Cisco ASR 9901, ASR 9001, and ASR 9001-S Routers Hardware Installation Guide

First Published: 2013-08-25

Last Modified: 2018-03-08

CONTENTS

Preparing for Installation

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

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

- Power and cabling requirements must be in place at your installation site.

- Special equipment must be available for installing the router.

- The environmental conditions that your installation site must meet to maintain normal operation.

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

- Keep the router in the shipping container until you have determined the installation site.

- The router should always be transported or stored in its shipping package in the upright position.

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

This chapter contains these installation topics:

Overview

Cisco ASR 9901 Router

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

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

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

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

  Note 1GE copper SFPs are not supported in converted dual-rate ports.

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

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

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

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

Figure 1: Front Panel of the Cisco ASR 9901 Router
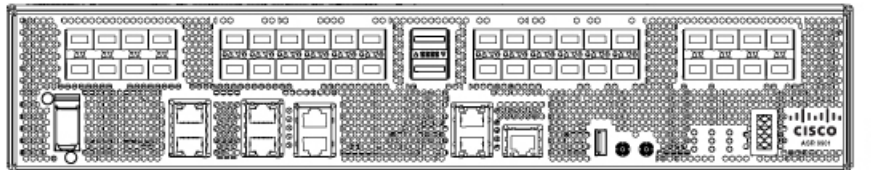
Cisco ASR 9001 Router

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

Figure 2: Front Panel of the Cisco ASR 9001 Router
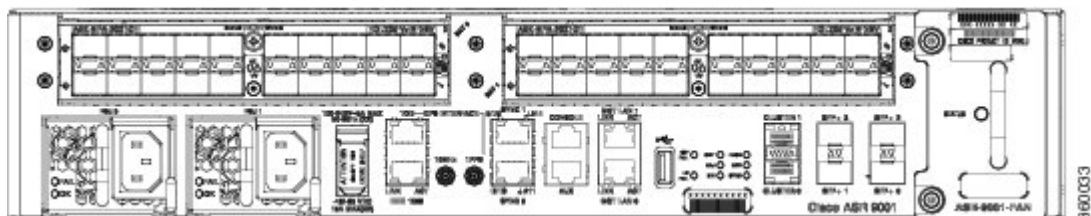
Cisco ASR 9001-S Router

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

Figure 3: Front Panel of the Cisco ASR 9001-S Router
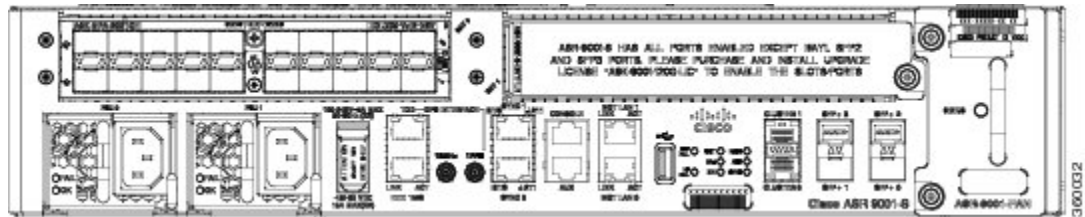
In order to achieve the full bandwidth of 120 Gbps and to enable the disabled ports, a Cisco license can be obtained. Once the license is obtained and installed, the Cisco ASR 9001-S Router must be reloaded to bring up the full 120 Gbps capacity. For information on configuring the Cisco license for Cisco ASR 9001-S Router, see the Cisco ASR 9001-S 120G Upgrade License Configuration Guide .

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

Safety Guidelines

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

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

General Safety Guidelines

- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always disconnect the power source and unplug all power cables before lifting, moving, or working on the router.
- Keep the work area clear and dust free during and after installation.
- Keep tools and router components away from walkways and equipment rack aisles.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the router.
- Fasten your tie or scarf and sleeves.

• Operate Cisco equipment safely by using it in accordance with its electrical ratings and product usage instructions.
• Do not work alone if potentially hazardous conditions exist.
• Always unplug power cables when performing maintenance or working on the router, unless the replacement part is hot swappable and designed for online insertion and removal (OIR).
• Ensure that the installation of the router is in compliance with national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 364, part 1 through part 7.

Compliance and Safety Information

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

Laser Safety

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

⚠

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

Energy Hazard

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

⚠

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

Figure 4: Connecting an ESD-Preventive Wrist Strap to the Cisco ASR 9001 Router Chassis
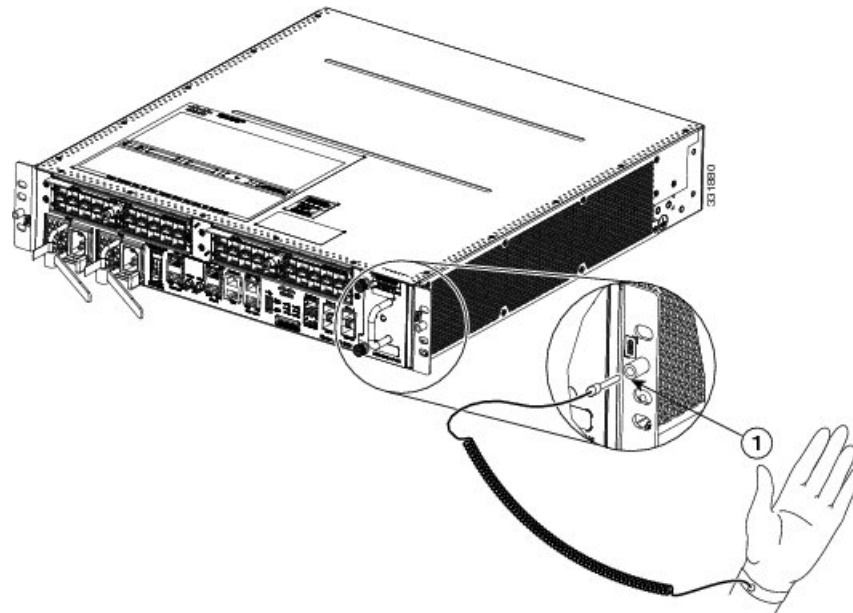
| 1 | Location of chassis socket for ESD strap on the Cisco ASR 9001 Router |

Lifting Guidelines

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

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

- Do not lift equipment alone; have another person help you to lift the equipment.

- Ensure that your footing is solid; balance the weight of the object between your feet.

- Lift the equipment slowly; never move suddenly or twist your body as you lift.

- Keep your back straight and lift with your legs, not your back. When bending down to lift equipment, bend at the knees (not at the waist), to reduce the strain on your lower back muscles.

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

Site Requirement Guidelines

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

Site Layout and Equipment Dimensions

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

- Install the system in a restrictive access location with means for a permanent grounding.

- Ensure the site of the rack includes provisions for source AC or DC power, grounding, and network interface cables.

- Allow sufficient space to work around the rack during the installation. You need at least 3 feet (91.44 cm) adjacent to the rack to move, align, and insert the chassis.

- Maintain at least 24 inches (61 cm) of clearance in front of, and behind the chassis for maintenance after installation.

- To mount the router between two posts or rails, the usable aperture (the width between the *inner* edges of the two mounting flanges) must be at least 17.7 inches (45 cm) for the Cisco ASR 9001 Router and at least 17.75 inches (45.09 cm) for the Cisco ASR 9901 Router.

- Height of the Cisco ASR 9901 Router and Cisco ASR 9001 Router is 3.47 inches (8.8 cm).

- When fully populated with cards, the router can weigh as much as 37.91 pounds (17.2 kg). To maintain equipment rack stability and to ensure your safety, the rack is provided with stabilizing devices. Make sure you install the stabilizers before installing the router.

- If you use a telco-style rack, the weight of the chassis is cantilevered off the two rack posts. Make sure that:

    - Weight of the router does not make the frame unstable.

    - Frame is bolted to the floor and is secured to the building structure using either wall brackets or overhead brackets.

- When mounting the router in a telco-style rack or 4-post rack, be sure to use all the screws provided to secure the chassis to the rack posts.

- Install the cable-management brackets included with the router to keep cables organized. Be sure to use appropriate strain-relief methods to protect cables and equipment connections.

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

The following figure shows the top-down view chassis dimensions of the Cisco ASR 9901 Router.

Figure 5: Cisco ASR 9901 Router Chassis Footprint and Dimensions—Top View
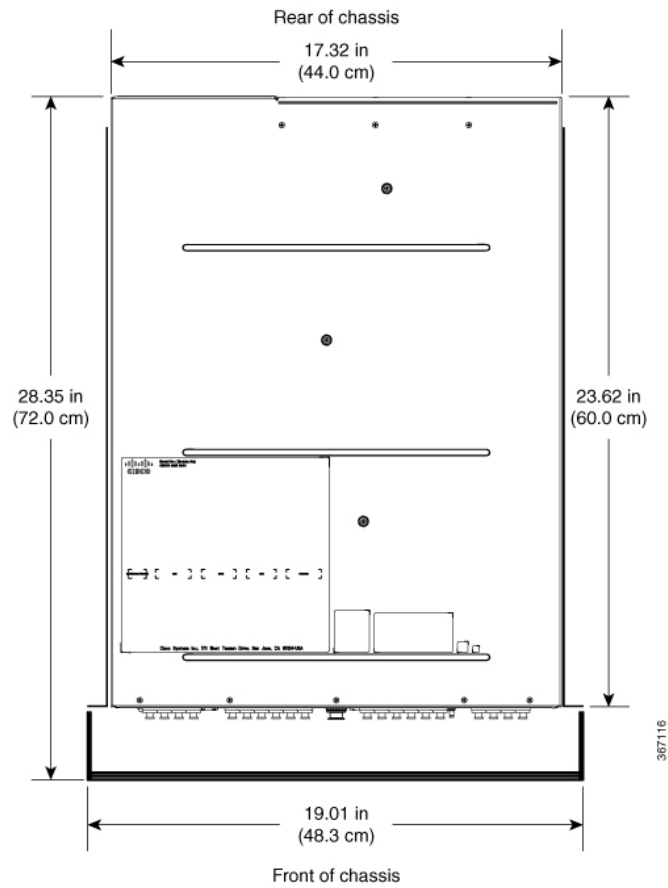
The following figure shows the top-down view chassis dimensions of the Cisco ASR 9001 Router.

Figure 6: Cisco ASR 9001 Router Chassis Footprint and Dimensions—Top View
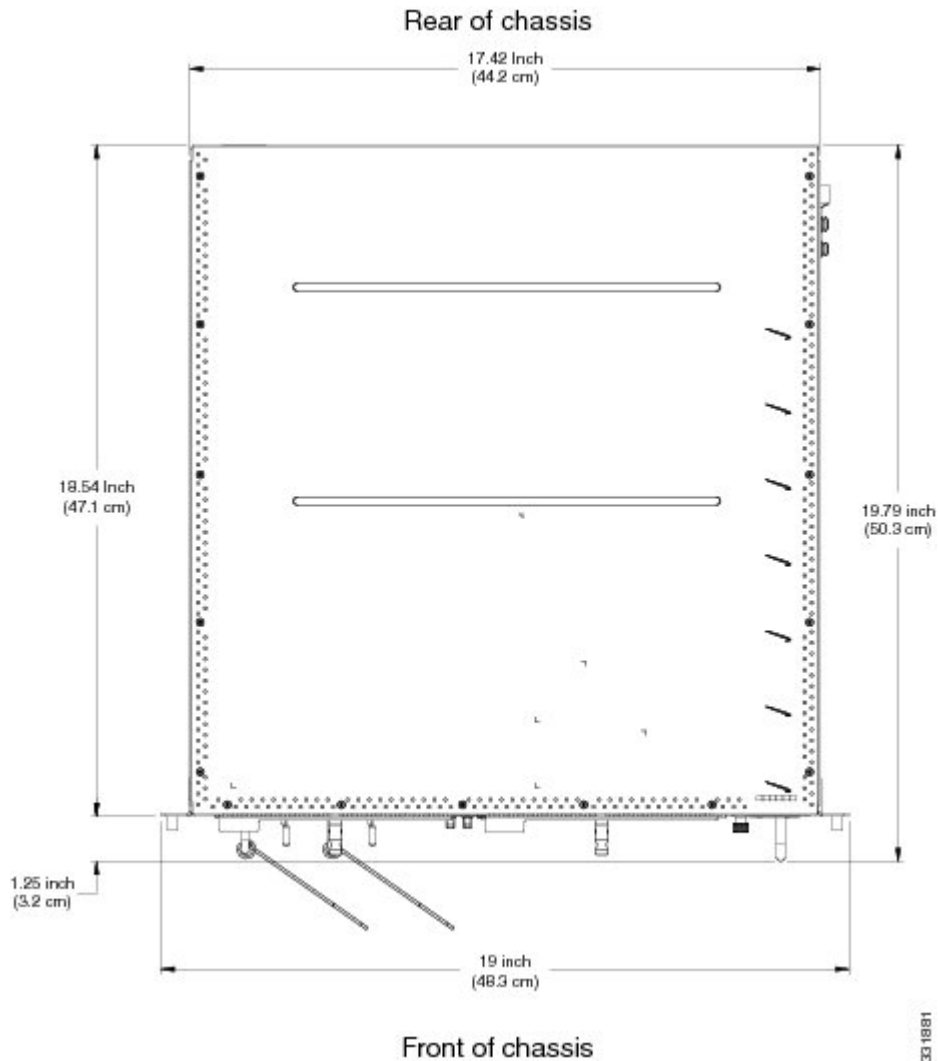
Site Wiring Guidelines

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

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

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

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

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

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

Chassis Air Flow Guidelines

Cisco ASR 9901 Router

Cool air is circulated front-to-back through the Cisco ASR 9901 Router by three fan trays located in the rear of the router (see the following figure).

The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis. Each power supply is also equipped with fans that draw cool air into the front of the power supply and force warm air out of the air exhaust.

Note   See the following section for details on air flow clearance requirements for installation in an enclosed 4-post rack.

Figure 7: Air Flow Path through the Cisco ASR 9901 Router
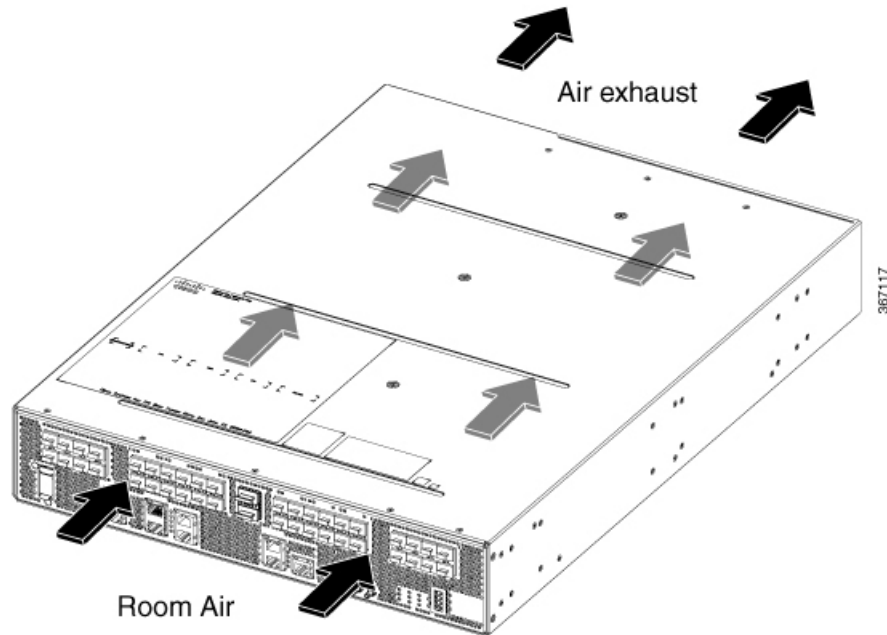
Cisco ASR 9001 Router

Cool air is circulated through the Cisco ASR 9001 Router by one fan tray located along the right side of the router (see the following figure).

The fan tray maintains acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis. Each power supply is also equipped with fans that draw cool air into the front of the power supply and force warm air out of the air exhaust.

Note See the following section for details on air flow clearance requirements for installation in an enclosed 4-post rack.

Figure 8: Air Flow Path through the Cisco ASR 9001 Router
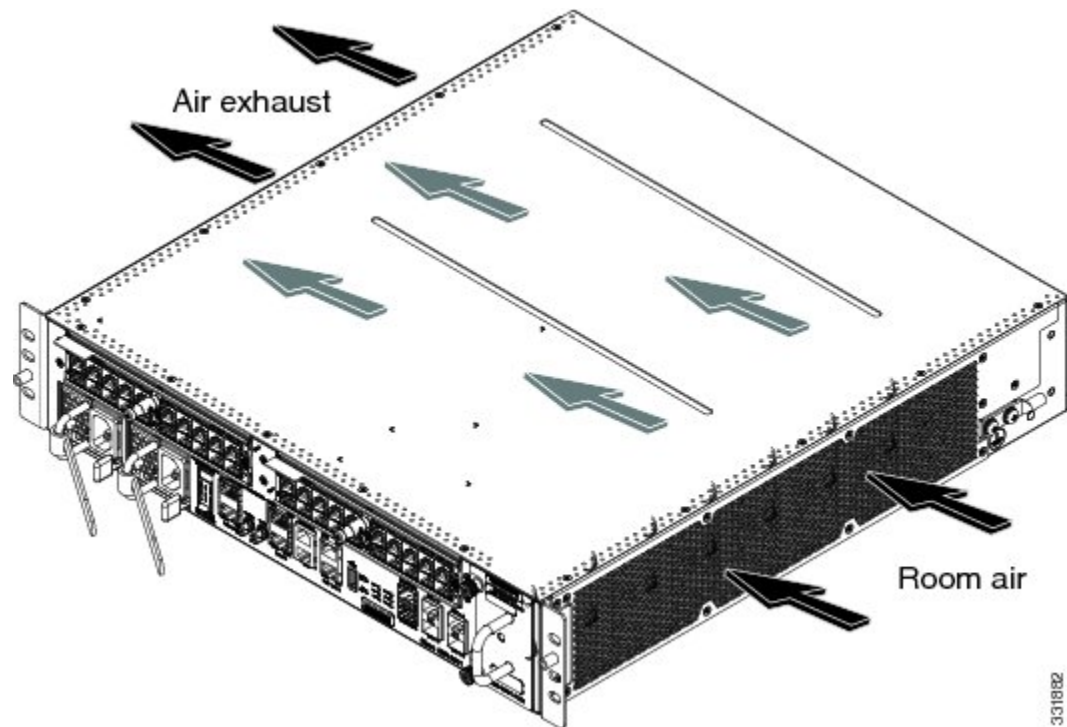
When selecting a site to install the router, observe these guidelines:

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

- Unrestricted air flow—Allow sufficient air flow by maintaining a minimum of 6 inches (15.24 cm) of clearance at both the inlet and exhaust openings on the chassis and the power modules. If the air flow is blocked or restricted, or if the inlet air is too warm, an over-temperature condition can occur within the router. Under extreme conditions, the environmental monitoring system powers off the router to protect the components.

Rack-Mounting and Air Flow Clearance Guidelines

The router can be mounted in most 2-post, 4-post, or telco-style 19-inch equipment racks that comply with the Electronics Industries Association (EIA) standard for equipment racks (EIA-310-D). The rack must have at least two posts with mounting flanges to mount the router chassis. The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inches ± 0.06 inch (46.50 cm ± 0.15 cm).

The following figure shows examples of typical 2-post, 4-post, and telco-type equipment racks.

Figure 9: Equipment Rack Types
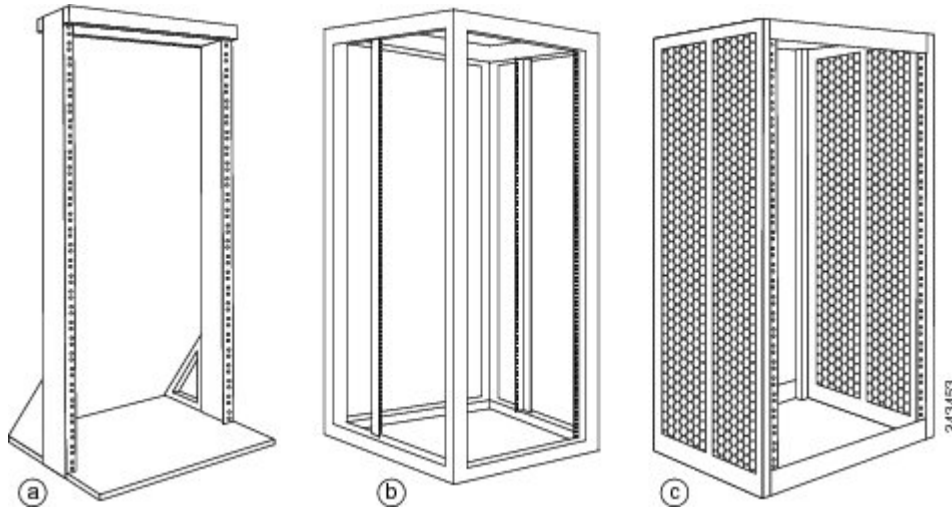
a	Telco-style rack	b	Free-standing, 4-post open rack with two mounting posts in the front, two mounting posts in the back or along each side	c	Free-standing enclosed rack with perforated sides and two mounting posts in the front

Telco 2-Post Rack

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

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

Cisco ASR 9901 Router

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

Figure 10: Cisco ASR 9901 Router Mounted in a 2-Post Rack
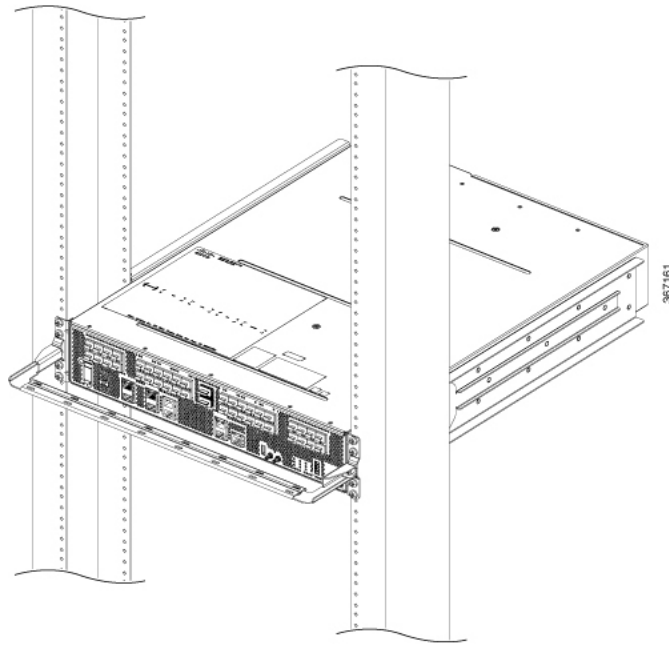
Cisco ASR 9001 Router

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

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

Figure 11: Cisco ASR 9001 Router Mounted in a 2-Post Rack
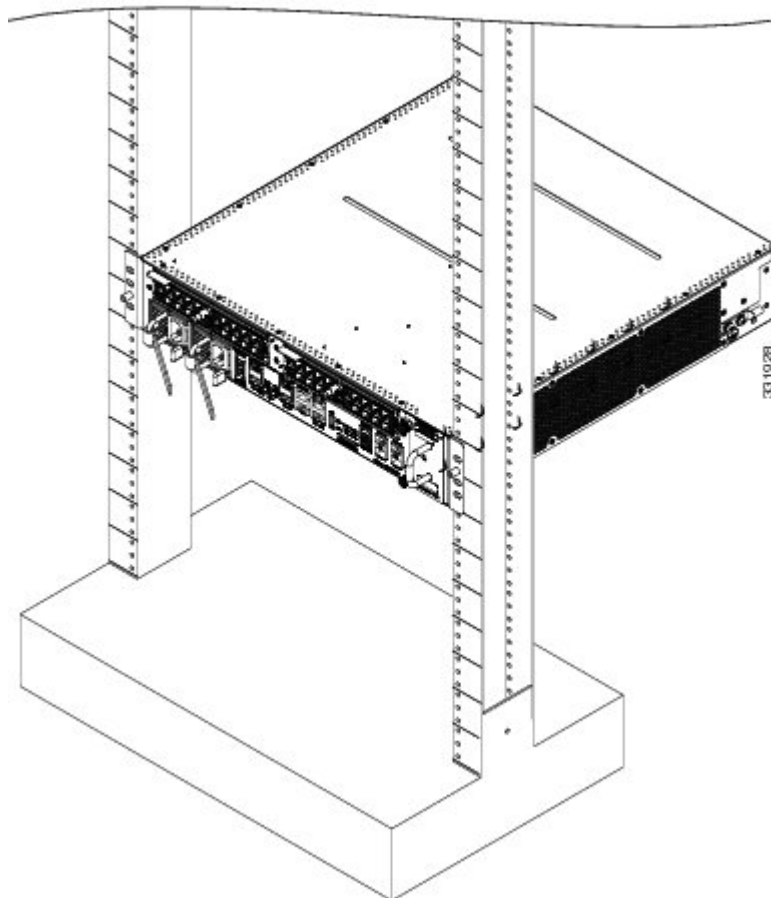
Open 4-Post Rack

Item b in Figure 9: Equipment Rack Types, on page 12 shows a free-standing, 4-post open rack with two mounting posts in the front and two mounting posts in the back or along the side. The mounting posts in this type of rack are often adjustable so that you can position the rack-mounted unit within the depth of the rack rather than flush-mount it with the front of the rack.

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

Enclosed Rack with Perforated Sides

Item c in Figure 9: Equipment Rack Types, on page 12 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 9901 or Cisco ASR 9001 Router in any type of fully-enclosed rack that does not have the required perforated sides or doors; the router requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of fully-enclosed rack without proper perforation could disrupt the air flow, trap heat next to the chassis, and cause an over-temperature condition inside the router.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco ASR 9901 or Cisco ASR 9001 Router in an enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for ETSI 800mm racks).

Cisco ASR 9901

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

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

Figure 12: ASR 9901 Clearance Requirements for an Enclosed Rack Installation
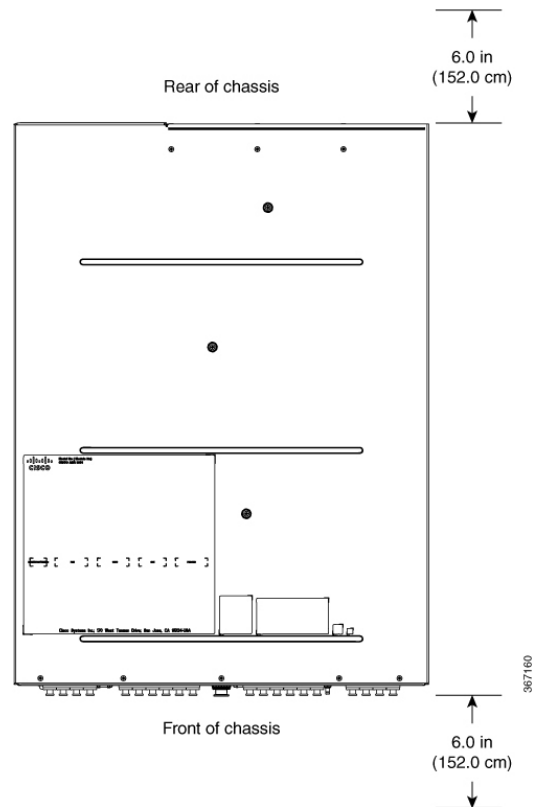
Cisco ASR 9001

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

- Rear: Minimum of 3.15 inches (8.00 cm) of clearance

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

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

Figure 13: ASR 9001 Clearance Requirements for an Enclosed 4-Post Rack Installation
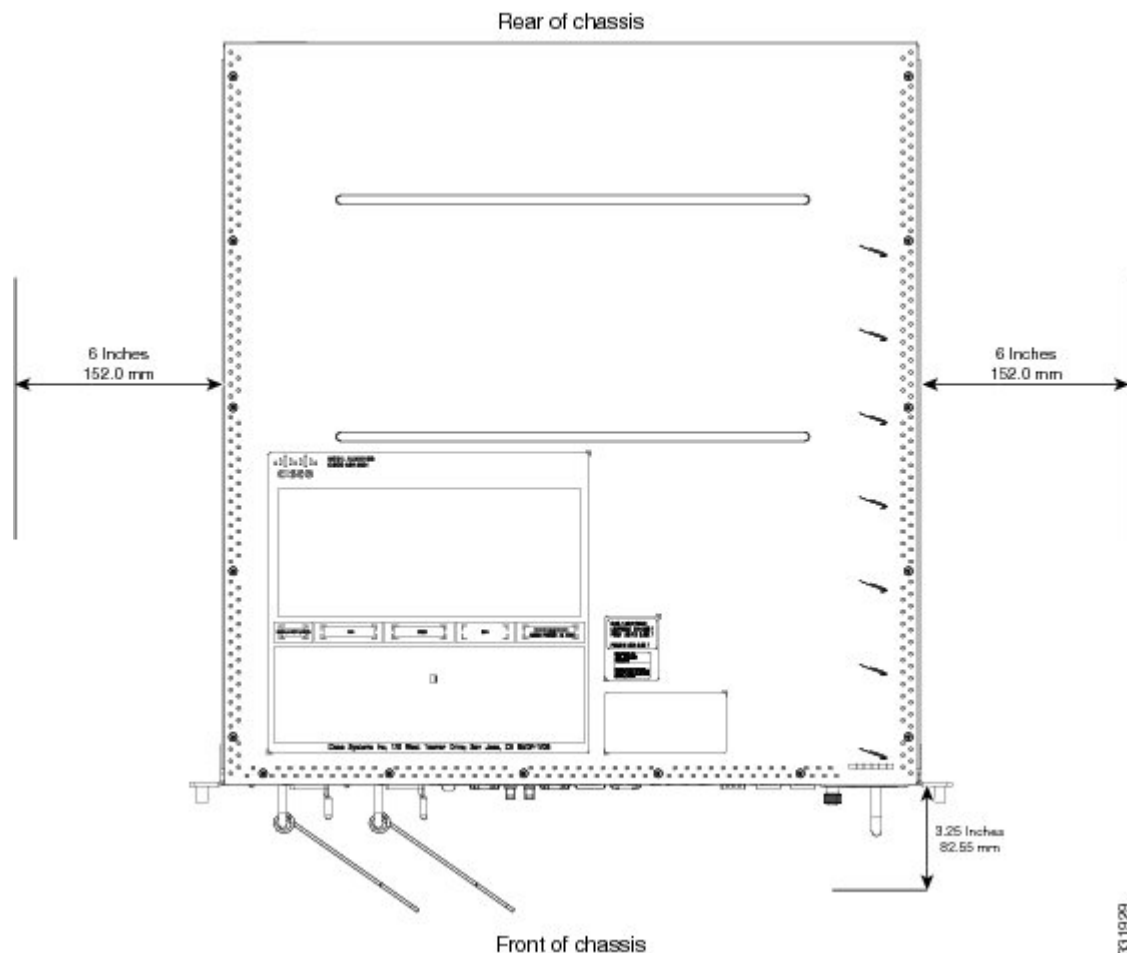
Temperature and Humidity Guidelines

The operating and nonoperating environmental site requirements are listed in Environmental Specifications, on page 142. The router normally operates within the ranges listed in Environmental Specifications, on page 142; 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 9901 or Cisco ASR 9001 Router is powered by only one type of input: AC or DC. A hybrid (AC+DC) power configuration is not supported.

⚠️

Caution Proper grounding is necessary to avoid damage from lightning and power surges. See NEBS Supplemental Unit Bonding and Grounding Guidelines, on page 34 for grounding requirements.

AC Powered Routers

Cisco ASR 9901

AC power modules operate in the input range of 200 VAC to 240 VAC, 50 to 60 Hz and require a minimum service of:

- 15 A for operation in North America and Japan

- 10 A for international operation

- 13 A for operation in the UK

Each of the AC power inputs requires a separate dedicated branch circuit. For a list of the nominal and acceptable value ranges for source AC power, see AC Input Voltage Range, on page 146.

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

Table 1: AC-Input Power Cord Options for Cisco ASR 9901 Router

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

Locale	Part Number	Length	Power Cord Rating
Europe	CAB-AC-16A-SG-EU	14 ft (4.26 m)	16A, 250 VAC
India	CAB-AC-16A-SG-IND	14 ft (4.26 m)	16A, 250 VAC
International/UK	CAB-AC-16A-SG-IN	14 ft (4.26 m)	16A, 250 VAC
Israel	CAB-AC-16A-SG-IS	14 ft (4.26 m)	16A, 250 VAC
Italy	CAB-AC-16A-SG-IT	14 ft (4.26 m)	16A, 250 VAC
Japan	CAB-AC-16A-SG-JPN	14 ft (4.26 m)	16A, 250 VAC
South Africa	CAB-AC-16A-SG-SA	14 ft (4.26 m)	16A, 250 VAC
Switzerland	CAB-AC-16A-SG-SW	14 ft (4.26 m)	16A, 250 VAC
UK	CAB-AC-16A-SG-UK	14 ft (4.26 m)	16A, 250 VAC
North America (non locking) 110 VAC operation	CAB-AC-20A-SG-US	14 ft (4.26 m)	20A, 110 VAC
North America (locking) 125 VAC operation	CAB-AC-20A-SG-US1	14 ft (4.26 m)	20A, 125 VAC
North America (non locking) 200-240 VAC operation	CAB-AC-20A-SG-US2	14 ft (4.26 m)	20A, 250 VAC
North America (locking) 200-240 VAC operation	CAB-AC-20A-SG-US3	14 ft (4.26 m)	20A, 250 VAC
North America 277 VAC operation	CAB-AC-20A-SG-US4	14 ft (4.26 m)	20A, 277 VAC
North America Cabinet Jumper Power Distribution unit (PDU)	CAB-AC-20A-SG-C20	14 ft (4.26 m)	20A, 250 VAC
North America, Ring Terminal source plug	CAB-HV-25A-SG-US2	14 ft (4.26 m)	20A, 300 VAC/500 VDC
International IEC/EU, Ring Terminal source plug	CAB-HV-25A-SG-IN2	14 ft (4.26 m)	20A, 300 VAC/500 VDC
International IEC/EU	CAB-HV-25A-SG-IN3	14 ft (4.26 m)	20A, 300 VAC

AC Power Cord Illustrations for Cisco ASR 9901 Router

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

Figure 14: CAB-AC-16A-SG-AR Power Cord

Plug: IRSM 2073

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-AR
CPN: 37-1649-01
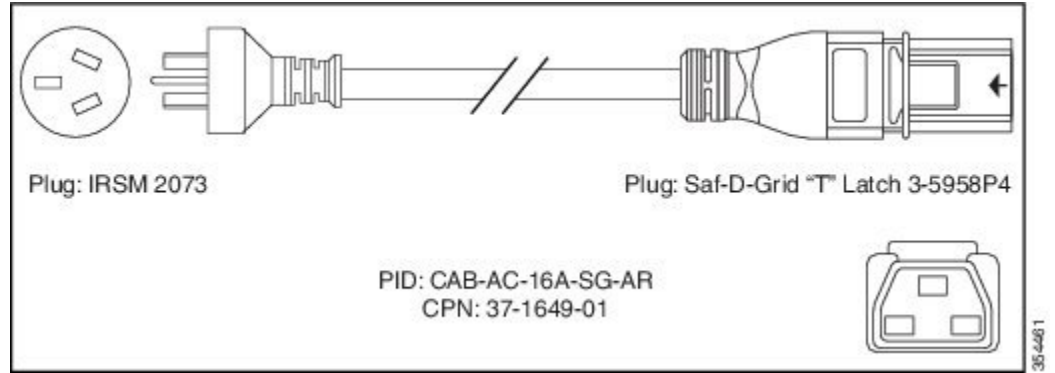
Figure 15: CAB-AC-16A-SG-AZ Power Cord

Plug: AU20LS3

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-AZ
CPN: 37-1661-01
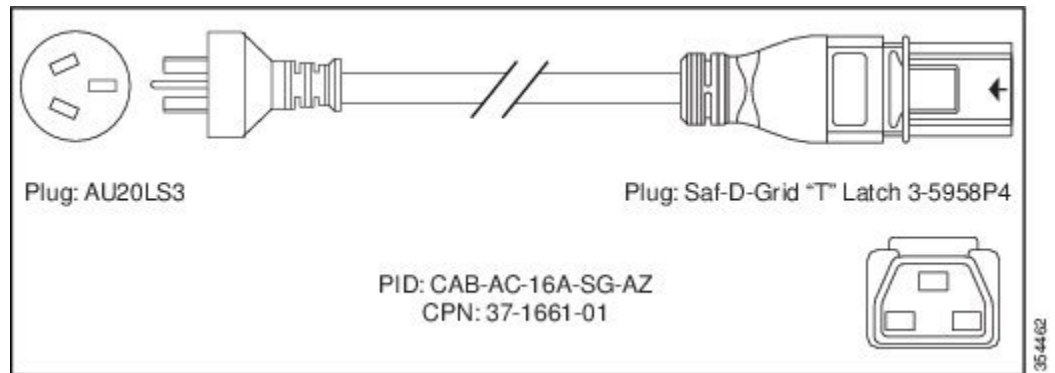
Figure 16: CAB-AC-16A-SG-BR Power Cord

Plug: EL224

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-BR
CPN: 37-1650-01
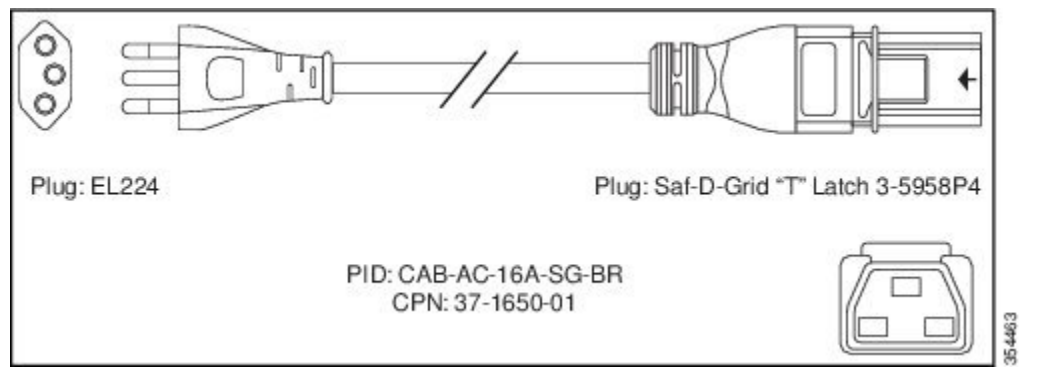
Figure 17: CAB-AC-16A-SG-CH Power Cord

Plug: GB 16C

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-CH
CPN: 37-1655-01
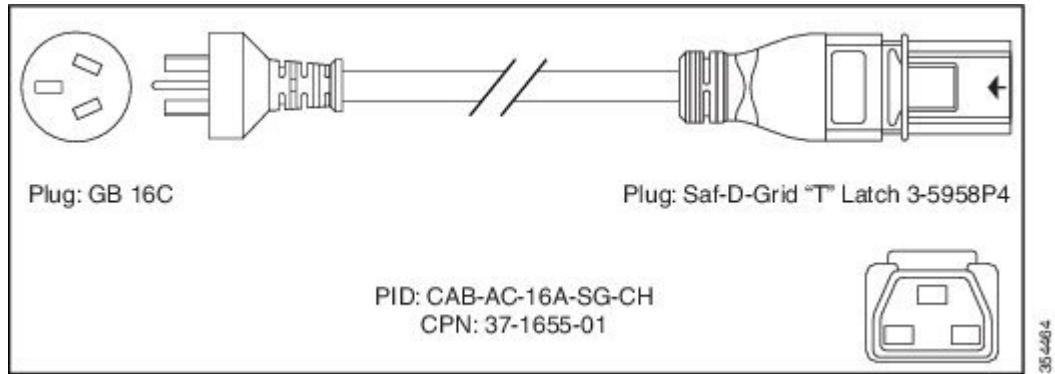
Figure 18: CAB-AC-16A-SG-EU Power Cord

Plug: CEE 7-7

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-EU
CPN: 37-1660-01
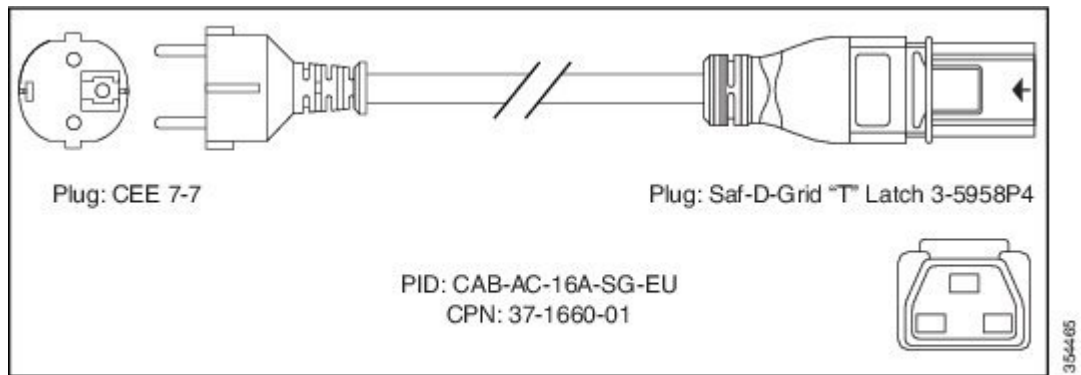
Figure 19: CAB-AC-16A-SG-IND Power Cord

Plug: SABS 164-1

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-IND
CPN: 37-1648-01
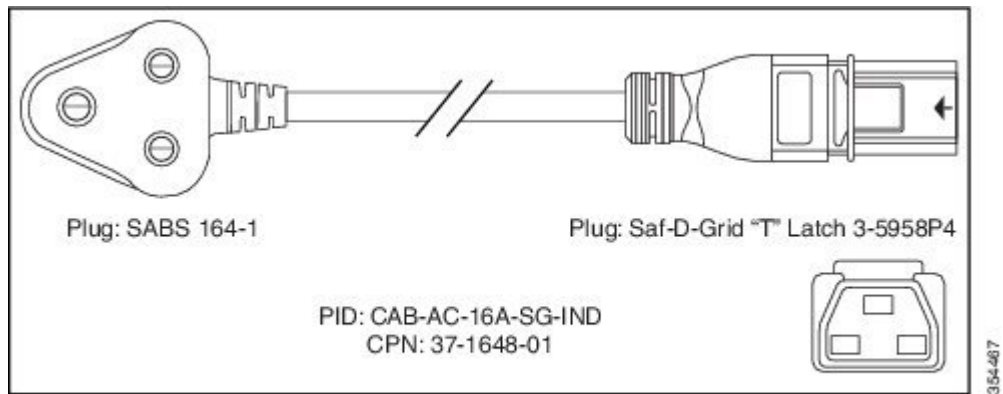
Figure 20: CAB-AC-16A-SG-IN Power Cord

Plug: IEC60309

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-IN
CPN: 37-1659-01
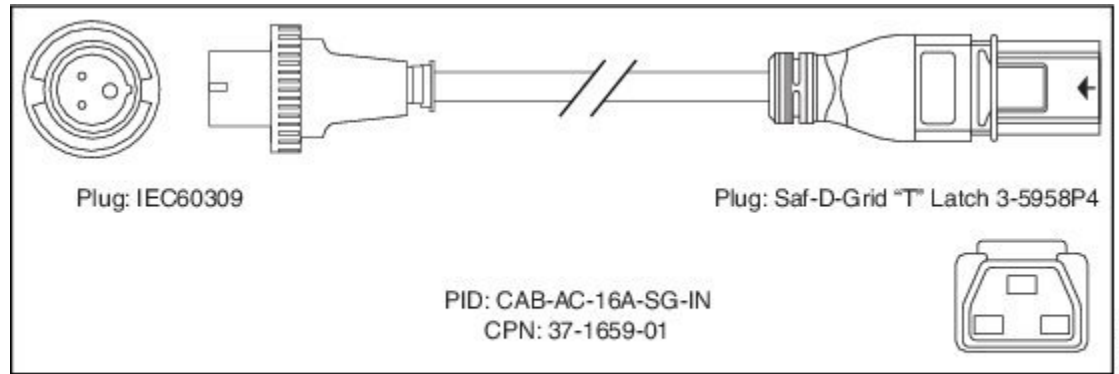
Figure 21: CAB-AC-16A-SG-IS Power Cord

Plug: SI 16S3

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-IS
CPN: 37-1658-01
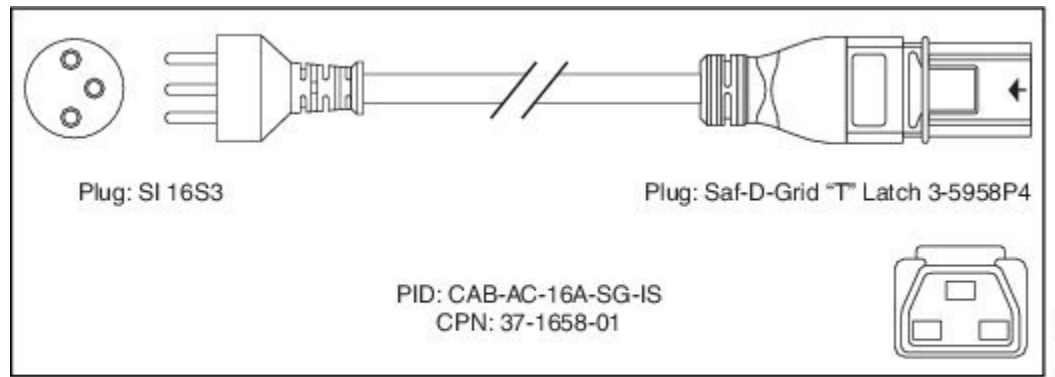
Figure 22: CAB-AC-16A-SG-IT Power Cord

Plug: CEI 23-50

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-IT
CPN: 37-1651-01
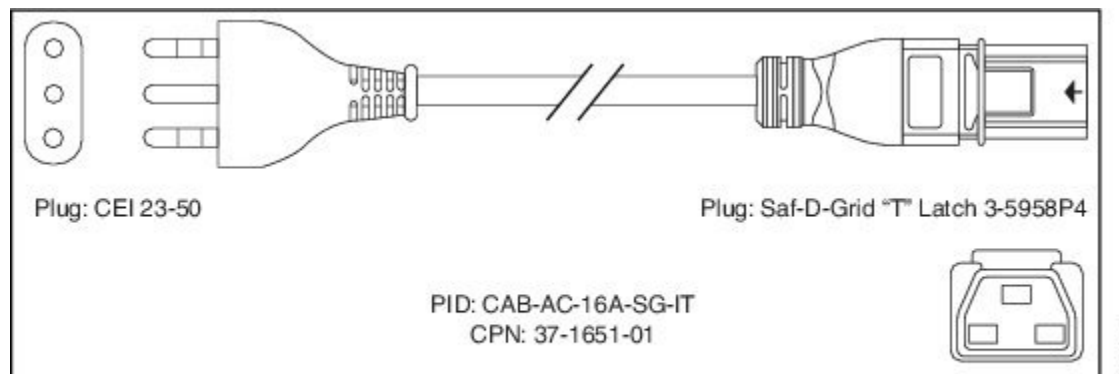
Figure 23: CAB-AC-16A-SG-JPN Power Cord

Plug: USL620PS3   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-JPN
CPN: 37-1656-01
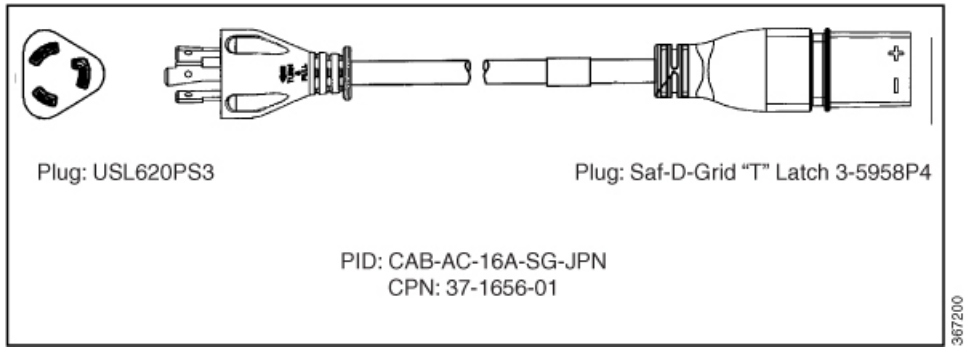
Figure 24: CAB-AC-16A-SG-SA Power Cord

Plug: EL   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-SA
CPN: 37-1647-01
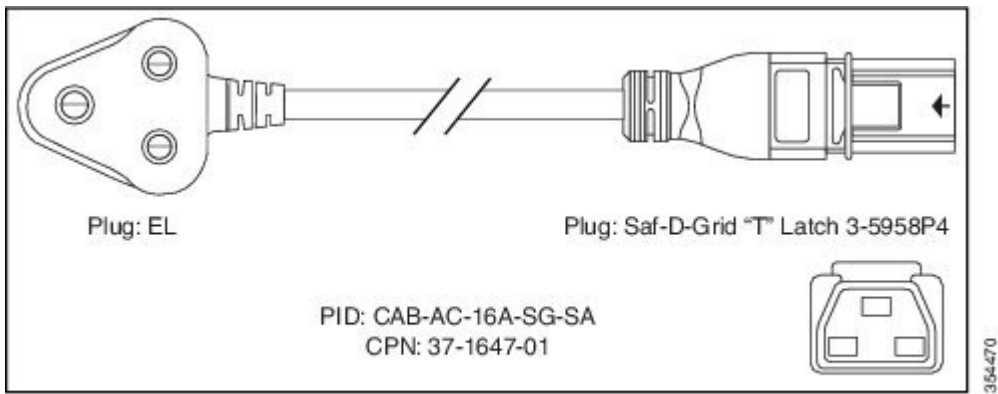
Figure 25: CAB-AC-16A-SG-SW Power Cord

Plug: SEV 5934-2   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-SW
CPN: 37-1654-01
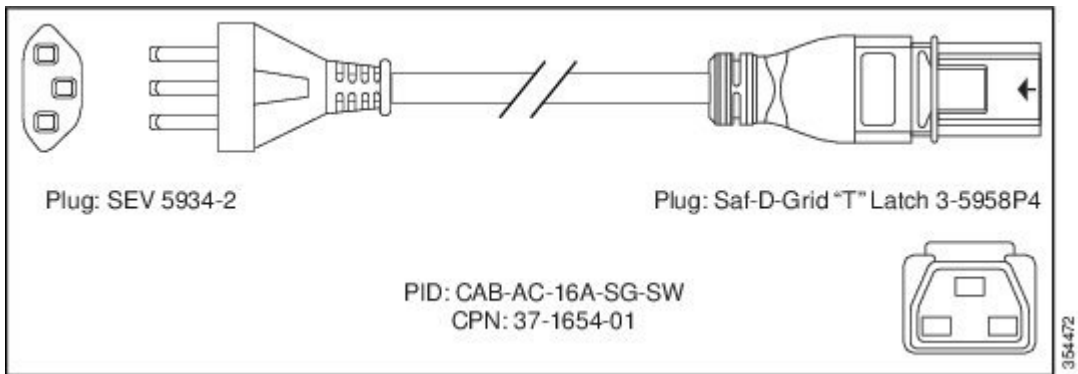
Figure 26: CAB-AC-16A-SG-UK Power Cord

Plug: MP5004

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-16A-SG-UK
CPN: 37-1864-01

367201
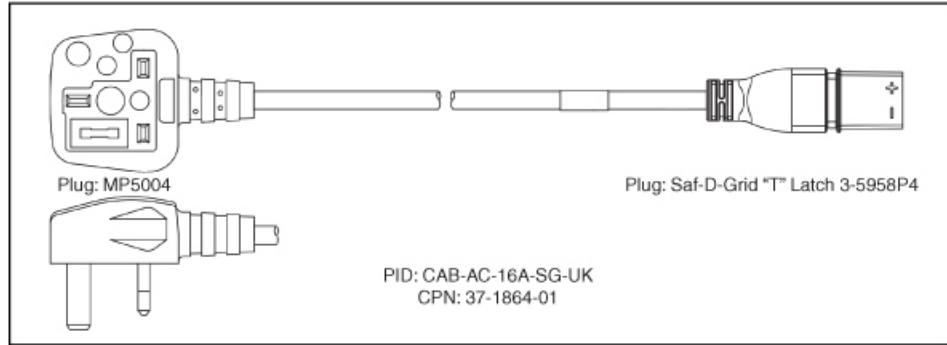
Figure 27: CAB-AC-20A-SG-US Power Cord

Plug: NEMA 5-20P

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-20A-SG-US
CPN: 37-1662-01

354473
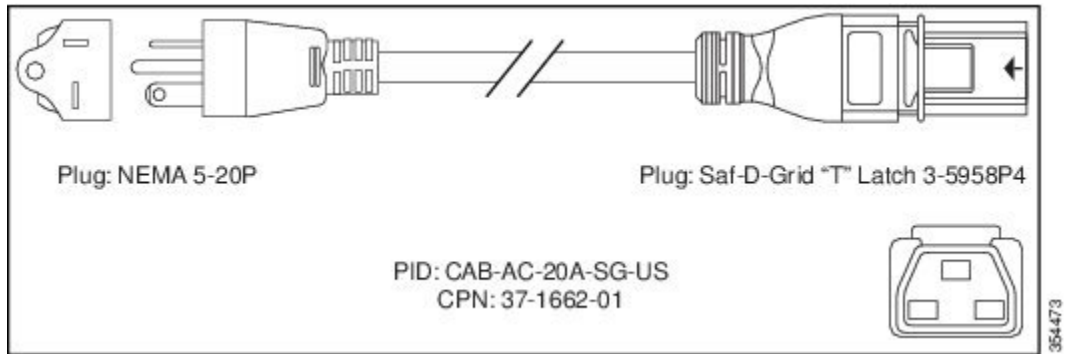
Figure 28: CAB-AC-20A-SG-US1 Power Cord

Plug: NEMA L5-20

Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-20A-SG-US1
CPN: 37-1652-01

354474
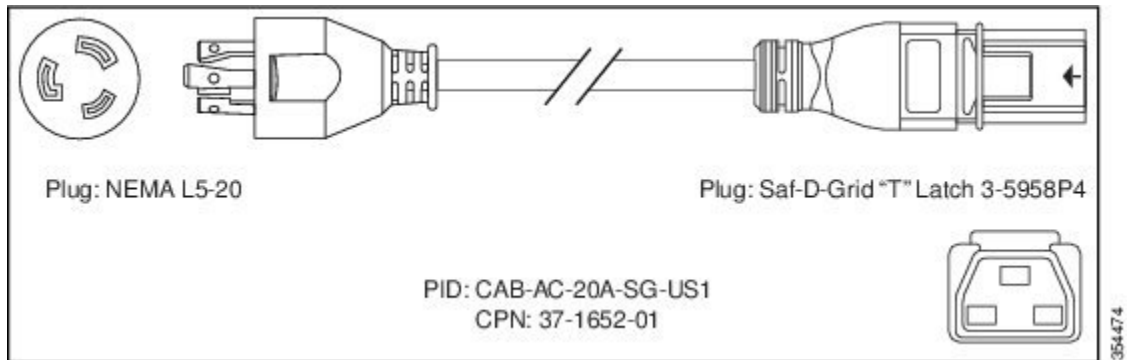
Figure 29: CAB-AC-20A-SG-US2 Power Cord
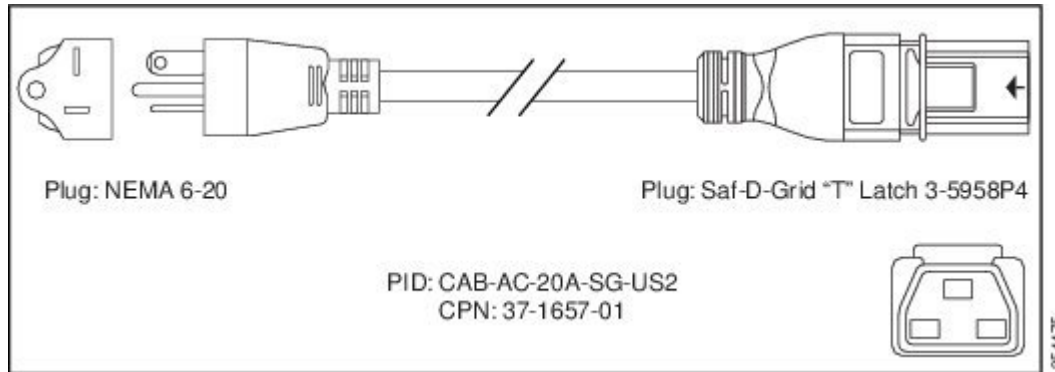
Figure 30: CAB-AC-20A-SG-US3 Power Cord
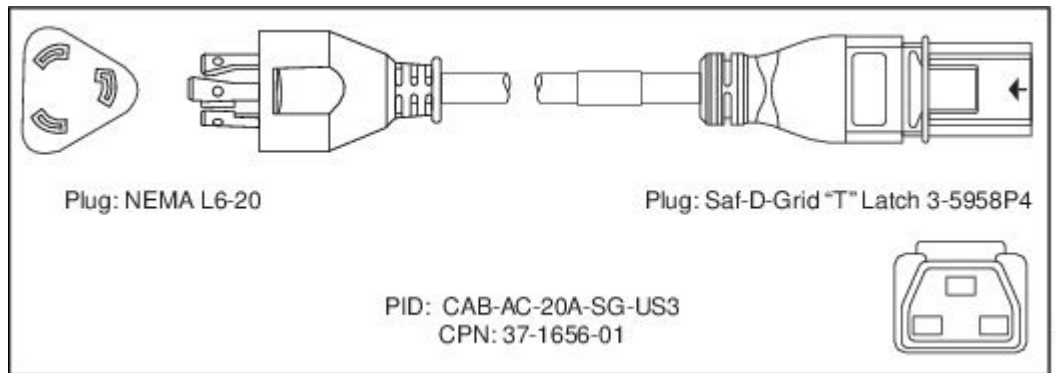
Figure 31: CAB-AC-20A-SG-US4 Power Cord
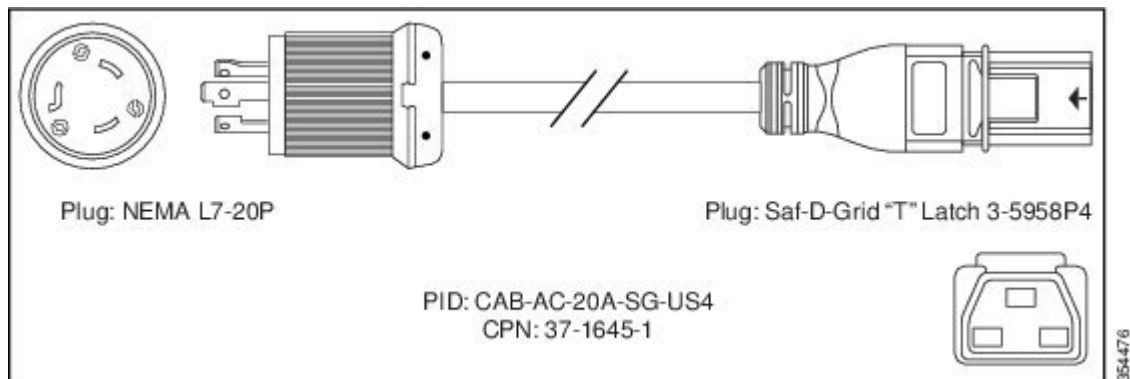
Figure 32: CAB-AC-20A-SG-C20 Power Cord

Plug: IEC C20   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-AC-20A-SG-C20
CPN: 37-1653-01
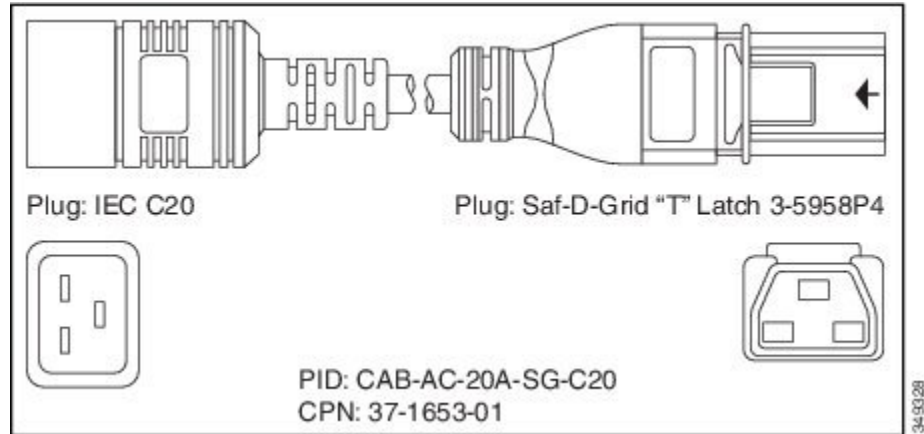
Figure 33: CAB-HV-25A-SG-US2 Power Cord

Plug: 3/8-inch Ring Terminals   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-HV-25A-SG-US2
CPN: 37-1641-01
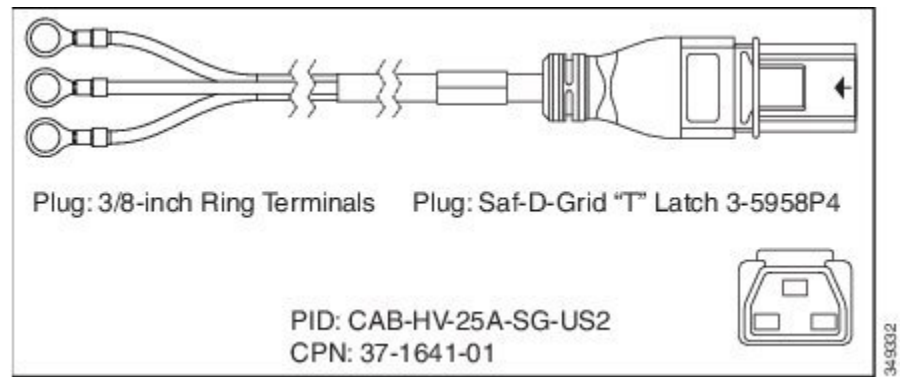
Figure 34: CAB-HV-25A-SG-IN2 Power Cord

Plug: 3/8-inch Ring Terminals   Plug: Saf-D-Grid "T" Latch 3-5958P4

PID: CAB-HV-25A-SG-IN2
CPN: 37-1640-01
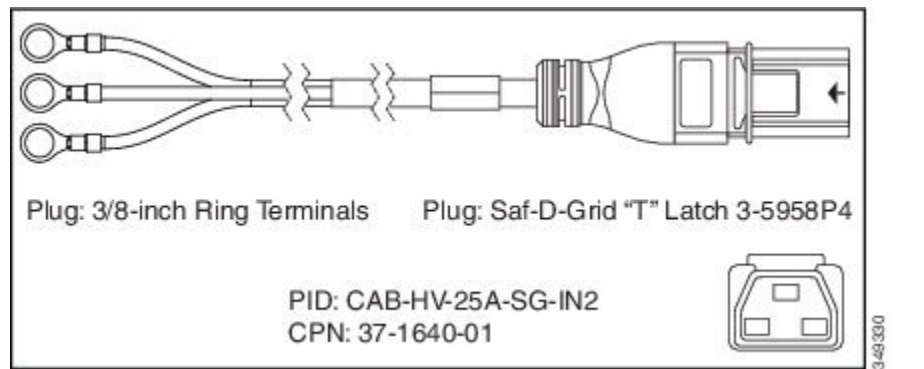
Figure 35: CAB-HV-25A-SG-IN3 Power Cord
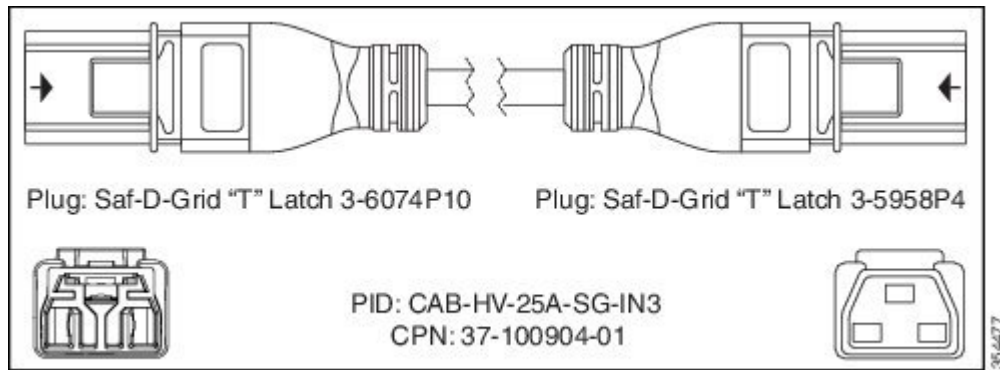
Cisco ASR 9001

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

- 15 A for operation in North America and Japan

- 10 A for international operation

- 13 A for operation in the UK

Each of the AC power inputs requires a separate dedicated branch circuit. For a list of the nominal and acceptable value ranges for source AC power, see AC Input Voltage Range, on page 146.

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

Table 2: AC-Input Power Cord Options for ASR 9001 Router

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

Locale	Part Number	Length	Power Cord Rating
Europe	CAB-9K10A-EU	8.2 feet (2.5 m)	10 A, 250 V
Israel	SFS-250V-10A-IS	8.2 feet (2.5 m)	10 A, 250 V

AC Power Cord Illustrations for Cisco ASR 9001 Router

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

Figure 36: AC Power Cord CAB-AC
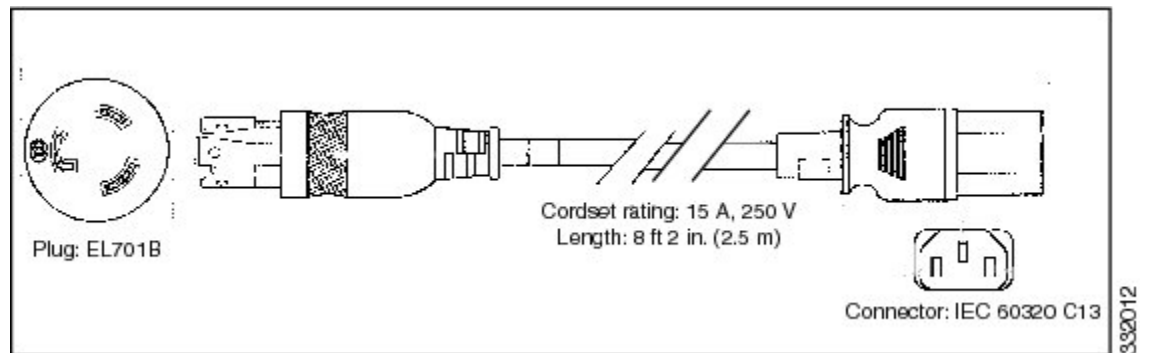
Figure 37: AC Power Cord CAB-L620P-C13-JPN
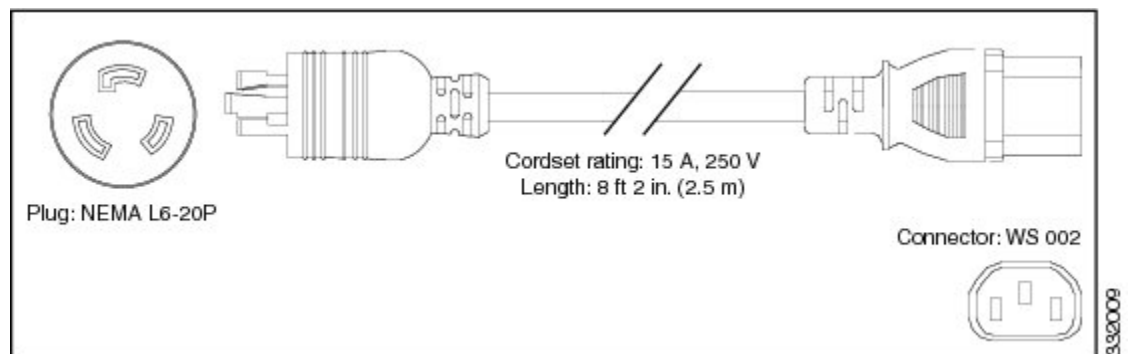
Figure 38: AC Power Cord CAB-ACA
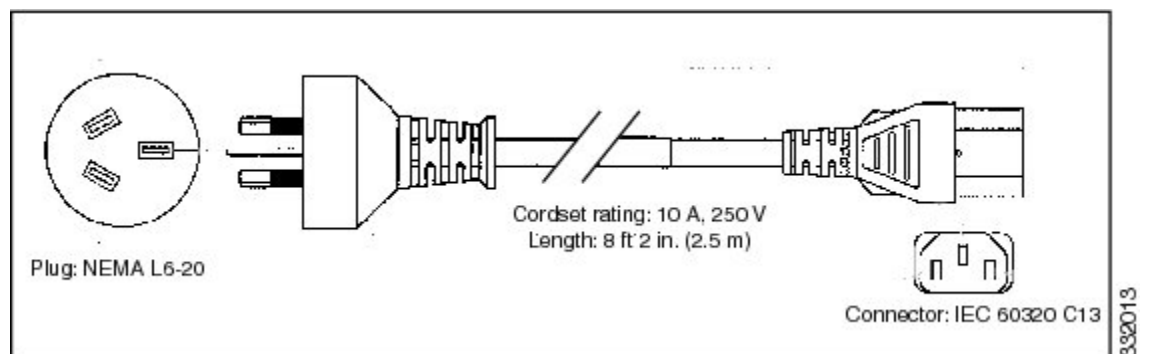
Figure 39: AC Power Cord CAB-ACI

Plug: CEI 23-16

Cordset rating: 10 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: IEC 60320 C13
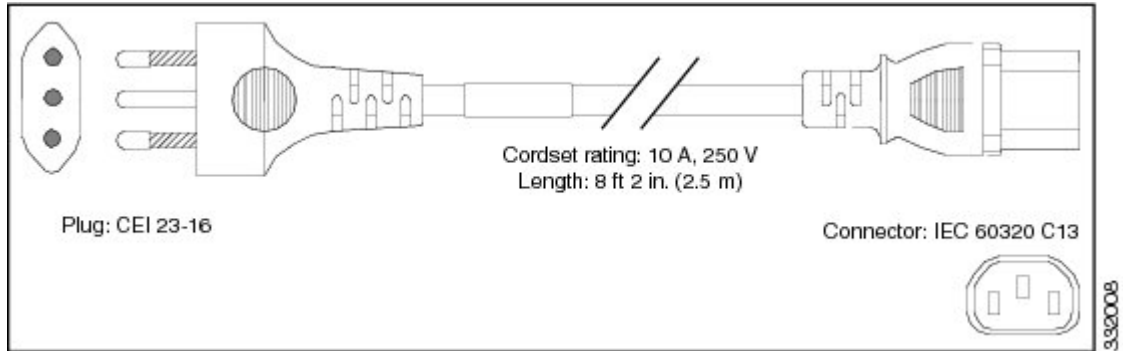
Figure 40: AC Power Cord CAB-ACR

Plug: EL 219 (IRAM 2073)

Cordset rating: 10 A/250 V
Length: 8 ft 2 in. (2.5 m)

Connector: IEC 60320 C13
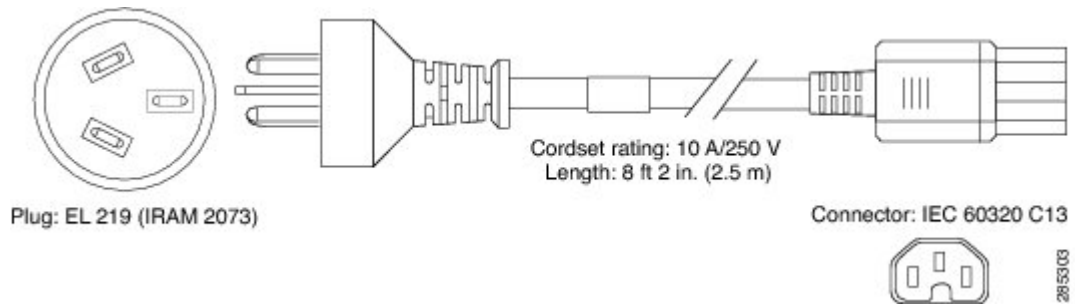
Figure 41: AC Power Cord CAB-ACS

Plug: NEMA L6-20P

Cordset rating: 10 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: WS 002
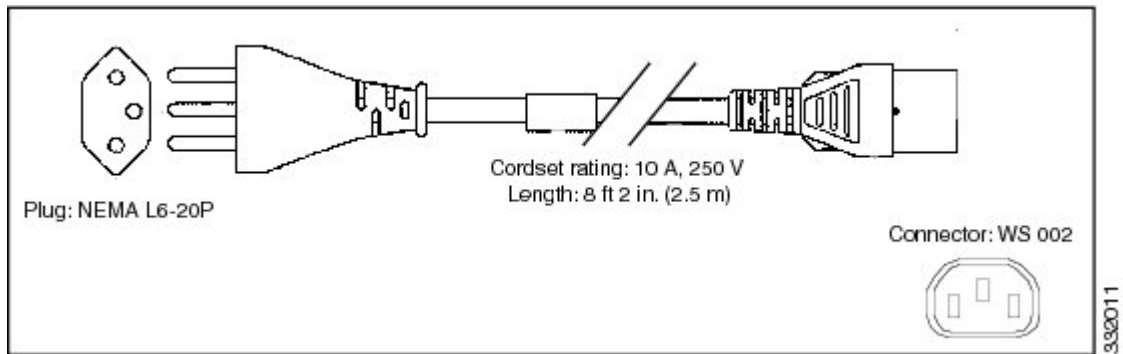
Figure 42: AC Power Cord CAB-ACU

Plug: BSI 1363

Cordset rating: 13 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: IEC 60320 C13

285301
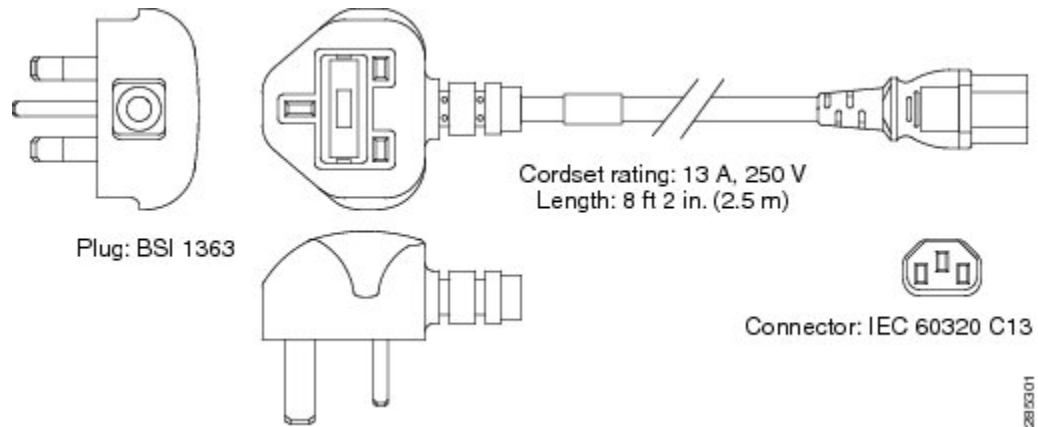
Figure 43: AC Power Cord CAB-ACC

Plug: NEMA L6-20P

Cordset rating: 10 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: WS 002

332010
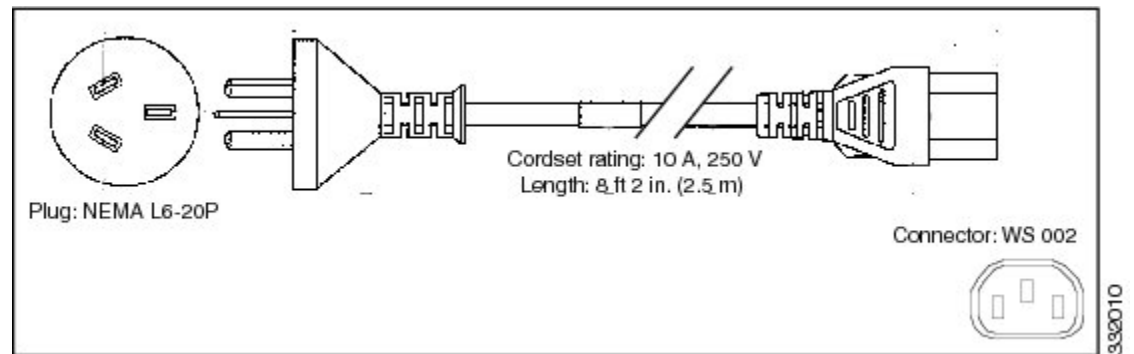
Figure 44: AC Power Cord CAB-ACSA

Plug: EL 208
(SABS 164-1)

Cordset rating: 10 A, 250 V
Length: 8 ft 2 in. (2.5 m)

Connector: IEC 60320 C15

285302
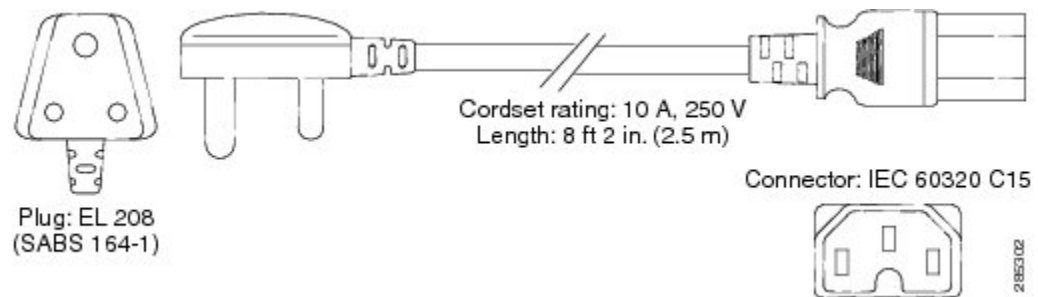
Figure 45: AC Power Cord CAB-9K10A-EU
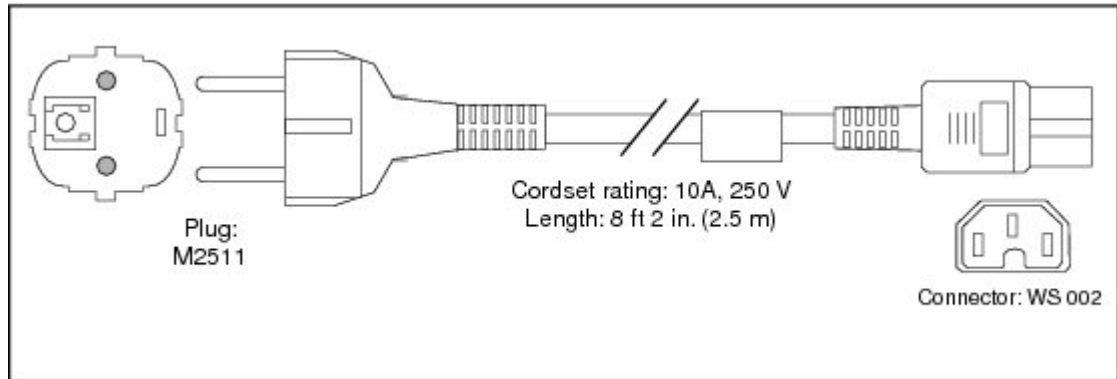
Figure 46: AC Power Cord SFS-250V-10A-IS
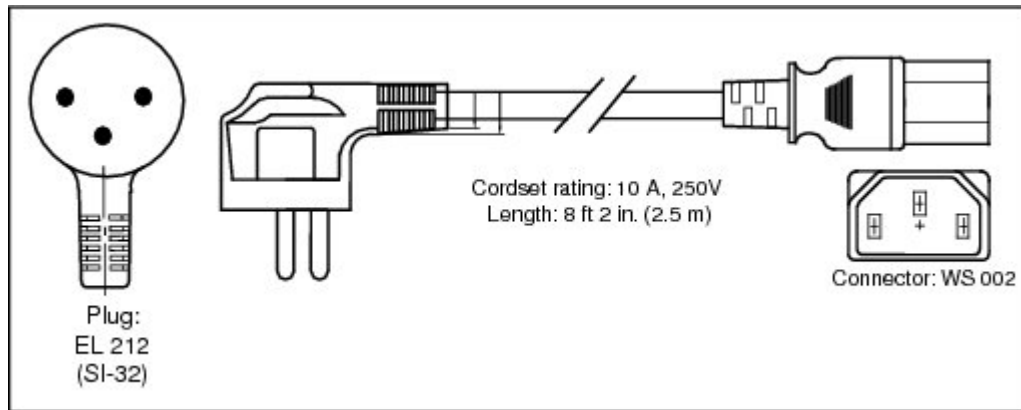
DC Powered Router

Connections to DC power modules are rated at 20 A maximum. The system accepts a nominal input voltage of –48 VDC with an operational tolerance range of –40.5 VDC to –72 VDC. One dedicated, commensurately rated DC power source is required for each power module connection.

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

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

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

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

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

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

Figure 47: Cisco ASR 9901 DC Power Cable Terminal Block
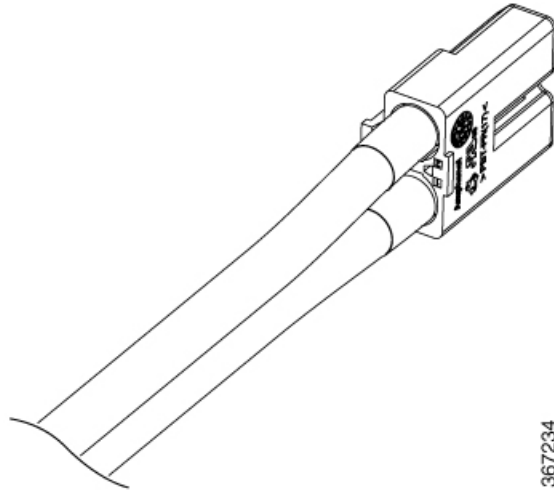
Figure 48: Cisco ASR 9001 DC Power Cable Terminal Block
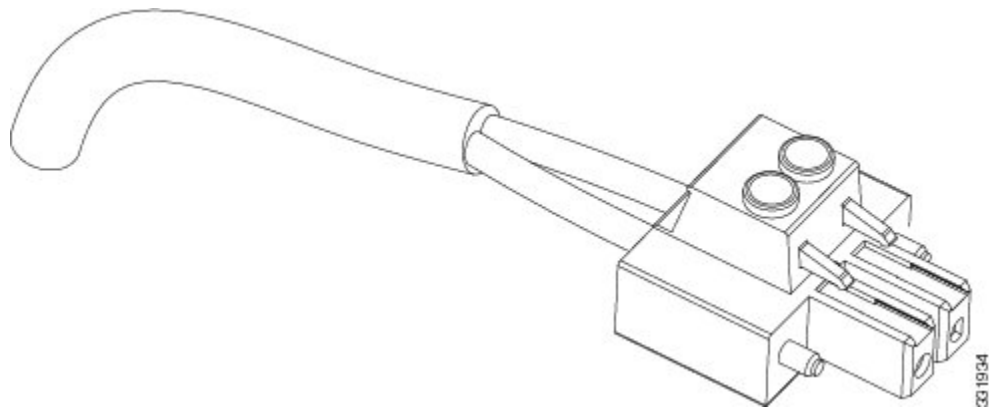
The figure below shows DC power source cable connections for single DC power module.

⚠️

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

⚡

Warning   **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

Figure 49: Cisco ASR 9901 DC Power Source Cabling Scheme for a Single DC Power Module
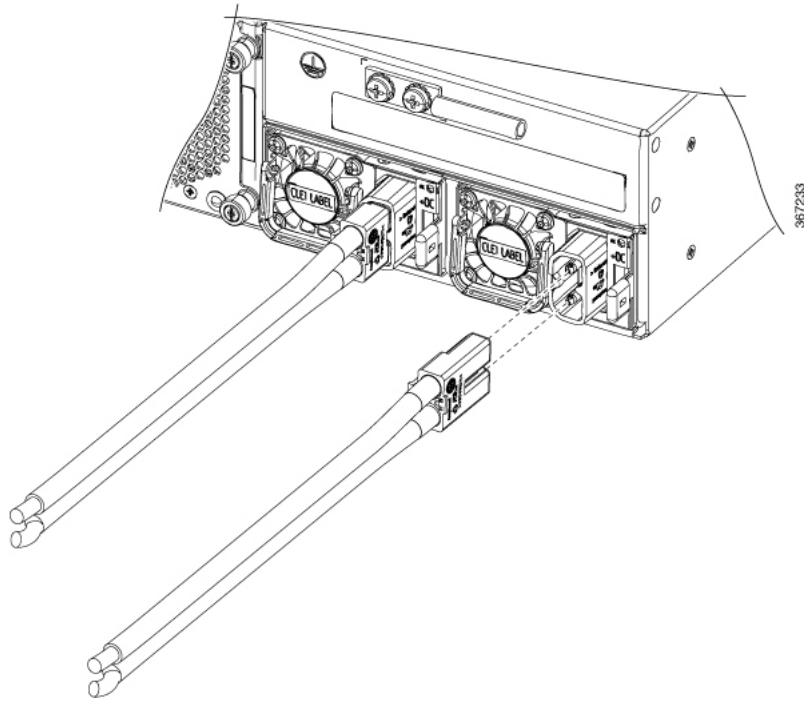
Figure 50: Cisco ASR 9001 DC Power Source Cabling Scheme for a Single DC Power Module
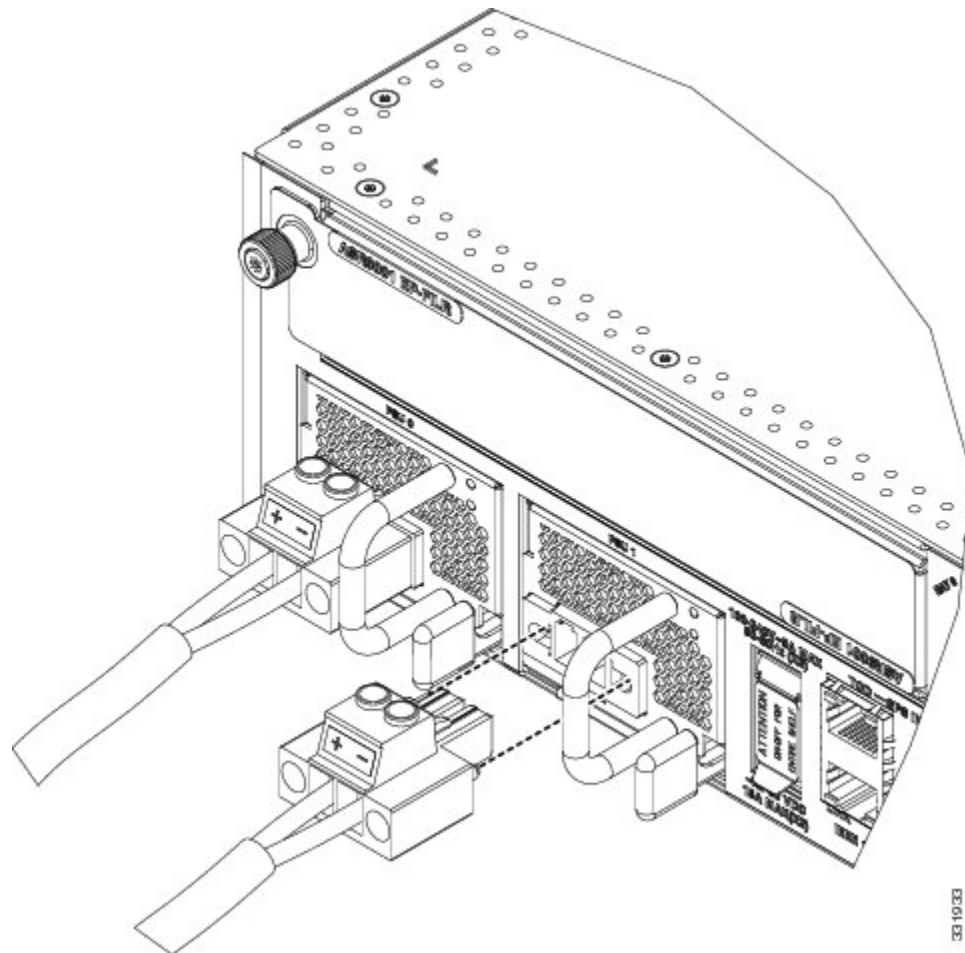
The color coding of the source DC power cable leads depends on the color coding of the site DC power source. Because there is no color code standard for source DC wiring, be sure that power source cables are connected to the power modules using the proper positive (+) and negative (−) polarity:

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

- Green (or green and yellow) cable typically indicates that it is a ground cable.

⚠

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

For a list of the nominal and acceptable value ranges for source DC power, see Power System DC Output Levels, on page 146.

NEBS Supplemental Unit Bonding and Grounding Guidelines

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

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

The following figures show the NEBS grounding locations for the Cisco ASR 9901 Router and Cisco ASR 9001 Router.

Figure 51: NEBS Bonding and Grounding Points on the Cisco ASR 9901 Router
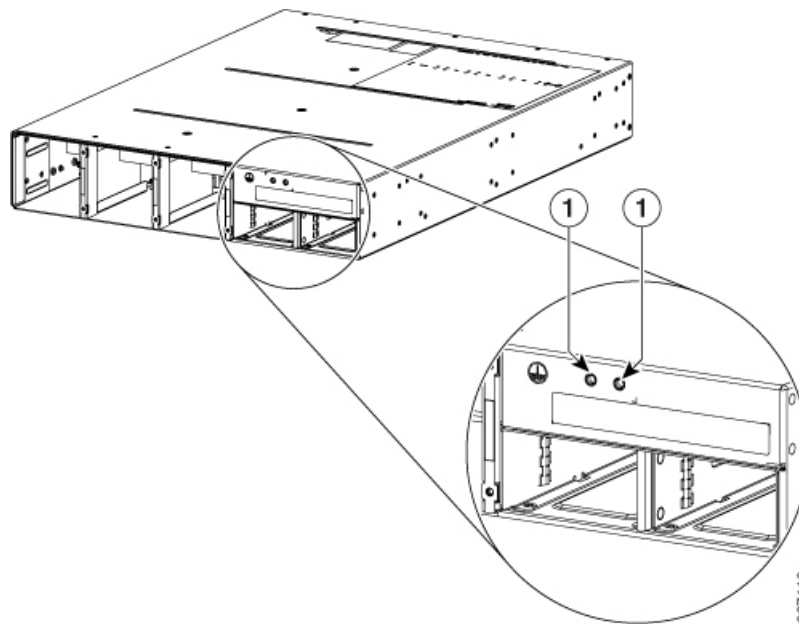
1	NEBS grounding point on rear of chassis

Figure 52: NEBS Bonding and Grounding Points on the Cisco ASR 9001 Router
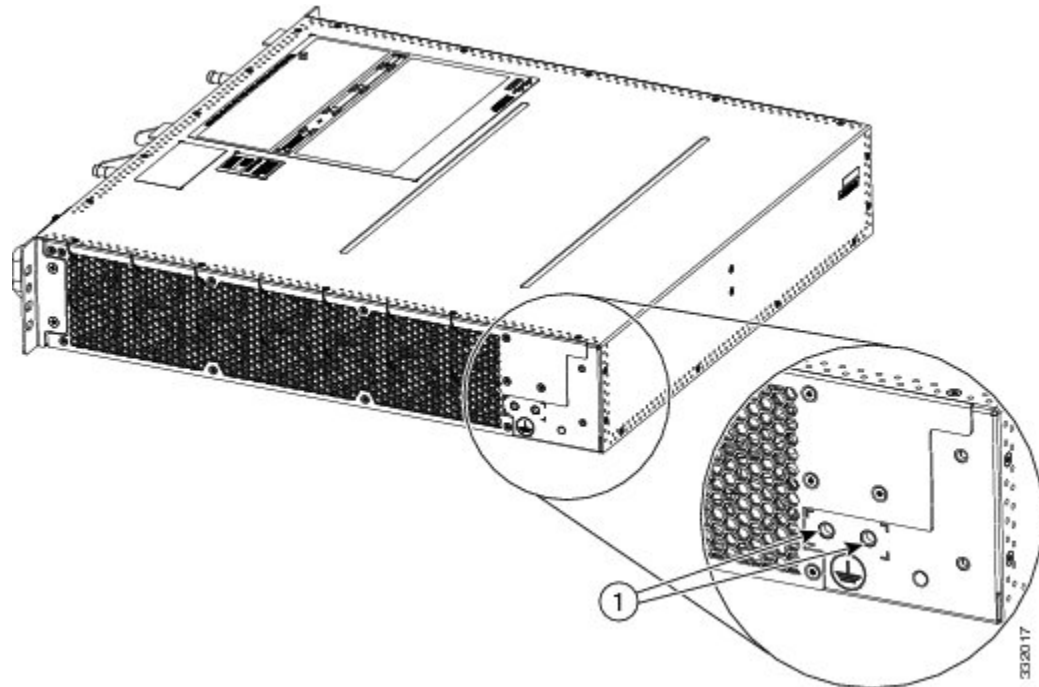
1	NEBS grounding point on side of chassis

To ensure a satisfactory supplemental ground connection to the router, use these 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 large enough to accept a six AWG or larger, multistrand copper wire. For four AWG cable, use Panduit part number LCD4-14AF-L; for six AWG, use Panduit part number LCD6-14AF-L.

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

- One grounding wire. Although we recommend at least six AWG multistrand copper wire, the wire diameter and length depend on your router location and site environment. This cable is not available from Cisco Systems; it is available from any commercial cable vendor.

Port Connection Guidelines

This section contains detailed cabling and signal information for all interface and port connections to the RP. It also provides information for Ethernet routing and equipment.

⚠️

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

Figure 53: Cisco ASR 9901 Router Front Panel Ports
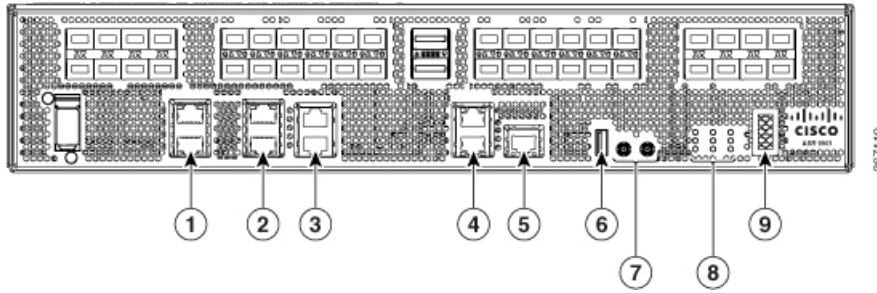
1	SYNC (BITS/J.211) ports	6	External USB port
2	Service LAN and ToD ports	7	10MHz and 1PPS ports
3	CONSOLE and AUX ports	8	Nine discrete LED indicators
4	Management LAN ports	9	LED matrix display
5	Connectivity Management Processor (CMP) port		

Figure 54: Cisco ASR 9001 Router Front Panel Ports
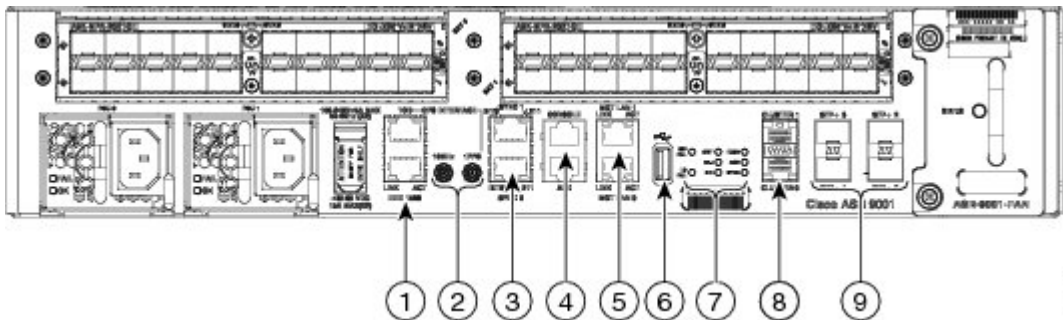
1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS ports	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports
4	CONSOLE and AUX ports	9	Fixed SFP+ ports
5	Management LAN ports		

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

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

Table 3: Cisco ASR 9901 and Cisco ASR 9001 Router Front Panel Ports Description

Port Name	Connector Type	Description
TOD Port	RJ45	Time of Day Input/Output Port along with 1PPS Signal. Signal type is RS422.
Service LAN Port (IEEE 1588)	RJ45	A 10/100Mbps Ethernet Port for IEEE1588 Grand Master Connection through CAT5 cable. Signal type is MLT3.
10MHz Connector	SMB	10MHz Input or Output for GPS Synchronization. This signal can provide 10MHz output as well from Cisco ASR 9001 Router. Signal type is sinusoidal.
1PPS Connector	SMB	1PPS Input or Output for GPS Synchronization. This signal can provide output as well from Cisco ASR 9001 Router. Signal type is square wave.
SYNC Ports (SYNC 0/SYNC 1)	RJ45	Used as BITS or DTI (one at a time) Input/Output Port based on the configuration used. CAT5 Ethernet cable can be used for DTI. In DTI mode link resembles an Ethernet (802.3) 10BaseT link. Signal type depends on the mode such as B8ZS for T1, HDB3 for E1, Manchester Coded Data for DTI, Sinusoidal for 6.3128 Out.
CONSOLE Port	RJ45	Local Craft Terminal for connecting the box with terminal. Used to command the CPU and to collect CPU log. This console port operates at default 115200 baud rate. Signal type is RS232.
AUX Port	RJ45	Local Craft Terminal with modem handshaking signals. This port operates at default 115200 baud rate. Signal type is RS232.
Management LAN Ports (MGT LAN 0/1)	RJ45	Management Port. It is a tri speed (10/100/1000 Mbps) Ethernet port with auto negotiation enabled. Connection through CAT5E cable. Signal type is 8B/10B for 1G, MLT3 for 100 Mbps, Manchester coded for 10 Mbps.

Port Name	Connector Type	Description
USB Port	USB TYPE-A Receptacle	For connecting USB Device. This port can be used to upload installable modules, temporary binaries, scripts etc through USB disk. Also, it can be used to transfer router log from the internal eUSB to the external memory stick. Signal type is NRZI.
CLUSTER Ports (0/1) (Cisco ASR 9001 Router only)	SFP	For Cascading two Cisco ASR 9001 Router systems. The pinout and signal level is as per the SFP standard. This supports copper/optical SFP modules.

Console Port and Auxiliary Port Connection Guidelines

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

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

- Auxiliary port—RJ-45 interface for connecting a modem.

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

Console Port Signals

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

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

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

Table 4: RP Console Port Signals

Console Port Pin	Signal	Input/Output	Description
1	RTS	Output	Request to Send
2	—	—	(Not connected)
3	TxD	Output	Transmit data
4	GND	—	Signal ground
5	GND	—	Signal ground

Console Port Pin	Signal	Input/Output	Description
6	RxD	Input	Receive data
7	—	—	(Not connected)
8	CTS	Input	Clear to Send

Auxiliary Port Signals

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

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

Table 5: 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

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

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

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

Management port characteristics are:

- Maximum transmission unit (MTU) is fixed at 1514 and cannot be configured.

- Flow control is disabled and cannot be configured.

- Input unicast packets with an unknown destination address are filtered and dropped.

• Autonegotiation of port speed (10/100/1000) and duplex (full/half) is supported. Autonegotiation cannot be disabled.

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

Table 6: RP Management LAN Port Signals

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

Management LAN Port LED Indicators

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

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

Figure 55: RP Management LAN Port LED Indicators
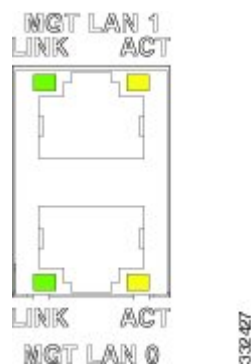
Management LAN RJ-45 Cabling

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

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

Figure 56: Straight-Through Cable Pinout to a Hub, Repeater or Switch
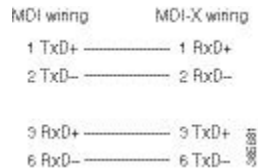
When connecting to a router, use the crossover cable pinout shown in the figure below.

Figure 57: Crossover Cable Pinout Between RP
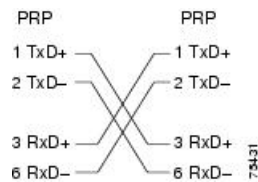
Sync Ports Connection Guidelines

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

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

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

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

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

SYNC Port LED Indicators

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

- in BITS mode:

    - Green — Connection is alive.
    - Amber — A fault has occurred.

- in J.211 mode:

    - Green — DTI is operating in normal mode.
    - Amber — DTI is operating in fast mode.

Figure 58: SYNC Port Connector
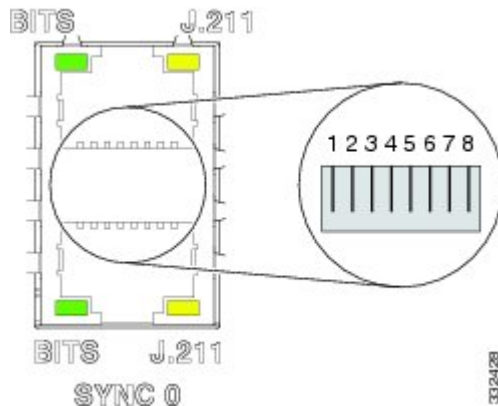
Table 7: BITS/J.211 Connector Pinout

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

RP External USB Port

The Cisco ASR 9901 Router and Cisco ASR 9001 Router has an external USB Type A slot accessible on the front panel. The front panel USB slot accepts widely available USB thumb drives. The only restriction on devices you can plug into the front panel external USB slot is that they need to be USB 2.0 devices. These devices can be formatted with FAT16, FAT32 or QNX4 file systems.

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

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

Unpacking and Installing the Chassis

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

Pre-Installation Considerations and Requirements

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

In particular, observe the guidelines for preventing electrostatic discharge (ESD) damage described in Preventing Electrostatic Discharge Damage, on page 4. Use the figure as a reference in locating and using the ESD sockets on the front of the router chassis.

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

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

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

Unpacking the Router

Follow these steps to unpack the Cisco ASR 9901 Router or Cisco ASR 9001 Router from its shipping container (see the below figures).

Figure 59: Unpacking the Cisco ASR 9901 Router from the Shipping Container
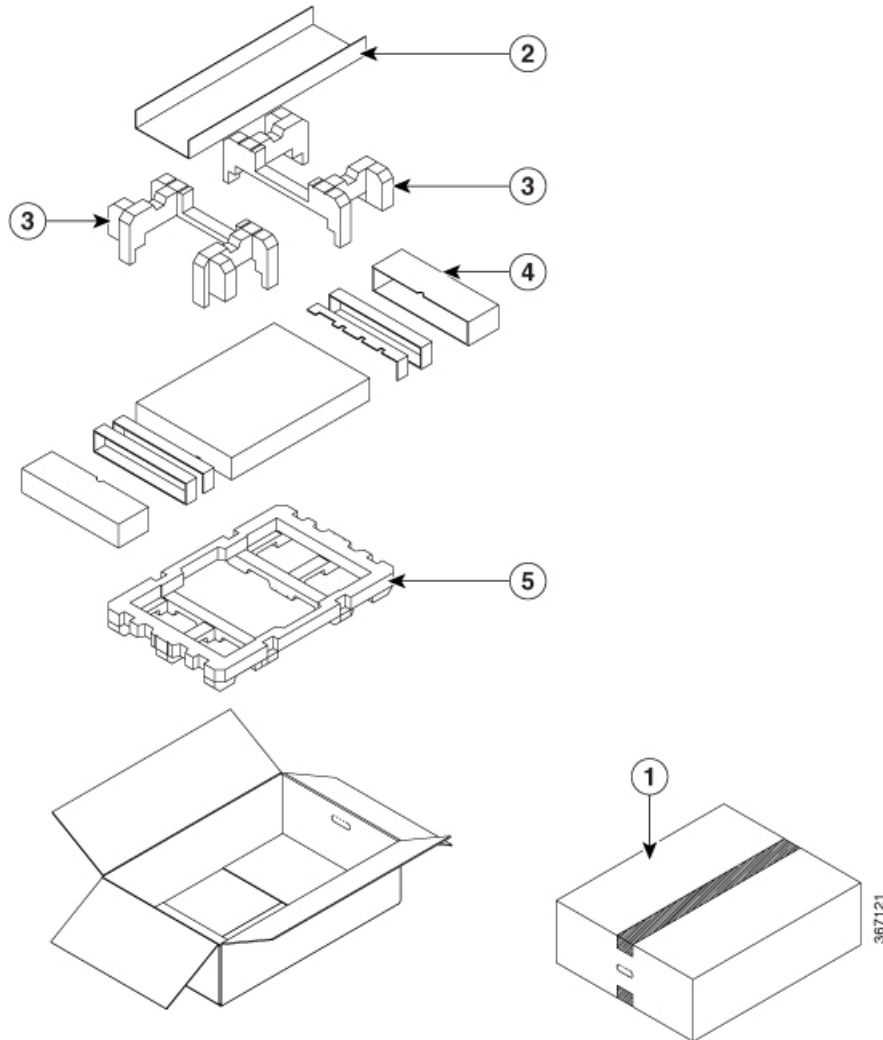
Figure 60: Unpacking the Cisco ASR 9001 Router from the Shipping Container
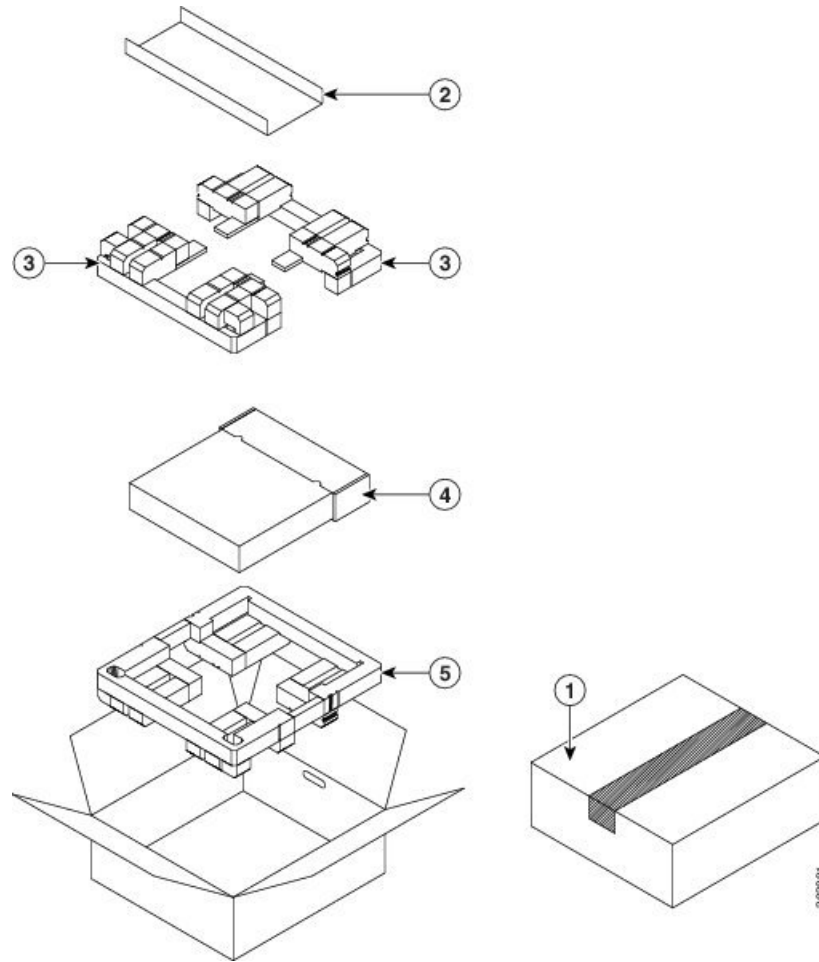
1	Cardboard packaging container	4	Cardboard cap
2	Accessory tray	5	Foam packaging material - bottom cap
3	Foam packaging material- top caps		

Procedure

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

Step 2   Remove the accessory box.

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

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

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

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

Positioning the Router

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

Verifying Rack Dimensions

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

Procedure

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

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

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

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

- **Cisco ASR 9901**—The space must be at least 17.75 inches (45.085 cm) to accommodate the width of the chassis with the mounting brackets and slide rails, and fits between the mounting posts on the rack.

- **Cisco ASR 9001**—The space must be at least 17.7 inches (45 cm) to accommodate the chassis, which is approximately 17.45 in. (44.32 cm) wide, and fits between the mounting posts on the rack.

Installing the Cisco ASR 9901 Chassis

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

Before you Begin

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

- ESD-preventive wrist strap

- Number 1 and number 2 Phillips screwdrivers

- 1/4-inch (6.35-mm) and 3/16-inch (4.5-mm) flat-blade screwdrivers

- Tape measure

> • Level (optional)

> • One of the following rack-mounting kits (provided by Cisco):

>> • Cisco PID ASR-9901-2P-KIT for mounting the chassis in a 19-inch or 23-inch two-post rack.

>> • Cisco PID ASR-9901-4P-KIT for mounting the chassis in a 19-inch or 23-inch four-post rack.

Installing the Chassis in a Two-Post Rack

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

Before you begin

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

Procedure

Step 1   Attach the mounting brackets to the sides of the chassis using twelve M4 flat-head screws per side. The recommended maximum torque is 15 in.-lb (1.7 N-m).
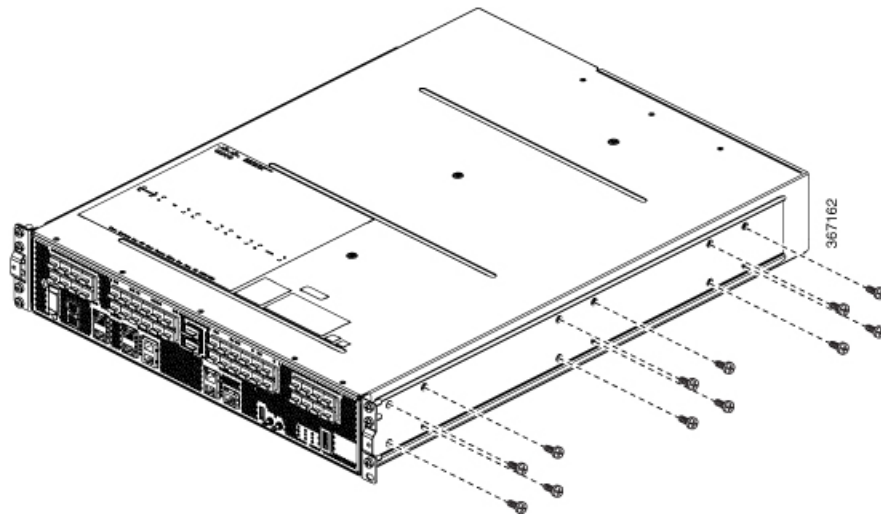
Step 2   Attach the left and right slide rail assemblies to the back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).
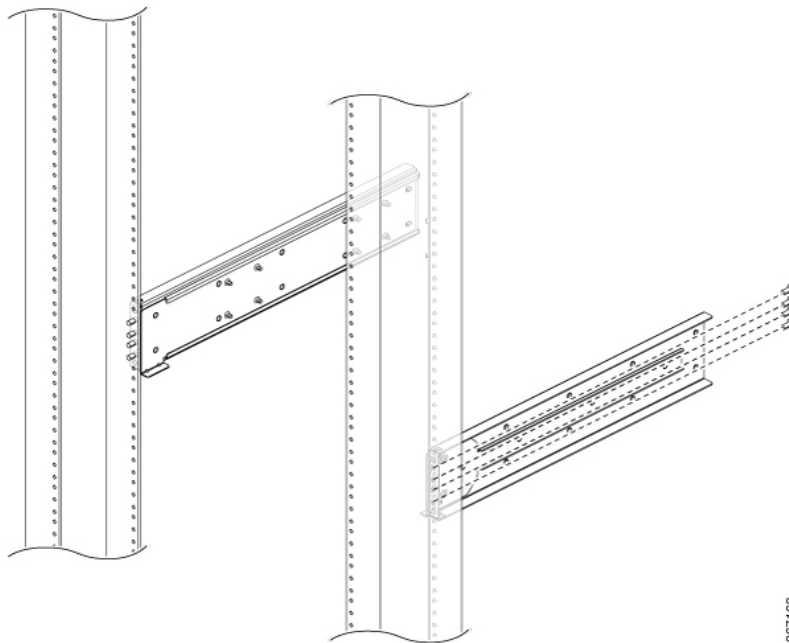
Note   If you are installing the router in a 23-inch rack, attach extension plates to the front and back of the 2-post rack using six M5 pan head screws each. Use a level to make sure the plates are level. Attach the left and right slide rail assemblies to the extension plates on back of the 2-post rack using four M5 pan head screws per side. The recommended maximum torque is 31 in.-lb (3.5 N-m).
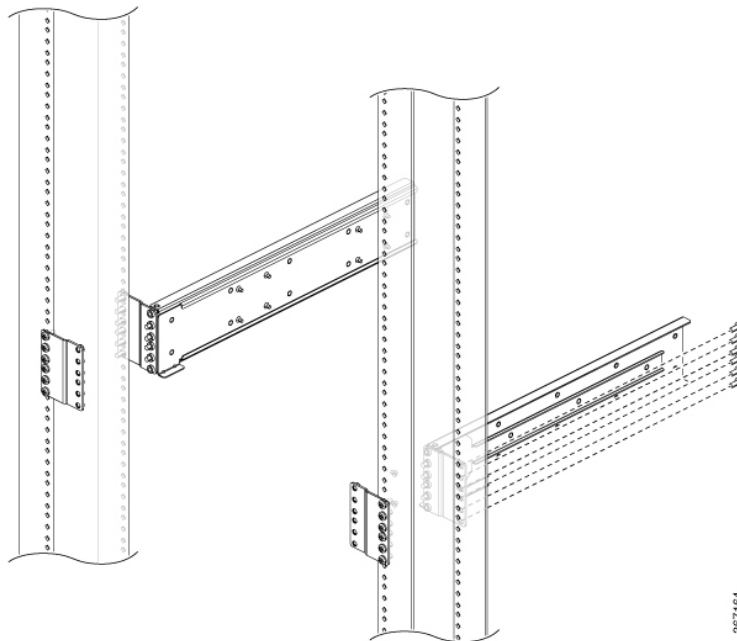
Step 3   Use two persons to lift the chassis into the rack holding the top and bottom of the chassis.

Figure 61: Correct Lifting Positions
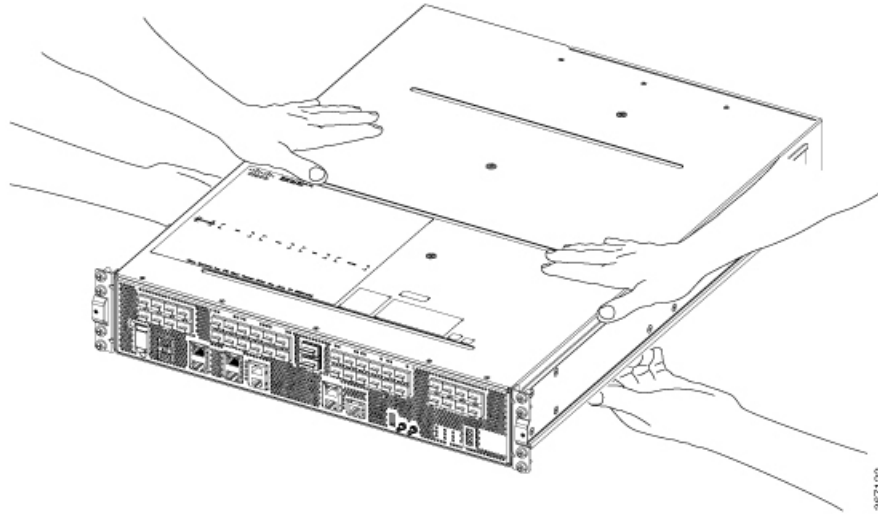
Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

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

Figure 62: 19-Inch Two-Post Rack
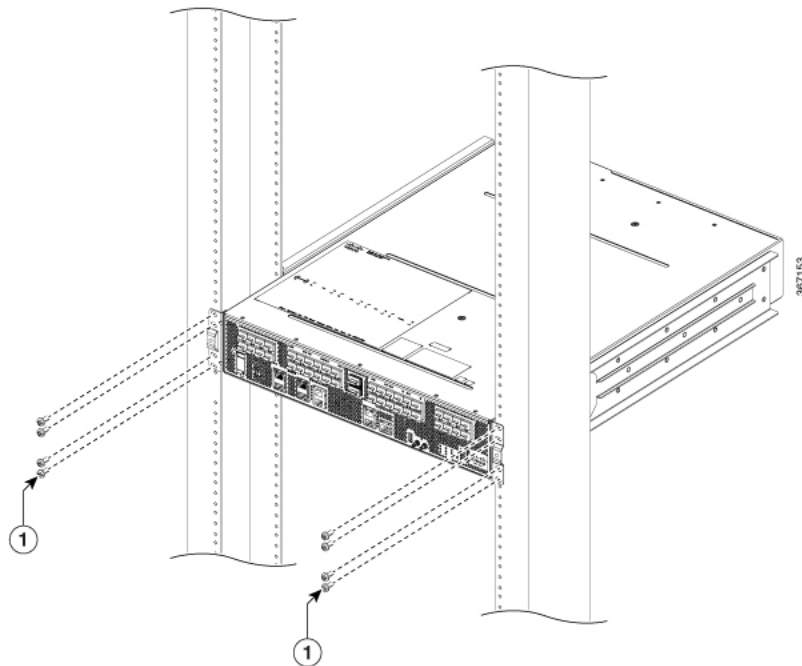
Figure 63: 23-Inch Two-Post Rack
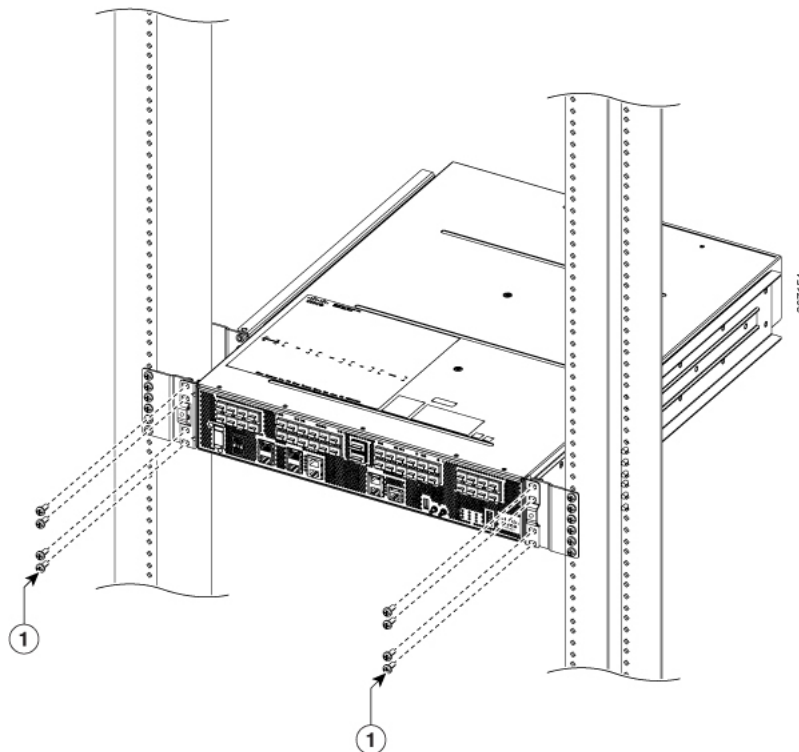
1	Four screws on each side to attach the chassis to the rack

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

Installing the Chassis in a Four-Post Rack

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

Before you begin

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

Procedure

Step 1   Attach the mounting brackets to the sides of the chassis using twelve M4 flat-head screws per side. The recommended maximum torque is 15 in.-lb (1.7 N-m).
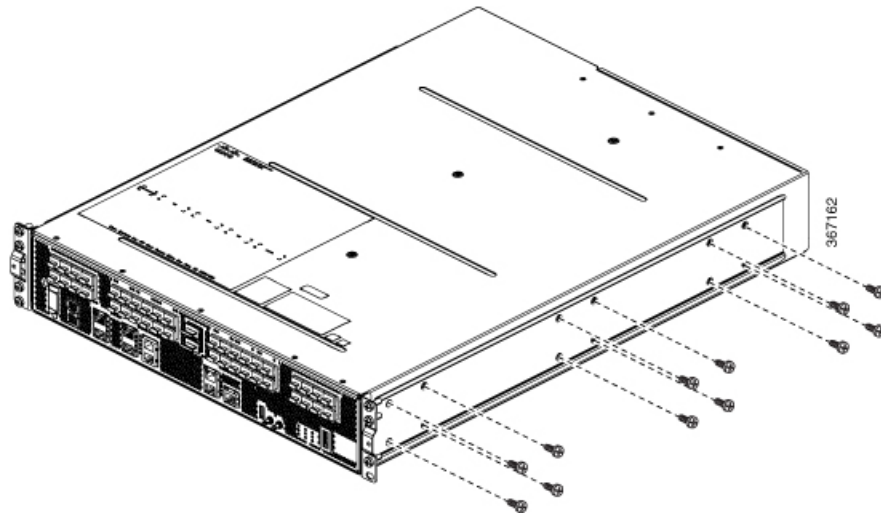
Step 2   Attach the right slide rail assembly to the right side of the rack. Use two M5 pan head screws in the center holes of the front bracket and four M5 pan head screws for the rear bracket. Repeat for the left slide rail assembly. The recommended maximum torque is 31 in.-lb (3.5 N-m).
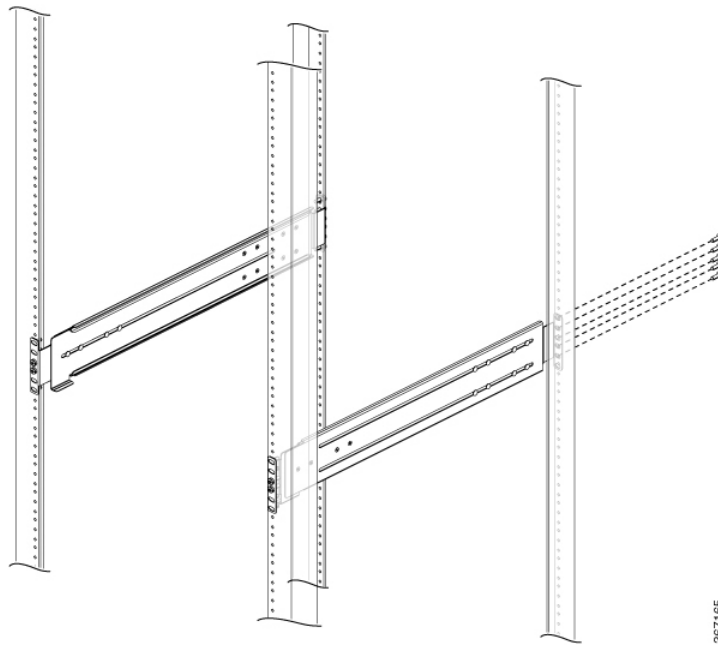
Note   If you are installing the router in a 23-inch rack, attach extension plates to each post of the rack using six M5 pan head screws per plate. Use a level to make sure the plates are level. Attach the left and right slide rail assemblies to the extension plates on each post using two M5 pan head screws in the center holes of the front bracket and four M5 pan head screws for the rear bracket. The recommended maximum torque is 31 in.-lb (3.5 N-m).
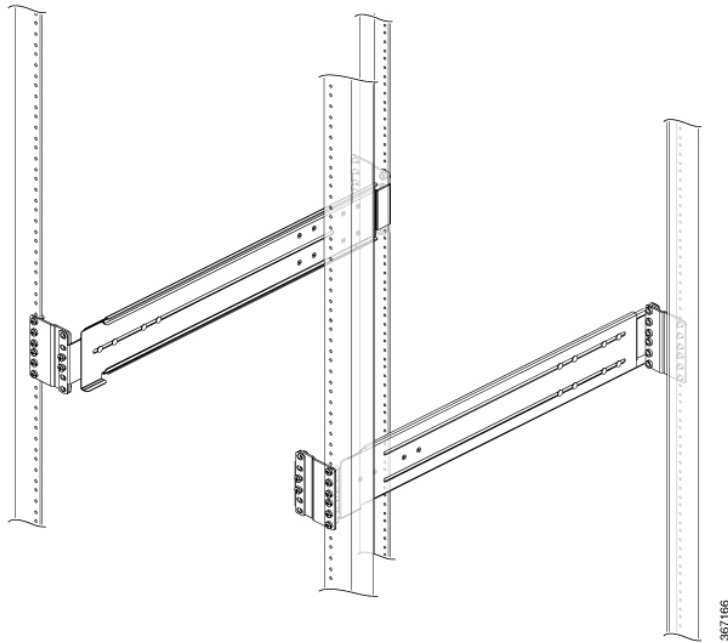
Step 3 Use two persons to lift the chassis into the rack holding the top and bottom of the chassis (see the figure below).

Figure 64: Correct Lifting Positions
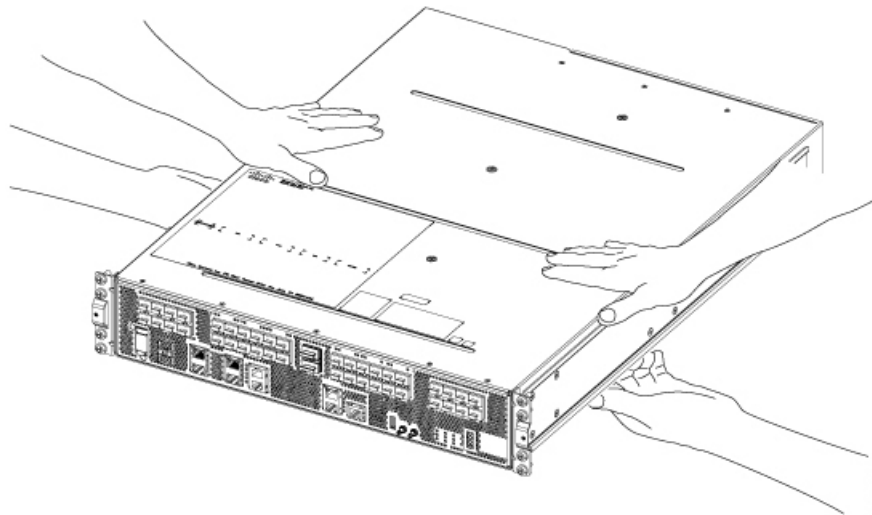
Step 4 Position the chassis so that the mounting brackets on the sides of the chassis align with the slide rail assemblies.

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

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

Figure 65: 19-Inch Four-Post Rack
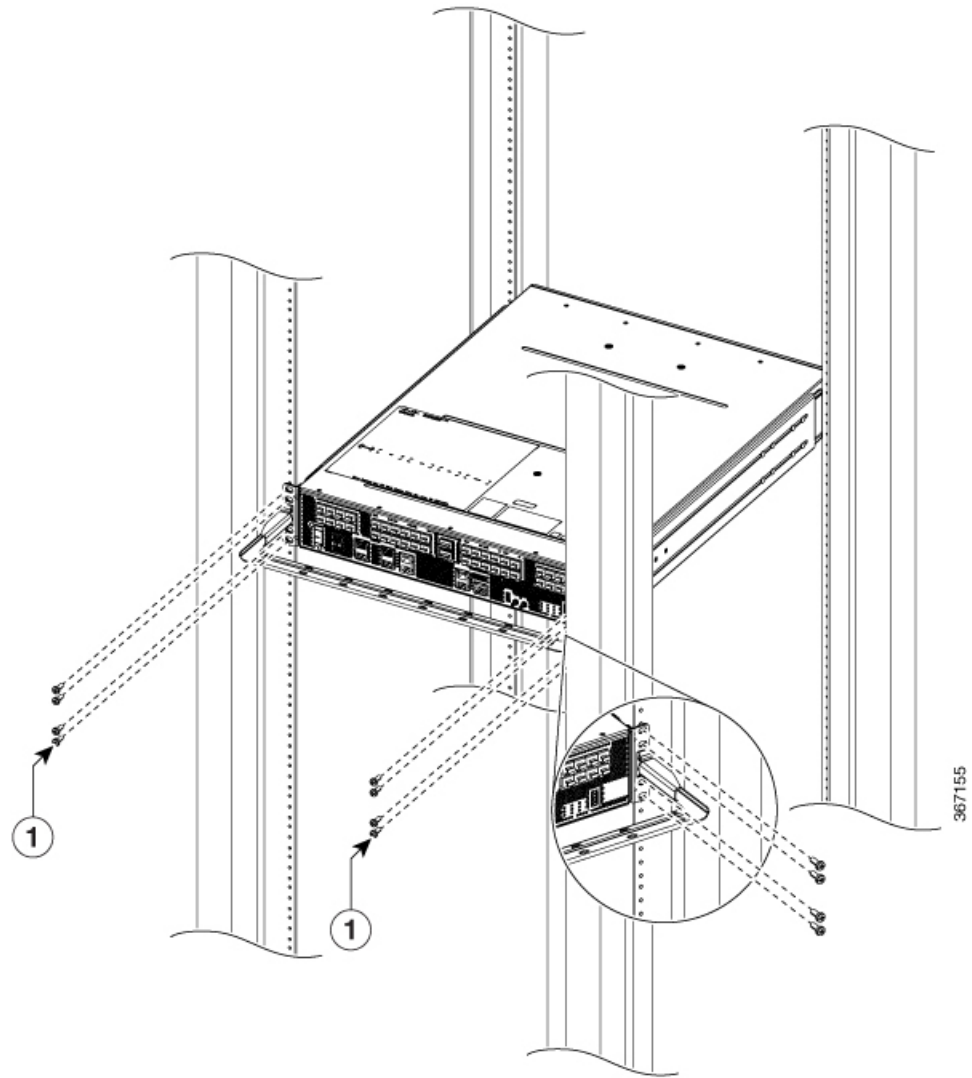
Figure 66: 23-Inch Four-Post Rack
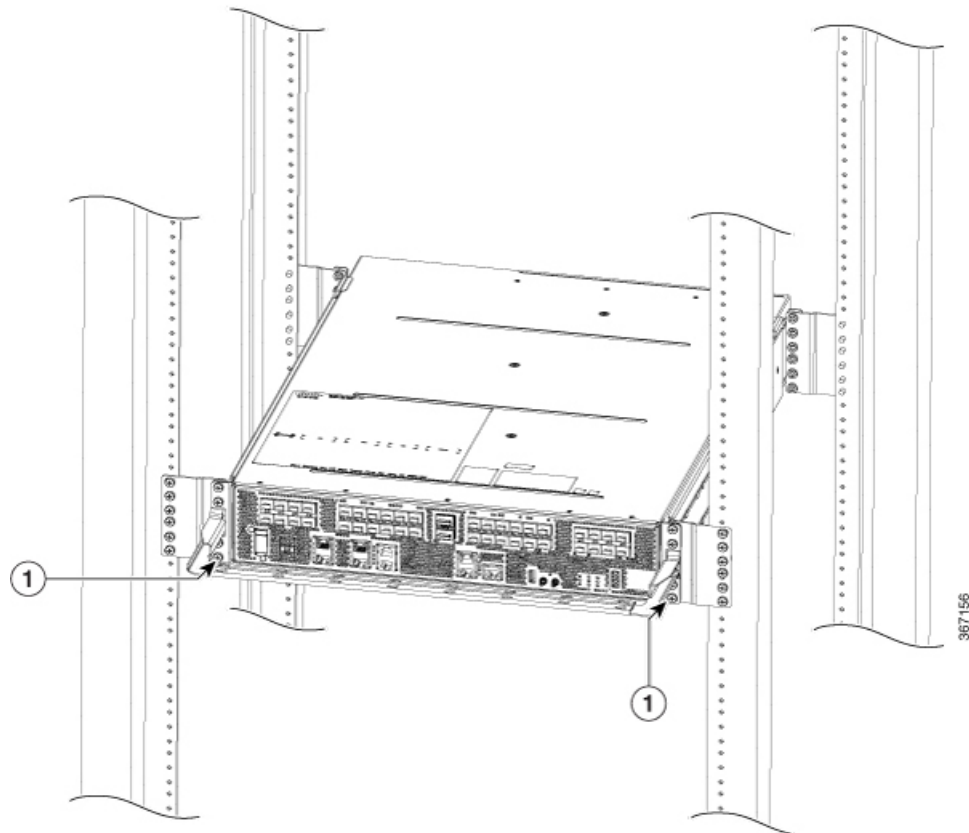
1	Four screws on each side to attach the chassis to the rack

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

Installing the Cisco ASR 9001 Chassis

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

Before you Begin

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

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

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

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

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

Rack-Mounting the Chassis

The chassis is installed in a front-mounted position, as shown in Figure 10: Cisco ASR 9901 Router Mounted in a 2-Post Rack. In a front-mounted position, the chassis rack-mounting flanges are secured directly to the rack posts.

Note   Before you install the chassis in a rack, read the information in Rack-Mounting and Air Flow Clearance Guidelines, on page 11.

Installing the Chassis in a Two-Post Rack

Before you install the chassis in the rack, make sure that you have the necessary tools and equipment (see Before you Begin, on page 56).

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

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

Procedure

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

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

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

Figure 67: Correct Lifting Positions
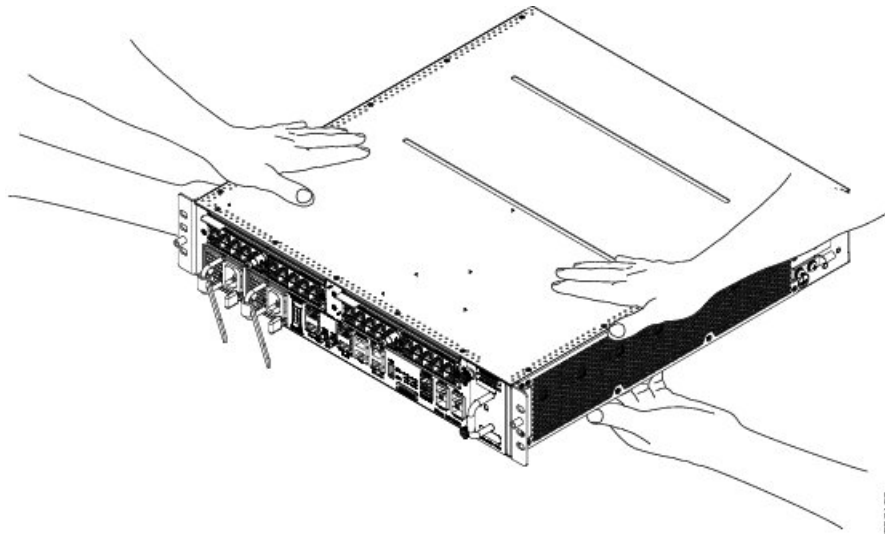
Caution   Do not grasp air inlet or exhaust when lifting the router chassis.

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

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

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

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

What to do next

Figure 68: Installing the Cisco ASR 9001 Chassis in a Two-Post Rack
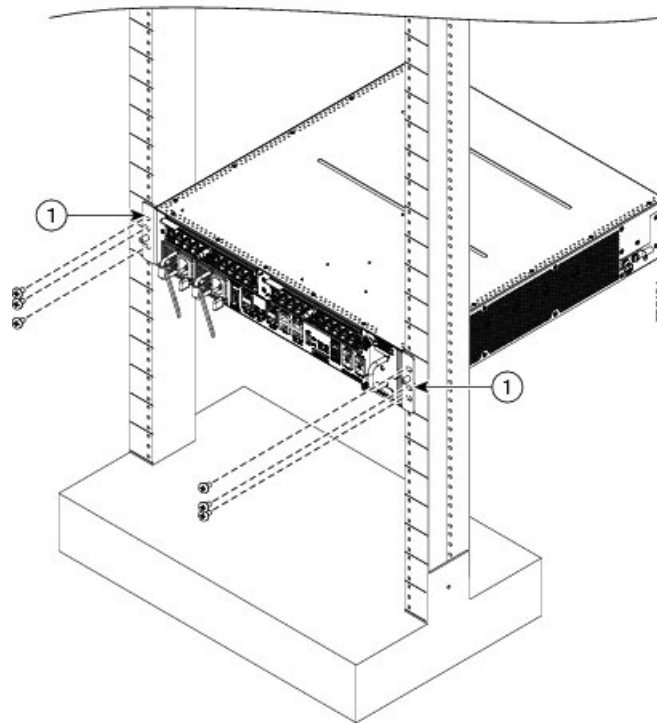
| 1 | Three screws on each side (minimum two) to attach the chassis to the rack |

Installing the Chassis in a Four-Post Rack

If you are installing the chassis without air plenum kit, you will need two side mounting brackets used to attach the chassis to the rear posts as shown in the figure below. See Before you Begin, on page 56 for mounting bracket information.

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

Procedure

Step 1 Follow the steps in Installing the Chassis in a Two-Post Rack, on page 57 to secure the chassis to the front rack posts.

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

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

What to do next

Figure 69: Installing the Cisco ASR 9001 Router Chassis in a Four-Post Rack
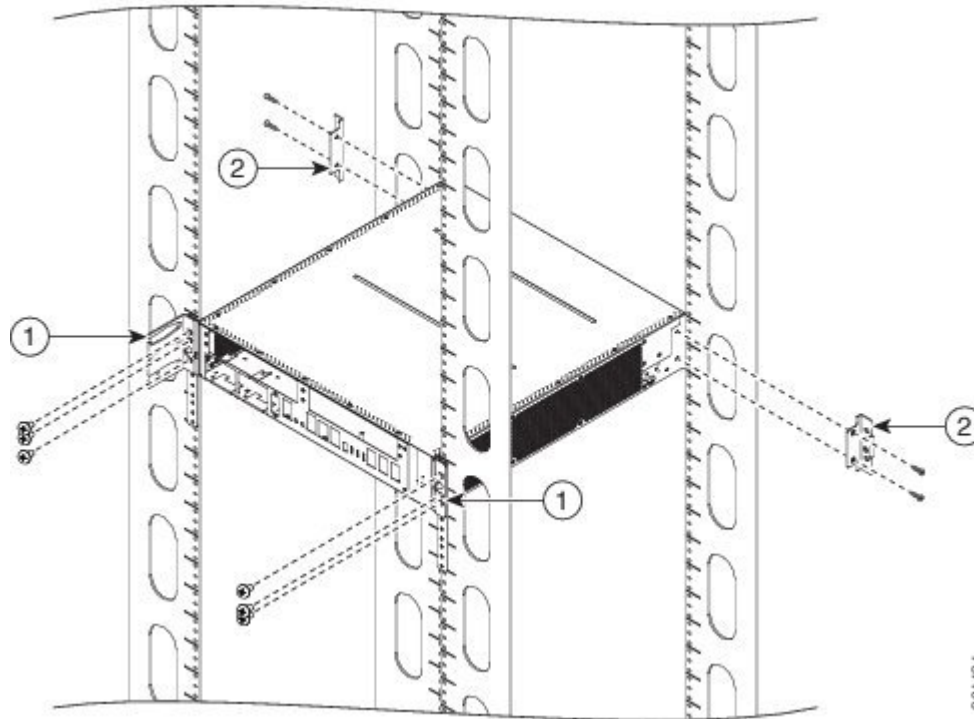
1	Three screws on each side (minimum two) to attach the chassis to the rack.	2	Two rear mounting brackets on each side to attach the chassis to the rear rack posts.

Supplemental Bonding and Grounding Connections

Before you power on the router for the first time, we recommend that you connect the central office ground system or Network Equipment Building System (NEBS) to the threaded supplemental bonding and grounding receptacles on the router. For more information on supplemental bonding and grounding cable requirements, see NEBS Supplemental Unit Bonding and Grounding Guidelines, on page 34.

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

Procedure

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

Figure 70: NEBS Bonding and Grounding for the Cisco ASR 9901 Router
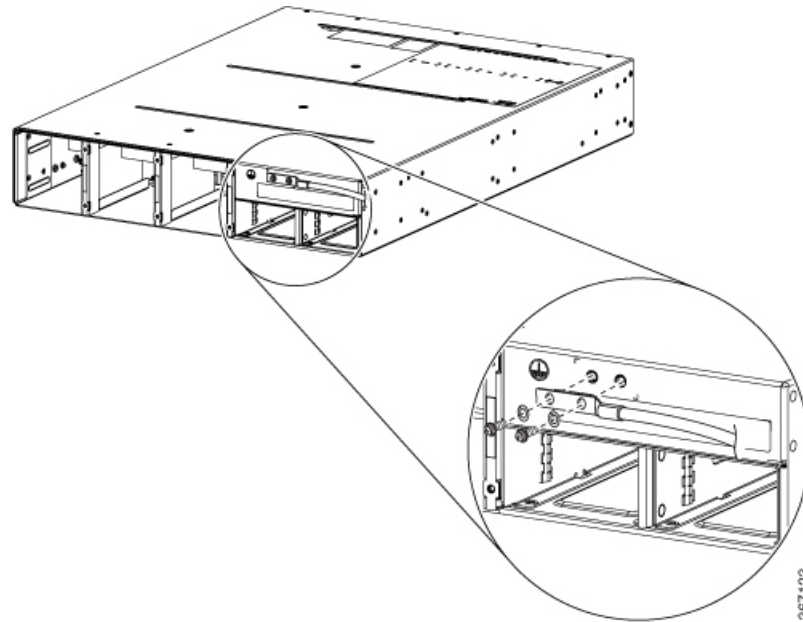
Figure 71: NEBS Bonding and Grounding for the Cisco ASR 9001 Router
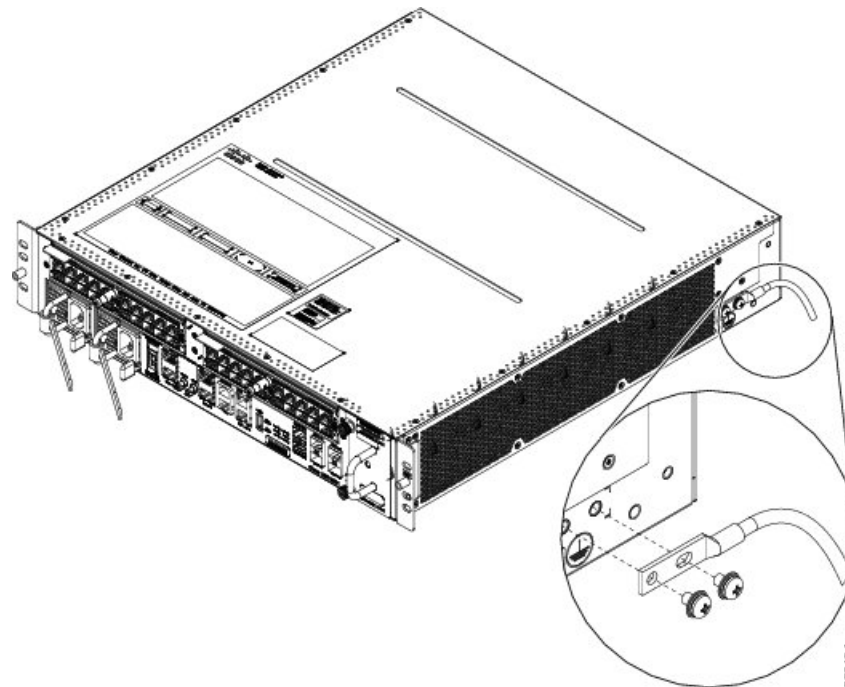
Step 2   Tighten the grounding screws securely to the receptacles.

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

Installing the Optional Air Plenum Kit

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

Air Plenum Kit Contents
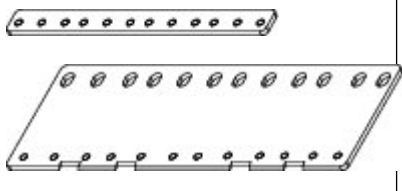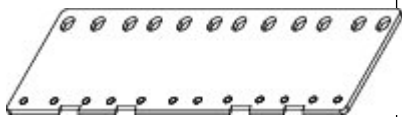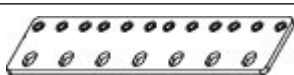
The Cisco ASR 9001 Plenum Kit includes:

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

Supported Rack Types and Adapter Plates

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

Table 8: Supported Rack Types and Adapter Plates

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

Installing the Air Plenum Kit

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

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

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

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

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

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

Installing the Air Plenum Kit in a 19-inch Rack

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

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

Procedure

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

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

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

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

Figure 72: Installing the Plenum Base in a 19-inch Rack
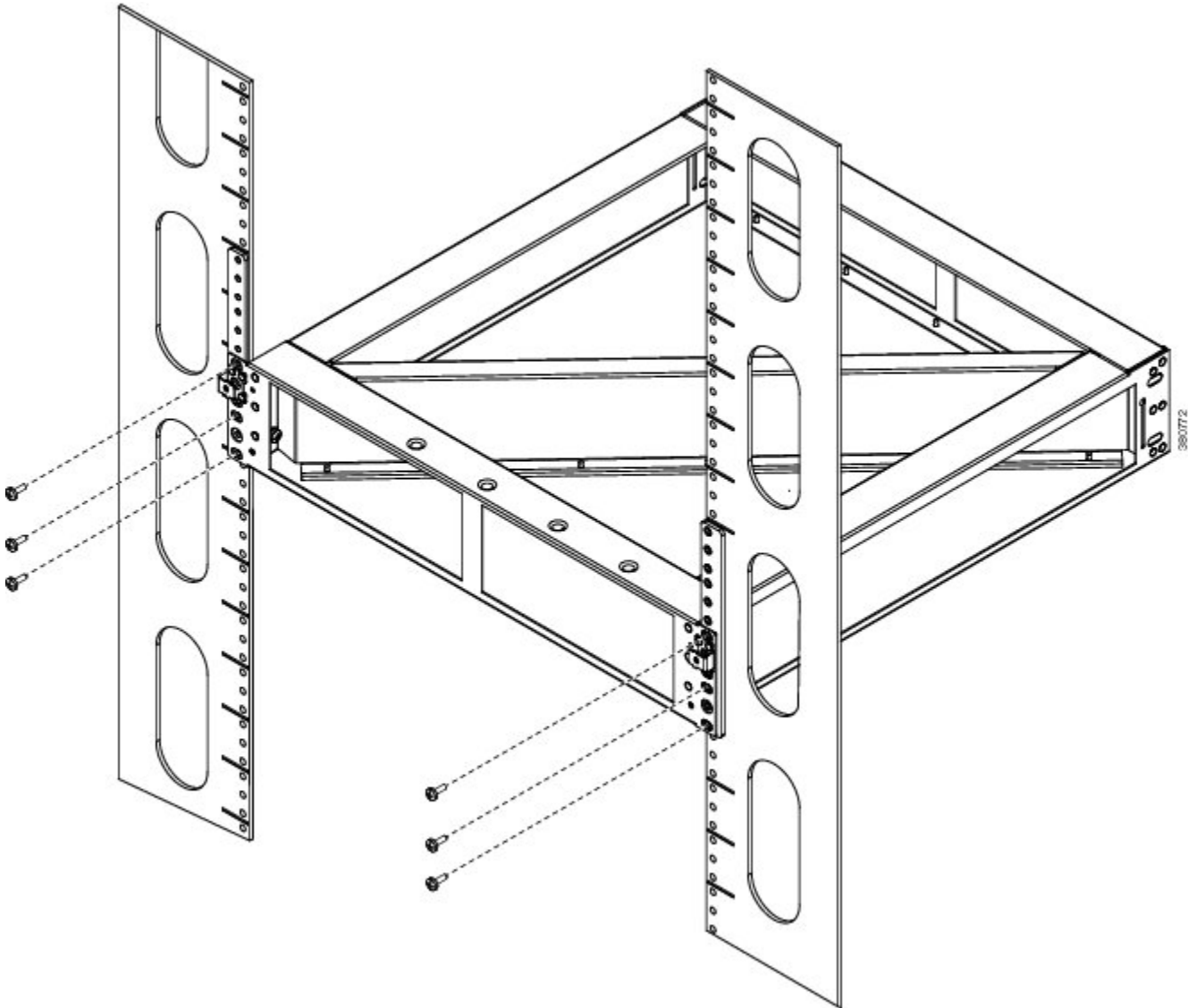
Step 4	Attach the left and right air baffles to the plenum base using the Cisco supplied M5x10mm screws (four for each air baffle). The keyholes on each side of the plenum base will help to guide the air baffles into position (see *Attaching the Air Baffles to the Plenum Base* figure).
Step 5	Position the air filter at the front of the plenum assembly using the two key locators. Insert and hand-tighten the two captive screws to secure the air filter assembly to the plenum assembly (see *Attaching the Air Filter Assembly to the Plenum Assembly* figure).
Step 6	Position the cable management tray at the front of the plenum assembly (see *Attaching the Cable Management Tray to the Plenum Assembly* figure). Insert and hand-tighten both captive screws to secure the cable management tray to the plenum assembly.
Step 7	If you are installing the air plenum kit to a four-post rack:

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

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

Figure 73: Attaching the Rear Adapter Plates (Four-Post Rack)
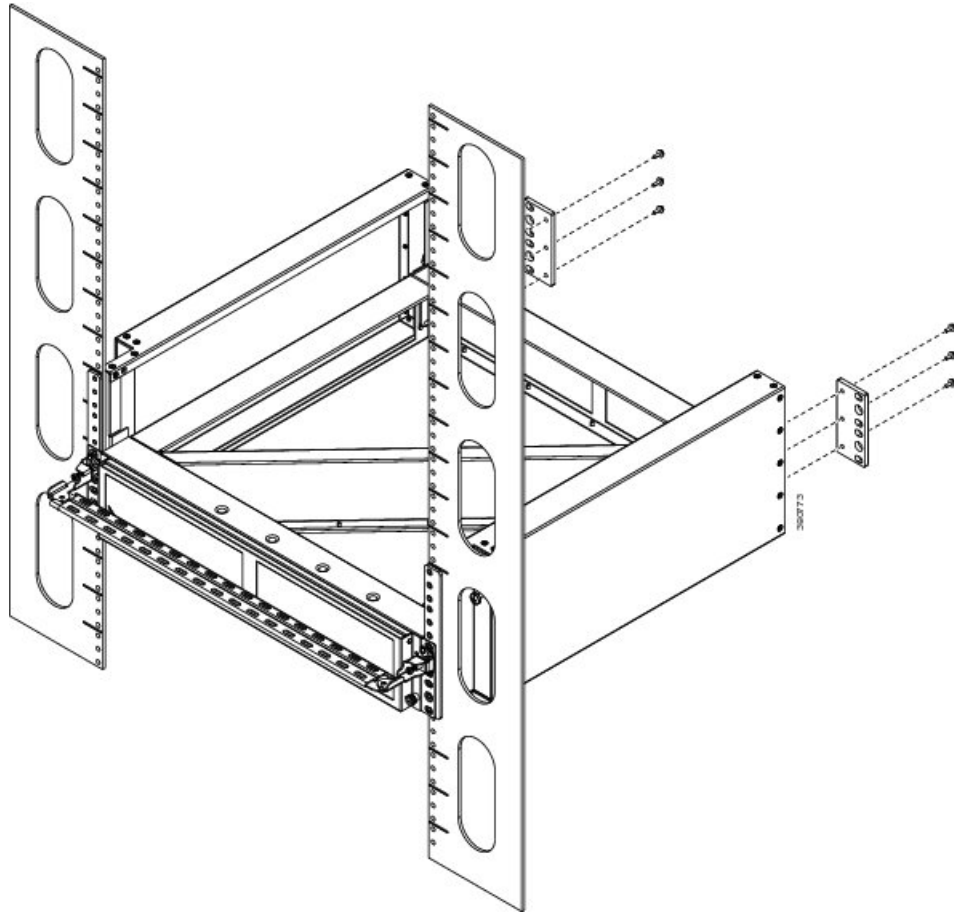
Step 8   Place the Cisco ASR 9001 Router on a flat and stable surface. Attach the rear grounding bracket (see the figure below).

Figure 74: Rear Grounding Bracket
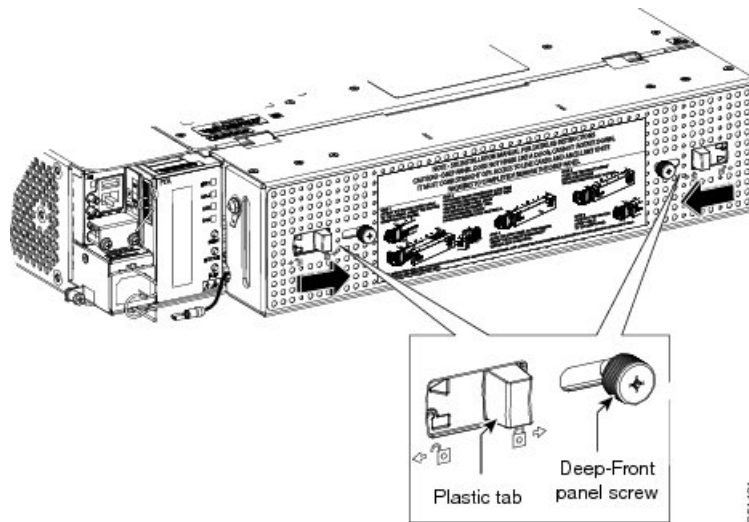
Step 9   Install the Cisco ASR 9001 Router in the plenum assembly in the rack (see Installing the Chassis in a Two-Post Rack, on page 57 or Installing the Chassis in a Four-Post Rack, on page 59).

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

Figure 75: Attaching the Cable Guide
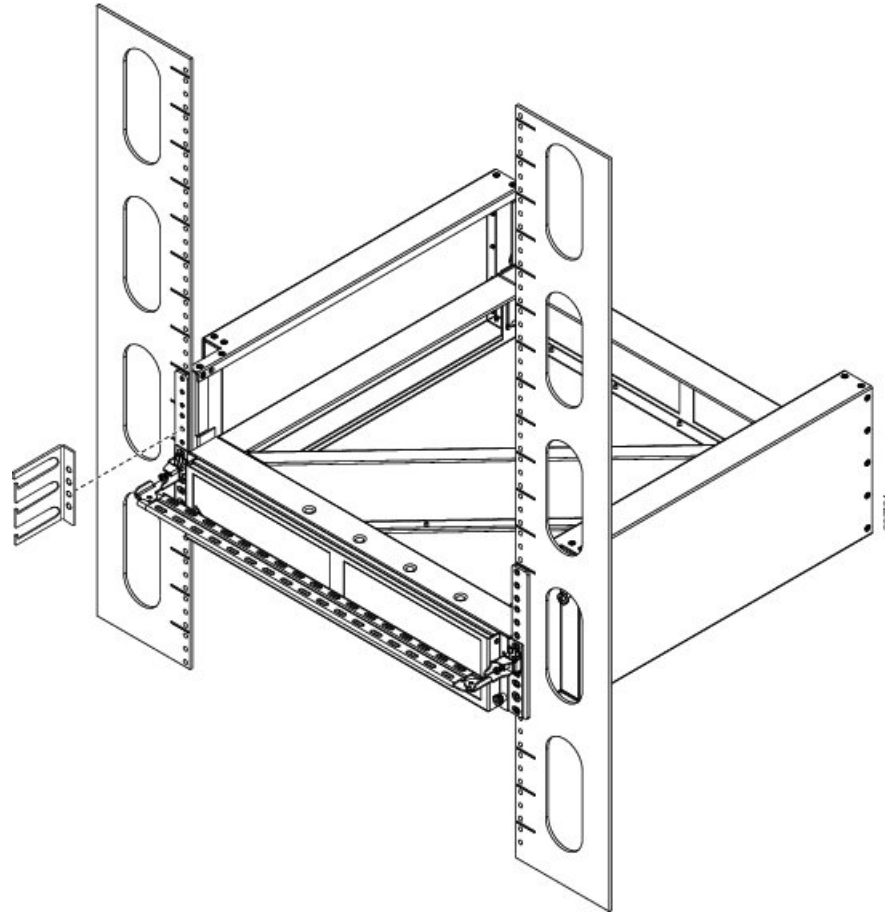
Installing the Air Plenum Kit in an ETSI Two-Post to Four-Post Rack

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

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

Procedure

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

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

Figure 76: Attaching the Air Baffles to the Plenum Base
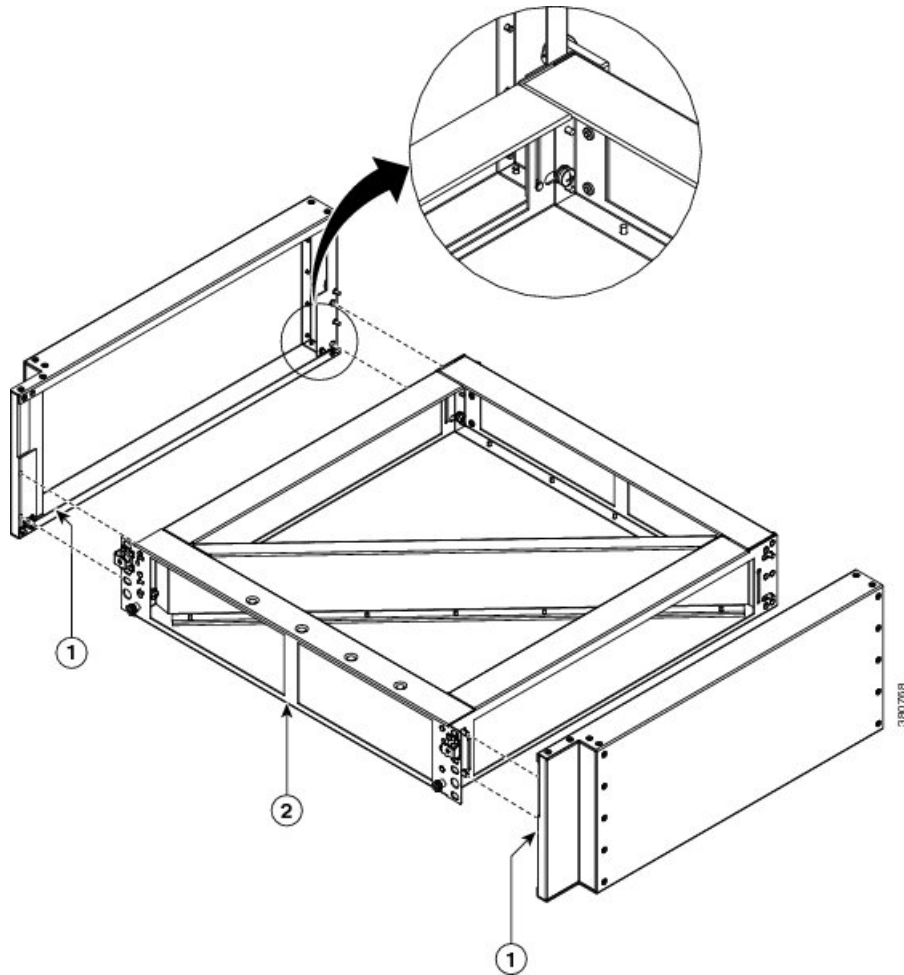
1	Air Baffle	2	Plenum base

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

Figure 77: Attaching the Air Filter Assembly to the Plenum Assembly
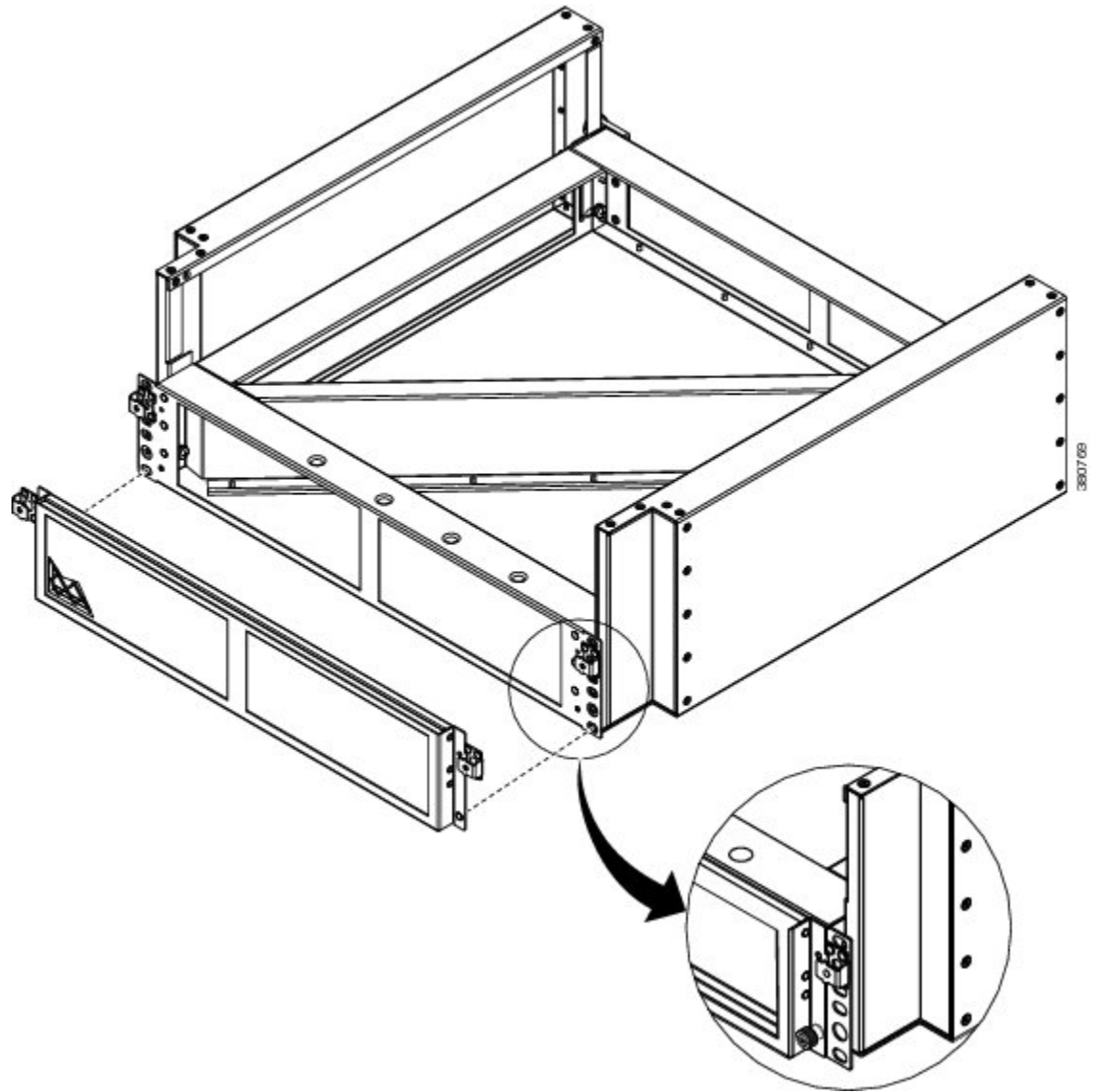
Step 4   Position the cable management tray at the front of the plenum assembly (the figure below). Insert and hand-tighten both captive screws (one on each side) to secure the cable management tray to the plenum assembly.

Figure 78: Attaching the Cable Management Tray to the Plenum Assembly
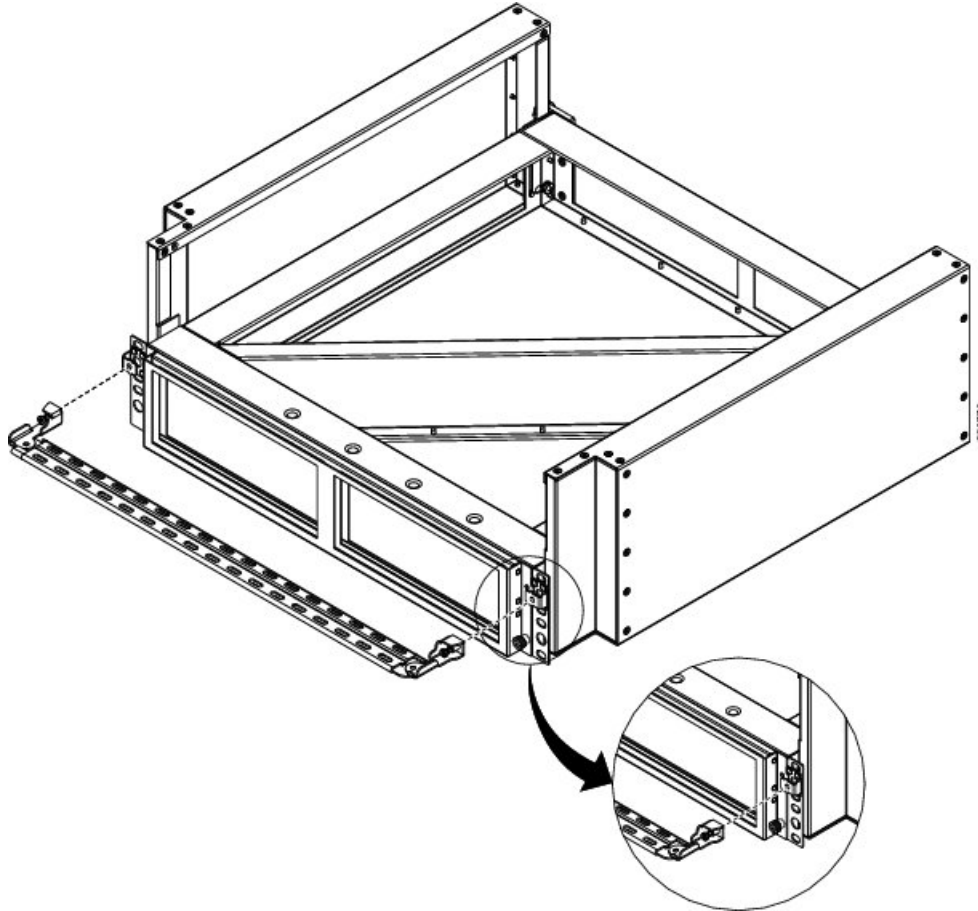
Step 5   Lift the plenum assembly to the desired position in the rack. Align the screw holes on the adapter plates of the plenum assembly with the mounting holes in the rack.

Figure 79: Installing the Plenum Assembly in a Rack
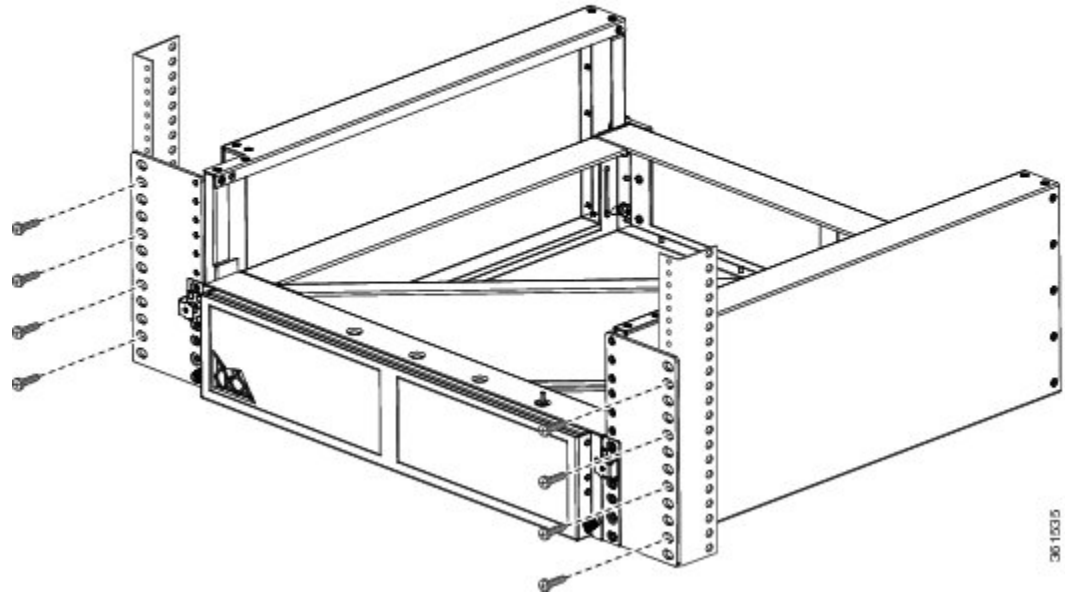
Step 6   Attach the plenum assembly to the left and right rack rails using customer-supplied rack-mounting screws. We recommend a minimum of four screws per side. These screws can vary in size and type depending on the rack that you use. Torque the screws to the weight specified for your particular rack.

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

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

Figure 80: Attaching the Rear Adapter Plates
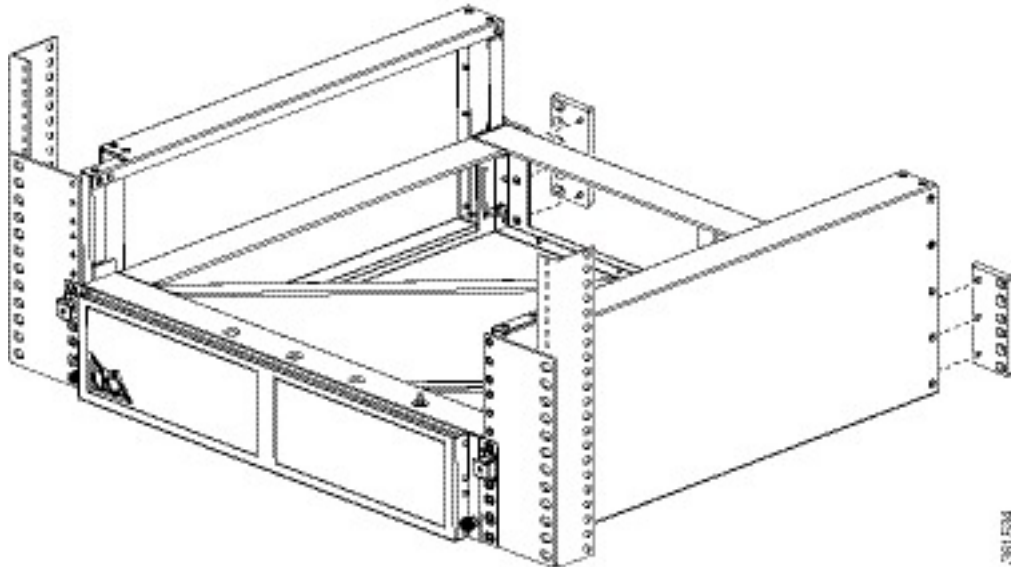
Step 8   Place the Cisco ASR 9001 Router on a flat and stable surface. Attach the rear grounding bracket (*Rear Grounding Bracket* figure).

Step 9   Install the Cisco ASR 9001 Router in the plenum assembly in the rack (see Installing the Chassis in a Two-Post Rack, on page 57 or Installing the Chassis in a Four-Post Rack, on page 59).

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

CHAPTER 3

Installing Modules and Cables in the Chassis

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

Cisco ASR 9901 Router Fixed Ports

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

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

Figure 81: Cisco ASR 9901 Fixed Ports
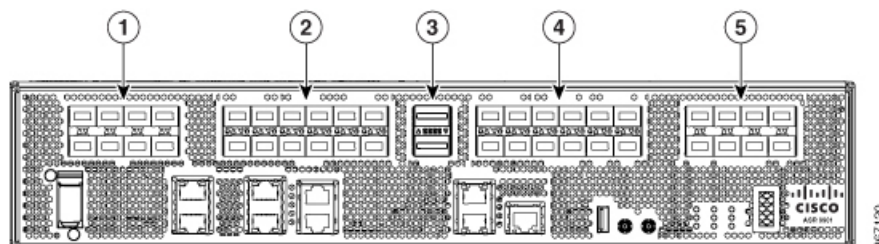
1	SFP ports (0-7)	4	SFP/SFP+ ports (22-33)
2	SFP/SFP+ ports (8-19)	5	SFP ports (34-41)
3	QSFP28 ports (20-21)		

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

Cisco ASR 9001 Router Fixed Ports and Modular Port Adapters

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

Fixed 4x10-Gigabit Ethernet Ports

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

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

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

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

Figure 82: 4x10-Gigabit Ethernet SFP+ Ports
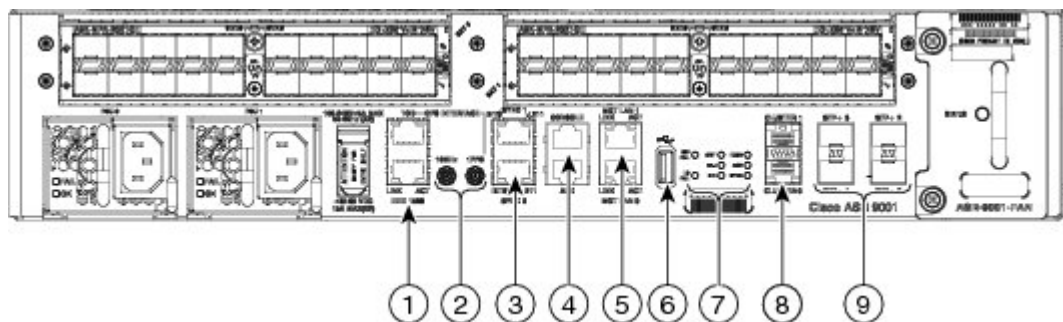
1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS indicators	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports
4	CONSOLE and AUX ports	9	Fixed SFP+ ports

5	Management LAN ports		

Modular Port Adapters

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

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

20-Port Gigabit Ethernet Modular Port Adapter

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

Each SFP cage on the Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated SFP port, as described in Status LEDs, on page 122 section.

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

Figure 83: 20-Port Gigabit Ethernet Modular Port Adapter
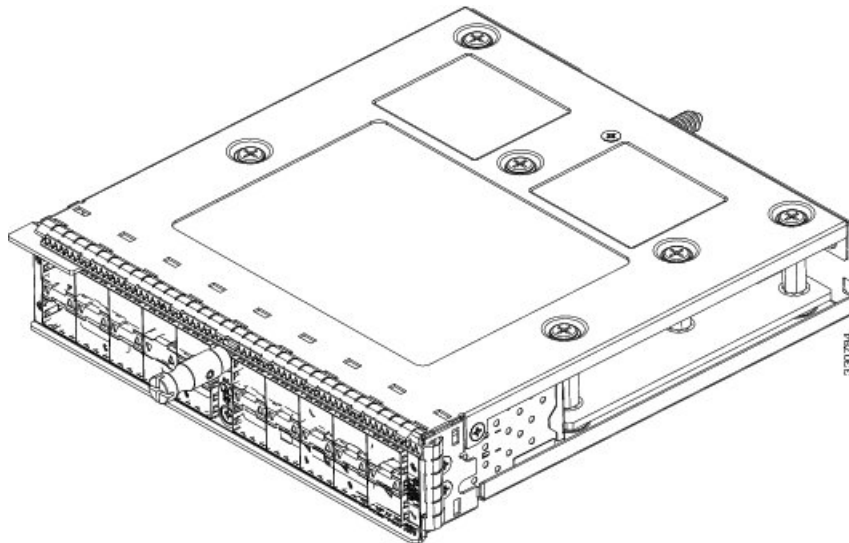
The following table describes the 20-Port Gigabit Ethernet modular port adapter LEDs.

Table 9: 20-Port Gigabit Ethernet Modular Port Adapter LEDs

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

4-Port 10 Gigabit Ethernet Modular Port Adapter

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

Each XFP cage on the 4-Port 10 Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated XFP port, as described in Status LEDs, on page 122 section.

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

Figure 84: 4-Port 10 Gigabit Ethernet Modular Port Adapter
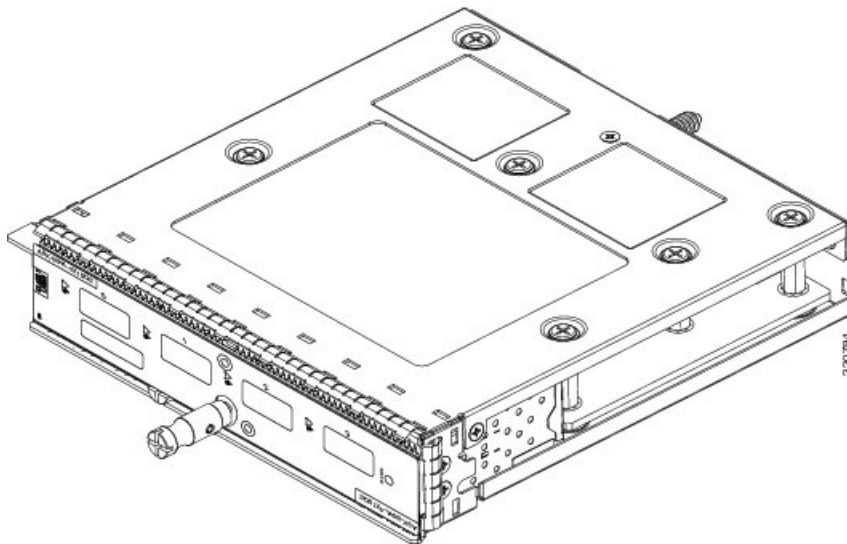
The following table describes the 4-Port 10 Gigabit Ethernet modular port adapter LEDs.

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

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

2-Port 10 Gigabit Ethernet Modular Port Adapter

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

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

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

Figure 85: 2-Port 10 Gigabit Ethernet Modular Port Adapter
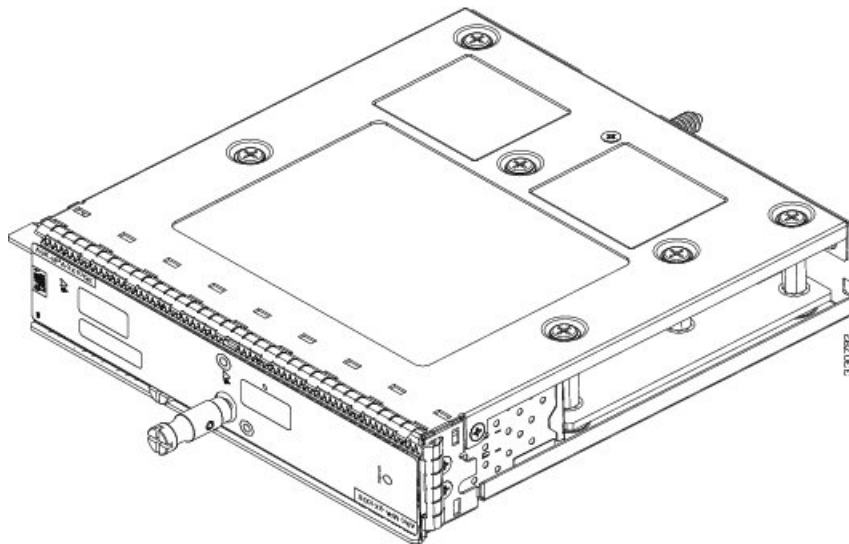
The following table describes the 2-Port 10 Gigabit Ethernet modular port adapter LEDs.

Table 11: 2-Port 10 Gigabit Ethernet Modular Port Adapter LEDs

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

1-Port 40 Gigabit Ethernet Modular Port Adapter

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

The QSFP cage on the 1-Port 40 Gigabit Ethernet modular port adapter has an adjacent Link LED visible on the front panel. The Link LED indicates the status of the associated QSFP port, as described in Status LEDs, on page 122 section.

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

Figure 86: 1-Port 40 Gigabit Ethernet Modular Port Adapter
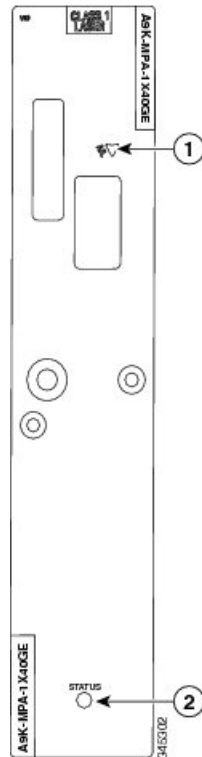
| 1 | A/L (Active/Link) LED | 2 | STATUS LED |

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

Table 12: 1-Port 40 Gigabit Ethernet Modular Port Adapter LEDs

LED Label	Color	State	Meaning
A/L	Off	Off	Port is not enabled.
	Green	On	Port is enabled and the link is up.
	Amber	On	Port is enabled and the link is down.
STATUS	Off	Off	Modular port adapter power is off.
	Green	On	Modular port adapter is ready and operational.
	Amber	On	Modular port adapter power is on and good, and the modular port adapter is being configured.

Installing and Removing Modular Port Adapters

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

Handling Modular Port Adapters (MPAs)

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

⚠️

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

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

Figure 87: Handling a Modular Port Adapter (MPA)
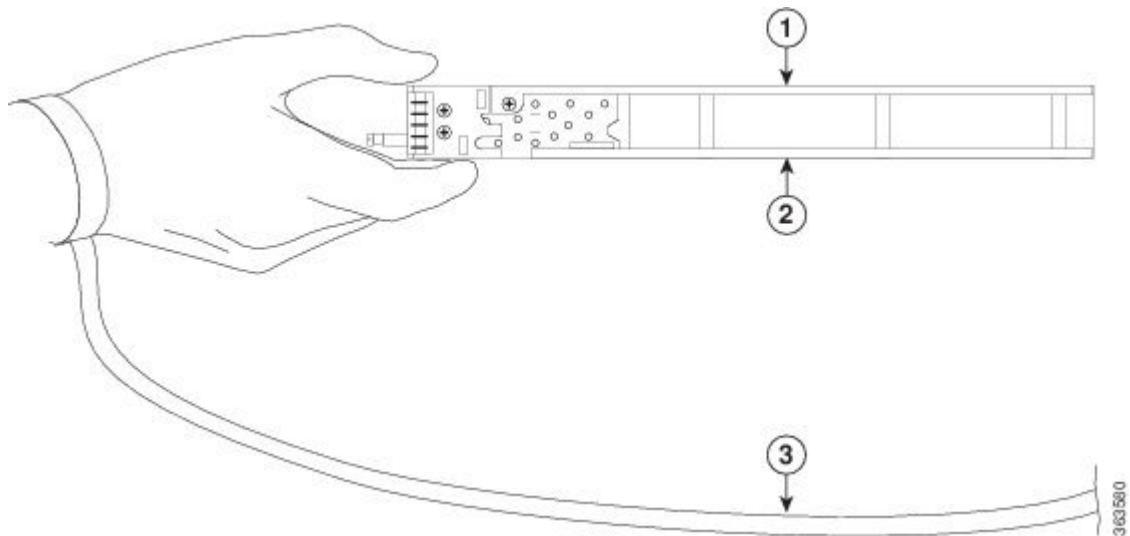
Online Insertion and Removal

📝

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

Cisco ASR 9001 router modular port adapters (MPAs) support online insertion and removal (OIR).

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

• Soft OIR

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

- Managed OIR

A managed online insertion and removal of Modular port adapters (MPAs) is comprised of these steps:

1. Shut down the MPA with the **hw-module subslot 0/0/1 shutdown** command.

2. Confirm that the LEDs have gone from green to off.

3. Execute the **do show plat** command to verify that the MPA to be removed is in the disabled state.

4. Physically remove the MPA to be replaced.

5. Physically insert the replacement MPA.

6. Return the MPA to the up state with the **no hw-module subslot 0/0/1 shutdown** command.

- Hard OIR

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

If the bay is empty when the Cisco ASR 9001 router modular line card (MLC) boots you can do the following:

- Insert a 20 GE MPA

- Remove and then insert a replacement 20 GE MPA

If the MLC boots with a 20 GE MPA in the bay you can remove and then insert a replacement 20 GE MPA

If the MLC boots with a 4 10-GE MPA in the bay you can remove and then insert a replacement 4 10-GE MPA

If the MLC boots with a 2 10-GE MPA in the bay you can remove and then insert a replacement 2 10-GE MPA

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

Modular Port Adapter (MPA) Installation and Removal

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

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

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

Procedure

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

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

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

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

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

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

Optical Device Installation and Removal

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

Cleaning Optical Devices

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

Checking the Installation

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

Verifying the Installation

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

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

To verify that a MPA is installed correctly:

Procedure

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

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

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

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

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

Step 3 If the modular port adapters (MPAs) do not become active within three minutes, refer to the system console messages. If there is no indication that a field-programmable device (FPD) upgrade is underway, see Troubleshooting the Installation, on page 101 section.

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

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

To verify the MPA status:

Procedure

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

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

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

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

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

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

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

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

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

Table 13: show Commands to Display Modular Port Adapter (MPA) Information

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

Table 14: show Commands to Display Modular Port Adapter (MPA) Information

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

Using the ping Command to Verify Network Connectivity

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

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

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

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

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

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

Installing and Removing Transceiver Modules

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

Cable Management

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

⚠️

Caution   Excessive bending of interface cables can damage the cables.

The cable-management system consists of these separate components:

- A cable-management bracket—Cisco ASR 9901

- A cable-management bracket—Cisco ASR 9001

- A cable-management tray—Cisco ASR 9001

Cable Management Bracket—Cisco ASR 9901

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

Figure 88: Cisco ASR 9901 Router Cable Management Bracket
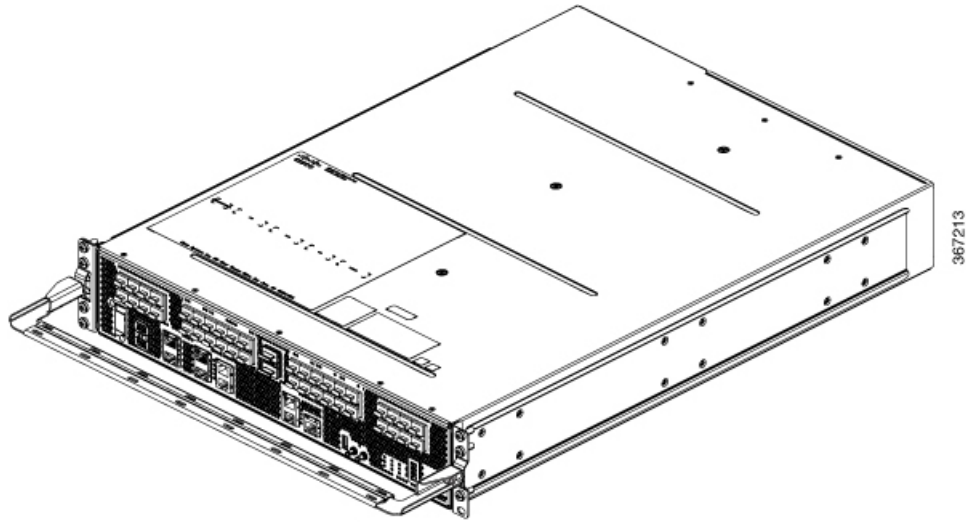
Note When shipped, the cable-management bracket is not attached to the router chassis. You must attach the cable-management bracket to the chassis before you insert the cables into the ports.

Installing a Cable Management Bracket

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

Procedure

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

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

Figure 89: Cable-Management Bracket Installation and Removal
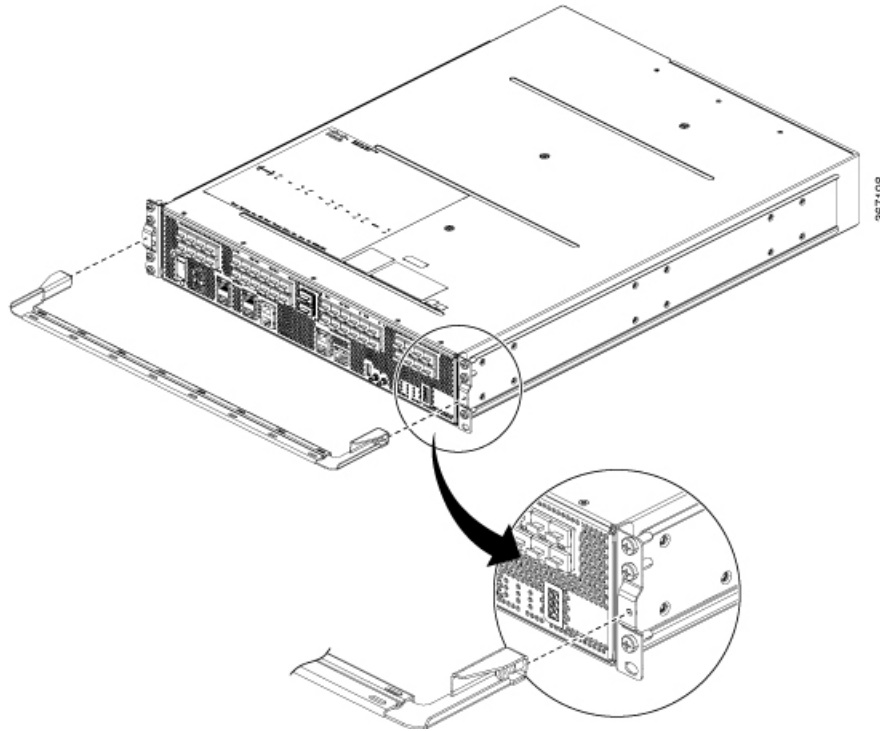
Step 3 Insert and tighten the provided screws to secure the bracket.

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

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

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

Removing a Cable-Management Bracket

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

Procedure

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

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

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

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

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

Cable Management Bracket—Cisco ASR 9001

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

Figure 90: Example Cable Routing through Cisco ASR 9001 Router Cable Management Brackets
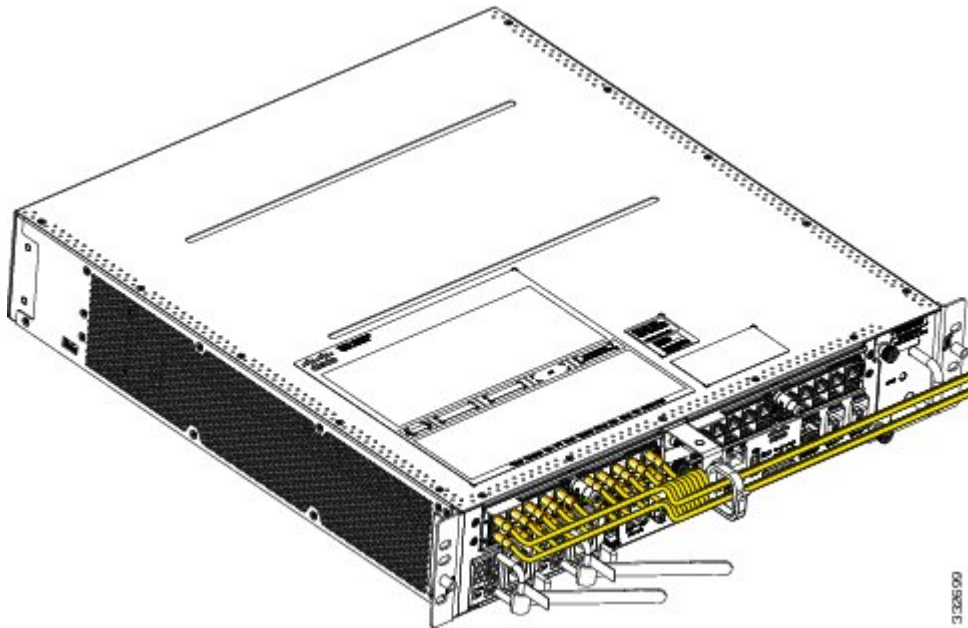
Note   When shipped, the cable-management bracket is not attached to the router chassis. You must attach the cable-management bracket to the chassis before you insert the cables into the ports.

Installing a Cable Management Bracket

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

Procedure

Step 1   Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
Step 2   Position the cable-management bracket over the front of the chassis front panel.

Figure 91: Cable-Management Bracket Installation and Removal
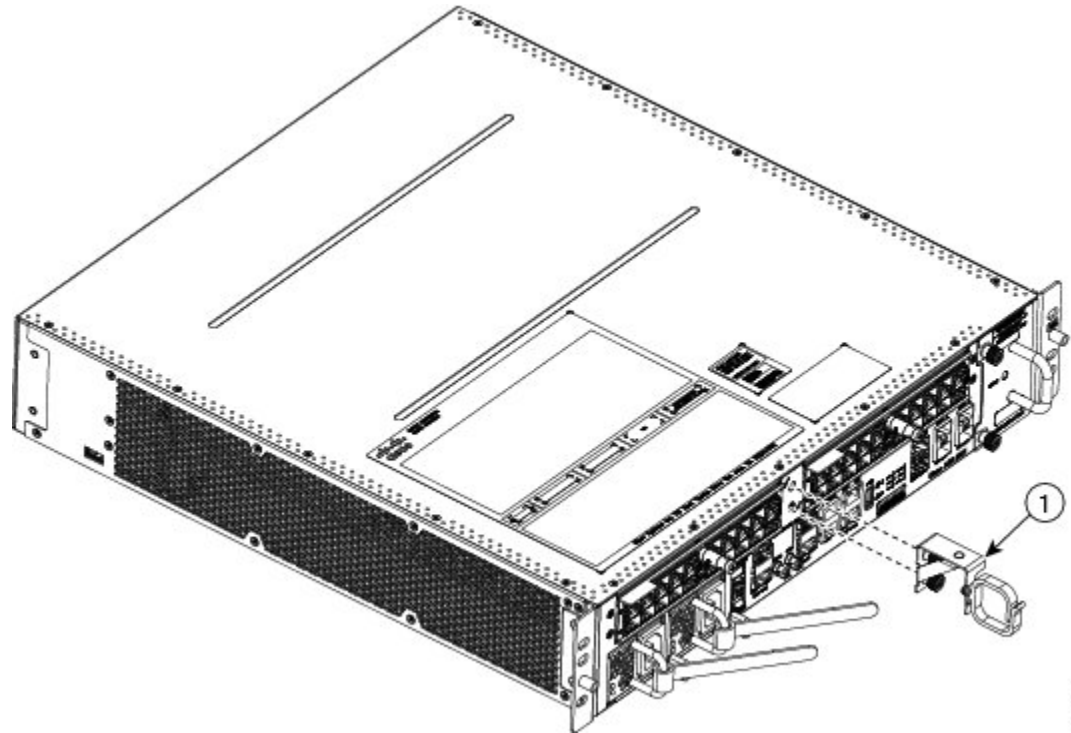
| 1 | Cable-Management Bracket |

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

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

Removing a Cable-Management Bracket

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

Procedure

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

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

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

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

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

Cable Management Tray—Cisco ASR 9001

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

Figure 92: Example Cable Routing through the Cisco ASR 9001 Router Cable Management Tray
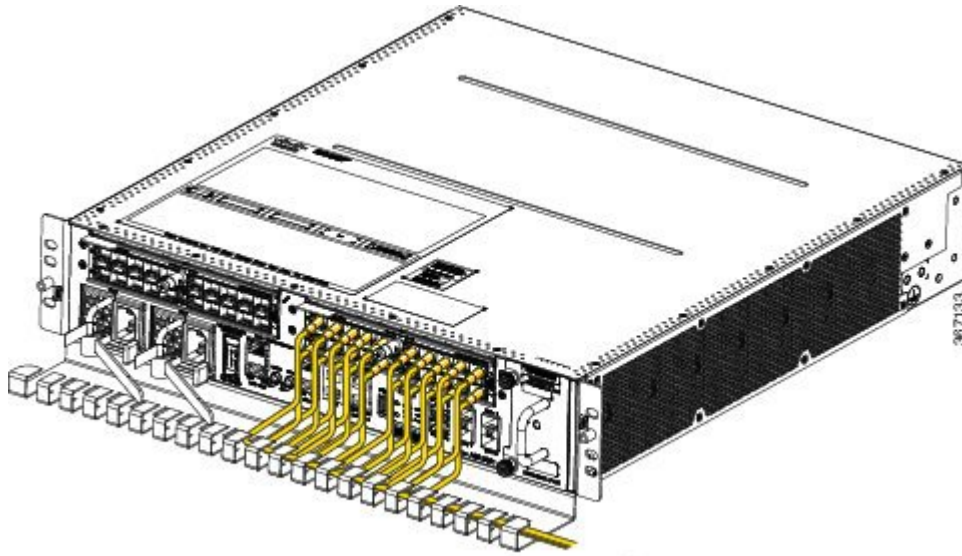
Installing a Cable Management Tray

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

Procedure

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

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

Figure 93: Cable-Management Tray Installation and Removal
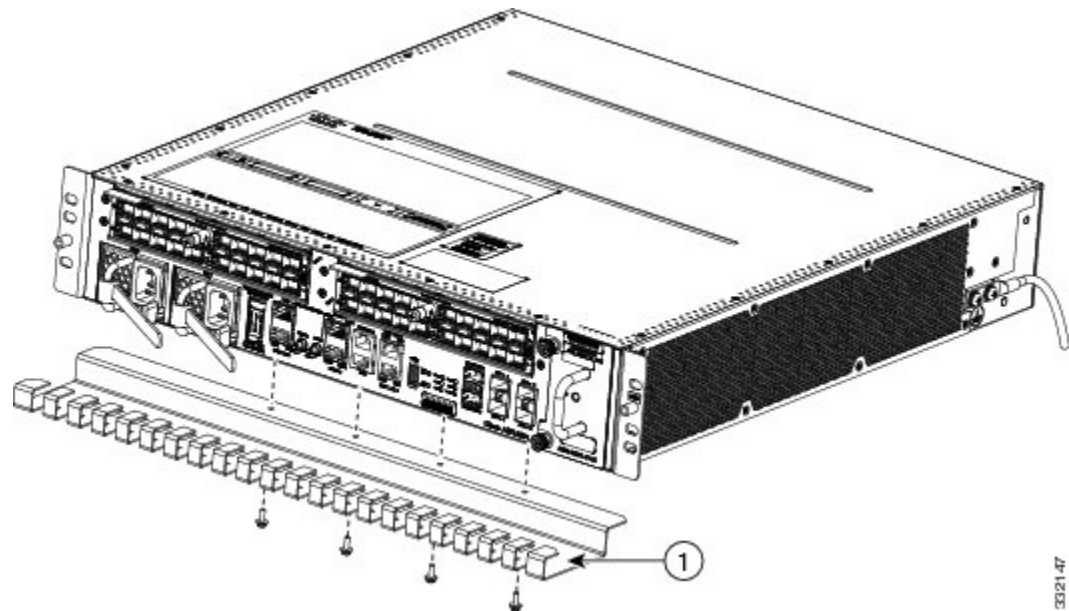
1. Cable-Management Tray

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

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

Removing a Cable-Management Tray

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

Procedure

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

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

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

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

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

Connecting Route Processor Cables

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

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

Figure 94: RP Console and Auxiliary Port Connections
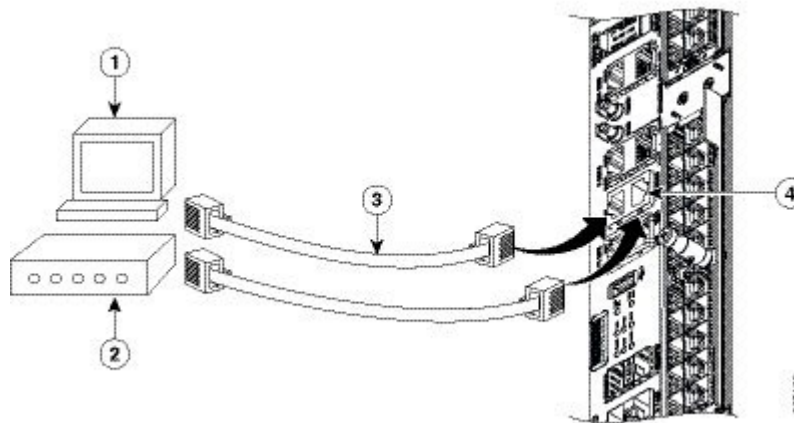
| 1 | Console terminal | 3 | RJ-45 cables |
| 2 | Modem | 4 | Console and Auxiliary port |

⚠

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

✎

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

✎

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

Connecting to the RP Console Port

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

require either a crossover cable or a straight-through RJ-45 cable. See Port Connection Guidelines, on page 35 for additional information about the console port.

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

Procedure

Step 1	Set your terminal to these operational values: 115200 bps, 8 data bits, no parity, 1 stop bits (115200 8N1).
Step 2	Attach the terminal end of the cable to the interface port on the data terminal.
Step 3	Attach the other end of the cable to the RP console port.
Step 4	Power on the data terminal.

Connecting to the RP Auxiliary Port

The auxiliary port on the RP is a RJ-45 receptacle for connecting a modem or other data communication equipment (DCE) device (such as another router) to the RP. The asynchronous auxiliary port supports hardware flow control and modem control. See Port Connection Guidelines, on page 35 for additional information about the auxiliary port.

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

Procedure

Step 1	Power off the asynchronous serial device.
Step 2	Attach the device end of the cable to the interface port on the asynchronous serial device.
Step 3	Attach the other end of the cable to the RP auxiliary port.
Step 4	Power on the asynchronous serial device.

Connecting to the RP Ethernet Management Ports

To connect cables to the RP management ports, attach STP (Shielded Twisted Pair) cables directly to the MGT LAN 0 and MGT LAN 1 RJ-45 receptacles on the RP. STP cables are required to meet NEBS requirements. See Management LAN Ports Connection Guidelines, on page 39 for additional information about the Ethernet management LAN ports.

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

⚠

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

✎

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

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

Procedure

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

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

Connecting Power to the Router

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

⚠

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

Connecting Power to an AC-Powered Router

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

✎

Note   Connect each AC power supply to a dedicated power source (branch circuit). Each AC-input power supply operates at a nominal input level of 100 to 240 VAC and requires at least a 15 A service for use in North America and Japan, or a 10 A service for international use. For more information on AC power input levels, see Power Connection Guidelines, on page 17.

Procedure

Step 1   Check that the power switch at the front of the chassis is set to the OFF position.

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

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

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

Step 4   Do one of the following:

- **Cisco ASR 9901**: Plug the AC power cord into the receptacle at the rear of the chassis (see the following figure).
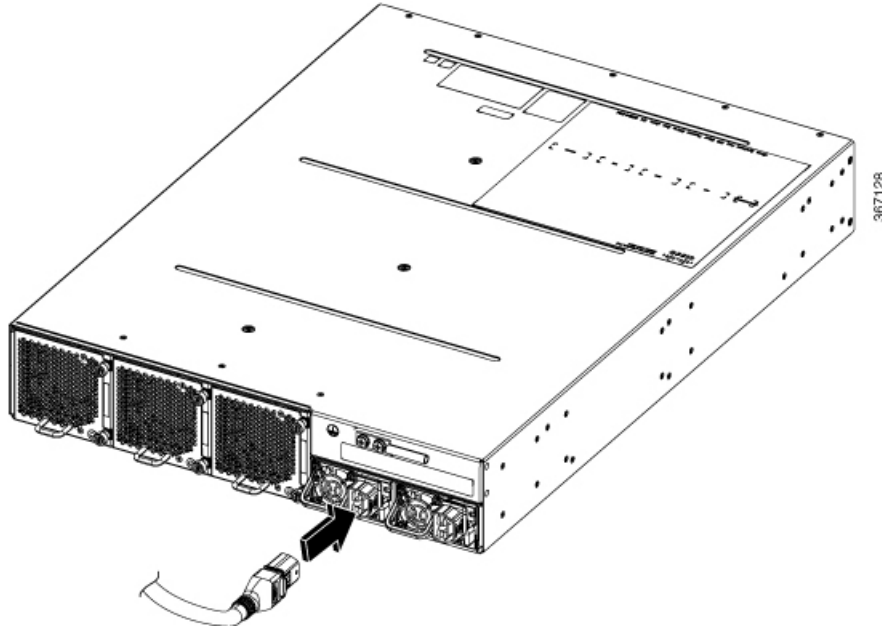
- **Cisco ASR 9001**: Plug the AC power cord into the receptacle at the front of the chassis (see the following figure).
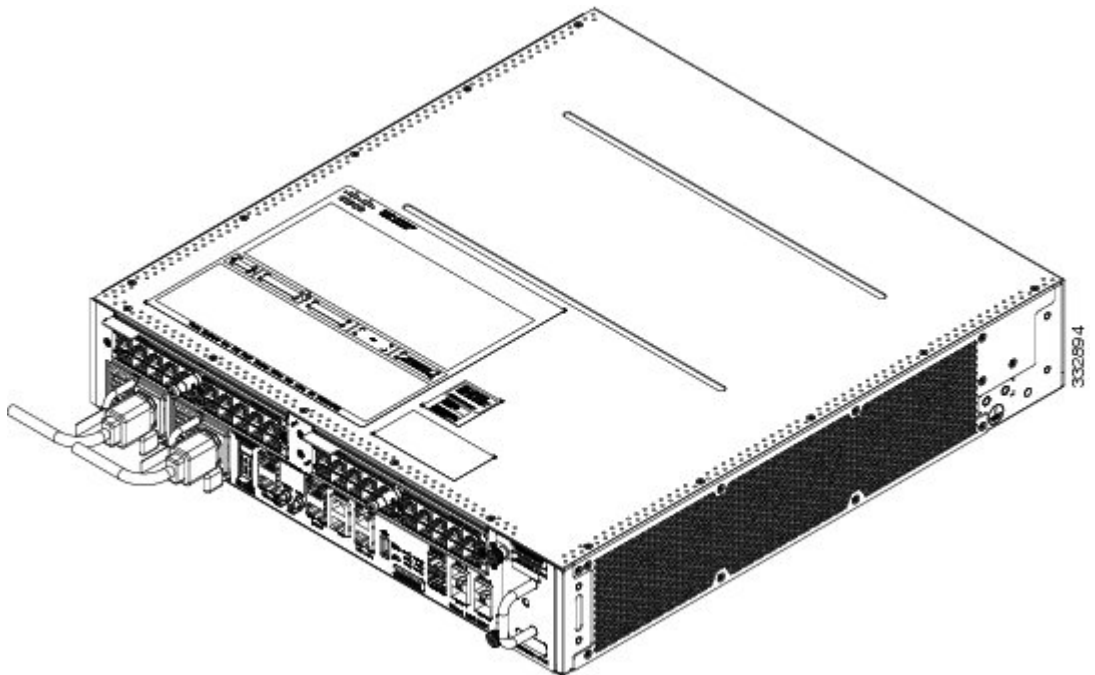
Step 5 Close the cable wrap to secure the AC power cord plug to the power module receptacle.

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

Step 7 Proceed to Powering on the Router, on page 98.

Connecting Power to a DC-Powered Router

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

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

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

- Green (or green and yellow) cable typically indicates that it is a ground cable.

⚠️

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

✎

Note The length of the cables depends on the location of your router in relation to the source of DC power. These cables are not available from Cisco Systems. They are available from external commercial cable vendors. For more information on site power and source DC cable requirements, see Power Connection Guidelines, on page 17.

✎

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

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

Procedure

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

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

1. Positive cables first.

2. Negative cable last.

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

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

Figure 95: Cisco ASR 9901: Typical Power Connections for a Single DC Power Module
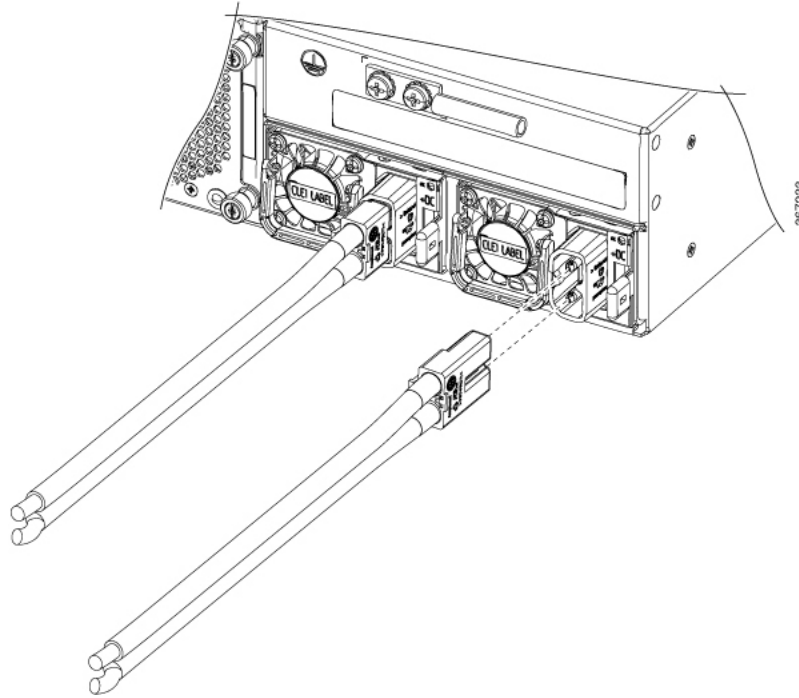
Figure 96: Cisco ASR 9001: Typical Power Connections for a Single DC Power Module
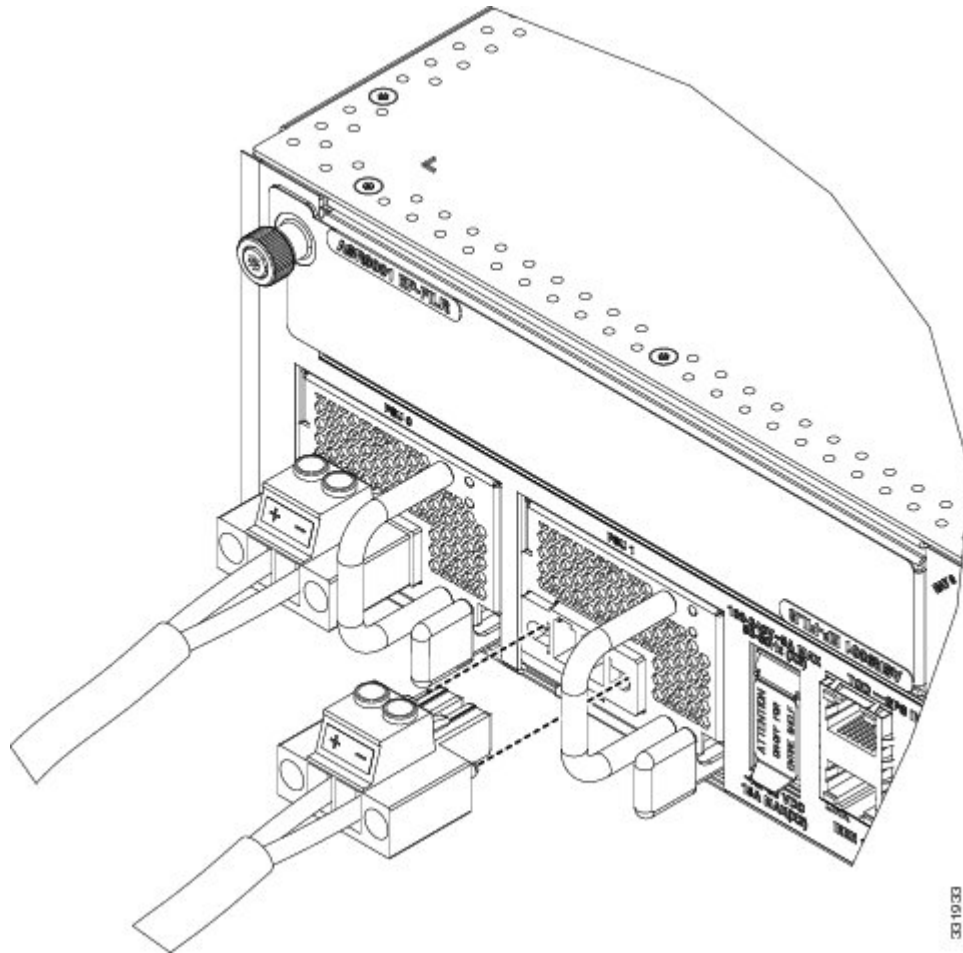
Step 4   Proceed to the next section.

Powering on the Router

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

Procedure

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

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

Step 3   Set the power switch to the ON position.

Figure 97: Power Switch on the Cisco ASR 9901
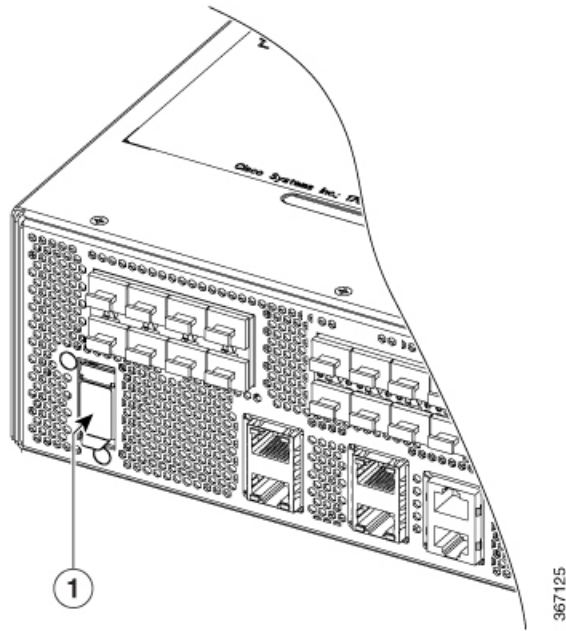
Figure 98: Power Switch on the Cisco ASR 9001
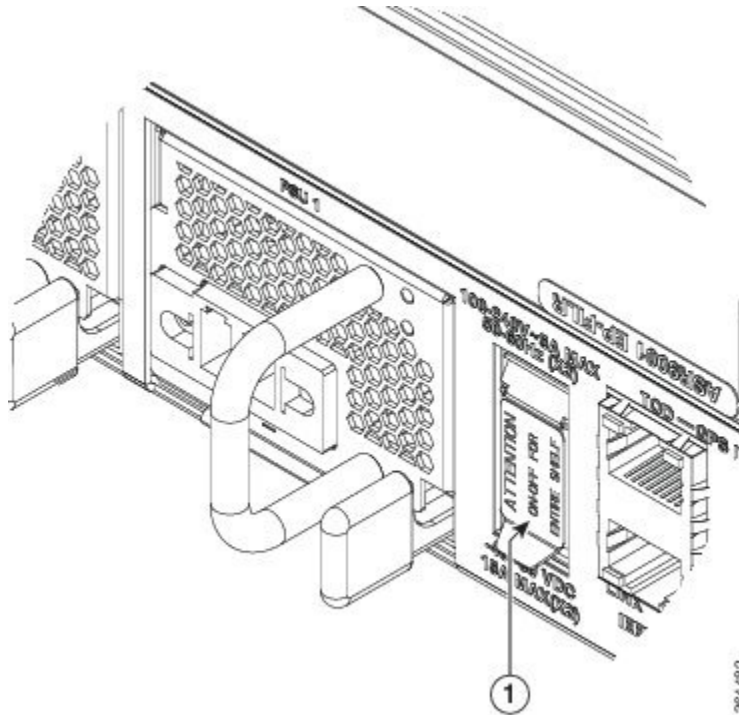
Step 4   Verify that the Green Power LED on each power module is lit.

Troubleshooting the Installation

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

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

Troubleshooting Overview

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

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

- Date you received the router and the chassis serial number (located on a label on the back of the chassis).
- Installed line card and Cisco software release number:

    - Use the **show version** command to determine the Cisco software release number.

- Brief description of the symptoms and steps you have taken to isolate and solve the issue.
- Maintenance agreement or warranty information.

Troubleshooting Using a Subsystem Approach

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

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

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

- Chassis backplane power distribution—System transfers +12 VDC power from the power modules to the chassis backplane and distributes it to all the cards through the backplane connectors. The fan tray receives power from the chassis backplane and communicate to the RP CAN Bus controller.

- Processor subsystem—Includes the active Route Processor (RP) card with line card. The RP is equipped with onboard processors. The RP downloads a copy of the Cisco software image to the line card processor.

- Cooling subsystem—The Cisco ASR 9001 Router has one fan tray (with 14 fans). The Cisco ASR 9901 Router has three fan trays. The fan trays circulate cooling air through the chassis.

Normal Router Startup Sequence

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

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

Procedure

Step 1	The fan in each power module receives power and begins drawing air through the power supply.
	The power module input power and output power indicators are on.
Step 2	The fans in the fan tray receive power and begin drawing air through the chassis.
	The fan tray OK indicator is on.
Step 3	As the power-on and boot process progresses for the RP, the status of the RP appears on the front panel of the card.

Identifying Startup Issues

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

Table 15: LEDs at System Startup

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

Component	Type of Indicator	Display Contents/LED Status and Meaning
Fan Tray	Fan tray status LED	Green (ON): Fan Tray OK. The fan tray fans are operating correctly.

Troubleshooting the Power Subsystem

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

Troubleshooting the AC-Input Power Subsystem

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

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

Figure 99: Cisco ASR 9901 AC-Input Power Module Status Indicators

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

Figure 100: Cisco ASR 9001 AC-Input Power Module Status Indicators

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

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

Procedure

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

- Latch on the ejector lever is locked securely.

• Power switch on the front panel is set to the ON position.

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

• Power cables are securely attached to their power module terminal studs.

• Power cords at the power source end are securely plugged into their own AC power outlets.

• Source AC circuit breaker is switched on.

Step 3   Check the power supply status LED indicators:

• **Cisco ASR 9901:**

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

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

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

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

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

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

• **Cisco ASR 9001:**

    • OK (green) Power LED—Indicates that the input AC power is OK.

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

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

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

Troubleshooting the DC-Input Power Subsystem

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

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

Figure 101: Cisco ASR 9901 DC-Input Power Module Status Indicators

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

Figure 102: Cisco ASR 9001 DC-Input Power Module Status Indicators

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

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

Procedure

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

• Latch on the ejector lever is locked securely.

• Power switch on the front panel is set to the ON position.

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

• Power cables are securely attached to their power module terminal studs.

• Power cables are securely attached at the DC source end.

• Source DC circuit breaker is switched on.

Step 3 Check the power supply status LED indicators:

• **Cisco ASR 9901:**

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

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

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

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

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

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

• **Cisco ASR 9001:**

• OK (green) Power LED—Indicates that the input DC power is OK.

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

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

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

Additional Power Subsystem Troubleshooting Information

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

Hardware and Software Identification

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

Table 16: Power Module Hardware and Software IDs

Hardware ID	Software ID
PS0 M0	PM0
PS0 M1	PM1

Obtaining Temperature and Environmental Information

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

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

```
RP/0/RSP0/CPU0:router(admin)#show environment
Sat Apr 15 04:57:35.185 UTC

Temperature Information

----------------------------------------------

R/S/I Modules Sensor (deg C)

0/RSP0/*

 host Inlet0 31.1

 host Inlet1 30.3

 host Hotspot0 45.8

 host Hotspot1 38.3

 host Hotspot2 45.5

 host Hotspot3 46.0


0/0/*

 ep0 Inlet0 33.1

 ep0 Hotspot0 38.5


 ep1 Inlet0 33.6

 ep1 Hotspot0 37.5


 host Hotspot0 43.5

 host Hotspot1 37.8
```

```
 host Hotspot2 45.7

 host Hotspot3 41.6

 host Hotspot4 45.9

 host Inlet0 36.0


Voltage Information

--------------------------------------------

R/S/I Modules Sensor (mV) Margin

0/RSP0/*

 host 5.0V 5000 n/a

 host VP3P3_CAN 3299 n/a

 host 0.75V 750 n/a

 host 3.3V_RSP 3299 n/a

 host 2.5V_RSP 2499 n/a

 host 1.8V_RSP 1799 n/a

 host 1.5V_RSP 1500 n/a

 host 1.2V_RSP 1199 n/a

 host 1.9V_LDO_RSP 1900 n/a

 host 1.2V_TIMEX 1199 n/a

 host 1.0V_IMIO_CORE 1000 n/a

 host 1.8V_USB 1799 n/a

 host 12.0V 12004 n/a

 host 7.0V_RSP 7000 n/a

 host 3.3V_OCXO_RSP 3301 n/a

 host 1.0V_RSP 1000 n/a


0/0/*

 ep0 IBV 7960 n/a

 ep0 VP3P3 3319 n/a

 ep0 VP1P2 1200 n/a

 ep0 VP1P2_PHY 1193 n/a

 ep0 VP3P3_AUX 3276 n/a
```

```
ep1 VP2P5 2499 n/a

ep1 VP3P3 3300 n/a

ep1 VP1P2 1200 n/a

ep1 VP1P8 1799 n/a

ep1 VP5P0 5000 n/a

ep1 VP0P9_HEXP0 899 n/a

ep1 VP0P9_LDO 900 n/a

ep1 VP1P2_LDO 1199 n/a


host 5.0V 5000 n/a

host VP3P3_CAN 3299 n/a

host 2.5V 2500 n/a

host 0.75V 749 n/a

host 2.5V_DB 2499 n/a

host 1.8V_DB 1799 n/a

host 7.0V 6998 n/a

host VP1P0_SAC_CORE 1000 n/a

host VP1P0_SAC_VDDA 1000 n/a

host VP1P0_SAC_VDDD 1000 n/a

host VP1P2_SAC_VDDT 1199 n/a

host VP1P8_SAC_VDDR 1799 n/a

host VP1P0_SKT1_CORE 1000 n/a

host VP1P0_SKT2_CORE 1000 n/a

host VP1P0_CPU_CORE 999 n/a

host VP1P2 1199 n/a

host VP1P5 1500 n/a

host VP3P3_DB 3300 n/a

host VP1P5_DB 1499 n/a

host 1.2V_BLWDO 1200 n/a

host 1.0V_BLWDO 1000 n/a

host 1.8V_LC 1799 n/a
```

```
        host 1.0V_FPGA_CORE_LC 999 n/a

        host 1.2V_LC 1199 n/a

        host 1.2V_PHY_LDO 1200 n/a

        host 0.9V_PHY_LDO 900 n/a

        host 0.9V_PHY_CORE 899 n/a

        host 1.0V_LC_MB 999 n/a

        host 3.3V_LC 3300 n/a

        host 1.8V_ZAR_LDO 1799 n/a

        host 3.3V_ZAR_LDO 3300 n/a

        host 2.5V_SKT_SKM 2500 n/a

        host 1.8V_LGTNG 1800 n/a

        host 1.5V_NP4C_1 1500 n/a

        host 1.5V_SKT 1500 n/a

        host 1.05V_NP4C_CORE 1050 n/a

        host 1.0V_SKT 1000 n/a

        host 1.0V_SKM 999 n/a

        host 1.0V_LGTNG_CORE 1000 n/a

        host 0.9V_TCAM0_CORE 910 n/a

        host 0.9V_TCAM1_CORE 909 n/a

        host 3.3V_CLK_LDO 3299 n/a

        host 2.5V_CLK_LDO 2499 n/a

        host 1.2V_WL_LDO 1199 n/a

        host 1.0V_WL_LDO 999 n/a

        host 1.0V_PEX1 992 n/a

        host 1.0V_PEX2 999 n/a

        host 1.5V_NP4C2 1500 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

 host Fail Off

RP/0/RSP0/CPU0:ios#
```

Troubleshooting the Power Distribution System

The power distribution system consists of:

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

Use this procedure to troubleshoot the power distribution system:

Procedure

Step 1 Check each power module to make sure that:

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

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

Step 2 Make sure the fan tray is operating:

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

Troubleshooting the Route Processor Subsystem

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

Route Processor Overview

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

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

Figure 103: Cisco ASR 9901 Router Chassis Front Panel
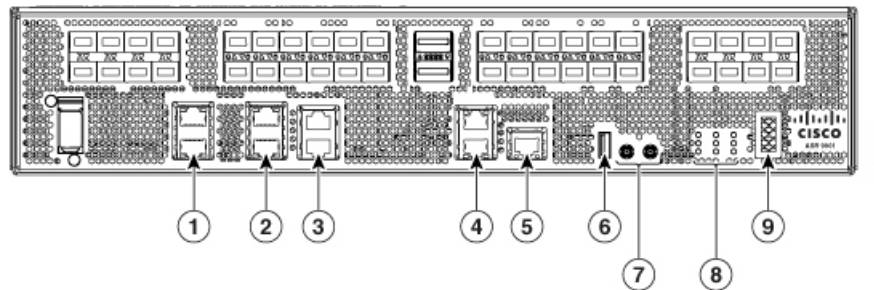
1	SYNC (BITS/J.211) ports	6	External USB port
2	Service LAN and ToD ports	7	10MHz and 1PPS ports
3	CONSOLE and AUX ports	8	Nine discrete LED indicators
4	Management LAN ports	9	LED matrix display
5	Connectivity Management Processor (CMP) port		

Figure 104: Cisco ASR 9001 Router Chassis Front Panel
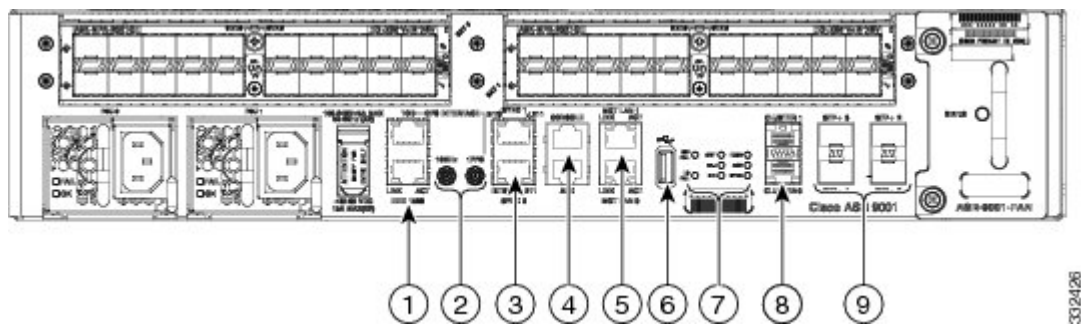
1	Service LAN and ToD ports	6	External USB port
2	10MHz and 1PPS ports	7	Eight discrete LED indicators
3	SYNC (BITS/J.211) ports	8	CLUSTER ports

4	CONSOLE and AUX ports	9	Line Card SFP+ ports
5	Management LAN ports		

RP Front Panel Indicators

The RP on the Cisco ASR 9901 has 9 discrete LED indicators for display of system information. The RP on the Cisco ASR 9001 has 8 discrete LED indicators for display of system information.

The following table lists the display definitions of the discrete LEDs on the RP front panel as well as the normal LED states on the power modules (AC or DC) and the fan tray after a successful system startup.

Table 17: RP Discrete LED Display Definitions

Indicator (Label)	LED	Color	Description
RSP FAIL	Bi-color	Red	RSP in initializing or failed state.
		Green	RSP is up and running.
		Off	RSP is normal.
LC FAIL (Cisco ASR 9001)	Bi-color	Red	LC in initializing or failed state.
		Green	LC is up and running.
		Off	LC is normal.
LC STAT/INPUT OK (Cisco ASR 9901)	Bi-color	Red	LC in initializing or failed state. **Note:** When power is connected to the chassis but the chassis power switch is set to the OFF position, the LED is red and all other LEDs are off.
		Green	LC is up and running.
		Off	LC is powered off. The LED might turn off momentarily when switching between the states described above, although the LC has not powered off.
Critical Alarm (CRIT)	Single color	Red	Critical Alarm LED. A critical alarm has occurred.
		Off (Default after reset)	No critical alarm has occurred.
Major Alarm (MAJ)	Single color	Red	Major alarm LED. A major alarm has occurred.
		Off (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Single color	Amber	Minor alarm LED. A minor alarm has occurred.
		Off (Default after reset)	No minor alarm has occurred.

Indicator (Label)	LED	Color	Description
External USB 2.0 (EUSB) (Cisco ASR 9001)	Single color	Green	External USB is busy/active. The LED is driven by the USB controller.
		Off (Default after reset)	External USB is not busy/active.
Internal Solid State Hard Disk Drive (SSD) (Cisco ASR 9901 only)	Single color	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD/SAS controller.
		Off	Internal Solid State Hard Disk Drive is not busy/active.
Alarm Cutoff (ACO) (Cisco ASR 9001)	Single color	Off	Alarm Cutoff is not enabled. **Note:** ACO LED is not in use and will always be OFF.
Synchronization (SYNC)	Bi-color	Green	Sync - Time core is synchronized to an external source (either GPS or IEEE1588).
		Amber	Not used.
		Off (Default after reset)	Time core clock synchronization is either disabled OR Time core is synchronized with external source excluding GPS and IEEE1588
GPS (Cisco ASR 9901 only)	Single color	Green	GPS interface provisioned and ports are turned on. ToD, 1 PPS, 10 Mhz are all valid.
		Off (Default after reset)	Either the interface is not provisioned, or the ports are not turned on. ToD, 1 PPS, 10 Mhz are not valid.
Fan fault (FAN FLT) (Cisco ASR 9901 only)	Single color	Red	One (or more) fan tray does not have set speed, is experiencing power fault, or is not inserted.
		Off	All fan trays performing normally without speed variations.
Power Module			
FAIL/OK (ASR 9001 Power Module)	Bi-color	Green	See Figure 100: Cisco ASR 9001 AC-Input Power Module Status Indicators and Figure 102: Cisco ASR 9001 DC-Input Power Module Status Indicators for detailed description
		Amber	
OK (ASR 9901 Power Module)	Bi-color	Green (solid or flashing)	See Figure 99: Cisco ASR 9901 AC-Input Power Module Status Indicators and Figure 101: Cisco ASR 9901 DC-Input Power Module Status Indicators for detailed description
		Amber (solid or flashing)	
Fan Tray			
STATUS (Fan tray)	Bi-color	Amber	Fan tray power ON state.
		Green	Fan tray fully functional.
		Red	Fan failure condition.

LED Matrix Display

The LED matrix displays one row of four characters. The matrix becomes active when the CPU powers on and displays the stages of the boot process, as well as displaying runtime information during normal operation. If there are CAN Bus Controller problems, error messages are displayed.

LED Matrix Boot Stage and Runtime Display

The following tables describe the boot process and runtime display information for the RSP.

Not all of these messages are seen during a successful boot up process because the screen is updated too quickly for the message to be visible. A failure detected during the boot up process results in the message remaining visible indicating the stage where the boot up process stopped. When possible, the RSP logs the failure information and reboots.

Table 18: RSP Boot Stages and Runtime Displays

LED Matrix Display	Description
INIT	Card is inserted and microcontroller is initialized.
BOOT	Card is powered on and CPU is booting.
IMEM	Starting initialization of memory.
IGEN	Starting initialization of card.
ICBC	Initializing communication with the microcontroller.
SCPI	Board is not plugged in properly.
STID	CBC was unable to read slot ID pins correctly.
PSEQ	CBC detected power sequencer failure.
DBPO	CBC detected an issue during board power up.
KPWR	CBC detected an issue during board power up.
LGNP	CBC detected an issue during board power up.
LGNI	CBC detected an issue during board power up.
IPNP	CBC detected an issue during board power up.
IPNI	CBC detected an issue during board power up.
RMN	All tests finished and ROMMON is ready for commands.
LOAD	Downloading Minimum Boot Image (MBI) image to CPU.
RRST	ROMMON rebooting board after MBI validation timeout.
MVB	ROMMON trying MBI validation boot.
MBI	Starting execution of MBI.

LED Matrix Display	Description
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 is in Out of Service, Maintenance mode.
ACT	The RSP is active (IOS-XR completely up and ready for traffic)
AUTH	The RSP failed anti-counterfeiting authentication and rebooted. If authentication continues to fail, the RSP will be in a continuous reboot loop.

LED Matrix CAN Bus Controller Error Display

The following table shows the error messages the LED matrix displays if the RSP card fails one of the power on self tests.

Table 19: RSP LED Matrix CAN Bus Controller Status Display

LED Matrix Display	Description
PST1	Failed DDR RAM memory test
PST2	Failed FPGA image cyclic redundancy checking (CRC) check
PST3	Failed card type and slot ID verification

Ethernet Ports and Status LEDs

The RP has two 8-pin media-dependent interface (MDI) RJ-45 Management LAN ports for 10 Mbps, 100 Mbps, and 1000Mbps Ethernet connections. These ports are labeled MGT LAN 0 and MGT LAN 1.

The transmission speed of the Ethernet port is not user-configurable. You set the speed through an auto-sensing scheme on the RP, the speed is determined by the network to which the Ethernet port is connected. However, even at an auto-sensed data transmission rate of 100 Mbps, the Ethernet port can only provide a usable bandwidth of substantially less than 100 Mbps. You can expect a maximum usable bandwidth of approximately 12 Mbps when using an Ethernet connection.

These LEDs on the front panel indicate traffic status and port selection (see the following figure):

- LINK—Indicates link activity.
- ACT—Indicates which Ethernet port is selected (ETH 0 or ETH 1).

Note Because both ports are supported on the RP card, MGT LAN 0 is always on. MGT LAN 0 lights when it is selected.

Figure 105: Management LAN Port Activity LEDs
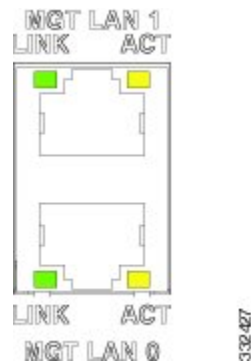
Auxiliary and Console Ports

The auxiliary and console ports on the RP are EIA/TIA-232 (also known as RS-232) asynchronous serial ports connect external devices to monitor and manage the system:

- Auxiliary port—RJ45 interface that supports flow control and is often used to connect a modem, a channel service unit (CSU), or other optional equipment for Telnet management.
- Console port—Receptacle (female) that provides a RJ45 interface for connecting a console terminal.

Monitoring Critical, Major, and Minor Alarm Status

Alarms warn of:

- Overtemperature condition on a component in the card
- Fan failure in the fan tray
- Overcurrent condition in a power supply
- Out-of-tolerance voltage on the card

The alarm LEDs are controlled by the CAN microcontoller software, which sets the threshold levels for triggering the different stages of alarms.

The RP card continuously polls the system for temperature, voltage, current, and fan speed values. If a threshold value is exceeded, the RP sets the appropriate alarm severity level on the alarm card, which lights the corresponding LED, and energizes the appropriate alarm display relays to activate any external audible or visual alarms wired to the alarm display. The RP also logs a message about the threshold violation on the system console.

Note   If one or more of the alarm LEDs is on, check the system console for messages describing the alarm.

Troubleshooting the Line Card

Initial Boot Process

During a typical line card boot process, these events occur:

1. The line card receives power and begins executing initialization software.
2. The line card performs internal checks, and prepares to accept the Cisco IOS XR software from the RP.
3. The RP loads the line card with its Cisco IOS XR software.

To verify that the line card is working properly:

Procedure

Step 1 Check that the LC FAIL LED is ON (green) to verify that the card is operating normally.

Step 2 Check that the RSP FAIL LED for the port of interest is ON (green or blinking) to verify that the port is active. If the RSP FAIL LED is not ON, verify that the associated interface is not shut down.

Step 3 If one of the conditions above is not met, see to identify any possible problems.

Status LEDs

You can use the LC FAIL LED or the RSP FAIL LED on the RP card front panel to verify proper operation or troubleshoot a failure.

Table 20: RSP FAIL and LC FAIL LEDs

RSP FAIL LED	
Green	Port state is up and a valid physical layer link is established.
Blinking	Line activity is occurring. The LED blinks green-amber-green.
Red	Port state is up, but there is a link loss or SFP/XFP failure.
Off	Port is administratively shut down.
LC FAIL LED	
Green	Line card has booted properly, and is ready to pass or is passing traffic.
Red	Line card has encountered a hardware error, and is not passing traffic.
Off	Line card is powered off. The LED might turn off momentarily when switching between the states described above, although the line card has not powered off.

Configuring and Troubleshooting Line Card Interfaces

After the person who installed the hardware verifies that the line card is working properly by examining the LEDs, the network administrator can configure the new interface. These sections provide information on configuring and troubleshooting the line card:

Configuration Parameters

The following table lists the default interface configuration parameters that are present when an interface is enabled on a 10-Gigabit Ethernet line card. See Cisco IOS XR software documentation for complete information about these parameters.

Table 21: Line Card Configuration Default Values

Parameter	Configuration File Entry	Default Value
Flow control	flow-control	egress oningress off
MTU	mtu	1514 bytes for normal frames
		1518 bytes for IEEE 802.1Q tagged frames
		1522 bytes for Q-in-Q frames
MAC address	mac address	Hardware burned-in address (BIA)

Line Card Interface Address

A Cisco ASR 9901 Router or Cisco ASR 9001 Router identifies an interface address by its rack number, line card slot number, instance number, and port number, in the format *rack*/*slot* /*instance*/*port*. The rack parameter is reserved for multirack systems; so, the *rack* parameter is always 0 (zero) for the Cisco ASR 9901 Router or Cisco ASR 9001 Router.

The Cisco ASR 9001 Router line card slot is numbered 0 with three subslots. The subslots on the line card are numbered 0, 1, and 2. 0 and 1 are reserved for EP ports and 2 is for native ports on the line card. Even if the line card contains only one port, you must use the *rack*/*slot* /*instance*/*port* notation.

Using Configuration Commands

The command line interface (CLI) for Cisco IOS XR software is divided into different command modes. To configure a line card, you enter the correct mode and then enter the commands you need.

When you first log in, you are automatically in EXEC mode. Next, enter the configure command to access configuration mode. Then, enter the interface command to enter interface configuration mode and specify the interface. You are now in the command mode where you can configure the new interface. Be prepared with the information you will need, such as the interface IP address.

Basic Line Card Configuration

This procedure is for creating a basic configuration—enabling an interface and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration.

This example shows one way to configure the basic parameters of a line card:

Procedure

Step 1 Enter EXEC mode:

```
Username: username
Password: password
RP/0/RSP0/CPU0:router#
```

Step 2 Check the status of each port by entering the **show interface** command:

```
RP/0/RSP0/CPU0:router# show interface
```

Step 3 Enter global configuration mode and specify that the console terminal will be the source of the configuration commands:

```
RP/0/RSP0/CPU0:router# configure terminal
```

Step 4 At the prompt, specify the new interface to configure by entering the **interface** command, followed by the *type* (for example, **gigabitethernet** or tengige) and rack/*slot* /instance/*port* (line card rack, slot number, subslot number, port number). Remember that Cisco ASR 9001 Router rack and subslot values are always 0 (zero). For example, to configure port 4 on bay 0 of the line card:

```
RP/0/RSP0/CPU0:router# interface tengige 0/0/0/3
```

Step 5 Assign an IP address and subnet mask to the interface with the **ipv4 address** configuration subcommand, as in the following example:

```
RP/0/RSP0/CPU0:router(config-if)# ipv4 address 10.1.2.3 255.255.255.0
```

Step 6 Use the **no shutdown** command to enable the interface:

```
RP/0/RSP0/CPU0:router(config-if)# no shutdown
```

The **no shutdown** command passes an **enable** command to the line card. It also causes the line card to configure itself based on the most recent configuration commands received by the line card.

Step 7 If you want to disable the Cisco Discovery Protocol (CDP), which is not required, use this command:

```
RP/0/RSP0/CPU0:router(config-if)# no cdp
```

Step 8 Add any other configuration subcommands required to enable routing protocols and adjust the interface characteristics. Examples of such subcommands are:

```
RP/0/RSP0/CPU0:router(config-if)# flow-control ingress
RP/0/RSP0/CPU0:router(config-if)# mtu 1448
RP/0/RSP0/CPU0:router(config-if)# mac-address 0001.2468.ABCD
```

Step 9 When you have included all the configuration subcommands to complete the configuration, enter the **commit command to commit all changes you made to the running configuration.**

```
RP/0/RSP0/CPU0:router(config-if)# commit
```

Step 10 **Enter Ctrl-Z** to exit configuration mode. If you did not enter the commit command, you will be prompted to do so:

```
RP/0/RSP0/CPU0:router(config-if)#
Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:
Answer yes to commit, no to exit without a commit, or cancel to cancel the exit (default).
```

Step 11 Write the new configuration to memory:

```
RP/0/RSP0/CPU0:router# copy run disk0:/config/running/alternate_cfg :/router.cfg
Destination file name (control-c to abort): [/router.cfg]?
The destination file already exists. Do you want to overwrite? [no]: yes
Building configuration.
223 lines built in 1 second
[OK]
```

The system displays an OK message when the configuration has been stored.

Verifying the Transceiver Modules

Use the **show inventory all** command to display SFP or XFP module information for all transceiver modules currently installed in the router. To display SFP or XFP module information for a particular module, you can use the **show inventory location <slot ID> command.**

The output of these commands lists such information as the slot ID, transceiver type, description, product ID, version, and serial number.

For example, to list module information for all modules in the router:

```
RP/0/RSP0/CPU0:router# show inventory all
Mon Mar 26 13:08:28.805 UTC
NAME: "module 0/RSP0/CPU0", DESCR: "ASR9001CHASSIS"
PID: ASR-9001, VID: V00, SN: FOC154682GG
NAME: "module 0/0/CPU0", DESCR: "ASR9001CHASSIS"
PID: ASR-9001, VID: V00, SN: FOC1547809S
NAME: "module 0/0/0", DESCR: "ASR 9000 4-port 10GE Modular Port Adapter"
PID: A9K-MA-4X10GE, VID: V01, SN: FOC1539862S
NAME: "module mau 0/0/0/0", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V02 , SN: ONT1535101F
NAME: "module mau 0/0/0/1", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V01 , SN: ONT15011038
NAME: "module mau 0/0/0/2", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V02 , SN: ONT1535103K
NAME: "module mau 0/0/0/3", DESCR: "XFP"
PID: XFP-10G-MM-SR       , VID: V01 , SN: ONT150111N5
NAME: "module 0/0/1", DESCR: "ASR 9000 20-port 1GE Modular Port Adapter"
PID: A9K-MPA-20X1GE, VID: V01, SN: FOC155181Q7
NAME: "module mau 0/0/1/0", DESCR: "SFP"
PID: SFP-GE-S            , VID: V01 , SN: FNS15501BQS
NAME: "module mau 0/0/1/1", DESCR: "SFP"
```

```
            PID: SFP-GE-S            , VID: V01 , SN: AGM1501P2VN
            NAME: "module mau 0/0/1/2", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501BDQ
            NAME: "module mau 0/0/1/3", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501YHS
            NAME: "module mau 0/0/1/4", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501YJA
            NAME: "module mau 0/0/1/5", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJD
            NAME: "module mau 0/0/1/6", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501SPE
            NAME: "module mau 0/0/1/7", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AHA
            NAME: "module mau 0/0/1/8", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AGX
            NAME: "module mau 0/0/1/9", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AKF
            NAME: "module mau 0/0/1/10", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501BDT
            NAME: "module mau 0/0/1/11", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501BET
            NAME: "module mau 0/0/1/12", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AKX
            NAME: "module mau 0/0/1/13", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJ5
            NAME: "module mau 0/0/1/14", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AK4
            NAME: "module mau 0/0/1/15", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS155009QS
            NAME: "module mau 0/0/1/16", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJX
            NAME: "module mau 0/0/1/17", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS155009TE
            NAME: "module mau 0/0/1/18", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS155009TR
            NAME: "module mau 0/0/1/19", DESCR: "SFP"
            PID: SFP-GE-S            , VID: V01 , SN: FNS15501AJQ
            NAME: "module mau 0/0/2/0", DESCR: "SFP"
            PID: SFP-10G-SR          , VID: V03 , SN: SPC1503050L
            NAME: "module mau 0/0/2/1", DESCR: "SFP"
            PID: SFP-10G-SR          , VID: V03 , SN: FNS15210Q2K
            NAME: "module mau 0/0/2/2", DESCR: "SFP"
            PID: SFP-10G-SR          , VID: V03 , SN: SPC150305MD
            NAME: "module mau 0/0/2/3", DESCR: "SFP"
            PID: SFP-10G-LR          , VID: V02 , SN: ECL150200Y9
```

Advanced Line Card Troubleshooting

This section briefly describes advanced troubleshooting commands that can be used if a line card fails.

✎

Note This section assumes that you possess basic proficiency in the use of Cisco IOS XR software commands.

By using the commands listed in this section, you should be able to determine the nature of the problems you are having with your line card. The first step is to identify the cause of the line card failure or console errors that you are seeing.

To discover which card may be at fault, it is essential to collect the output from these commands:

- **show logging**

- show diag slot
- show context location slot

Along with these show commands, you should also gather the following information:

- Console Logs and Syslog Information—This information is crucial if multiple symptoms are occurring. If the router is configured to send logs to a Syslog server, you may see some information on what has occurred. For console logs, it is best to be directly connected to the router on the console port with logging enabled.
- Additional Data—The show tech-support command is a compilation of many different commands, including show version, show running-config, **show tech ethernet**, **show tech pfi**, and show stacks. This information is required when working on issues with the Cisco Technical Assistance Center (Cisco TAC).

For examples of how to use these commands and the resulting output, see the Cisco ASR 9000 Series Troubleshooting Guide.

Note   It is important to collect the show tech-support command data before doing a reload or power cycle. Failure to do so can cause all information about the problem to be lost. Output from these commands varies slightly depending on which line card you are using, but the basic information is the same.

Troubleshooting the Cooling Subsystem

You may need to troubleshoot the cooling subsystem if an over-temperature condition occurs. The cooling subsystem of the router consists of a fan tray in the chassis and a fan in each of the power supplies. The fan tray and the power supply fans circulate air to maintain acceptable operating temperatures within the router.

Fan Tray Operation

The fan tray maintains acceptable operating temperatures for the internal components by drawing cooling air into the system chassis. The fan tray receives power from the chassis backplane.

The Cisco ASR 9901 uses 3 individual fan trays. The Cisco ASR 9001 uses a single fan tray that contains 14 fans. Each fan tray has a controller card and one front panel STATUS LED indicator:

- Green—Fan tray is functioning properly.

- Red—There is a fault detected in the fan tray.

Note   The Cisco ASR 9901 also has a front panel fan fault LED. See RP Front Panel Indicators.

If the air temperature inside the chassis rises, blower speed increases to provide additional cooling air to the internal components. If the internal air temperature continues to rise beyond the specified threshold, the system environmental monitor shuts down all internal power to prevent equipment damage because of excessive heat.

If the system detects that one or more of the fans in the fan tray has failed, it displays a warning message on the system console. In addition, the remaining fans go to full speed to compensate for the loss of the failed fan.

Power Module Fans

Each AC or DC power module is equipped with one fan that draws cooling air in through the front of the power module and force warm air out through the air exhaust of the chassis:

- If the power source is within the required voltage range, the power supply fan remains on.
- If a fan fails:

    - Power module detects an internal over-temperature condition.
    - Fault and Temp indicators light.
    - Power module sends an over-temperature warning to the system and then power supply switchover to the redundant power module.

For additional power supply troubleshooting information, see Troubleshooting the Power Subsystem, on page 103.

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

Over-temperature Conditions

This console error message indicates that the system has detected an over-temperature condition or out-of-tolerance power value inside the system:

```
Queued messages:
%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
```

The preceding message could also indicate a faulty component or temperature sensor. Enter the **show environment** command or the **show environment all** command at the user EXEC prompt to display information about the internal system environment. The information generated by these commands includes:

- Voltage measurements on each card from the DC-to-DC converter

- The +5 VDC for the I2C module

- Operating voltage for the fan tray

- Temperature measurements received by all sensors of RP and LC module as well as temperature measurements from sensors located in each power module

If an environmental shutdown results from an over-temperature or out-of-tolerance condition, the Fault indicator on the power supply lights before the system shuts down.

Although an over-temperature condition is unlikely at initial system startup, make sure that:

- Heated exhaust air from other equipment in the immediate environment is not entering the chassis card cage vents.

- You allow sufficient air flow by maintaining a minimum of 6 inches (15.24 cm) of clearance at both the inlet and exhaust openings on the chassis and the power modules to allow cool air to enter freely and hot air to be expelled from the chassis.

Isolating Cooling Subsystem Problems

Use this procedure to isolate a problem with the chassis cooling system if you have an over-temperature condition:

Procedure

Step 1   Make sure the fan tray is operating properly when you power on the system. To determine if the fan tray is operating, check the LED indicator on the fan tray front panel:

- OK (green)—Fan tray is functioning properly and receiving +12 VDC power, indicating that the cables from the chassis backplane to the fan tray are good.

- Fail (red)—Fault is detected in the fan tray. Replace the fan tray.

- If neither indicator is on and the blower is not operating, there may be a problem with either the fan tray or the +12 VDC power supplied to the fan tray. Go to Step 2.

Step 2   Eject and reseat the fan tray making sure the captive screws are securely tightened to a torque of 10 +/–1 in-lb.

If the fan tray still does not function, go to Step 3.

Step 3   Check for +12 VDC power by looking at the LED indicators on each power module:

- If the Pwr OK indicator is on and the Fault indicator is off on each power module, it indicates that the fan tray is receiving +12 VDC:

    - If the fan tray is still not functioning, there could be a problem with the fan tray controller card or an undetected problem in the fan tray cable. Replace the fan tray.

    - If the new fan tray does not function, contact a Cisco customer service representative for assistance.

- If the Fault indicator is on, the power supply is faulty. Replace the power supply.

- If the Temp and Fault indicators are on, an over-temperature condition exists:

    - Verify that the power supply fan is operating properly.

    - If the fan is not operating, replace the power supply.

    - Contact your Cisco representative if replacing the power supply does not fix the problem.

CHAPTER 5

Replacing Router Components

The router is equipped as ordered and is ready for installation and startup when it is shipped. As network requirements change, you may need to upgrade the system by adding or changing components. This chapter describes how to maintain router components.

Procedures for maintaining the router are described in these sections:

- Prerequisites and Preparation, on page 131
- Removing and Replacing the Fan Tray, on page 133
- Removing and Replacing the Air Filter, on page 135
- Removing and Replacing AC or DC Power System Components, on page 137
- Removing a Chassis from the Equipment Rack, on page 139
- Installing a Replacement Chassis in the Equipment Rack, on page 140
- Packing a Chassis for Shipment, on page 140

Prerequisites and Preparation

Before you perform any of the procedures in this chapter, be sure that you:

- Review the Safety Guidelines, on page 3.
- Read the safety and ESD-prevention guidelines described in the Compliance and Safety Information, on page 4, and the Regulatory Compliance and Safety Information for the Cisco ASR 9000 Aggregation Services Router.
- Ensure that you have all the necessary tools and equipment before beginning the procedure.

Field Replaceable Units

These components are field replaceable units (FRUs):

- Chassis
- Power modules
- Fan tray
- Transceiver modules
- Modular port adapters (Cisco ASR 9001 Router)

Online Insertion and Removal

Some field-replaceable units (FRUs) for the Cisco ASR 9000 Series Routers can be removed and replaced with the power on and the system operating. This facility is known as online insertion and removal (OIR). Unless otherwise noted, the maintenance tasks described in this chapter can be performed while the router remains powered on.

Powering Off the Router

⚠️

Caution   Do not turn off the switch on the power tray to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

If it becomes necessary to turn all power off to the router, follow these steps:

Procedure

Step 1   Set the power switch on the chassis to the off (0) position.

Figure 106: Power Switch on the Cisco ASR 9901
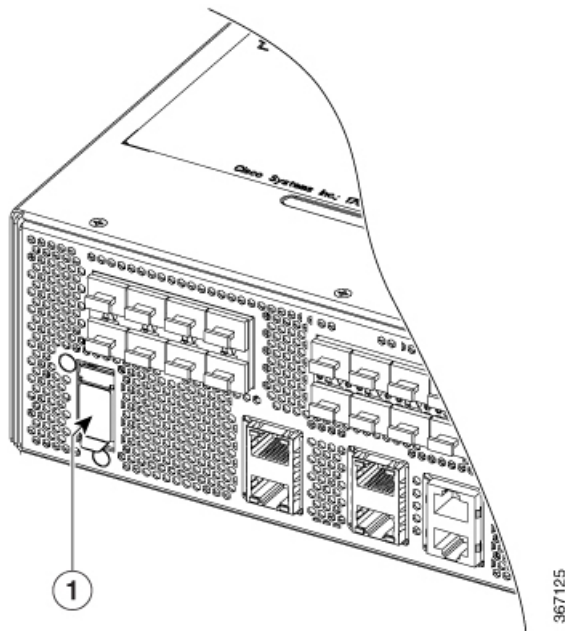
Figure 107: Power Switch on the Cisco ASR 9001
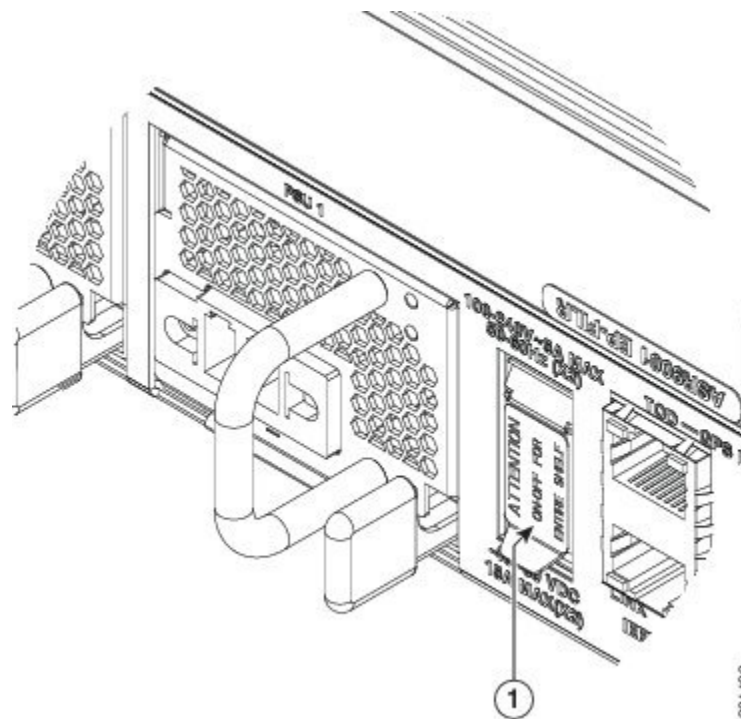
Step 2 Power off all circuit breakers for the source power lines connected to the power trays.

Step 3 Verify that the Pwr OK indicator on each power module is off.

Step 4 Verify that the OK indicator on the fan tray is off.

Removing and Replacing the Fan Tray

Note Fan tray OIR (Online Insertion and Removal) is supported from Cisco IOS XR Release 4.2.3.

The fan tray can be removed and replaced while the router is operating.

Cisco ASR 9901—We recommend that you replace a fan tray within 5 minutes.

Cisco ASR 9001—We recommend that you replace the fan tray within the following times to ensure that the router does not overheat:

- 3.1 minutes at 25°C operating temperature

- 2 minutes at 40°C operating temperature

- 42 seconds at 55°C operating temperature

⚠️

Warning   **The fans might still be turning when you remove the fan assembly from the chassis. Keep fingers, screwdrivers, and other objects away from the openings in the fan assembly's housing.** Statement 263

⚠️

Caution   Be sure that the fans have stopped running before removing the fan tray. The fans can take from 3 to 5 seconds to completely stop running after disengaging the fan tray latch. Handling the fan tray before the fans have stopped running could cause fingertip injury.

Removing and Replacing a Fan Tray

⚠️

Caution   Each Cisco ASR 9901 Router fan tray weighs approximately 1.1 pounds (0.5 kg). The Cisco ASR 9001 Router fan tray weighs approximately 2.6 pounds (1.2 kg). Use both hands when handling the fan tray.

To remove and replace a fan tray from the chassis:

Procedure

Step 1   Loosen the captive screw(s) that secure the fan tray.

Step 2   Use the handle on the fan tray front panel to pull the fan tray halfway out of the module bay (see the following figure).

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

Step 4   To reinstall the fan tray, lift the fan tray (with two hands) and slide it halfway into the module bay (see the following figure).

Step 5   Slowly push the fan tray into the chassis until it mates with the backplane connector at the back of the module bay.

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

Step 6   Tighten the captive screw(s) on the fan tray to a torque of 10 +/–1 in-lb to secure it to the chassis.

Step 7   Verify that the (green) OK status indicator on the front of the fan tray goes on. If the OK indicator does not light, see Troubleshooting the Cooling Subsystem, on page 127 section.

Figure 108: Removing or Installing the Fan Tray on the Cisco ASR 9901 Router Chassis
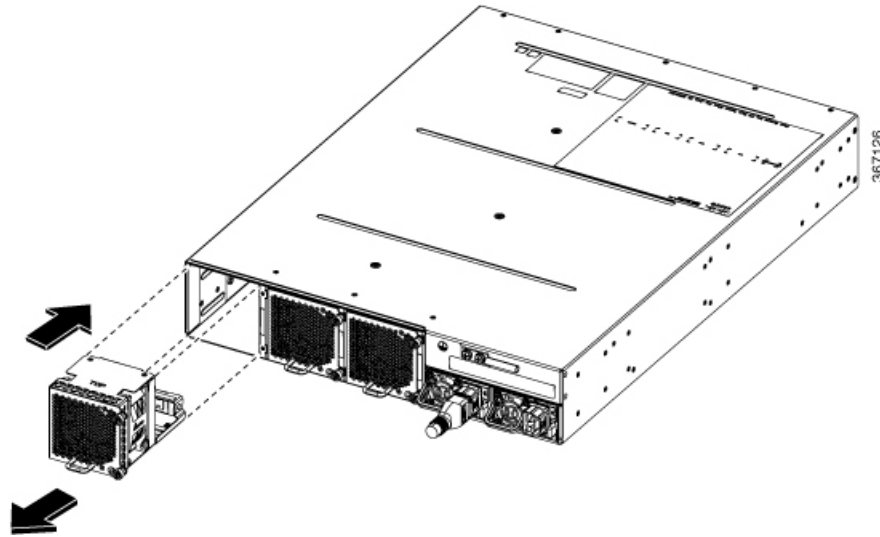
Figure 109: Removing or Installing the Fan Tray on the Cisco ASR 9001 Router Chassis
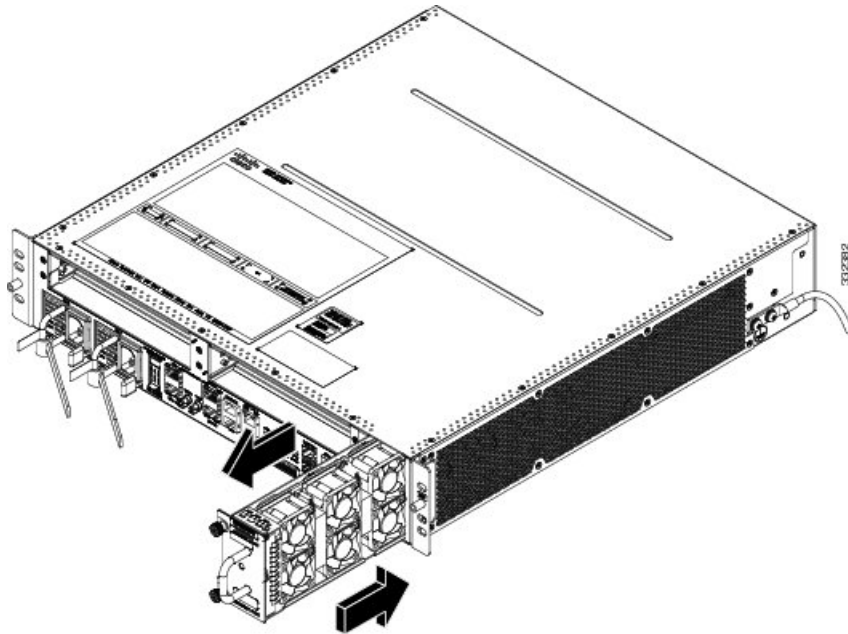
Removing and Replacing the Air Filter

The Cisco ASR 9001 Series Router, when used with the air plenum, has a serviceable air filter (Cisco PID ASR-9001-PLNMFLTR=) that is accessible from the top of the of the air filter assembly (see the following figure). The air filter removes dust from the room air drawn into the chassis by the fan trays.

Regularly check the air filter at least every three months. If used in a dusty environment, check the air filter once a month. Replace it if it appears excessively dirty or damaged. Failure to replace a compromised air filter can result in insufficient air circulation through the chassis.

Note   To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployments, the air filter must be replaced.

Note   The air filter can be removed from the air plenum assembly without removing the cables or the fan tray.

To replace the air filter, follow these steps:

Procedure

Step 1   Loosen the two captive screws on the air filter cover and remove it from the chassis.

Step 2   Grasp the pull tab in the center of the air filter, and slide it out from the slot.

Figure 110: Replacing the Air Filter
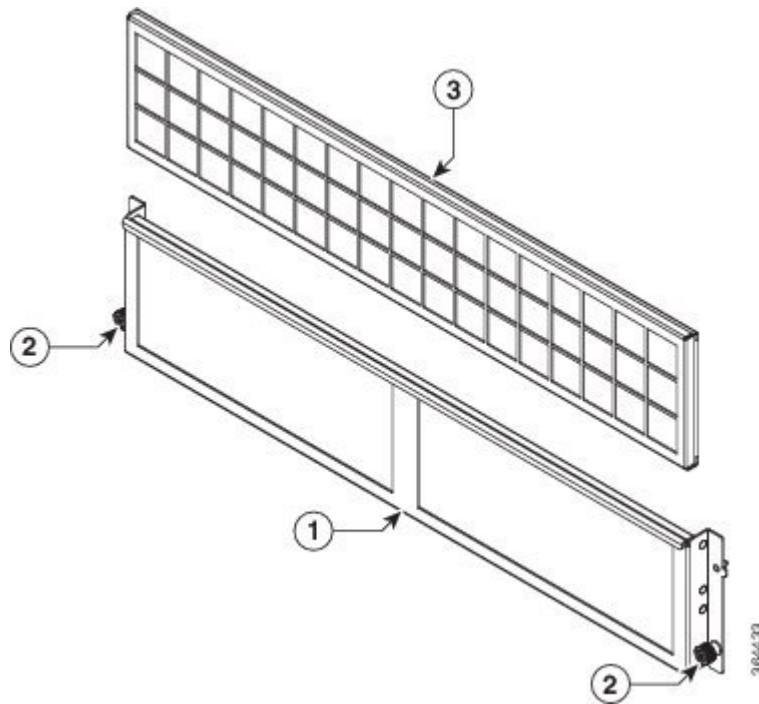
1	Air filter cover	2	Two captive screws
3	Air filter		

Step 3   Install the replacement air filter.

> **Note** Verify the air flow direction when installing the new air filter. An air flow direction arrow is stamped on the air filter frame and should be pointing towards the chassis and be visible when installed in the air filter cover.

  a) Slide the new air filter into the slot.

  b) Tighten the two captive screws on the front of the air filter cover.

Removing and Replacing AC or DC Power System Components

This section contains removal and replacement procedures for the AC and DC power systems used in the Cisco ASR 9901 Router and Cisco ASR 9001 Router.

Power Module Replacement Guidelines

The Cisco ASR 9901 Router and Cisco ASR 9001 Router support online insertion and removal (OIR) for power modules. If you are replacing a redundant power module, you can remove and install the power module while the system remains powered on without causing an electrical hazard or damage to the system. This feature enables you to replace a power module while the system maintains all routing information and ensures session preservation.

However, to maintain operational redundancy and proper cooling, and to meet EMI compliance standards, you must have at least one working power module installed. When you remove a failed power module with the router in operation, perform the replacement as soon as possible. Make sure you have the replacement power module ready before beginning the removal and installation procedure.

Removing and Replacing an AC or DC Power Module

This section contains the procedure to remove and replace an AC or DC power module from the chassis.

> **Note** It is not necessary to turn off the switch on the unit to remove individual power modules. Power modules support OIR, so they can be removed and replaced with the power on and the system operating.

Removing an AC or DC Power Module

To remove an AC or DC power module from the chassis:

Procedure

Step 1 Disconnect the power cabling from the power module before removing it from the chassis.

Step 2 Pull the keying lever towards the left side to unlock the module from the chassis.

Step 3 Slide the power module out of its bay while supporting it with your other hand.

Figure 111: Removing or Installing an AC or DC Power Module (Cisco ASR 9901 AC power shown)
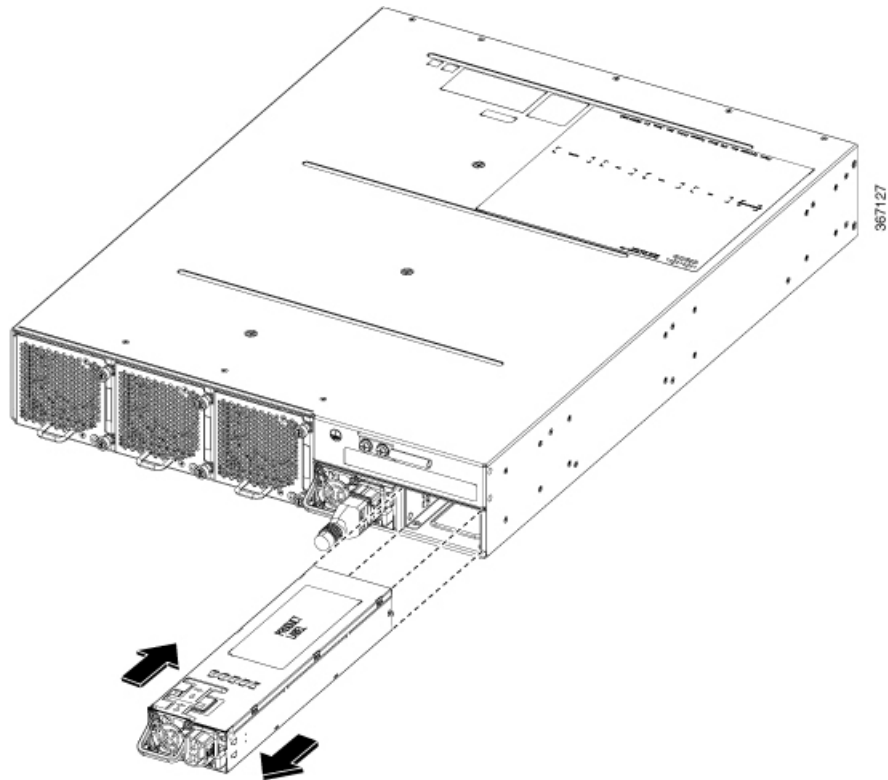
Figure 112: Removing or Installing an AC or DC Power Module (Cisco ASR 9001 AC power shown)
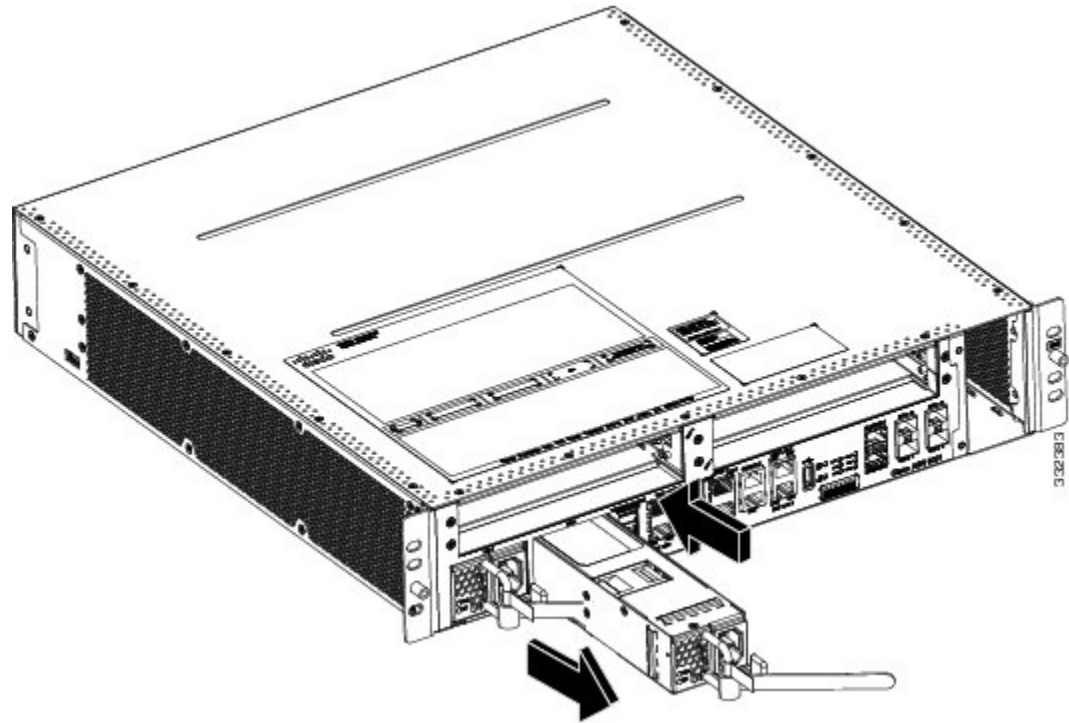
Installing an AC or DC Power Module

To install an AC or DC power module (see the above figure):

Procedure

Step 1   Slide the power module into the open bay until it mates with its backplane connector. Make sure that keying lever locks with the chassis.

Step 2   Attach the power cabling to the power module.

Step 3   Verify that the OK (green) power indicator on the front of the power module comes ON. If the indicator does not light up, see Troubleshooting the Power Subsystem, on page 103 section.

Removing a Chassis from the Equipment Rack

Use this procedure to remove the chassis and its components from the equipment rack:

⚠

Caution   You must use two people to remove the chassis from the equipment rack safely. An empty chassis can weigh up to approximately 24.69 pounds (11.2 kg).

Procedure

Step 1	Power off the router (see Powering Off the Router, on page 132).
Step 2	Power off the circuit breakers to the power supplies.
Step 3	Disconnect the power from the power modules on the front of the chassis:
Step 4	Disconnect RP cables connected to the console port, auxiliary port, or either of the management Ethernet ports.
	Be sure to label each of the RP cables before you disconnect the cables.
Step 5	Disconnect the line card interface cables.
Step 6	Disconnect the supplemental bonding and grounding connection from the chassis (see Supplemental Bonding and Grounding Connections, on page 60).
Step 7	Remove the chassis from the rack.
	a) Remove the screws that attach the chassis rack mount flanges and the side rack mount brackets to the rack posts.
	b) Carefully lift the chassis out of the rack and set it aside.

Installing a Replacement Chassis in the Equipment Rack

Use this procedure to install the replacement chassis and components in the equipment rack:

Procedure

Step 1	Install the new chassis in the rack (see Rack-Mounting the Chassis, on page 57).
Step 2	Connect the supplemental bonding and grounding connection (if there is one) to the chassis (see Supplemental Bonding and Grounding Connections, on page 60).
Step 3	Connect all line card and interface cables (see Connecting Route Processor Cables, on page 92).
Step 4	Connect power to the power modules on the front of the chassis.
Step 5	To turn on power to the router, see Powering on the Router, on page 98.

Packing a Chassis for Shipment

Use the packaging that came with the replacement chassis to repack and ship the chassis being replaced.

Technical Specifications

This appendix lists certain technical specifications for the Cisco ASR 9001 and ASR 9001-S Routers.

Physical Specifications

Table 22: Physical Specifications

Description	Value
Chassis height	ASR 9901: 3.43 in. (8.7 cm)
	ASR 9001: 3.46 in. (8.79 cm)
Chassis width	ASR 9901: 17.32 in. (44.0 cm)
	ASR 9001: 17.42 in. (44.2 cm)
Chassis depth	ASR 9901: 23.62 in. (60.0 cm)
	ASR 9001: 18.5 in. (47.0 cm)

Description	Value

Chassis weight	ASR 9901
	
	• Chassis only: 47.62 lb (21.6kg)
	
	   Note Chassis only does not include power modules, fan trays, or chassis accessories.
	
	• Fully configured chassis: 55.97 lb (25.4 kg)
	
	   Note Fully configured includes two power modules and three fan trays.
	
	ASR 9001
	
	• Chassis only: 24.69 pounds (11.2 kg)
	
	   Note Chassis only does not include cards, power modules, fan tray, or chassis accessories.
	
	• Fully configured chassis: 37.91 pounds (17.2 kg)
	
	   Note Fully configured includes two MPAs, two power modules, and one fan tray.

Environmental Specifications

Table 23: Environmental Specifications

Description	Value
Operating Temperature (Nominal):	41° to 104°F (5° to 40°C)
Operating Temperature(Short term): **Note** Short-term refers to a period of not more than 96 consecutive hours, and a total of no more than 15 days in a year. (This refers to a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period.)	23° to 131° F (−5° to 55°C)
Humidity	Operating: 10 to 85 percent noncondensing Nonoperating: 5 to 95 percent noncondensing
Altitude	Operating: 0 to 13,000 ft (0 to 4,000 m) Nonoperating: 0 to 15,000 ft (0 to 4,570 m)
Power Dissipation	Cisco 9901—1100 W maximum Cisco 9001—750 W maximum
Acoustic noise	70 dB at 80.6°F (27°C) maximum

Description	Value
Shock	Operating (halfsine): 21 in/sec (0.53 m/sec)
	Nonoperating (trapezoidal pulse): 20 G, 52 in/sec (1.32 m/sec)
	Note G is a value of acceleration, where 1G equals 32.17 ft/sec2 (9.81 m/sec2).
Vibration	Operating: 0.35 Grms from 3 to 500 Hz
	Note Grms is the root mean square value of acceleration.
	Nonoperating: 1.0 Grms from 3 to 500 Hz

AC Electrical Specifications

⚠

Caution   Be sure that the chassis configuration complies with the required power budgets. Failure to properly verify the configuration may result in an unpredictable state if one of the power units fails. Contact your local sales representative for assistance.

Cisco ASR 9901 AC Electrical Specifications

Description	Value
Power modules per system	Up to two AC power modules per system
Total AC input power	1633 VA (volt-amps) per AC power supply (up to two AC power supply modules per system)
Rated input voltage **Note** For each AC power supply module.	100–240 VAC nominal (range: 90 to 264 VAC) 220–240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	15 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). AC powered systems are 1+1 protected.

Cisco ASR 9001 AC Electrical Specifications

Description	Value
Power modules per system	Up to two AC power modules per system
Total AC input power	765 VA (volt-amps) per AC power supply (up to two AC power supply modules per system)
Rated input voltage **Note** For each AC power supply module.	100–240 VAC nominal (range: 90 to 264 VAC) 220–240 VAC (UK)
Rated input line frequency	50/60 Hz nominal (range: 47 to 63 Hz) 50/60 Hz (UK)
Input current rating	15 A maximum at 100 VAC 13 A maximum at 220 to 240 VRMS (UK)
Source AC service requirement	15 A North America and Japan; 10 A international; 13 A UK
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). AC and DC powered systems are N+1 protected.

DC Electrical Specifications

Cisco ASR 9901 DC Electrical Specifications

Description	Value
Power modules per system	Up to two DC power modules per system
Total DC input power per power module	1600 W
Rated input voltage per power module	–48 VDC nominal in North America –60 VDC nominal in the European Community (range: –40.5 to –72 VDC [–75 VDC for 5 ms])

Description	Value
Input current rating	45 A maximum at –48 VDC nominal
Note For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.	35 A maximum at –60 VDC nominal
Source DC service requirement[1]	Sufficient to supply the rated input current. Local codes apply.
Redundancy	DC powered systems are 1+1 protected.

[1] For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.

Cisco ASR 9001 DC Electrical Specifications

Description	Value
Power modules per system	Up to two DC power modules per system
Total DC input power per power module	750 W
Rated input voltage per power module	–48 VDC nominal in North America–60 VDC nominal in the European Community(range: –40.5 to –72 VDC [–75 VDC for 5 ms])
Input current rating	15 A maximum at –48 VDC nominal
Note For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.	15 A maximum at –60 VDC nominal
Source DC service requirement[2]	Sufficient to supply the rated input current. Local codes apply.
Redundancy	Power redundancy requirements vary, based on system configuration (number and type of line cards, etc). DC powered systems are N+1 protected.

2   For each DC power supply module. Some power/chassis configurations may operate at lower current ratings than those specified in this table. Contact your Cisco technical representative for more information.

AC Input Voltage Range

Cisco ASR 9901 AC Input Voltage Range – 1600 W (Single-Phase Power Source)

Range	Minimum	Minimum Nominal	Nominal	Maximum Nominal	Maximum
Input Voltage	90 VAC	100 VAC	220 VAC	240 VAC	264 VAC
Line Frequency	47 Hz	50 Hz	50/60 Hz	60 Hz	63 Hz

Cisco ASR 9001 AC Input Voltage Range – 750 W (Single-Phase Power Source)

Range	Minimum	Minimum Nominal	Nominal	Maximum Nominal	Maximum
Input Voltage	90 VAC	100 VAC	220 VAC	240 VAC	264 VAC
Line Frequency	47 Hz	50 Hz	50/60 Hz	60 Hz	63 Hz

DC Input Voltage Range

Table 24: DC Input Voltage Range

Range	Minimum	Nominal	Maximum
Input Voltage	–40 VDC	–48 VDC	–72 VDC

Power System DC Output Levels

Table 25: DC Output Levels for AC or DC Power System

Parameter	Value
Voltage	
Maximum	12.6 VDC

Parameter	Value
Nominal	12 VDC
Minimum	11.4 VDC
Power	
Minimum (one power module)	Cisco ASR 9001—750 W Cisco ASR 9901—1600 W
Maximum (two power modules)	Cisco ASR 9001—1500 W Cisco ASR 9901—3200 W

RP Port Specifications

Table 26: RP Port Specifications

Description	Value
Console port	EIA/TIA-232 RJ-45 interface, 115200 Baud, 8 data, no parity, 1 stop bit with software handshake (default)
Auxiliary port	EIA/TIA-232 RJ-45 interface, 115200 Baud, 8 data, no parity, 1 stop bit with software handshake (default)
Management ports (0, 1)	Triple-speed (10M/100M/1000M) RJ-45
Sync ports (0, 1)	Can be configured as one of the following: • BITS (Building Integrated Timing System) port • J.211 or UTI (Universal Timing Interface) port

Power Consumption Specifications

The following table lists the power consumption specifications for a fully configured chassis.

⚠

Caution   Be sure that the chassis configuration complies with the required power budgets. Failure to properly verify the configuration may result in an unpredictable state if one of the power units fails. Contact your local sales representative for assistance.

Table 27: Power Consumption Specifications

Description	Cisco ASR 9901	Cisco ASR 9001
Power consumption	750 W at 77°F (25°C)	400 W at 77°F (25°C)
	800 W at 104°F (40°C)	425 W at 104°F (40°C)
	900 W at 131°F (55°C)	450 W at 131°F (55°C)

Transceiver Modules

Refer to the *Cisco Transceiver Compatibility Information* page for information on supported transceiver modules on the Cisco ASR 9901 Router and Cisco ASR 9001 Router.

Refer to the *Cisco Transceiver Data Sheets* for transceiver specifications.

Site Log

The site log provides a historical record of all operation and maintenance actions performed on the router. Keep your site log at a convenient place near the router where it can be easily accessed.

- Site Log, on page 149

Site Log

The site log might include these entries:

- Installation progress—Make entries in the site log to record installation progress. Note any difficulties and remedies during the installation process.
- Upgrades or removal and replacement procedures—Use the site log as a record of router maintenance and expansion history.

Each time a procedure is performed on the router, update the site log to record these:

- - Any field replaceable unit (FRU) that is installed, removed, or replaced
  - Any router configuration changes
  - Software upgrades
  - Corrective or preventive maintenance procedures performed
  - Intermittent problems
  - Related comments

A sample site log format is provided in the next page. You can make copies of the sample, or design your own site log page to meet the customized needs of your site and equipment.

Date	Description of Action Performed or Symptoms Observed	Initials