Preparing for Installation

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

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

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

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

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

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

This chapter contains these installation topics:

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

Overview

This topic provides an overview of the following routers:

Cisco ASR 9902 Router

Table 1: Feature History Table

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

This table lists the components of Cisco ASR 9902 router:

Table 2: Cisco ASR 9902 Router Components

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

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

Note A slice is a logical grouping of physical ports.

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

Figure 1: Front Panel of the Cisco ASR 9902 Router

Figure 2: Rear Panel of the Cisco ASR 9902 Router

Cisco ASR 9903 Router

Table 3: Feature History Table

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

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

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

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

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

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

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

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

Figure 3: Front Panel of the Cisco ASR 9903 Router

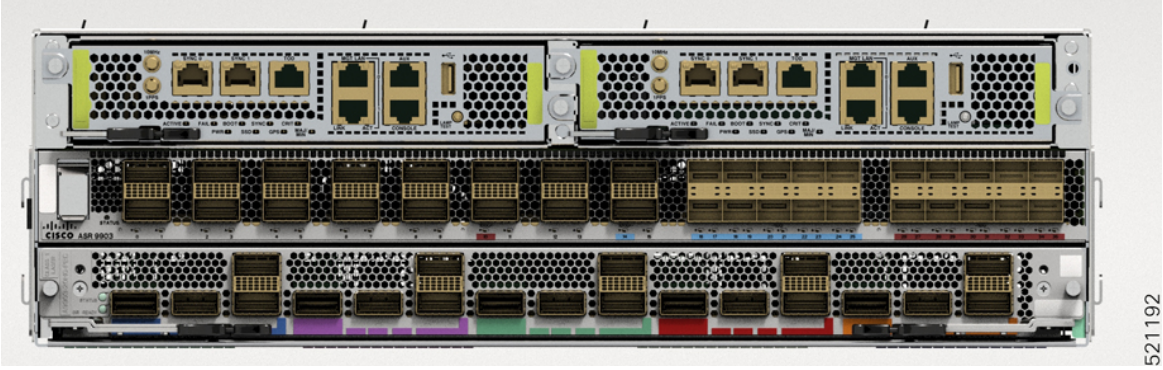


Figure 4: Rear Panel of the Cisco ASR 9903 Router

Cisco ASR 9901 Router

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

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

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

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

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

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

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

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

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

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

Figure 5: Front Panel of the Cisco ASR 9901 Router

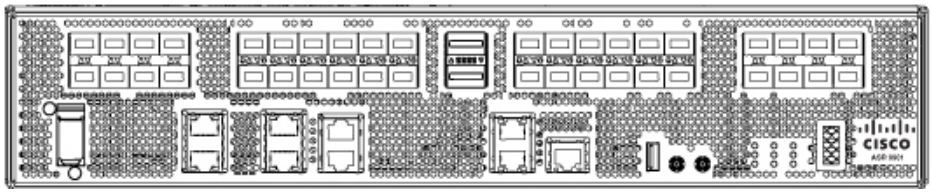
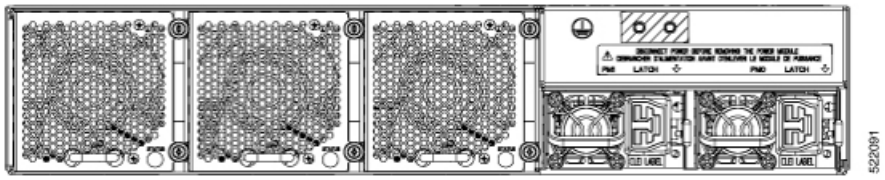


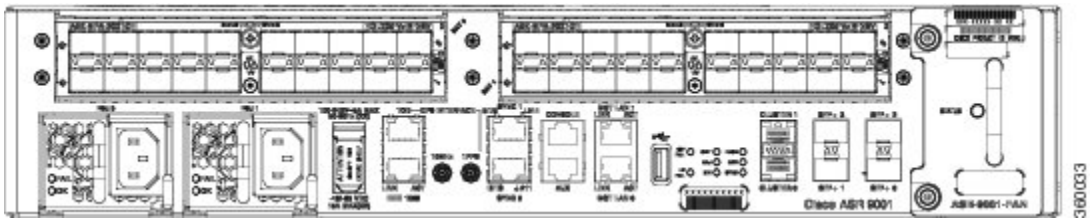
Figure 6: Back Panel of the Cisco ASR 9901 Router



Cisco ASR 9001 Router

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

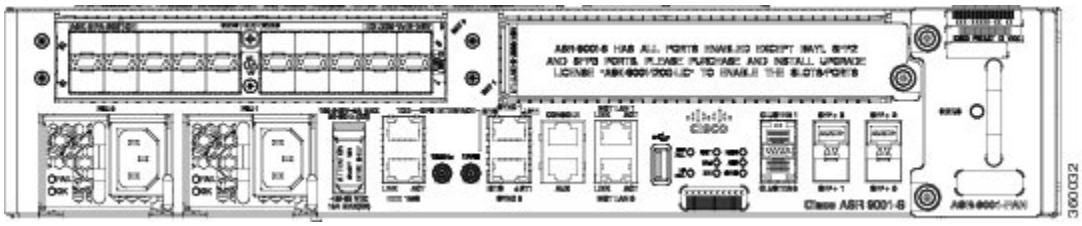
Figure 7: Front Panel of the Cisco ASR 9001 Router



Cisco ASR 9001-S Router

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

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



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

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

Safety Guidelines

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

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

General Safety Guidelines

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

Compliance and Safety Information

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

Warning

Statement 1071—Warning Definition

IMPORTANT SAFETY INSTRUCTIONS

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

SAVE THESE INSTRUCTIONS

Laser Safety

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

Warning **Statement 1051—**Laser Radiation

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

Energy Hazard

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

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

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

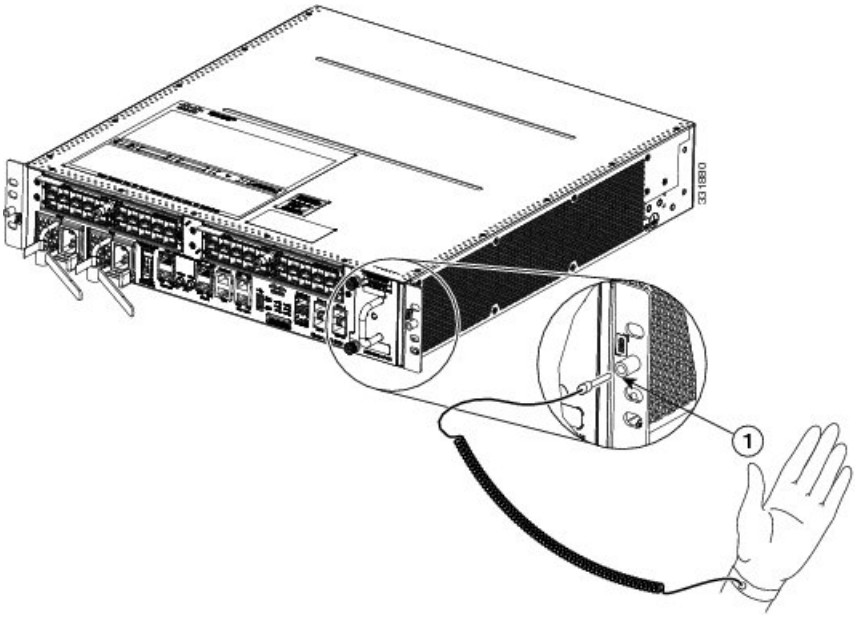
Preventing Electrostatic Discharge Damage

Many router components can be damaged by static electricity. Not exercising the proper electrostatic discharge (ESD) precautions can result in intermittent or complete component failures. To minimize the potential for ESD damage, always use an ESD-preventive antistatic wrist strap (or ankle strap) and ensure that it makes good skin contact.

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

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

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



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

Lifting Guidelines

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

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

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

Warning

Statement 1032—Lifting the Chassis

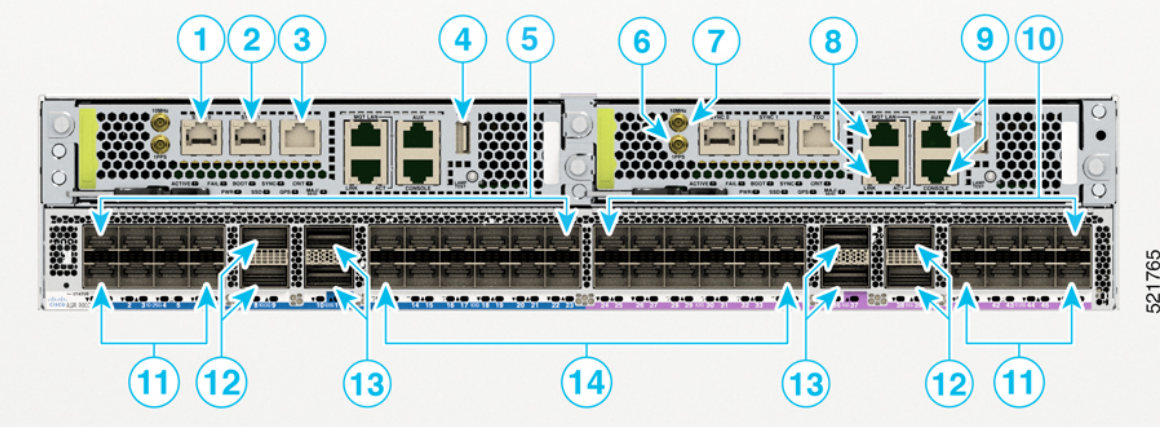
To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules, such as power supplies, fans, or cards. These types of handles are not designed to support the weight of the unit.

Port Connection Guidelines

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

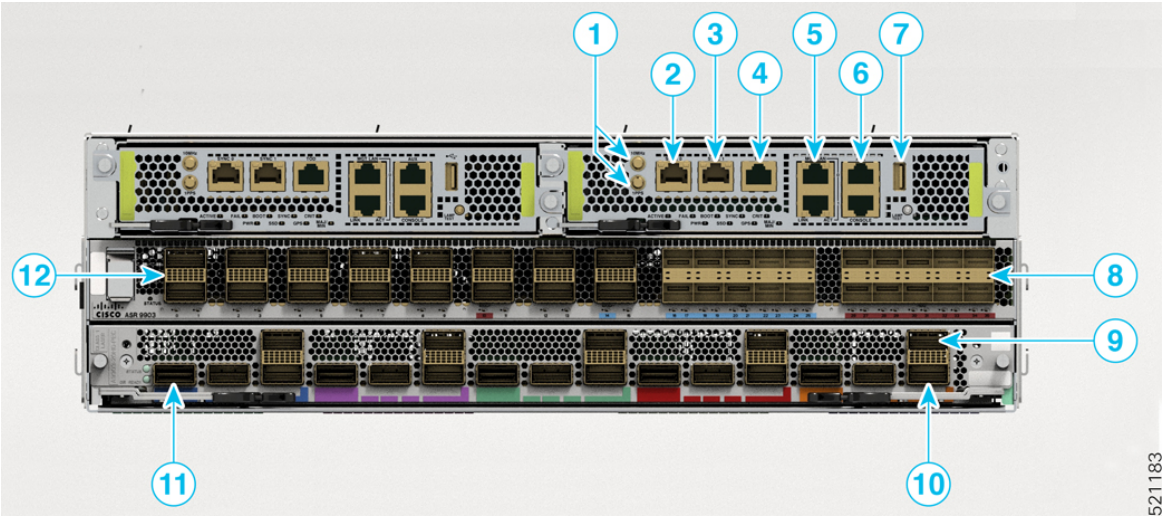
Caution Ports labeled Ethernet, SYNC, CONSOLE, and AUX are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits.

Figure 10: Cisco ASR 9902 Router Front Panel Ports



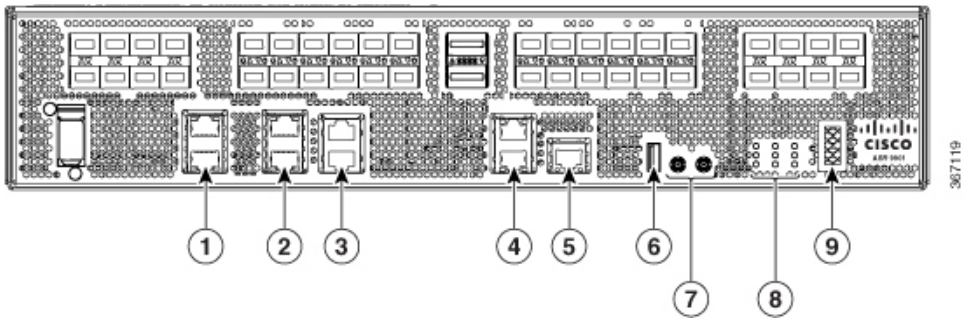
1	SYNC 0 port	8	Management port
2	SYNC 1 port	9	AUX and CONSOLE ports
3	TOD port	10	Slice 1
4	USB port	11	25GE/10GE SFP28 ports; eight on ea
5	Slice 0	12	100GE/40GE QSFP28 ports
6	1 PPS port	13	100GE/40GE ports Top ports support QSFP-DD transceiv QSFP28 transceiver
7	10MHz port	14	10GE SFP+ with OTN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

Figure 11: Cisco ASR 9903 Router Front Panel Ports



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

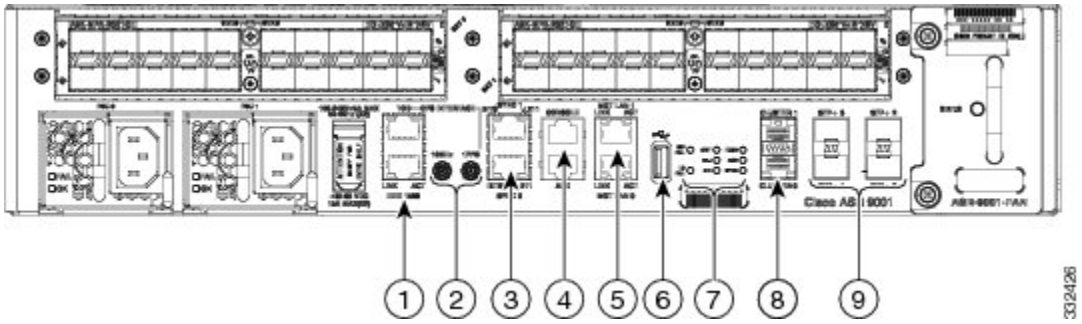
Figure 12: Cisco ASR 9901 Router Front Panel Ports



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

5	Connectivity Management Processor (CMP) port		

Figure 13: Cisco ASR 9001 Router Front Panel Ports



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

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

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

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

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

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

Console Port and Auxiliary Port Connection Guidelines

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

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

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

Console Port Signals

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

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

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

Table 5: RP Console Port Signals

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

Auxiliary Port Signals

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

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

Table 6: RP AUX Port Signals

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

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

Management LAN Ports Connection Guidelines

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

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

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

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

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

Management port characteristics are:

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

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

Table 7: RP Management LAN Port Signals

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

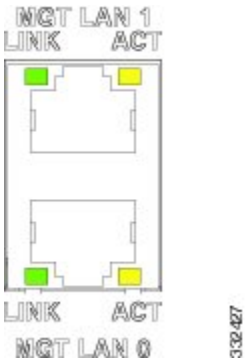
7	—	BI_DD+
8	—	BI_DD–

Management LAN Port LED Indicators

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

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

Figure 14: RP Management LAN Port LED Indicators



Management LAN RJ-45 Cabling

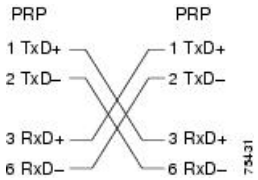
When connecting the RJ-45 port to a hub, repeater, or switch, use the straight-through cable pinout shown in the following figure.

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

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

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

Figure 16: Crossover Cable Pinout Between RP



Sync Ports Connection Guidelines

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

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

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

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

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

SYNC Port LED Indicators

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

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

Figure 17: SYNC Port Connector

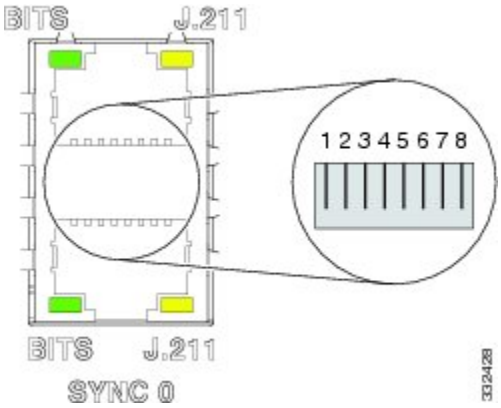


Table 8: BITS/J.211 Connector Pinout

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

RP External USB Port

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

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

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

Site Requirement Guidelines

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

Site Layout and Equipment Dimensions

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

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

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

The following figures show the the chassis footprint and dimensions:

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

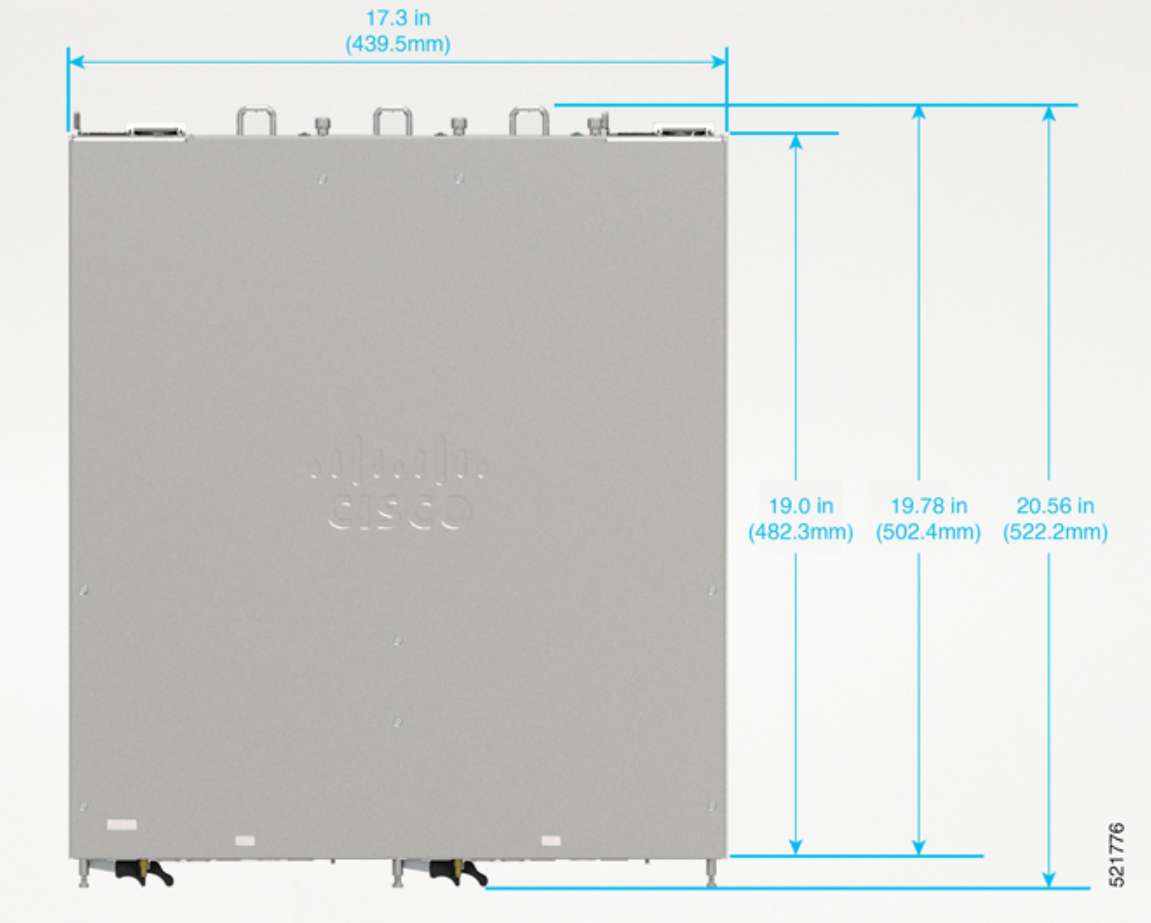


Figure 19: Cisco ASR 9903 Router Chassis Footprint and Dimensions—Top View

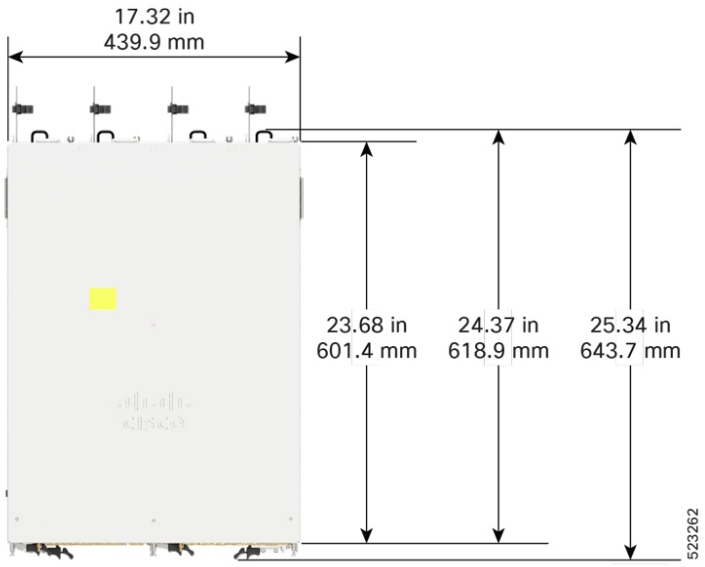


Figure 20: Cisco ASR 9901 Router Chassis Footprint and Dimensions—Top View

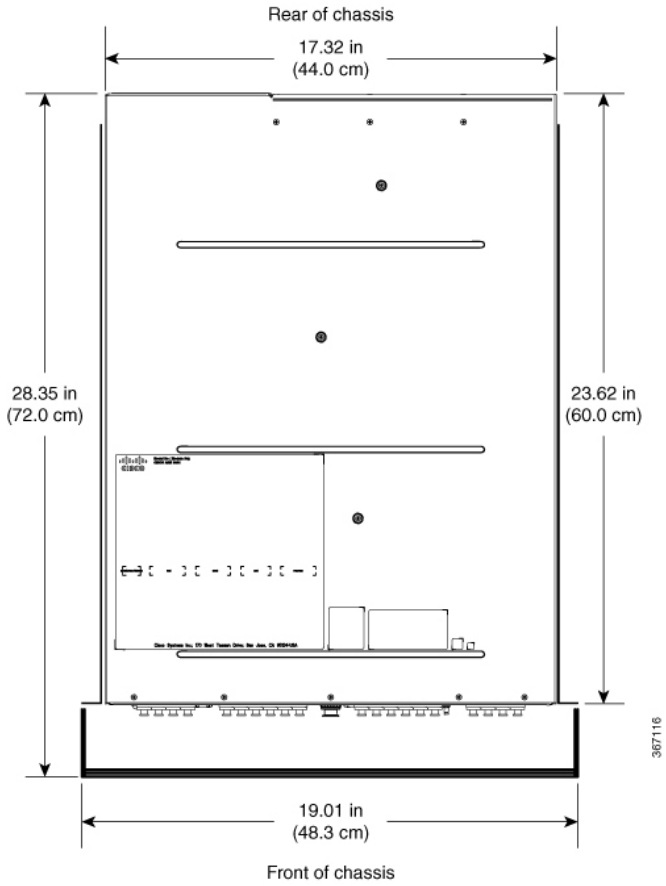
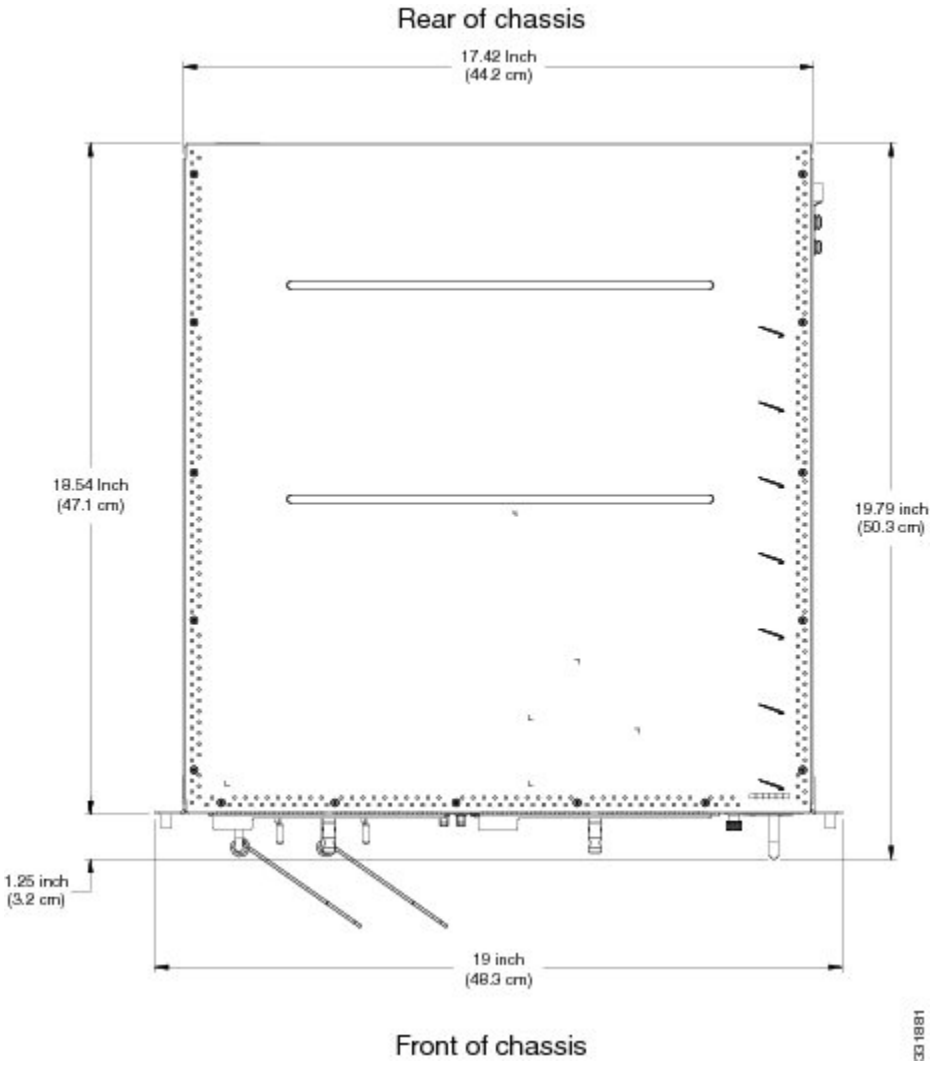


Figure 21: Cisco ASR 9001 Router Chassis Footprint and Dimensions—Top View



Site Wiring Guidelines

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

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

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

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

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

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

Chassis Air Flow Guidelines

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

The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis. Each power supply is also equipped with fans that draw cool air to cool the inner components.

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

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

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

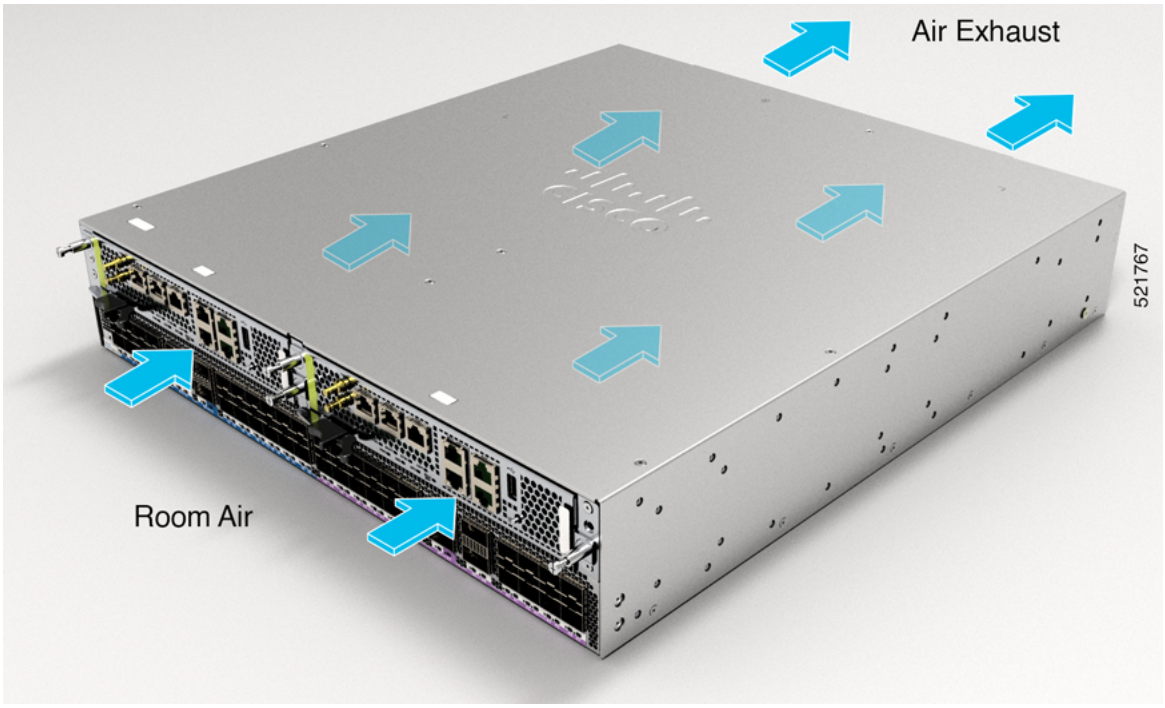


Figure 23: Air Flow Path through the Cisco ASR 9903 Router

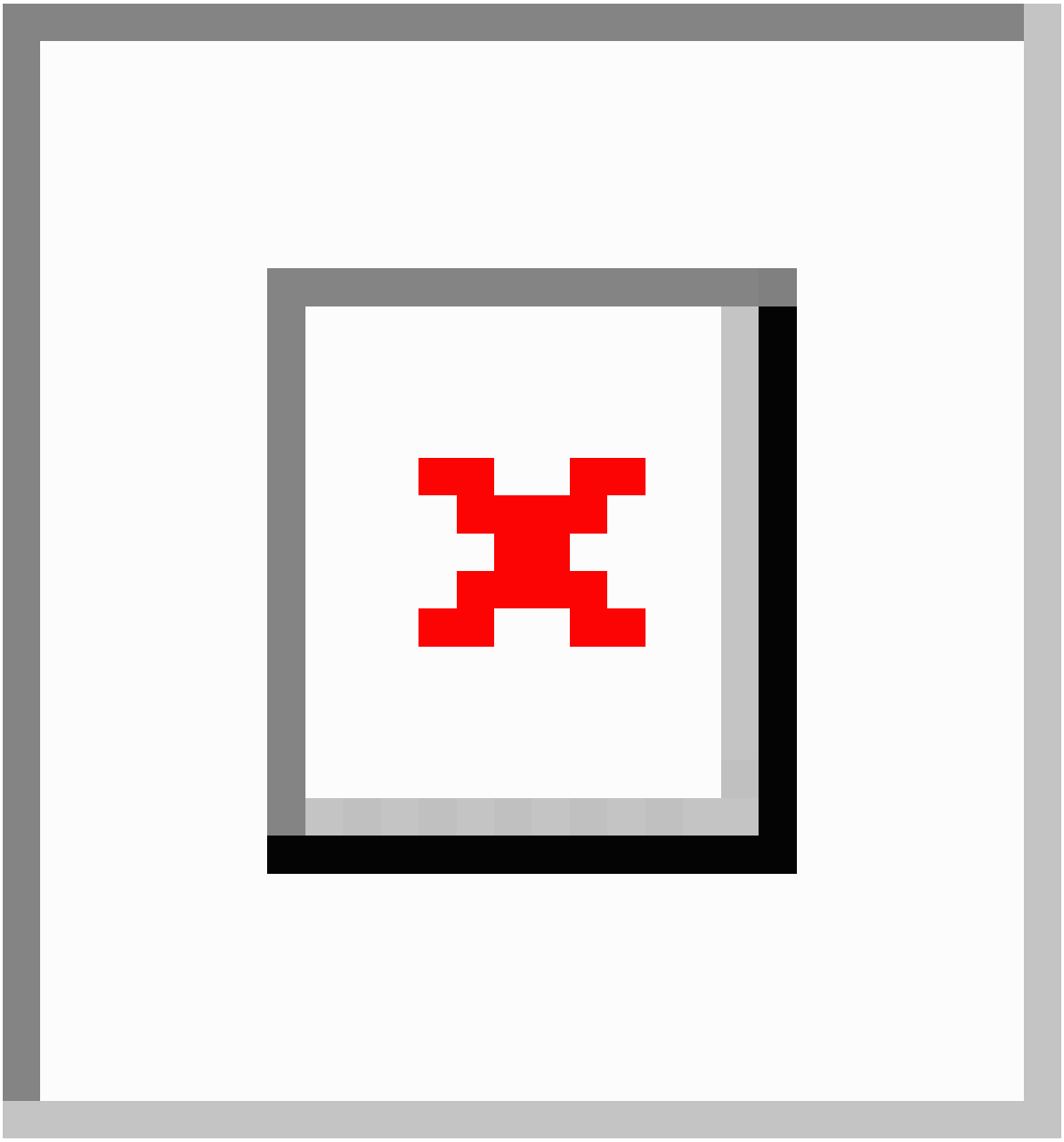


Figure 24: Air Flow Path through the Cisco ASR 9901 Router

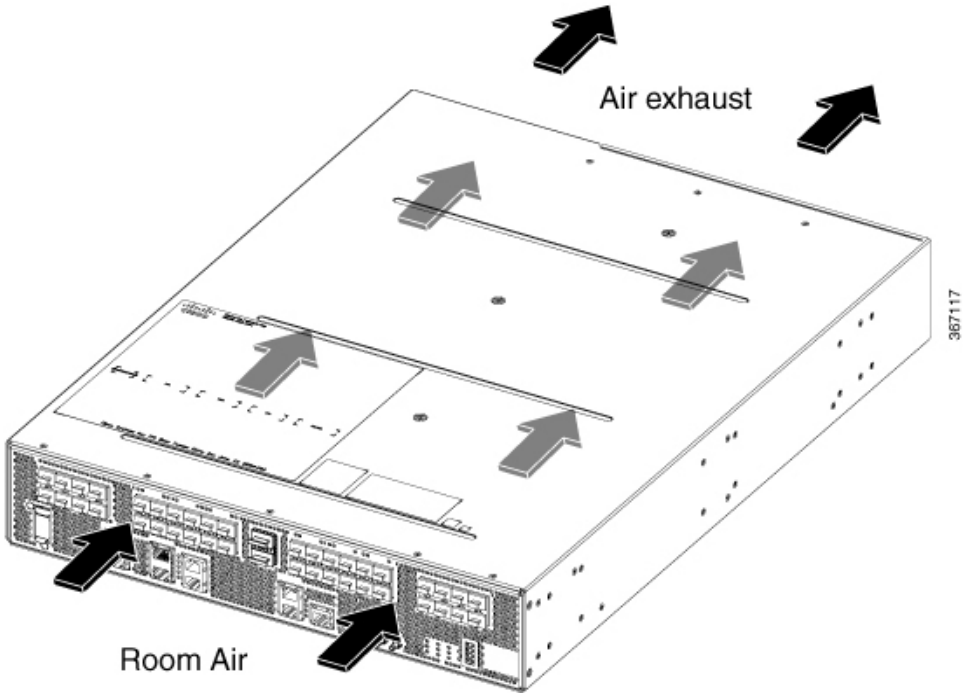
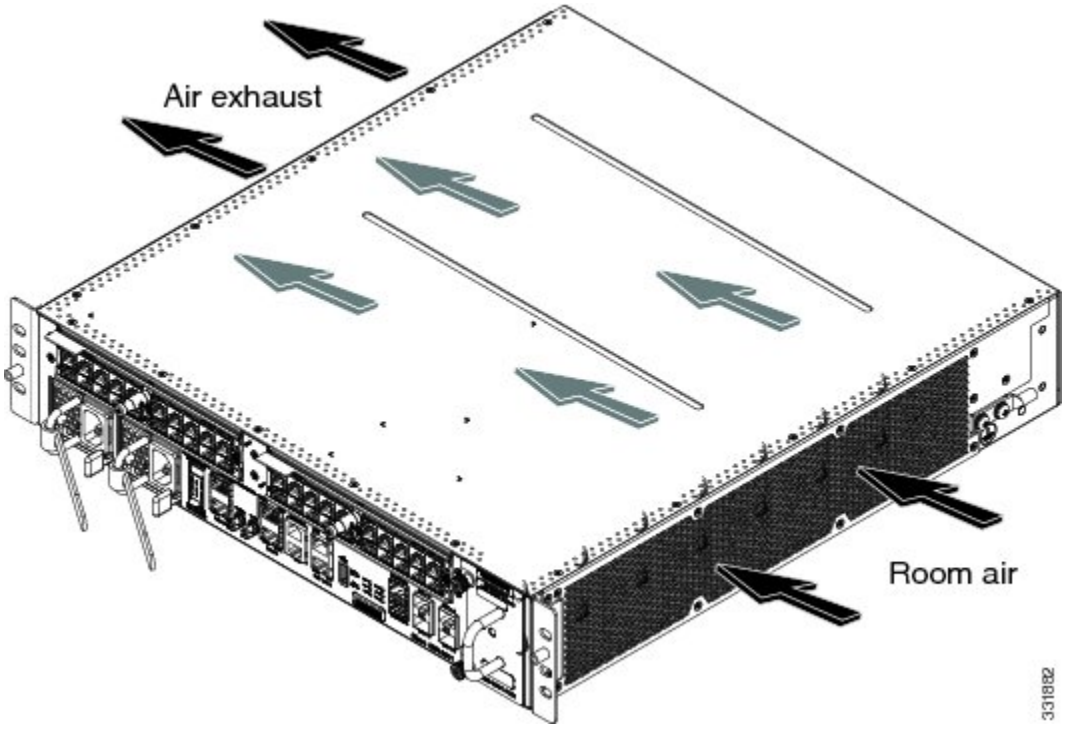


Figure 25: Air Flow Path through the Cisco ASR 9001 Router



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

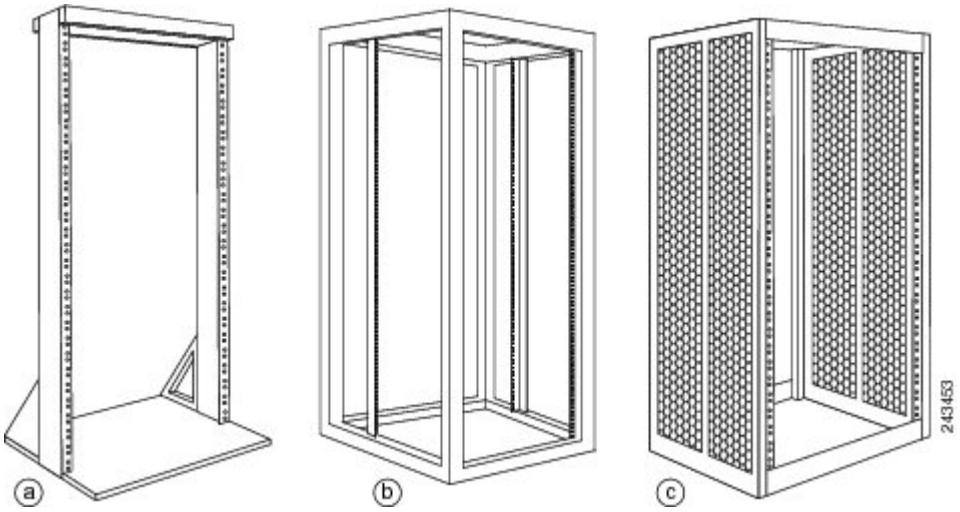
- Dust free area—Site should be as dust free as possible. Dusty environments can clog the power supply intake vents, reducing the cooling air flow through the router. Clogged filters and vents can cause an over-temperature condition in the router.
- Unrestricted air flow—Allow sufficient air flow by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

Rack-Mounting and Air Flow Clearance Guidelines

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

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

Figure 26: Equipment Rack Types



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

Telco 2-Post Rack

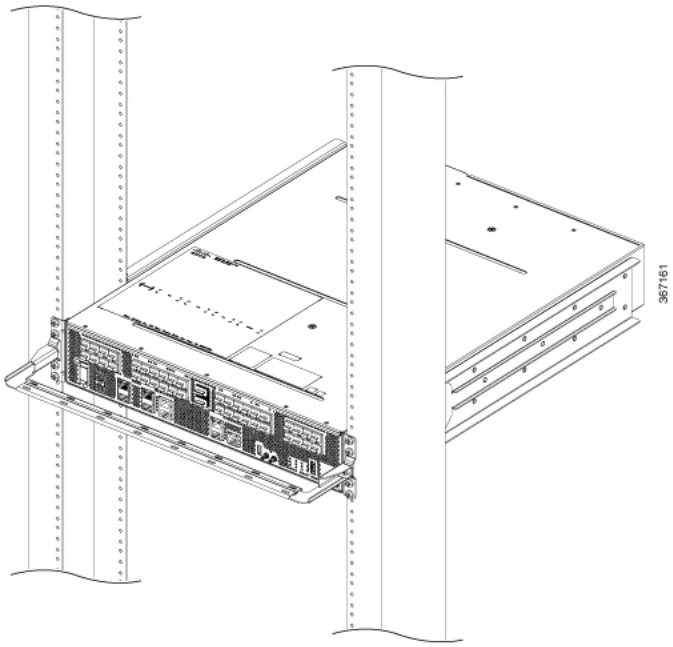
Item a in the above figure shows a telco-style rack. The *telco-style rack* is an open frame consisting of two posts tied together by a cross-bar at the top and a floor-stand at the bottom.

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

Cisco ASR 9901 and Cisco ASR 9902 Router

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

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

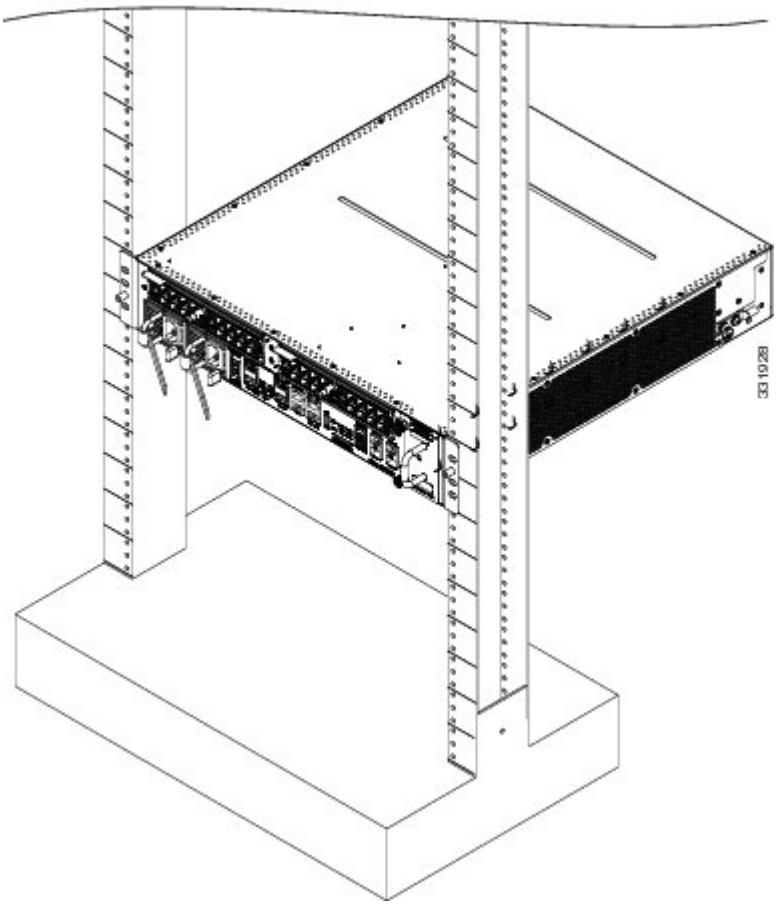


Cisco ASR 9001 Router

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

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

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



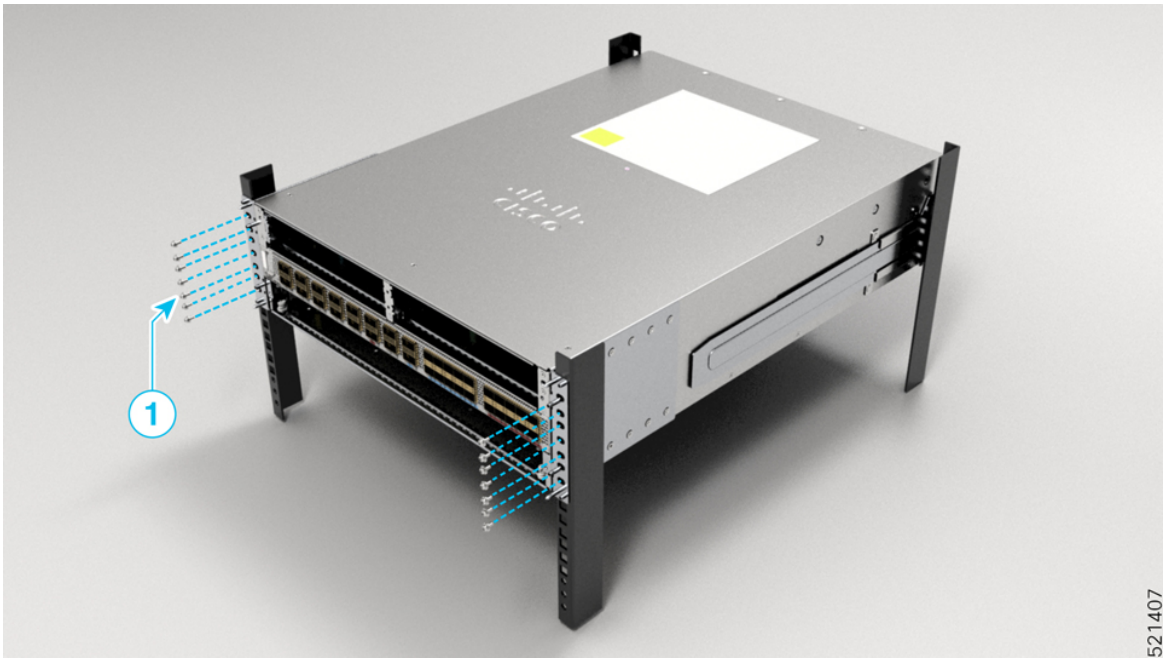
Open 4-Post Rack

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

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

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

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



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

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

Enclosed Rack with Perforated Sides

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

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

Air Flow Guidelines for Enclosed Rack Installation

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

Cisco ASR 9902, and Cisco ASR 9903

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

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

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

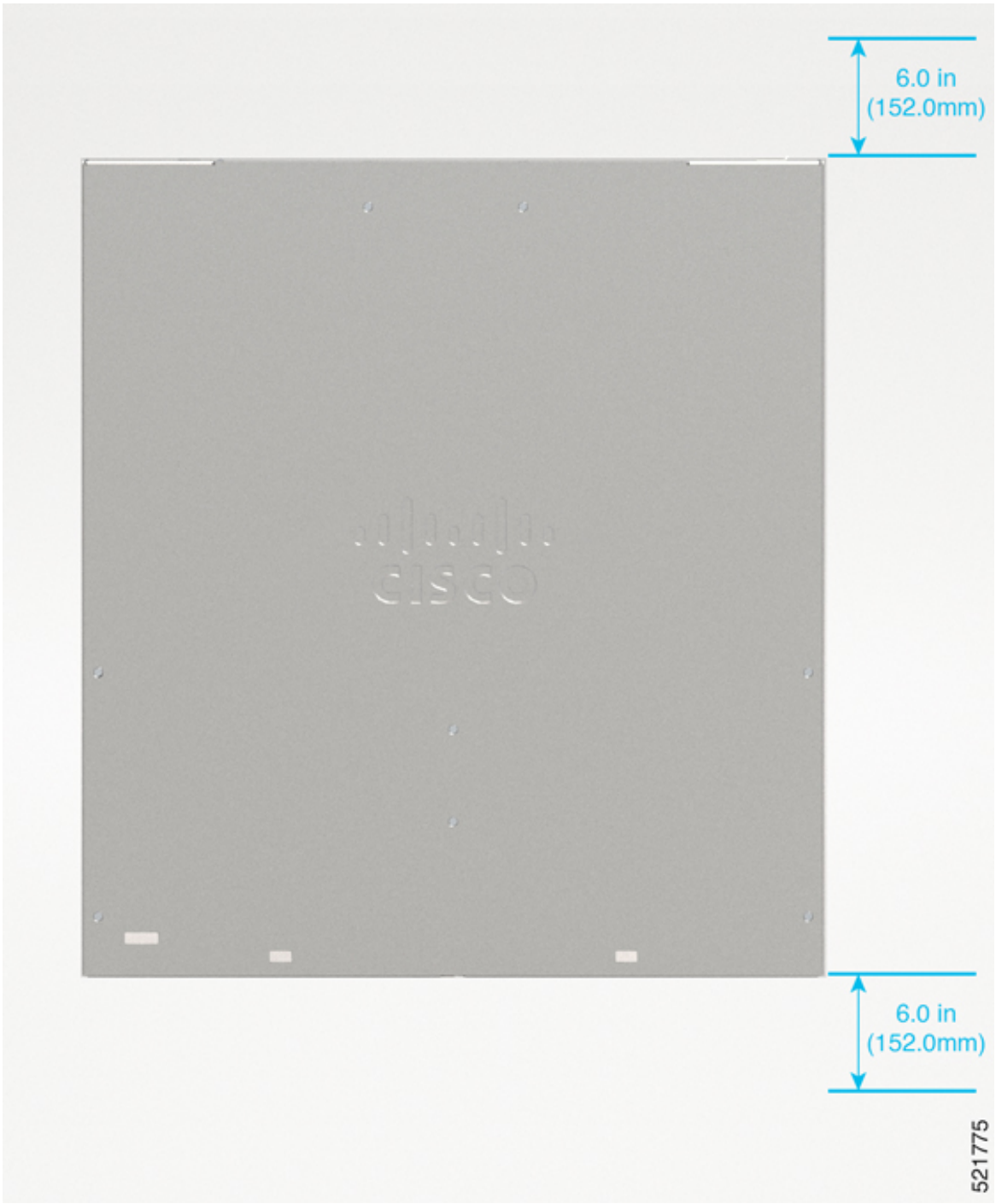
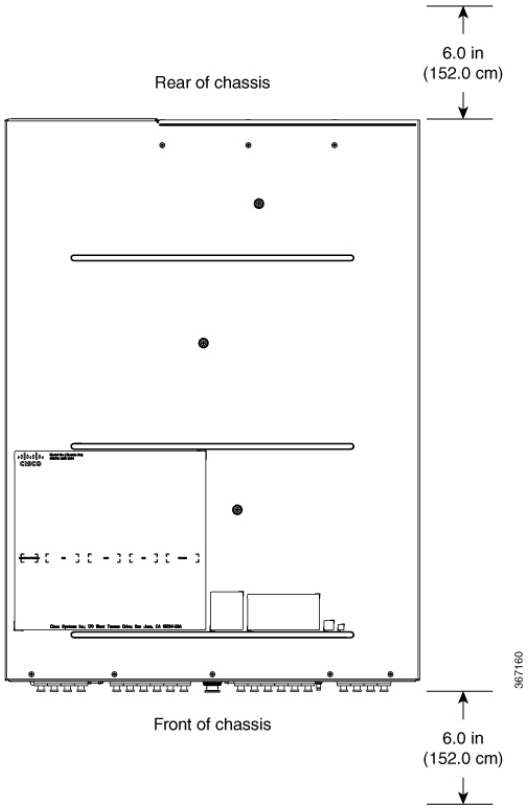


Figure 31: ASR 9903 Clearance Requirements for an Enclosed Rack Installation

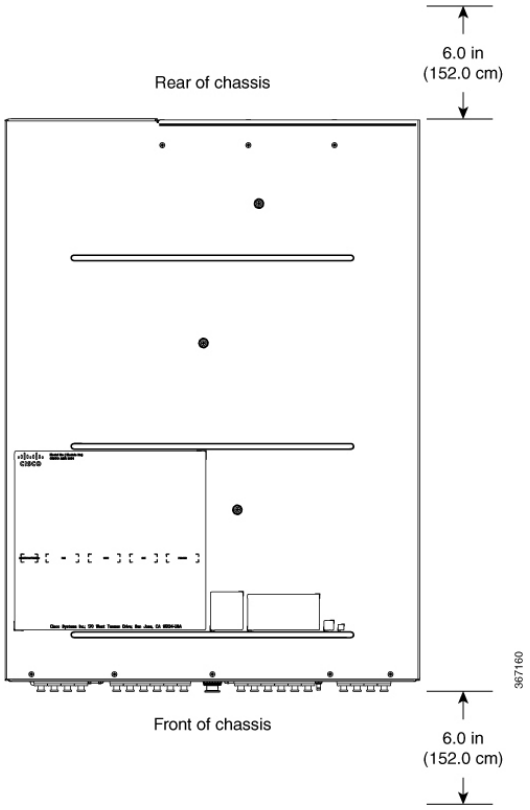


Cisco ASR 9901

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

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

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



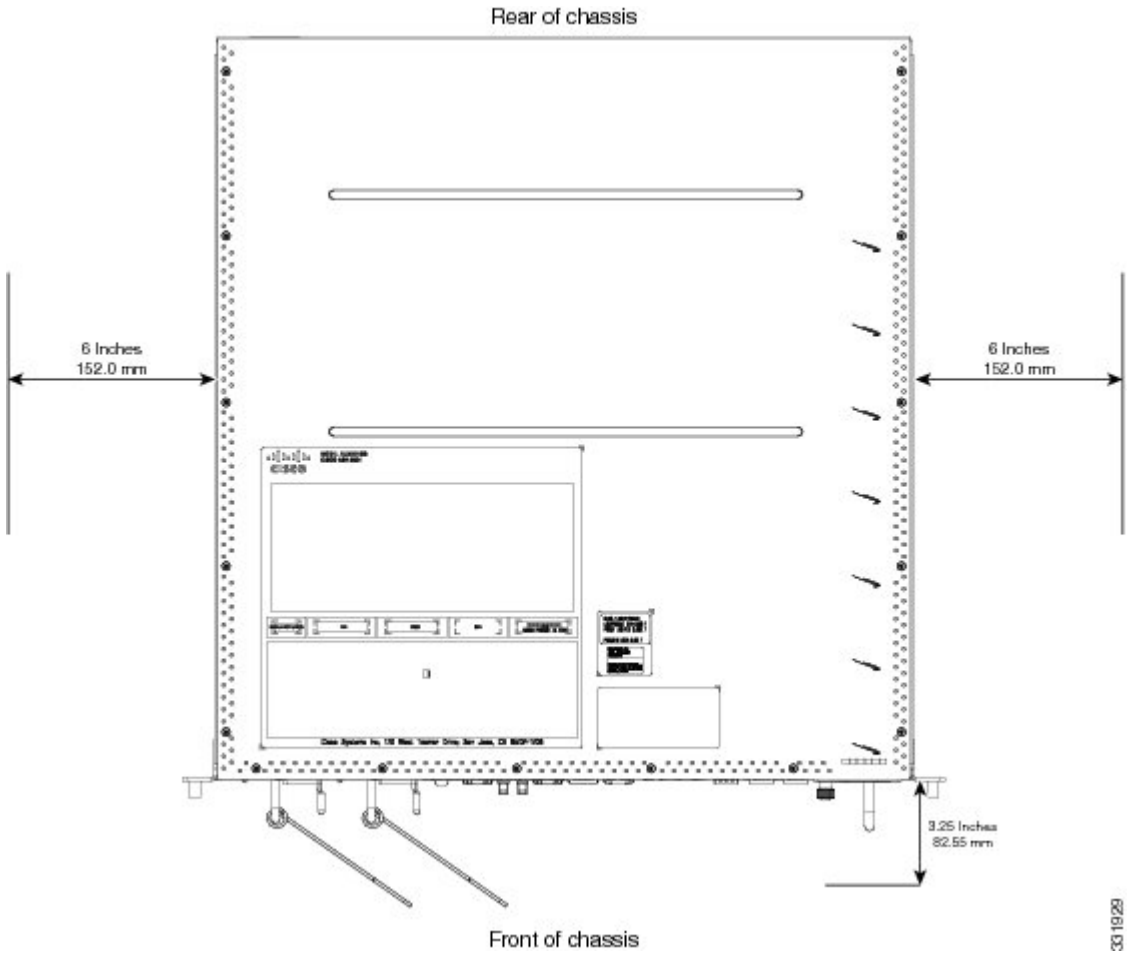
Cisco ASR 9001

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

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

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

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



Temperature and Humidity Guidelines

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

Power Connection Guidelines

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

⚠

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

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

AC Powered Routers

Cisco ASR 9902 and Cisco ASR 9903

AC power modules operate within the following input range:

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

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

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

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

Note

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

Each AC power inputs requires a separate dedicated branch circuit.

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

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

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

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

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

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

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

Cisco ASR 9901

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

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

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

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

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

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

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

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

AC Power Cord Illustrations for Cisco ASR 9901 Router

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

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

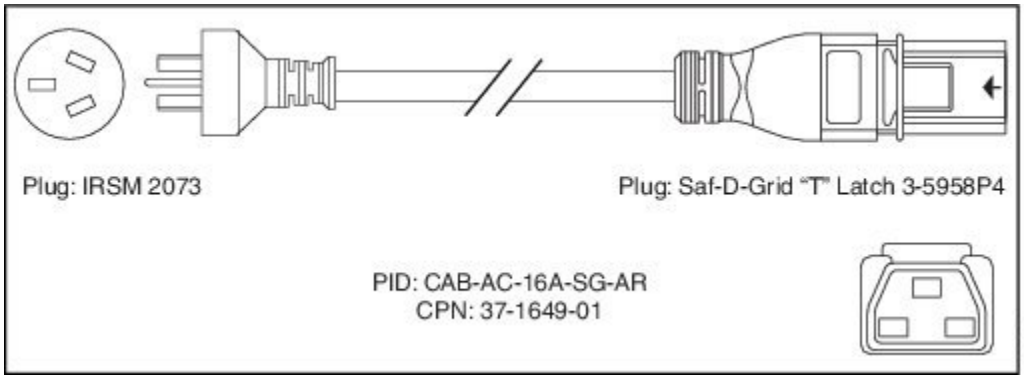


Figure 35: CAB-AC-16A-SG-AZ Power Cord

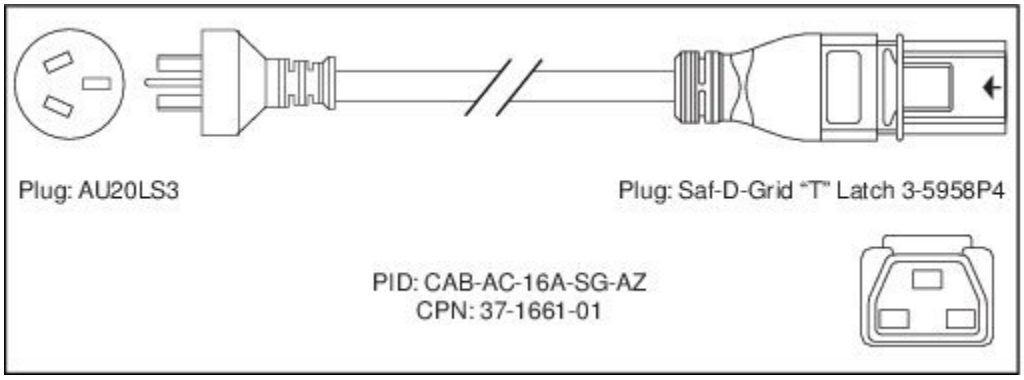


Figure 36: CAB-AC-16A-SG-BR Power Cord

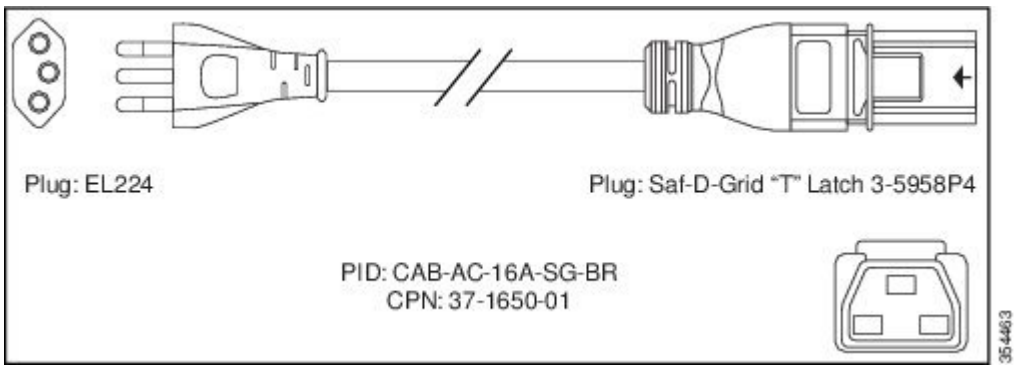


Figure 37: CAB-AC-16A-SG-CH Power Cord

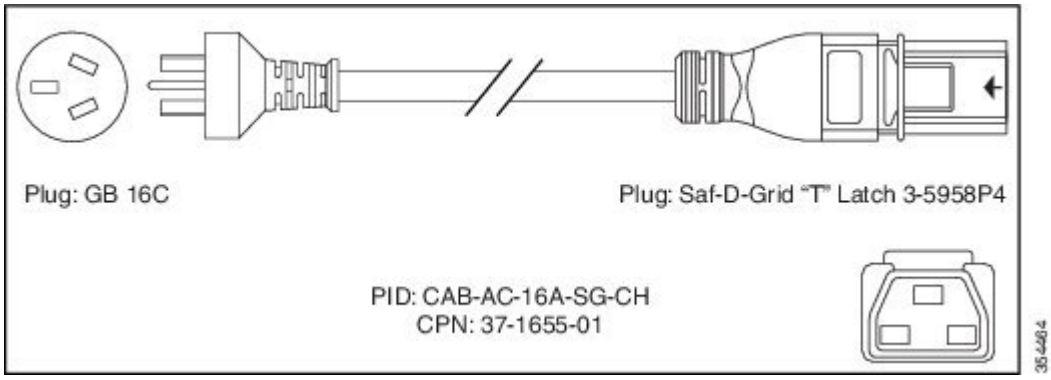


Figure 38: CAB-AC-16A-SG-EU Power Cord

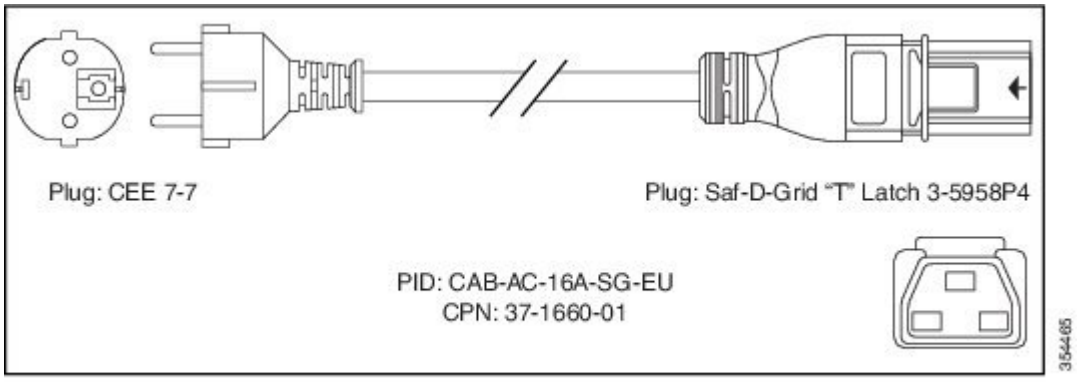


Figure 39: CAB-AC-16A-SG-IND Power Cord

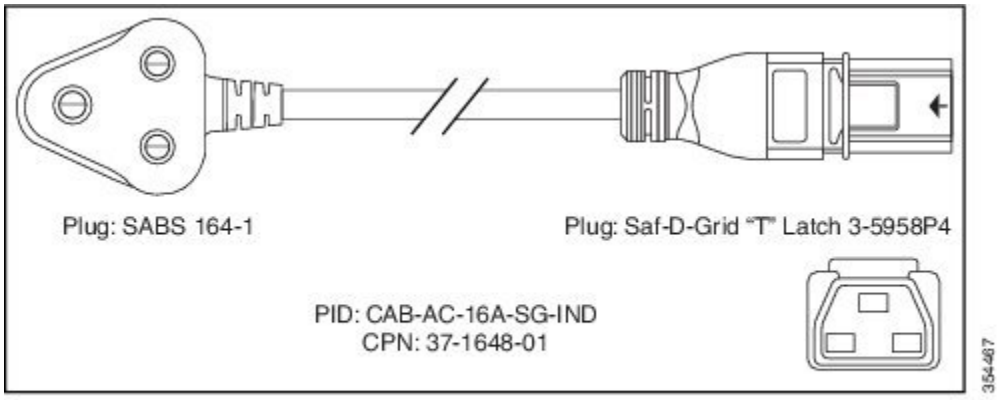


Figure 40: CAB-AC-16A-SG-IN Power Cord

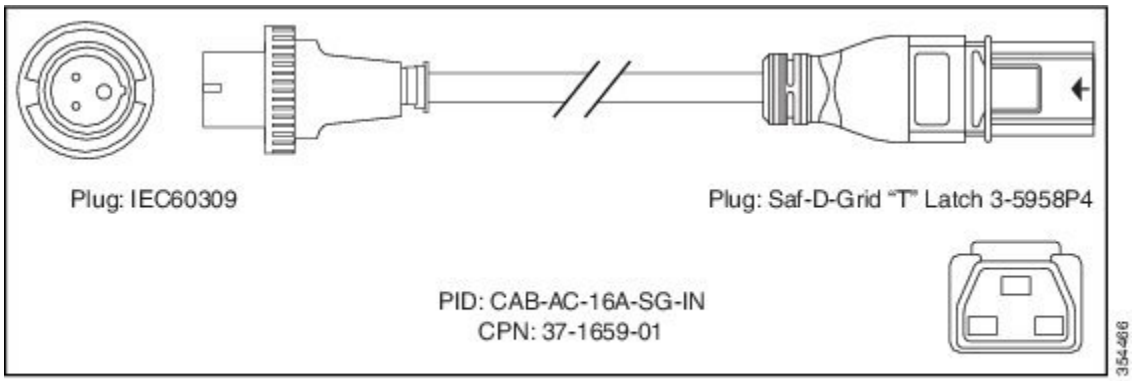


Figure 41: CAB-AC-16A-SG-IS Power Cord

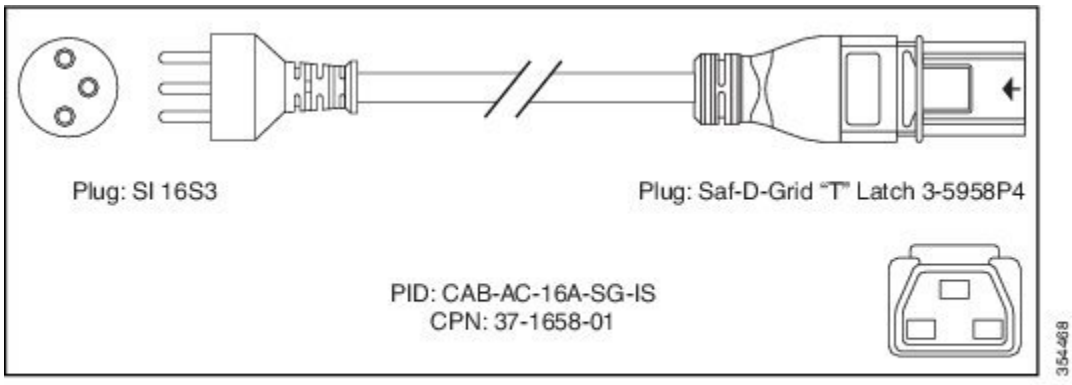


Figure 42: CAB-AC-16A-SG-IT Power Cord

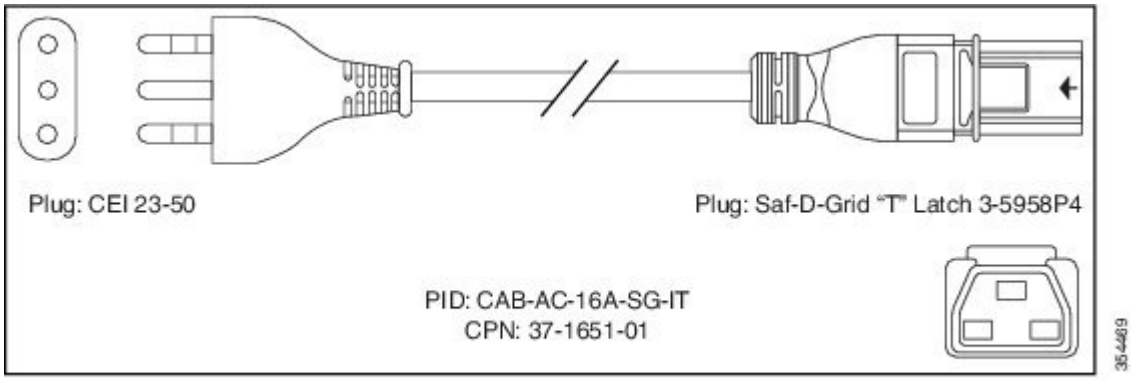


Figure 43: CAB-AC-16A-SG-JPN Power Cord

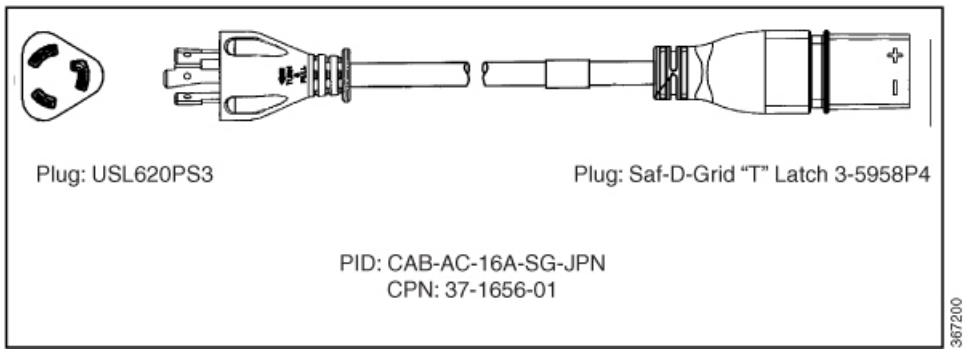


Figure 44: CAB-AC-16A-SG-SA Power Cord

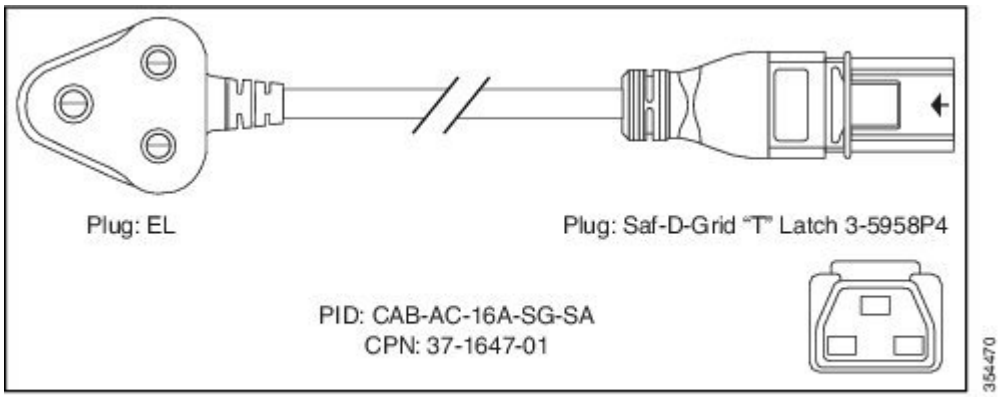


Figure 45: CAB-AC-16A-SG-SW Power Cord

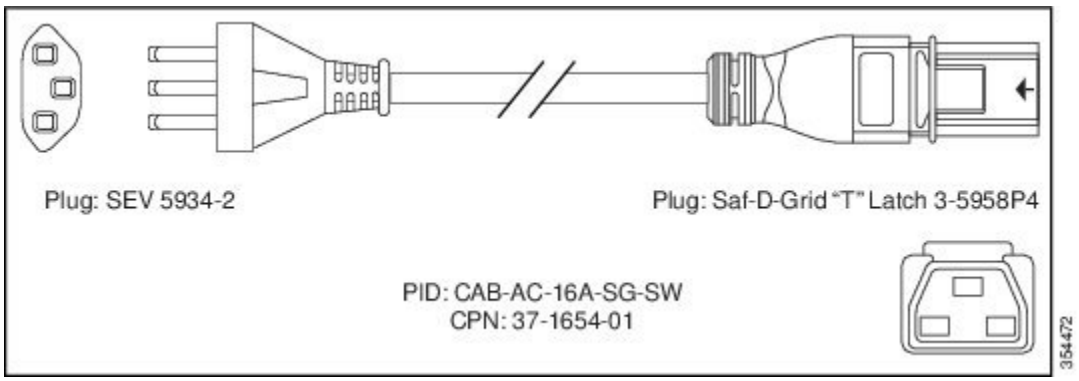


Figure 46: CAB-AC-16A-SG-UK Power Cord

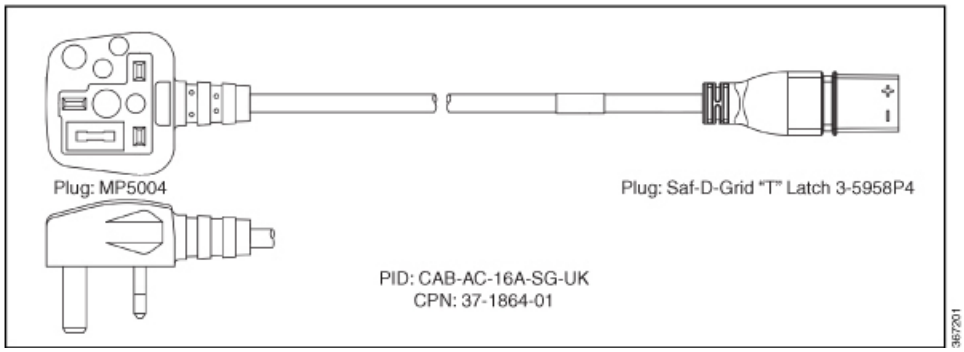


Figure 47: CAB-AC-20A-SG-US Power Cord

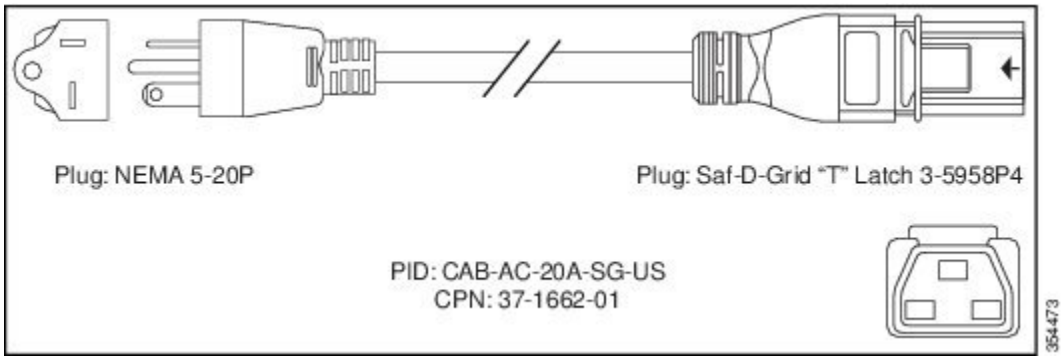


Figure 48: CAB-AC-20A-SG-US1 Power Cord

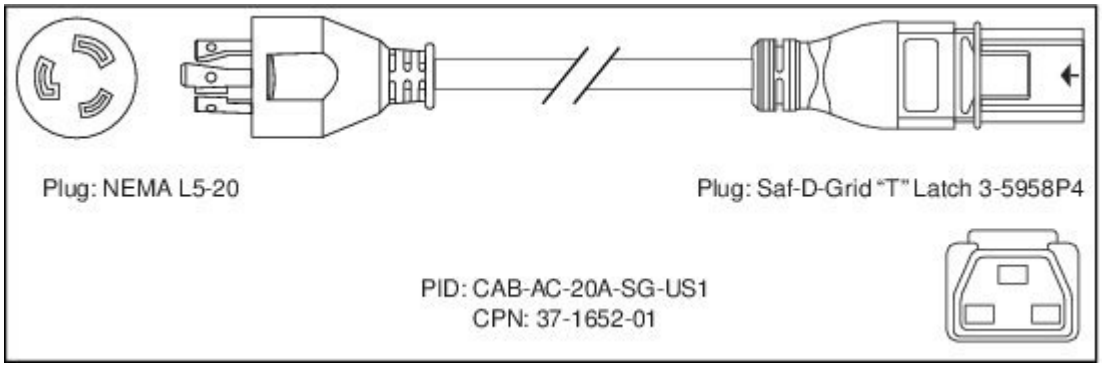


Figure 49: CAB-AC-20A-SG-US2 Power Cord

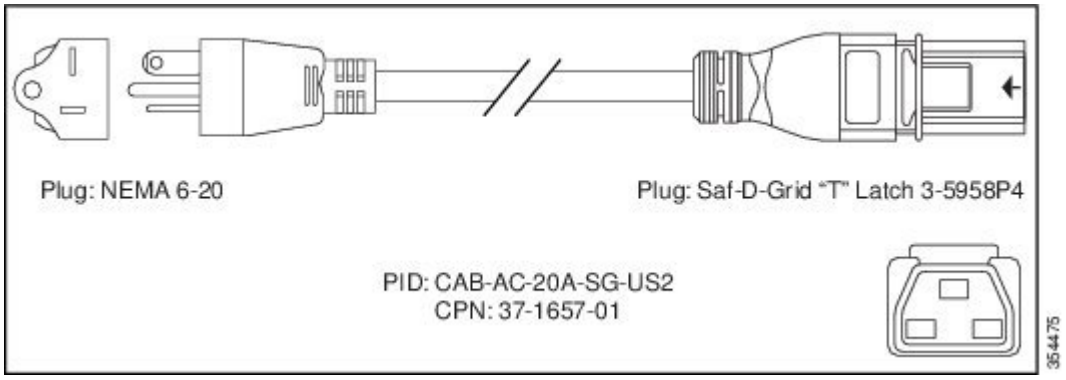


Figure 50: CAB-AC-20A-SG-US3 Power Cord

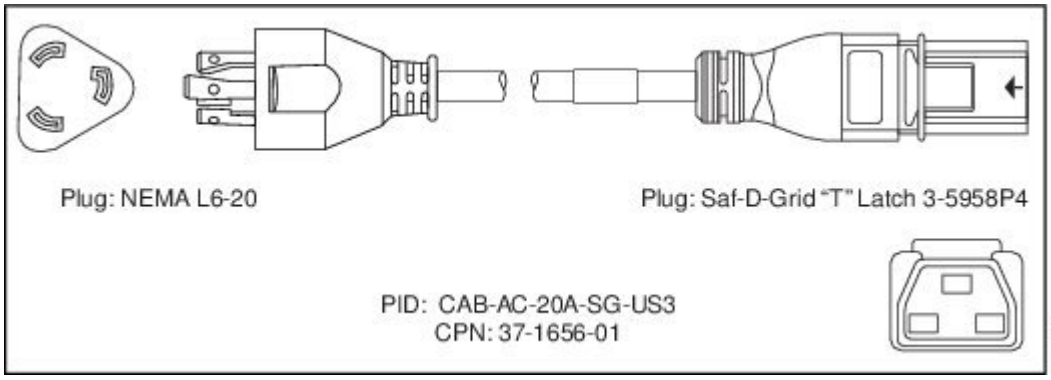


Figure 51: CAB-AC-20A-SG-US4 Power Cord

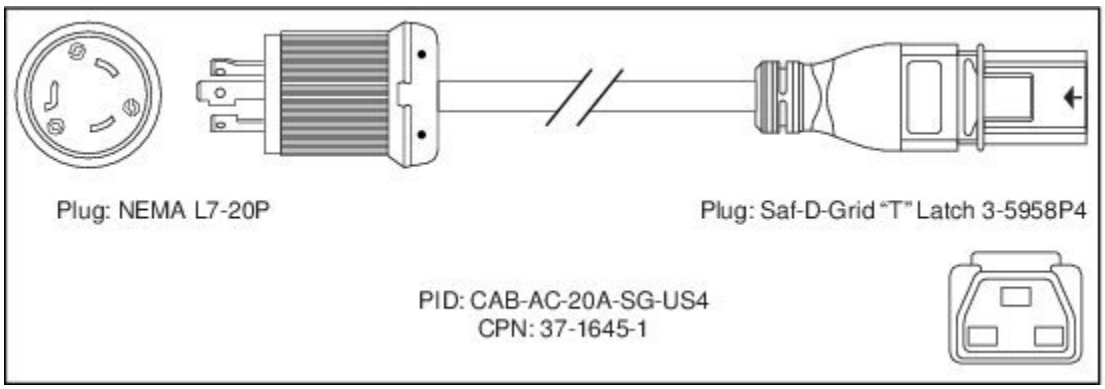


Figure 52: CAB-AC-20A-SG-C20 Power Cord

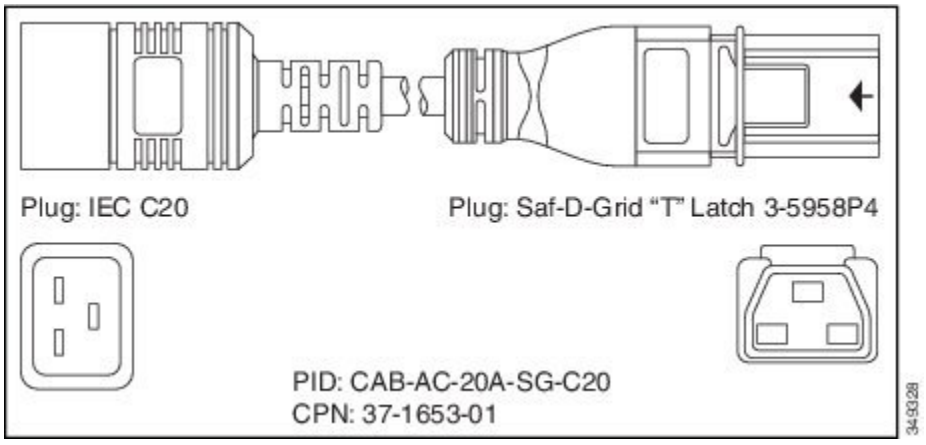


Figure 53: CAB-HV-25A-SG-US2 Power Cord

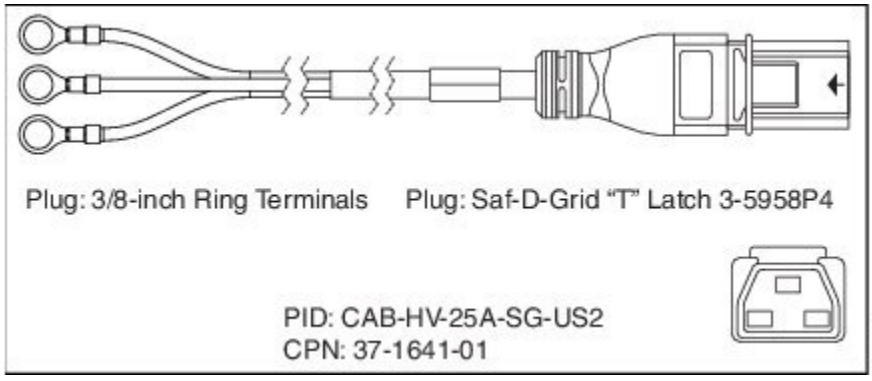


Figure 54: CAB-HV-25A-SG-IN2 Power Cord

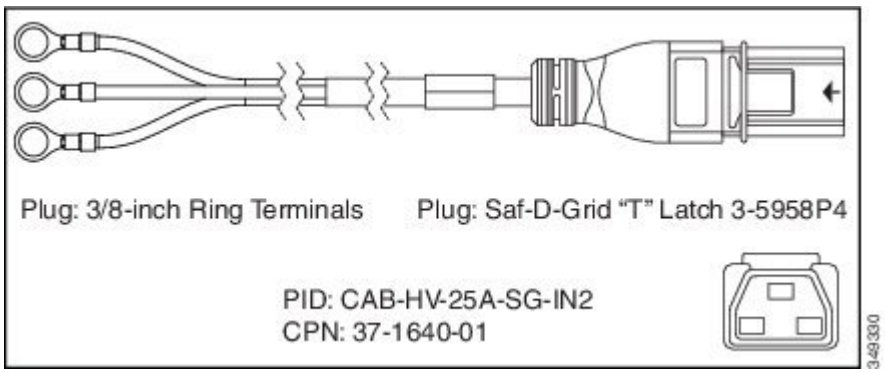
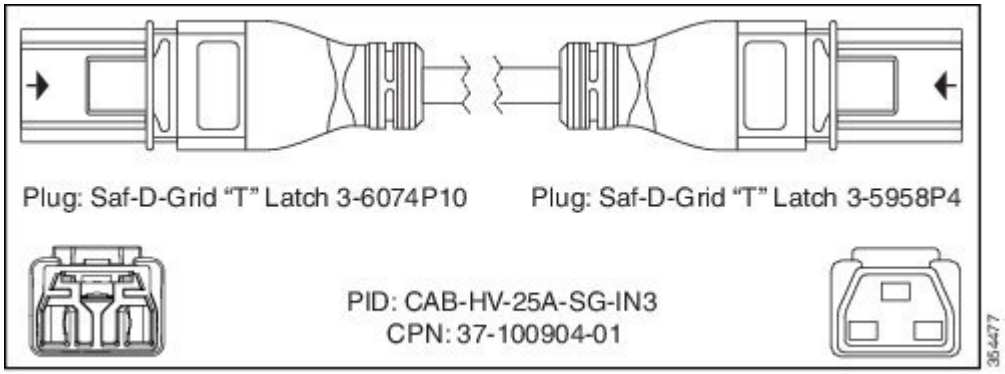


Figure 55: CAB-HV-25A-SG-IN3 Power Cord



Cisco ASR 9001

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

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

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

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

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

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

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

AC Power Cord Illustrations for Cisco ASR 9001 Router

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

Figure 56: AC Power Cord CAB-AC

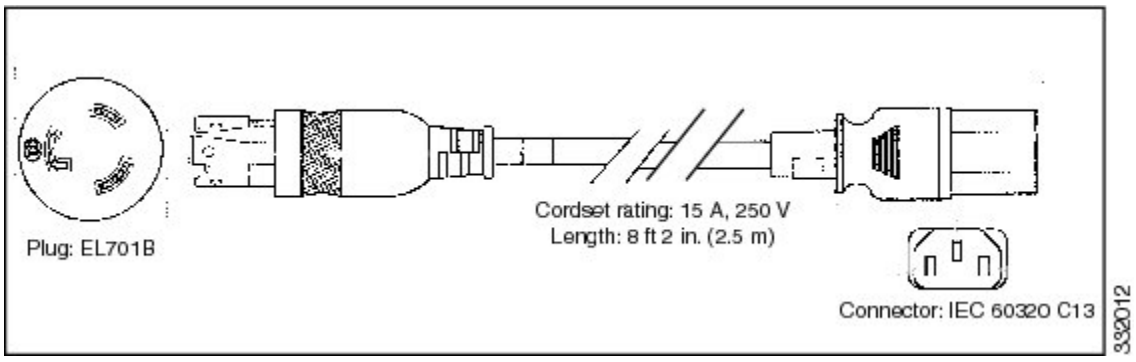


Figure 57: AC Power Cord CAB-L620P-C13-JPN

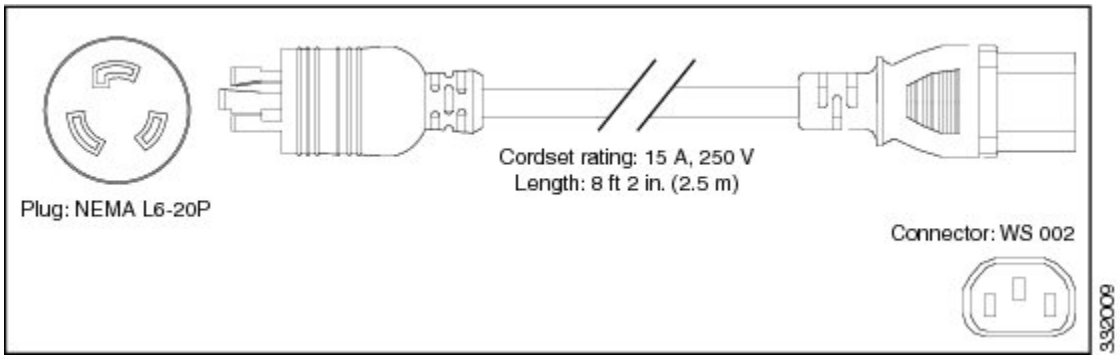


Figure 58: AC Power Cord CAB-ACA

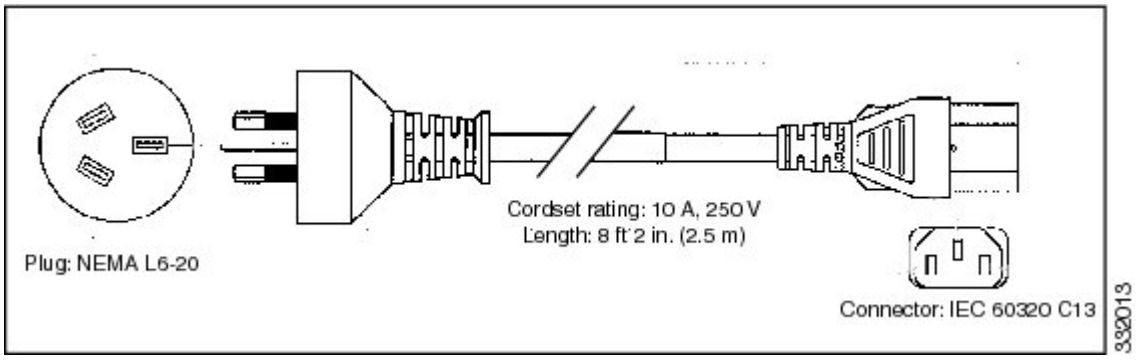


Figure 59: AC Power Cord CAB-ACI

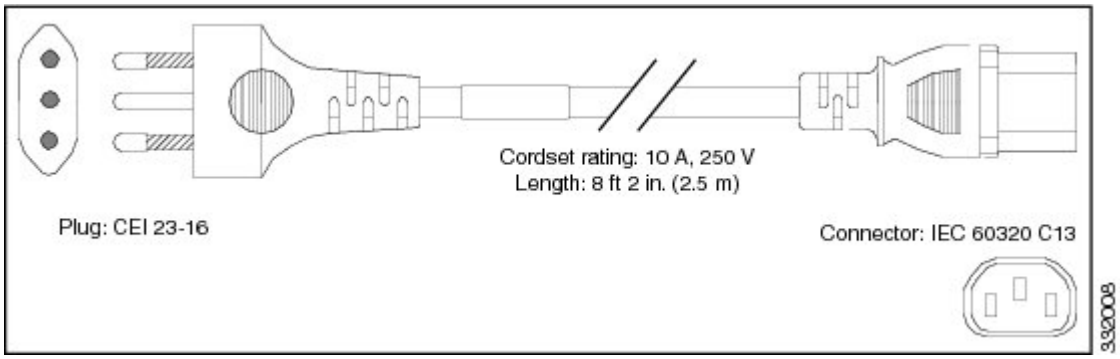


Figure 60: AC Power Cord CAB-ACR

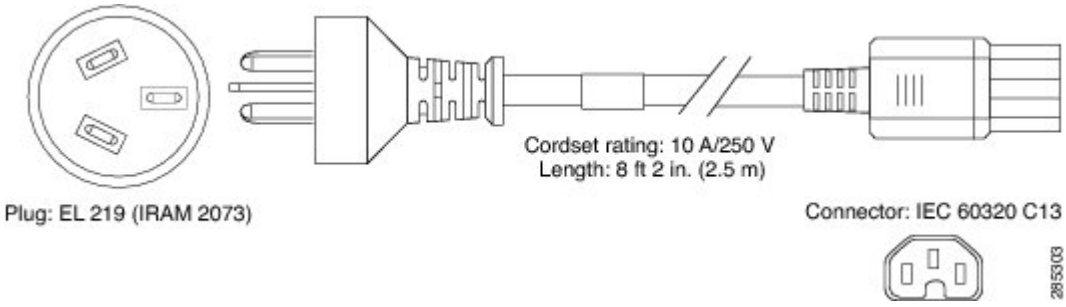


Figure 61: AC Power Cord CAB-ACS

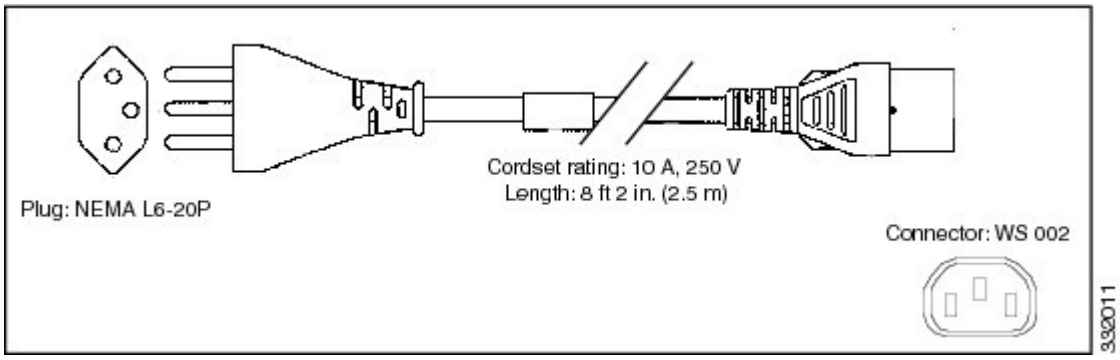


Figure 62: AC Power Cord CAB-ACU

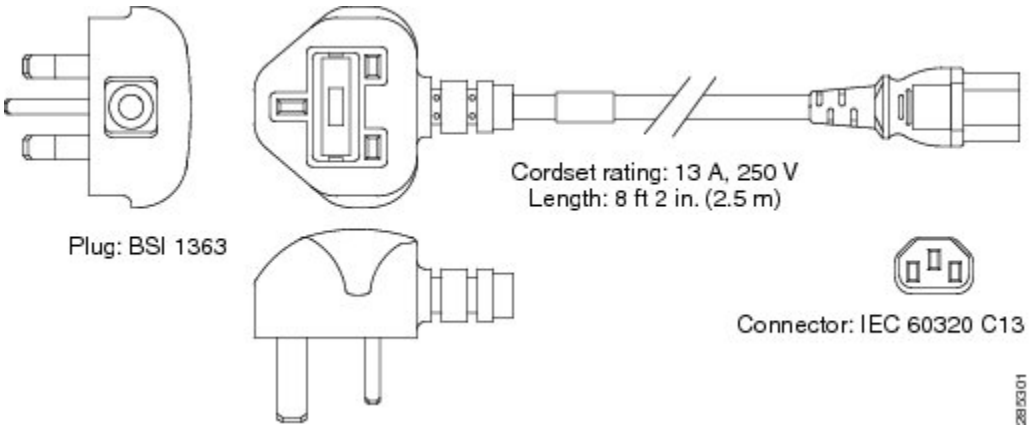


Figure 63: AC Power Cord CAB-ACC

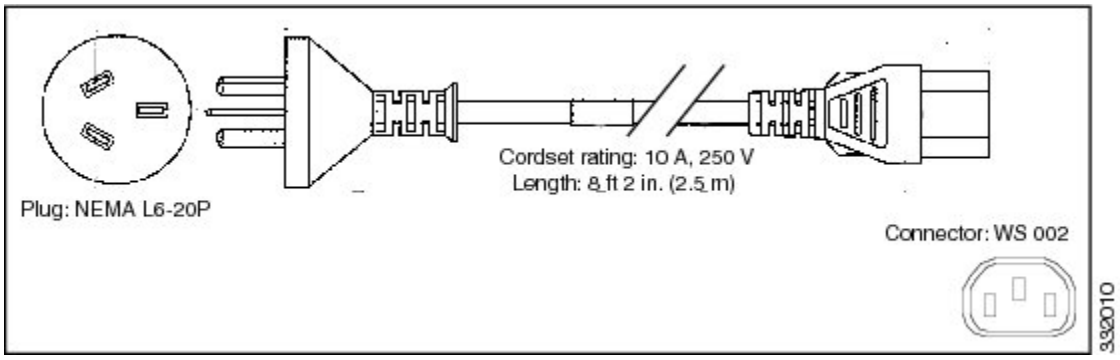


Figure 64: AC Power Cord CAB-ACSA

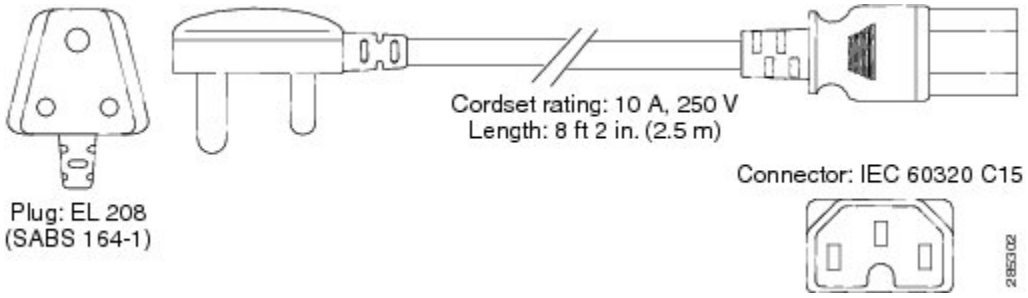


Figure 65: AC Power Cord CAB-9K10A-EU

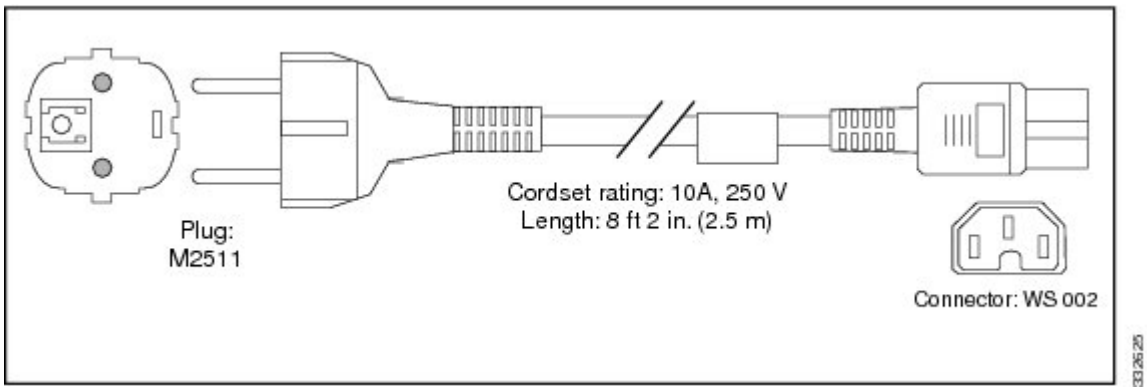
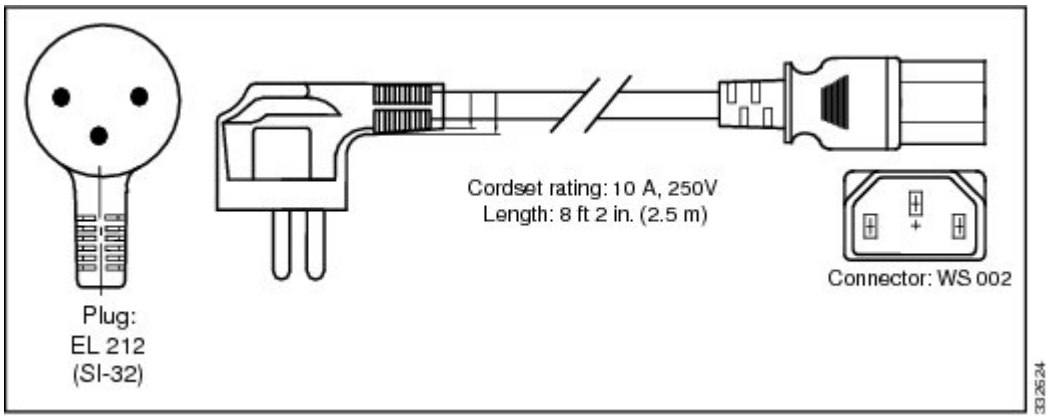


Figure 66: AC Power Cord SFS-250V-10A-IS



DC Powered Router

Connections to DC power modules are rated as follows:

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

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

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

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

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

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

The standard DC power cable PIDs are:

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

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

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

Figure 67: Cisco ASR 9903 DC Power Cable Terminal Block

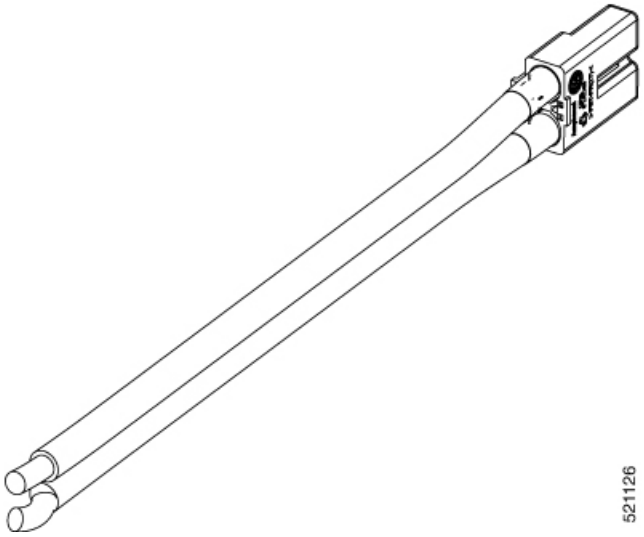


Figure 68: Cisco ASR 9901 DC Power Cable Terminal Block

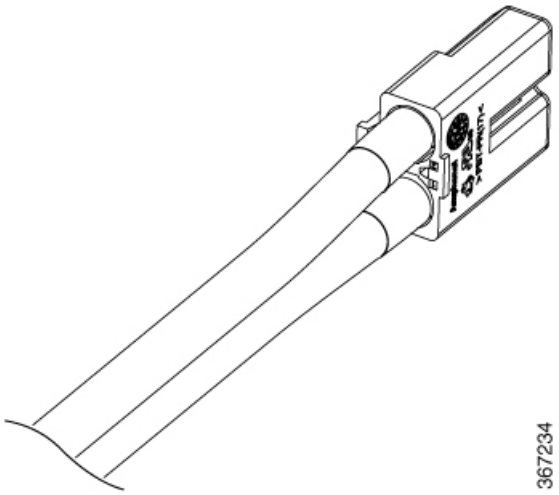
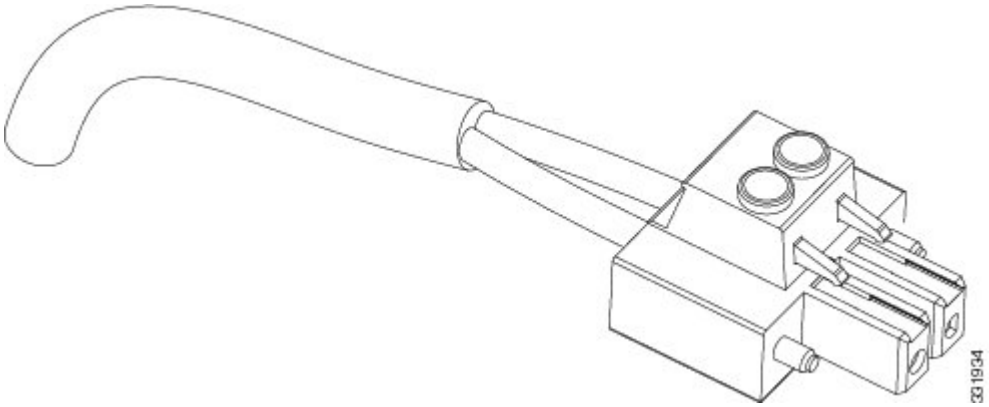


Figure 69: Cisco ASR 9001 DC Power Cable Terminal Block



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

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

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

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

Figure 70: Cisco ASR 9902 DC Power Source Cabling Scheme

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

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

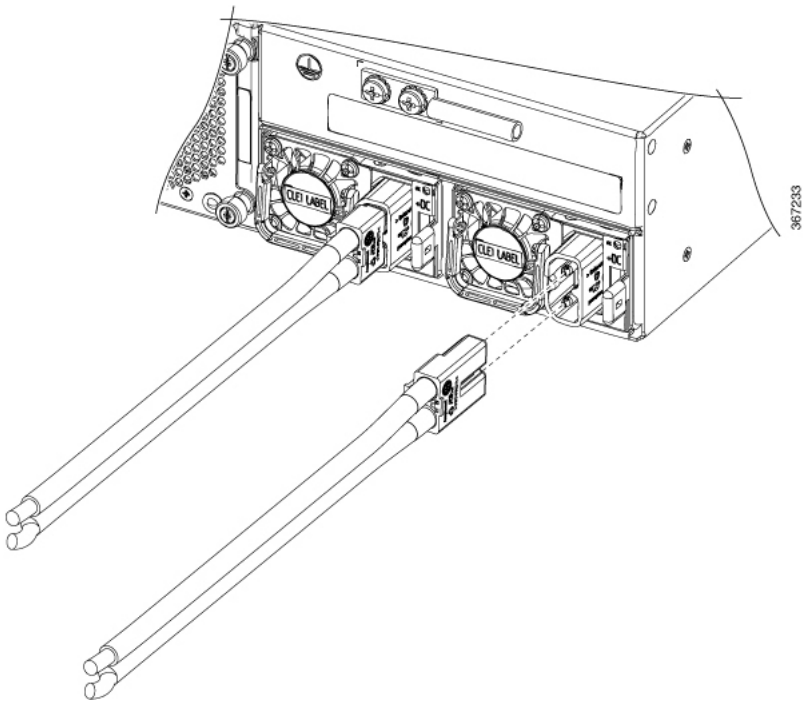
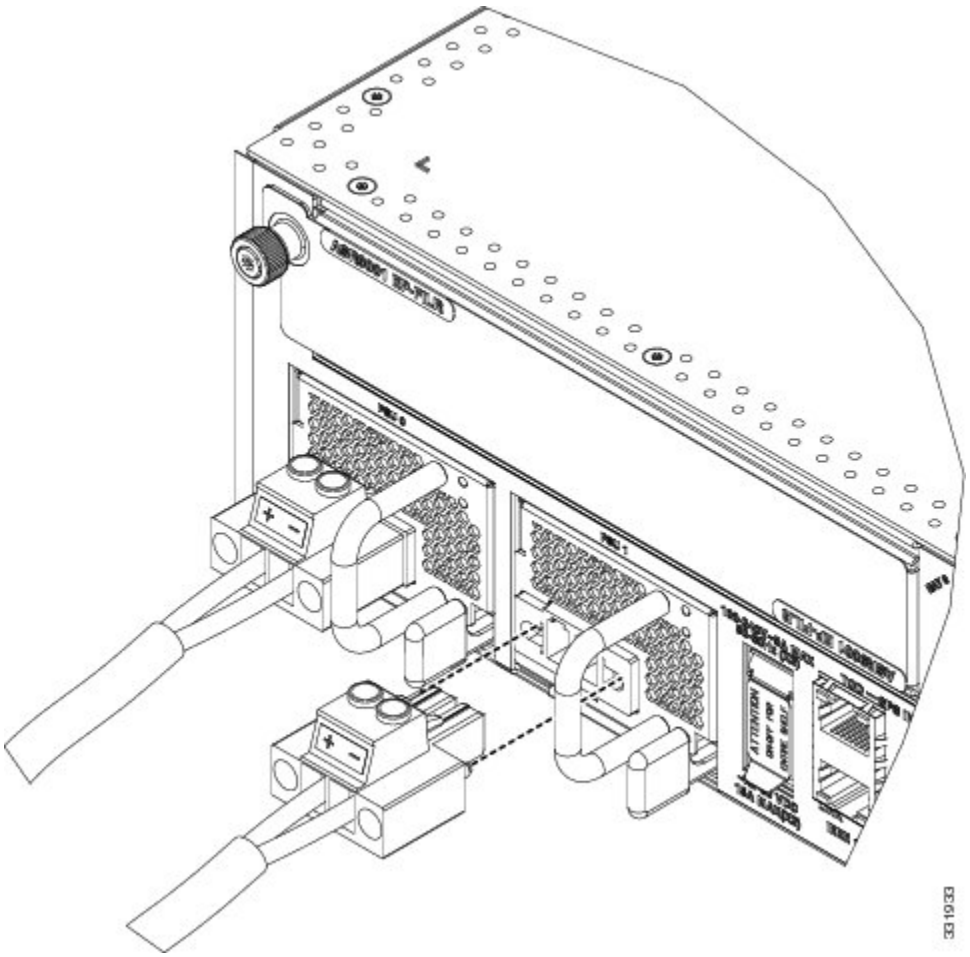


Figure 73: Cisco ASR 9001 DC Power Source Cabling Scheme for a Single DC Power Module



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

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

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

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

NEBS Supplemental Unit Bonding and Grounding Guidelines

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

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

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

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

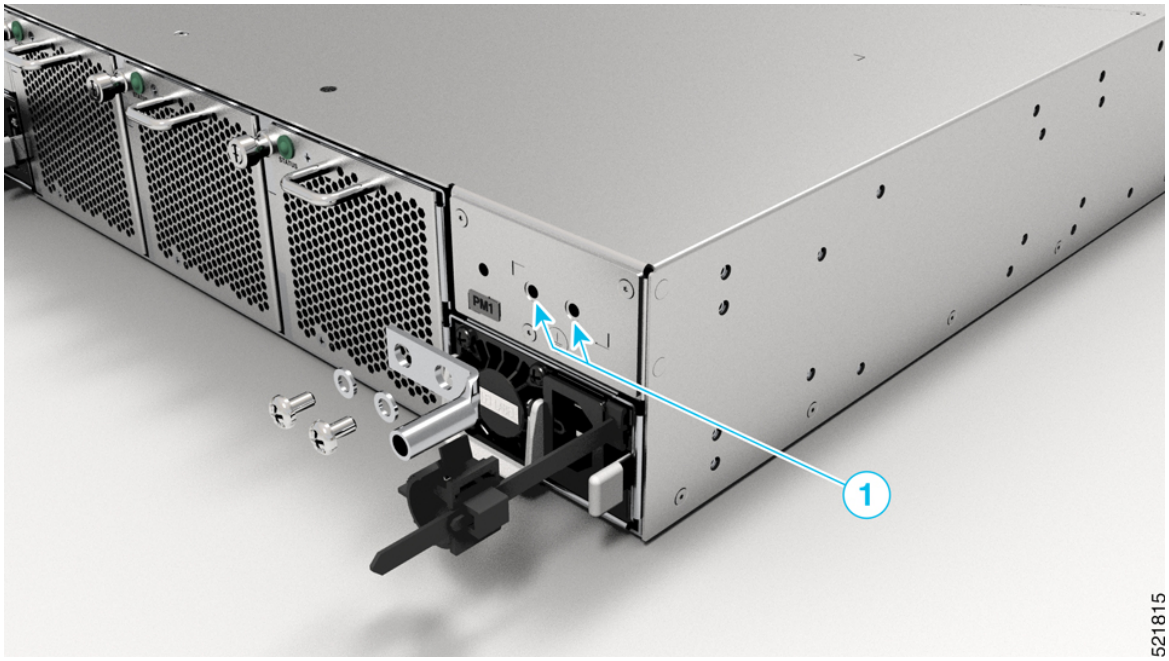


Figure 75: NEBS Bonding and Grounding Points on the Cisco ASR 9903 Router

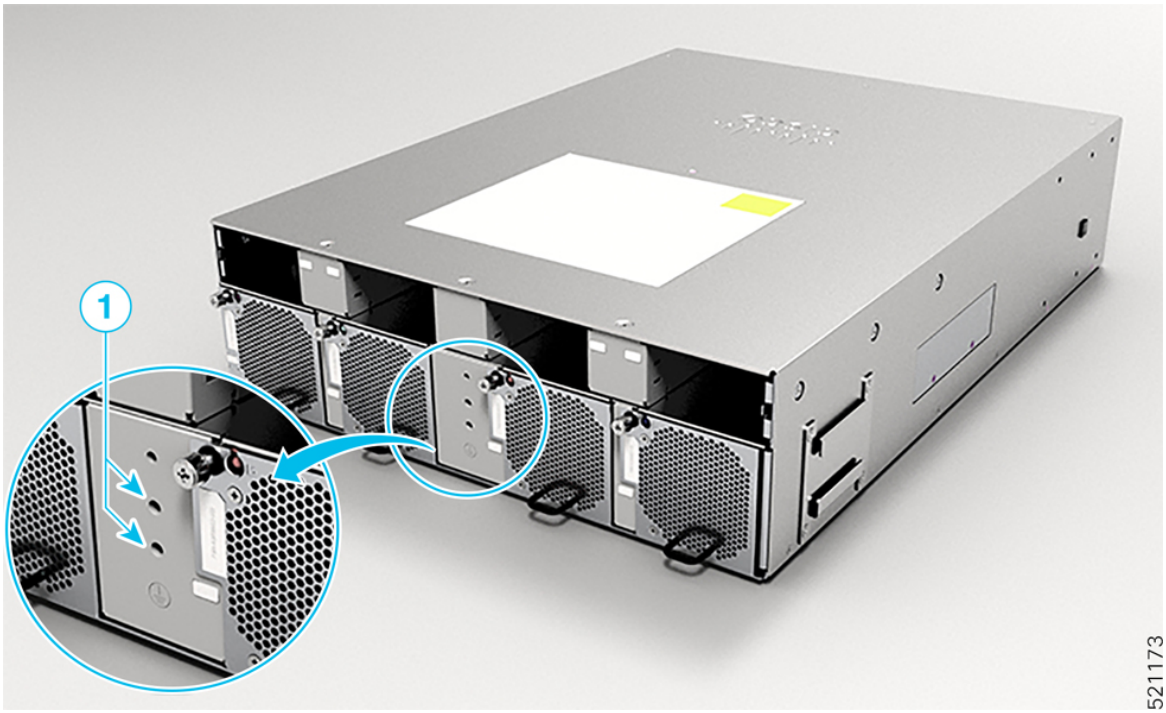


Figure 76: NEBS Bonding and Grounding Points on the Cisco ASR 9901 Router

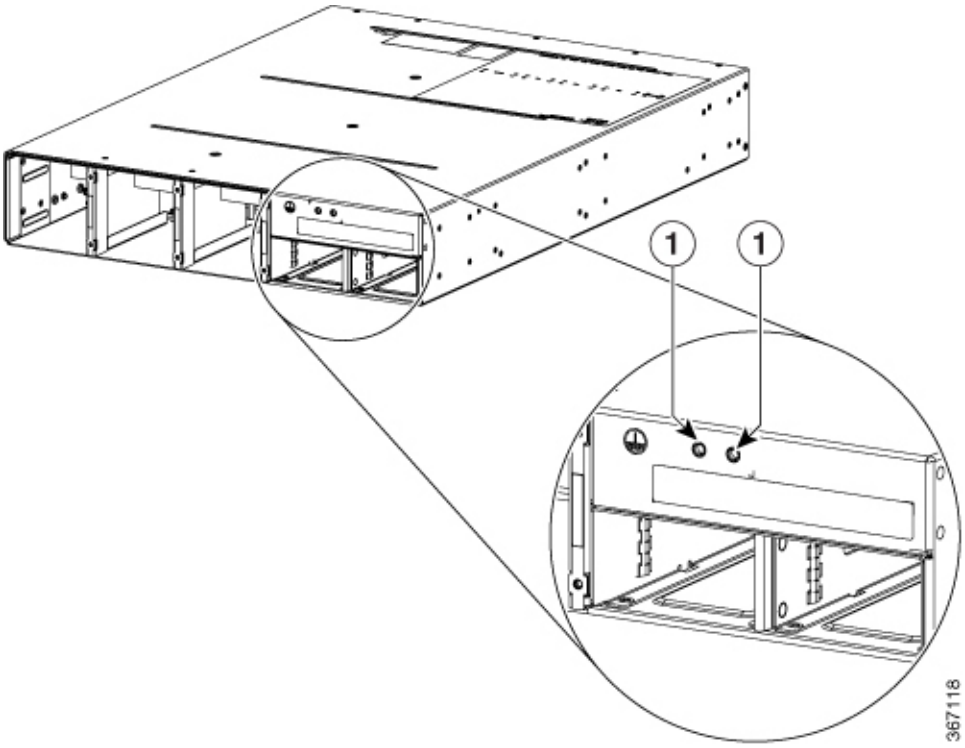
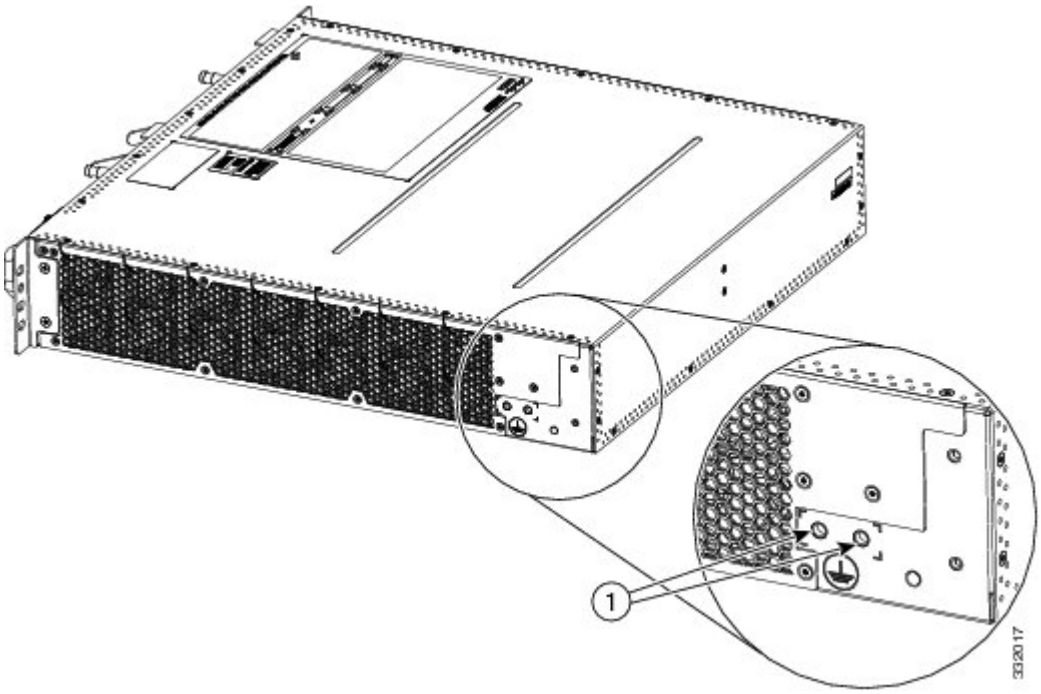


Figure 77: NEBS Bonding and Grounding Points on the Cisco ASR 9001 Router



1	NEBS grounding point on the chassis

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

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