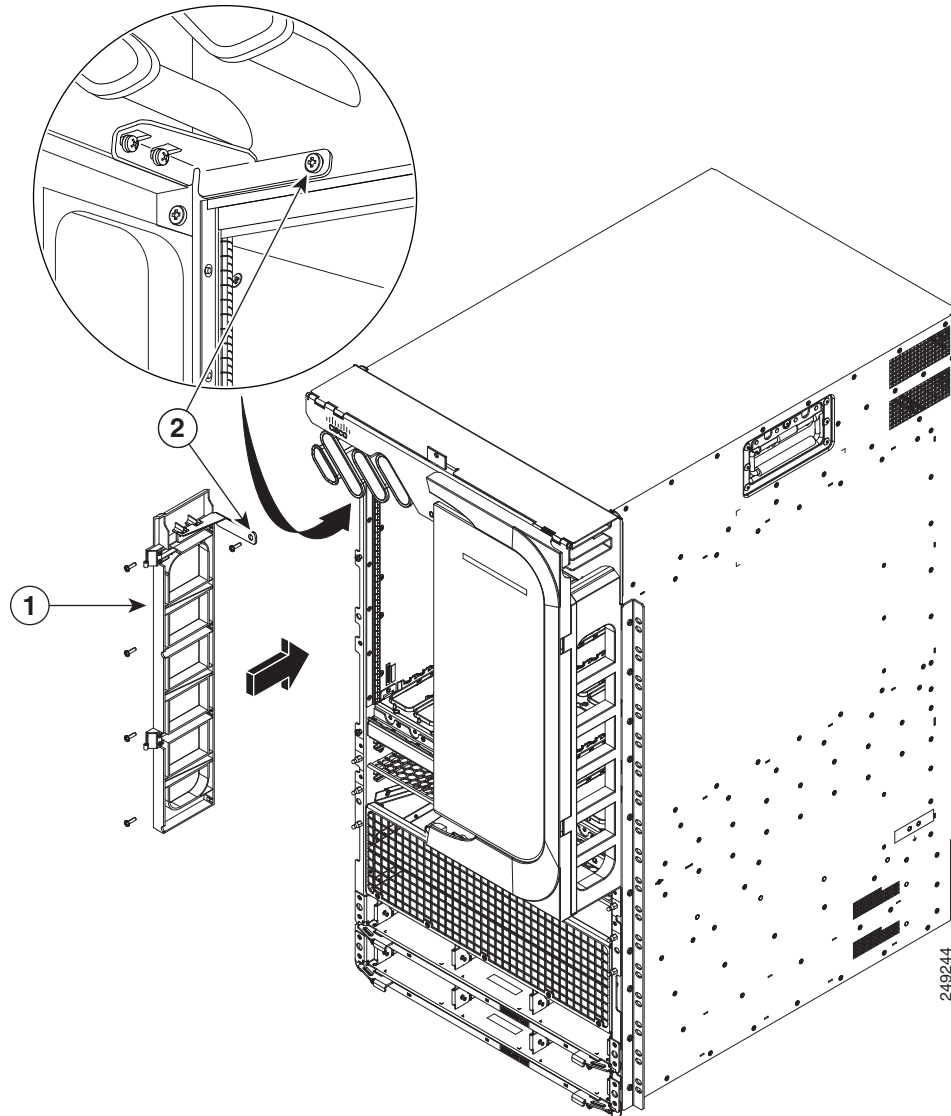
1	Install each hinge bracket, with an L-shaped bracket attached, using four screws.	2	After the hinge brackets are installed, secure each L-shaped bracket to the cable management tray and chassis with the screw that you previously removed from that location.

Step 7   Install the mid-cover with door lock (item 6 in Figure 2-57) by engaging it to the upper four ball studs and lining up the grooves in the top outside edges of the mid-cover with ridges at the bottom of the hinge brackets.

Step 8   Attach two doors to the hinge brackets (one per side). For each door:

a.   Align the door hinge hole with the bracket hinge hole (Figure 2-60).

b.   Insert the captive pin in the door hinge through the hole in the bracket hinge.

Note You must install the lower fan tray before attaching the accessory grill. The lower fan tray slot is located behind the accessory grill. See Installing Fan Trays, page 3-4.

Figure 2-60   Installing Optional Chassis Accessory Doors on the Cisco ASR 9010 Router
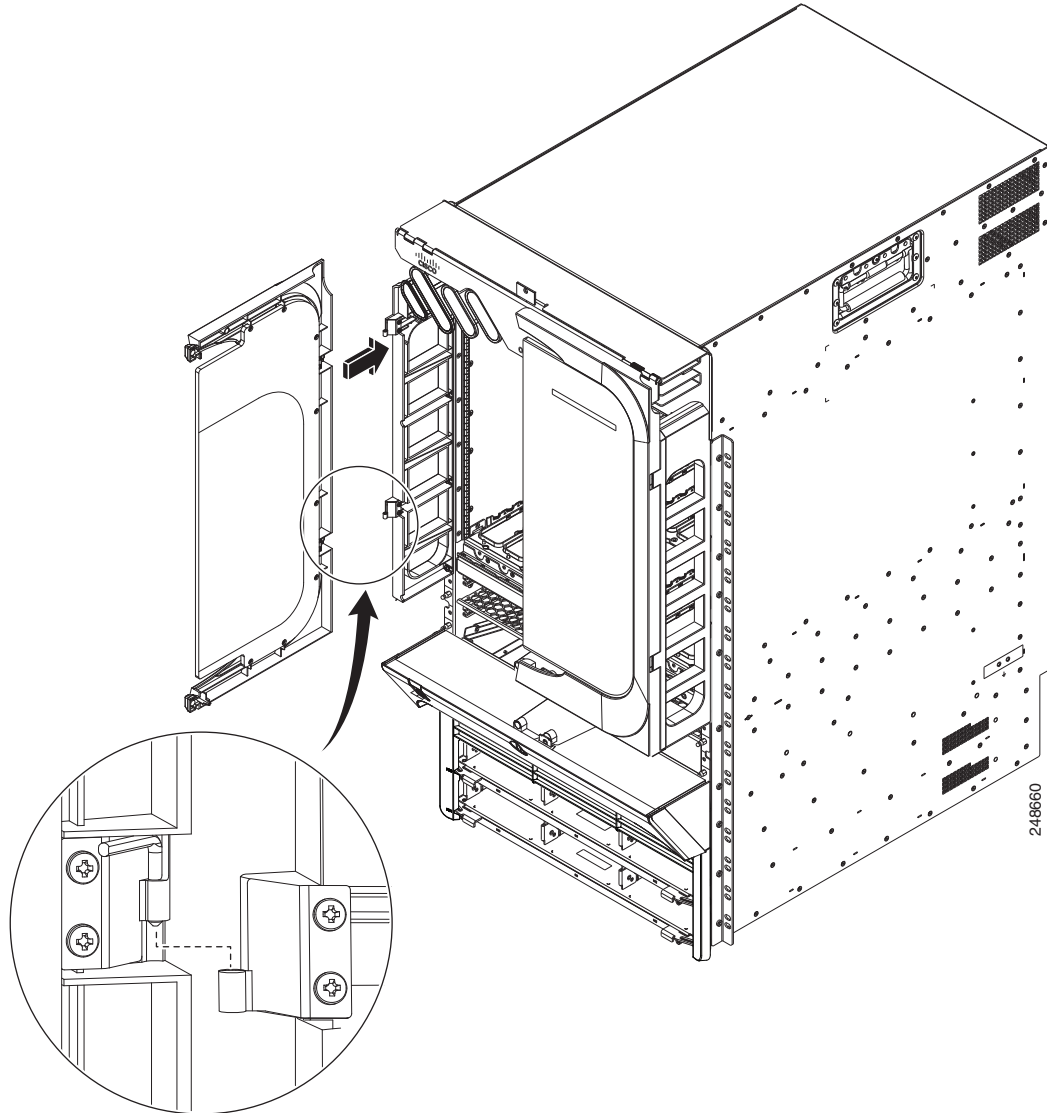
Step 9 Install the front grill (item 8 in Figure 2-57) by aligning and engaging it to the bottom two ball studs and pressing it in.

Installing Base Chassis Accessories on the Cisco ASR 9006 Router

The base chassis accessories for the Cisco ASR 9006 Router include:

- One plastic fan tray door accessory piece
- Two metal mounting brackets (left and right)
- Two chassis side brackets (left and right)
- Two plastic chassis corner pieces (left and right)
- Two screws for attaching the plastic fan tray door accessory piece
- Six screws for attaching the metal mounting brackets
- Six screws for attaching the side brackets

Note   If you ordered the optional accessories set, see Installing Optional Chassis Accessories on the Cisco ASR 9006 Router, page 2-72 to install both the base and optional accessories.

If you did not order the optional accessory set, follow these steps to install the supplied base chassis accessories on the Cisco ASR 9006 Router.

Step 1   Attach the plastic accessory piece to the fan tray door using two supplied screws. Insert the screws through the fan tray door from the inside of the door into the accessory piece (Figure 2-61).

Step 2   Attach the left metal mounting bracket to the front upper left corner of the chassis with three screws.

Figure 2-61 *Installing Plastic Fan Tray Door Accessory and Metal Mounting Brackets on the Cisco ASR 9006 Router*
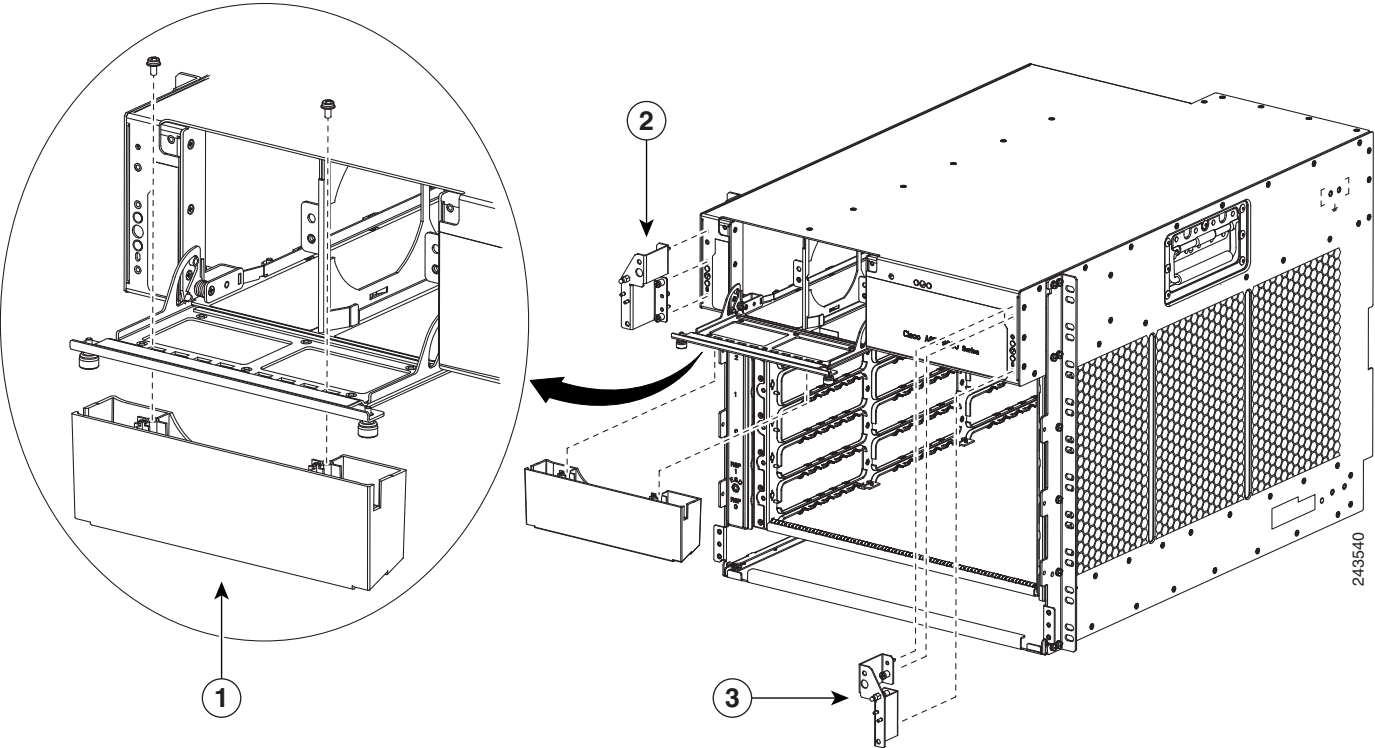
1	Plastic fan tray door accessory	**2**	Metal mounting bracket on left upper corner of chassis	**3**	Metal mounting bracket on right upper corner of chassis

Step 3   Attach the right metal mounting bracket to the front upper right corner of the chassis with three screws.

Step 4   Attach the left and right side brackets to the chassis front edge on each side (Figure 2-62). Attach each bracket to the chassis using three screws per bracket inserted from the inside of the chassis, through the three chassis tabs into the plastic brackets. Tighten the screws to a torque of 7 in-lb (0.80 N-m).

Figure 2-62   Installing Chassis Side Brackets on the Cisco ASR 9010 Router
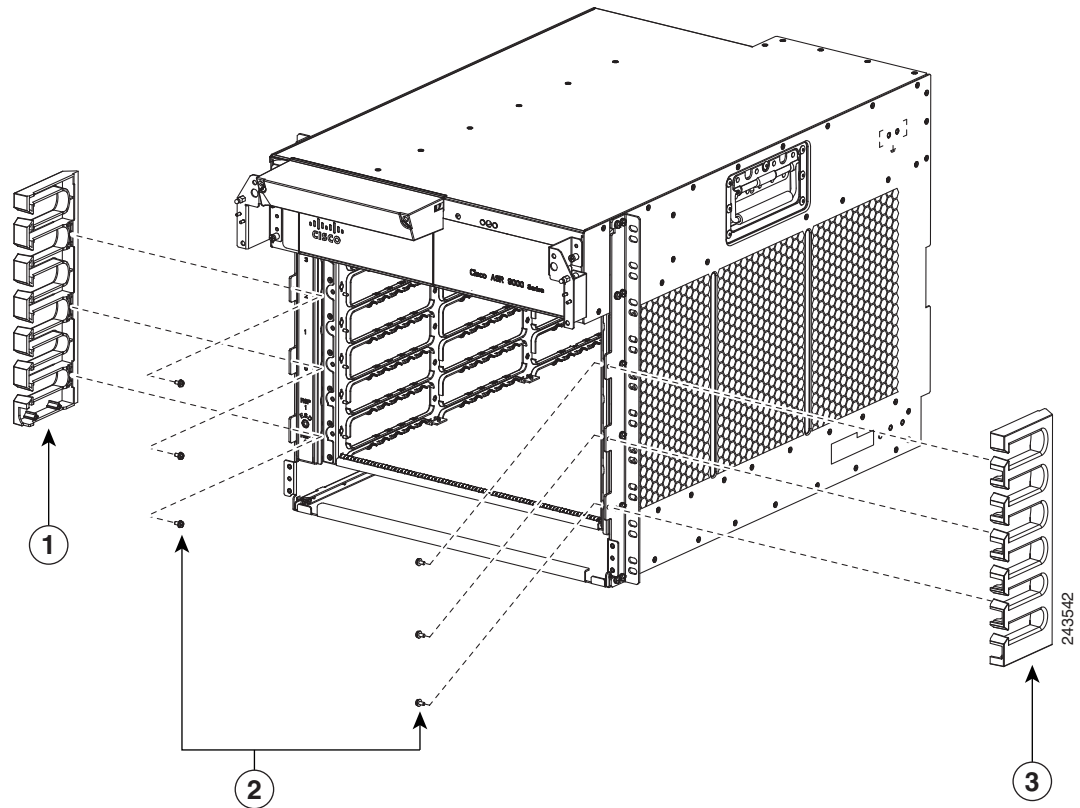
1	Left chassis side bracket	**2**	Six screws for attaching the chassis side brackets (three per side)	**3**	Right chassis side bracket

Step 5   Attach the left plastic corner piece to the mounting bracket at the front upper left corner of the chassis (Figure 2-63).

Step 6   Attach the right plastic corner piece to the mounting bracket at the front upper right corner of the chassis.

Figure 2-63   *Installing Plastic Chassis Corners on the Cisco ASR 9006 Router (Base Accessories Installation)*

1	Plastic chassis corner piece attaches to metal bracket at upper left corner of chassis	2	Plastic chassis corner piece attaches to metal bracket at upper right corner of chassis

After the chassis has been installed in the rack and all chassis accessories have been attached, you can install the fan trays, power supply modules, and RSP and line cards. See Chapter 3, "Installing Cards and Modules in the Chassis," for detailed installation instructions.

Installing Optional Chassis Accessories on the Cisco ASR 9006 Router

The optional chassis accessories for the Cisco ASR 9006 Router include:

- Four ball stud assembly pieces (one set of two pieces per side)
- One door with attached hinges
- Four screws for assembling and attaching the ball stud assemblies
- Four small hex nuts for attaching the door hinges

Installation of the optional accessory pieces also includes all base accessory pieces. If you ordered the optional accessories set, follow these steps to install both the base and optional accessories:

Step 1   Perform Step 1 through Step 4 of the Installing Base Chassis Accessories on the Cisco ASR 9006 Router, page 2-69.

Step 2   Assemble and attach the two ball stud assemblies (Figure 2-64) to each chassis side bracket. For each assembly:

    a. Align the two halves of the assembly to each other and to the screw holes in the chassis side bracket.

    b. Insert and tighten two screws to secure the assembly to the side bracket.

Figure 2-64   Installing Ball Stud Assemblies on the Cisco ASR 9006 Router (Shown with Version 1 Power System)
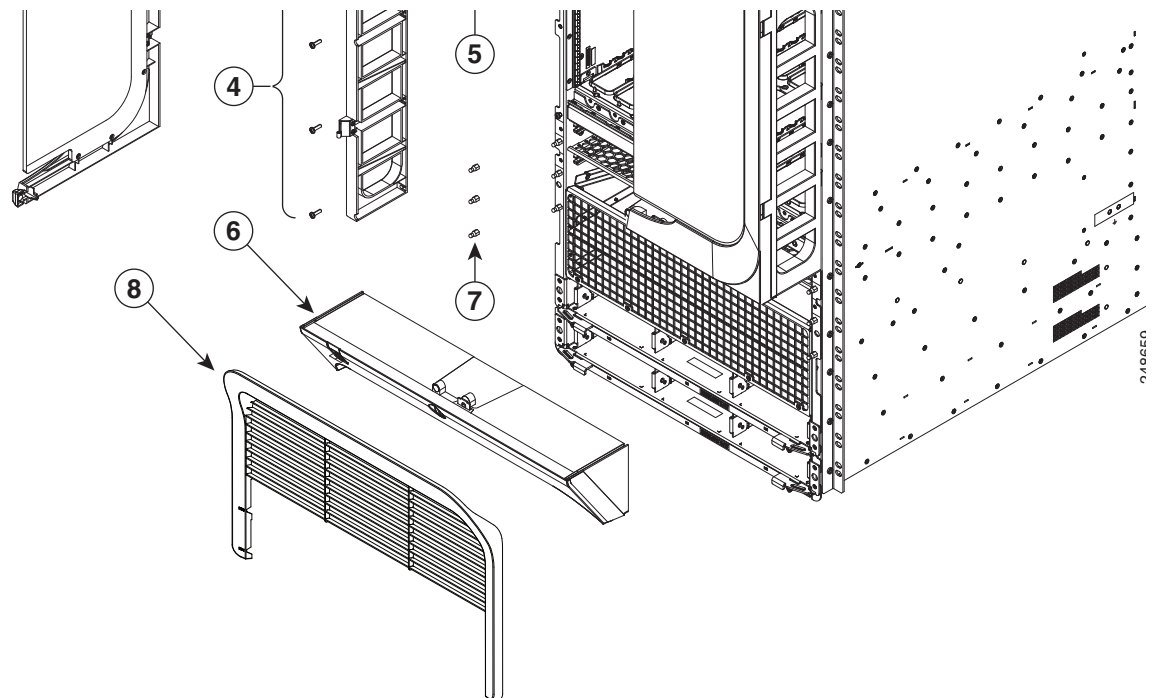
Step 3   Attach the door to the upper chassis panel (Figure 2-65) using two hex nuts per side to secure the door hinges to the panel. Tighten the hex nuts to a torque of 4 in-lb (0.45 N-m).

⚠

Caution   Do not overtighten the hex nuts. They can be broken through overtightening.

⚠

Caution When opening the door, be sure to grasp the center of the door to pull it open. Do not open the door by pulling on a corner or side of the door frame.

Figure 2-65   Installing the Optional Accessory Door on the Cisco ASR 9006 Router
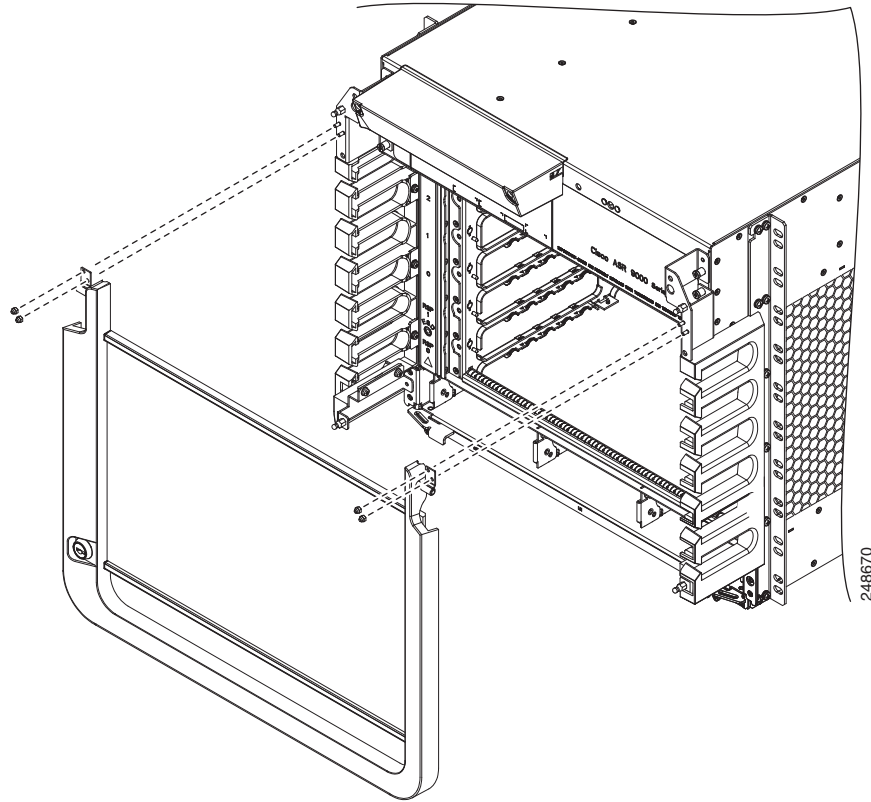
Step 4   Attach the left plastic corner piece to the mounting bracket at the front upper left corner of the chassis (Figure 2-66).

Step 5   Attach the right plastic corner piece to the mounting bracket at the front upper right corner of the chassis.

Figure 2-66   *Installing Plastic Chassis Corners on the Cisco ASR 9006 Router (Optional Accessories Installation)*

1	Plastic chassis corner piece attaches to metal bracket at upper left corner of chassis	2	Plastic chassis corner piece attaches to metal bracket at upper right corner of chassis

After the chassis has been installed in the rack and all chassis accessories have been attached, you can install the fan trays, power supply modules, and RSP and line cards. See Chapter 3, "Installing Cards and Modules in the Chassis" for detailed installation instructions.

Installing Optional Air Baffles on the Cisco ASR 9006 Router

The Cisco ASR 9006 Router has an optional air baffle accessory kit (800-43858-01) for mounting the router chassis in a 2-post or 4-post 19-inch rack. The accessory kit includes:

- – One plenum with two pre-installed front rack-mounting brackets for attaching plenum to front side of rack-post

- – One support bracket

- – One plastic glide strip

- – Two rear rack-mounting brackets for attaching plenum to rear side of rack-post

- – Twelve 12-24 x 0.5 in. pan-head screws (six for attaching support bracket to chassis and six for securing chassis to rack-mounted plenum)

- – Twelve 8-32 x 0.5 in. pan-head screws for attaching rear rack-mounting brackets on plenum

Air baffles allow for front-to-back air flow through the chassis and help isolate exhaust air from the intake air.

If you ordered the optional air baffle accessory kit, follow these steps to install it:

Step 1   Attach the support bracket (part number: 800-43857-01) to the left side of the Cisco ASR 9006 Router using six 12-24 x 0.5 in. pan-head screws (part number: 48-0523-01). See Figure 2-67.

Figure 2-67   Attaching the Support Bracket to the Left Side of the Cisco ASR 9006 Router Chassis
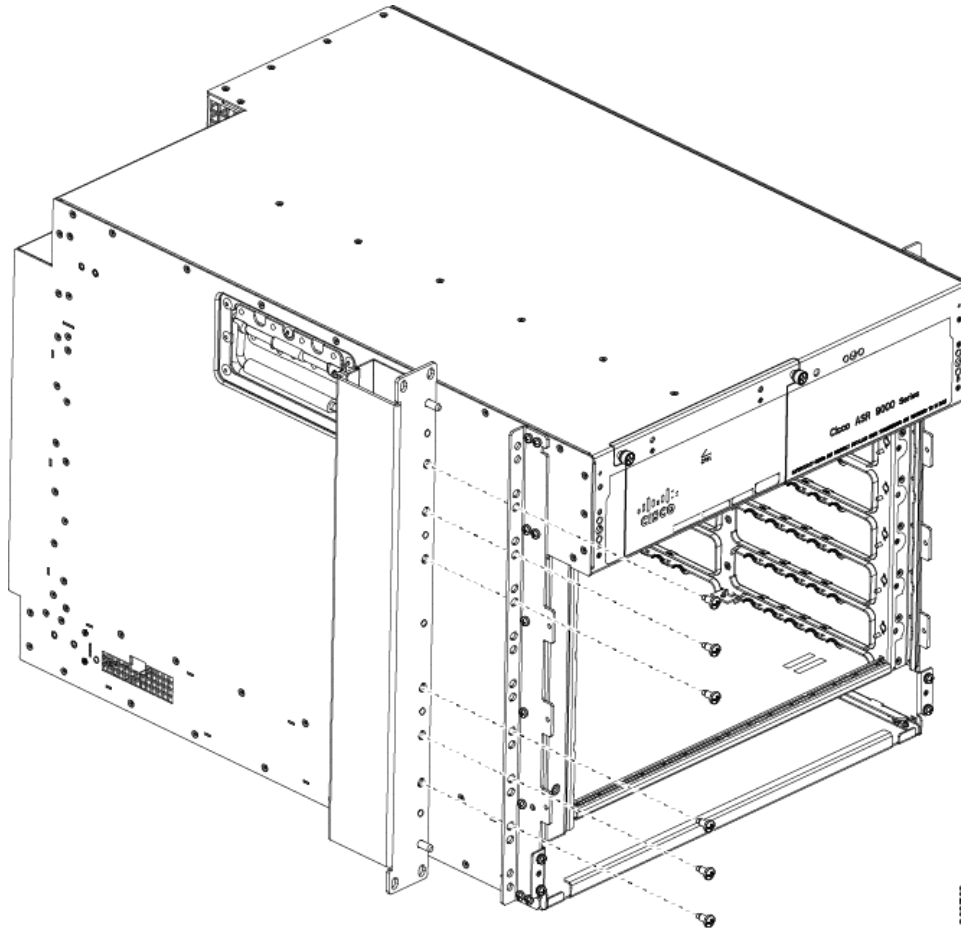
Step 2   Remove the paper liner from the plastic guide strip and install on the right side of the chassis card cage, as shown in Figure 2-68.

Figure 2-68   Attaching Plastic Glide Strip to Chassis
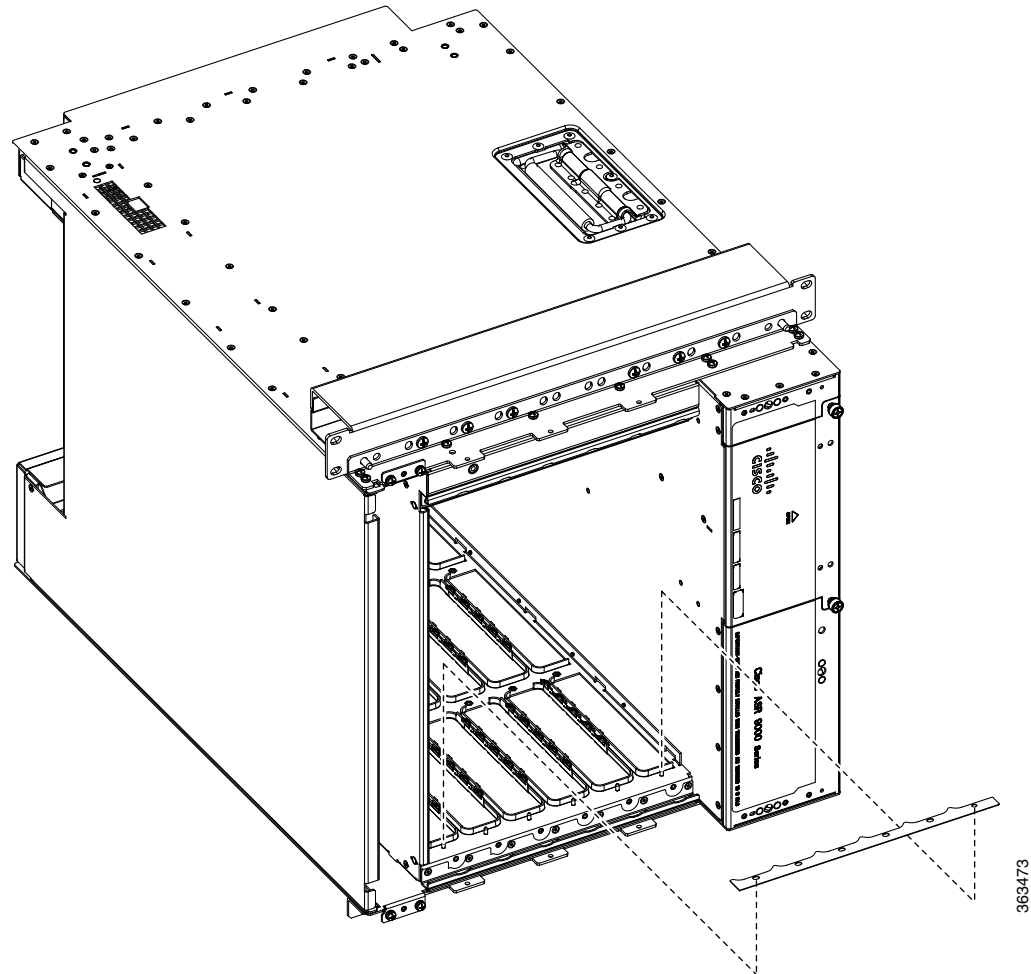
Step 3   Install the plenum in the rack. Insert and tighten four customer-supplied screws to secure the plenum to the front of the rack-post (two on each side). These screws can vary in size and type depending on the rack that you use. Torque the screws to the weight specified for your particular rack. See Figure 2-69 and Figure 2-70.

Figure 2-69   *Plenum with Pre-Installed Front Mounting Brackets*
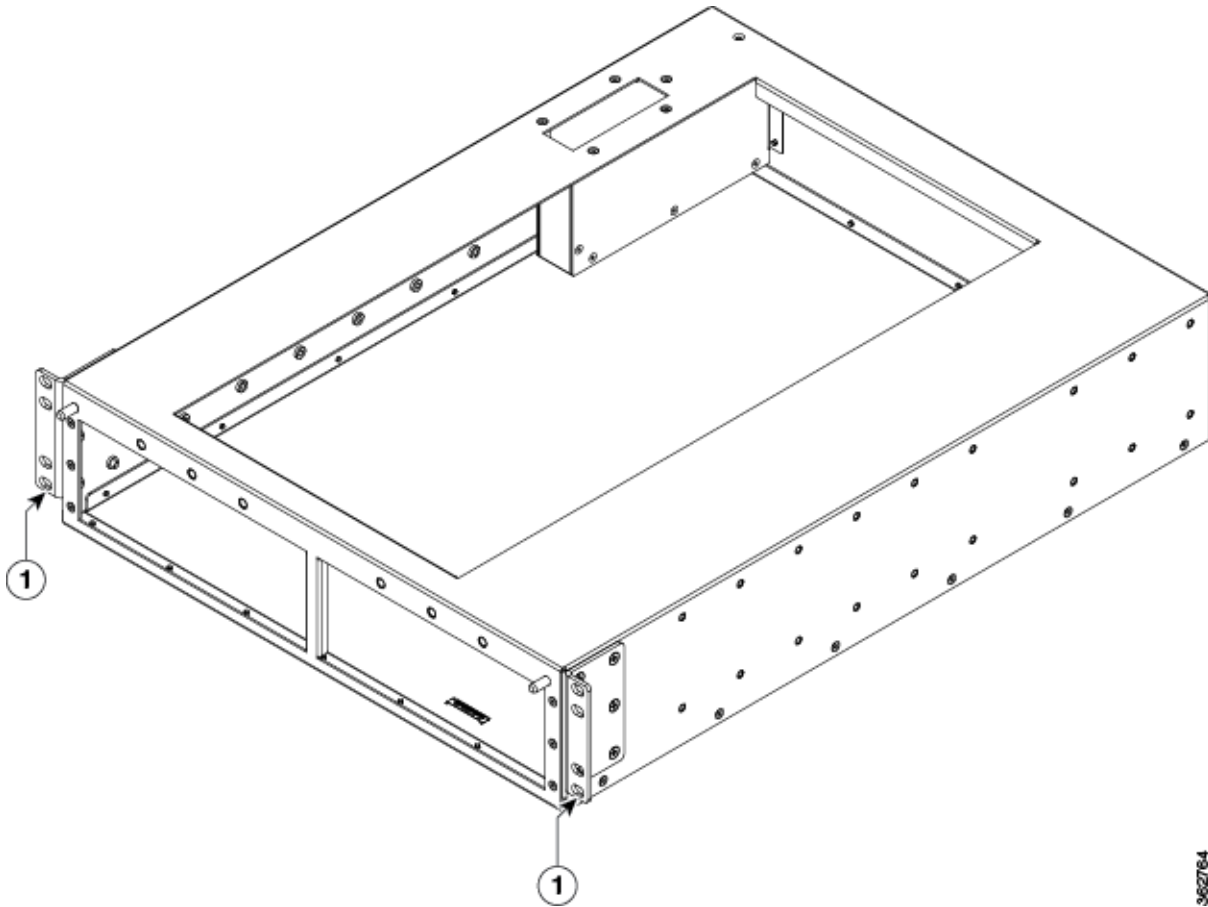
| 1 | Front rack-mounting bracket, pre-installed |

Step 4   Attach the rear rack-mounting brackets (part number: 700-47414-01) to the left and right sides of the plenum base, using twelve 8-32 x 0.5 in. pan-head screws ((part number: 48-0828-01), six per bracket.

- If you are installing the chassis in a two-post rack, the rear rack-mounting brackets secure the plenum to the rear of the rack-posts (Figure 2-70).

- If you are installing the chassis in a four-post rack, rotate the rear rack-mounting brackets by 180 degrees and attach to both sides of the plenum. The rear rack-mounting brackets secure the plenum to the rear rack-posts.

Step 5   Insert and tighten four customer-supplied screws to secure the plenum to the rear of the rack-post (two on each 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 (Figure 2-70).

Figure 2-70   Installing the Plenum in a Two-Post 19-Inch Rack
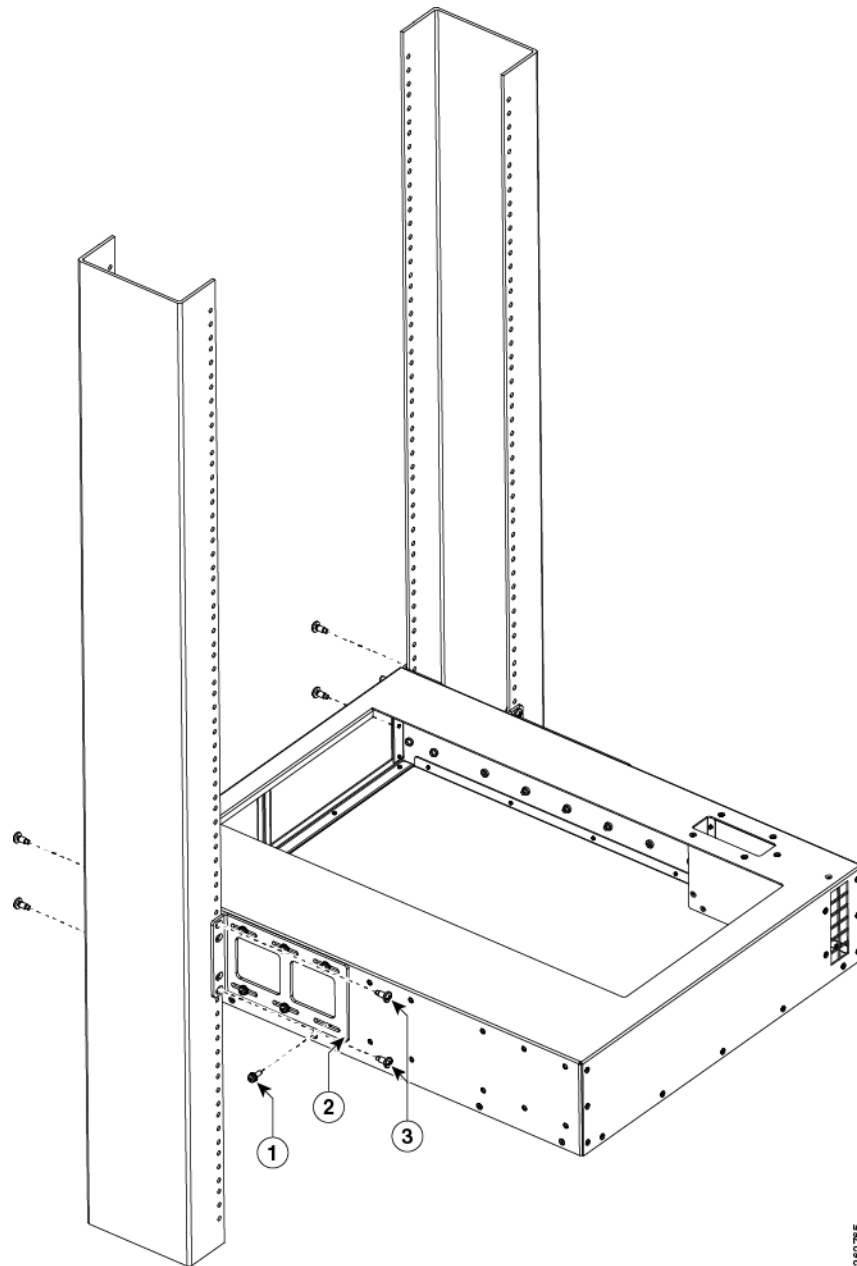
1	Screw attaching rear-rack mounting bracket to plenum (six per bracket)	3	Screws attaching rear-rack mounting bracket to rack (two per bracket)
2	Rear rack-mounting bracket		

Step 6   Turn the chassis sideways and slide it into the rack (Figure 2-71).

Step 7   Insert and tighten four customer-supplied rack-mounting screws to secure the support bracket on the chassis to the front of the rack-post (two on each 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 (Figure 2-71).

Step 8   Insert six 12-24 x 0.5 in.pan-head screws (part number: 48-0523-01) screws to secure the chassis to the rack-mounted plenum (Figure 2-71).

Figure 2-71   Securing the ASR 9006 Router in a Two-Post 19-Inch Rack
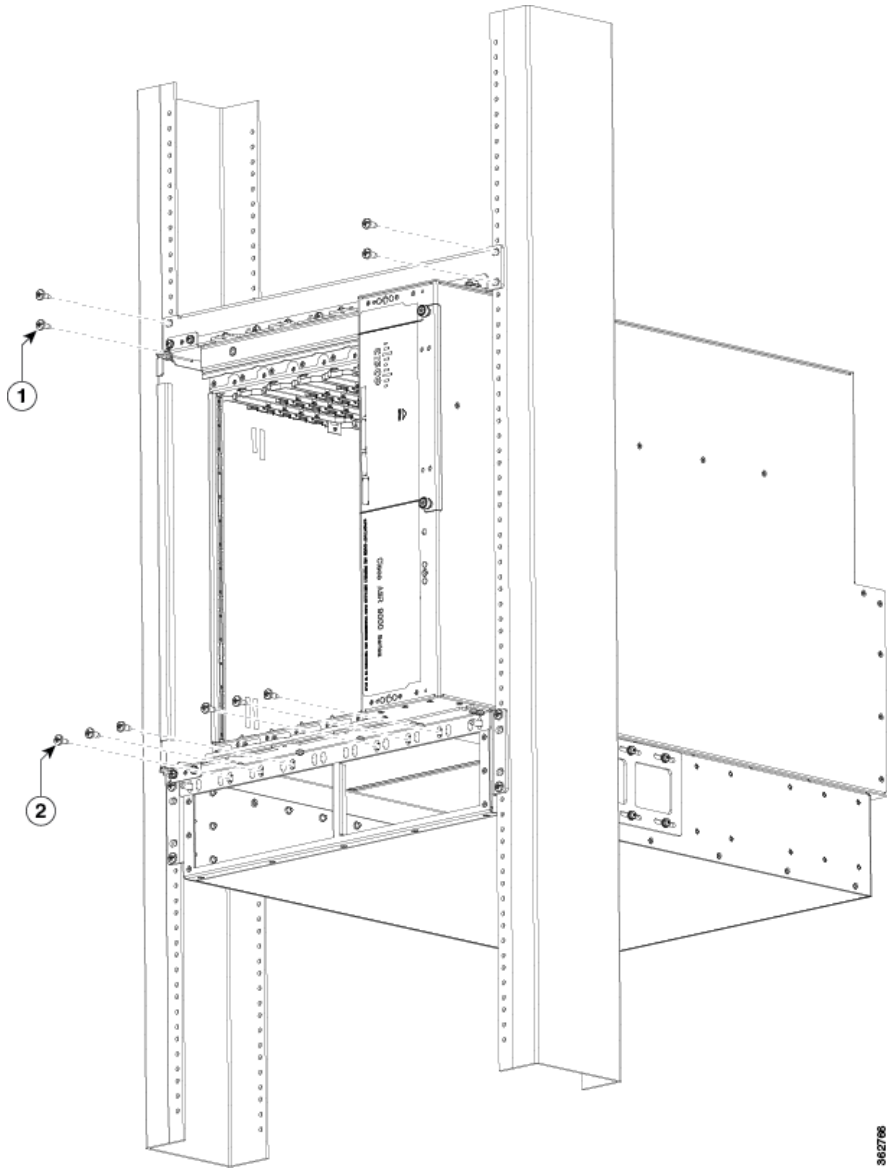
1	Screws attaching chassis to rack	**2**	Screws attaching chassis to plenum

Step 9   Install the optional chassis accessories, if desired. See Installing Optional Chassis Accessories on the Cisco ASR 9006 Router, page 2-72.

Figure 2-72 shows the air baffle accessory kit and Cisco ASR 9006 Router with its optional accessories fully installed in a two-post 19-inch rack.

Figure 2-72   *Cisco ASR 9006 Router Fully Installed with Air Baffle Accessory Kit and Optional*
Chassis Accessories
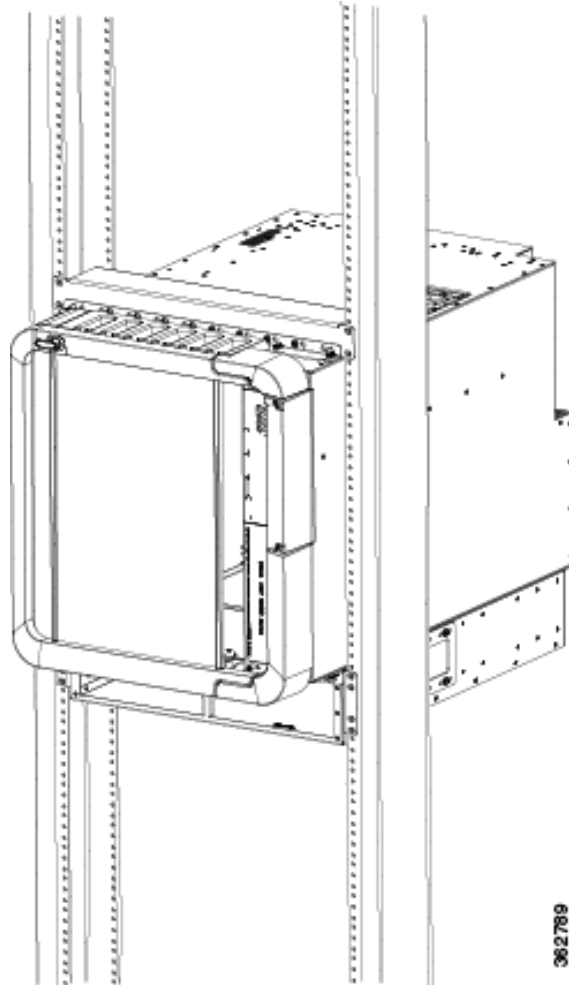
Installing Optional Air Baffles on the Cisco ASR 9904 Router

The Cisco ASR 9904 Router has an optional air baffle accessory kit (ASR-9904-BAFFLE=) for mounting the router chassis in a 2-post 23-inch rack. The accessory kit includes:

- Two adapter plates
- Two air baffles (left and right)
- Two air deflectors
- Twenty-eight 12-24 screws for attaching the air baffles and air deflectors to the adapter plate
- Eight 8-32 screws for securing the side baffles to the air deflectors

Air baffles allow for front-to-back air flow through the chassis and help isolate exhaust air from the intake air. For air baffle dimensions, see Figure 2-80 and Figure 2-81.

If you ordered the air baffle accessory kit, follow these steps to install it:

Step 1   Attach the adapter plates (Figure 2-73) to the left and right rack rails using customer-supplied rack screws (we recommend a minimum of ten 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.

Figure 2-73   ***Attaching the Adapter Plates to the Left and Right Rack Rails on the Cisco ASR 9904 Router Chassis***
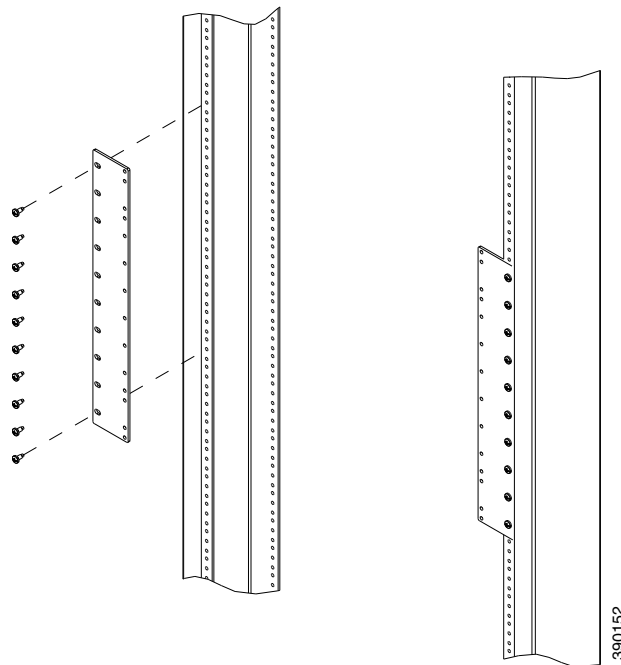
Step 2   Loosely attach the left and right side air baffles to the adapter plate (Figure 2-74) with 12-24 screws (four per side). Do not tighten these screws. To ensure the correct orientation, "Left Front" and "Right Front" are stamped on each side of the baffle.

Figure 2-74   *Installing the Air Baffles on the Cisco ASR 9904 Router Chassis*
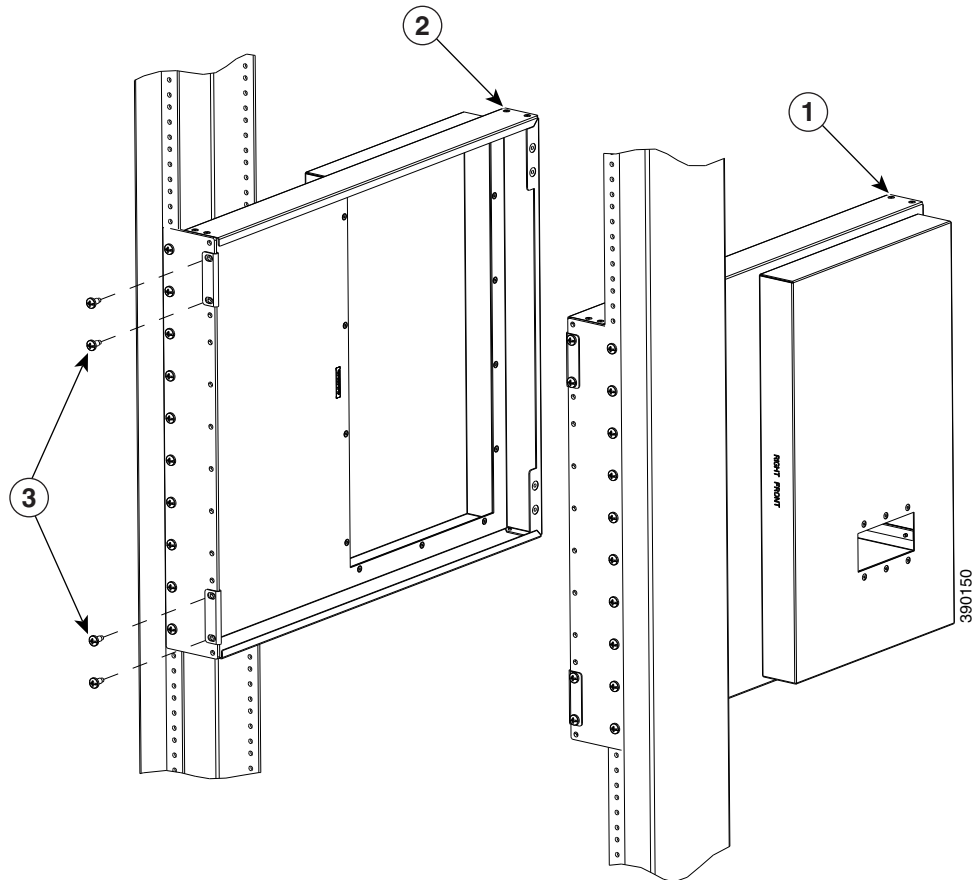
1	Right side air baffle	**3**	12-24 screws for attaching the baffles (four per side)
2	Left side air baffle		

Step 3 Install the top and bottom air deflectors (Figure 2-75) with the "bottom side" stamp facing down (note that the top and bottom air deflectors both have the same part number: 800-41357-01).

Step 4 Tighten the screws to a torque of 41 in-lb.

Figure 2-75   Attaching the Air Deflectors on the Cisco ASR 9904 Router Chassis — Top View
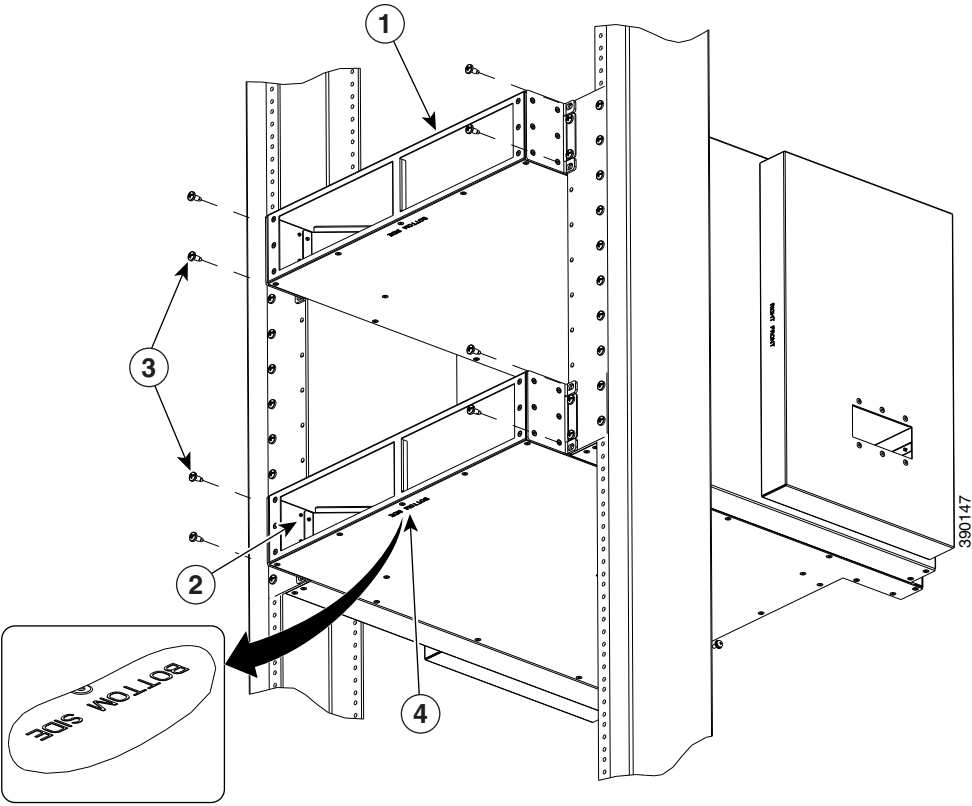
1	Top air deflector	3	12-24 screws for attaching the air deflectors (two screws per side)
2	Bottom air deflector	4	Bottom side stamp

Step 5   Secure the side air baffles to the air deflectors using the supplied 8-32 screws (Figure 2-76). Do not tighten the screws.

Figure 2-76   Securing the Cisco ASR 9904 Router Chassis Side Baffles to the Air Deflectors (Rear View)
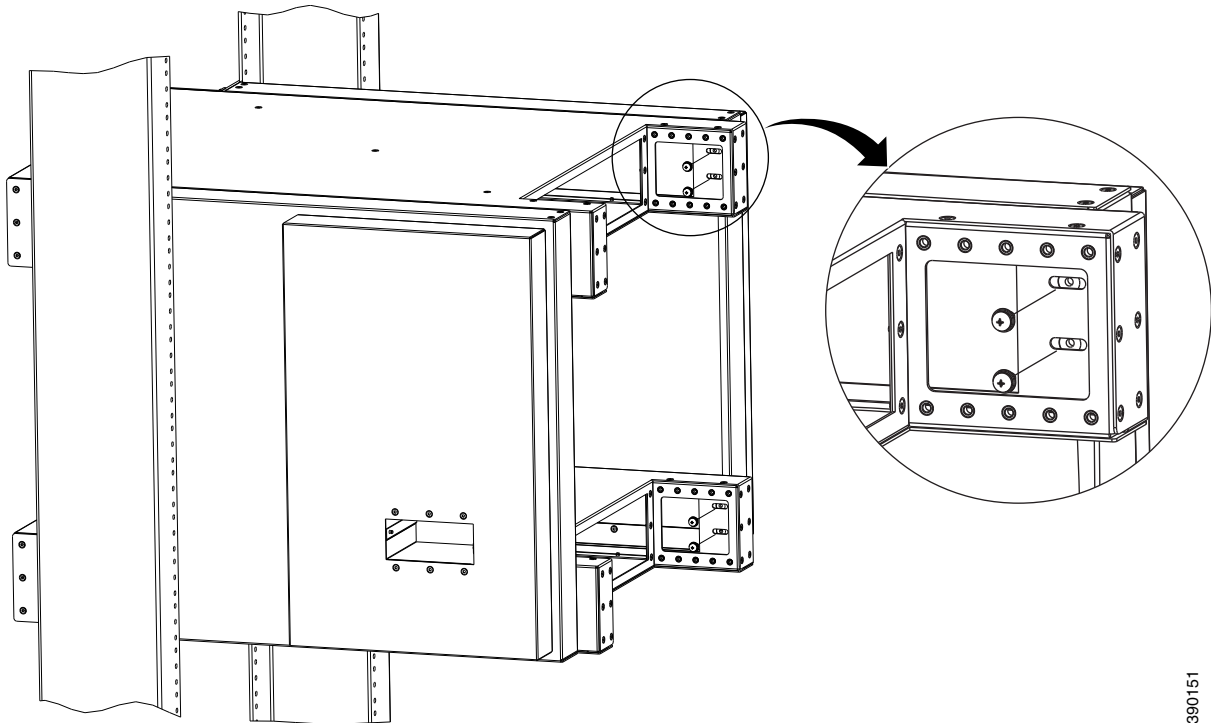
Step 6   Use six 12-24 screws to fasten each side of the chassis to the 23-inch rack. Torque each of the six screws to 41 in-lbs. (Figure 2-77).

Figure 2-77   *Mounting the Cisco ASR 9904 Router Chassis in a 23-Inch Rack*
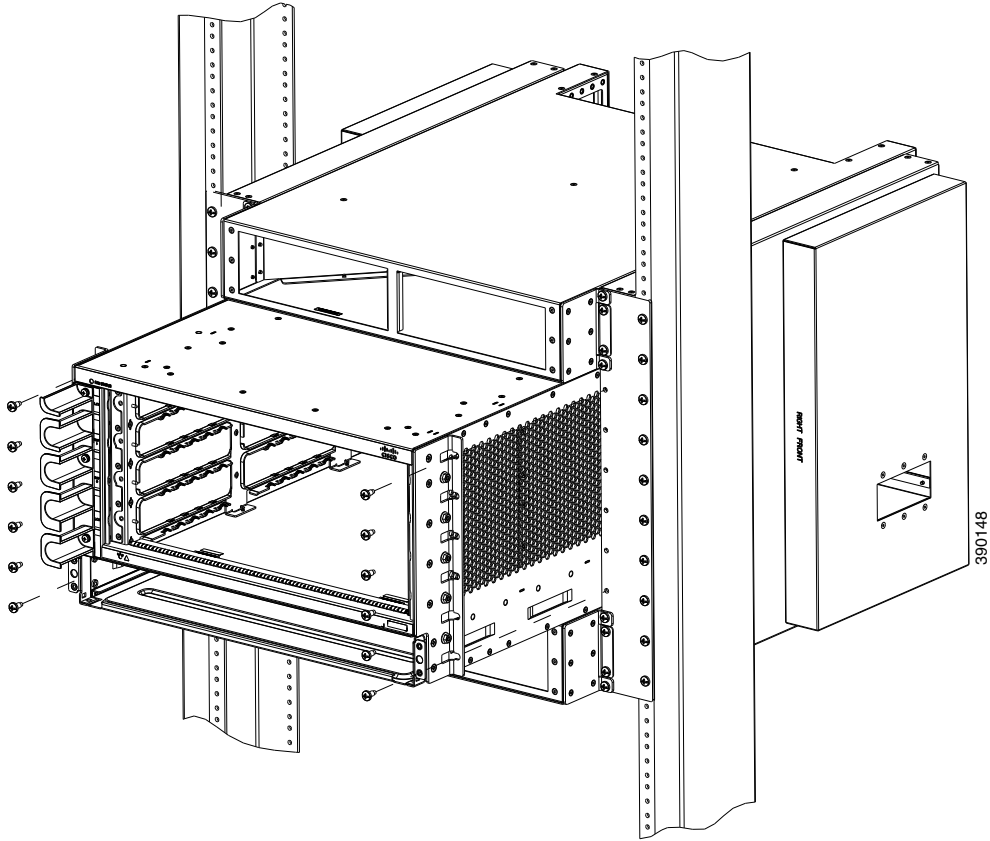
Step 7   Tighten the remaining loose screws to complete the installation. Torque the 8-32 screws to 18 in-lb and the 12-24 screws to 41 in-lb.

Figure 2-78 shows the router chassis with the air baffle installed in a 2-post 23-inch rack.

Figure 2-78   Cisco ASR 9904 Router Chassis with Air Baffle in 2-Post 23-Inch Rack
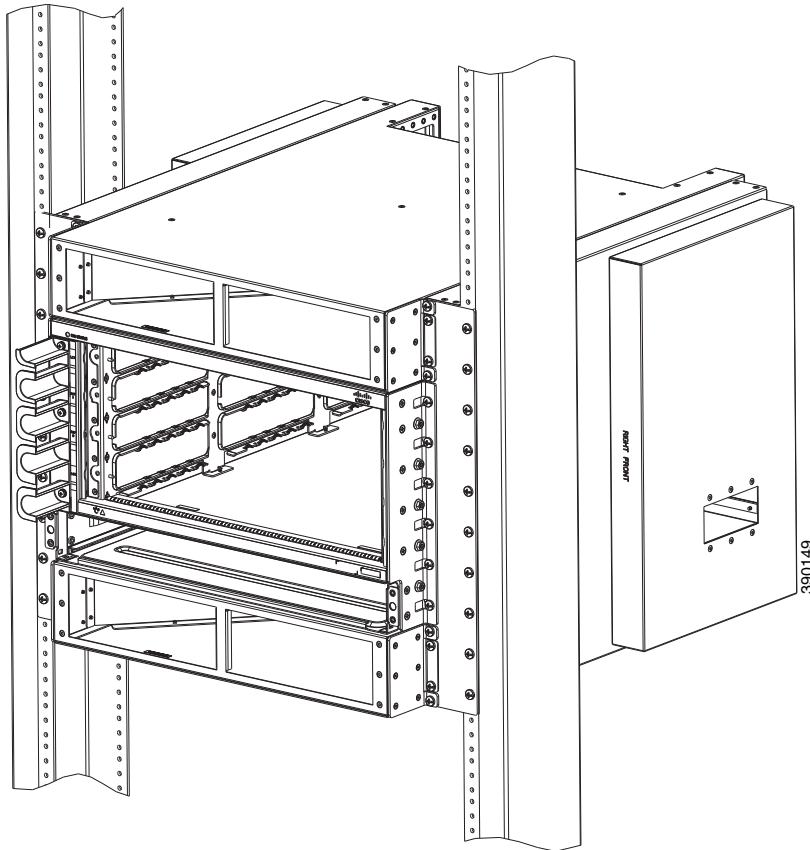
An electrical conducting path must exist between the product chassis and the metal surface of the enclosure or rack in which it is mounted, or to a grounding conductor. The chassis has two grounding points on each side of the baffle, however only one ground is required. The other will be grounded through the top and bottom air deflectors. Figure 2-79 shows the baffle ground location on the chassis.

You can ground the baffle by either attaching a grounding lug to the chassis (NEBS Supplemental Unit Bonding and Grounding Guidelines, page 1-52), or by using thread-forming mounting screws to establish a metal-to-metal contact. If you are using screws, remove any paint or other non-conductive coatings on the surfaces between the mounting hardware and the enclosure or rack. Clean all surfaces and apply an antioxidant applied before the installation.

Figure 2-79   Cisco ASR 9904 Router Baffle Ground
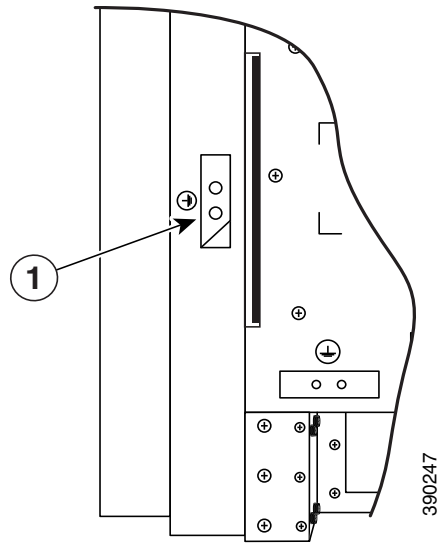
1	Baffle ground location

Figure 2-80   Cisco ASR 9904 Router Air Baffle Dimensions—Top View

24.59 in
(62.5 cm)

21.19 in
(53.8 cm)

17.57 in
(44.6 cm)

1.26 in
(3.2 cm)

25.00 in
(63.5 cm)

20.16 in
(51.2 cm)

20.54 in
(52.2 cm)

9.96 in
(25.3 cm)

2X
23" ADAPTER PLATE
700-44117-01

2.57 in
(6.5 cm)

2.32 in
(5.9cm)
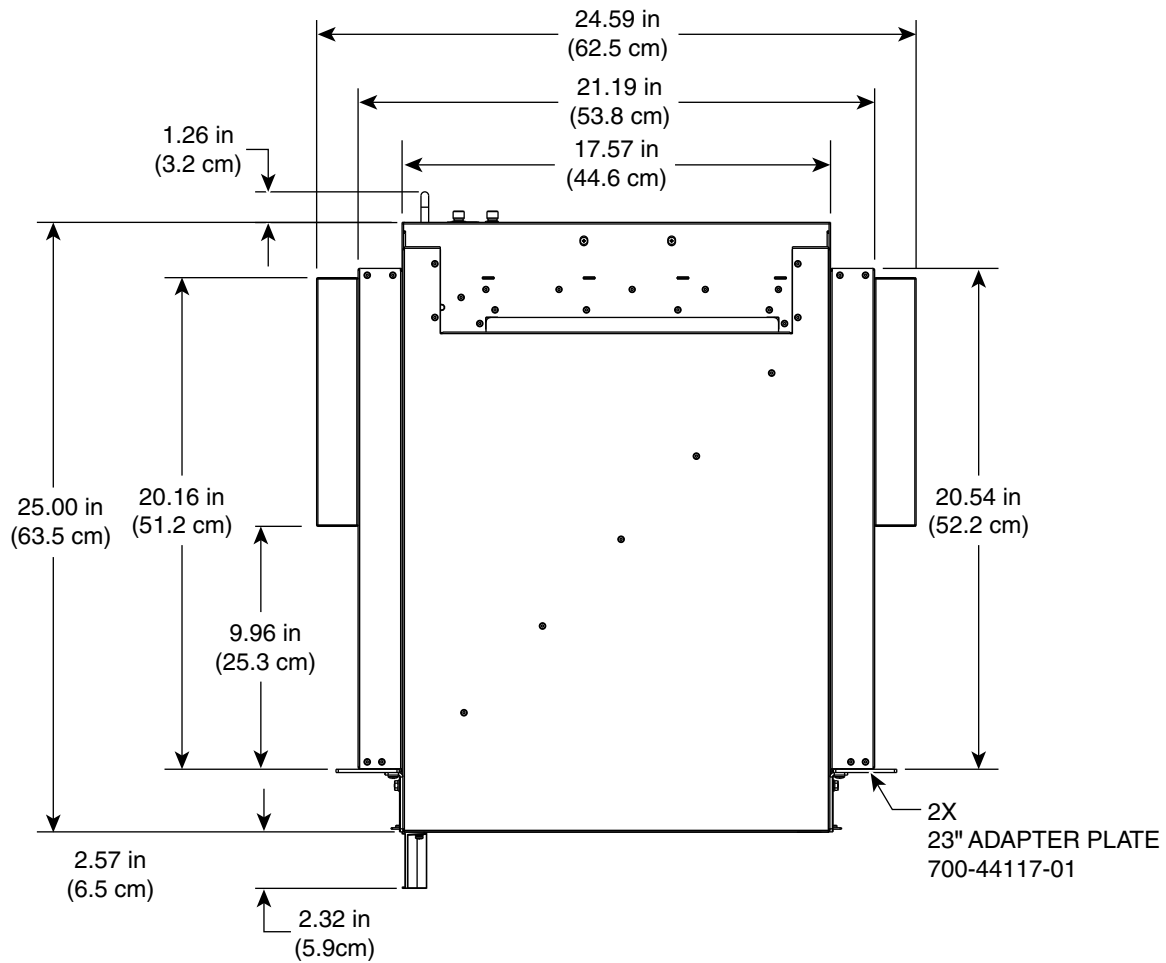
390299

Figure 2-81   Cisco ASR 9904 Router Air Baffle Dimensions—Front View
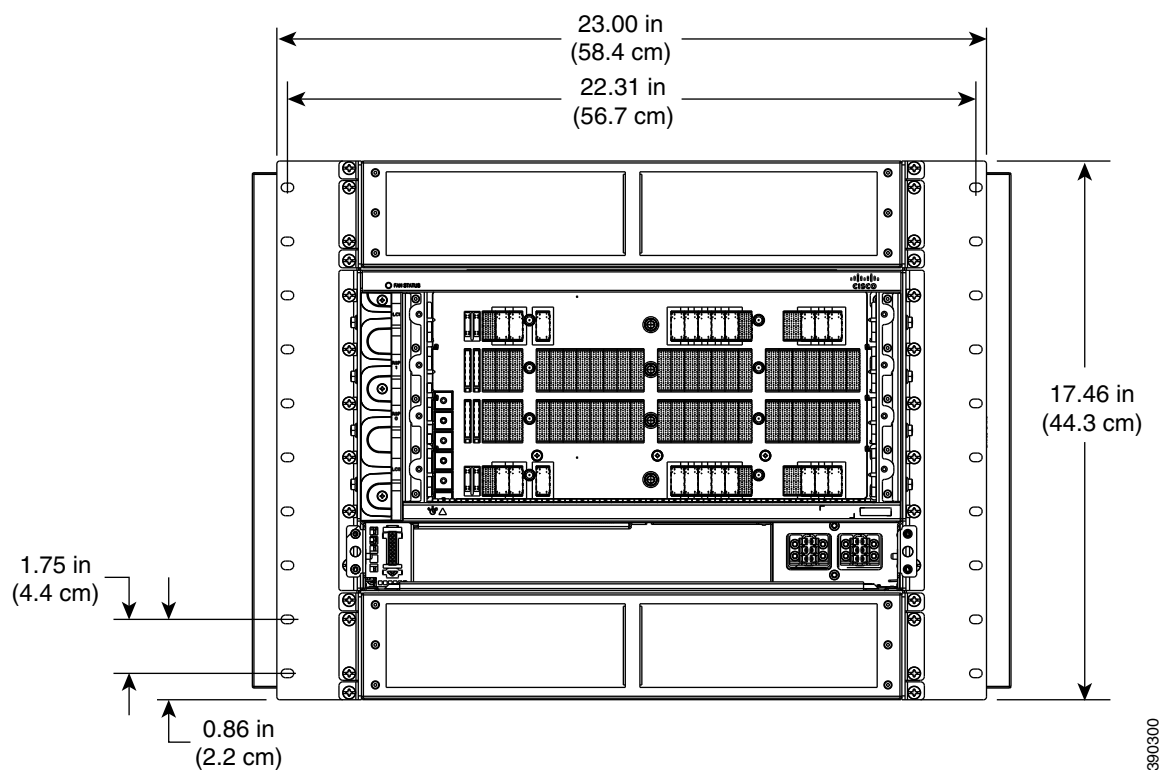
Installing Optional Chassis Accessories on the Cisco ASR 9922 Router

The optional chassis accessories for the Cisco ASR 9922 Router include:

- Fan tray covers
- Top and bottom card cage front doors
- Rear exhaust air deflector

If you ordered the optional accessories set, follow these steps to install the accessories:

Step 1   Remove the two screws that secure the bottom edge of the cable management tray to the chassis.

Note   Four ball studs are preinstalled on the Cisco ASR 9922 Router chassis.

Figure 2-82   Optional Fan Tray Covers for the Cisco ASR 9922 Router
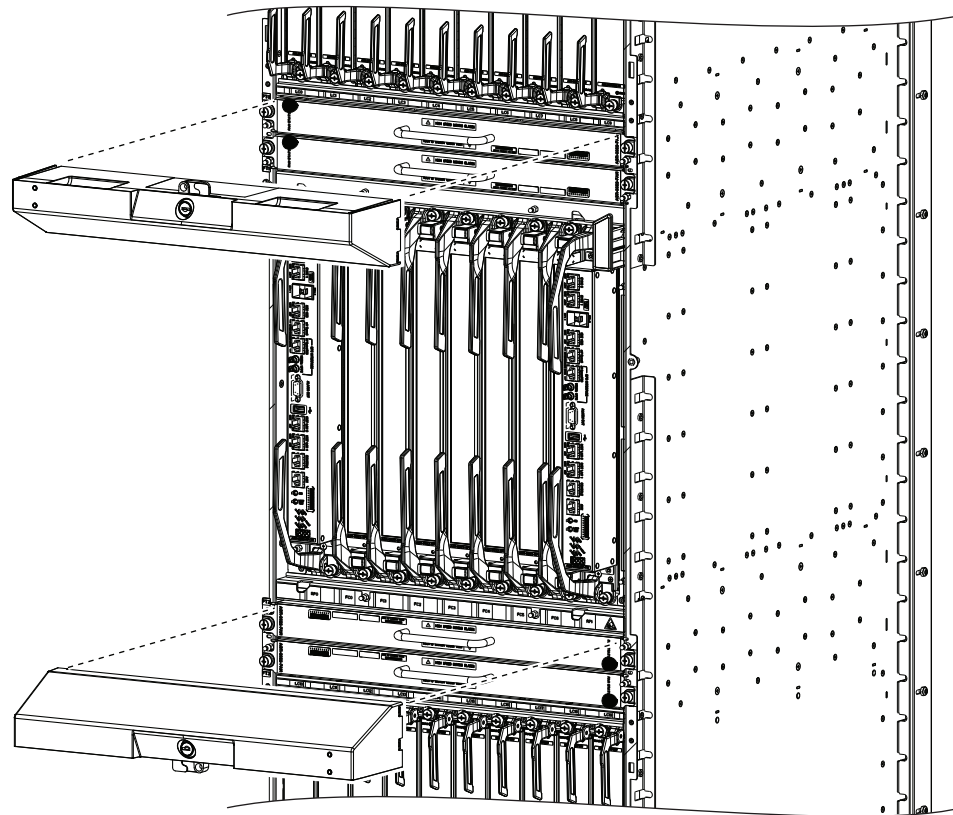
Figure 2-83   *Optional Card Cage Doors for the Cisco ASR 9922 Router*
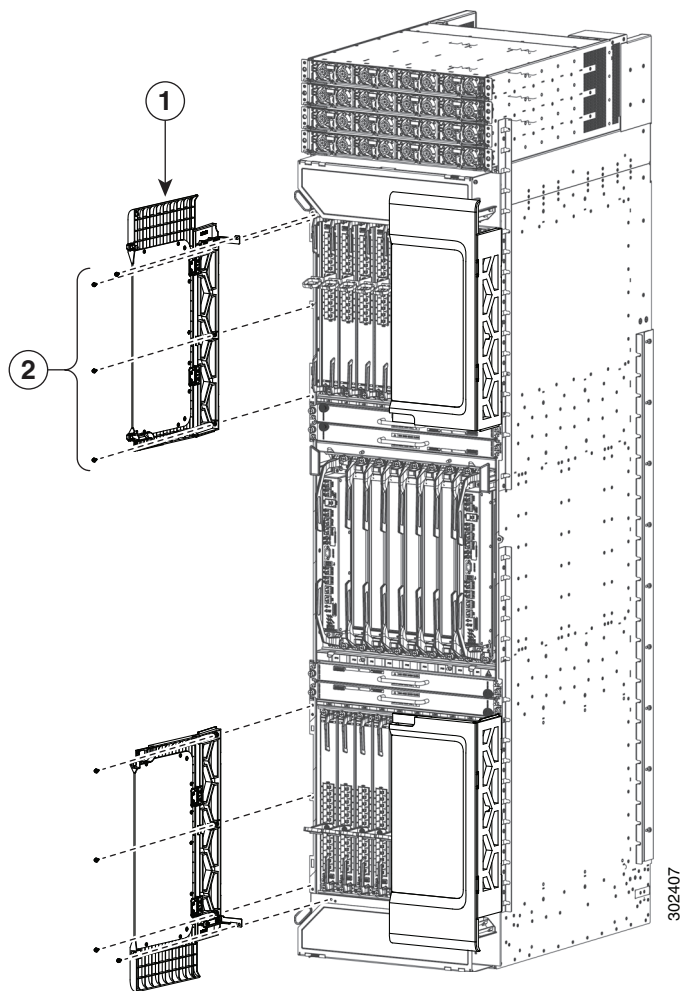
1	Card cage door	**2**	Hinge bracket

Step 2   Attach the left and right hinge brackets to the chassis using three screws (M4 thread) for each bracket. Tighten the screws to a torque of 11 in-lb (1.20 N-m). The L-shaped brackets should align with the holes in the cable management tray from which you removed the screws.

Step 3   Secure the L-shaped brackets to the chassis and cable management tray by re-inserting and tightening the cable management tray screws you removed.

Step 4   Align the exhaust air deflector at the rear of the chassis behind the top fan tray outlets (Figure 2-84), and use a screwdriver to tighten the two screws, one on each side of the deflector. The deflector's measurements are width 17.48" x height 4.72" x depth 5.21" and deflects the outgoing exhaust air.

Figure 2-84   Optional Rear Exhaust Air Deflector on the Cisco ASR 9922 Router
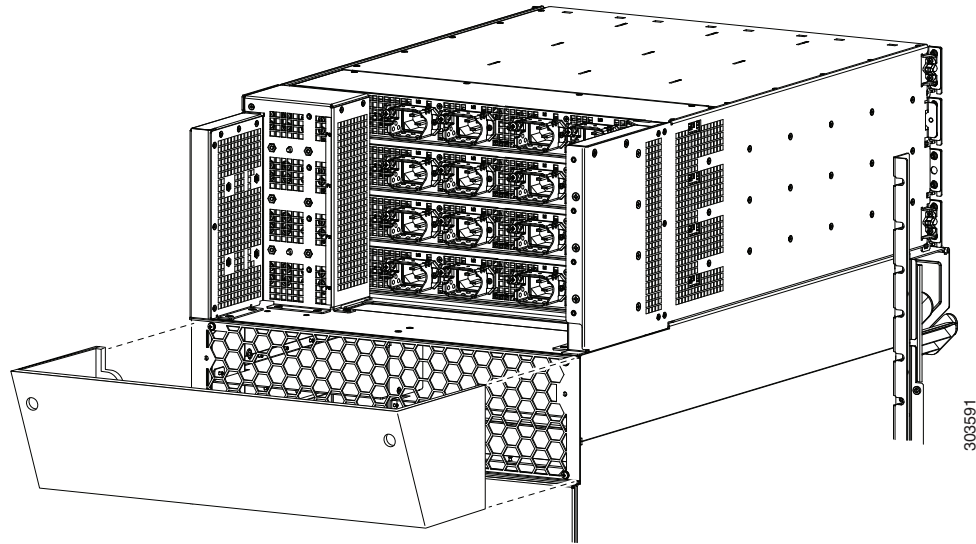
After the chassis has been installed in the rack and all chassis accessories have been attached, you can install the fan trays, power supply modules, RP cards, FCs and LCs. See Chapter 3, "Installing Cards and Modules in the Chassis," for detailed installation instructions.

Installing Base Chassis Accessories on the Cisco ASR 9912 Router

The base chassis accessories for the Cisco ASR 9912 Router include (Figure 2-85):

- One honeycomb cosmetic cover
- One vented bezel to cover the front of the power system

Step 1   Attach the honeycomb cosmetic cover to the front of the chassis above the cable management bracket by aligning the cover above the screw tabs on the chassis.

Step 2   Attach the vented bezel cover by snapping it into place in front of the power system.

Note   You will need to remove the vented bezel cover in order to install the power system. After the power system is installed, you can re-install the vented bezel cover.

Figure 2-85   *Installing Base Accessories on the Cisco ASR 9912 Router*
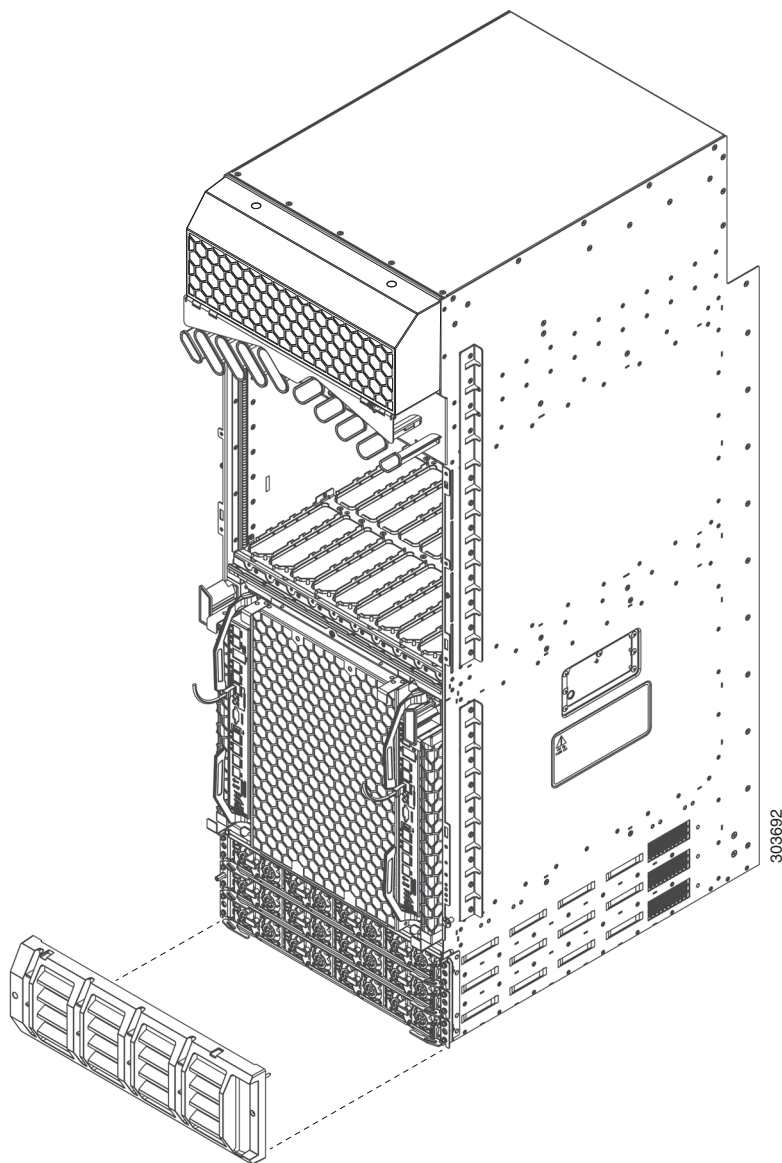
After the chassis has been installed in the rack and all chassis accessories have been attached, you can install the fan trays, RP cards, FCs and LCs. See Chapter 3, "Installing Cards and Modules in the Chassis," for detailed installation instructions.

## Installing Optional Chassis Accessories on the Cisco ASR 9912 Router

The optional chassis accessories for the Cisco ASR 9912 Router include:

- Front door for the line card cage
- Two hinge brackets (left and right side)
- Six screws for attaching the hinge brackets to the chassis
- Rear exhaust air deflector

If you ordered the optional accessories set, follow these steps to install the accessories:

Step 1   Attach the left (if not pre-installed) and right hinge brackets to the chassis using three screws (M4 thread) for each bracket (Figure 2-86). Tighten the screws to a torque of 11 in-lb (1.20 N-m).

Figure 2-86   Optional Card Cage Door on the Front of the Cisco ASR 9912 Router
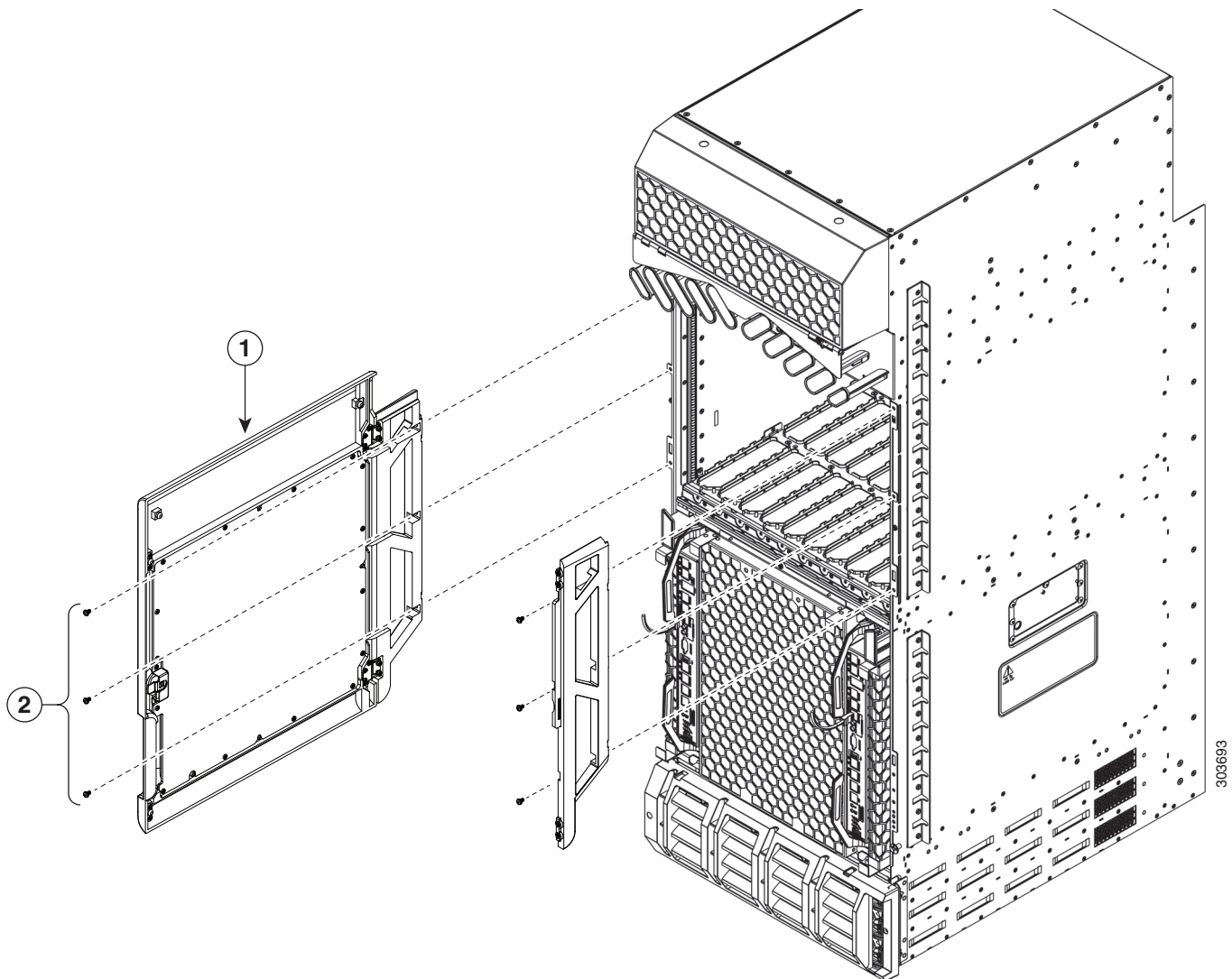
1	Card cage door	2	Hinge bracket

Step 2   Align the exhaust air deflector at the top rear of the chassis above the fan trays (Figure 2-87), and use a screwdriver to tighten the two screws, one on each side of the deflector.

Figure 2-87   Optional Rear Exhaust Air Deflector on the Cisco ASR 9912 Router
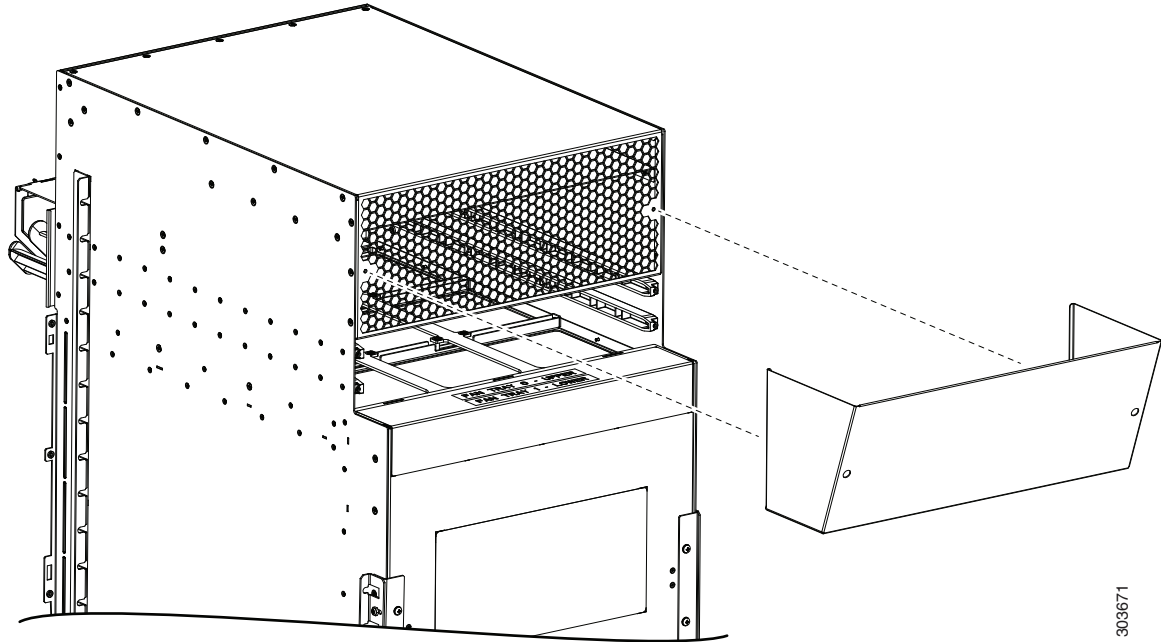
After the chassis has been installed in the rack and all chassis accessories have been attached, you can install the fan trays, RP cards, FCs, and LCs. See Chapter 3, "Installing Cards and Modules in the Chassis," for detailed installation instructions.

Installing Cards and Modules in the Chassis

This chapter contains the procedures for installing cards and modules into the chassis after the chassis has been installed into a rack. This chapter also describes how to connect cables to RSP, RP, alarm, and line cards.

> **Note** The procedures in this chapter for all Cisco ASR 9000 Series Routers are identical unless otherwise noted.

Installing Power Modules

The following procedures describe how to reinstall the power modules back into the chassis. Be sure to follow the correct procedure for the type of power modules that you have.

> **Caution** Never force a power module into the power tray if you feel any resistance! The power modules are keyed to prevent AC modules from being plugged into a DC power tray or a DC module into an AC power tray. Forcing a module into the incorrect tray can cause damage to the module and the tray.

Installing AC Power Modules

Prerequisites

There are no prerequisites for this task.

Required Tools and Equipment

You need the following tool to perform this task:

- 7/16 hex socket and torque wrench, torque 50 in-lb.

Steps

Follow these steps to reinstall the AC power modules back into the chassis (see Figure 3-1 for the version 1 power module, Figure 3-2 for the version 2 and version 3 power modules, and Figure 3-3 for installing a version 2 power module in the Cisco ASR 9904 Router.

> **Note**   The Slide the power module into the power tray until it mates with its backplane connector.

Step 1   Secure the module:

   a.   Version 1 power module: Pivot the power module door fully to the left until it locks to securely seat the power module to its backplane connector.

   b.   Version 2 and version 3 power modules: Move the handle up and tighten the screw using the 7/16 hex socket and torque wrench with the torque set to 50 in-lb.

> **Caution**   To prevent damage to the power tray backplane connector, do not use excessive force when inserting the power module into the power tray.

Step 2   Repeat Note and Step 1 for the other AC power modules.

Step 3   Go to Installing Fan Trays, page 3-4 to install the fan tray.

Figure 3-1   *Installing a Version 1 Power- Module*
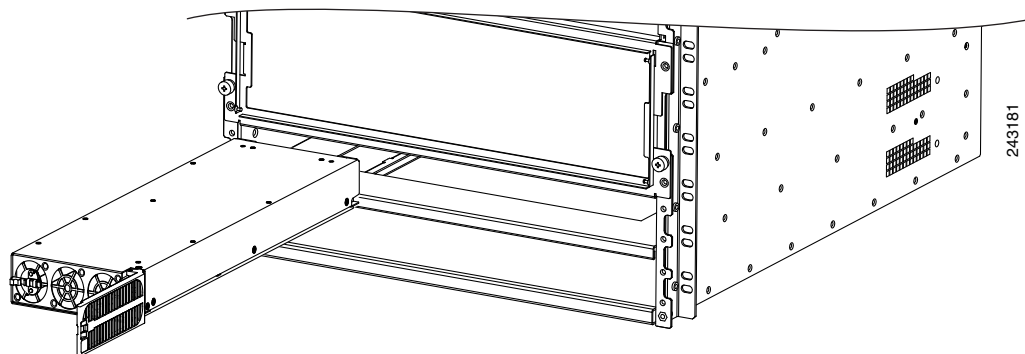
Figure 3-2   Installing a Version 2 or Version 3 Power Module in the Cisco ASR 9010, 9912, 9922 Routers
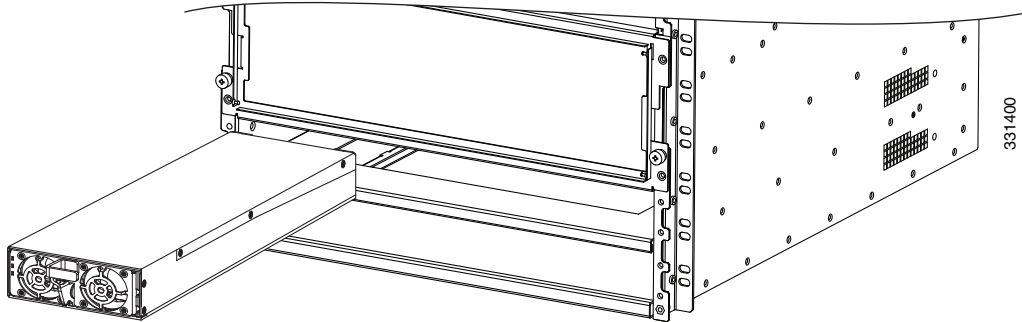
Figure 3-3   Installing a Version 2 Power Module in the Cisco ASR 9904 Router
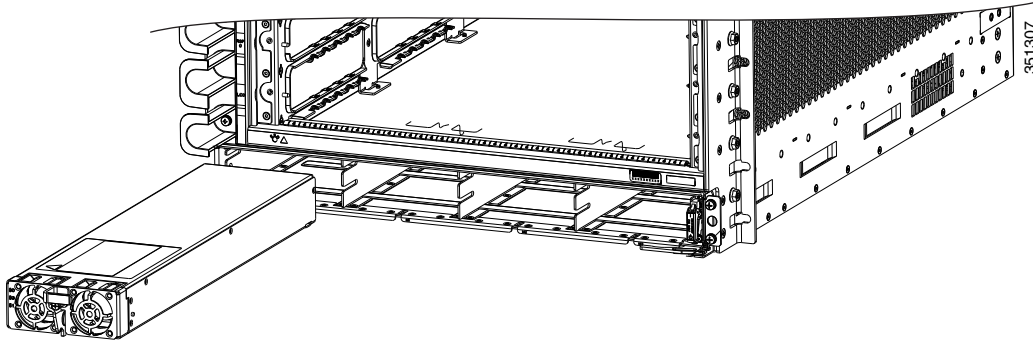
Installing DC Power Modules

Required Tools and Equipment

You need the following tool to perform this task:

- 7/16 hex socket and torque wrench, torque 50 in-lb.

Steps

Follow these steps to reinstall the DC power modules back into the chassis (see Figure 3-1 for the version 1 power module or Figure 3-2 for the version 2 or version 3 power module.

Step 1 Slide the power module into the power tray until it mates with its backplane connector.

Step 2 Secure the module.

   a. Version 1 power module: Pivot the power module door fully to the left until it locks to securely seat the power module to its backplane connector.

   b. Version 2 power and version 3 module: Move the handle up and tighten the screw using the 7/16 hex socket and torque wrench with the torque set to 50 in-lb.

⚠

Caution To prevent damage to the power tray backplane connector, do not use excessive force when inserting the power module into the power tray.

Step 3 Repeat Step 1 and Step 1 for the other DC power modules.

Installing Fan Trays

Prerequisites

Install the power modules before installing the fan trays.

Required Tools and Equipment

You need the following tool to perform this task:

- 6-inch long number 2 Phillips screwdriver, torque 10 inch-lb.

Steps

✎

Note If you are installing a fan tray for the Cisco ASR 9010 Router, install the lower fan tray before attaching the accessory grill. The lower fan tray slot is located behind the accessory grill. See the Installing Chassis Accessories, page 2-61

Before installing the fan tray, first determine its location. Refer to the figure that applies to your router. See Removing Fan Trays, page 2-18.

Follow these steps to install fan trays in the chassis.

Step 1 Lift the fan tray (with two hands) and slide it halfway into the module bay.

Step 2 Slowly push the fan tray into the chassis until it mates with the backplane connector at the back of the chassis bay.

⚠

Caution To prevent damage to the connectors, do not use excessive force when inserting the fan tray into the chassis.

Step 3 Tighten the captive screw(s) on the fan tray using the 6-inch long number 2 Phillips screwdriver to a torque of 10 in-lb to secure it to the chassis.

Step 4 Repeat Step 1 through Step 3 for the second fan tray.

✎

Note On the Cisco ASR 9922 Router, the third and fourth fan trays (under the middle cage) are installed *upside down* compared to the first and second fan trays (above the middle cage).

Installing Cards in the Chassis

This section describes how to reinstall the RSP cards, RP cards, FCs, and LCs back into the chassis.

See the *Cisco ASR 9000 Series Aggregation Services Router SIP and SPA Hardware Installation Guide* for information about installing shared port adapter (SPA) and SPA interface processor (SIP) cards.

⚠️
Caution   Be sure to verify that you are inserting a card into its correct slot. RSP/RP cards must only be inserted in the two slots reserved for RSP/RP cards (RSP0, RSP1, RP0, RP1). FCs must only be inserted in the FC slots of the Cisco ASR 9922 Router and Cisco ASR 9912 Router. All other slots are for LCs.

⚠️
Caution   Unoccupied card slots must have a blank filler card installed for electromagnetic compatibility (EMC) and to ensure proper air flow through the chassis.

⚠️
Caution   Be careful to avoid damaging the electromagnetic interference (EMI) gasket that runs along the full height of the card front panel edges. Damage to the EMI gasket can affect the ability of your system to meet EMC requirements.

⚠️
Caution   Handle all cards by the metal card carrier edges only; avoid touching the board or any connector pins. After removing a card, carefully place it in an antistatic bag or similar environment to protect it from ESD and dust in the optic ports (fiber-optic line cards).

⚠️
Caution   To avoid damaging card mechanical components, never carry an RSP card, RP card, FC, or LC by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

⚠️
Caution   Be sure to always tighten the captive installation screws on the RSP card, RP card, FC, or LC. Failure to tighten the screws can cause boot failure or prevent proper router operation.

Installing RSP Cards in the Chassis

Follow these steps to reinstall RSP cards into the chassis (See Figure 2-20 and Figure 2-21 for slot numbering):

Step 1   Starting at slot RSP0, slide the card into the slot.

Step 2   Pivot the ejector levers to seat the card to the backplane connector.

⚠

Caution   Do not apply excessive force to the RSP card to seat it. When seated, the RSP card ejector levers are angled slightly outward from the card faceplate (item 1 in Figure 3-4). When the captive installation screws are fully tightened, the ejector levers are parallel to the card faceplate (item 2 in Figure 3-4). Some flexing in the backplane is normal. When you push the ejector levers fully vertical, the card is seated in the backplane connectors. However, when you release the levers, backplane flexing pushes the levers out, so the levers may be slightly loose. Tightening the captive installation screws prevents any additional movement from flexing of the backplane.

Step 3   Tighten the captive screws at the top and bottom of the front panel to a torque of 10 +/–1 in-lb.

Step 4   Repeat Step 1 through Step 3 to install the second RSP card into slot RSP1.

✎

Note   Even when the RSP card is fully seated with installation screws fully tightened, there may be a slight gap between the card and the chassis (item 3 in Figure 3-4).

Figure 3-4   RSP Card Ejector Lever Positions During Installation
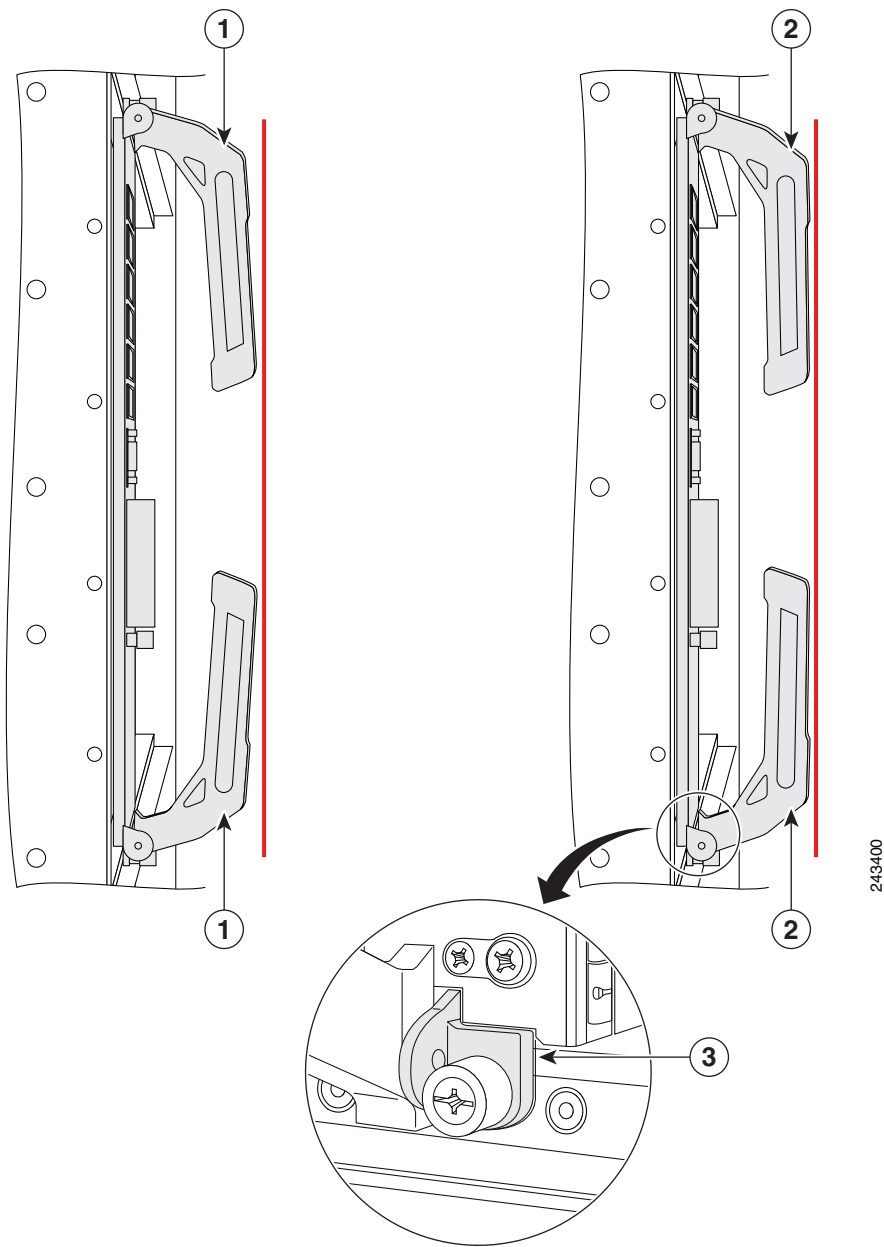
Note: Vertical red lines in Figure 3-4 indicate a line fully parallel to the RSP card front panel.

1	Slightly loose position of ejector levers when the RSP card is fully seated in the backplane, but the captive installation screws are not fully tightened	2	Fully parallel position of ejector levers when the RSP card is fully seated in the backplane and captive installation screws are fully tightened	3	Slight gap that may be present when the RSP card is fully seated in the backplane and captive installation screws are fully tightened

RSP Cable Management Ties

The Cisco ASR 9010 Router has cable management ties on the front of the cable management tray assembly. Cables to the RSP cards can be routed as shown in Figure 3-5 to separate them from line card cabling.

Figure 3-5   RSP Cable Management Ties
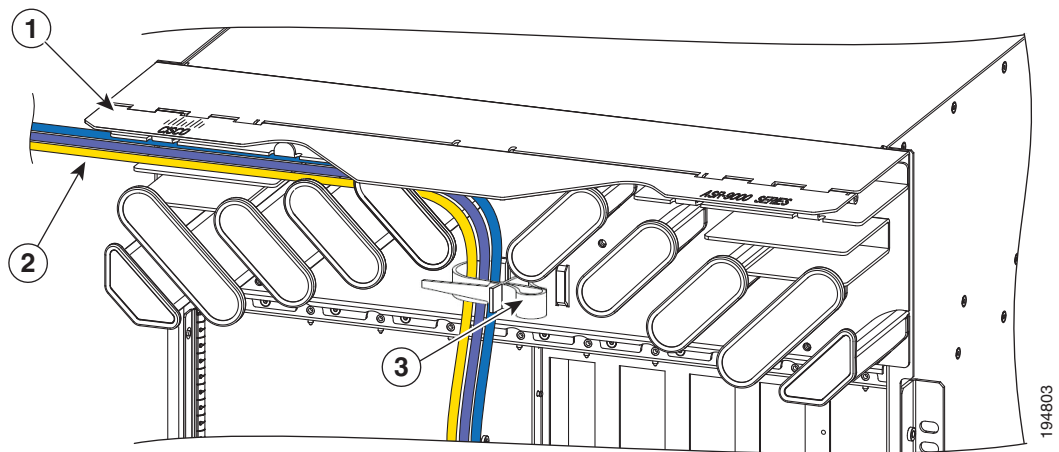
1	Hinged cover (shown in the raised position)	**2**	RSP cable bundle routed through the tray	**3**	RSP cable management tie

Installing RP Cards in the Chassis

Follow these steps to reinstall RP cards into the Cisco ASR 9922 Router (see Figure 2-27 for slot numbering) and Cisco ASR 9912 Router (see Figure 2-31 for slot numbering).

Step 1   Starting at slot RP0, slide the card into the slot.

Step 2   Pivot the ejector levers to seat the card to the backplane connector.

⚠

Caution   Do not apply excessive force to the RP card to seat it. When seated, the RP card ejector levers are angled slightly outward from the card faceplate (item 1 in Figure 3-4). When the captive installation screws are fully tightened, the ejector levers are parallel to the card faceplate (item 2 in Figure 3-4). Some flexing in the backplane is normal. When you push the ejector levers fully vertical, the card is seated in the backplane connectors. However, when you release the levers, backplane flexing pushes the levers out, so the levers may be slightly loose. Tightening the captive installation screws prevents any additional movement from flexing of the backplane.

Step 3   Tighten the captive screws at the top and bottom of the front panel to a torque of 10 +/–1 in-lb.

Step 4   Repeat Step 1 through Step 3 to install the second RP card into slot RP1.

✏

Note   Even when the RP card is fully seated with installation screws fully tightened, there may be a slight gap between the card and the chassis (item 3 in Figure 3-4).

Installing Fabric Cards in the Chassis

Follow these steps to reinstall fabric cards (FCs) into the Cisco ASR 9922 Router (see Figure 2-27 for slot numbering) and Cisco ASR 9912 Router (see Figure 2-31 for slot numbering).

Step 1   Starting at slot FC0, slide the card into the slot.

Step 2   Pivot the ejector levers to seat the card to the backplane connector.

Caution   Do not apply excessive force to the FC to seat it. When seated, the FC ejector levers are angled slightly outward from the card faceplate (item 1 in Figure 3-4). When the captive installation screws are fully tightened, the ejector levers are parallel to the card faceplate (item 2 in Figure 3-4). Some flexing in the backplane is normal. When you push the ejector levers fully vertical, the card is seated in the backplane connectors. However, when you release the levers, backplane flexing pushes the levers out, so the levers may be slightly loose. Tightening the captive installation screws prevents any additional movement from flexing of the backplane.

Step 3   Tighten the captive screws at the top and bottom of the front panel to a torque of 10 +/–1 in-lb.

Step 4   Repeat Step 1 through Step 3 to install the remaining FCs into slots FC1 to FC6.

Note   Even when the FC is fully seated with installation screws fully tightened, there may be a slight gap between the card and the chassis (item 3 in Figure 3-4).

Installing Line Cards in the Chassis

Before you begin reinstalling cards in the card cage, identify slot assignments by referring to the written list you prepared when you removed the cards (see Figure 2-20, Figure 2-22, and Figure 2-27, and Figure 2-31 for slot numbering).

Caution   Be careful to avoid damaging the EMI gasket that runs along the full height of the card front panel edges. Damage to the EMI gasket can affect the ability of your system to meet EMI requirements.

Follow these steps to reinstall line cards in the chassis card cage:

Step 1   Starting at the lowest numbered line card slot, slide the card into the slot (see Figure 3-6, Figure 3-7, Figure 3-9, or Figure 3-10) until it mates with the backplane connector.

Step 2   Pivot the ejector levers to seat the card into the backplane connector.

Step 3   Tighten the captive screws at the top and bottom of the front panel to a torque of 10 +/–1 in-lb.

Figure 3-6   Installing a Line Card into the Cisco ASR 9010 Router Chassis
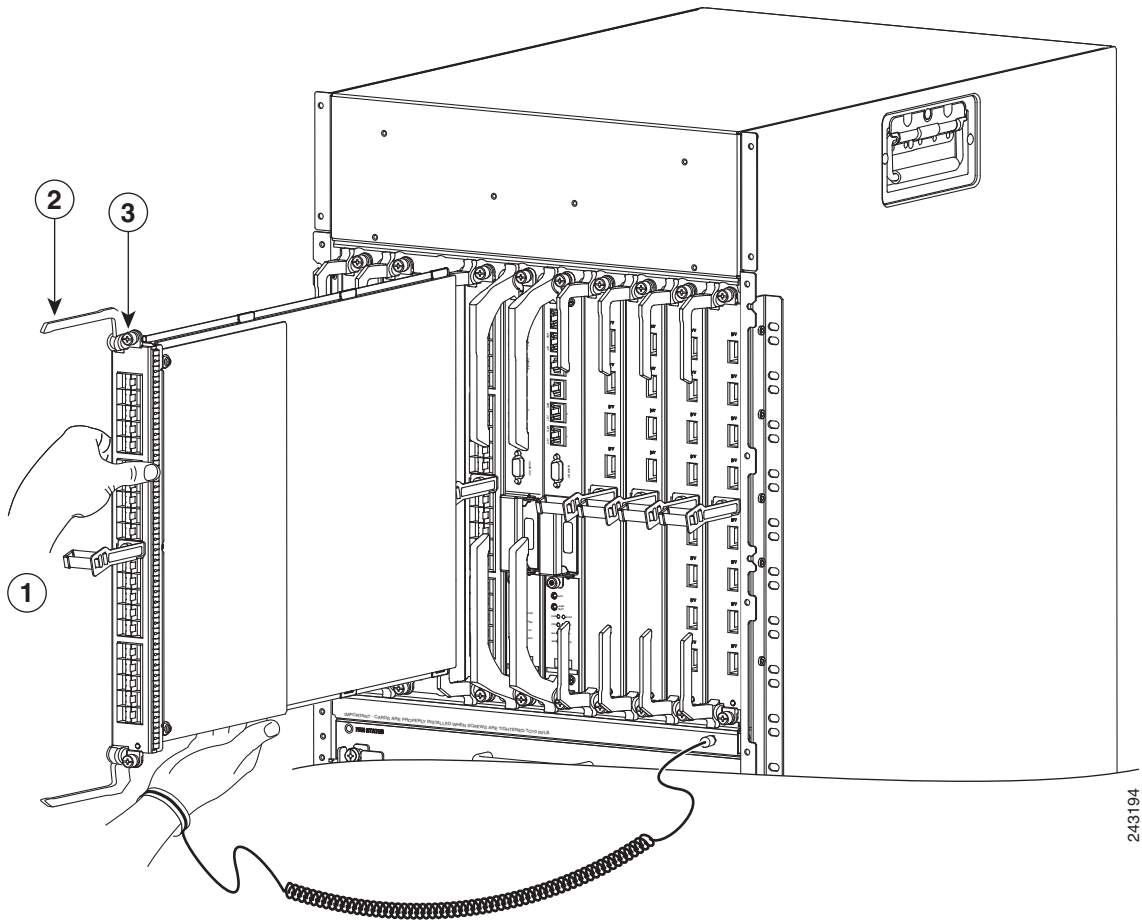
1	Slide the card into the chassis.	2	Pivot the ejector levers to seat the card into the backplane connector.	3	Tighten the captive screws.

Figure 3-7 *Installing a Line Card into the Cisco ASR 9006 Router Chassis*
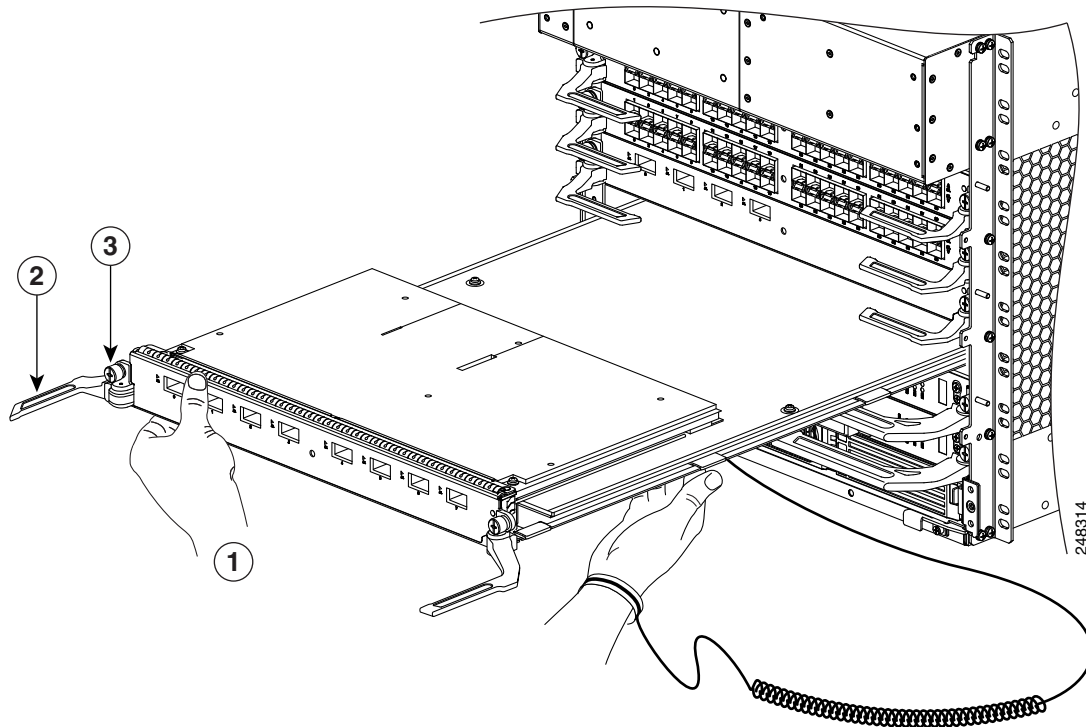
1	Slide the card into the chassis.	2	Pivot the ejector levers to seat the card into the backplane connector.	3	Tighten the captive screws.

Figure 3-8   Installing a Line Card in the Cisco ASR 9904 Router Chassis
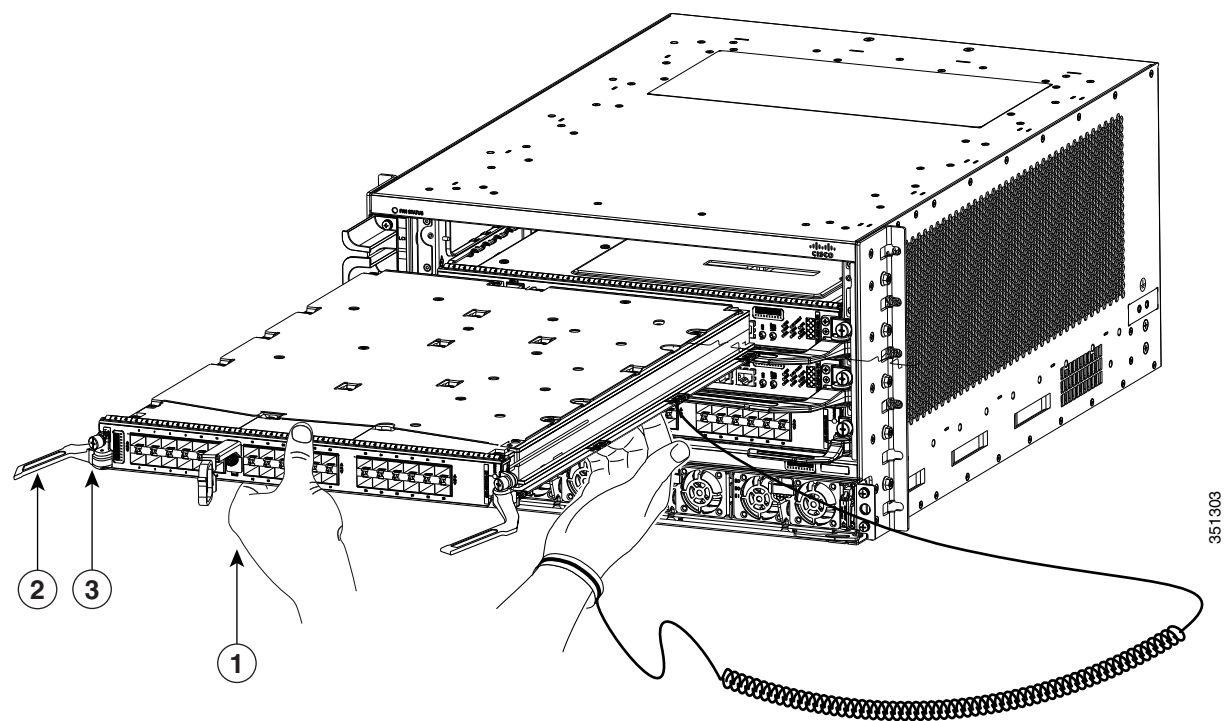
1	Slide the card into the chassis.	**2**	Pivot the ejector levers to seat the card into the backplane connector.	**3**	Tighten the captive screws.

Figure 3-9   Installing a Line Card into the Cisco ASR 9922 Router Chassis

1	Slide the card into the chassis.	**2**	Pivot the ejector levers to seat the card into the backplane connector.	**3**	Tighten the captive screws.

Figure 3-10   Installing a Line Card into the Cisco ASR 9912 Router Chassis

1	Slide the card into the chassis.	**2**	Pivot the ejector levers to seat the card into the backplane connector.	**3**	Tighten the captive screws.

Step 4   Repeat Step 1 through Step 3 for each line card.

Note   In the Cisco ASR 9922 Router, up to ten line cards are installed in slots 0 through 9 in the top card cage, and up to ten line cards are installed *upside down* in slots 10 through 19 in the bottom card cage.

Step 5   Go to the Connecting Line Card Network Interface Cables, page 3-17 to connect the network interface cables.

Connecting Line Card Network Interface Cables

This section describes how to route the network interface cables through the router cable-management system and attach the network interface cables to the line card ports.

This procedure uses an 40x1GE line card as an *example* to describe how to attach a network interface cable to a line card port and route the cable through the cable-management system. Depending on which line cards are installed in your system, your cable connection procedure might differ slightly from this example. For cable connection information for your specific line card, refer to the installation and configuration note for that line card.

Note   You can access the most current Cisco line card documentation online at: http://www.cisco.com

Follow these steps as an example to route the network interface cables through the cable-management system and connect them to the line card:

Step 1   Route an interface cable across the horizontal cable management tray (Figure 3-11), and down through the cable tray opening to connect it to the line card.

Note   Each line card has its own cable routing slot in the cable management tray. For example, Figure 3-11 shows cables being routed to line card 3 in slot 3 in a Cisco ASR 9010 Router.

Figure 3-11   Routing Interface Cables through the Cable Management Tray
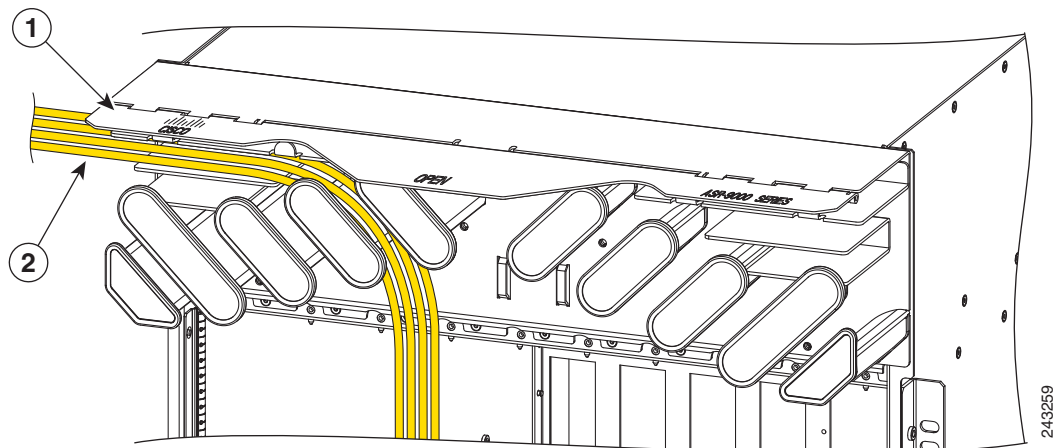
1	Hinged cover (shown in the raised position)	**2**	Line card cable bundle routed through the tray

Step 2   Attach a line card cable management bracket to the line card front panel (Figure 3-12). This bracket is shipped with the line card.

Step 3   Route the cable through the cable-management bracket and carefully press the cable into the channel so it is held in place by the cable clips, as shown in Figure 3-13.

- For an example of cable routing in the Cisco ASR 9006 Router, see Figure 3-14.
- For an example of cable routing in the Cisco ASR 9904 Router, see Figure 3-15.

Step 4   Insert the cable connector into its assigned port.

Step 5   Repeat Step 1 through Step 4 for each additional cable connection to that line card.

Figure 3-12   Attaching a Line Card Cable Management Bracket

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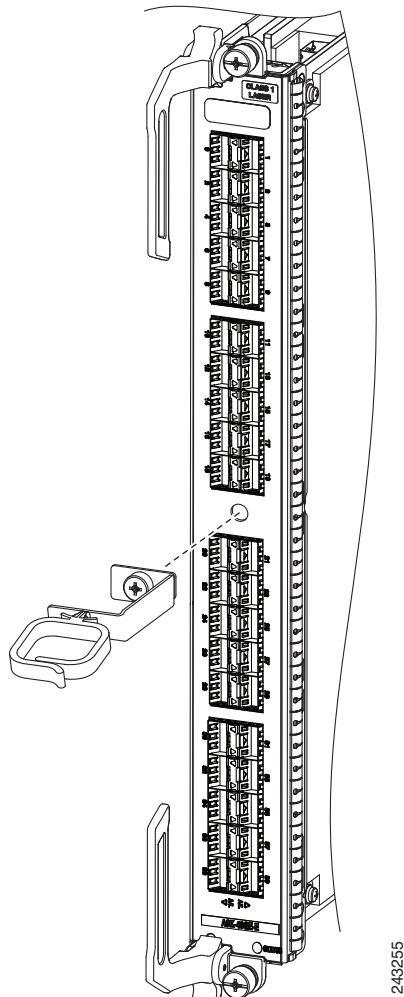
Caution   Make sure the interface cables do not have any kinks or sharp bends, which can destroy or degrade the ability of the optical fiber to propagate the signal-encoded beam of light accurately from one end of the cable to the other. Always allow adequate strain relief in the interface cable.

Figure 3-13   Interface Cable Routing Using the Line Card Cable Management Bracket
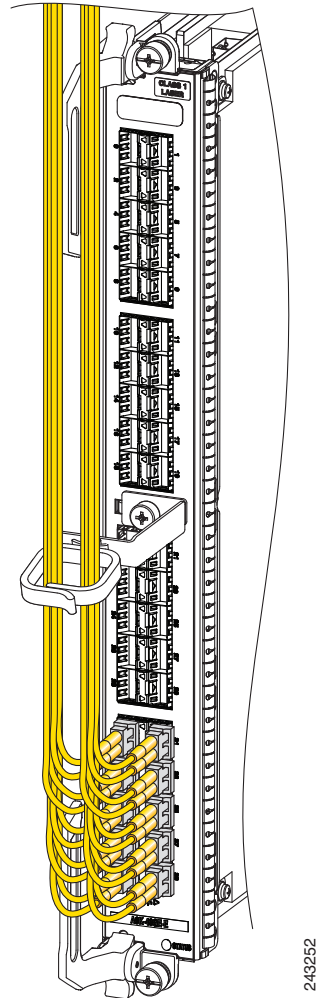
Figure 3-14   *Interface Cable Routing Using the Line Card and Chassis Cable Management Bracket on the Cisco ASR 9006 Router*

243406
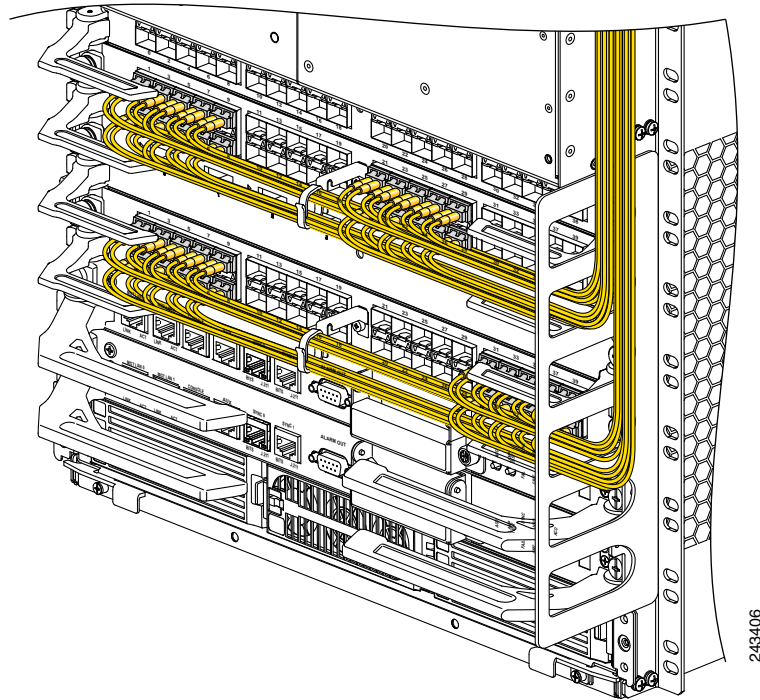
Figure 3-15   Interface Cable Routing Using the Line Card and Chassis Cable Management Bracket on the Cisco ASR 9904 Router
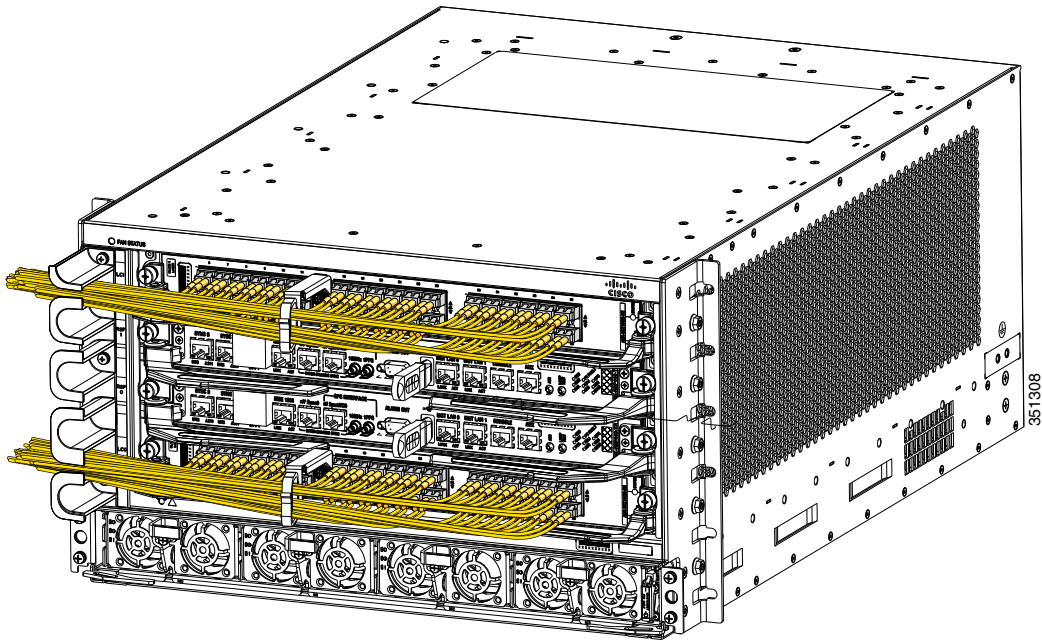
Connecting Cables to the RSP or RP

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

Figure 3-16 shows an example of an RSP with data terminal and modem connections called out.

Figure 3-16   RSP Console and Auxiliary Port Connections
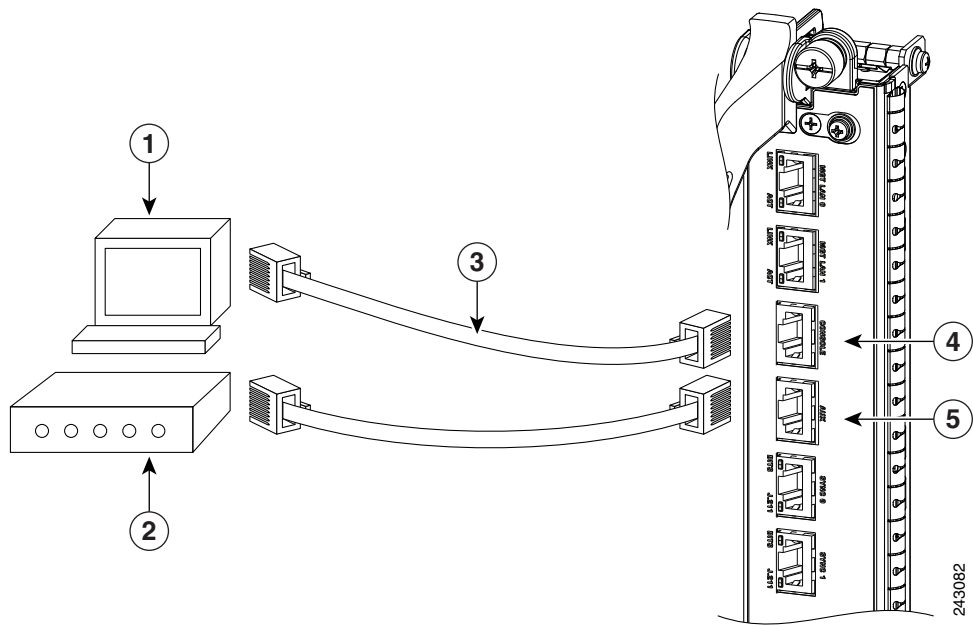
1	Console terminal	**3**	RJ-45 Ethernet cables	**5**	Auxiliary (AUX) port
2	Modem	**4**	Console port		

Figure 3-17 shows an example of an RP with data terminal and modem connections called out.

Figure 3-17   RP Console and Auxiliary Port Connections
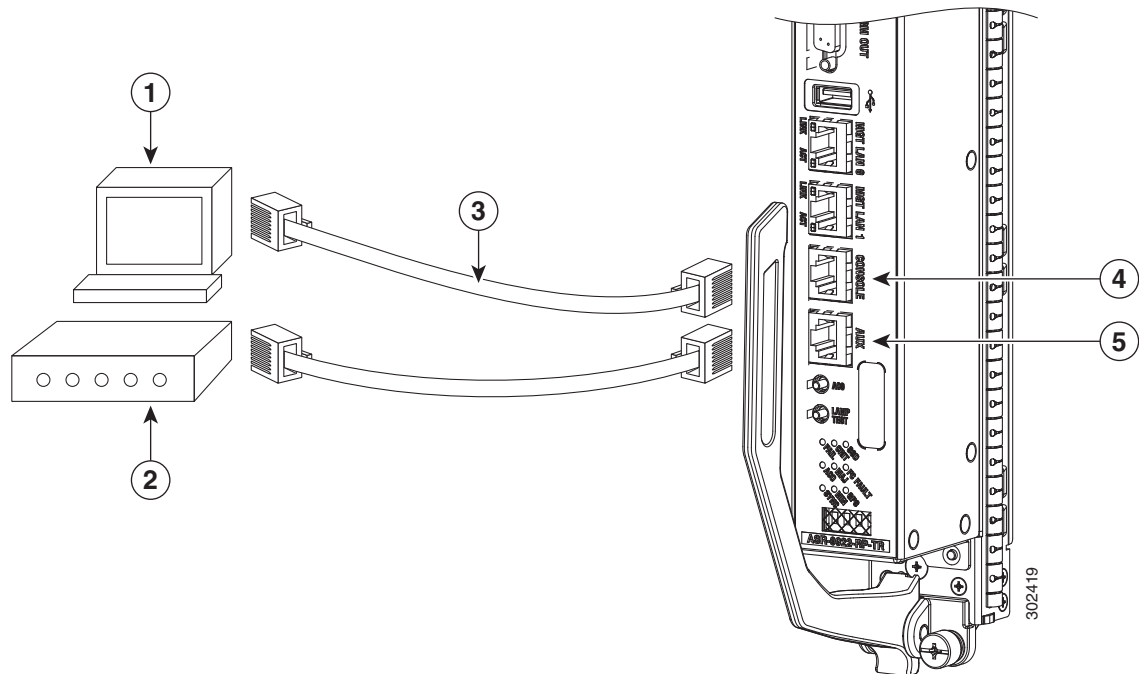
1	Console terminal	**3**	RJ-45 Ethernet cables	**5**	Auxiliary (AUX) port
2	Modem	**4**	Console port		

⚠

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

✎

Note   RSP/RP cables are not available from Cisco, but they are available from any commercial cable vendor.

✎

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 to the console, auxiliary, and 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 Console Port

The system console port on the RSP/RP is an RJ-45 receptacle for connecting a data terminal to perform the initial configuration of the router. The console port requires a straight-through RJ-45 cable.

See RSP and RP Port Connection Guidelines, page 1-55 for additional information about the console port.

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

Step 1   Set your terminal to these operational values: 9600 bps, 8 data bits, no parity, 2 stop bits (9600 8N2).

Step 2   Power off the data terminal.

Step 3   Attach the terminal end of the cable to the interface port on the data terminal.

Step 4   Attach the other end of the cable to the RSP/RP console port.

Step 5   Power on the data terminal.

Connecting to the Auxiliary Port

The auxiliary port on the RSP/RP is a RJ-45 receptacle for connecting a modem or other data communication equipment (DCE) device (such as another router) to the RSP/RP. The asynchronous auxiliary port supports hardware flow control and modem control.

See RSP and RP Port Connection Guidelines, page 1-55 for additional information about the auxiliary port.

Follow this procedure to connect an asynchronous serial device to the RSP/RP auxiliary port:

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 RSP/RP auxiliary port.

Step 4   Power on the asynchronous serial device.

Connecting to the Ethernet Management Ports

To connect cables to the RSP/RP management ports, attach Category 5 UTP cables directly to the MGT LAN 0 and MGT LAN 1 RJ-45 receptacles on the RSP/RP.

See Management LAN Ports Connection Guidelines, page 1-57 for additional information about the Ethernet management LAN ports.

Note   RJ-45 cables are not available from Cisco Systems; they are available from outside 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 9000 Series Router, 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 RSP/RP are endstation devices only, not repeaters.

Follow these steps to connect an Ethernet cable to the RSP/RP RJ-45 Ethernet receptacle:

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.

Connecting the Alarm Cable

The router alarm connector, located on the RSP/RP front panel, is a 9-pin D-subconnector, labeled Alarm Out (Figure 3-18).

Figure 3-18   Alarm Out Cable Connector
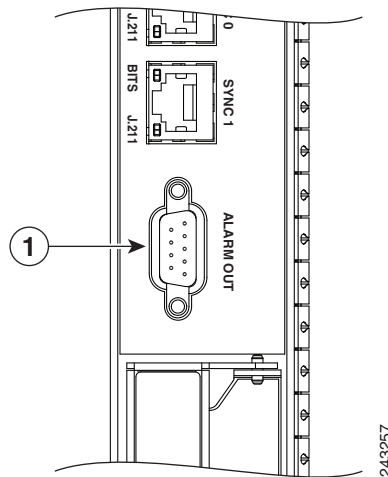
1	Alarm Out cable connector

The alarm subconnector can be used to connect the router to an external site alarm maintenance system. Any critical, major, and minor alarms generated by the router also energize alarm relays on the alarm card and activate the external site alarm. The alarm relay contacts on the RSP/RP card consist of standard common, normally open, and normally closed relay contacts that are wired to the Alarm Out connector pins.

Table 1-8 lists the pin-to-signal correspondence between the connector pins and the alarm relay contacts. Because alarm contact cables are entirely dependent on installation site circumstances, alarm connector cables are not available from Cisco. For information about alarm connector wiring requirements and the pinouts for the alarm connector interface, see Alarm Connection Guidelines, page 1-59.

⚠
Caution   Only safety extra-low voltage (SELV) circuits can be connected to the Alarm Out connector. Maximum rating for the alarm circuit is 100 mA, 50 V.

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

Connecting Power to the Router

Use the one of the following procedures to connect power to your router.

- Connecting Power to an AC-Powered Router, page 3-26
- Connecting Power to a DC-Powered Router, page 3-28

⚠
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

Follow these steps 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 200 to 240 VAC. For more information on AC power input levels, see Power Connection Guidelines, page 1-36.

Step 1   Check that the power switch is set to the STANDBY (0) position.

- On version 1 power trays, this switch is at the rear of the power tray.
- On version 2 and version 3 power trays, this switch is at the front of the power tray.

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.

⚠

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

Step 4   Plug the AC power cord into the receptacle at the rear of the AC power tray (see Figure 3-19 for the version 1 power tray and Figure 3-20 for the version 2 and version 3 power tray).

Step 5   Close the retainer bracket to secure the AC power cord plug to the version 1 power tray receptacle. For the version 2 and version 3 power tray, tighten the screw that clamps the AC power cord plug in place.

Figure 3-19   Typical AC Power Connections to an AC Power Tray—Version 1 Power System
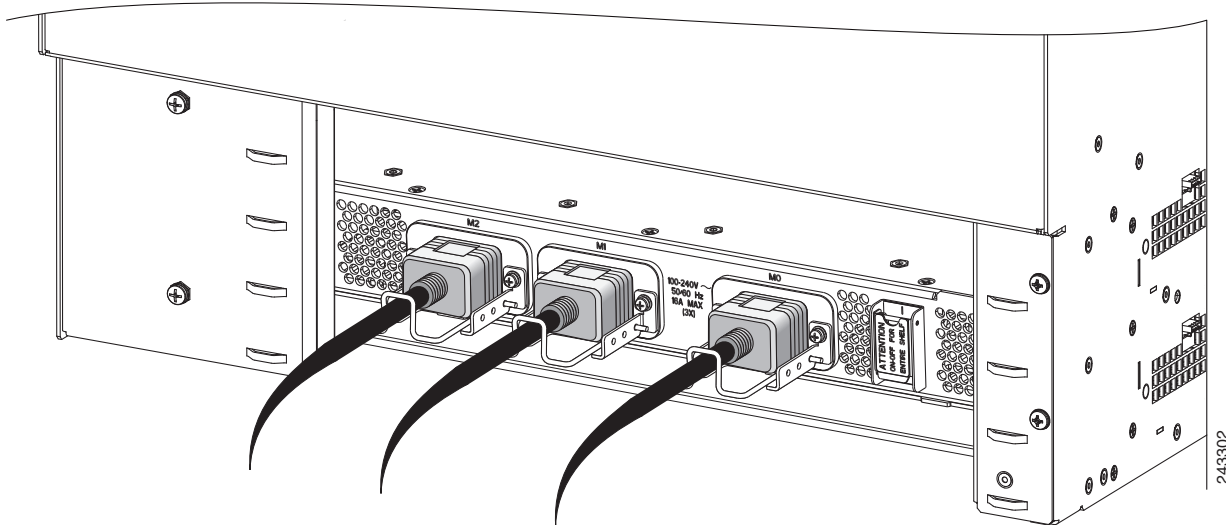
Figure 3-20   Typical AC Power Connections to an AC Power Tray—Version 2 and Version 3 Power System
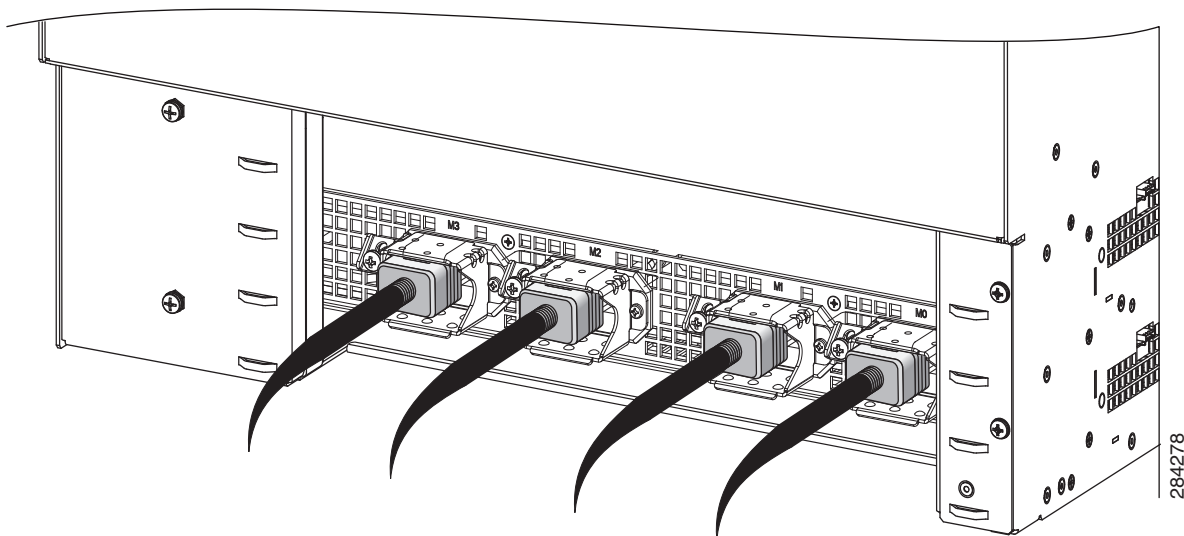
Step 6   Plug the other end of the AC power cord into the AC source receptacle.

Step 7   Proceed to the "Powering On the Router" section on page 3-32.

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 circuitry to trip the breaker on the power module if the power module 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 and the cable lugs used to attach the cables to the router chassis are not available from Cisco Systems. They are available from any commercial cable vendor. For more information on site power and source DC cable requirements, see Power Connection Guidelines, page 1-36.

⚠
Caution   To ensure that power remains off while you are performing this procedure, lock-out/tag-out the DC circuit breaker switch in the off (0) position until you are ready to turn it on.

Follow these steps to connect the DC source power cables to a DC power tray:

Step 1   Verify that the power tray switch is set to the STANDBY (0) position.

Step 2   Remove the clear plastic safety covers that fit over the DC power connection terminal studs.

Step 3   Connect the DC power cables in the following order (see Figure 3-19 for the version 1 power system, Figure 3-20 for the version 2 power system, and Figure 3-23 for the version 3 power system.

    a.   Ground cables first.

    b.   Positive cables next.

    c.   Negative cable last.

Step 4   Repeat Step 3 for the other power modules installed in the tray.

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

⚠

Caution   Do not overtighten the nuts that secure the DC power cables to the power tray terminals. Using the 7/16 hex socket and torque wrench the nuts should be tightened to a torque of 45 to 50 in-lb.

Figure 3-21   ***Typical Power Connections to a Power Tray for a Single DC Power Module—Version 1 Power System***
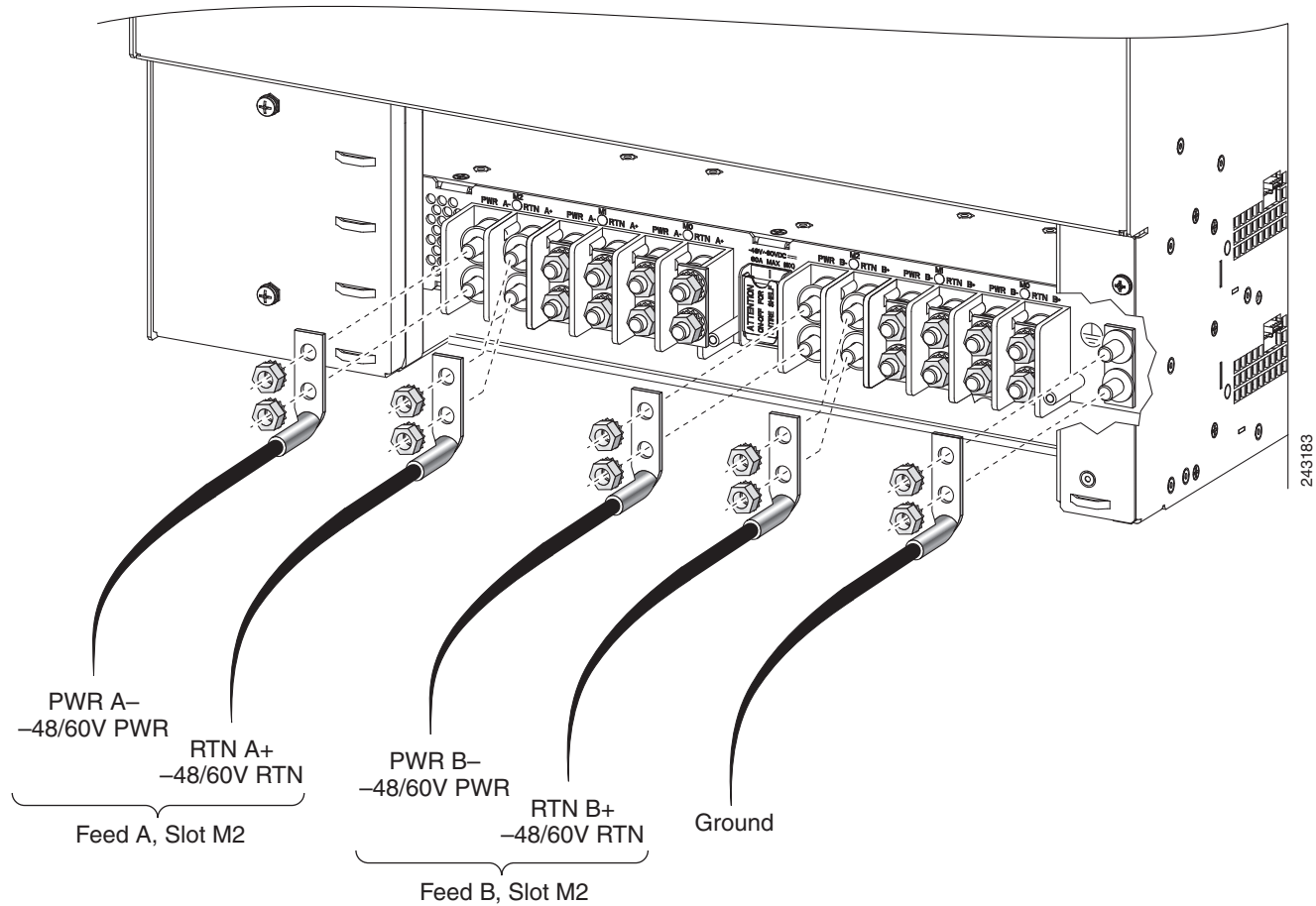
Figure 3-22   *Typical Power Connections to a Power Tray for a Single DC Power Module—Version 2
Power System*
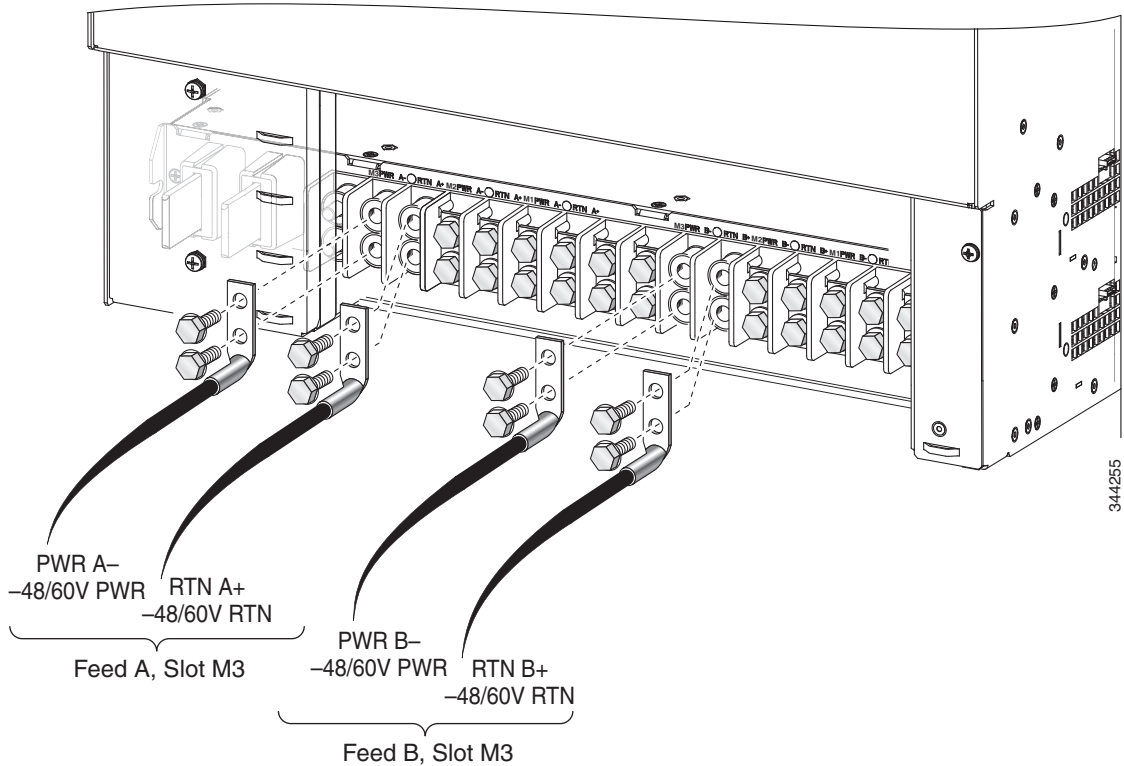
Figure 3-23   Typical Power Connections to a Power Tray for a Single DC Power Module—Version 3 Power System
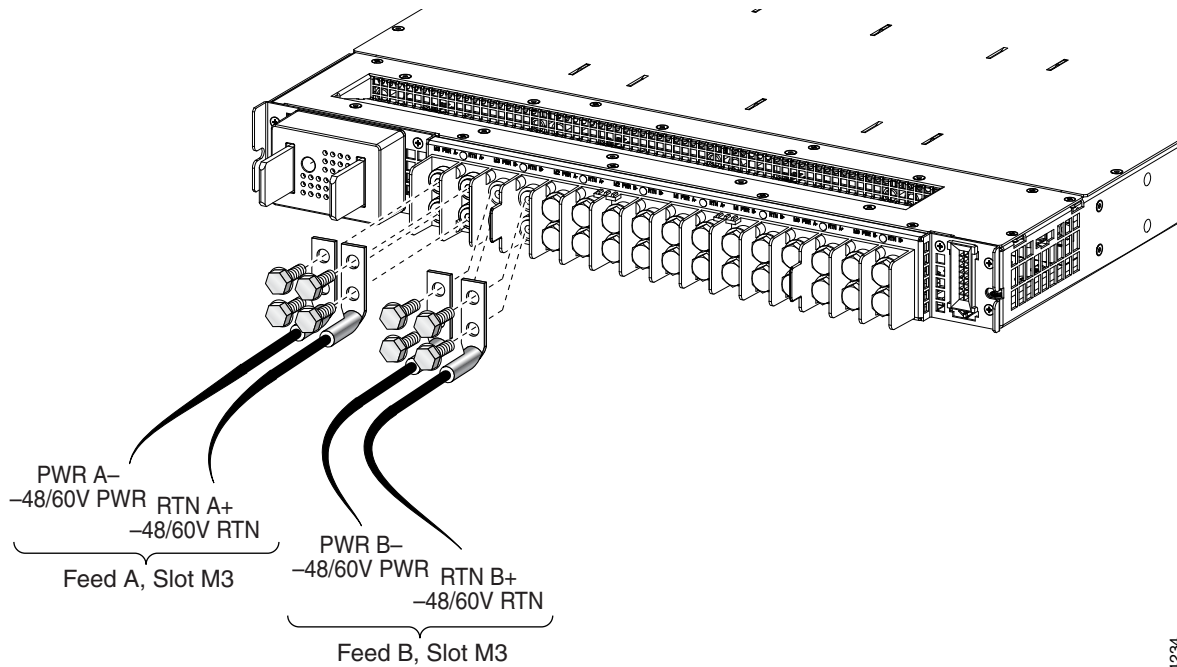
Figure 3-24   Location of DC Power Switch—Version 2 and Version 3 Power System
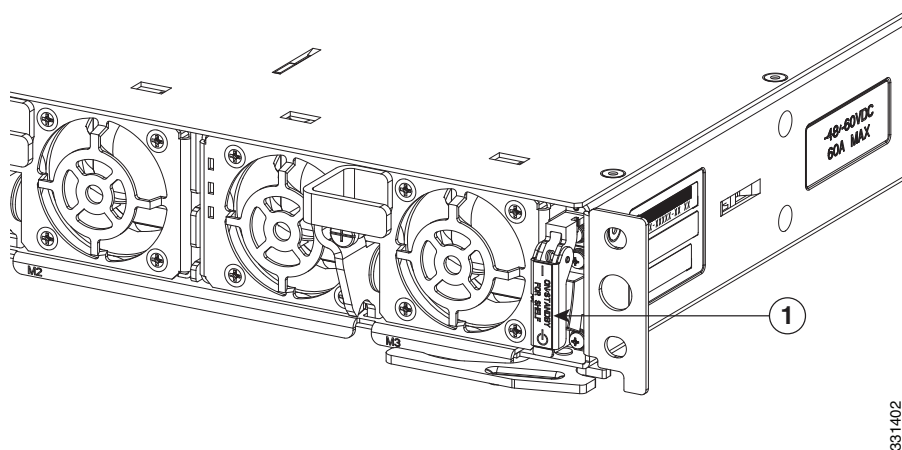
1	Power switch		

Step 5   Replace the clear plastic safety covers over the connection terminal studs. Figure 3-24 shows the plastic safety cover being installed over the version 2 DC power tray connection terminals. The plastic covers for the version 2 DC power tray are similar.

Step 6   Proceed to Powering On the Router, page 3-32.

Powering On the Router

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

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

Step 2 Verify that the Power Input LED on each power module in the tray is lit.

> ✎
>
> **Note** On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.

Step 3 Set the power tray switch for Feed A Slots M03 to the ON (1) position. For the feeds, see Figure 3-19 for the version 1 power system and Figure 3-22 for the version 2 power system, and Figure 3-23 for the version 3 power system. For the locations of the power switch, see Figure 3-22 for the version 1 power system, and Figure 3-24 for the version 2 and version 3 power systems.

Step 4 Verify that the Power Output LED on each power module in the tray is lit.

Step 5 Repeat Step 3 and Step 4 for Slots M03 for Feed B.

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 overtemperature condition is unlikely at initial startup, environmental monitoring functions are included in this chapter because they also monitor internal voltages.

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. Cisco customer service and technical support can be reached at:

http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html

When you call, please have the following information ready:

- Date you received the router and the chassis serial number (located on a label on the back of the chassis).
- Installed line cards and Cisco software release number:
  - Use the **show version** command to determine which line cards are installed and the Cisco software release number, if possible.
- 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 current router behavior with 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.

Table 4-1 describes the subsystems for the Cisco ASR 9000 Series Routers:

Table 4-1   Subsystem Descriptions for the Cisco ASR 9000 Series Routers

Type of Subsystem	Description
Power subsystem	• Up to 8 AC input or DC input power supply modules can be installed in the Cisco ASR 9010 Router chassis. • Up to 4 AC input or DC input power supply modules installed in the Cisco ASR 9006 Router chassis. • Up to 6 AC input or DC input power supply modules installed in the Cisco ASR 9904 Router chassis. • Up to 16 AC input or DC input power supply modules installed in the Cisco ASR 9922 Router chassis. • Up to 12 AC input or DC input power supply modules installed in the Cisco ASR 9912 Router chassis.
Chassis backplane power distribution	The system transfers −54 VDC power from the power modules to the chassis backplane and distributes it to all the cards through the backplane connectors.
Processor subsystem Cisco ASR 9010 Router Cisco ASR 9006 Router Cisco ASR 9904 Router	Includes the active Route Switch Processor (RSP) card (and optional, redundant RSP card, if installed). Up to eight line cards in the Cisco ASR 9010 Router, four line cards in the Cisco ASR 9006 Router, and two line cards in the Cisco ASR 9904 Router. **Note** The RSP and line cards are equipped with onboard processors. The RSP downloads a copy of the Cisco software image to each line card processor. The system uses an alphanumeric display on the active RSP to display status and error messages, which can help in troubleshooting.
Processor subsystem Cisco ASR 9922 Router Cisco ASR 9912 Router	Includes the active Route Processor (RP) card, standby redundant RP card. Up to 20 line cards in the Cisco ASR 9922 Router or 10 line cards in the Cisco ASR 9912 Router. **Note** The RP and line cards are equipped with onboard processors. The RP downloads a copy of the Cisco software image to each line card processor. The system uses an alphanumeric display on the active RP to display status and error messages, which can help in troubleshooting.

Table 4-1   *Subsystem Descriptions for the Cisco ASR 9000 Series Routers (continued)*

Type of Subsystem	Description
Cooling subsystem Cisco ASR 9010 Router Cisco ASR 9006 Router Cisco ASR 9904 Router Cisco ASR 9912 Router	Consists of one or two fan trays, which circulate air through the card cage to cool the cards, and two fans in each of the power modules, which circulate cooling air through the power module.
Cooling subsystem Cisco ASR 9922 Router	Consists of four fan trays, which circulate air through the top and bottom line card cages to cool the cards, and two fans in each of the power modules, which circulate cooling air through the power module.

> **Note** There are two types of image files, -P PIE files, and x86-based -PX PIE files. -P PIE files are for use on Cisco ASR 9000 Series Routers with RSP route switch processors (RSP-4G and RSP-8G). -PX PIE files are for use on the routers with RSP-440/RSP-440 Lite and RSP-880 route switch processors, and the Cisco ASR 9922 Router and Cisco ASR 9912 Router route processors.

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 the alphanumeric displays on the RSP, RP, and line cards.

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

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.

2. The fans in the fan tray receive power and begin drawing air through the chassis.

    The fan tray OK indicator is on.

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

Identifying Startup Issues

Table 4-2 shows the contents of the alphanumeric displays on the various RSP/RP cards, as well as the normal LED states on the power modules (AC or DC) and the fan tray after a successful system startup.

Note For the RSP/RP card to communicate properly to a power module in a power tray, the appropriate input power should be present.

Table 4-2   Alphanumeric Displays and LEDs at System Startup

Component	Type of Indicator	Display Contents/LED Status and Meaning
RSP card	Alphanumeric display	INIT—Card is inserted and microcontroller is initialized
		BOOT—Board is powered on and CPU is booting
		IMEM—Start initializing memory
		IGEN—Start initializing the board
		ICBC—Start initializing communication with the microcontroller
		PDxy—Loading programmable devices (x = FPGA, y = ROMMON)
		PSTx—Power on self test x
		RMN—All tests are finished and ROMMON is ready for commands
		LOAD—Downloading Minimum Boot Image (MBI) image to CPU
		MBI—Starting execution of MBI
		IOXR—Cisco IOS XR software is starting execution
		ACTV—RSP role is determined to be active RSP
		STBY—RSP role is determined to be standby RSP
		PREP—Preparing disk boot

Table 4-2   *Alphanumeric Displays and LEDs at System Startup (continued)*

Component	Type of Indicator	Display Contents/LED Status and Meaning
RSP-440 RSP-440 Lite RSP-880 card	Alphanumeric display	INIT—Card is inserted and microcontroller is initialized BOOT—Board is powered on and CPU is booting IMEM—Start initializing memory IGEN—Start initializing the board ICBC—Start initializing communication with the microcontroller SCPI—Board is not plugged in properly RSP-440/RSP 440-Lite • 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 RMN—All tests are finished and ROMMON is ready for commands LOAD—Downloading MBI image to CPU RRST—ROMMON is performing a soft reset after 5 consecutive MBI validation requests timed out MVB—ROMMON trying MBI validation boot MBI—Starting execution of MBI IOXR—Cisco IOS XR software is starting execution LDG—The RSP is loading (MBI started and card preparing for activity) INCP—The software or configuration is incompatible with the RSP OOSM—The RSP is in Out of Service, Maintenance mode ACTV—RSP role is determined to be active RSP STBY—RSP role is determined to be standby RSP PREP—Preparing disk boot

Table 4-2 **Alphanumeric Displays and LEDs at System Startup (continued)**

Component	Type of Indicator	Display Contents/LED Status and Meaning
RP card RP2 card	Alphanumeric display	INIT—Card is inserted and microcontroller is initialized BOOT—Board is powered on and CPU is booting IMEM—Start initializing memory IGEN—Start initializing the board ICBC—Start 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 RMN—All tests are finished and ROMMON is ready for commands LOAD—Downloading MBI image to CPU RRST—ROMMON is performing a soft reset after 5 consecutive MBI validation requests timed out MVB—ROMMON trying MBI validation boot MBI—Starting execution of MBI IOXR—Cisco IOS XR software is starting execution LDG—The RP is loading (MBI started and card preparing for activity) INCP—The software or configuration is incompatible with the RP OOSM—The RP is in Out of Service, Maintenance mode ACTV—RP role is determined to be active RP STBY—RP role is determined to be standby RP PREP—Preparing disk boot
Line Cards	Status LED	Green: The line card is enabled and ready for use.
AC Power Modules	Power status LEDs	Input power indicator on (green): Input AC power OK. Output power indicator on (green): Output DC power OK. Fault LED off (red): No fault is present. The correct power module voltages are present and no faults have been detected.

Table 4-2   Alphanumeric Displays and LEDs at System Startup (continued)

Component	Type of Indicator	Display Contents/LED Status and Meaning
DC Power Modules	Power status LEDs	Input power indicator on (green): Input DC power OK. On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid. Output power indicator on (green): Output DC power OK. Fault LED off (red): No fault is present. The correct power module voltages are present and no faults have been detected.
Fan Trays	Fan tray status LED	Green LED on: Fan Tray OK. The fan tray fans are operating correctly.

Troubleshooting the Power Subsystem

This section contains information to troubleshoot the power subsystems:

Note   For the RSP/RP card to communicate properly to a power module in a power tray, input power to at least one of the three power modules in the power tray should be present.

Troubleshooting the AC Input Power Subsystem

AC input power modules are monitored for internal temperature, voltage, and current load by the RSP/RP. If the router detects an extreme condition, it generates an alarm and logs the appropriate warning messages on the console.

Figure 4-1 shows the status indicators for the version 1 power module, Figure 4-2 shows the status indicators for the version 2 power module, and Figure 4-3 shows the status indicators for the version 3 AC power module. The indicator definitions follow the two figures.

Figure 4-1   *Version 1 Power Module Status Indicators*

1	Input power LED	ON continuously when the input voltage is present and within the correct range
		BLINKING when the input voltage is out of acceptable range On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.
		OFF when no input voltage is present
2	Output power LED	ON when the power module output voltage is present
		BLINKING when the power module is in a power limit or overcurrent condition
3	Fault LED	ON to indicate that a power module failure has occurred

Figure 4-2   *Version 2 Power Module Power Module Status Indicators*

1	Input power LED	ON continuously when the input voltage is present and within the correct range
		BLINKING when the input voltage is out of acceptable range On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.
		OFF when no input voltage is present
2	Output power LED	ON when the power module output voltage is present
		BLINKING when the power module is in a power limit or overcurrent condition
3	Fault LED	ON to indicate that a power module failure has occurred

Figure 4-3   *Version 3 AC Power Module Status Indicators*

1	Input power LED	ON continuously when the input voltage is present and within the correct range
		BLINKING when the input voltage is out of acceptable range On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.
		OFF when no input voltage is present
2	Output power LED	ON when the power module output voltage is present
		BLINKING when the power module is in a power limit or overcurrent condition
3	Fault LED	ON to indicate that a power module failure has occurred

Follow these steps to troubleshoot the AC power module if it is not operating properly.

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

- Latch on the door/ejector lever is locked securely.
- Power switch on the power tray is set to the ON (1) position.

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

- Power cords plugged into the power tray receptacles are secured in place with their retention clips.

- 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:

- Input power LED (green)—Indicates that the AC power input is operating normally, and the source AC input voltage of 200 to 240 VAC is within the nominal operating range.

   If the input power LED is blinking, the input voltage is out of acceptable range. Verify that each AC power source is operating in the nominal range of 200 to 240 VAC.

   ✎
   Note   On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.

- Output power LED (green)—Indicates that the DC power output is operating normally and the –54 VDC output voltage to the backplane are within the nominal operating range. This indicator lights only when the power switch at the rear of the power tray is set to the ON (1) position.

   – If the Output power LED remains off after checking all the power sources, replace the power supply with a spare. If the spare power module does not work, troubleshoot the power tray in which the module is plugged.

   – If the output power LED is blinking, the power module is in a power limit or overcurrent condition. 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 200 to 240 VAC and is supplying a minimum service of 20 A, North America (or 13 A, international).

- Fault LED (red)—Indicates that the system has detected a fault within the power supply. This indicator remains off during normal operation. If the fault LED is on:

   – If your system has more than one power tray (Cisco ASR 9010 Router, Cisco ASR 9922 Router, and Cisco ASR 9912 Router) with power modules installed for redundancy, you can toggle the power switch at the rear of the first power tray off and then on. If the fault LED remains on after several attempts to power it on, replace the power module with a spare.

   – If the spare power module also fails, the problem could be a faulty power tray backplane connector. Power off the router and contact a Cisco service representative for assistance.

   – Verify that the power module fans are operating properly.

   – Verify that the fan tray is operating properly.

   If the power module fans and the fan trays are operating properly, replace the existing power module with a spare.

⚠
Caution   Because the AC input power subsystems use redundant power modules, a problem with the DC output voltage to the backplane from only one power module should not affect router operation. When the router is equipped with two AC power supplies, it powers on and operates even if one power supply fails. However, complete router functionality may be affected depending on the system load.

Troubleshooting the DC Input Power Subsystem

DC input power supplies are monitored for internal temperature, voltage, and current load by the RSP/RP. If the router detects an extreme condition, it generates an alarm and logs the appropriate warning messages on the console.

Figure 4-1 shows the status indicators for the version 1 power module, Figure 4-2 shows the status indicators for the version 2 power module, and Figure 4-4 shows the status indicators for the version 3 DC power module. The indicator definitions follow the two figures.

Figure 4-4   Version 3 DC Power Module Status Indicators

1	Input power LED	ON continuously when the input voltage is present and within the correct range
		BLINKING when the input voltage is out of acceptable range On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid.
		OFF when no input voltage is present
2	Output power LED	ON when the power module output voltage is present
		BLINKING when the power module is in a power limit or overcurrent condition
3	Fault LED	ON to indicate that a power module failure has occurred

Troubleshooting a DC Power Module

Follow these steps to troubleshoot a DC power module if it is not operating properly.

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

- Latch on the door/ejector lever is locked securely.
- Power switch on the power tray is set to the ON (1) position.

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

- 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:

- Input power LED (green)—Indicates that the DC power input is operating normally, and the source DC input voltage is within the nominal operating range of –40 to –72 VDC.

    - If the input power LED is blinking, input connections to the power module are loose or not connected, or the input voltage is below the minimum. Verify that DC power from the source is operating in the nominal range of –40 to –72 VDC.

        > **Note**   On the DC power tray, the Power Input LED is lit solid green if both DC feeds are valid and blinks green if only a single DC feed is valid. Check the input connections to the power module.

    - If the indicator is still flashing after you perform the above checks, replace the power module.

- Output power LED (green)—Indicates that the DC power output is operating normally, and the –54 VDC output voltage to the backplane is within the nominal operating range. This indicator lights only when the power switch at the rear of the power tray is set to the ON (1) position.

    - If the output power LED remains off after checking all the power sources, replace the power module with a spare. If the spare power module does not work, troubleshoot the power tray in which the module is plugged.

    - If the output power LED is blinking, the power module is in a power limit or overcurrent condition. 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.

- Fault LED (red)—Indicates that the system has detected a fault within the power supply. This indicator remains off during normal operation. If the fault LED is on, check the following:

  – If your system has more than one power tray (Cisco ASR 9010 Router, Cisco ASR 9922 Router, and Cisco ASR 9912 Router) with power modules installed for redundancy, you can toggle the power switch at the rear of the first power tray off and then on. If the fault LED is still on, eject and reseat the power module. If the fault LED remains on after several attempts to power it on, replace the power module with a spare.

  – If the spare power module also fails, the problem could be a faulty power tray backplane connector. Power off the router and contact a Cisco service representative for assistance.

  – Verify that the power module fans are operating properly.

  – Verify that the fan tray is operating properly.

  – If the power module fans and the fan trays are operating properly, replace the faulty power module with a spare.

⚠ **Caution**   Because there are redundant power modules, a problem with the DC output voltage to the backplane from only one power module should not affect router operation. When the router is equipped with two DC power supplies, it powers on even if one power supply fails. However, complete router functionality may be affected depending on the system load.

Additional Power Subsystem Troubleshooting Information

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

Obtaining Temperature and Environmental Information

If both the RSP/RP and fan trays 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:

```
RP/0/RSP0/CPU0:router(admin) #show environment

Temperature Information
--------------------------------------------

R/S/I   Modules         Inlet           Hotspot
                        Temperature     Temperature
                        (deg C)         (deg C)

0/RSP0/*
        host            25.3            41.6

0/0/*
        host            29.2            30.0
0/1/*
        host            35.0            46.6

0/FT0/*
        host            21.2            20.8
```

```
0/FT1/*
        host                22.0            21.5


Voltage Information
----------------------------------------------

R/S/I   Modules Sensor                    (mV)    Margin
0/RSP0/*

          host    VP3P3_CAN                3300    n/a
          host    VP2P5                    2499    n/a
          host    VP3P3                    3299    n/a
          host    VP1P2                    1199    n/a
          host    VP1P5                    1500    n/a
          host    VP1P8                    1800    n/a
          host    VP5P0                    5000    n/a
          host    VP7P0                    6999    n/a
          host    VP2P5_DB                 2499    n/a
          host    VP1P8_DB                 1800    n/a
          host    VP1P5_DB                 1500    n/a
          host    VP1P2_DB                 1199    n/a
          host    VP0P75_DB                 750    n/a
          host    VP1P05_DB                1050    n/a
          host    VP1P8_ENSO               1800    n/a
          host    VP1P0_SAC0_VDDA          1000    n/a
          host    VP1P0_SAC0_VDDD_VDDACM    999    n/a
          host    VP1P2_SERDES_PLL_LGN     1199    n/a
          host    VP1P0_SAC1_VDDD_VDDACM    999    n/a
          host    VP1P0_SAC1_VDDA           999    n/a
          host    VP1P0_SAC1_VDD           1000    n/a
          host    VP1P0_SAC0_VDD           1000    n/a
          host    VP1P0_DAO                 999    n/a
          host    VP1P0_KAW_LDO            1000    n/a
          host    VP1P0_MGTVCC_DAO         1000    n/a
          host    VP1P2_SERDES_PLL_DAO     1200    n/a
          host    VP1P0_SKT_IO             1000    n/a
          host    VP1P0_SKT_CORE           1000    n/a
          host    VP1P9_LDO                1900    n/a
          host    VP1P8_10GPHY_LDO         1800    n/a
          host    VP1P2_10GPHY_01          1200    n/a
          host    VP0P75_TMX_VTT            743    n/a
          host    VP3P3_OCXO               3300    n/a
          host    VP1P8_OCXO               1799    n/a
          host    VP1P0_ARB                 999    n/a


      0/0/*
          host    IBV                     10552    n/a
          host    5.0V                     4939    n/a
          host    VP3P3_CAN                3275    n/a
          host    3.3V                     3303    n/a
          host    2.5V                     2515    n/a
          host    1.8VB                    1803    n/a
          host    1.2VB                    1203    n/a
          host    1.8VA                    1795    n/a
          host    0.9VB                     881    n/a
          host    1.2V_LDO_BRG0            1195    n/a
          host    1.2V_LDO_BRG1            1196    n/a
          host    1.8VC                    1806    n/a
          host    1.5VB                    1504    n/a
          host    1.5VA                    1499    n/a
          host    1.1V(1.05V_CPU)         1051    n/a
          host    0.75VA                    749    n/a
          host    0.75VB_0.75VC            754    n/a
```

```
          host    1.1VB                    1101    n/a
          host    1.2V_TCAM0               1203    n/a
          host    1.2V_TCAM1               1202    n/a
          host    1.0V_Bridge_LDO           995    n/a
          host    1.0VB                    1046    n/a
          host    0.75VD_and_0.75VE         755    n/a
          host    1.2V_TCAM2               1208    n/a
          host    1.2V_TCAM3               1203    n/a
          host    1.5VC                    1507    n/a
          host    1.8VD                    1793    n/a
          host    1.1VC                    1105    n/a
          host    ZARLINK_3.3V             3284    n/a
          host    ZARLINK_1.8V             1810    n/a
          host    1.2V_DB                  1200    n/a
          host    3.3V_DB                  3320    n/a
          host    2.5V_DB                  2498    n/a
          host    1.5V_DB                  1493    n/a
          host    1.8V_DB                  1827    n/a
          host    5.0V_XFP_DB              5034    n/a
          host    1.2VB_DB                 1226    n/a

0/1/*
          host    IBV                     10460    n/a
          host    5.0V                     4920    n/a
          host    VP3P3_CAN                3283    n/a
          host    3.3V                     3294    n/a
          host    2.5V                     2510    n/a
          host    1.8VB                    1804    n/a
          host    1.2VB                    1203    n/a
          host    1.8VA                    1794    n/a
          host    0.9VB                     882    n/a
          host    1.2V_LDO_BRG0            1191    n/a
          host    1.2V_LDO_BRG1            1194    n/a
          host    1.8VC                    1816    n/a
          host    1.5VB                    1508    n/a
          host    1.5VA                    1497    n/a
          host    1.1V(1.05V_CPU)          1054    n/a
          host    0.75VA                    749    n/a
          host    0.75VB_0.75VC             755    n/a
          host    1.1VB                    1104    n/a
          host    1.2V_TCAM0               1205    n/a
          host    1.2V_TCAM1               1207    n/a
          host    1.0V_Bridge_LDO           995    n/a
          host    1.0VB                    1047    n/a
          host    0.75VD_and_0.75VE         753    n/a
          host    1.2V_TCAM2               1207    n/a
          host    1.2V_TCAM3               1199    n/a
          host    1.5VC                    1503    n/a
          host    1.8VD                    1805    n/a
          host    1.1VC                    1102    n/a
          host    ZARLINK_3.3V             3272    n/a
          host    ZARLINK_1.8V             1811    n/a
          host    1.2V_DB                  1197    n/a
          host    3.3V_DB                  3318    n/a
          host    2.5V_DB                  2540    n/a
          host    1.5V_DB                  1511    n/a
```

```
LED Information
-----------------------------------------------

R/S/I    Modules LED              Status
0/RSP0/*
        host    Critical-Alarm  Off
        host    Major-Alarm     Off
        host    Minor-Alarm     Off
        host    ACO             Off

Fan Information
---------------------------------------------

  Fan speed (rpm):
        FAN0    FAN1    FAN2    FAN3    FAN4    FAN5

0/FT0/*
        7080    7020    6990    7020    6960    6900
0/FT1/*
        6900    6900    7110    6960    6900    7020
Power Supply Information
---------------------------------------------

R/S/I    Modules Sensor          Watts           Status

0/PM0/*
        host    PM              3000            Ok


Power Shelves Type: AC

Total Power Capacity:                      3000W
Usable Power Capacity:                     3000W
Supply Failure Protected Capacity:           0W
Worst Case Power Used:                     1910W

 Slot                                       Max Watts
 ----                                       ---------
 0/RSP0/CPU0                                      250
 0/RSP1/CPU0                                      250  (default)
 0/0/CPU0                                         375
 0/1/CPU0                                         375
 0/FT0/SP                                         330  (default)
 0/FT1/SP                                         330  (default)

Worst Case Power Available:        1090W
Supply Protected Capacity Available:   Not Protected
```

Troubleshooting the Power Distribution System

The power distribution system consists of:

- AC or DC power modules, which supply –54 VDC to the backplane.

- Chassis backplane, which carries voltage to chassis components.

- DC-to-DC converters, which convert –54 VDC from the backplane to the correct voltages required by the line cards.

Follow these steps to troubleshoot the power distribution system:

Step 1   Check each power module to make sure that:

- Power module door is fully closed and properly secured by its latch.

- Green Input Power LED is on.

- Green Output Power LED is on.

- Red Fault 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 trays are operating:

- If the fan trays are functioning, then the –54 VDC from the chassis backplane and the cables from the backplane to the fan trays are functioning properly.

- If one or both fan trays are not functioning, there may be a problem with either the fan trays themselves, or the –54 VDC power supplied to the fan trays. Eject and reseat the fan trays.

- If a fan tray is still not operating, there could be a problem with the fan tray controller card or cable. Replace the fan tray.

- Contact your Cisco representative if replacing a fan tray or both fan trays does not fix the problem.

Troubleshooting the Route Processor Subsystem

The router processor subsystem consists of the route processor located on the RSP card. The RSP and the line cards each have 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.

Note   A minimally configured router must have an RSP/RP installed in RSP slot 0 or RP slot 0 of the card cage to operate. If the router is equipped with a redundant RSP/RP, the redundant RSP/RP must be installed in RSP slot 1 or RP slot 1 of the card cage.

This section contains information to troubleshoot the route processor subsystem, including:

- Route Processor Overview, page 4-19
- RSP and RP Front Panel Indicators, page 4-25
- Troubleshooting RSP and RP Cards, page 4-29
- Fabric Card Front Panel Indicator, page 4-31
- Troubleshooting Line Cards and Modular Port Adapters, page 4-31

Route Processor Overview

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

The RP2 card has more processing power than the earlier RP. It also doubles the amount of storage and supported memory as well as the memory bandwidth. This provides the path to scale the number of routes up in this generation. In addition the internal control plane bandwidth has been scaled up to allow better control of the linecards as the network bandwidth increases. Figure 4-8 identifies the ports and LEDs on the RP card front panel. Figure 4-9 identifies the ports and LEDs on the RP2 card front panel.

Figure 4-5 identifies the ports and LEDs on the RSP card front panel.

Figure 4-6 identifies the ports and LEDs on the RSP-440 and RSP-440 Lite card front panel.

Figure 4-7 identifies the ports and LEDs on the RSP-880 card front panel.

Figure 4-8 identifies the ports and LEDs on the RP card front panel.

Figure 4-9 identifies the ports and LEDs on the RP2 card front panel.

Figure 4-5   RSP Card Front Panel
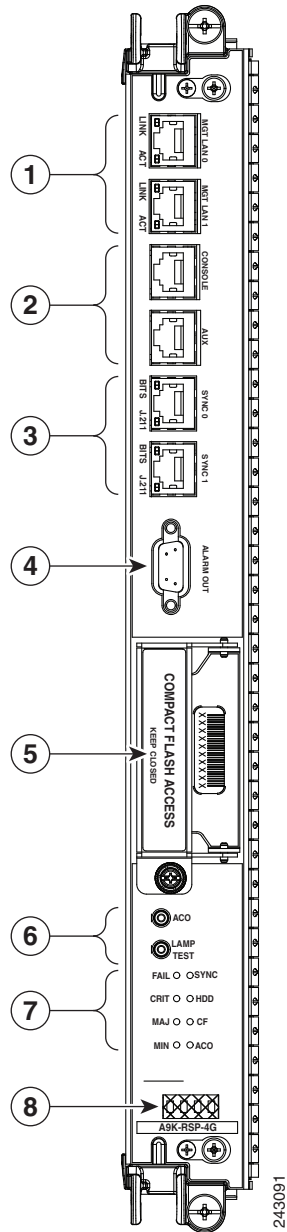
1	Management LAN ports	5	Compact Flash type I/II
2	Console and Auxiliary (AUX) ports	6	Alarm Cutoff (ACO) and Lamp Test push buttons
3	Sync (BITS and J.211) ports	7	Eight discrete LED indicators
4	Alarm Out DB9 Connector	8	LED matrix display

Figure 4-6   RSP-440 and RSP-440 Lite Card Front Panel
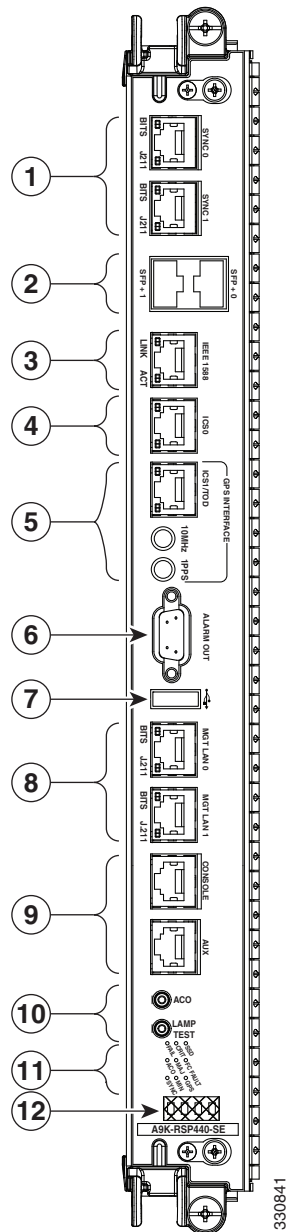
1	SYNC (BITS/J.211) ports	**7**	External USB port
2	SFP/SFP+ ports	**8**	Management LAN ports
3	Service LAN port	**9**	Console and Auxiliary (AUX) ports
4	ToD port	**10**	Alarm Cutoff (ACO) and Lamp Test push buttons
5	10 MHz and 1 PPS indicators	**11**	Eight discrete LED indicators
6	Alarm Out DB9 connector	**12**	LED matrix display

Figure 4-7   *RSP-880 Card Front Panel*
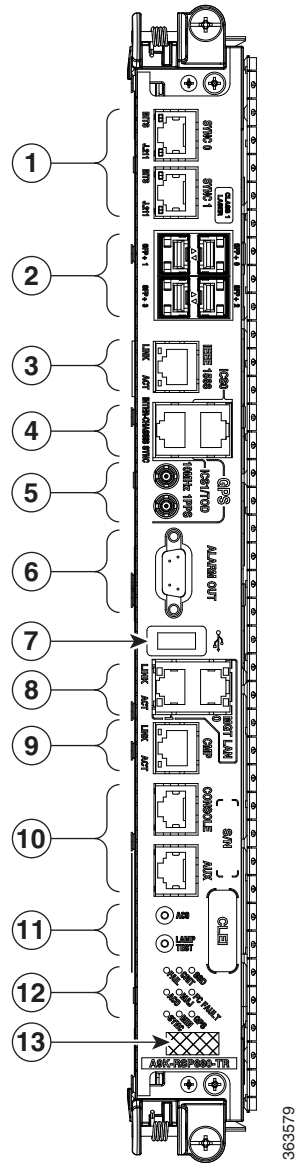
1	SYNC (BITS/J.211) ports	**8**	Management LAN ports
2	SFP/SFP+ ports	**9**	CMP port
3	Service LAN port	**10**	Console and Auxiliary (AUX) ports
4	Inter Chassis Sync ports and ToD port	**11**	Alarm Cutoff (ACO) and Lamp Test push buttons
5	10 MHz and 1 PPS indicators	**12**	Eight discrete LED indicators
6	Alarm Out DB9 connector	**13**	LED matrix display
7	External USB port		

Figure 4-8   *RP Card Front Panel*
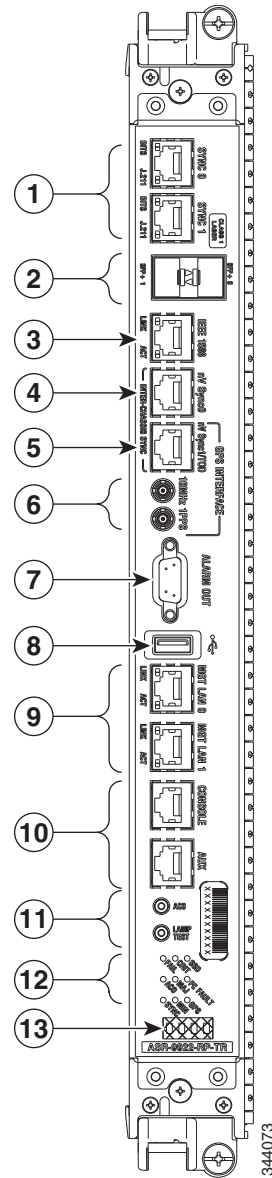
1	SYNC (BITS/J.211) ports	**8**	External USB port
2	SFP/SFP+ ports	**9**	Management LAN ports
3	IEEE 1588 port	**10**	CONSOLE and AUX ports
4	Inter-chassis nv Sync0	**11**	Alarm Cutoff (ACO) and Lamp Test push buttons
5	Inter-chassis nv Sync1 GPS ToD	**12**	Nine discrete LED indicators
6	10 MHz and 1 PPS indicators	**13**	LED matrix display
7	Alarm Out DB9 connector		

Figure 4-9   RP2 Card Front Panel

363906
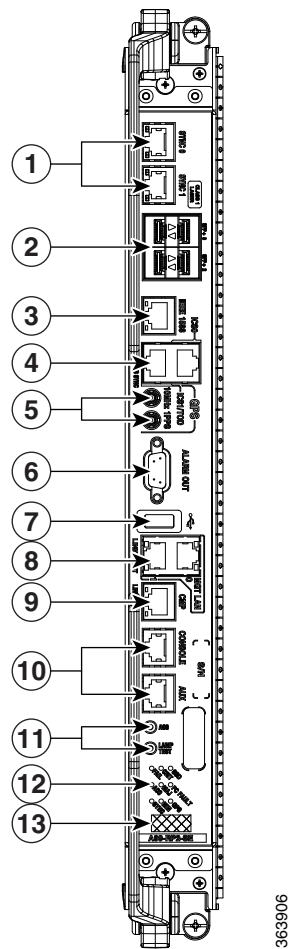
1	SYNC (BITS/J.211) ports	8	Management LAN ports
2	SFP/SFP+ ports	9	CMP Port
3	IEEE 1588 port	10	CONSOLE and AUX ports
4	Inter-chassis nv Sync0 and 1	11	Alarm Cutoff (ACO) and Lamp Test push buttons
5	10 MHz and 1 PPS indicators	12	Nine discrete LED indicators
6	Alarm Out DB9 connector	13	LED matrix display
7	External USB port		

RSP and RP Front Panel Indicators

LED Display Definitions

The RSP card has eight discrete LED indicators and an LED dot-matrix display for system information. The RSP-440, RSP-440 Lite, and RSP-880 have nine discrete LED indicators, a LED dot-matrix display for system information, and three USB-specific LEDs. The RP has nine discrete LED indicators and a LED dot-matrix display for system information.

Table 4-3 describes the discrete LEDs and the three USB LEDs on the RSP, RSP-440, RSP-440 Lite, and RSP-880 cards. Table 4-4 describes the discrete LED definitions for the RP and RP2 cards.

Table 4-3   RSP, RSP-440, RSP-440 Lite, RSP-880 Discrete LED Display Definitions

Indicator (Label)	Color	Description
Power Fail (FAIL)	Red	Standby Power Fail LED. The LED is turned off by the CAN bus controller after it is up and running.
	Off	Standby power is normal.
Critical Alarm (CRIT)	Red	Critical Alarm LED. A critical alarm has occurred.
	Off (Default after reset)	No critical alarm has occurred.
Major Alarm (MAJ)	Red	Major alarm LED. A major alarm has occurred.
	Off (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Amber	Minor alarm LED. A minor alarm has occurred.
	Off (Default after reset)	No minor alarm has occurred.
Synchronization (SYNC)	Green	System timing is synchronized to an external timing source.
	Amber	System timing is free running.
	Off	LED never turns off.
Alarm Cutoff (ACO)	Amber	Alarm Cutoff has been enabled. The ACO push button was pressed after at least one alarm has occurred.
	Off (Default after reset)	Alarm Cutoff is not enabled.
Internal Hard Disk Drive (HDD) [RSP only]	Green	Hard Disk Drive is busy/active. The LED is driven by the SAS controller.
	Off (Default after reset)	Hard Disk Drive is not busy/active

Table 4-3   *RSP, RSP-440, RSP-440 Lite, RSP-880 Discrete LED Display Definitions (continued)*

Indicator (Label)	Color	Description
External Compact Flash (CF) [RSP only]	Green	Compact Flash is busy/active.
	Off (Default after reset)	Compact Flash is not busy/active.
Internal Solid State Hard Disk Drive (SSD)	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD/SAS controller.
RSP-440/RSP-440 Lite RSP-880	Off (Default after reset)	Internal Solid State Hard Disk Drive is not busy/active.
GPS RSP-440/RSP-440 Lite RSP-880	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.
External USB 2.0 RSP-440/RSP-440 Lite RSP-880	Green	External USB is busy/active.
	Off (Default after reset)	External USB is not busy/active.
Internal USB 2.0 A RSP-440/RSP-440 Lite RSP-880	Green	Internal USB is busy/active.
	Off (Default after reset)	Internal USB is not busy/active.
Internal USB 2.0 B RSP-440/RSP-440 Lite RSP-880	Green	Internal USB is busy/active.
	Off (Default after reset)	Internal USB is not busy/active.

Table 4-4   *RP and RP2 Discrete LED Display Definitions*

Indicator (Label)	Color	Description
Power Fail (FAIL)	Red (Default after power on)	Standby Power Fail LED. The LED is turned off by the CAN bus controller after it is up and running.
	Off	Standby power is normal.
Critical Alarm (CRIT)	Red	Critical Alarm LED. A critical alarm has occurred.
	Off (Default after reset)	No critical alarm has occurred.
Major Alarm (MAJ)	Red	Major alarm LED. A major alarm has occurred.
	Off (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Amber	Minor alarm LED. A minor alarm has occurred.
	Off (Default after reset)	No minor alarm has occurred.
Alarm Cutoff (ACO)	Amber	Alarm Cutoff has been enabled. The ACO push button was pressed after at least one alarm has occurred.
	Off (Default after reset)	Alarm Cutoff is not enabled.

Table 4-4   **RP and RP2 Discrete LED Display Definitions (continued)**

Indicator (Label)	Color	Description
Synchronization (SYNC)	Green	System timing is synchronized to an external timing source including IEEE 1588.
	Amber	System timing is free running.
	Off (Default after reset)	LED never turns off.
Internal Solid State Hard Disk Drive (SSD)	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD/SAS controller.
	Off (Default after reset)	Internal Solid State Hard Disk Drive is not busy/active.
FC Fault	Amber	A fault has occurred on any or all of the FCs installed. This LED will be on during the boot phase of the FC. This LED will be turned off by the Controller Area Network (CAN) bus controller after it is up and running.
	Off (Default after reset)	All FCs are booted up and ready.
GPS	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.

Compact Flash and Status LEDs

One compact flash slot provides the RSP with additional flash memory capacity. All combinations of different flash devices are supported by the RSP. You can use ATA flash disks, Type 1 or Type 2 linear flash memory cards, or a combination of the two.

Note   The RSP card only supports +5.2 VDC flash memory devices. It does not support +3.3 VDC PCMCIA devices.

Note   The RSP-440, RSP-440 Lite, RSP-880, and RP cards do not have a compact flash slot.

The slot has an eject button (located behind the cover) to remove a flash card from the slot.

Ethernet Ports and Status LEDs

The RSP/RP cards have two 8-pin media-dependent interface (MDI) RJ-45 Management LAN ports for 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 autosensing scheme on the RSP/RP, which determines the speed by the network that the Ethernet port is connected to. However, even at an autosensed 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.

The following LEDs on the front panel indicate traffic status and port selection (Figure 4-10):

- LINK—Indicates link activity.

- ACT—Indicates which Ethernet port is selected (ETH 0 or ETH 1).

✎
Note   Because both ports are supported on the RSP/RP card, MGT LAN 0 is always on. MGT LAN 0 lights when it is selected.

Figure 4-10   Management LAN Port Activity LEDs
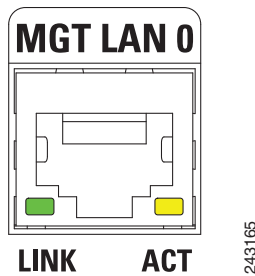
Auxiliary and Console Ports

The auxiliary and console ports on the RSP/RP are EIA/TIA-232 (also known as RS-232) asynchronous serial ports connect external devices to monitor and manage the system:

- Auxiliary port—RJ-45 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 RJ-45 interface for connecting a console terminal.

Alphanumeric Message Displays

The alphanumeric message displays are organized in one row of four LED characters (see callout 8 in Figure 4-5 for the RSP card, callout 12 in Figure 4-6 for the RSP-440 and RSP-440 Lite cards, callout 13 in Figure 4-7 for the RSP-880 card, callout 13 in Figure 4-8 for the RP card, and callout 13 in Figure 4-9 for the RP2 card.

The alphanumeric message displays show router status messages during the boot process and after the boot process is complete:

- During the boot process, the message displays are controlled directly by the CAN microcontroller.

- After the boot process, the message displays are controlled by Cisco IOS XR software (through the CAN bus).

- Cisco IOS XR System Error Message Reference Guide

The alphanumeric message displays also provide information about different levels of system operation, including the status of the RSP/RP, router error messages, and user-defined status and error messages.

✎
Note   For a list of all system and error messages, see the *Cisco IOS XR System Error Message Reference Guide*

Flash Memory

You can use the flash memory on the RSP card to store multiple Cisco IOS XR software and microcode images that you can use to operate the router. You can download new images to flash memory over the network (or from a local server) to replace an existing image or to add it as an additional image. The router can be booted (manually or automatically) from any of the stored images in flash memory.

Flash memory also functions as a Trivial File Transfer Protocol (TFTP) server to allow other servers to boot remotely from the stored images, or to copy them into their own flash memory.

The system uses two types of flash memory:

*   Onboard flash memory (bootflash)—Contains the Cisco IOS XR boot image
*   Compact flash memory disks (or cards)—Contains the Cisco IOS XR software images

✎

Note   The RSP-440, RSP-440 Lite, RSP-880, and RP cards do not have a compact flash slot.

Table 4-5 lists supported compact flash disk sizes and Cisco part numbers.

Table 4-5   Supported Compact Flash Disk Sizes

Compact Flash Disk Size	Part Number
1 GB	16-3204-01

Troubleshooting RSP and RP Cards

When the router is powered on, the alphanumeric display on the RSP indicates the following sequence:

INIT—Card is inserted and microcontroller is initialized.

BOOT—Board is powered on and CPU is booting.

IMEM—Start initializing memory.

IGEN—Start initializing the board.

ICBC—Start initializing communication with the microcontroller.

PDxy—Loading programmable devices (x = FPGA, y = ROMMON).

PSTx—Power on self test x.

RMN—All tests are finished and ROMMON is ready for commands.

LOAD—Downloading Minimum Boot Image (MBI) image to CPU.

MBI—Starting execution of MBI.

IOXR—Cisco IOS-XR software is starting execution.

ACTV—RSP role is determined to be active RSP.

STBY—RSP role is determined to be standby RSP.

PREP—Preparing disk boot.

When the router is powered on, the alphanumeric display on the RSP-440, RSP-440 Lite, RSP-880 and RP indicates the following sequence:

INIT—Card is inserted and microcontroller is initialized

BOOT—Board is powered on and CPU is booting

IMEM—Start initializing memory

IGEN—Start initializing the board

RSP-440 and RSP-440 Lite Only

- 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

UPWR—User requested power off (not applicable for RSP-880 and RP2)

TEMP—Over temperature

CPU—CPU communication failure (not applicable for RSP-880 and RP2)

RMN—All tests are finished and ROMMON is ready for commands

LOAD—Downloading MBI image to CPU

RRST—ROMMON is performing a soft reset after 5 consecutive MBI validation requests timed out

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

OOSM—The RSP/RP is in Out of Service, Maintenance mode

ACTV—RSP/RP role is determined to be active RSP/RP

STBY—RSP/RP role is determined to be standby RSP/RP

PREP—Preparing disk boot

You can use the alphanumeric display to isolate a problem with the RSP:

- Alphanumeric display is powered directly from the CAN microcontroller on the RSP card through the chassis backplane:

  - If the alphanumeric display is not operating, the CAN microcontroller may be malfunctioning.

  - If the CAN microcontroller is operating, the alphanumeric display could be on even if the RSP failed to power on.

- If the alphanumeric display is not operating, but the power modules and the fan trays are operational, the RSP may not be installed properly, or the +5 VDC output from the chassis backplane may be faulty:

  - Make sure that the system is powered on.

  - Initialize the RSP card by ejecting it from the chassis backplane and then reseating it.

- If the alphanumeric display is operating, check the meaning of the messages (see Table 4-6 for the RSP).

  When the DC-to-DC converters are powered on by the CAN microcontroller, the begins the RSP boot process and displays various status messages. Some messages appear briefly; while others appear for several seconds. If the messages appear to stop at a particular point, the boot process may be halted:

  – Make a note of the message.

  – Turn off power to the router, then turn on the power again to reset the router and start the boot process. If the router halts again, replace the RSP (see Removing and Replacing Cards from the Chassis, page 5-25).

Table 4-6   Troubleshooting Using the RSP Alphanumeric Display Messages

Message	Description
PST1	Failed DDR RAM memory test
PST2	Failed FPGA image CRC check
PST3	Failed board type and slot ID verification

Fabric Card Front Panel Indicator

The front panel of the fabric card (FC) has one tri-color LED indicator for system information.

Table 4-7 lists the display definitions of the discrete LED on the FC front panel.

Table 4-7   Fabric Card LED Display Definitions

Indicator (Label)	Color	Description
Power Fail (FAIL)	Green	FC powered on and FPGA is programmed. **Note** Fabric Data Link failure is not detected so LED remains green. Monitor CLI messages for status.
	Red	Fault or malfunction in FC power up or FPGA programming. **Note** Once any ejector lever release button is pushed in, the FC must be physically removed and reinserted (OIR) to restart the FC. During this time before the FC is restarted, the LED is red.
	Amber	FC is powered on but fabric not active.
	Off (Default after reset)	FC is powered off through the CLI.

Troubleshooting Line Cards and Modular Port Adapters

See the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide* for information about troubleshooting line cards and modular port adapters (MPA).

Monitoring Critical, Major, and Minor Alarm Status

The alarms can warn of:

- Overtemperature condition on a component in the card cage
- Fan failure in a fan tray
- Overcurrent condition in a power supply
- Out-of-tolerance voltage on one of the cards
- Insertion count for an RSP card, RP, card, FC, or LC has reached a specified threshold. For more information on OIR insertion counts, see OIR Monitoring, page 5-3.

The alarm LEDs are controlled by the CAN microcontroller software, which sets the threshold levels for triggering the different stages of alarms.

The RSP/RP card continuously polls the system for temperature, voltage, current, and fan speed values. If a threshold value is exceeded, the RSP/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 RSP/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 Cooling Subsystem

You may need to troubleshoot the cooling subsystem if an overtemperature 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.

Caution   When troubleshooting the fan trays, never unplug all the fan trays at the same time.

- Chassis Cooling Requirements, page 4-32
- Power Module Fans, page 4-34
- Fan Tray Operation, page 4-33
- Power Module Fans, page 4-34
- Overtemperature Conditions, page 4-34
- Isolating Cooling Subsystem Problems, page 4-35

Chassis Cooling Requirements

The Cisco ASR 9000 Series supports version 1 and version 2 fan trays. Version 2 high-speed fans provide additional cooling for new generation line cards that draw more power and generate more heat. Table 4-8 lists the chassis cooling requirements for these cards.

Table 4-8   Chassis Cooling Requirements for Next Generation Line Cards

Chassis Type and Fan Tray	4x100GE	8x100GE	Mod200 (1xNPU) Low density EP	20x10GE	Mod200 (1xNPU), 2x100GE EP
Cisco ASR 9922, V2 fan tray	-5 to 50°C 0 to 1800 m	-5 to 50 °C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m
Cisco ASR 9912, V1 fan tray	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m
Cisco ASR 9910, V2 fan tray, low power optics (less than 1.5W)	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m
Cisco ASR 9910, V2 fan tray, high power optics (greater than 1.5W)	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 45°C (SFP+) 0 to 1800 m	-5 to 50°C 0 to 1800 m
Cisco ASR 9006 with baffle, V2 fan tray	-5 to 40°C 0 to 3000 m	-5 to 40°C 0 to 3000 m	-5 to 50°C 0 to 1800 m	-5 to 45°C (SFP+) 0 to 1800 m	-5 to 50°C 0 to 1800 m
Cisco ASR 9904 with baffle, V1 fan tray	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m	-5 to 50°C 0 to 1800 m

Fan Tray Operation

The fan trays maintain acceptable operating temperatures for the internal components by drawing cooling air through a replaceable air filter into the switch fabric and alarm card cage and then through the line card and RSP card cage.

- See Figure 1-12 for the Cisco ASR 9010 Router cooling path, Figure 1-13 for the Cisco ASR 9006 Router cooling path, and Figure 1-14 for the Cisco ASR 9904 Router cooling path.

- In the Cisco ASR 9922 Router, the fan trays draw cooling air from the front of the chassis into the middle card cage and then through each of the two line card cages top and bottom (Figure 1-15). The fan tray receives power from the chassis backplane through a wiring harness.

- In the Cisco ASR 9912 Router, the rear-insertion fan trays draw cooling air from the front of the chassis into the card cage and then up through the chassis to exit out the rear (Figure 1-16).

The fan tray contains 12 fans (Cisco ASR 9010 Router, Cisco ASR 9904 Router, Cisco ASR 9922 Router, and Cisco ASR 9912 Router) or six fans (Cisco ASR 9006 Router), 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.

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.

> **Note**   Due to air leakage, the chassis should not be operated with any of the fan trays completely missing. Replace any missing fan tray within five minutes. Any fan tray replacement should be performed when the chassis is back to room temperature.

Power Module Fans

Each AC or DC power module is equipped with two fans that draw cooling air in through the front of the power module and force warm air out the back of the power tray:

- If the power source is within the required range, the power supply fan remains on.
- If a fan fails:
    - Power module detects an internal overtemperature condition.
    - Fault and Temp indicators light.
    - Power module sends an overtemperature warning to the system and then shuts down the system.

For additional power supply troubleshooting information, see Troubleshooting the Power Subsystem, page 4-7.

> **Note**   For the RSP/RP to communicate properly to a power module in a power tray, input power to at least one of the three power modules in the power tray should be present.

Overtemperature Conditions

The following console error message indicates that the system has detected an overtemperature 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 trays
- Temperature measurements received by two sensors on each card (one for inlet air temperature and one for the card's hot-spot temperature) as well as temperature measurements from sensors located in each power module

If an environmental shutdown results from an overtemperature or out-of-tolerance condition, the Fault indicator on the power supply lights before the system shuts down.

Although an overtemperature 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

Follow these steps to isolate a problem with the chassis cooling system if you have an overtemperature condition:

Step 1   Make sure the fan trays are operating properly when you power on the system. To determine if a fan tray is operating, check the LED indicator on each fan tray front panel:

- OK (green)—Fan tray is functioning properly and receiving –48 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.

- If neither indicator is on and the blower is not operating, there may be a problem with either the fan tray or the –48 VDC power supplied to the fan tray. Go to Step 2.

⚠
Caution   Never unplug all the fan trays at the same time.

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 –48 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 trays are receiving –48 VDC:

    - If a 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 overtemperature 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.

Replacing Cisco ASR 9000 Series 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.

Prerequisites and Preparation

Before you perform any of the procedures in this chapter, be sure that you:

- Review the Safety Guidelines, page 1-1.
- Read the safety and ESD-prevention guidelines described in Compliance and Safety Information, page 1-2.
- Ensure that you have all the necessary tools and equipment before beginning the procedure.

Have access to the safety and compliance document during the installation, see:

Regulatory Compliance and Safety Information for the Cisco ASR 9000 Aggregation Services Router

Field Replaceable Units

In the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router the following components are field replaceable units (FRU):

- All line cards
- RSP cards
- Power modules
- Fan trays
- Air filters
- Line card and RSP blank fillers
- Compact flash disk
- Gigabit Ethernet small form-factor pluggable (SFP) transceiver modules
- 10-Gigabit Ethernet small form-factor pluggable (SFP+) transceiver modules
- 10-Gigabit Ethernet small form-factor pluggable (XFP) transceiver modules
- Optional card cage doors (Cisco ASR 9010 Router only)

Note The backplane is not field-replaceable.

In the Cisco ASR 9922 Router and Cisco ASR 9912 Router, the following components are FRUs:

- All line cards
- RP cards
- Fabric cards
- Power modules
- Fan trays and covers
- Air filters and foam media
- Blank line card fillers
- Gigabit Ethernet small form-factor pluggable (SFP) transceiver modules
- 10-Gigabit Ethernet small form-factor pluggable (SFP+) transceiver modules
- 100-Gigabit Ethernet small form-factor pluggable (CFP) transceiver modules
- Optional card cage doors

Note The backplane and BPID cards are not FRUs but are field serviceable.

Online Insertion and Removal

Most Cisco ASR 9000 Series Routers FRUs can be removed and replaced with the power on and the system operating. This is known as online insertion and removal (OIR). Power modules, fan trays, Route Switch Processor (RSP) cards, Route Processor (RP) cards, Fabric Controller (FC) cards, Line Cards

(LCs), shared port adapter (SPA), and SPA interface processor (SIP) cards all support OIR. Unless otherwise noted, the maintenance tasks described in this chapter can be performed while the router remains powered on.

⚠

Caution   Never unplug all the fan trays at the same time.

✎

Note   Although the power trays are not a true FRU because they do not support OIR, a procedure for replacing the power trays in Cisco ASR 9000 Series Routers is included in this chapter if a replacement becomes necessary.

OIR Monitoring

The BPID board monitors OIR by counting the number of card insertions for each slot and saving that information in non-volatile memory. OIR monitoring is done for all fan trays, RSP cards, RP cards, FCs, and LCs. A card insertion is determined by the CAN Bus Controller (CBC) of the inserted card booting up and sending a CBC message which is intercepted by the BPID board. Note that a CBC reset or power cycle on a card will also be interpreted as a card insertion.

✎

Note   A card with an OIR count that exceeds 175 will generate a minor alarm against that slot. If the card OIR count exceeds 200, a major alarm is generated against that slot. Fan tray insertion counts are not checked against a threshold. See the Release Notes for Cisco ASR 9000 Series Aggregation Services Routers for Cisco IOS XR Software Release 3.9.1 for information about CLI commands for obtaining and resetting card insertion data.

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:

Step 1   Set the power switch on each power tray to the off (0) position.

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.

Replacing the Chassis Air Filter

The Cisco ASR 9000 Series Routers are equipped with user-replaceable air filters that help prevent dust from being drawn into the router. One time per month (or more often in dusty environments), examine the air filters for damage and cleanliness.

✎

Note   In the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router, the chassis air filter is not serviceable. We recommend that you replace the filter at regular maintenance intervals. The interval may vary between 3 and 12 months depending on the environment.

✎

Note   In the Cisco ASR 9922 Router and Cisco ASR 9912 Router, the three air filters (left, center, and right) contain foam media which filters the air going into the chassis. The three air filters can be removed from the chassis so that the foam media (Cisco PIDs 9922-CEN-FLTRMED= and 9922-LR-FLTRMED=) can be replaced on a regular maintenance interval. The interval may vary between 3 and 12 months depending on the environment.

⚠

Caution   Damage to the air filter can restrict the airflow, cause overheating in the router, and degrade electromagnetic interference (EMI) compliance. Be careful when cleaning and replacing the filter.

Table 5-1 describes the air filter locations for the Cisco ASR 9000 Series Routers.

Table 5-1   *Air Filter Locations for the Cisco ASR 9000 Series Routers*

Router	Air Filter Location
Cisco ASR 9010 Router	Located underneath the fan trays (Figure 5-1).
Cisco ASR 9006 Router	Located along the right side of the chassis and is accessible from the rear (Figure 5-2).
Cisco ASR 9904 Router	Single air filter located along the right side of the chassis and is accessible from the rear (Figure 5-3).
Cisco ASR 9922 Router	Three air filters located on the front of the middle card cage (Figure 5-4).
Cisco ASR 9912 Router	Three air filters on the front of the RP and FC card cage (Figure 5-6).

Follow these steps to replace an air filter:

Step 1   If the accessory grill has been installed on the front of the Cisco ASR 9010 Router, remove it from the front of the chassis by simply pulling on the grill until it comes loose. See the Installing Base Chassis Accessories on the Cisco ASR 9010 Router, page 2-61, and Figure 2-56 for information about the accessory grill.

Step 2   For the Cisco ASR 9010 Router, remove the air filter by simply sliding it out of the chassis (Figure 5-1).

Figure 5-1   *Replacing the Cisco ASR 9010 Router Chassis Air Filter*

243206
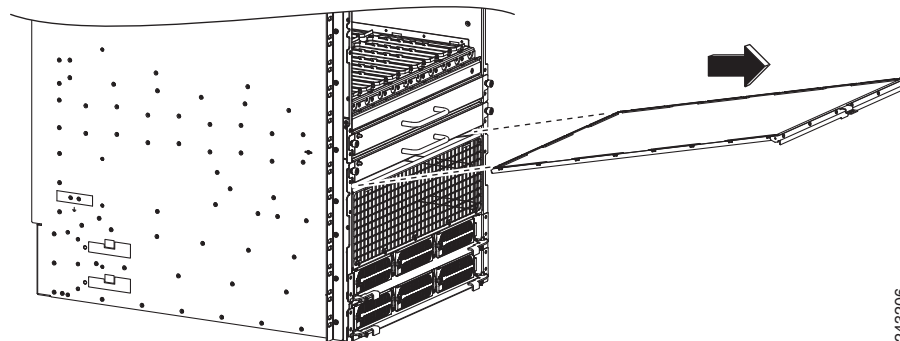
Step 3   For the Cisco ASR 9006 Router and Cisco ASR 9904 Router loosen the thumb screw that secures the filter to the chassis, and then slide the air filter out of the chassis (Figure 5-2).

Figure 5-2   Replacing the Cisco ASR 9006 Router Chassis Air Filter

1	Air filter	**2**	Thumb screw
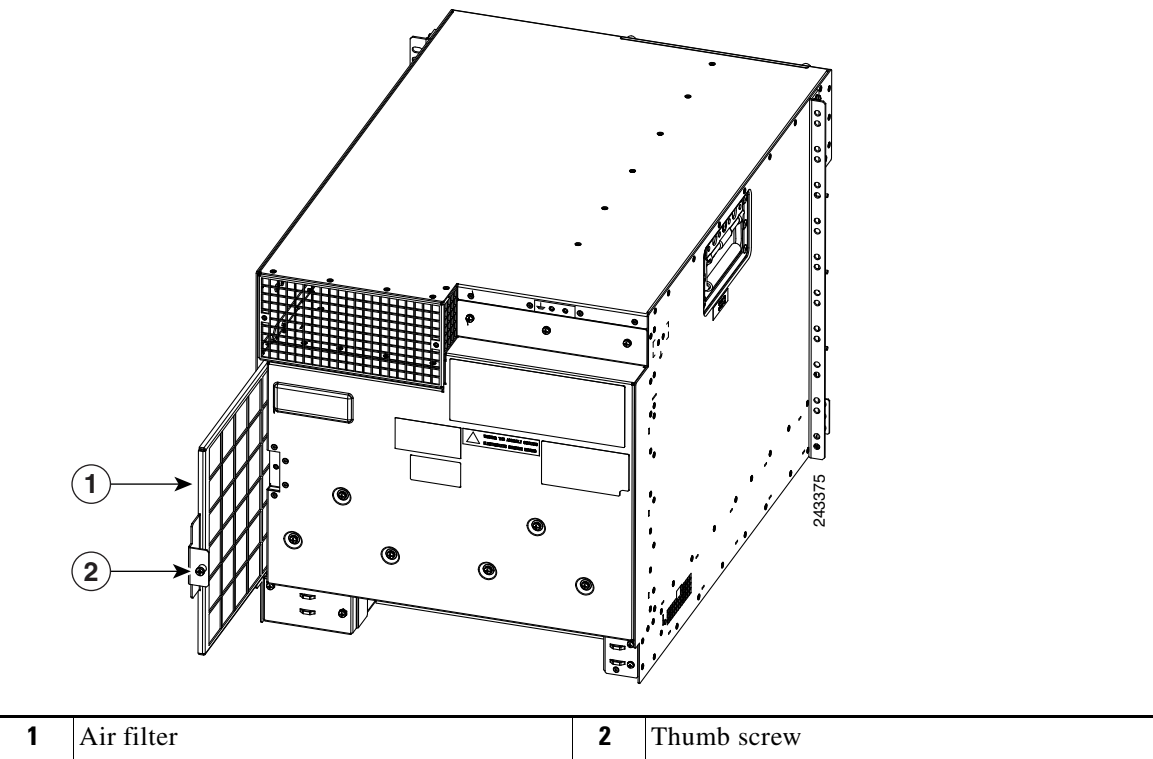
Figure 5-3   Replacing the Cisco ASR 9904 Router Chassis Air Filter

1	Air filter	**2**	Thumb screw
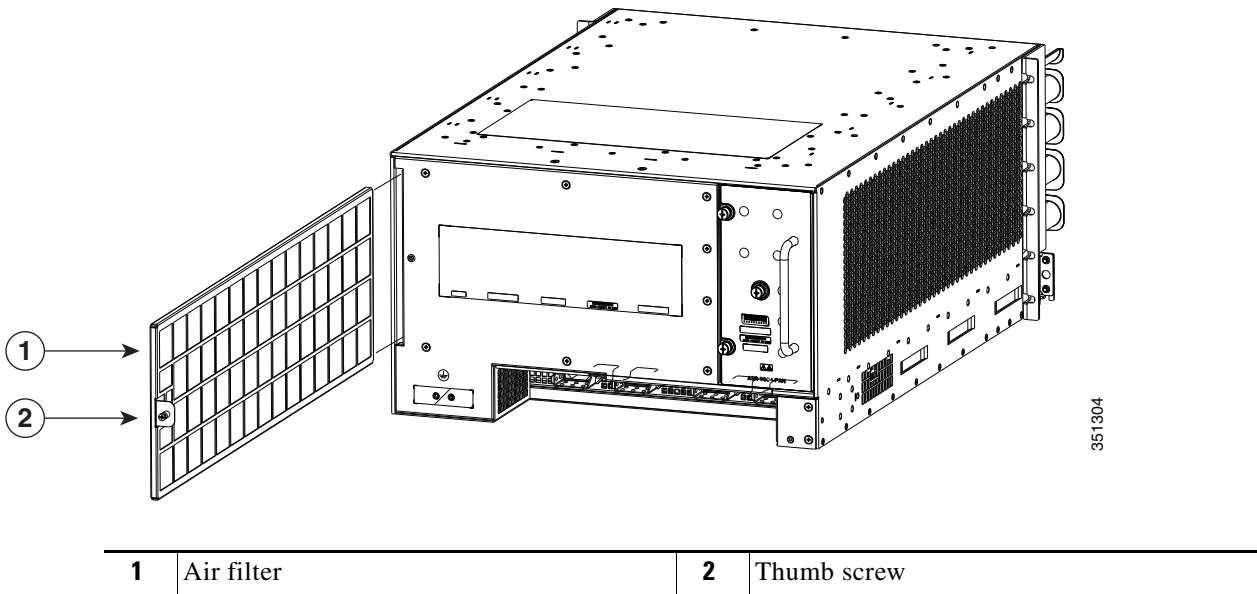
Step 4   If any fan tray covers have been installed on the front of the chassis, remove them by simply pulling on the covers until they come loose.

Step 5   For the Cisco ASR 9922 Router and Cisco ASR 9912 Router, remove the three air filters by pulling them off the front of the chassis (Figure 5-4 and Figure 5-6). Then, for each filter, loosen the thumb screws, rotate the inner frame out, and replace the foam media (Figure 5-7 and Figure 5-8).

Note   In the Cisco ASR 9922 Router (version 2 air filter) the center air filter, shown in Figure 5-5, does not does not contain replaceable foam media. The left and right air filters are the same as version 1 and contain replaceable foam media.

Figure 5-4   Cisco ASR 9922 Router Chassis Air Filters
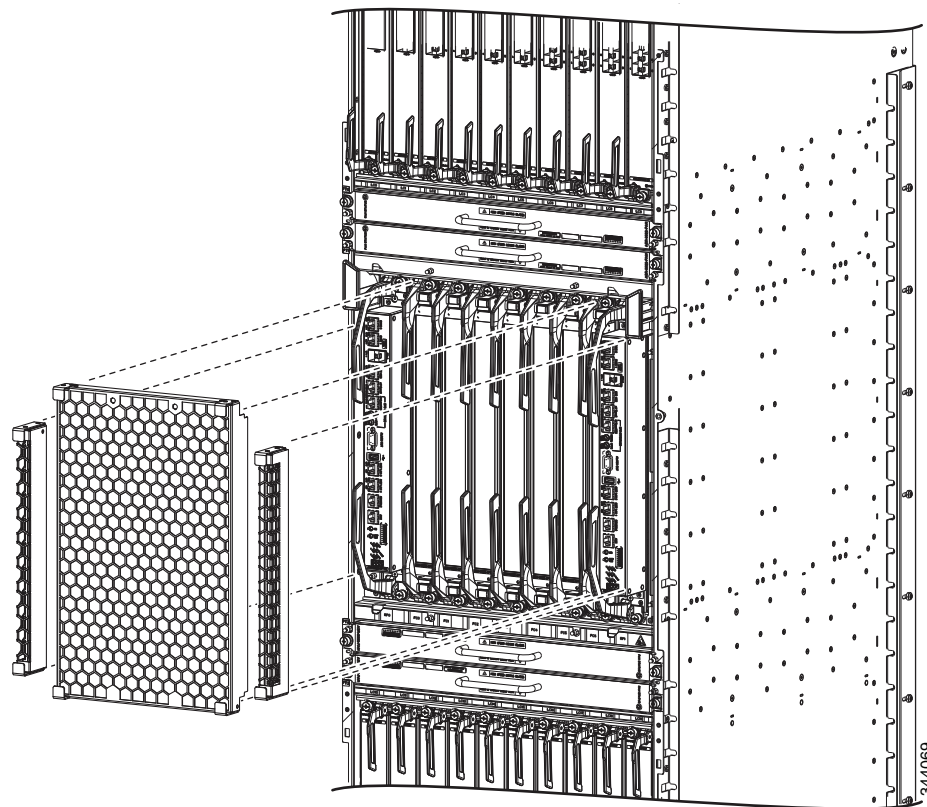
Figure 5-5   *Cisco ASR 9922 Router Chassis Center Air Filter—Version 2*

362043
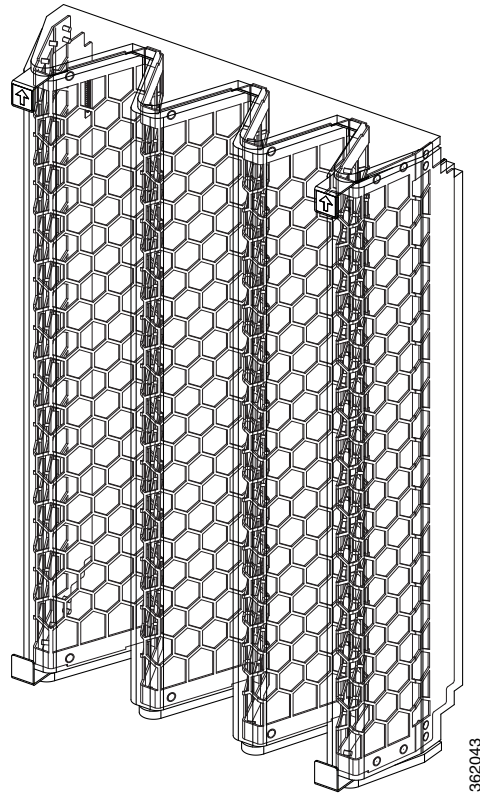
Figure 5-6   Cisco ASR 9912 Router Chassis Air Filter
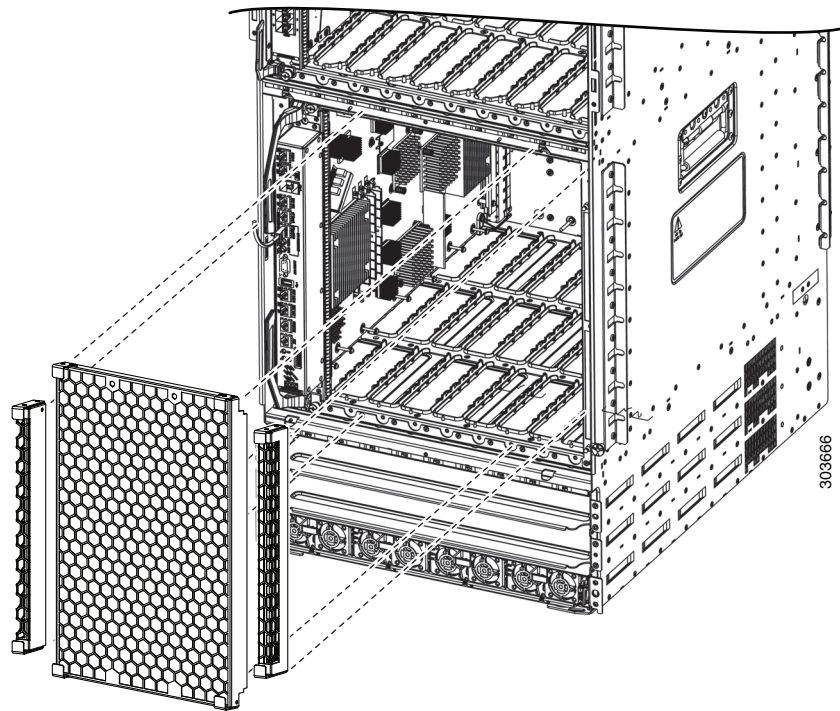
Figure 5-7   Removing the Cisco ASR 9922 Router Chassis Center Air Filter—Version 1
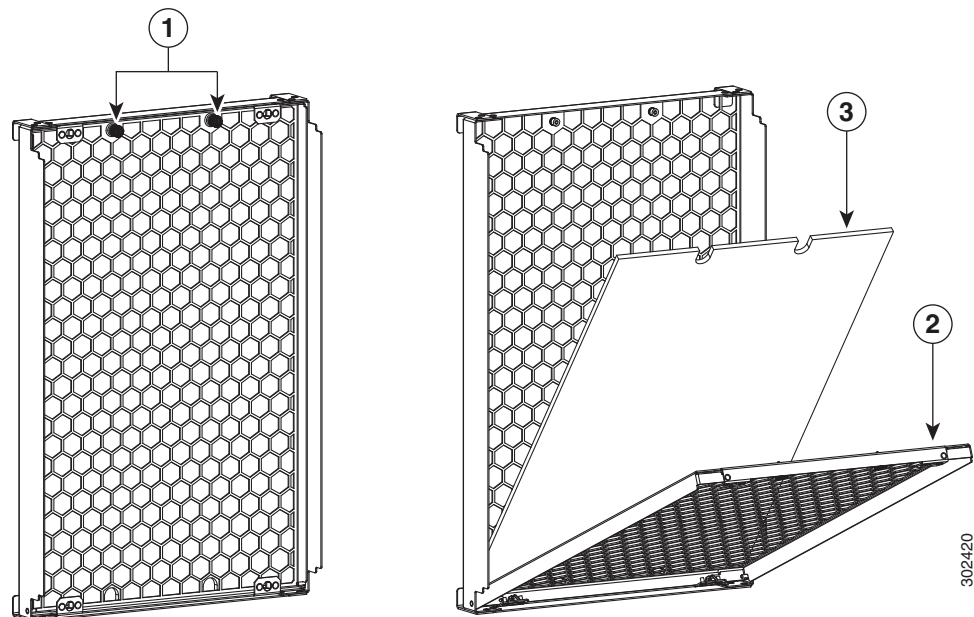
1	Loosen thumb screws	**3**	Remove foam filter media
2	Rotate and lower inner frame		

Figure 5-8   Removing the Cisco ASR 9922 Router Chassis Side Air Filter — Versions 1 and 2
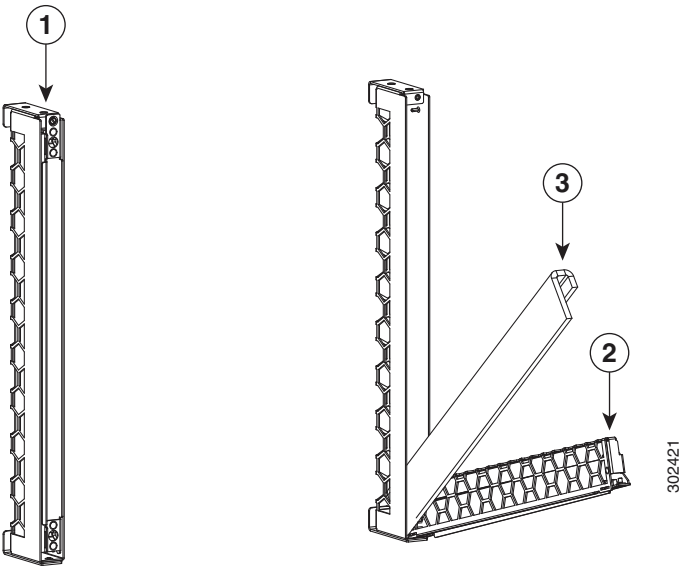
1	Loosen thumb screws	3	Remove foam filter media
2	Rotate and lower inner frame		

Step 6   Visually check the condition of the air filter and/or its foam media to determine whether to install a new replacement filter or foam media.

Step 7   Install the new air filter.

- For the Cisco ASR 9010 Router, slide the new air filter into the air filter door (honeycomb side up).

- For the Cisco ASR 9006 Router and Cisco ASR 9904 Router, tighten the thumb screw to secure the filter to the chassis.

- For the Cisco ASR 9922 Router (version 1 air filter) and Cisco ASR 9912 Router, tighten the thumb screws that attach the inner frame to the air filter and re-attach the three air filters to the front of the chassis. For the Cisco ASR 9922 Router (version 2 air filter) tighten the thumb screws that attach the inner frame to the left and right air filters only. Attach the new center air filter, with arrows pointing upwards, and re-attach both side filters to the front of the chassis.

Note   For the version 2 air filter on the Cisco ASR 9922 Router, the center does not have thumb screws because it does not have replaceable foam media.

Caution   Align and seat the door carefully to avoid damaging the EMI-preventive gaskets on the door. The air filter door must be closed and secured at all times to maintain correct EMI performance.

Removing and Replacing the Fan Trays

Prerequisites

For the Cisco ASR 9010 Router, remove the accessory grill before removing and replacing the fan trays. For the Cisco ASR 9922 Router and Cisco ASR 9912 Router, remove the fan tray cover before removing the fan trays for replacement.

Required Tools and Equipment

- 6-inch long number 2 Phillips screwdriver (torque 10 in-lb)

Steps

Follow these steps to remove and replace the fan trays:

⚠️
Caution Never unplug all the fan trays at the same time.

⚠️
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.

✎
Note Due to air leakage, the chassis should not be operated with any of the fan trays completely missing. Replace any missing fan tray within five minutes. Any fan tray replacement should be performed when the chassis is back to room temperature.

✎
Note If the accessory grill has been installed on the front of the Cisco ASR 9010 Router, you must remove it before you can remove the lower fan tray. You can remove the accessory grill by simply pulling on the grill until it comes loose. See Installing Base Chassis Accessories on the Cisco ASR 9010 Router, page 2-61, and Figure 2-56 for information about the accessory grill.

✎
Note If the fan tray cover has been installed on the front of the Cisco ASR 9922 Router or Cisco ASR 9912 Router, you must remove it before you can remove the fan tray. Remove the fan tray cover by simply pulling on the cover until it comes loose.

To remove a fan tray from the chassis (see Figure 2-14, Figure 2-15, Figure 2-16, or Figure 2-17):

Step 1 Use the 6-inch long number 2 Phillips screwdriver to a torque of 10 +/–1 in-lb to 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.

Step 3 Slide out the fan tray completely from the chassis while supporting it with your other hand.

Caution   Use two hands when handling the fan tray. Each Cisco ASR 9010 Router version 1 fan tray weighs about 16 pounds (7.27 kg). Each Cisco ASR 9922 Router fan tray or Cisco ASR 9010 Router version 2 fan tray weighs about 18 pounds (8.18 kg).

To install a fan tray into the chassis:

Step 1   Lift the fan tray (with two hands) and slide it halfway into the module bay.

Step 2   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 3   Tighten the captive screw(s) on the fan tray using the 6-inch long number 2 Phillips screwdriver to a torque of 10 +/–1 in-lb to secure it to the chassis.

Step 4   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, page 4-32.

Removing and Replacing Power System Components

The Cisco ASR 9000 Series Routers support OIR of 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 (more than one for a fully configured system). When you remove a failed power module with the router in operation, perform the replacement as quickly as possible. Make sure you have the replacement power module ready before beginning the removal and installation procedure.

Note   For the RSP/RP to communicate properly to a power module in a power tray, input power to at least one of the power modules in the power tray should be present.

This section contains procedures on how to remove and install AC and DC power modules used in the Cisco ASR 9000 Series Routers.

- Changing Between Version 1, Version 2, Version 3, AC, and DC Power Modules, page 5-13
- Removing a Version 1 AC or DC Power Module, page 5-14
- Removing a Version 2 or Version 3 AC or DC Power Module, page 5-15
- Installing a Version 1 AC or DC Power Module, page 5-16
- Installing a Version 2 or Version 3 AC or DC Power Module, page 5-16

⚠

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.

Changing Between Version 1, Version 2, Version 3, AC, and DC Power Modules

Follow these steps when changing between version 1, version 2, version 3, AC, and DC power modules:

Step 1   Before making any physical changes, check the software configuration to ensure no ROMMON variable CHASSIS_TYPE (such as CHASSIS_TYPE=10_SLOT) is set to override the chassis type.

Step 2   At the Cisco IOS-XR command prompt on the RSP console, run the **pwrmod_change** command. This command displays the current power module and system information.

```
RP/0/RSP0/CPU0:RO9_P2RSP3# run
Wed Jul  4 20:18:58.034 UTC
 # pwrmod_change
 Current system:
 power supply type : AC power supply version 2
 chassis type : 10-slot
 chassis bpid: 0x2fa, PID: ASR-9010-AC
 UDI name: ASR-9010 AC, UDI desc: ASR-9010 AC
```

Step 3   Enter your new power module type.

```
Please enter the number that corresponds to the power supply type that is being migrated
to. Do not enter the current power system information, use the future power system type.
 1)      AC power supply version 1, fits 3 across in power shelf ASR-9010-AC
 2)      DC power supply version 1, fits 3 across in power shelf ASR-9010-AC
 3)      AC power supply version 2, fits 4 across in power shelf ASR-9010-AC
 4)      DC power supply version 2, fits 4 across in power shelf ASR-9010-AC

ATTENTION: You are about to commit a change in the power system type for the chassis.
Please confirm that the OLD and NEW power system information listed here is correct. Once
the system software change is committed, you must physically remove the OLD power system
and replace it with the NEW power system of the type specified below here. Any mismatch
between the programmed system value and the actual physical installation may cause boot
and power management issues in the system.

  OLD POWER SYSTEM:
  power supply type: AC power supply version 2
  chassis type: 10-slot
  chassis bpid: 0x2fa, PID: ASR-9010-AC
  UDI name: ASR-9010 AC, UDI desc: ASR-9010 AC

  NEW POWER SYSTEM:
  power supply type: DC power supply version 2
  chassis type: 10-slot
  chassis bpid: 0x2fa, PID: ASR-9010-DC
  UDI name: ASR-9010 DC, UDI desc: ASR-9010 DC
```

Step 4   Confirm your choice.

```
Please confirm that you wish to upgrade from AC power supply version 2 power system to DC
power supply version 2 power system by typing "yes" at the prompt below. Any other
response will cancel the power system change operation [yes/cancel]?
    yes
```

Step 5   After the success message appears, power down the chassis.

```
start update CBC eeprom, offset = 0x0,length=1000

............................................................
done update CBC eeprom
start update I2C eeprom
............................................................
done update I2C eeprom

The power system programming change is complete. The system must now be completely powered
down, and the NEW power system hardware installed. When the system is rebooted the
software will recognize the new power system. Please power down the system at this point.
#
```

Step 6   Remove the old power module (see Removing a Version 1 AC or DC Power Module, page 5-14 or
Removing a Version 2 or Version 3 AC or DC Power Module, page 5-15).

⚠ **Caution**   Use two hands to remove the power module. The power supply weighs about 6.5 pounds (2.95 kg).

Step 7   Install the new power module (see Installing a Version 1 AC or DC Power Module, page 5-16 or
Installing a Version 2 or Version 3 AC or DC Power Module, page 5-16).

⚠ **Caution**   To prevent damage to the power tray backplane connector, do not use excessive force when inserting the
power module into the power tray.

Step 8   Power up the chassis.

Step 9   Verify that the (green) Power Input indicator on the front of the power module goes on. If the indicator
does not light, see Troubleshooting the Power Subsystem, page 4-7.

Removing a Version 1 AC or DC Power Module

Follow these steps to remove a version 1 AC or DC power module from the power tray (Figure 5-9).

Step 1   Push the door latch to the left to release the door.

Step 2   Pivot the door to the right to eject the power module from its bay.

Step 3   Slide the power module out of its bay while supporting it with your other hand.

⚠ **Caution**   Use two hands to remove the power module. The power supply weighs about 6.5 pounds (2.95 kg).

Figure 5-9   Removing or Installing a Version 1 AC or DC Power Module
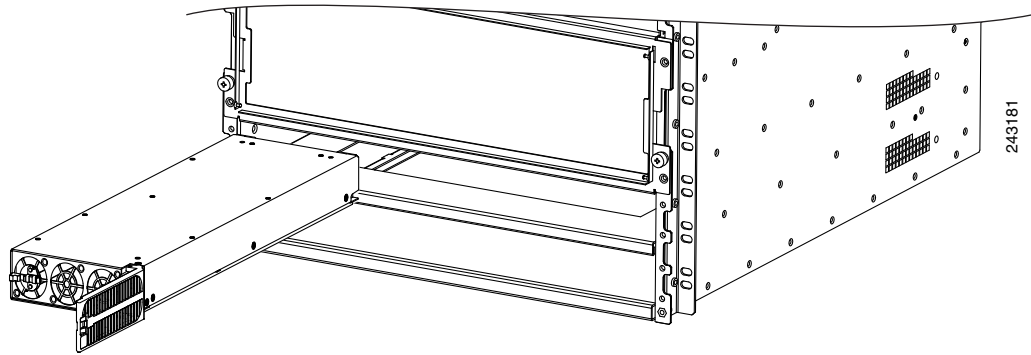
Removing a Version 2 or Version 3 AC or DC Power Module

Follow these steps to remove a version 2 or version 3 AC or DC power module from the chassis (see Figure 5-10). The Cisco ASR 9904 Router chassis only has one power tray as shown in Figure 5-11.

Note   Unscrew the screw that secures the power module using a 7/16 hex socket and torque wrench with the torque set to 50 in-lb.

Step 4   Pull the handle down.

Step 5   Slide the power module out of its bay while supporting it with your other hand.

Figure 5-10   Removing or Installing a Version 2 or Version 3 AC or DC Power Module
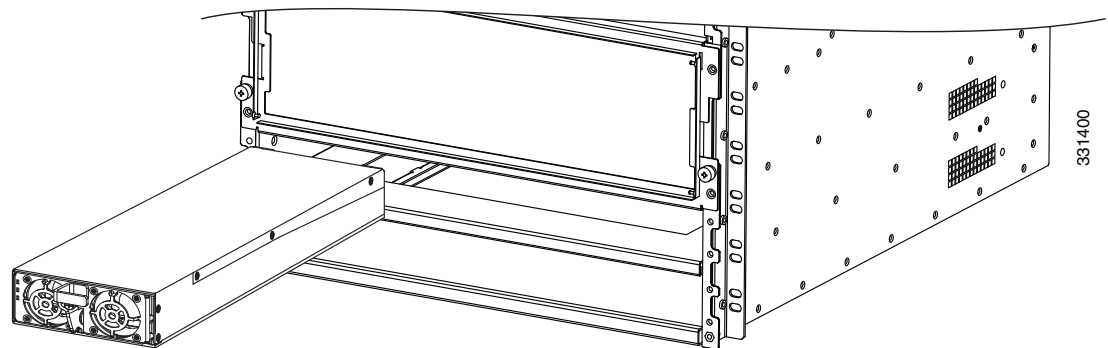
Figure 5-11   *Removing or Installing a Version 2 AC or DC Power Module from the Cisco ASR 9904 Router*
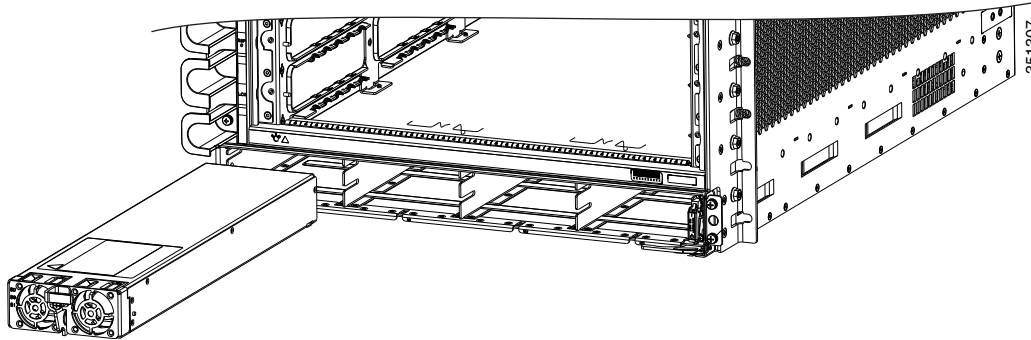
Installing a Version 1 AC or DC Power Module

Follow these steps to install a new version 1 AC or DC power module (Figure 5-9):

Step 1   Slide the power module into the bay until it mates with its backplane connector.

Step 2   Pivot the door to the left until the door latch locks.

⚠
Caution   To prevent damage to the power tray backplane connector, do not use excessive force when inserting the power module into the power tray.

Step 3   Verify that the (green) Power Input indicator on the front of the power module goes on. If the indicator does not light, see Troubleshooting the Power Subsystem, page 4-7.

Installing a Version 2 or Version 3 AC or DC Power Module

Follow these steps to install a new version 2 or version 3 AC or DC power module (Figure 5-10):

Step 1   Slide the power module into the bay until it mates with its backplane connector.

Step 2   Move the handle up.

Step 3   Tighten the screw that secures the power module using a 7/16 hex socket and torque wrench with the torque set to 50 in-lb.

⚠
Caution   To prevent damage to the power tray backplane connector, do not use excessive force when inserting the power module into the power tray.

Step 4   Verify that the (green) Power Input indicator on the front of the power module goes on. If the indicator does not light, see Troubleshooting the Power Subsystem, page 4-7.

Disconnecting AC Power

Follow these steps to disconnect an individual AC power cord:

Step 1   Power OFF (0) the circuit breaker assigned to the AC power source you are disconnecting.

Step 2   Loosen the retainer bracket holding the AC power cord to the power tray receptacle.

Step 3   Unplug the AC power cord from the power tray receptacle.

⚠

Caution   Do not turn off the switch on the power tray to remove AC power cords. An individual AC power cord can be unplugged while the system is powered from other AC power sources.

If it becomes necessary to disconnect *all* AC power from the router, follow these steps:

⚠

Caution   Do not disconnect all power from the router to replace components, including power modules. See Removing and Replacing Power System Components, page 5-12.

Step 1   Set the power switch at the rear of the Version 1 AC power tray to the OFF (0) position. For Version 2 and Version 3 AC power trays, set the power switch at the front of the to the OFF (0) position.

Step 2   Power OFF (0) the circuit breakers assigned to the AC power sources you are disconnecting.

⚠

Caution   To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the OFF (0) position until you are ready to turn it on.

Step 3   Loosen the retainer bracket holding the AC power cords to the power tray receptacle.

Step 4   Unplug the AC power cords from the power tray receptacles.

Reconnecting AC Power

Follow these steps to reconnect an individual AC power cord to a power tray:

Step 1   Power OFF (0) the circuit breaker assigned to the AC power source you are reconnecting.

Step 2   Plug the AC power cord into the power tray receptacle.

Step 3   Close and tighten the retainer bracket holding the AC power cord to the power tray receptacle.

Step 4   Power on the AC power source circuit breaker.

⚠
Caution   Do not turn off the switch on the power tray to reconnect AC power cords. An individual AC power cord can be plugged in while the system is powered from other AC power sources.

If power has been totally disconnected from the router, follow these steps to reconnect AC power to the AC power tray:

⚠
Caution   The following procedure is only to be used when reconnecting power to all power trays in a system that has been powered down completely.

Step 1   Verify that the power switch at the rear of the Version 1 AC power tray is set to the OFF (0) position. For Version 2 and Version 3 AC power trays, verify that the power switch at the front of the power tray set to the OFF (0) position.

Step 2   Check that the circuit breaker assigned to the AC power source you are connecting is set to OFF (0).

⚠
Caution   To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the OFF (0) position until you are ready to turn it on.

Step 3   Plug the AC power cords into the power tray receptacle (Figure 3-19).

Step 4   Close the retainer bracket to secure the AC power cord plug to the power tray receptacle.

Step 5   Power on the AC power source circuit breaker.

Step 6   Set the power switch at the rear of the AC power tray to the ON (1) position.

Disconnecting DC Power

⚠️

Caution   It is not necessary to disconnect all power from the router to replace components, including power modules. See Removing and Replacing Power System Components, page 5-12.

Follow these steps to disconnect an individual DC power source from a power tray (Figure 3-21 for version 1 DC power, Figure 3-22 for version 2 DC power, or Figure 3-23 for version 3 DC power):

Step 1   Power off the circuit breaker assigned to the DC power source you are disconnecting.

⚠️

Caution   To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the STANDBY (0) position until you are ready to turn it on.

Step 2   Remove the clear plastic safety covers that fit over the DC power connection terminal studs.

⚠️

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

Step 3   Disconnect the DC power cables from their terminals in the following order and note the color of each cable (Figure 3-21 for version 1 DC power, Figure 3-22 for version 2 DC power, or Figure 3-23 for version 3 DC power):

   a.   Negative (PWR) cables first.

   b.   Positive (RTN) cables next.

   c.   Ground cable last.

Step 4   Repeat Step 1 through Step 3 for the other power tray, if installed.

If it becomes necessary to disconnect *all* DC power from the router, follow these steps (Figure 3-21 for version 1 DC power, Figure 3-22 for version 2 DC power, or Figure 3-23 for version 3 DC power):

✎

Note   This procedure describes how to disconnect DC power from all power modules in a single DC power tray. The procedure is the same for each DC power tray, if more than one is installed.

⚠️

Caution   If only one power tray is installed, performing the following procedure turns off all power to the router.

Step 1   Set the power tray switch to the STANDBY (0) position.

Step 2   Power OFF (0) the circuit breaker assigned to the DC power source you are disconnecting.

⚠️

Caution   To ensure that power remains off while you are performing this procedure, lock-out/tag-out the circuit breaker switch in the OFF (0) position until you are ready to turn it on.

Step 3   Remove the clear plastic safety covers that fit over the DC power connection terminal studs.

⚠
Caution   To prevent injury and damage to the equipment, always remove the source DC power cables and ground from the power tray terminals in the following order: (1) negative (–), (2) positive (+), (3) ground.

Step 4   Disconnect the DC power cables from their terminals in the following order and note the color of each cable (Figure 3-21 for version 1 DC power, Figure 3-22 for version 2 DC power, or Figure 3-23 for version 3 DC power):

    a. Negative (PWR) cables first.

    b. Positive (RTN) cables next.

    c. Ground cable last.

Step 5   Repeat Step 1 through Step 4 for the other power tray, if installed.

Reconnecting DC Power

⚠
Caution   Use this procedure only when reconnecting power to all power modules in a system that is powered down completely.

Follow these steps to reconnect DC power to a DC power tray:

Step 1   Set the power switch to the OFF (0) position.

Step 2   Check that the circuit breaker assigned to the DC power source you are reconnecting is powered OFF (0).

Step 3   Reconnect the DC power cables in the following order:

    a. Ground cables first.

    b. Positive (RTN) cables next.

    c. Negative (PWR) cable last.

    d. Repeat Step 1 through Step 3 for the other power tray (Cisco ASR 9010 Router only)

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

⚠
Caution   Do not overtighten the nuts that secure the DC power cables to the power tray terminals. The nuts should be tightened using the 7/16 hex socket and torque wrench to a torque of 45 to 50 in-lb.

Step 4   Replace the clear plastic safety covers over the DC power connection terminal studs and tighten the screws.

Step 5   Set the DC power source circuit breaker to ON (1).

Step 6   Set the power tray switch to ON (1).

Removing an AC or DC Power Tray from a Cisco ASR 9000 Series Router

The power trays are not a true FRU because they do not support OIR. However, if replacement is necessary, follow these steps to remove and replace the power trays in a Cisco ASR 9000 Series Router.

⚠

Caution   Power tray removal and replacement procedures are to be performed by qualified service persons only.

⚠

Caution   All power to the node must be shut off at the branch circuit disconnect device before beginning power tray replacement procedures. Removal of a tray requires disconnection of power cabling on the back of the chassis that exposes service persons to exposed wiring from the unaffected tray.

⚠

Caution   All terminal block covers should be replaced prior to energizing the power cabling to the system.

Follow these steps to remove an AC or DC power tray from the chassis:

Step 1   Disconnect AC or DC power from the power tray rear panel.

Step 2   Remove all power modules from the power tray.

Step 3   For the Cisco ASR 9010 Router, remove the front grill by pulling it away from the chassis (Figure 5-12).

Figure 5-12   Removing the Front Grill on the Cisco ASR 9010 Router
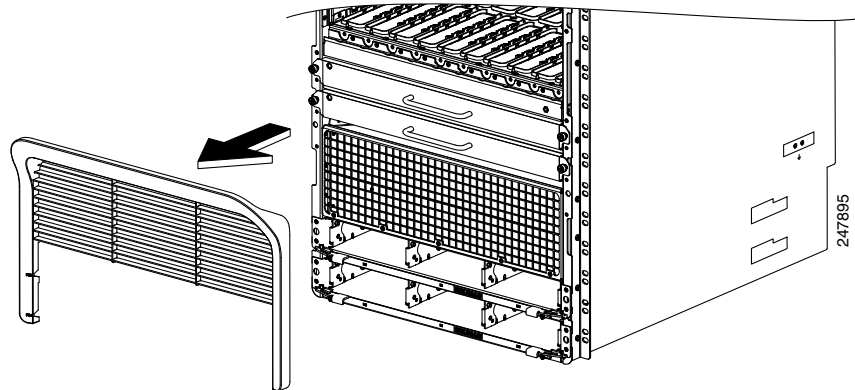
Step 4   For the Cisco ASR 9922 Router, the front power tray bezel is a standard item that comes with ball studs already installed. Simply install it by snapping it onto the chassis, or remove it by pulling it away from the chassis (Figure 5-13).

Figure 5-13   Removing the Front Power Tray Bezel on the Cisco ASR 9922 Router
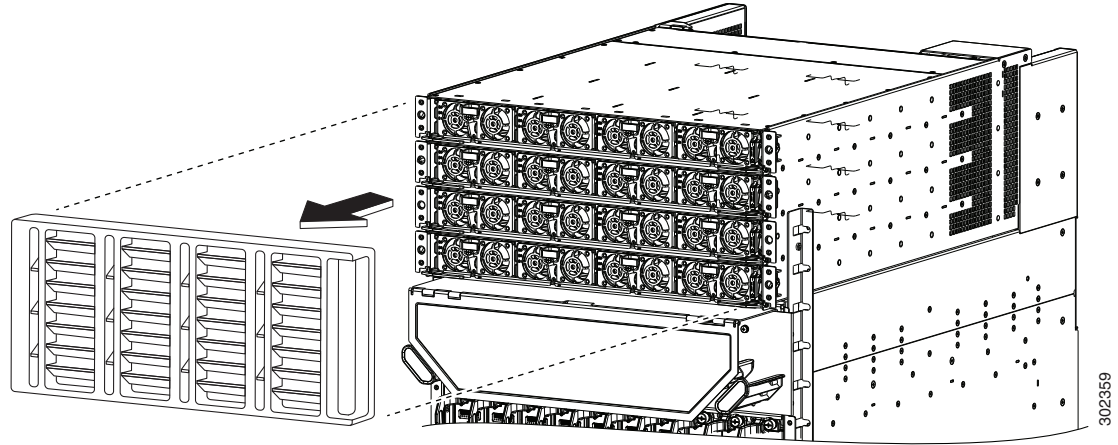
Step 5   For the Cisco ASR 9912 Router, the vented power tray bezel is a base chassis accessory that snaps onto the front of the power system. comes with ball studs already installed. Remove it by pulling it away from the chassis (Figure 2-85).

Step 6   Loosen and remove the four screws (two screws at each end) that attach the power tray to the chassis.

Step 7   Loosen the two captive screws (one per ejector lever) to release the ejector levers. Figure 5-14 shows the process for the version 1 power trays, and Figure 5-15 shows the process for the version 2 power trays. The process for version 3 power trays is similar to the process for version 2 power trays, as shown in Figure 5-15.

Figure 5-14   Removing a Power Tray—Version 1 Power Tray (Cisco ASR 9010 Router Shown)
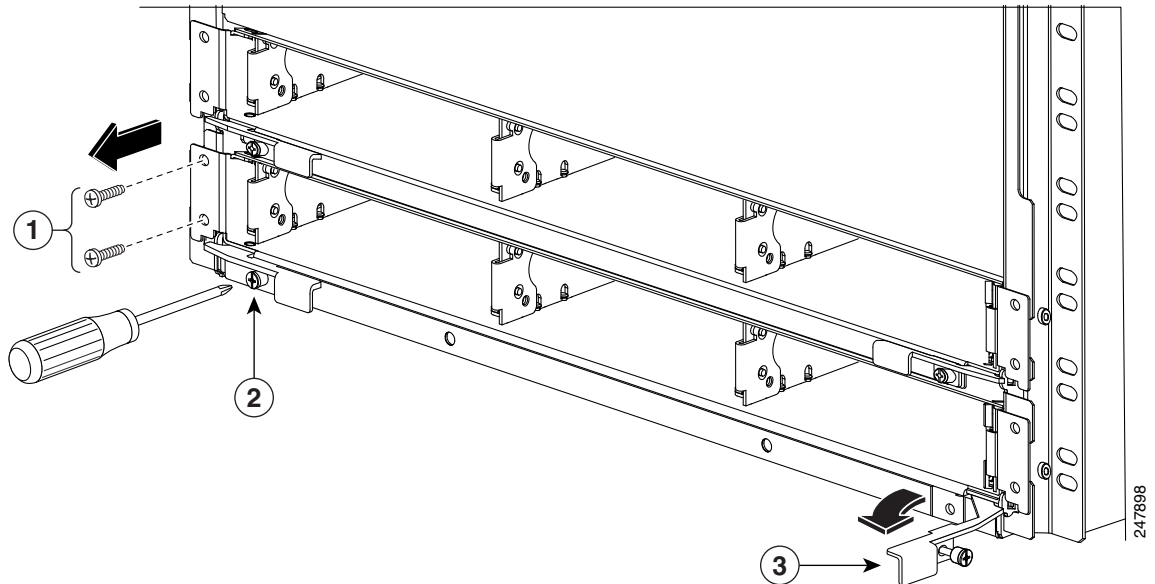
Figure 5-15   Removing a Power Tray –Version 2 Power Tray (Cisco ASR 9010 Router Shown)
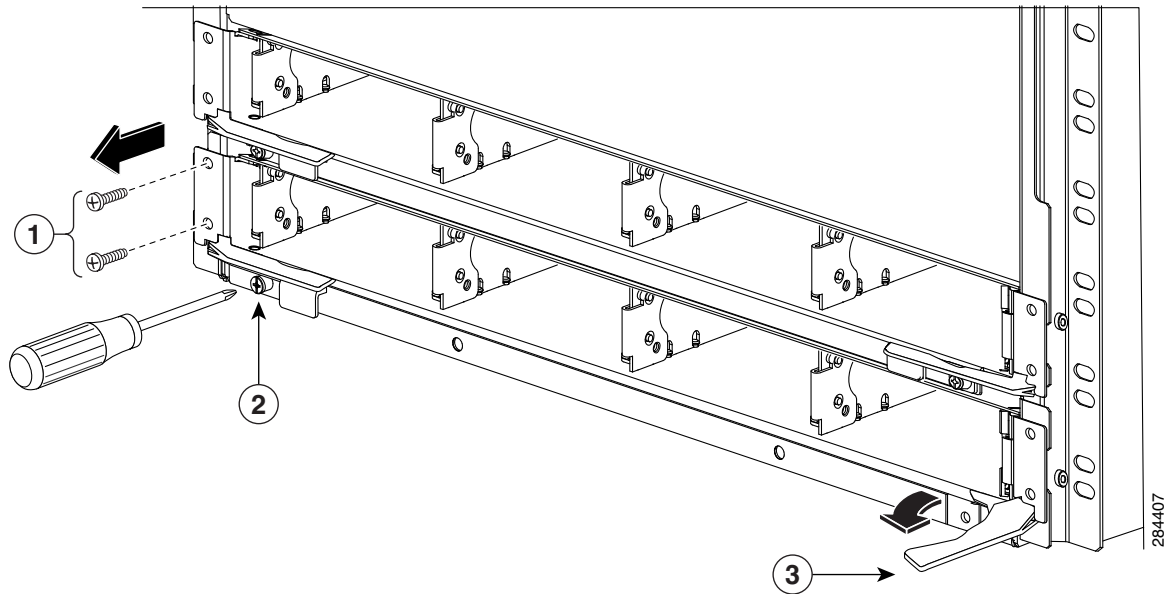
1	Remove screws on each side that secure the power tray to the chassis	2	Loosen the captive screw in each ejector lever	3	Rotate the ejector levers out to unseat the tray from its mating connector

Step 8   Rotate the ejector levers away from the tray to unseat the tray from its mating connector. Figure 5-14 shows the process for the version 1 power trays, and Figure 5-15 shows the process for the version 2 and version 3 power trays.

Step 9   Slide the power tray out of the bay of the chassis.

Installing an AC or DC Power Tray into a Cisco ASR 9000 Series Router

Follow these steps to install an AC or DC power tray into the chassis:

Step 1   Slide the power tray into the bay until it engages its mating connector on the chassis. The ejector levers will partly rotate inward as you do this.

Step 2   Fully rotate the ejector levers inward to fully seat the power tray into its mating connector and seat the power tray mounting ears against the chassis mounting ears. Figure 5-16 shows how to install the version 1 power trays and Figure 5-17 shows how to install the version 2 power trays. The installation of version 3 power trays is similar to the installation of version 2 power trays, as shown in Figure 5-17.When the power tray is fully seated, the captive screw in each ejector aligns with the screw hole in the power tray frame.

Figure 5-16   *Rotating the Ejector Levers Inward to Seat the Version 1 Power Tray*
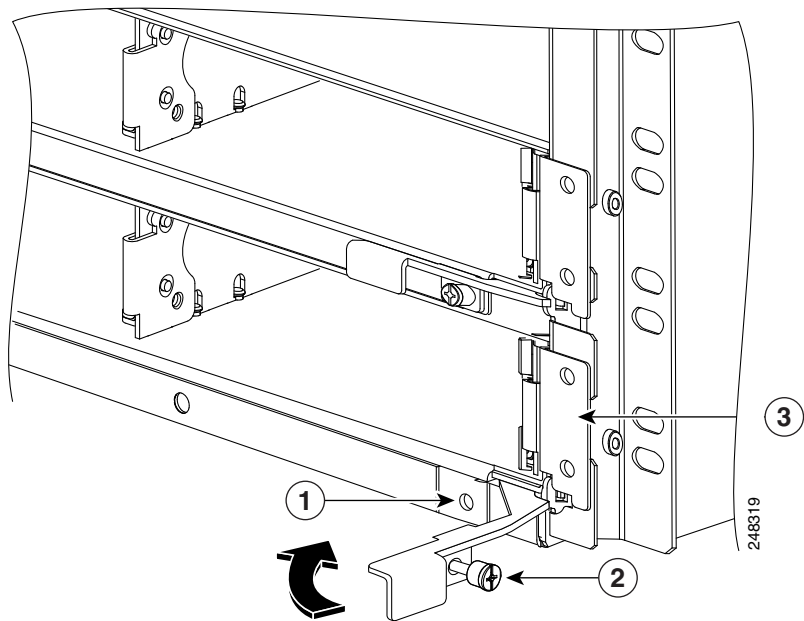
1	Screw hole in the power tray frame for ejector lever captive screw	2	Ejector lever captive screw	3	Power tray mounting ear

Figure 5-17   *Rotating the Ejector Levers Inward to Seat the Version 2 Power Tray*
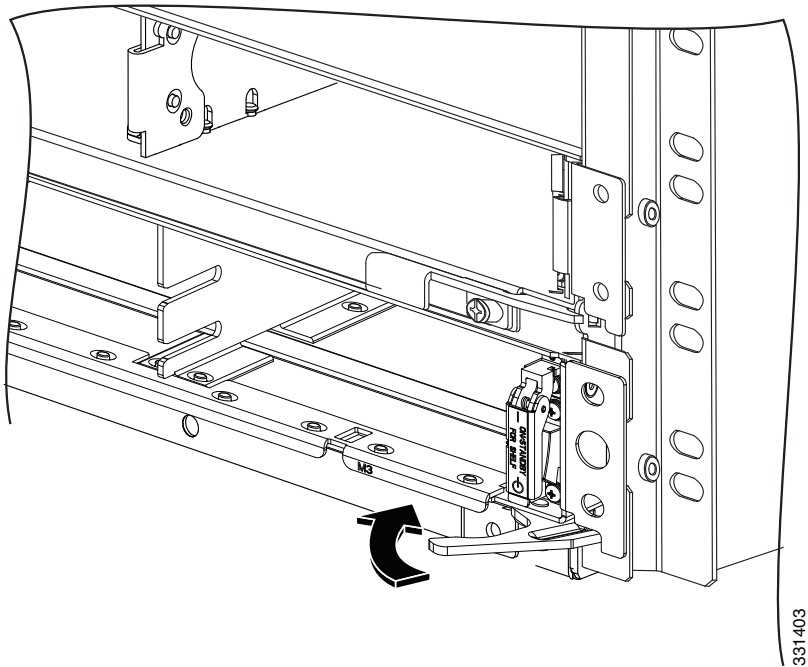
Step 3   Install the captive screw in each ejector lever into the screw hole in the power tray frame (Figure 5-16 or Figure 5-17).

Step 4   Use the 6-inch long number 2 Phillips screwdriver to tighten the two ejector screws to a torque of 10 +/-1 in-lb to secure the ejectors and to secure the tray to its mating connector.

Step 5   Install and tighten two screws through the power tray mounting ears on each side into the screw holes in the chassis mounting ears to secure the tray to the chassis.

Removing and Replacing Cards from the Chassis

This section describes the procedures for removing and installing an RSP card, RP card, FC, or LC.

See the *Cisco ASR 9000 Series Aggregation Services Router SIP and SPA Hardware Installation Guide* for information about removing and installing SIP and SPA cards.

- For a information about the router components and slot numbering for the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router, see Removing RSP Cards and Line Cards from the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router, page 2-23.

- For a information about the router components and slot numbering for the Cisco ASR 9922 Router and Cisco ASR 9912 Router, see Removing RP Cards, Fabric Cards, and Line Cards from the Cisco ASR 9922 Router and Cisco ASR 9912 Router, page 2-31.

⚠
Caution   Handle all cards by the metal card carrier edges only; avoid touching the board or any connector pins. After removing a card, carefully place it in an antistatic bag or similar environment to protect it from ESD and dust in the optic ports (fiber-optic line cards).

⚠
Caution   Be careful to avoid damaging the EMI gasket that runs along the full height of the card front panel edges. Damage to the EMI gasket can affect the ability of your system to meet EMI requirements.

⚠
Caution   To avoid damaging card mechanical components, never carry an RSP card, RP card, FC, or LC by the captive installation screws or ejector levers. Doing so can damage these components and cause card insertion problems.

✎
Note   The BPID board monitors OIR by counting the number of card insertions for each slot and saving that information in non-volatile memory. OIR monitoring is done for all line cards, the RSP, the RP, and the fan trays. See OIR Monitoring, page 5-3 for more information.

Removing Cards from the Chassis

Follow these steps to remove and replace an RSP card, RP card, FC, or LC from the card cage:

Step 1   Disconnect any cables from the card.

   a. Identify the type of line card and its slot number. Write this information down before you disconnect the cables. You'll need this information when you reinstall the line cards.

   b. Identify the line card cable and its port connection. Label the cable with this information.

   c. Starting with the port of the line card farthest from the cable management bracket, disconnect the interface cable connectors from each of the line card ports.

   d. Carefully remove the cables from the cable-management bracket attached to the front panel of the line card.

   e. (Optional) Use the 6-inch long number 2 Phillips screwdriver to a torque of 10 +/–1 in-lb to loosen the captive screw that secures the cable-management bracket to the line card and remove the cable-management bracket from the line card.

   f. Carefully remove the cables from the horizontal cable management tray at the top of the chassis or side cable management brackets (Cisco ASR 9006 Router) and carefully place the cable bundle out of the way.

Step 2   Remove the card (Figure 2-24, Figure 2-25, Figure 2-35, or Figure 2-36):

   a. Use the 6-inch long number 2 Phillips screwdriver to loosen the captive screws at each end of the card front panel.

   b. On the FC and LC push in both ejector lever release buttons.

   c. Pivot the ejector levers to unseat the card from the backplane connector.

   d. Slide the card out of the slot and place it directly into an antistatic bag or other ESD-preventive container.

Step 3   Repeat Step 1 and Step 2 for each card.

Replacing Cards in the Chassis

Follow these steps to replace a previously removed RSP card, RP card, FC, or LC from the card cage:

Step 1   Install the card (Figure 2-24, Figure 2-25, Figure 2-35, or Figure 2-36):

   a. Slide the card into the slot, being sure to install the card in the same slot you recorded when you removed the card.

   b. Use the 6-inch long number 2 Phillips screwdriver to a torque of 10 +/–1 in-lb to tighten the captive screws at each end of the card front panel.

   c. Pivot the ejector levers to seat the card into the backplane connector.

Step 2   Reconnect cables to the card:

   a. If you previously disconnected the card cable management bracket, reattach it to the card and use the 6-inch long number 2 Phillips screwdriver to a torque of 10 +/–1 in-lb to tighten the captive screw on the bracket to secure it to the card front panel.

b. Carefully reroute the cables through the horizontal cable management tray at the top of the chassis (the Cisco ASR 9922 Router has an additional tray at the bottom of the chassis) or side cable management brackets (Cisco ASR 9006 Router and Cisco ASR 9904 Router).

c. Carefully reroute cables through the card cable-management bracket.

d. Starting with the port of the card closest to the cable management bracket, reconnect the interface cable connectors to each of the card ports using the cable and port connection information you recorded when removing the cables.

Step 3 Repeat Step 1 and Step 2 for each card.

Removing a Chassis from the Equipment Rack

Follow these steps 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 300 pounds (136 kg).

Step 1 Power off the router (see Powering Off the Router, page 5-4).

Step 2 Power off the circuit breakers to the power supplies.

Step 3 Disconnect the power from the power modules on the rear of the chassis:

- For AC power modules, see Disconnecting AC Power, page 5-17.
- For DC power modules, see Disconnecting DC Power, page 5-19.

Step 4 Disconnect the supplemental bonding and grounding connection from the chassis (see Supplemental Bonding and Grounding Connections, page 2-56).

Step 5 Remove the fan tray (see Removing and Replacing the Fan Trays, page 5-11).

Step 6 Disconnect RSP/RP cables connected to the console port, auxiliary port, or either of the management Ethernet ports. Be sure to label each of the RSP/RP cables before you disconnect the cables.

Step 7 Disconnect any cables connected to the external alarm port on the alarm display.

Label each of the alarm display cables before you disconnect the cables.

Step 8 Disconnect the line card interface cables.

Step 9 Remove the RSP cards, RP cards, FCs, and LCs from the chassis (see Removing and Replacing Cards from the Chassis, page 5-25).

Step 10 Remove the chassis air filter (see Replacing the Chassis Air Filter, page 5-4).

Step 11 Remove the chassis from the rack.

a. Using the side handles to support the weight of the chassis, 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.

c. Use the rear handle on the Cisco ASR 9922 Router to push the chassis out of the rack and onto an adjacent pallet jack for transport.

Installing a Replacement Chassis in the Equipment Rack

Follow these steps to install the replacement chassis and components in the equipment rack:

Step 1 Install the new chassis in the rack (see Rack-Mounting the Router Chassis, page 2-42).

Step 2 Install the power modules (see Removing and Replacing Power System Components, page 5-12).

Step 3 Install the fan tray (see Removing and Replacing the Fan Trays, page 5-11).

Step 4 Install the RSP cards, RP cards, FCs, and LCs. (see Removing and Replacing Cards from the Chassis, page 5-25).

Step 5 Install the chassis air filter (see Replacing the Chassis Air Filter, page 5-4).

Step 6 Connect all line card and interface cables (see Connecting Line Card Network Interface Cables, page 3-17).

Step 7 Connect the supplemental bonding and grounding connection (if there is one) to the chassis (see Supplemental Bonding and Grounding Connections, page 2-56).

Step 8 Connect power to the power trays on the rear of the chassis.

- For AC power modules, see Reconnecting AC Power, page 5-17.
- For DC power modules, see Reconnecting DC Power, page 5-20.

Step 9 To turn on power to the router, see Powering On the Router, page 3-32.

Packing a Chassis for Shipment

Use the packaging that came with the replacement chassis to repack and ship the chassis being replaced.

Before shipping the chassis being replaced, pack the chassis back into the shipping rack (see Unpacking the Router, page 2-3).

Technical Specifications

This appendix lists specifications for the Cisco ASR 9000 Series Aggregation Services Routers.

- Cisco ASR 9000 Series Routers Physical Descriptions
- Cisco ASR 9000 Series Routers Environmental Specifications
- Cisco ASR 9000 Series Routers AC Electrical Specifications
- Cisco ASR 9000 Series Routers DC Electrical Specifications
- AC Input and DC Input Voltage Range
- Power System DC Output Levels
- RSP/RP Port Specifications
- RSP Cards, RP Cards, and Fabric Card Power Consumption Specifications
- Fan Tray Power Consumption Specifications

Cisco ASR 9000 Series Routers Physical Descriptions

Table A-1   *Cisco ASR 9000 Series Routers Physical Descriptions*

Router	Chassis Height	Chassis Width	Chassis Depth	Chassis Weight
Cisco ASR 9010 Router	36.75 inches (93.35 cm)	17.50 inches (44.45 cm) 19.0 inches (48.3 cm) including chassis rack-mount flanges and front door width	28.65 inches (72.72 cm) including cable management system and front cover	Chassis only[1] Chassis: fully configured using all card slots and six power modules 149.5 pounds (67.81 kg) 375 pounds (170.5 kg)
Cisco ASR 9006 Router	17.50 inches (44.45 cm)	17.50 inches (44.45 cm) 19.0 inches (48.3 cm) including chassis rack-mount flanges and front door width	28.65 inches (72.72 cm) including cable management system and front cover	Chassis only[1] Chassis: fully configured using all card slots and six power modules 87.5 pounds (39.69 kg) 230 pounds (104.33 kg)
Cisco ASR 9904 Router	10.38 inches (26.36 cm)	17.75 inches (45.08 cm) 19.0 inches (48.3 cm) including chassis rack-mount flanges	28.26 inches (71.78 cm) including cable management system	Chassis only[1] Chassis: fully configured using all card slots and four power modules 43.3 pounds (19.64 kg) 122.8 pounds (55.70 kg)
Cisco ASR 9922 Router	77.00 inches (195.58 cm)	17.60 inches (44.70 cm) 19.0 inches (48.3 cm) including chassis rack-mount flanges and front door width	26.3 inches (66.82 cm) 30.00 inches (76.20 cm) including cable management system 30.62 inches (77.77 cm) with front doors	Chassis only[1] Chassis: fully configured using all card slots and four power modules 300 pounds (136 kg) 1038 pounds (470.28 kg)
Cisco ASR 9912 Router	52.5 inches (133.4 cm)	17.6 inches (44.7 cm) 19.0 inches (48.3 cm) including chassis rack-mount flanges and front doors	25.7 inches (65.2 cm) 29.4 inches (74.7 cm) including cable management system 30.1 inches (76.4 cm) including cable management system and front doors	Chassis only[1] Chassis: fully configured using all card slots and three power trays 181 pounds (82.10 kg) 643 pounds (291.66 kg)

1. Chassis only does not include cards, power modules, fan trays, filter or chassis accessories.

Cisco ASR 9000 Series Routers Environmental Specifications

Table A-2   Cisco ASR 9000 Series Routers Environmental Specifications

Description	Value
Operating Temperature:[1]	41 to 104°F (5 to 40°C)
Operating Temperature[1,2] (Short term)[3,4]	23 to 131° F (-5° to 55°C) for Cisco ASR 9904 Router 23 to 131° F (–5° to 55°C) for Cisco ASR 9006 Router 23 to 122° F (–5° to 50°C) for Cisco ASR 9010 Router Cisco ASR 9922 Router, and Cisco ASR 9912 Router
Non-operating Temperature	-40 to 158ºF (-40 to 70ºC)
Humidity	Operating: 10 to 85 percent noncondensing Non-operating: 5 to 95 percent noncondensing
Altitude[5]	Operating: 0 to 13,000 ft. (0 to 4,000 m) Non-operating: 0 to 15,000 ft (0 to 4,570 m) 16-port 10-Gigabit Ethernet line card: 0 to 5,904 ft (0 to 1,800 m)
Power Dissipation	All Cisco ASR 9000 Series Routers Use the Cisco Power Calculator (Cisco.com account required) at http://tools.cisco.com/cpc/launch.jsp to estimate the maximum power distribution.
Acoustic noise	78 dB at 80.6°F (27°C) maximum
Shock	Operating (halfsine): 21 in/sec (0.53 m/sec.) Non-operating (trapezoidal pulse): 20 G[6], 52 in/sec (1.32 m/sec)
Vibration	Operating: 0.35 Grms[7] from 3 to 500 Hz Non-operating: 1.0 Grms from 3 to 500 Hz

1. Operating temperature specifications for the router will differ from those listed in this table when 40-port Gigabit Ethernet line cards using GLC-GE-100FX SFP transceiver modules are installed in the router. This is due to the lower temperature specifications of the SFP module. Please contact a Cisco representative for more information.

2. Short term operating temperature specifications for the router will differ from those listed in this table when the 16-port 10-Gigabit Ethernet line card is installed in the router because of the lower temperature specifications of the SFP+ modules and that are used in this line card. When using this line card, the maximum operating temperature is 104°F (40°C).

3. Short-term refers to a period of not more than 96 consecutive hours and a total of no more than 15 days in 1 year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.).

4. The 24 port 10 Gigabit Ethernet linecard requires high temperature optics to run in the extended temperature range.

5. Operating altitude specifications for the router will differ from those listed in this table when the 16-port 10-Gigabit Ethernet line card is installed in the router. When using the SFP-10G-SR module, the maximum altitude is 5905 ft. (1800 m). When using the SFP-10G-LR or SFP-10G-ER modules, the maximum altitude is sea level.

6. G is a value of acceleration, where 1 G equals 32.17 ft./sec^2 (9.81 m/sec^2).

7. Grms is the root mean square value of acceleration.

Cisco ASR 9000 Series Routers AC Electrical Specifications

Table A-3   Cisco ASR 9000 Series Routers AC Electrical Specifications

Description	Cisco ASR 9010	Cisco ASR 9006	Cisco ASR 9904	Cisco ASR 9922	Cisco ASR 9912
Power modules per system	Version 1 power system: Up to six AC power modules per system, three per tray Version 2 power system: Up to eight AC power modules per system, four per tray Version 3 power system: Up to six AC power modules per system, three per tray	Version 1 power system: Up to three AC power modules per system Version 2 power system: Up to four AC power modules per system	Version 2 power system: Up to four AC power modules per system	Version 2 power system: Up to sixteen AC power modules per system, four per tray Version 3 power system: Up to twelve AC power modules per system, three per tray	Version 2 power system: Up to twelve AC power modules per system, four per tray Version 3 power system: Up to nine AC power modules per system, three per tray
Total AC input power per power module	Version 2 power system: 3290 VA (3000 W output module) Version 3 power system: 6510 VA (6000 W output module)	Version 1 power system: 3400 VA (volt-amps) per AC power module Version 2 power system: 3290 VA (3000 W output module)	Version 2 power system: 3290 VA (3000 W output module)	Version 2 power system: 3290 VA (3000 W output module) Version 3 power system: 6510 VA (6000 W output module)	Version 2 power system: 3290 VA (3000 W output module Version 3 power system: 6510 VA (6000 W output module)
Rated input voltage per power module	200–240 VAC nominal (range: 180 to 264 VAC) 220–240 VAC (UK)				
Rated input line frequency[1]	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)				
Input current draw[1]	15 A maximum at 200 VAC 13 A maximum at 220 to 240 VRMS (UK)				
Source AC service requirement[1]	20 A North America; 16 A international; 13 A United Kingdom				
Redundancy	AC power modules operate in N+N redundancy mode[2]	At least two AC power modules required for N+1 redundancy for a fully configured system	At least two AC power modules required for N+1 redundancy for a fully configured system	AC power modules operate in N+N redundancy mode[2]	AC power modules operate in N+N redundancy mode[2]

1. For each AC 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.

2. The number of AC power modules needed depends on the configuration of the chassis (e.g. number of line cards, RP cards, and FCs installed). Use the Cisco Power Calculator (Cisco.com account required) at http://tools.cisco.com/cpc/launch.jsp to calculate how many AC power modules are needed.

⚠

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 9000 Series Routers DC Electrical Specifications

Table A-4   Cisco ASR 9000 Series Routers DC Electrical Specifications

Description	Cisco ASR 9010	Cisco ASR 9006	Cisco ASR 9904	Cisco ASR 9922	Cisco ASR 9912
Power modules per system	Version 1 power system: Up to six DC power module per system, three per tray Version 2 power system: Up to eight DC power modules per system, four per tray Version 3 power system: Up to eight DC power modules per system, four per tray	Version 1 power system: Up to three DC power modules per system Version 2 power system: Up to four DC power modules per system	Version 2 power system: Up to four DC power modules per system	Version 2 power system: Up to sixteen DC power modules per system, four per tray Version 3 power system: Up to sixteen DC power modules per system, four per tray	Version 2 power system: Up to twelve DC power modules per system, four per tray Version 3 power system: Up to twelve DC power modules per system, four per tray
Total DC input power per power module	Version 1 power system: 1700 W (1500 W output module) Version 2 power system: 2340 W (2100 W output module) Version 3 power system: 4730 W (4400 W output module)	Version 1 power system: 1700 W (1500 W output module) Version 2 power system: 2300 W (2100 W output module)	Version 2 power system: 2300 W (2100 W output module)	Version 2 power system: 2340 W (2100 W output module) Version 3 power system: 4730 W (4400 W output module)	Version 2: 2340 W (2100 W output module) Version 3 power system: 4730 W (4400 W output module)
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])				
Rated input current draw	49 A maximum at –48 VDC nominal 39 A maximum at –60 VDC nominal				
Source DC service requirement[1]	Sufficient to supply the rated input current. Local codes apply.				
Redundancy	DC power modules operate in N+1 redundancy mode[2]	At least two DC power modules are required for N+1 redundancy for a fully configured system	At least two DC power modules are required for N+1 redundancy for a fully configured system	DC power modules operate in N+1 redundancy mode[2]	DC power modules operate in N+1 redundancy mode[2]

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.

2. The number of DC power modules needed depends on the configuration of the chassis (e.g. number of line cards, RP cards, and FCs installed). Use the Cisco Power Calculator (Cisco.com account required) at http://tools.cisco.com/cpc/launch.jsp to calculate how many AC power modules are needed.

AC Input and DC Input Voltage Range

AC Input Voltage Range

Table A-5   AC Input Voltage Range (Single-Phase Power Source)

Range	Minimum	Minimum Nominal	Nominal	Maximum Nominal	Maximum
Input Voltage	180 VAC	200 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 A-6   DC Input Voltage Range

Range	Minimum	Nominal	Maximum
Input Voltage	–40 VDC	–48 VDC	–72 VDC

Power System DC Output Levels

DC Output Levels for Version 1 Power System

Table A-7   DC Output Levels for Version 1 Power System

Parameter	Value
Voltage	
Maximum	–54.5 VDC
Nominal	–54.0 VDC
Minimum	–53.5 VDC
Power	
Minimum (one power module)	1500 W
Maximum (three 2100 W power modules per tray x two trays)	12,600 W (Cisco ASR 9010 Router only)[1]
Maximum (three 2100 W power modules in a single tray)	6300 W (Cisco ASR 9006 Router only)

1. Maximum output power the power system is capable of supporting (not system power consumption).

DC Output Levels for Version 2 Power System

Table A-8   DC Output Levels for Version 2 Power System

Parameter	Value
Voltage	
Maximum	–55.5 VDC
Nominal	–54.0 VDC
Minimum	–52.5 VDC
Power	
Minimum (one power module)	2100 W
Maximum (four 2100 W DC power modules or 3000 W AC power modules in a single tray)[1]	8400 W (DC) 12, 000 W (AC) Cisco ASR 9006 Router and Cisco ASR 9904 Router
Maximum (four 2100 W DC power modules or 3000 W AC power modules per tray x two trays)	16,800 W (DC) 24,000 W (AC) (Cisco ASR 9010 Router only)
Maximum (four 2100 W DC power modules or 3000 W AC power modules per tray x four trays)	33,600 W (DC) 48,000 W (AC) (Cisco ASR 9922 Router only)

1. Maximum output power the power system is capable of supporting (not system power consumption).

DC Output Levels for Version 3 Power System

Table A-9   DC Output Levels for Version 3 Power System

Parameter	Value
Voltage	
Maximum	–55.5 VDC
Nominal	–54.0 VDC
Minimum	–52.5 VDC
Power	
Minimum (one power module)	4400 W
Maximum (four 4400 W DC power modules or three 6000 W AC power modules per tray x two trays)[1]	35,200 W (DC) 36,000 W (AC) (Cisco ASR 9010 Router only)
Maximum (four 4400 W power modules or three 6000 W AC power modules per tray x three trays)	52,800 W (DC) 54,000 W (AC) (Cisco ASR 9912 Router only)
Maximum (four 4400 W power modules or three 6000 W AC power modules per tray x four trays)	70,400 W (DC) 72,000 W (AC) (Cisco ASR 9922 Router only)

1. Maximum output power the power system is capable of supporting (not system power consumption).

RSP/RP Port Specifications.

Table A-10   RSP/RP Port Specifications

Description	Value
Console port	EIA/TIA-232 RJ-45 interface, 9600 Baud, 8 data, no parity, 2 stop bits with flow control none (default)
Auxiliary port	EIA/TIA-232 RJ-45 interface, 9600 Baud, 8 data, no parity, 1 stop bit with software handshake (default)
Management ports (0, 1)	Dual-speed (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

RSP Cards, RP Cards, and Fabric Card Power Consumption Specifications

The following table lists the power consumption specifications for the RSP cards, RP cards, and fabric cards. For power consumption values for the Ethernet line cards, see the *Cisco ASR 9000 Series Aggregation Services Router Ethernet Line Card Installation Guide*.

⚠

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.

Table A-11   RSP Cards, RP Cards, and Fabric Card Power Consumption Specifications

Card	Power Consumption
RSP Card	
Power consumption	175 W at 77°F (25°C) 205 W at 104°F (40°C) 235 W at 131°F (55°C)
RSP-440 Card	
Power consumption	285 W at 77°F (25°C) 350 W at 104°F (40°C) 370 W at 131°F (55°C)
RSP-440 Lite Card	
Power consumption	240 W at 77°F (25°C) 270 W at 104°F (40°C) 300 W at 131°F (55°C)
RSP-880 Card	
Power consumption	425 W at 81°F (27°C) 430 W at 104°F (40°C) 450 W at 131°F (55°C)
RP Card	
Power consumption	227 W at 77°F (25°C) 251 W at 104°F (40°C) 259 W at 131°F (55°C)
RP2 Card	
Power consumption	390 at 81°F (27°C) 400 at 104°F (40°C) 410 at 131°F (55°C)
FC Card (ASR 9922)	
Power consumption	135 W at 77°F (25°C) 147 W at 104°F (40°C) 160 W at 131°F (55°C)
FC2 Card (ASR 9922)	

Table A-11   RSP Cards, RP Cards, and Fabric Card Power Consumption Specifications (continued)

Card	Power Consumption
Power consumption	155 W at 81°F (27°C) 160 at 104°F (40°C) 165 at 131°F (55°C)
FC Card (ASR 9912)	
Power consumption	80 W at 77°F (25°C) 82 W at 104°F (40°C) 88 W at 131°F (55°C)
FC2 Card (ASR 9912)	
Power consumption	94 W at 81°F (27°C) 103 W at 104°F (40°C) 105 W at 131°F (55°C)

Fan Tray Power Consumption Specifications

> **Note** The fan tray power consumption numbers reflect the power budget for a single fan tray

Table A-12   Fan Tray Power Consumption Specifications

Description	Power Consumption
ASR 9010 Fan Tray V1	
Power consumption	200 W at 77°F (25°C) 300 W at 104°F (40°C) 600 W at 131°F (55°C)
ASR 9010 Fan Tray V2	
Power consumption	240 W at 77°F (25°C) | 960 W at 104°F (40°C) 1100 W at 131°F (55°C)
ASR 9006 Fan Tray V2	
Power consumption	100 W at 77°F (25°C) 275 W at 104°F (40°C) 375 W at 131°F (55°C)
ASR 9904 Fan Tray V2	
Power consumption	100 W at 77°F (25°C) 360 W at 104°F (40°C) 605 W at 131°F (55°C)
ASR 9922 Fan Tray V2	
Power consumption	200 W at 77°F (25°C) 870 W at 104°F (40°C) 1000 W at 131°F (55°C)
ASR 9912 Fan Tray V2	
Power consumption	290 W at 77°F (25°C) 900 W at 104°F (40°C) 1800 W at 131°F (55°C)

Site Log

The site log provides a historical record of all actions relevant to the operation and maintenance of the router. Keep your site log in a convenient place near the router where anyone who performs the maintenance has access to it.

Site log entries might include the following:

- 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 show the following:

  - 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

The following page shows a sample site log format. You can make copies of the sample or design your own site log page to meet the needs of your site and equipment.

Date	Description of Action Performed or Symptoms Observed	Initials