

Cisco ASR 902 and ASR 902U Aggregation Services Router Hardware Installation Guide

First Published: 2014-03-14

Last Modified: 2026-01-29

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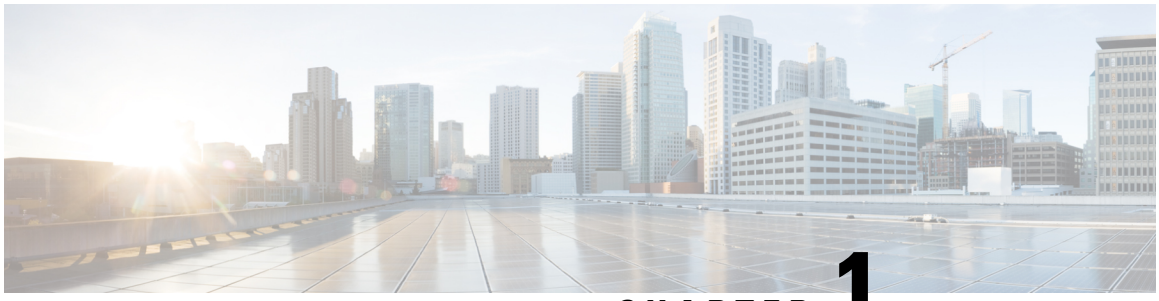
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CHAPTER 1

Overview

Note The Cisco ASR 902 Router and the Cisco ASR 902U Router are collectively referred to as the Cisco ASR 902 Router in this document. Any differences between the routers are specifically called out.

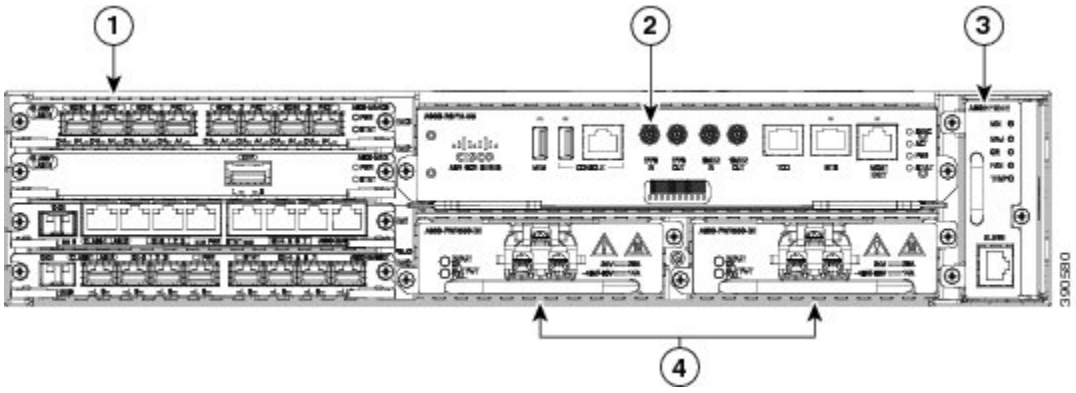
The Cisco ASR 902 Router is a full-featured aggregation platform designed for cost-effective delivery of converged mobile and business services. With shallow depth, low power consumption, and an extended temperature range, this compact 2-rack unit (RU) router provides high service scale and flexible hardware configuration.

The Cisco ASR 902 Router expands the Cisco service provider product portfolio by providing a rich and scalable feature set of Layer 2 VPN (L2VPN) and Layer 3 VPN (L3VPN) services in a compact package. It also supports a variety of software features, including Carrier Ethernet features, Timing over Packet, and pseudowire.

The Cisco ASR 902 Router is positioned as a preaggregation router in IP Radio Access Network (RAN) (Global System for Mobile Communications (GSM), Universal Mobile Telecommunications System (UMTS), Image Maximum (iMAX), Code division multiple access (CDMA), and Long Term Evolution (LTE)) networks or an aggregation router in Carrier Ethernet networks.

The figure below illustrates the Cisco ASR 902 Router chassis design.

Figure 1: Cisco ASR 902 Router Chassis Design



Label	Component
1	Interface modules
2	RSP unit
3	Fan tray
4	Redundant power units (two DC power units are shown)

- Cisco ASR 902 Router Features, on page 2
- Interface Numbering, on page 29
- Regulatory Compliance, on page 30

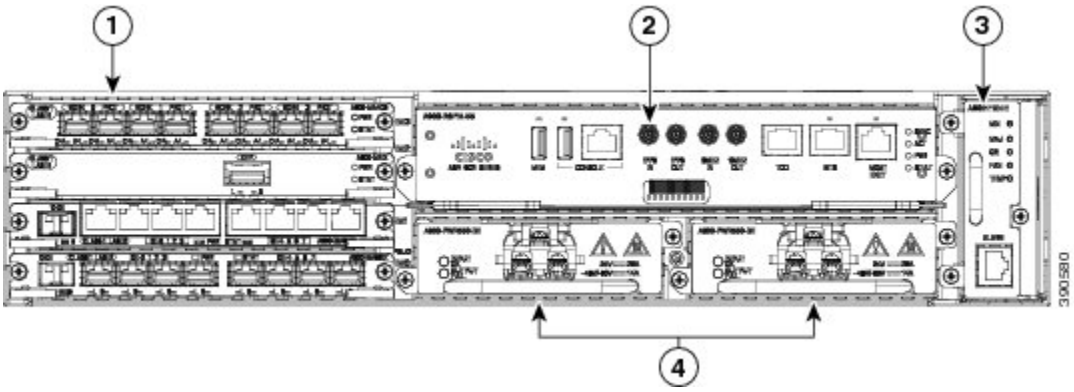
Cisco ASR 902 Router Features

The Cisco ASR 902 Router has the following hardware features:

- 2-RU modular chassis designed for installation in a 300-mm European Telecommunications Standards Institute (ETSI) cabinet
- Dedicated slots in the chassis that support the following:
  - Up to four interface modules
  - One Route Switch Processor (RSP)
  - Up to two DC or two AC or a combination of AC and DC power supply units
  - One fan tray
- Network frequency, phase, and time inputs and outputs for network interfaces (SyncE and TDM), BITS, 1 PPS or 10 MHz and Timing over Packet (IEEE 1588-2008)
- Adjustable front and rear rail mounting locations
- Front panel access to power supplies, fan tray, RSP, and interface modules
- Online insertion and removal (OIR) of interface modules, power supplies, and fan tray
- Discrete status LEDs on power supply, interface module, RSP, and fan tray units
- Two alarm dry contact inputs (either normally open or normally closed)
- Environmental-monitoring and environmental-reporting functions
- LED indicators for critical, major, and minor alarms
- Side-to-side forced air cooling
- Temperature range of -40 to 149 degrees F (-40 to 65 degrees C) with 550W DC power supply
- Temperature range of 32 to 122 degrees F (-5 to 55 degrees C) with 550W AC power supply

The figure below illustrates the Cisco ASR 902 Router chassis design.

Figure 2: Cisco ASR 902 Router Chassis Design



Label	Component
1	Interface modules
2	RSP unit
3	Fan tray
4	Redundant power units (two DC power units are shown)

System Specifications

The table below summarizes the system specifications and environmental requirements for the Cisco ASR 902 Router.

Table 1: Cisco ASR 902 Router System Specifications

Dimensions (Height x Width x Depth)	3.56 in. x17.44 in. x 10.565 in. (90.424 x 442.976 x 268.351 mm) **Note** This measurement includes handles from the power supply, fan tray, and interface modules installed in the chassis.
Weight	24.030 pounds (10.9 kg) **Note** This weight includes a power supply.
Operating Temperature	The Cisco ASR 902 Router supports the following temperature ranges with the DC power supply: • –60 to 4000 meters: –40 to 104ºF (–40 to + 40ºC) • –60 to 1800 meters: –40 to 149ºF (–40 to + 65ºC) The Cisco ASR 902 Router supports the following temperature ranges with the AC power supply: • –60 to 4000 meters: 32 to 104ºF (0 to 40ºC) • –60 to 1800 meters: 23 to 140ºF(–5 to 55ºC)

Nonoperating Temperature	–40 to 185ºF (–40 to +85ºC) storage temperature
Operating Humidity	5 to 95% operating noncondensing relative humidity
Operating Altitude	–60 to 1800m operating altitude for full operating temperature range; up to 4000m at up to 40ºC.
Nonoperating Altitude	4572m storage altitude
Vibration	1.0 g from 1.0 to 150 Hz
Shock	30 G half sine 6 and 11 ms
Nonoperating Vibration	Random: 1.15 gRMS 3 to 200 Hz, 30 minutes/axis Sine: 10 to 500 Hz @ 0.8 G peak/5 sweep cycles/axis
Operating Acoustics	< 68.5 dBa @ 27ºC

Power Supply Features

The Cisco ASR 902 Router supports AC and DC power supplies. For more information about installing the Cisco ASR 902 Router power supplies, see the Installing the Power Supply section. The power sections provide more information about the power supply:

Redundancy

The Cisco ASR 902 Router chassis includes a slot for optional redundant power supply. The redundant power supply option provides a second power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails. Redundancy is supported either with identical power supplies or a combination of AC and DC power supply. The Cisco ASR 902 Router supports current sharing between the power supplies.

A redundant power supply on the Cisco ASR 902 Router is recommended. Each power supply should be connected to separate independent power sources to ensure that the router maintains power in the event of a power interruption caused by an electrical failure, a wiring fault, or a tripped circuit breaker.



Caution To comply with IEC 61850-3 (voltage interruptions), redundant power supplies with separately derived power feeds are required.

Dying Gasp

The Cisco ASR 902 Router DC power supply supports the Dying Gasp feature, which allows the router to provide an input power loss notification to the RSP so that the RSP can send appropriate SNMP traps or OAM messages and update log files on the router. With the DC power supply, the router supports a minimum input power loss detection time of 2 milliseconds (DC) and continued operation of at least 6 milliseconds (DC) after the notification.

Note Continued DC power supply operation may vary for voltages other than +24/–48V.

Note Dying Gasp is not supported on the ASR 900 RSP3 module with the 1200 W DC power supply.

Status LEDs

LEDs are also provided on each power supply to indicate the status of the input power and the health of the power supply. For more information about the LEDs on the Cisco ASR 902 Router, see Troubleshooting.

DC Power Specifications

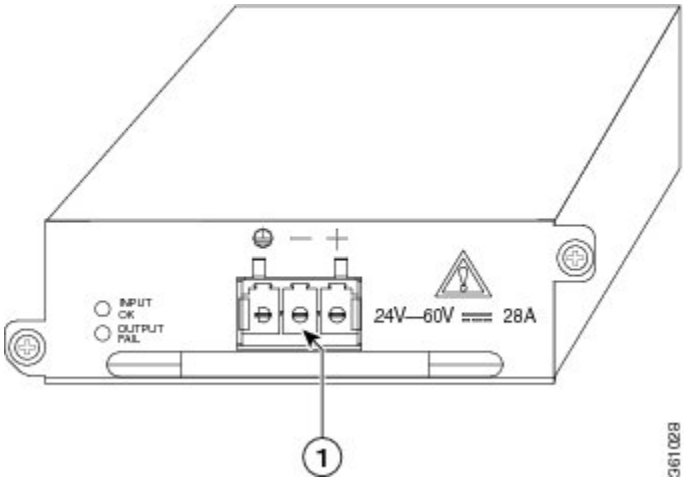
The Cisco ASR 902 Router uses a +24/-48 DC voltage power supply (with DC voltage tolerance from -19 to -72 VDC).

The power supply provides 550W output power for the system. The power supply is field replaceable, hot swappable, and operates separately from the fan tray. The power supply contains a front panel with mounting screws, a handle for insertion and removal, and two status LEDs. No ON/OFF switch is provided.

The DC PSU models supported on the router are:

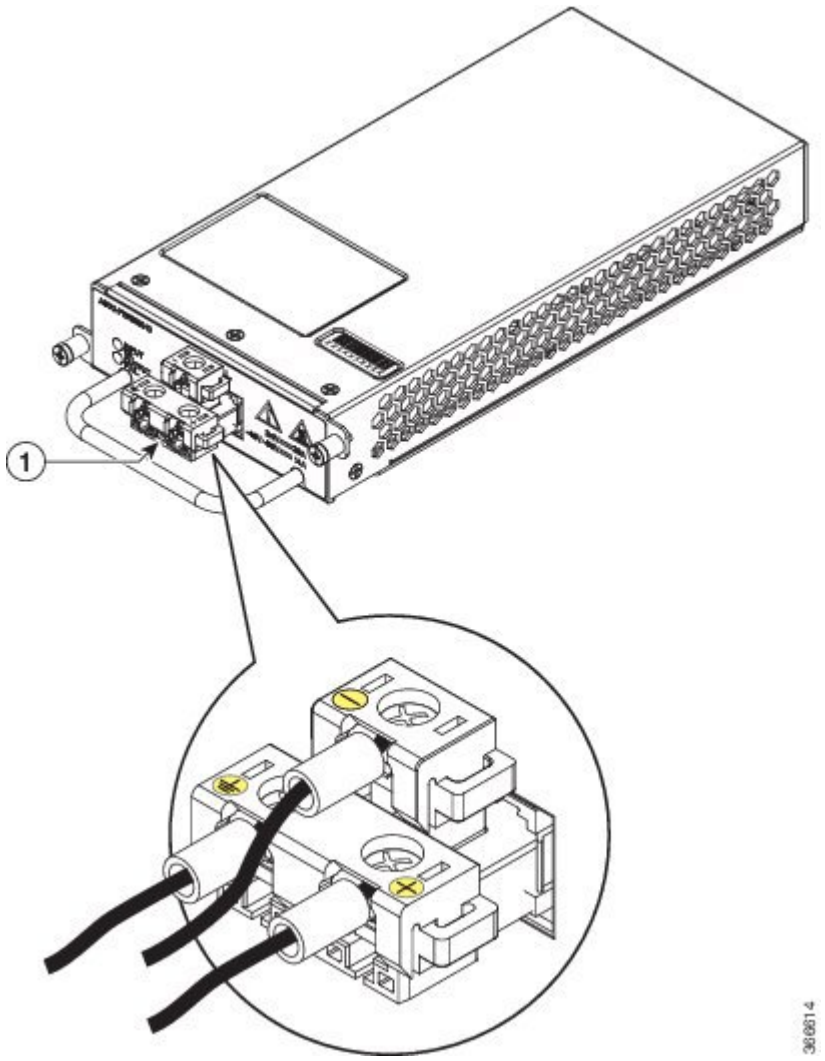
- A900-PWR550-D—Uses an Euro-style three-position terminal block connector (Figure 1-2)
- A900-PWR550-D-E—Uses a T-shaped connector (Figure 1-3)
- A900-PWR1200-D—Provides 975 W output power for system 12 V power with the A902-FAN-E module. As most of the system configurations using A900-RSP3C-200-S RSP modules require power exceeding 550 W, we recommend using the A900-PWR1200-D power supply with A900-RSP3C-200-S RSP modules. (Figure 1-4)

Figure 3: DC PSU Module (A900-PWR550-D) with Euro-Style Connector



Label	Component
1	Euro-style connector

Figure 4: DC PSU (A900-PWR550-D-E) with T-Shaped Connector



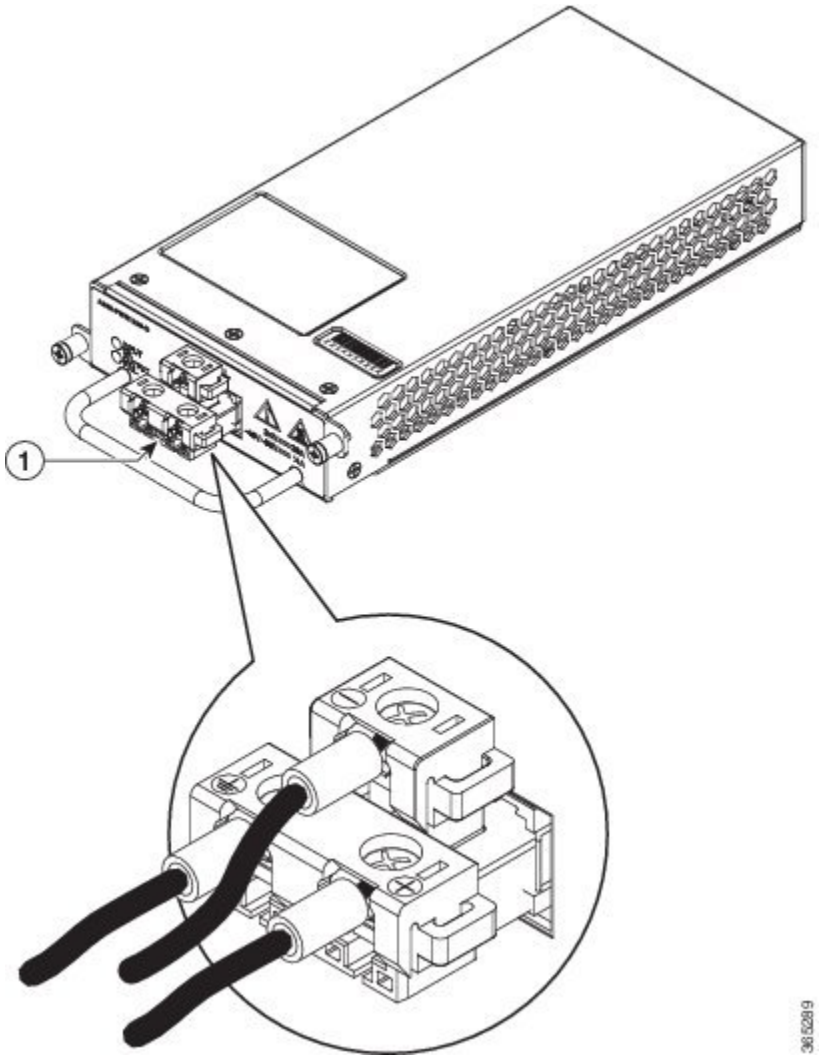
Label	Component
1	T-shaped connector

Table 2: DC Power Supply Specifications'(550 W)

Part numbers	A900-PWR550-D, A900-PWR550-D-E
Nominal input voltage specification	+24 VDC/–48 VDC
Input voltage range	–19.2 VDC to –72 VDC

Output voltage	+12 VDC
Wire gauge for DC input power connections	12 AWG minimum for –48/-60 VDC 8 AWG minimum for 24 VDC Connector accepts 8 AWG maximum
Maximum power output	550 W

Figure 5: DC PSU Module (A900-PWR1200-D)



Label	Component
1	T-shaped connector

Table 3: DC Power Supply Specifications (A900-PWR1200-D)

Part numbers	A900-PWR1200-D

Nominal input voltage specification	48V, GND, -48V
Input voltage range	-40.8 VDC to -72 VDC
Output voltage	+12 VDC
Wire gauge for DC input power connections	8-10 AWG minimum for -48/-60 VDC. Connector accepts 8 AWG maximum.
Maximum power output	1200 W 975W with A902-FAN-E

AC Power Specifications

The AC PSU models supported on the router are:

- A900-PWR550-A—Provides 550 W power
- A900-PWR1200-D—Provides 1200 W power

The table below summarizes the input power specifications for the Cisco ASR 902 Router AC power supply units.

Table 4: AC Power Supply Specifications (A900-PWR550-A)

Part number	A900-PWR550-A
Input power specification	115VAC/ 230VAC
Input voltage	85/264 VAC
Minimum input voltage	85 VAC
Maximum input voltage	264 VAC
Minimum output voltage	12 VDC
Maximum output voltage	12.4 VDC
Maximum power output	550 W

- A900-PWR1200-A—Provides 975 W output power for system 12 V power with the A902-FAN-E module. As most of the system configurations using A900-RSP3C-200-S RSP modules require power exceeding 550 W, we recommend using the A900-PWR1200-A power supply with A900-RSP3C-200-S RSP modules. (see the figure below)

Figure 6: Power Supply (A900-PWR1200-A)

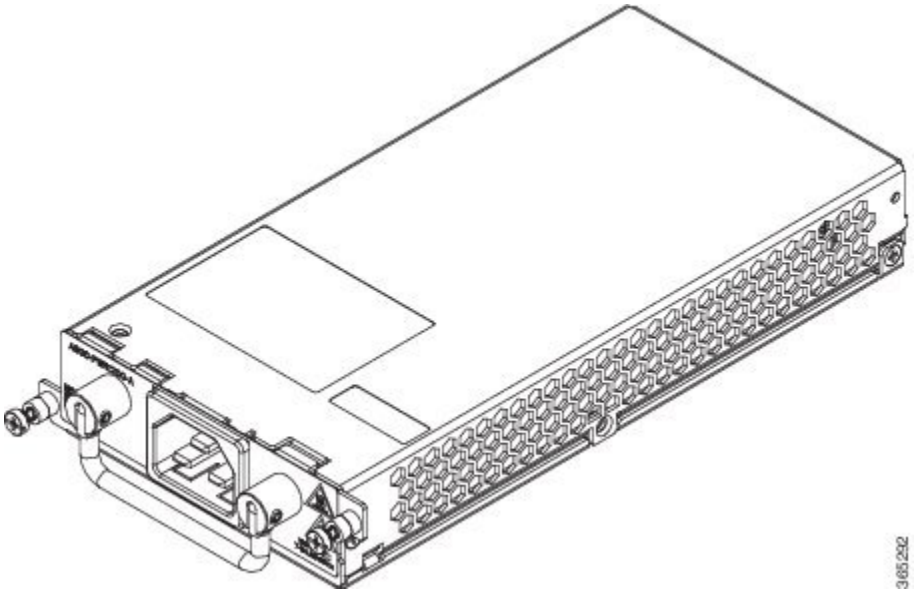


Table 5: AC Power Supply Specifications (A900-PWR1200-A)

Part number	A900-PWR1200-A
Input power specification	115VAC/ 230VAC
Input voltage	85/264 VAC
Minimum input voltage	85 VAC
Maximum input voltage	264 VAC
Minimum output voltage	12V
Maximum output voltage	12.4V
Maximum power output	1200 W 975W with A902-FAN-E

Fan Tray

The fan tray has the following hardware features:

- It provides side-to-side forced air cooling
- It provides redundant fans
- It is field replaceable
- It contains status LEDs
- It contains two alarm ports with two external alarm inputs

The fan tray modules supported on the router are:

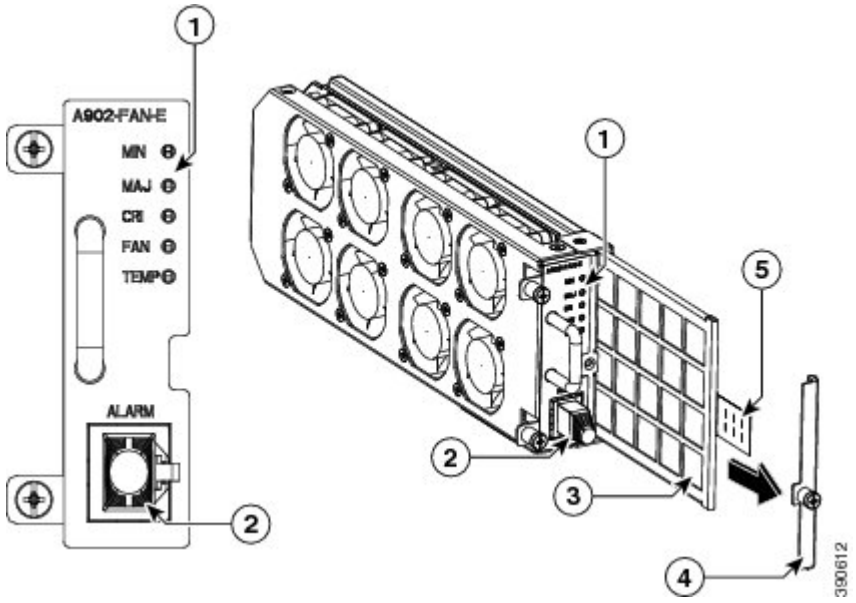
- A902-FAN-E (Figure 1-6)

For more information about air flow guidelines, see the Air Flow Guidelines section . For instructions on how to install the fan tray, see the Installing the Fan Tray section. For a summary of the LEDs on the fan tray, see the LED Summary section .

Fan Tray (A902-FAN-E)

The Cisco ASR 902 Router uses a modular fan tray that is separate from the power supply. The A902-FAN-E is a fan tray containing eight (40 x 40 x 20 mm) fans and provides sufficient capacity to maintain operations indefinitely in the event of an individual fan failure. It has a 8-mm fan dust filter that prevents dust from entering the unit and avoids possible damage to the components. The fan tray is IEC60950-1 compliant.

Figure 7: Cisco ASR 902 Fan Tray with Dust Filter and Dummy Cover (A902-FAN-E)



Label	Component	Label	Component
1	Label	4	Dummy cover
2	Alarm	5	Pull tab
3	Dust filter	—	—

Dust Filter (A902-FAN-F)

The dust filter (as shown in the figure in Fan Tray (A902-FAN-E section) on the fan tray is a quadrafoam 45PPI filter that is 85 percent dust resistant. A dummy cover (A902-FAN-F-B) secures the dust filter in the chassis. For installing the fan filter, see the Installing the Dust Filter section.

Note Use the pull tab to easily access the filter.

Air Plenum

Air plenum or air baffle assembly is used to change the air flow pattern of the unit. When the router is installed with the plenum, the air flow pattern is changed from side-side to front-back. The front-back air flow pattern provides a rack installation bay with a cool front zone and a hot rear zone. For information about installing the plenum, see Installing the Router Chassis in the Air Plenum.

Note When the air plenum and the fan filter are installed in the chassis, the system's maximum operating temperature should be 55 degrees Celsius.

To order an air plenum, contact the Sales and Marketing staff at GAW (www.GawTechnology.net) (see Table A-2).

RSP Modules

The Cisco ASR 902 Router is designed to use a single RSP module to handle the data plane, network timing, and control plane functionalities for the router. The RSP configuration allows you to use Cisco IOS software to control chassis management, external management, and system status indications on the router.

RSP features include:

- Loading software onto processor-based interface modules
- Packet processing
- Traffic management, including buffering, queuing, and scheduling, Ethernet MAC functions.
- Network clocking functions, including phase and time-of-day for Building Integrated Timing Source (BITS), 1 PPS, 10 MHz, and 1588 Precision Time Protocol (PTP) clock references.
- Storage of software images, system configuration, Onboard Failure Logging (OBFL), syslog.
- PTP packet processing, including IEEE 1588-2008 for recovering network timing (frequency, phase, and time) from upstream PTP clocks for generating PTP frequency and phase references as inputs to the Synchronous Equipment Timing Source (SETS), and for distributing them to downstream PTP clocks.
- External management interfaces (RS232 console, management ENET, USB console, USB storage) and system-status LED indicators.

Supported RSPs

The Cisco ASR 902 Router supports the following RSPs:

- A900-RSP2A-128—Provides 4-GB double data rate type three (DDR3) memory and 128-Gbps aggregate throughput.
- A900-RSP2A-64—Provides 4-GB double data rate type three (DDR3) memory and 64-Gbps aggregate throughput.
- A900-RSP3C-200-S—Provides 8 GB DDR3 memory, 64MB flash memory, 20 Mb of TCAM memory, 8 GB of SDRAM, 200 Gbps throughput, and a USB port for mass storage on the faceplate.

The Cisco ASR 902U Router supports the following RSPs:

- A900U-RSP2A-128—Provides 4-GB double data rate type three (DDR3) memory and 128-Gbps aggregate throughput.

- A900U-RSP2A-64—Provides 4-GB double data rate type three (DDR3) memory and 64-Gbps aggregate throughput.

Caution The SD memory card is not field replaceable. Do not try to remove or replace it.

Note The supported RSPs have different memory capacities, but they have the same interfaces and functionalities.

Figure 8: A900-RSP2A-128 Module

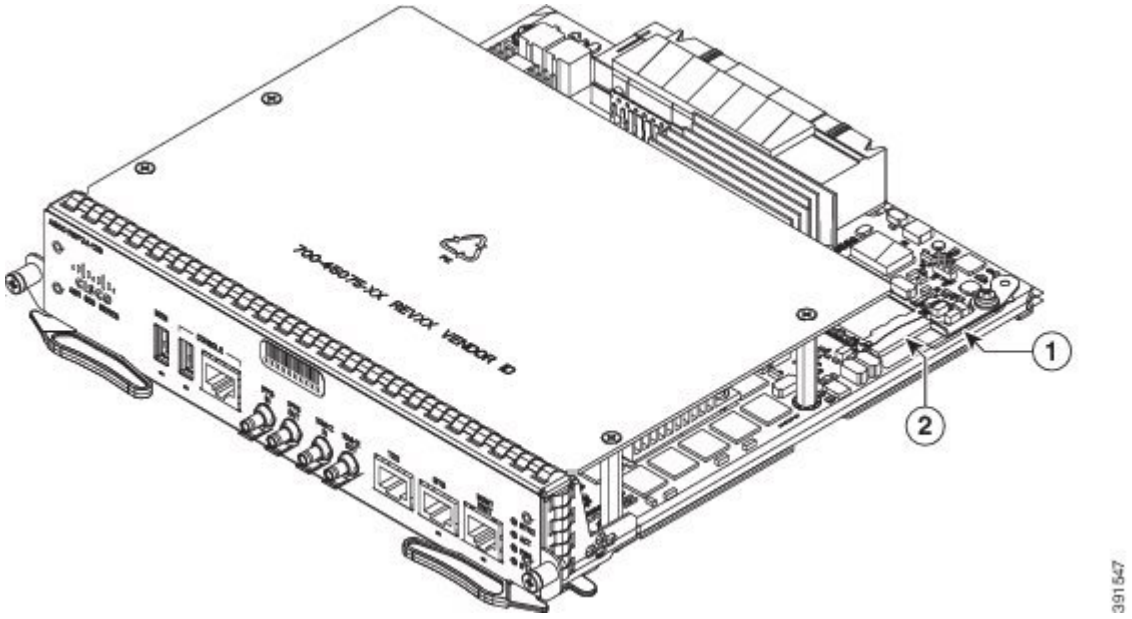
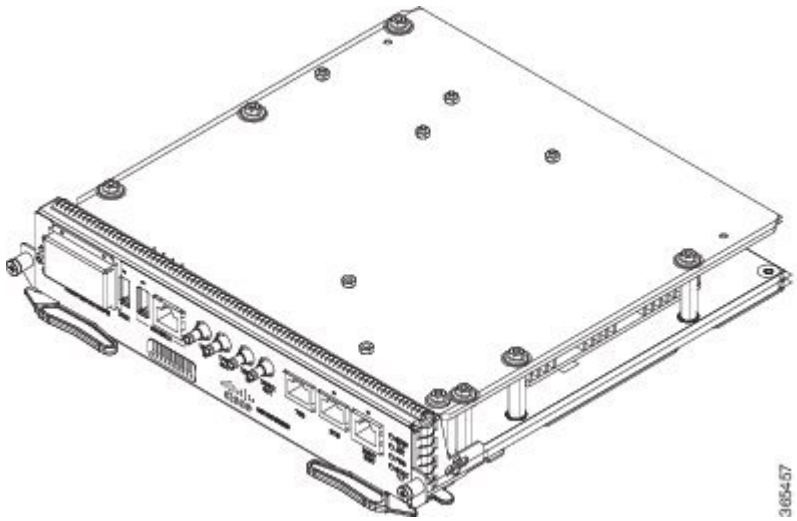


Figure 9: A900-RSP3C-200-S RSP Module



A900-RSP2-Supported Interface Modules (ASR 902 Router)

Table 6: A900-RSP2-Supported Interface Modules and Part Numbers

RSP	Interface Modules	Part Numbers	Slots
A900-RSP2A-128 A900U-RSP2A-128	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
	1-port 10-Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	
	16-port T1/E1 Interface Module	A900-IMA16D	
	4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
	SFP Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10-Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	
	Copper Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10-Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	14-port Serial Interface Module	A900-IMASER14A/S	
	4-port C37.94 Interface Module	A900-IMA4C3794	

RSP	Interface Modules	Part Numbers	Slots
A900-RSP2A-64 A900U-RSP2A-64	1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0-2
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module	A900-IMA4OS	
	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	0, 2 and 3
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	
	16-port T1/E1 Interface Module	A900-IMA16D	
	32-port T1/E1 Interface Module	A900-IMA32D	
	8-port T1/E1 Interface Module	A900-IMA8D	
	6-port E & M Interface Module	A900-IMA6EM	
	14-port Serial Interface Module	A900-IMASER14A/S	
	4-port C37.94 Interface Module	A900-IMA4C3794	

A900-RSP3C-200-S Supported Interface Modules (ASR 902 Router)

Table 7: A900-RSP3C-200 Supported Interface Modules and Part Numbers

RSP Module	Supported Interface Modules	Part Numbers	Slot
A900-RSP3C-200-S	8-port Gigabit Ethernet SFP Interface Module (8x1GE)	A900-IMA8S	All[1]
	8-port Gigabit Ethernet RJ45 (Copper) Interface Module (8x1GE)	A900-IMA8T	

RSP Module	Supported Interface Modules	Part Numbers	Slot
	1-port 10 Gigabit Ethernet XFP Interface Module (1x10GE)	A900-IMA1X	0 and 1
	SFP Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet (1x10GE)	A900-IMA8S1Z	All
	Copper Combo IM—8-port Gigabit Ethernet (8x1GE) + 1-port 10 Gigabit Ethernet Interface Module (1x10GE)	A900-IMA8T1Z	
	2-port 10 Gigabit Ethernet Interface Module (2x10GE)	A900-IMA2Z	
	8-port 10 Gigabit Ethernet Interface Module (8x10GE)	A900-IMA8Z	0
	2-port 40 Gigabit Ethernet QSFP Interface Module (2x40GE)	A900-IMA2F	

[1] There are restrictions using the interface modules in different slots with RSP3 module. Contact Cisco Sales/Support for the valid combinations..

Supported RSP Features

The following are the RSP features supported on the Cisco ASR 902 Router:

- Centralized data plane, timing, and control plane functions for the system
- High-level control of interface modules
- Management functionalities for the router
- Control plane (host) CPU and associated memory in which Cisco IOS-XE and platform-control software run
- Nonvolatile memory for storage of software images, configurations, and system files
- Enabling and monitoring the health and presence of fan trays, interface modules, and power supplies
- Field replacement

Network Timing Interfaces

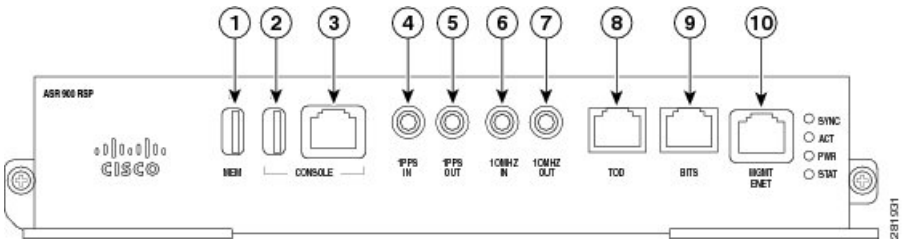
The RSP supports the following network timing interfaces:

- BITS input/output port—RJ48 jack
- 1 PPS input and output—Mini coax connectors
- 2.048 or 10 MHz input and output—Mini coax connectors
- Time of Day (ToD) —Shielded RJ45 jack

RSP Interfaces

The figure below summarizes the interfaces on an RSP module.

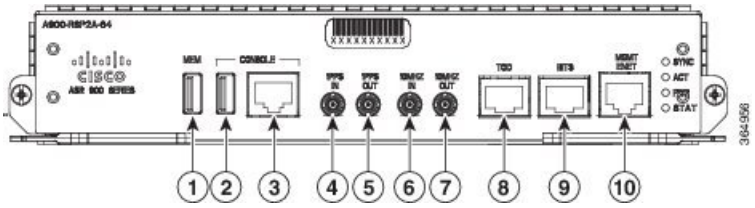
Figure 10: RSP Interfaces Summary



Label	Interface
1	USB memory port
2	USB console port
3	Console port
4	1-PPS input timing port
5	1-PPS output timing port
6	10-MHz input timing port
7	10-MHz output timing port
8	ToD timing port
9	BITS timing port
10	Ethernet management port

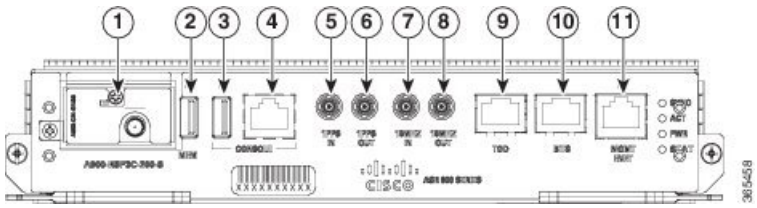
The A900-RSP2A has the following front panel interfaces. For information on cable pinouts, see Pinouts.

Figure 11: Cisco A900-RSP2A Interface Summary



- 1 USB Type-A Connector for USB flash (Label = MEM)
- 1 USB Type-A Connector for alternate console port (Label = CONSOLE)
- RJ45 Connector for Con/Aux (Label = CONSOLE)
- RJ48 Jack for BITS interface (Label = BITS)
- RJ48 Jack for Time-of-Day interface (Label= TOD)
- RJ45 Connector for Con/Aux (Label = MGMT ENET)
- 4 Mini-Coax Connectors (Label = 1PPS IN, 1PPS OUT, 10MHZ IN, 10MHZ OUT)

Figure 12: Cisco A900-RSP3C-200-S Interfaces



Label	Interface
1	GNSS module slot (optional)
2	USB memory port
3	USB console port
4	Console port
5	1-PPS input timing port
6	1-PPS output timing port
7	10-MHz input timing port
8	10-MHz output timing port
9	ToD timing port
10	BITS timing port
11	Ethernet management port

For more information about installing an RSP, see the RSP Installation section. For more information about RSP LEDs, see the RSP LEDs section.

GNSS Module (A900-CM-GNSS)

The GNSS module is present on the RSP3 modules. It is a pluggable module that allows direct interface with the external antenna.

Danger To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord. Statement 1023

Note The GNSS module is not hot swappable.

GNSS Module RF Input Requirements

- For optimal performance, the GNSS module requires an active GPS/GNSS antenna with built-in Low-Noise Amplifier (LNA). The antenna LNA amplifies the received satellite signals for two purposes:

- Compensation of losses on the cable
- Lifting the signal amplitude to the suitable range for the receiver frontend

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

The recommended range of LNA gain (minus all cable and connector losses) at the connector of the receiver module is 22dB to 30dB with a minimum of 20dB and a maximum of 35dB.

- GNSS module provides 5V to the active antenna through the same RF input.
- Surge requirement:
  - GNSS modules have built-in ESD protections on all pins, including the RF-input pin. However, additional surge protection may be required if rooftop antennas are to be connected, to meet the regulations and standards for lightning protection of countries where the end-product is installed.
  - A lightning protection must be mounted at the place where the antenna cable enters the building. The primary lightning protection must be capable of conducting all potentially dangerous electrical energy to PE.
  - Surge arrestors should support DC-pass and suitable for the GPS frequency range (1.575GHz) with low attenuation.
- Antenna Sky visibility:
  - GPS signals can only be received on a direct line of sight between antenna and satellite. The antenna must have a clear view of the sky. For proper timing, minimum of four satellites should be locked.



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

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



Note The splitter should have all the RF ports capable of DC-pass, if the antenna needs to feed power from GNSS module.

For information on pinout, see *GPS Port Pinouts*.

Interface Modules

The Cisco ASR 902 Router interface modules are field-replaceable units.



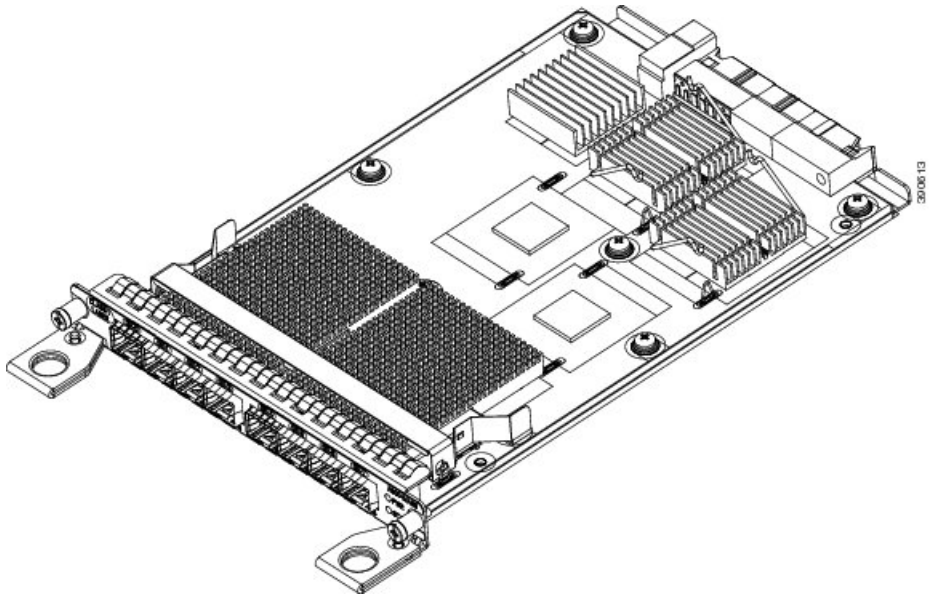
Note On RSP-1, Slot 2 Port 0 cannot be used for traffic flow on 8X1-G copper and 8X1-G SFP interface modules. To identify Slot 2 on a Cisco ASR 902 Router, see the figure in the Interface Numbering, on page 29 section.

In addition to the ports provided on an RSP, the Cisco ASR 902 Router supports the following interface modules:

Gigabit Ethernet SFP Interface Module

The Gigabit Ethernet Small Form-Factor Pluggable (SFP) interface module provides eight Gigabit Ethernet SFP modules. The figure below shows the 8-port 1Gigabit Ethernet SFP interface module.

Figure 13: 8 x 1-Gigabit Ethernet SFP Interface Module



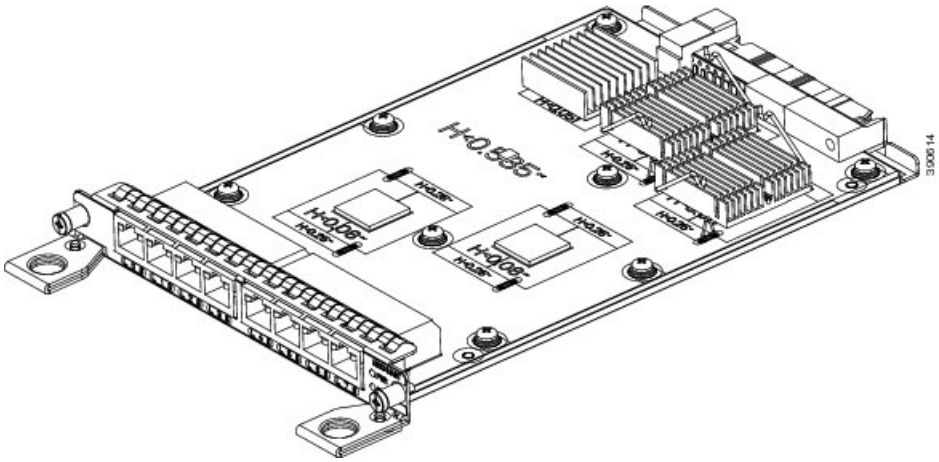
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing an SFP Gigabit Ethernet module, see the Interface Module Installation.

Gigabit Ethernet RJ45 Interface Module

The Gigabit Ethernet RJ45 interface module provides eight Gigabit Ethernet copper ports. The figure below shows the interface module.

Figure 14: 8 x 1-Gigabit Ethernet RJ45 (Copper) Interface Module



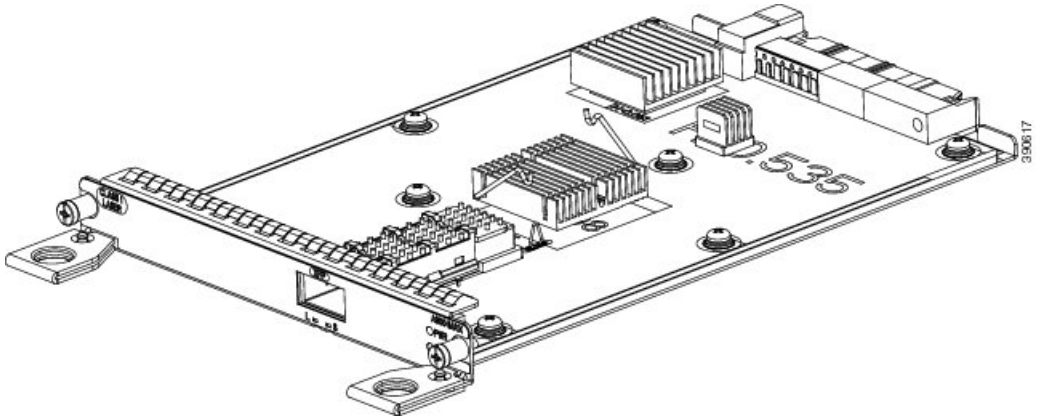
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing an RJ45 Gigabit Ethernet module, see the Interface Module Installation.

1-Port 10-Gigabit Ethernet XFP Interface Module

The 10-Gigabit Ethernet XFP interface module provides a single port supporting a 10-Gigabit Ethernet XFP module. The figure below shows the interface module.

Figure 15: 1 x 10-Gigabit Ethernet XFP Interface Module



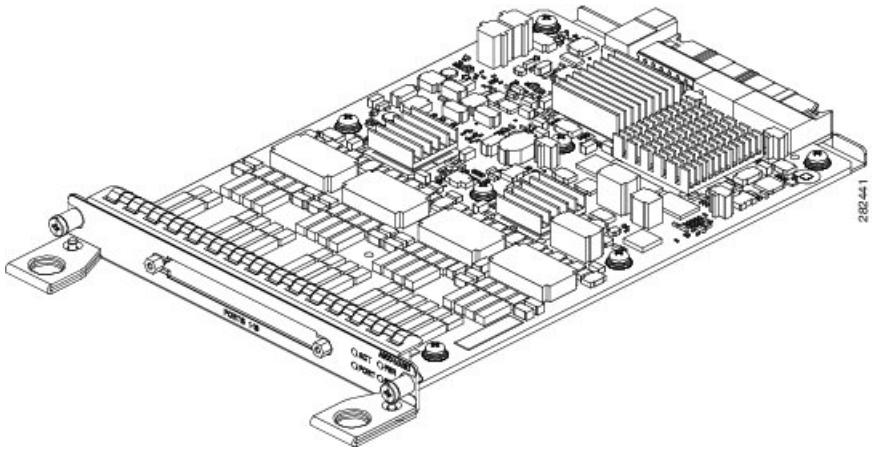
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing a 10-Gigabit Ethernet XFP module, see the Interface Module Installation.

16-Port T1/E1 Interface Module

The 16-port T1/E1 interface module provides connectivity for up to 16 T1/E1 ports through a 100-pin Amplimite connector. The T1/E1 interface module requires the use of a patch panel to provide RJ48 (T1) or BNC (E1) connectors. The figure below shows the interface module.

Figure 16: 16 x T1/E1 Interface Module



For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing a T1/E1 interface module, see theInterface Module Installation.

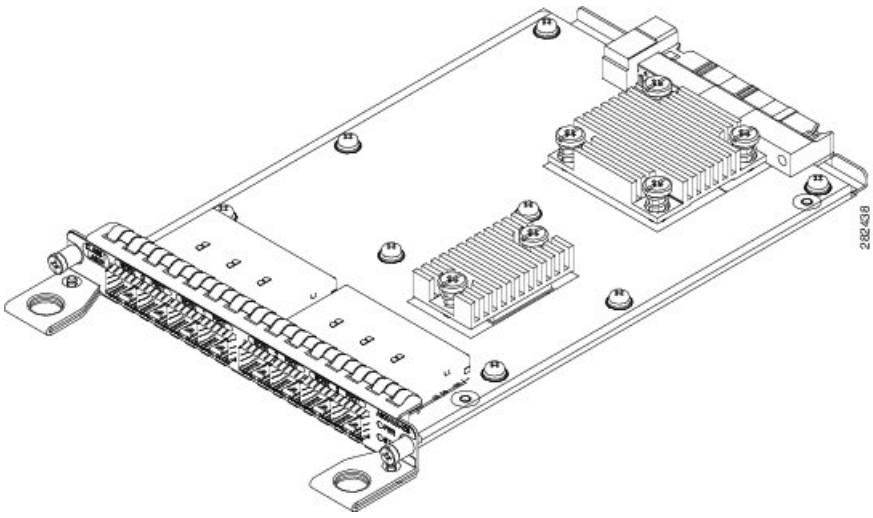
4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) Interface Module

The 4-port OC3/STM-1 (OC-3) or 1-port OC12/STM-4 (OC-12) interface module can operate as up to four STM-1 interfaces.

Note The optical interface module is designed for both OC-3 and OC-12 traffic.

The figure below shows the 4-port OC-3 interface module.

Figure 17: 4-port OC-3 Interface Module



For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

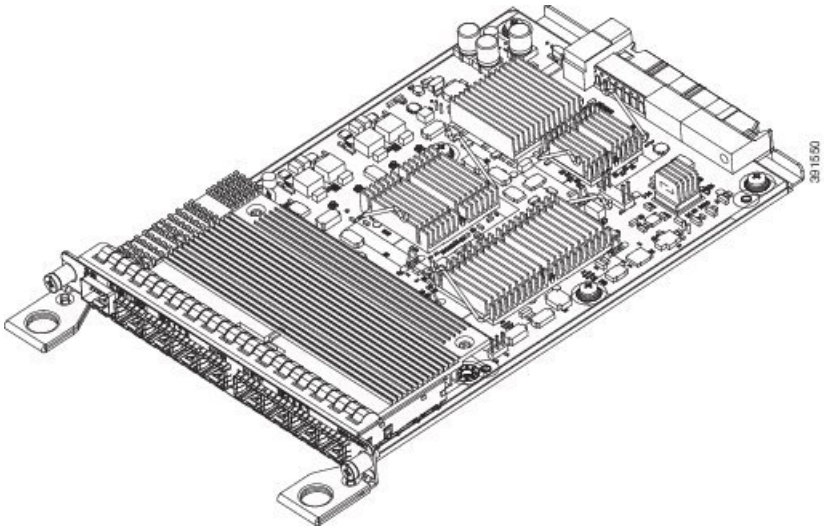
For more information about installing an optical interface module, see the Interface Module Installation.

For more information about using the LEDs to troubleshoot the Cisco ASR 902 Router, see Troubleshooting.

8x1 Gigabit Ethernet SFP + 1x10 Gigabit Ethernet SFP+ Combination Interface Module

The 8-port 1 Gigabit Ethernet SFP interface module with the 1-port 10 Gigabit Ethernet interface module is a high-density combination interface module. This module supports eight 1-Gigabit Ethernet SFP ports and one 10-Gigabit Ethernet SFP+ port.

Figure 18: 8x1 GE SFP + 1x10 GE SFP+ Interface Module



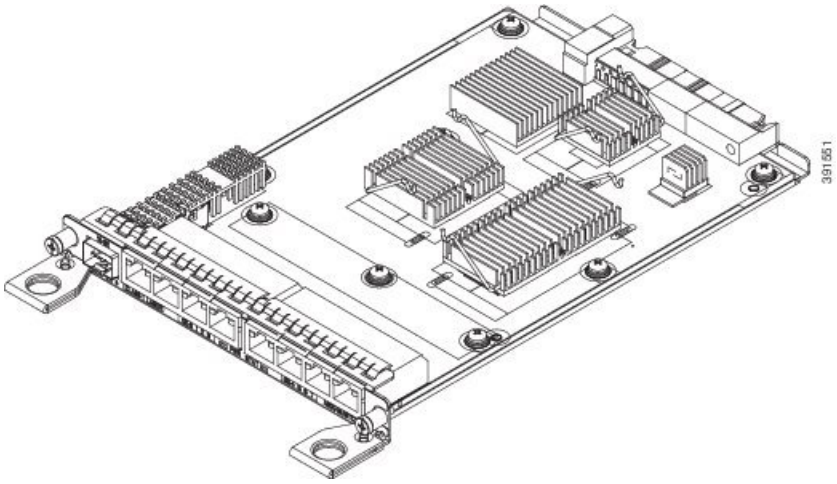
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing the 8X1 GE SFP + 1X10 SFP Gigabit Ethernet module, see the Interface Module Installation.

8x1 Gigabit Ethernet RJ45 + 1x10 Gigabit Ethernet SFP+ Combination Interface Module

This 8-port 1 Gigabit Ethernet RJ45 (Copper) interface module with the 1-port 10 Gigabit Ethernet interface module is a high-density combination interface module. This module supports eight 1 Gigabit Ethernet Copper ports and one 10 Gigabit Ethernet SFP+ port.

Figure 19: 8x1 GE RJ45 + 1x10 GE SFP+ Interface Module

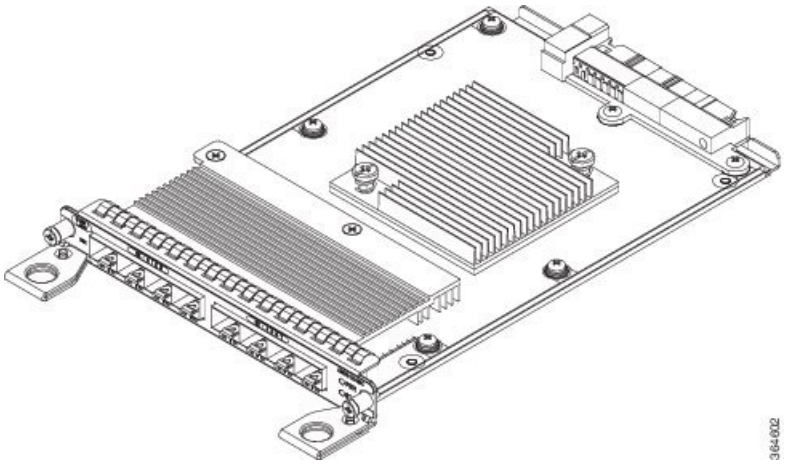


For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing the 8X1 GE RJ45 + 1X10 SFP Gigabit Ethernet module, see the Interface Module Installation.

8-Port 10 Gigabit Ethernet Interface Module (8x10GE)

Figure 20: 8x10 Gigabit Ethernet Interface Module



The high density 8x10 Gigabit Ethernet interface module supports eight 10 Gigabit Ethernet ports using SFP+ transceivers cages on the faceplate.

Note It does not support XFP transceivers on the ports.

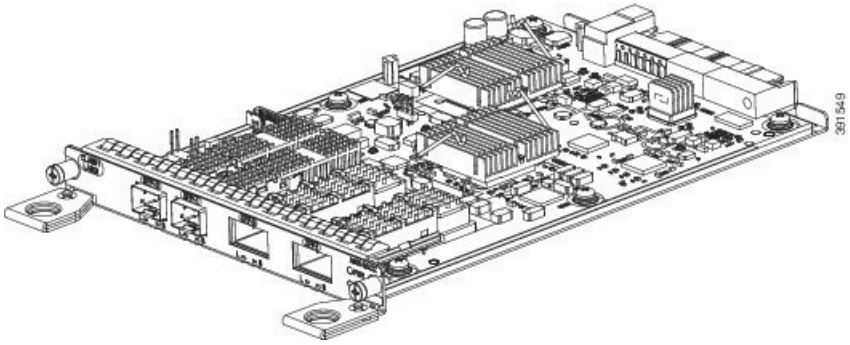
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing a 8X10GE module, see the Interface Module Installation.

2-Port 10 Gigabit Ethernet SFP+ Interface Module (2x10 GE)

The 2-port 10 Gigabit Ethernet interface module provides a dual port supporting a 10 Gigabit Ethernet SFP+ and XFP module.

Figure 21: 2-port 10 Gigabit Ethernet Interface Module



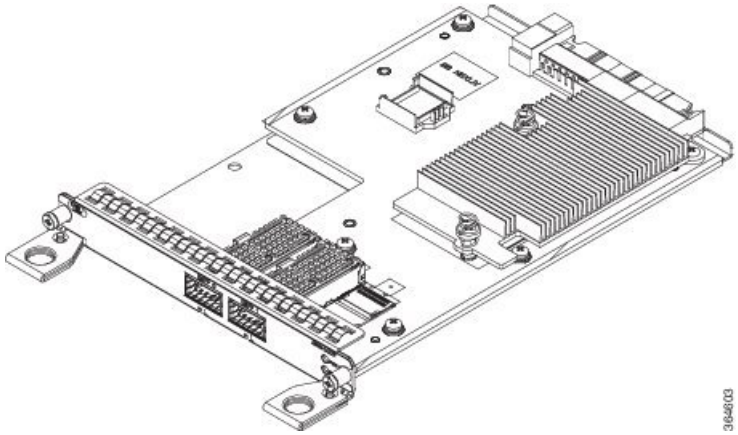
For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

For more information about installing the 2X10 GE SFP Gigabit Ethernet module, see the Interface Module Installation.

2-Port 40 Gigabit Ethernet QSFP Interface Module (2x40 GE)

The dual port 40 Gigabit Ethernet interface module supports the 40 Gigabit Ethernet port. The 40G interface is supported using QSFP+ optics. The figure below shows the interface module.

Figure 22: 2x40 Gigabit Ethernet Interface Module



For information on supported SFP modules, see Cisco ASR 900 Series Aggregation Services Routers Data Sheet.

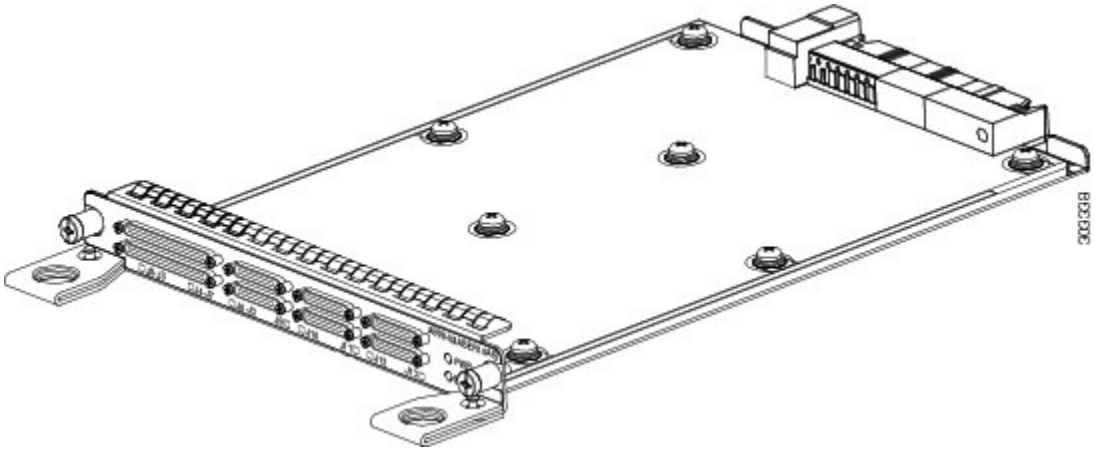
For more information about installing a 2X40GE module, see the Interface Module Installation.

14-Port Serial Interface Module

The Cisco (A900-IMASER14A/S) is a 14-port serial interface module for the router. The Cisco ASR 902 Router module has the following interfaces:

- 12-in-1 Connector (6)—Supports synchronous and asynchronous RS-232 interfaces using EIA/TIA-232 DB-25 connectors.
- 68-Pin Connector (2)—Supports up to 8 RS-232 interfaces in full or half duplex mode using 4 RS-232 connectors (DB-25, DB-9, or RJ-45).

Figure 23: 14-Port Serial Interface Module



1	Captive screws (2)	2	68-Pin Connector (2)
3	12-in-1 Connector (6)	4	Status (STAT) LED
5	Power (PWR) LED	6	LEDs—The LEDs are as follows: • J0–J3 and J4–J7—Indicate the function of the 68-pin connectors • J8–J13—Indicate the status of the 12-in-1 connectors

Supported Standards

The 14-port serial interface module supports the following standards:

Table 8: General Standard

Standard	Definition
IEEE 1613 2009	IEEE Standard for Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations
IEC 61850-3	IEC standard specifying general requirements for substation automation systems (SAS) communications and related system requirements.
IEC 60870-2-1:1995	IEC standard for substation environmental conditions
IEC 60870-2-2:1996	IEC standard for substation environmental conditions
IEC 61000-6-5:2001	IEC standard defining immunity for power station and substation environments

For more information about installing the module, see the Interface Module Installation.

For information on LEDs, see 14-Port Serial Interface Module LEDs.

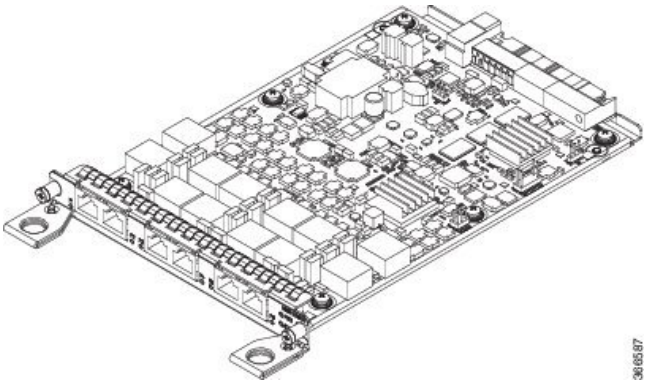
For information on cables and pinouts see, Connecting Serial Cables and Serial Interface Modules Pinouts.

6-Port E and M Interface Module

The Cisco A900-IMA6EM is a 6-port Ear and Mouth (E&M) interface module. The interface module provides the router with connectivity to tele-protection equipments. The front panel of the module consists of:

- six port RJ45 connectors
- two LED that display Power and Status
- one LED per RJ45 port

Figure 24: E and M Interface Module



For more information about installing the module, see the *Interface Module Installation* section.

4-Port C37.94 Interface Module

The Cisco (A900-IMA4C3794) is a 4-port interface module that provides IEEE C37.94-2002 compliant Nx64 kbps optical interface ports to the router. The interfaces support 50/62.5 multimode fiber at 850 nm. The physical interfaces use 2.5 mm ST connectors.

The front panel of the module consists of:

- four ports of IEEE C37.94 interfaces

Figure 25: C37.94 Interface Module

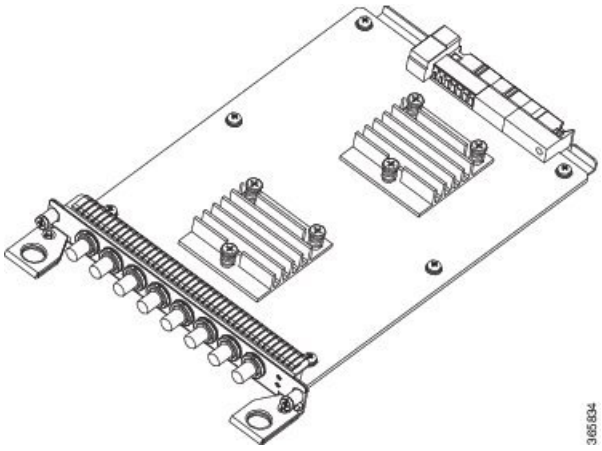
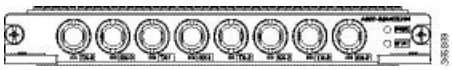


Figure 26: C37.94 Interface Module Front Panel

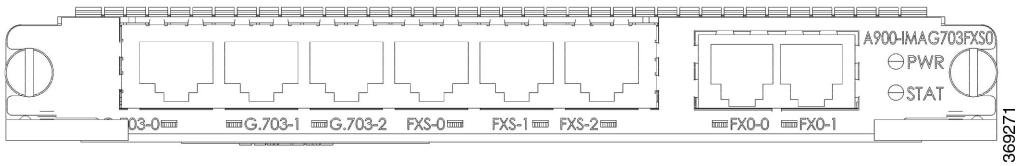


For more information about installing the module, see the *Interface Module Installation* section .

G.703/FXS/FXO Interface Module

The G.703/FXS/FXO Interface Module (A900-IMAG703FXSO) is a three port FXS, two port FXO, and three port G.703 64-Kbps co-directional interface module.

Figure 27: G.703/FXS/FXO Interface Module



Warning To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord. Statement 1023

For information on LEDs, see G.703/FXS/FXO Interface Module LEDs .

For more information about installing the module, see *Interface Module Installation*.

G.703/FXS/FXO Interface Module Connectors

- One dual-port RJ11 FXO connector
- One 6-port RJ45 connector (shared between FXS and G.703)

Blank Deflector (A900-IMA-BLNK-DEF)

The A900-IMA-BLNK-DEF is a special type of blank filler plate that can be used in empty interface module slots. In addition to just acting as a filler for the empty slots in the router, this blank deflects additional air towards the interface modules in the slot below it, thereby enhancing the cooling for the interface module.

Caution The A900-IMA-BLNK-DEF module should not be used in slot 0 in the Cisco ASR 902 Router.

For slot 0, always use the filler blank (A900-IMA-BLANK) when a blank filler needs to be used.

For more information on operating temperature, see Maximum Operating Ambient Temperature Support for RSP3 Modules .

Maximum Operating Ambient Temperature Support for RSP3 Modules

The router supports multiple fan trays with different cooling capacities. The maximum operating temperature of the router using the RSP3 modules, depends on the fan tray and the interface modules used in the router.

The table below provides an overview of the operating ambient temperature limits for different interface modules with A900-RSP3C-200-S in the router.

Note The temperature range could be further restricted by the optical modules used in the router.

Table 9: Operating Temperature for A900-RSP3C-200-S Module

Interface Modules	Fan Tray	Operating Temperature Limit (°C)
A900-IMA1X A900-IMA8T A900-IMA8S A900-IMA2Z A900-IMA8T1Z A900-IMA8S1	A902-FAN-E	–40 to 65
A900-IMA8Z		–40 to 50
A900-IMA2F		–40 to 45

Temperature Sensor

The Cisco ASR 902 Router has a temperature sensor to detect overtemperature conditions inside the chassis. The overtemperature detection trips at 75°C +/– 5% with the ambient (inlet) trip point at 67°C. This condition is reported to the processor as an interrupt, and the software takes action to generate the appropriate alarms.

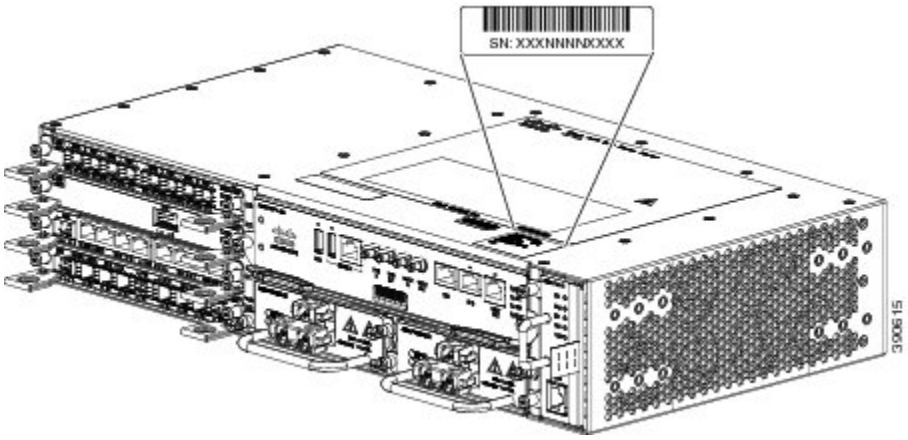
Temperature Sensors on the A900 RSP3 modules

The maximum operating temperature of the RSP3 module and the interface modules is less than the maximum operating temperature of the router. The IOS software decides the appropriate temperature thresholds to generate warnings, and shuts down the system when abnormally high temperature is detected.

Serial Number Label Location

The figure below shows the serial number label location on the Cisco ASR 902 Router.

Figure 28: Cisco ASR 902 Router Serial Number Location



Interface Numbering

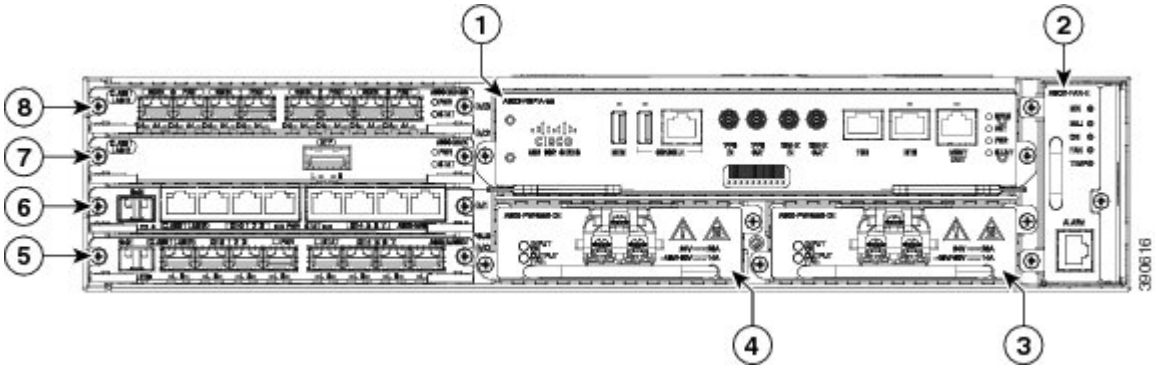
The Cisco ASR 902 Router chassis includes:

- Four interface module slots
- One RSP module slot
- Two power supply slots
- One fan tray slot

Each network interface on a Cisco ASR 902 Router is identified by a slot number and a port number.

The figure below shows interface numbering on a Cisco ASR 902 Router.

Figure 29: Cisco ASR 902 Router Slot Numbers



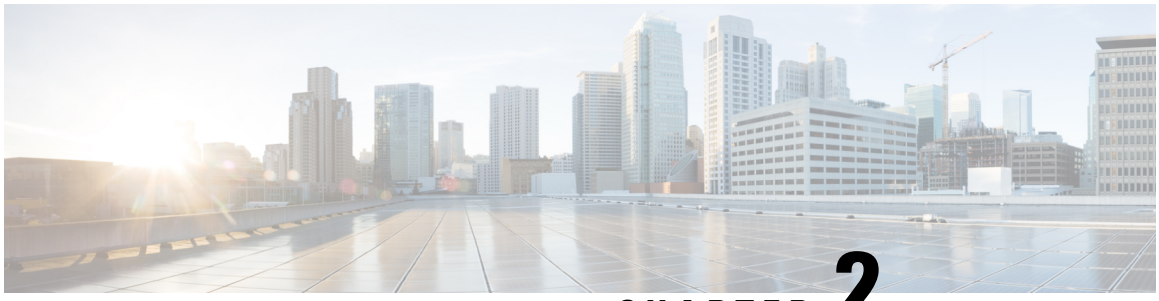
Label	Slot Identification
1	RSP slot
2	Fan tray slot
3	Power supply slot 1
4	Power supply slot 0
5	Interface module slot 0
6	Interface module slot 1
7	Interface module slot 2
8	Interface module slot 3

The following is an explanation of the interface module slot and port numbering:

- The numbering format is **interface type slot or interface** (port) **number**. Interface (port) numbers begin at logical 0 for each interface type.
- Interface module slots are numbered from bottom to top, with logical interfaces on each module numbered from left to right. Interfaces are hardwired. Therefore, port 0 is always logical interface 0/0, port 1 is always logical interface 0/1, and so on.

Regulatory Compliance

For regulatory compliance and safety information, see the Product Documentation and Compliance for the *Cisco ASR 900 Series Aggregation Services Routers* document.



CHAPTER 2

Preparing for Installation

This chapter describe how to prepare for the installation of the Cisco ASR 902 Router at your site.

- Safety Guidelines, on page 31
- Site Planning, on page 40
- Receiving the Cisco ASR 902 Router, on page 50

Safety Guidelines

Before you begin the installation of the Cisco ASR 902 Router, review the safety guidelines in this chapter to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco ASR 902 Router, review the safety warnings listed in the Product Documentation and Compliance for the Cisco ASR 900 Series Aggregation Services Routers document.

The following sections describe the safety guidelines for the Cisco ASR 902 Router:

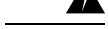
Standard Warning Statements

To see translations of the warnings that appear in this publication, refer to the Product Documentation and Compliance for the Cisco ASR 900 Series Aggregation Services Routers document.

Warning The appliance must be connected to a grounded outlet. Statement 0414

Warning To avoid or reduce the risk of personal injury, do not use the product if the product has been exposed to irregular environmental conditions, if the product has been misused or if parts of the product have been damaged. Consult qualified service personnel. Never try to service the product yourself. Statement 0416

Warning To reduce the risk of electric shock, fire or personal injury, do not place power cables in areas where they may be walked on or damaged by items placed upon or against it. Statement 0417



Warning This product is intended for use in a normal environment based on the standard IEC 60950-1. Do not use the product in vehicles, on board ships, in aircrafts or in medical applications with physical connection to the patient, nor in environments with exposure to moisture, dust, vibration or ingress of water. Statement 0418



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



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



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



Warning This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017



Warning If the symbol of suitability with an overlaid cross appears above a port, you must not connect the port to a public network that follows the European Union standards. Connecting the port to this type of public network can cause severe injury or damage your router. Statement 1031



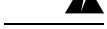
Warning Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool. Statement 1035



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



Warning Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Statement 1037



Warning Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning. Statement 1038



Warning To report a gas leak, do not use a telephone in the vicinity of the leak. Statement 1039



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



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



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



Warning IMPORTANT SAFETY INSTRUCTIONS: This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071



Warning No user-serviceable parts inside. Do not open. Statement 1073



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



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



Warning This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. Statement 287

Safety Guidelines for Personal Safety and Equipment Protection

The following guidelines help ensure your safety and protect the equipment. This list does not include all the potentially hazardous situations. Therefore, you should be on alert.

- Before moving the system, always disconnect all the power cords and interface cables.
- Never assume that power is disconnected from a circuit; always check.
- Before and after installation, keep the chassis area clear and dust free.
- Keep tools and assembly components away from walk areas where you or others could trip over them.
- Do not work alone if potentially hazardous conditions exist.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Do not wear loose clothing that may get caught in the chassis.
- When working under conditions that may be hazardous to your eyes, wear safety glasses.

Safety Precautions for Module Installation and Removal

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

To see the translations of the warnings that appear in this publication, refer to the Product Documentation and Compliance for the Cisco ASR 900 Series Aggregation Services Routers document.

Warning For connections outside the building where the equipment is installed, the following ports must be connected through an approved network termination unit with integral circuit protection . Statement 1044

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

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

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

Warning Do not stare into the beam or view it directly with optical instruments. Statement 1011

Warning Invisible laser radiation present. Statement 1016

Warning Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. Statement 1026



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



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



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

Safety with Electricity



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



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



Warning To prevent accidental discharge in the event of a power line cross, route on-premise wiring away from power cables and off-premise wiring, or use a grounded shield to separate the on-premise wiring from the power cables and off-premise wiring. A power line cross is an event, such as a lightning strike, that causes a power surge. Off-premise wiring is designed to withstand power line crosses. On-premise wiring is protected from power line crosses by a device that provides overcurrent and overvoltage protection. Nevertheless, if the on-premise wiring is in close proximity to or not shielded from, the off-premise wiring or power cable during a lightning strike or power surge, the on-premise wiring can carry a dangerous discharge to the attached interface, equipment, or nearby personnel. Statement 338

Warning High leakage current – earth connection essential before connection to system power supply. Statement 342

Warning Avoid using or servicing any equipment that has outdoor connections during an electrical storm. There may be a risk of electric shock from lightning. Statement 1088

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

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

Warning This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated: For a -48/-60 VDC installation, the wire shall be 12 AWG minimum with a 20 A branch circuit breaker. For a 24 VDC installation, the wire shall be 8 AWG minimum with a 40 A branch circuit breaker. Statement 1005

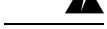
Warning This product relies on the building's installation for short-circuit (overcurrent) protection. For an AC installation, ensure that the branch circuit breaker is rated a maximum 20A. Statement 1005

Warning There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Statement 1015

Warning This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017

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

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



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



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



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



Warning This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Warning Use copper conductors only. Statement 1025



Warning Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. Statement 1026



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



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



Warning Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033



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

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

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

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

Warning When installing or replacing the unit, the ground connection must always be made first and When you connect or disconnect the power and/or alarm connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that all power is removed from the switch and any other circuits. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Statement 1058

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

Warning If you connect or disconnect the console cable with power applied to the switch or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Statement 1080

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

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

- Locate the room's emergency power-off switch. If an electrical accident occurs, you will be able to quickly turn off the power.
- Before starting work on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.
- Before doing the following, disconnect all power:
  - Working on or near power supplies
  - Installing or removing a router chassis or network processor module
  - Performing most hardware upgrades
- Never install equipment that appears damaged.

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

In addition, use the following guidelines when working with any equipment that is disconnected from a power source, but still connected to telephone wiring or network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for it.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- When installing or modifying telephone lines, use caution.

Power Supply Considerations

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



Warning This equipment has been designed for connection to TN and IT power systems. Statement 1007

Preventing ESD Damage



Warning This equipment needs to be grounded. Use a green and yellow 6 AWG ground wire to connect the host to earth ground during normal use. Statement 383

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. ESD may occur when electronic printed circuit cards are improperly handled and can cause complete or intermittent failures. When removing and replacing modules, always follow ESD prevention procedures:

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, ground yourself by touching a metal part of the chassis.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.

- When removing a component, use available ejector levers or captive installation screws, if any, to release the bus connectors from the backplane or midplane.
- Handle components by their handles or edges only; do not touch the printed circuit boards or connectors.
- Place a removed component board side up on an antistatic surface or in a static-shielding container. If you plan to return the component to the factory, immediately place it in a static-shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.



Note For the safety of your equipment, periodically check the resistance value of the antistatic wrist strap. It should be between 1 and 10 Mohm.

Site Planning

The following sections describe how to plan for the installation of the Cisco ASR 902 Router:

General Precautions

Observe the following general precautions when using and working with your Cisco ASR 902 Router system:

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

Site Planning Checklist

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

- The site meets the environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the Cisco ASR 902 Router.
- The floor space that the Cisco ASR 902 Router occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the Cisco ASR 902 Router complies with the requirements.
- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The Cisco ASR 902 Router Ethernet cabling distances are within the prescribed limitations.

- The equipment rack in which you plan to install the Cisco ASR 902 Router complies with prescribed requirements.
- When selecting the location of the rack, careful consideration must be given to safety, ease of maintenance, and proper airflow.

Site Selection Guidelines

The Cisco ASR 902 Router requires specific environmental operating conditions. Temperature, humidity, altitude, and vibration can affect the performance and reliability of the router. The following sections provide specific information to help you plan for the proper operating environment.

The Cisco ASR 902 Router is designed to meet the industry EMC, safety, and environmental standards described in the Product Documentation and Compliance for the Cisco ASR 900 Series Aggregation Services Routers document.

Environmental Requirements

The Cisco ASR 902 Router is Telcordia GR-3108-CORE Class-1/GR-63-Core Indoor compliant. Environmental monitoring of the Cisco ASR 902 Router protects the system and components from damage caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration *before* installation. After installation, make sure that the site maintains the environmental characteristics described in the System Specifications.

For an outside plant installation (cell site cabinet, hut etc.), it is required that the Cisco ASR 902 Router be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air or other reactive elements present in the outside air. To achieve this level of protection, we recommend that the unit be installed in a fully sealed enclosure or cabinet. Examples of such cabinets include IP65 cabinets with heat exchanger complying with Telecordia GR487. Temperature must be maintained within –40ºC to 65ºC.

Physical Characteristics

Be familiar with the physical characteristics of the Cisco ASR 902 Router to assist you in placing the system in the proper location. For more information, see the System Specifications.

Air Flow Guidelines

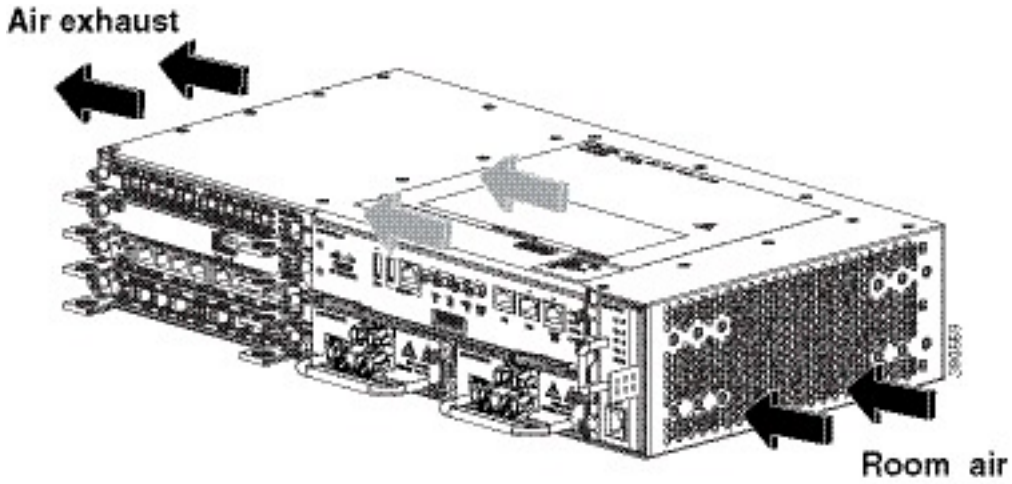
Cool air is circulated through the Cisco ASR 902 Router by a fan tray located along the right side of the router.

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.

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

- For horizontal mounting—Air flow is side to side and right to left, as shown in the figure below . To ensure adequate air flow through the equipment rack, we recommend that you maintain a clearance of at least 80 mm on each side of the rack at all times.

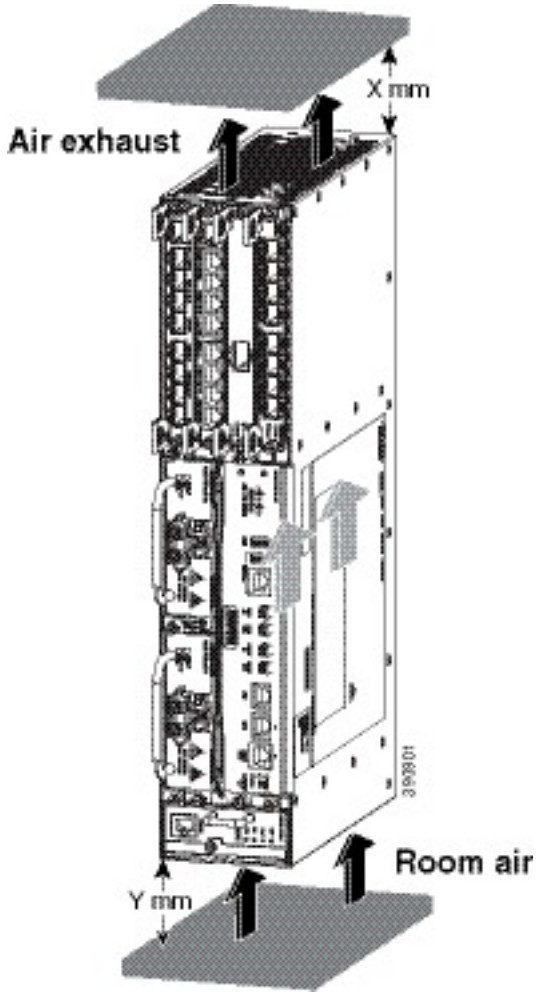
Figure 30: Cisco ASR 902 Router Chassis Air Flow - Horizontal Mounting



- For vertical mounting—Air flow is bottom to top, as shown in the figure below . To ensure adequate air flow through the equipment rack, we recommend that you maintain a clearance of at least 80 mm (X) on top and 100 mm (Y) at bottom of the rack at all times.

Caution When mounting the router vertically, ensure that the fan tray is at the bottom to ensure bottom-to-top air flow.

Figure 31: Cisco ASR 902 Router Chassis Air Flow - Vertical Mounting



- If airflow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an overtemperature condition may occur within the rack and the routers that occupy it.
- The site should also be as dust-free as possible. Dust tends to clog the router fans, reducing the flow of cooling air through the equipment rack and the routers that occupy it, thus increasing the risk of an overtemperature condition.
- Enclosed racks must have adequate ventilation. Ensure that the rack is not congested because each router generates heat. An enclosed rack should have louvered sides and a fan to provide cooling air. Heat that is generated by the equipment near the bottom of the rack can be drawn upward into the intake ports of the equipment above.
- When mounting a chassis in an open rack, ensure that the rack frame does not block the side intakes and the exhaust fans.
- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off all the other equipment in the rack (and in adjacent racks) to give the router maximum cooling air and clean power.

- Avoid locating the Cisco ASR 902 Router in a location in which the chassis air intake vents may draw in the exhaust air from adjacent equipment. Consider how the air flows through the router; the airflow direction is side to side, with ambient air drawn in from the vents located on the front right of the chassis.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco ASR 902 Router in a 4-post enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for ETSI 800-mm racks).

If you are mounting the chassis in a 4-post enclosed cabinet, ensure that you have a minimum of 6 inches (15.24 cm) of clearance on each side of the chassis.

Floor Loading Considerations

Ensure that the floor under the rack supporting the Cisco ASR 902 Routers is capable of supporting the combined weight of the rack and all the other installed equipment.

To assess the weight of a fully configured Cisco ASR 902 Router, refer to the System Specifications.

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

Site Power Guidelines

The Cisco ASR 902 Router has specific power and electrical wiring requirements. Adhering to these requirements ensures reliable operation of the system. Follow these precautions and recommendations when planning your site power for the Cisco ASR 902 Router:

- The redundant power option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails.
- In systems configured with the redundant power option, connect each of the two power supplies to separate independent power source. If you fail to do this, your system might be susceptible to total power failure due to a fault in the external wiring or a tripped circuit breaker.
- To prevent a loss of input power, be sure that the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and the breakers.
- Check the power at your site before installation, and periodically after installation to ensure that you are receiving clean power. Install a power conditioner, if necessary.
- Provide proper grounding to avoid personal injury and damage to the equipment due to lightning striking power lines or due to power surges. The chassis ground must be attached to a central office or other interior ground system.



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

Note The Cisco ASR 902 Router installation must comply with all the applicable codes, and is approved for use with copper conductors only. The ground bond-fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with a 6-AWG gauge wire copper ground conductor at a minimum.

The table below lists the maximum power draw of the Cisco ASR 902 Router chassis and its configurable hardware components. The maximum power-draw values are not affected by whether the router chassis contains 1 or 2 power supplies and if AC or DC.

Table 10: Maximum Power Draw For Cisco ASR 902 Router Chassis

Hardware Component	Maximum Power Draw Value
A900-RSP2A-64	70 W
A900-RSP2A-128	100 W
A900-RSP3-200-S	160 W
A900-IMA1X (1-port 10 Gigabit Ethernet XFP interface module)	13.0 W
A900-IMA8T (8-port 1 Gigabit Ethernet RJ45 interface module)	17.5 W
A900-IMA8S (8-port 1 Gigabit Ethernet SFP interface module)	17.5 W
A900-IMA16D (16-port T1/E1 interface module)	14.5 W
A900-IMA4OS (4-Port OC3 interface module)	26 W
A900-IMA8S1Z (8-port 1GE SFP + 1-port 10 GE interface module)	29 W
A900-IMA8T1Z (8-port 1GE RJ-45 Copper + 1 10 GE interface module	27 W
A900-IMA8Z (8-port 10 Gigabit Ethernet Interface Module)	60 W
A900-IMA2F (2-port 40 Gigabit Ethernet QSFP Interface Module)	60 W
A900-IMA2Z (2-port 10 GE interface module)	24 W
A900-IMASER14A/S (14-port Serial Interface Module)	20 W
A900-IMA6EM (6-port E & M Interface Module)	20 W
A900-IMA4C3794 (4-port C37.94 Interface Module)	14 W
A900-IMAG703FXSO (G.703/FXS/FXO Interface Module)	27 W

Electrical Circuit Requirements

Each Cisco ASR 902 Router requires a dedicated electrical circuit. If you equip the router with dual-power feeds, provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The Cisco ASR 902 Routers can be powered by a DC source or an AC source. Ensure that equipment grounding is present and observe the power-strip ratings. Make sure that the total ampere rating of all the products plugged into the power strip does not exceed 80% of the rating.

For more information about the Cisco ASR 902 Router power supply, see the Power Supply Features.

Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the Cisco ASR 902 Router, consider the type of cable required for each component, and the cable limitations. Consider the distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.

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

Before you begin, read these important notes about cabling:

- The T1/E1 interface module for the Cisco ASR 902 Router uses a high-density connector that requires the use of a T1/E1 interface cable and a customer-provided patch panel. For more information, see the Connecting T1/E1 Cables section.
- Shielded cables must be used to connect to the RJ45 alarm connector on the fan tray in order to comply with FCC/EN55022/CISPR22 Class A emission requirements. For information about the fan tray alarm port, see the Connecting the Fan Tray Alarm Port section .

Before you install the Cisco ASR 902 Router, have all the additional external equipment and cables on hand. For information about ordering, contact a Cisco customer service representative.

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

- Signal type
- Signal speed
- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline when planning your network connections >*prior to* installing the Cisco ASR 902 Router.

If wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Asynchronous Terminal Connections

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

Interference Considerations

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

The following sections describe the sources of interference and how to minimize their effects on the Cisco ASR 902 Router system.

Electromagnetic Interference

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

Strong EMI can destroy the signal drivers and receivers in the Cisco ASR 902 Router and even create an electrical hazard by causing power surges through the power lines into installed equipment. These problems are rare, but could be catastrophic.

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

For information about the electromagnetic compliance standards supported on the Cisco ASR 902 Router, see the Product Documentation and Compliance for the Cisco ASR 900 Series Aggregation Services Routers document.

Radio Frequency Interference

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

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

Lightning and AC Power Fault Interference

If signal wires exceed the recommended cabling distances, or if signal wires pass between buildings, you should consider the effect that a lightning strike in your vicinity might have on the Cisco ASR 902 Router.

The electromagnetic pulse (EMP) generated by lightning or other high-energy phenomena can couple enough energy into unshielded conductors to damage or destroy electronic equipment. If you have previously experienced such problems, you should consult with RFI and EMI experts to ensure that you have adequate electrical surge suppression and shielding of signal cables in your Cisco ASR 902 Router operating environment.

Rack-Mounting Guidelines

The following sections provide guidelines for rack-mounting the Cisco ASR 902 Router:

Precautions for Rack-Mounting

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

- Ensure that the rack is level and stable before extending a component from the rack.
- Ensure that proper airflow is provided to the components in the rack.

- Do not step on or stand on any component or system when servicing other systems or components in a rack.
- When mounting the Cisco ASR 902 Router in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Rack Selection Guidelines

The Cisco ASR 902 Router can be mounted in most two-post or four-post, 19-inch equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks (EIA-310-D 19-inch). The rack must have at least two posts with mounting flanges to mount the chassis.

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

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inch ± 0.06 inch (46.50 cm ± 0.15 cm). The rack-mounting hardware included with the chassis is suitable for most 19-inch equipment racks.

Consider installing the Cisco ASR 902 Router in a rack with the following features:

- NEBS-compliant, 19-inch wide (48.3-cm) rack.
- EIA or European Telecommunications Standards Institute (ETSI) hole patterns in the mounting rails. The required mounting hardware is shipped with the Cisco ASR 902 Router. If the rack that you plan to install the system in has metric-threaded rails, you must provide your own metric-mounting hardware.
- Perforated top and open bottom for ventilation to prevent overheating.
- Leveling feet for stability.

Caution The Cisco ASR 902 Router should *not* be installed in an enclosed rack because the chassis requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of enclosed rack—*even with the side doors removed* —could disrupt the air flow, trap heat next to the chassis, and cause an overtemperature condition inside the router. If you use an enclosed rack, ensure that there are air vents on all sides of the rack and there is proper ventilation.

Equipment Rack Guidelines

The placement of a rack can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics described in the System Specifications . Choose a proper location for the Cisco ASR 902 Router by following the guidelines described here.

Locating for Safety

If the Cisco ASR 902 Router is the heaviest or the only piece of equipment in the rack, consider installing it at or near the bottom to ensure that the rack's center of gravity is as low as possible.

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

Locating for Easy Maintenance

Keep at least 3 feet of clear space at the front and back of the rack. This space ensures that you can remove the Cisco ASR 902 Router components and perform routine maintenance and upgrades easily.

Avoid installing the Cisco ASR 902 Router in a congested rack and consider how routing of cables from other pieces of equipment in the same rack could affect access to the router cards.

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

Allow the following clearances for normal system maintenance:

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

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

- Use the **show environment all** command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings about high temperature and creates reports on other potentially dangerous occurrences. If warning messages are displayed, take immediate action to identify the cause, and correct the problem.
- Keep the Cisco ASR 902 Router off the floor and out of areas that collect dust.
- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Locating for Proper Airflow

Ensure that the Cisco ASR 902 Router location has enough airflow to keep the system operating within the environmental characteristics and the air temperature is sufficient to compensate for the heat dissipated by the system. For more information, see the Air Flow Guidelines section.

Installation Checklist

To assist you with your installation and to provide a record of what was done by whom and when, photocopy the Cisco ASR 902 Router Installation Checklist shown in the table below . Use this to record the completion and verification of each procedure. After the checklist is completed, place it in your Site Log along with the other records pertaining to your new Cisco router.

Table 11: Cisco ASR 902 Router Installation Checklist

Task	Verified By	Date
Date on which chassis received		
Chassis and all accessories unpacked		
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site Log established and background information entered		

Task	Verified By	Date
Site power voltages verified		
Site environmental specifications verified		
Required passwords, IP addresses, device names, and so on, available		
Required tools available		
Network connection equipment available		
Cable-management brackets installed (optional, but recommended)		
AC power cables connected to AC sources and router		
DC power cables connected to DC sources and router		
Network interface cables and devices connected		
System power turned on		
System boot complete (STATUS LED is on)		
Interface Module are operational		
Correct software configuration displayed after system banner appears		

Creating a Site Log

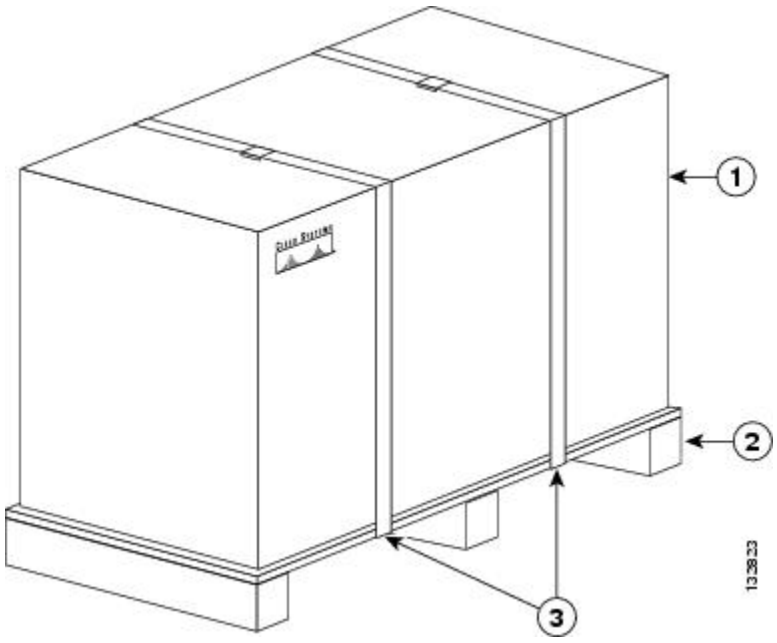
The Site Log provides a record of all the actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to the installation. (See Site Log for more information about the Site Log as well as a sample Site Log that can be used to make copies.)

Receiving the Cisco ASR 902 Router

Each Cisco ASR 902 Router chassis is shipped in a container that is strapped to a pallet, as illustrated in the figure below.

Figure 32: Cisco ASR 902 Router Packaged for Shipping



Label	Description	Label	Description
1	Outside carton	3	Packing straps
2	Pallet		

Chassis-Lifting Guidelines

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

Each time you lift the chassis or any heavy object, follow these guidelines:

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

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

Tools and Equipment

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

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

Note For more information about cable specifications, see Troubleshooting.

- Ethernet hub, switch, or PC with a network interface card for connecting to the Ethernet ports
- Console terminal (an ASCII terminal or a PC running terminal emulation software) that is configured for 9600 baud, 8 data bits, no parity, and 2 stop bits
- Console cable for connecting to the console port
- (Optional) Modem for connecting to the auxiliary port for remote administrative access
- Auxiliary cable for connecting to the auxiliary port (you can supply this cable or order one)
- Ratcheting torque screwdriver with a Phillips head that exerts up to 30-pound force per square inch (in-lb) or 0.02-kilograms force per square millimeter (kgf/mm2) of pressure
- Crimping tool as specified by the ground lug manufacturer
- Wire-stripping tools for stripping both 8-AWG and 12-AWG wires
- Tape measure and level

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

Unpacking and Verifying the Shipped Contents

When you receive your chassis, perform the following steps:

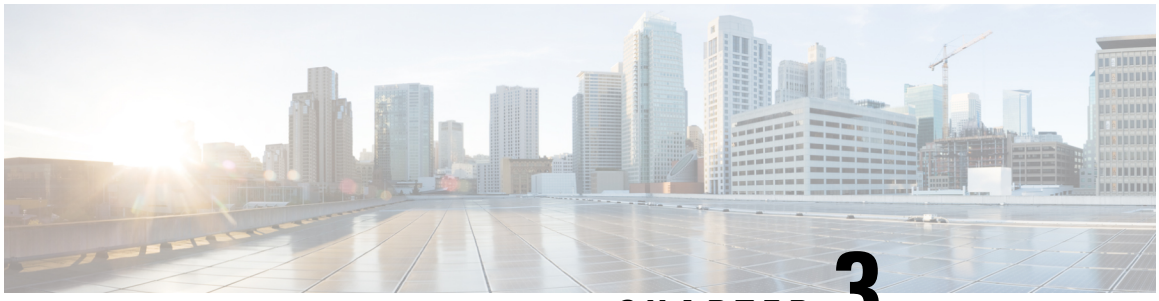
1. Inspect the box for any shipping damage. If there is obvious physical damage, contact your Cisco service representative.
2. Unpack the Cisco ASR 902 Router.
3. Perform a visual inspection of the chassis.
4. Use the table below to check the contents of the Cisco ASR 902 Router shipping container. Do not discard the shipping container. You will need the container if you move or ship the Cisco ASR 902 Router in the future.

Table 12: Cisco ASR 902 Router Shipping Container Contents

Component	Description
Chassis	Cisco ASR 902 Router chassis
	Fan tray
	Power supplies
	RSP
	Interface modules
Accessories kit	Chassis rack-mount brackets (19-inch EIA)
	Three sets of screws: • Front and rear rack-mount bracket screws (2 sets) • Cable-management bracket screws
	Six cable-management brackets (one per bracket)
	One earth lug with two 10-32 screws.
	1 RJ45 to RJ45 crossover cable 1 RJ45 to DB-9 (female) adapter
ESD, wrist strap (disposable)	One disposable wrist strap (optional)
Documentation	Cisco ASR 900 Series Aggregation Service Router Documentation
Optional equipment	Check the container for the following optional equipment: • Power cord if an AC power supply was shipped. There are no cords for the DC power supply units. • T1/E1 cable connector (required only for T1/E1 interface modules)



Note Most Cisco documentation is available online. The Cisco ASR 900 Series Aggregation Service Router Documentation that is shipped with your Cisco ASR 902 Router contains links and information about the various documents that are available online.



CHAPTER 3

Installing the Cisco ASR 902 Router

This chapter describes how to install the Cisco ASR 902 Router.

- Prerequisites, on page 55
- Installing the Router in a Rack, on page 55
- Installing the Chassis Ground Connection, on page 60
- Installing the Fan Tray, on page 62
- RSP Installation, on page 66
- Interface Module Installation, on page 68
- Installing the Power Supply, on page 70
- Connecting a Cisco ASR 902 Router to the Network, on page 83

Prerequisites

Before installing the Cisco ASR 902 Router, it is important to prepare for the installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOP).
- Unpacking and inspecting the Cisco ASR 902 Router.
- Gathering the tools and test equipment required to properly install the Cisco ASR 902 Router.

For more instructions on how to prepare for the installation of the Cisco ASR 902 Router, see Preparing for Installation, on page 31.

Installing the Router in a Rack

The following sections describe how to install the Cisco ASR 902 Router in a rack. The procedures in this section apply to both horizontal and vertical mounting of the router in a rack:

Installing the Chassis Brackets

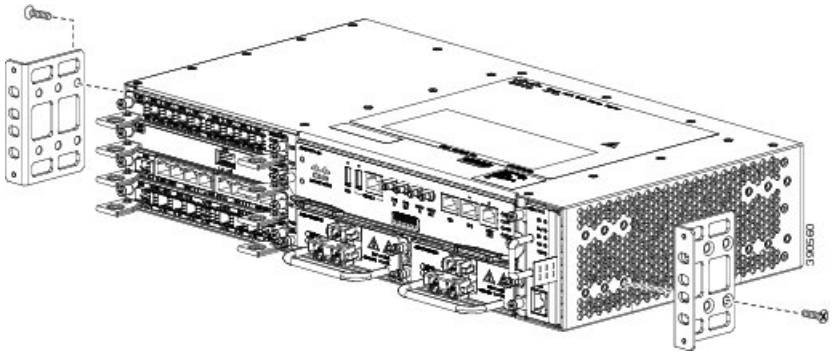
The chassis is shipped with mounting brackets that can be installed on the front or rear of the chassis. To install the brackets on the front of the chassis, perform these steps:

Procedure

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

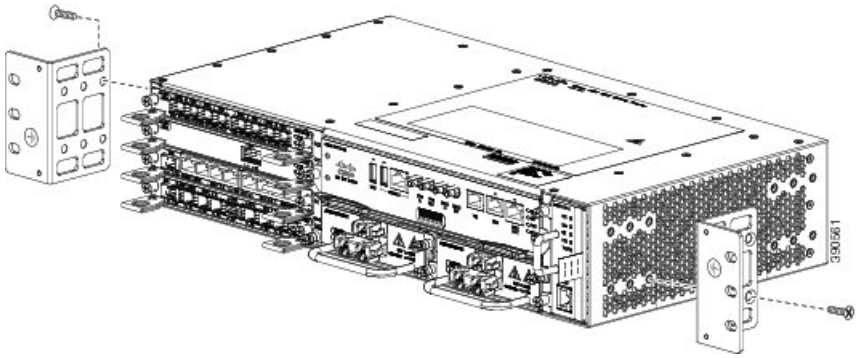
The figure below shows how to attach the brackets on the Cisco ASR 902 Router for a 19-inch EIA rack.

Figure 33: Attaching Mounting Brackets for a 19-inch EIA Rack



The figure below shows how to attach the brackets on the Cisco ASR 902 Router for a 300-mm ETSI cabinet.

Figure 34: Attaching Mounting Brackets for a 300-mm ETSI Cabinet



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

Step 3 Secure the bracket to the chassis with the screws removed when performing Step 1 . The recommended maximum torque is 28 in.-lb (3.16 N-m).

Step 4 Repeat Step 2 and Step 3 for the other bracket.

Installing the Router Chassis in the Rack

Note Ensure adequate air flow when mounting the router in a rack. For more information, see the Air Flow Guidelines section.

Note Install the cable guides before installing the router in a 19-inch EIA rack.

To install the router chassis in the equipment rack, perform these steps:

Procedure

Step 1 Position the chassis in the rack as follows:

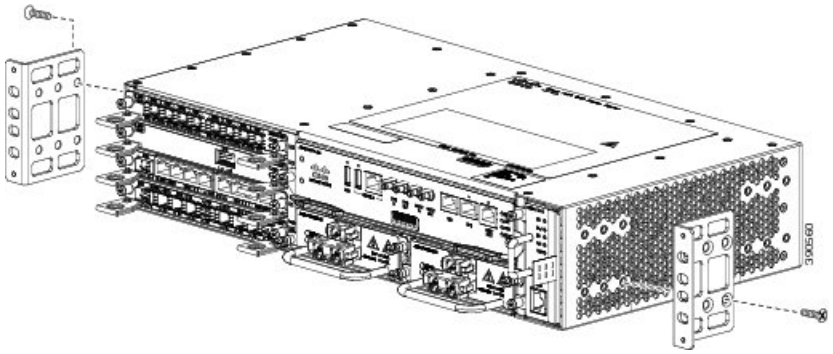
- If the front of the chassis (front panel) is at the front of the rack, insert the rear of the chassis between the mounting posts.
- If the rear of the chassis is at the front of the rack, insert the front of the chassis between the mounting posts.

Step 2 Align the mounting holes in the bracket (and optional cable guide) with the mounting holes in the equipment rack.

Caution
Do not use interface module or power supply ejector handles to lift the chassis; using these handles to lift the chassis can deform or damage the handles.

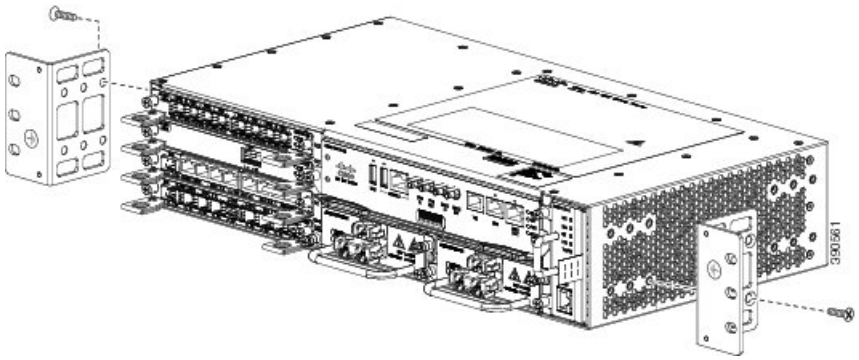
The figure below shows how to install the Cisco ASR 902 Router in a 19-inch EIA rack.

Figure 35: Attaching Mounting Brackets for a 19-inch EIA Rack



The figure below shows how to install the Cisco ASR 902 Router in a 300-mm ETSI Cabinet.

Figure 36: Installing the Chassis in a 300-mm ETSI Cabinet



Step 3 Install the 8 or 12 (4 or 6 per side) 12-24 x 3/4-inch or 10-32 x 3/4-inch screws through the holes in the bracket and into the threaded holes in the equipment rack posts.

Step 4 Use a tape measure and level to verify that the chassis is installed straight and level.

Installing the Router Chassis in the Air Plenum

Note Ensure that the router is not installed in the Air Plenum while mounting it on the rack.

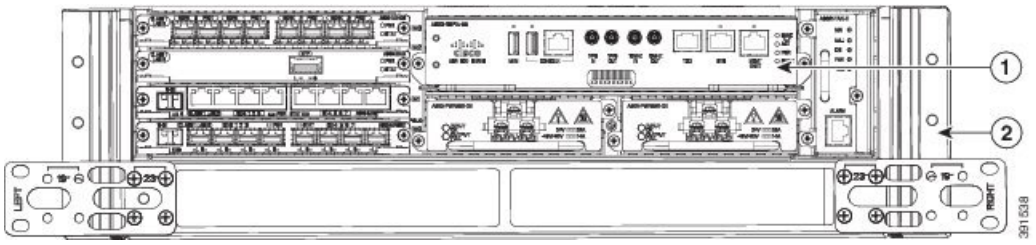
For instructions on mounting the air plenum on the rack, see Manufacturers of Equipment Used in Cisco ASR 902 Router, on page 128.

Procedure

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

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

Figure 37: Cisco ASR 902 Chassis with Air Plenum



1	Cisco ASR 902 router	2	Air plenum

Attaching the Cable Guides

The Cisco ASR 902 Router supports the following cable guides:

- A902-CABLE GUIDE-LEFT—This guide helps in routing the cables from the interface modules, thereby enabling a proper cable-bending radius. (See the figure below.)
- A902-CABLE GUIDE-RIGHT—This guide helps in routing the cables from the power supplies and the RSP module, thereby enabling a proper cable-bending radius. (See the figure below.)

Note If the chassis is mounted using 19-inch brackets, you must assemble the cable guides before installing the chassis on the rack.

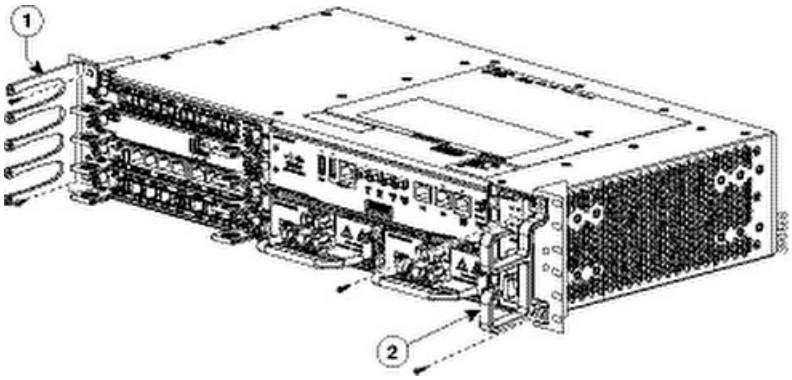
Note The cable guides should be assembled together. We recommend that the cable guides be installed before the chassis is installed in the air plenum.

To install a cable guide, perform these steps:

Procedure

Step 1 Position the cable guide-left and cable guide-right against the front of the chassis and align the four screw holes, as shown in the figure below.

Figure 38: Cable Guide Installation



Label	Component
1	Cable guide-left
2	Cable guide-right

Step 2 Secure the cable guides with the four M3.5 screws supplied with the cable kit. The recommended maximum torque is 10 in.-lb (1.12 N-m).

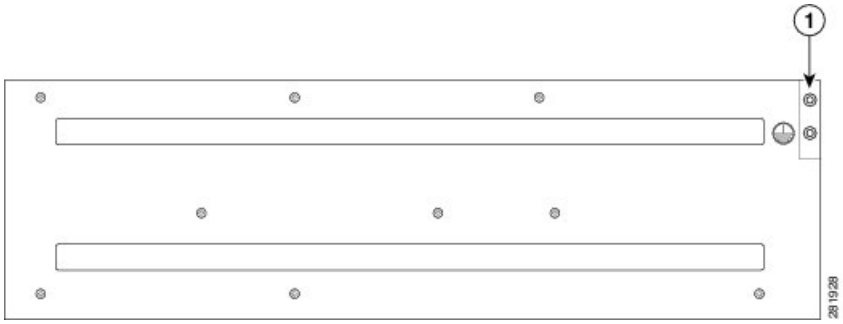
Installing the Chassis Ground Connection

Before you connect the power or turn on the power to the Cisco ASR 902 Router, you must provide an adequate chassis ground (earth) connection to your router.

This section describes how to ground the Cisco ASR 902 Router chassis. The router provides two locations for attaching a 2-hole grounding lug according to the rack-mounting brackets you use to install the router. The Cisco ASR 902 Router supports the following rack-mounting types:

- EIA 19-inch rack—Attach the grounding lug to the rear of the router, as shown in the figure below .

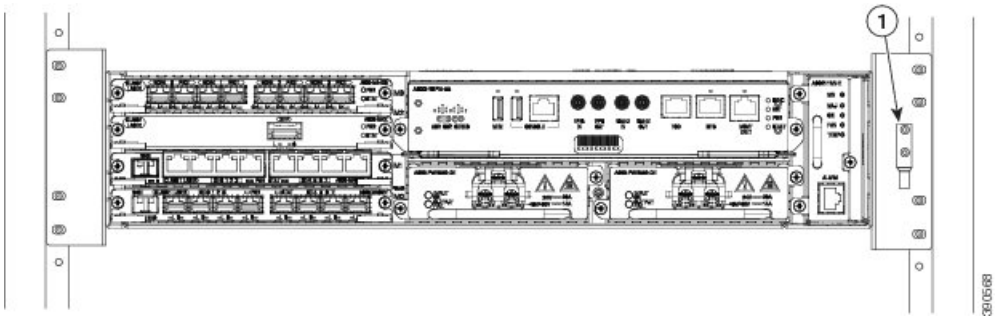
Figure 39: Attaching a Grounding Lug to the Rear of the Router



1	Grounding-lug (19-inch EIA rack)

- 300-mm ETSI cabinet—Attach the grounding lug on the rack-mount bracket on the front of the router, as shown in the figure below .

Figure 40: Attaching a Grounding Lug to the Rack-Mount Bracket



1	Grounding lug (300 mm ETSI cabinet)

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

- Ratcheting torque screwdriver with Phillips head that exerts up to 15 in.-lb (1.69 N-m) of pressure for attaching the ground wire to the router

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

Caution Before making connections to the Cisco ASR 902 Router, ensure that you disconnect the power at the circuit breaker. Otherwise, severe injury to you or damage to the router may occur.

Warning This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning Use copper conductors only. Statement 1025

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

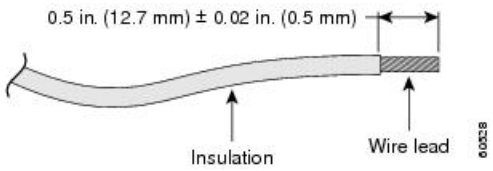
This unit is to be installed in a restrictive access location and must be permanently grounded to a minimum 6-AWG copper ground wire.

Perform the following procedure to ground the Cisco ASR 902 Router using a 2-hole lug and the corresponding mounting point. Most carriers require a minimum 6-AWG ground connection. Verify your carrier's requirements for the ground connection.

Procedure

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

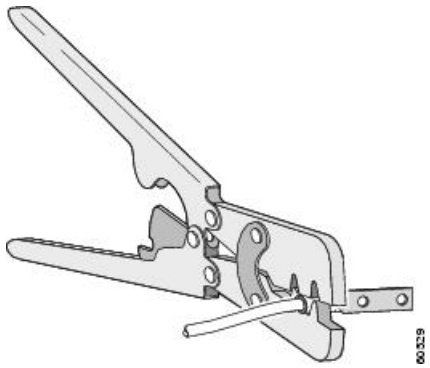
Figure 41: Stripping a Ground Wire



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

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

Figure 42: Crimping a Ground Lug on to the Ground Wire



Step 4 Use a Phillips head screwdriver to attach the 2-hole ground lug and wire assembly to the router with the 2 pan-head Phillips head screws. For a 19-inch EIA rack, attach the 2-hole ground lug to the rear of the router.

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

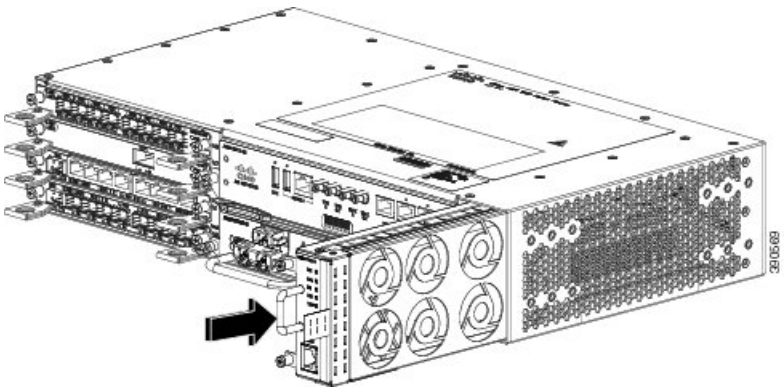
Installing the Fan Tray

The fan tray is a modular unit that provides cooling to the Cisco ASR 902 Router. Follow these steps to install the fan tray in the chassis:

Procedure

Step 1 Orient the fan tray so that the captive screws are on the left side of the fan tray's front panel. The figure below shows how to orient the fan tray.

Figure 43: Installing the Fan Tray



Step 2 Guide the fan tray into the chassis until it is fully seated.

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

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

Step 3 Secure the fan tray to the chassis using the attached captive installation screws. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

This completes the procedure for installing or replacing the fan tray in a Cisco ASR 902 Router.

For information about connecting cables to the fan tray alarm port, see the *Connecting the Fan Tray Alarm Port* section in the *Cisco ASR 902 and ASR 902U Aggregation Services Router Hardware Installation Guide*. For a summary of the LEDs on the fan tray, see the *LED Summary* section in the *Cisco ASR 902 and ASR 902U Aggregation Services Router Hardware Installation Guide*. For more information about air flow guidelines, see the *Air Flow Guidelines*section in the *Cisco ASR 902 and ASR 902U Aggregation Services Router Hardware Installation Guide*.

Installing the Dust Filter

Procedure

Step 1 Follow the steps for removing the fan tray (if installed) from the chassis. See the Removing and Replacing the Fan Tray.

Step 2 Remove the dummy cover from the fan tray. See the figure shown in the section Fan Tray (A902-FAN-E), on page 10.

Step 3 Slide the dust filter onto the fan tray. See the figure shown in the section Fan Tray (A902-FAN-E), on page 10.

Step 4 Insert the dummy cover on the fan tray to secure the filter within the chassis.

Step 5 Perform the steps to install the fan tray in the chassis. See Installing the Fan Tray.

Removing the Dust Filter

The dust filter must be removed for a replacement.

Note The dust filter is a single-use component.

Dust Filter Maintenance

A periodic health check of the filter, every three months based on the level of dust in the environment, helps in avoiding over clogging of the filters and provide a better life. This product's filter is used as a single-use component. If the product is installed in a controlled environment, check and replace the filter every three months, otherwise replace the filter every month.

Procedure

Step 1 Remove the dummy cover from the fan tray.

Step 2 Remove the dust filter from the fan.

Note
The filter can be accessed by pulling the pull tab by using fingers or pliers.

Step 3 Slide the replacement dust filter onto the fan tray

Step 4 Insert the dummy cover onto the fan tray to secure the filter within the chassis.

Removing and Replacing the Fan Tray

The fan tray supports online insertion and removal (OIR). There is no need to power down the Cisco ASR 902 Router to remove or replace the fan tray. However, there is a finite time to replace the fan tray. This time depends upon the specific RSP module used and the ambient temperature. The following table provides the time interval for replacing the fan tray. At higher ambient temperatures, the replacement time is lower.

Table 13: Fan Replacement Time

RSP Module	Replacement Time at 25°C Ambient
RSP2	5 minutes
RSP3	2 minutes

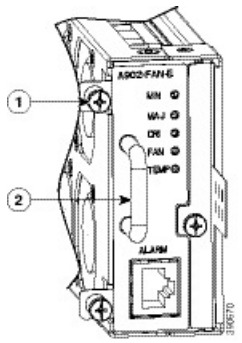
Caution To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after the fan tray has been removed or replaced.

Follow these steps to remove and replace the fan tray on the Cisco ASR 902 Router:

Procedure

Step 1 Using a No. 2 Phillips screwdriver or your fingers, loosen the captive installation screw that secures the fan tray to the chassis. The figure below shows the front of the fan tray, including the captive installation screws.

Figure 44: Detaching the Fan Tray



Label	Component
1	Captive installation screw
2	Handle

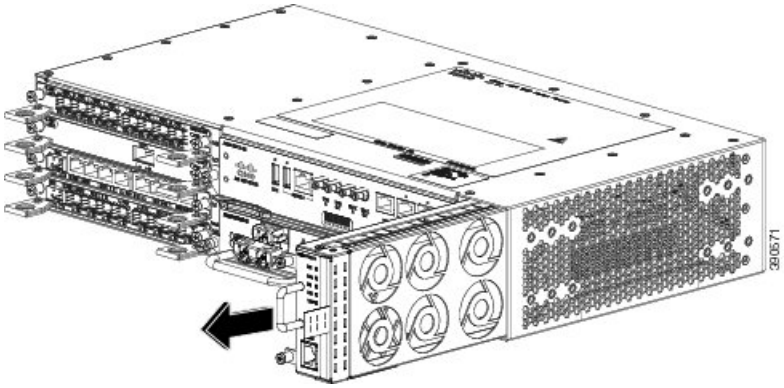
Step 2 Grasp the fan tray handle with one hand and the outside of the chassis with the other hand. the figure below shows the front of the fan tray, including the handle.

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

Step 3 Pull the fan tray backward towards you, no more than 1 inch, to disengage it from the power receptacle on the midplane, as shown in the figure below.

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

Figure 45: Fan Tray Removal



Step 4 Wait at least 5 seconds to allow the fans to stop spinning. Then, pull the fan tray backward towards you and out of the chassis..

Note

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

This completes the steps for removing the fan tray from the chassis.

To install a new fan tray, follow the steps in the Installing the Fan Tray.

RSP Installation

Follow these steps pertaining to handling an RSP module in the Cisco ASR 902 Router:

Installing an RSP Module

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

Procedure

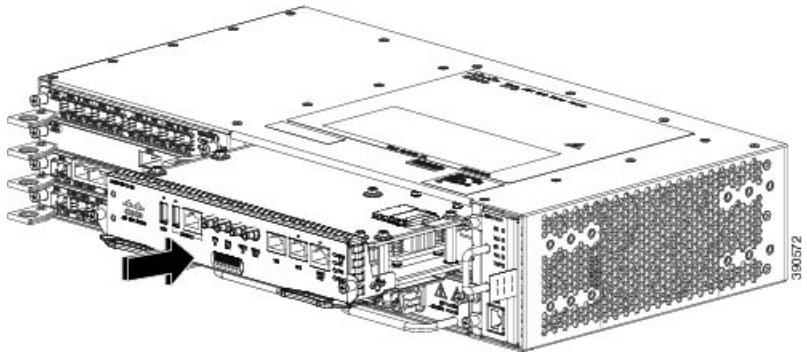
Step 1 Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head screws.

Step 2 Fully open both the ejector levers on the new module, as shown in the figure below .

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

Step 3 Position the module in the slot. Make sure that you align the sides of the module with the guides on each side of the slot, as shown in the figure below .

Figure 46: Cisco ASR 902 Router RSP Installation



Step 4 Carefully slide the module into the slot until the EMI gasket on the module makes contact with the module in the adjacent slot and both the ejector levers have closed to approximately 45 degrees with respect to the module faceplate.

Step 5 While pressing down, simultaneously close both the ejector levers to fully seat the module in the backplane connector. The ejector levers are fully closed when they are flush with the module faceplate.

Step 6 Tighten the two captive installation screws on the module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

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

Step 7 Verify that the captive installation screws are tightened on all of the modules installed in the chassis. This step ensures that the EMI gaskets on all the modules are fully compressed in order to maximize the opening space for the new or replacement module.

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

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

Note
Close all unused RJ-45 and USB ports on the RSP module using the appropriate dust caps to prevent dust from accumulating inside the cage. For information on dust caps, see the *Installing the Dust Caps* section.

Removing an RSP Module

Before you remove an RSP module from the router, you should save the current configuration using the **write {host file | network | terminal}** command. This saves you time when bringing the module back online.

If the module is running Cisco IOS software, save the current running configuration by entering the **copy running-config startup-config** command.



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



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

To remove an RSP module, perform the following steps:

Procedure

Step 1 Disconnect any cables attached to the ports on the module.

Step 2 Verify that the captive installation screws on all the modules in the chassis are tight. This step ensures that the space created by the removed module is maintained.

Note

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

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

Step 4 Place your thumbs on the ejector levers (the figure below) and simultaneously rotate the ejector levers outward to unseat the module from the backplane connector.

Step 5 Grasp the front edge of the module and slide the module straight out of the slot. If the chassis has horizontal slots, place your hand under the module to support its weight as you slide it out from the slot. Do not touch the module circuitry.

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

Step 6 Place the module on an antistatic mat or antistatic foam.

Interface Module Installation

The following sections describe the various tasks associated with interface module installation on the Cisco ASR 902 Router:

Installing an Interface Module

Note On RSP-1, Slot 2 Port 0 cannot be used for traffic flow on 8X1-G copper and 8X1-G SFP interface modules. To identify Slot 2 on the Cisco ASR 902 Router, see the figure shown in the Interface Numbering, on page 29 section.

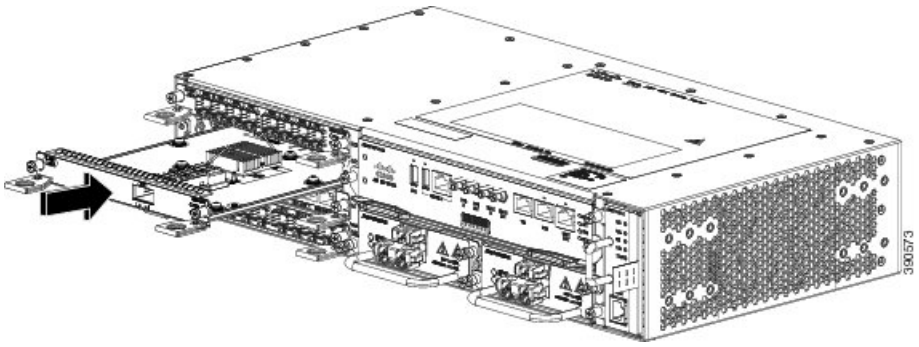
Procedure

Step 1 Before inserting an interface module, make sure that the chassis is grounded.

Step 2 To insert the interface module, carefully align the edges of the interface module between the upper and lower edges of the router slot.

Step 3 Carefully slide the interface module into the router slot until the interface module makes contact with the backplane. The figure below shows how to install the interface module.

Figure 47: Inserting an Interface Module



Step 4 Tighten the locking thumbscrews on both sides of the interface module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Step 5 Connect all the cables to each interface module.

Caution
Do not use interface module or power supply ejector handles to lift the chassis; using these handles to lift the chassis can deform or damage the handles.

Note
Close all unused SFP ports using SFP dust caps to prevent dust from accumulating inside the cage. The dust caps (Cisco part number A900-DCAP-SFP-S= (24 caps per package) or Cisco part number A900-DCAP-SFP-L= (240 caps per package)) can be ordered from Cisco. For information on dust caps, see Installing Dust Caps.

Note
Close all unused RJ-45, SFP, XFP, and QSFP ports on the interface module using the appropriate dust caps to prevent dust from accumulating inside the cage. For information on dust caps, see Installing Dust Caps.

Removing an Interface Module

Procedure

Step 1 To remove an interface module, disconnect all the cables from each interface module.

Step 2 Loosen the locking thumbscrews on both sides of the interface module.

Step 3 Slide the interface module out of the router slot by pulling on the handles. If you are removing a blank filler plate, pull the blank filler plate completely out of the router slot using the captive screws.

Hot-Swapping an Interface Module

The Cisco ASR 902 Router provides a feature that allows you to remove and replace an interface module without powering down the router. This feature, called hot-swapping or Online Insertion and Removal (OIR), allows you to remove and replace a redundant module without disrupting router operation.

Note The Cisco ASR 902 Router does not support hot-swapping an interface module with another module of a different type. For example, you cannot swap an SFP Gigabit Ethernet module with a copper Gigabit Ethernet module without disrupting router operation.

Note If you perform OIR on an interface module and move the module to a different slot, the router does not retain the module configuration; you must reconfigure the interface module.

When you remove or insert a redundant module while the router is powered on and running, the router does the following:

1. Determines if there is sufficient power for the module.
2. Scans the backplane for configuration changes.
3. Initializes the newly inserted module. In addition, the system notes any removed modules and places those modules in the administratively shutdown state.
4. Places any previously configured interfaces on the module back to the state they were in when they were removed.

The router runs diagnostic tests on any new interfaces and the test results indicate the following:

- If the tests are successful it means the router is operating normally.
- If the new module is faulty, the router resumes normal operation, but leaves the new interfaces disabled.
- If the diagnostic tests fail, the router stops operating, which usually indicates that the new module has a problem in the bus and should be removed.

Caution To avoid erroneous failure messages, note the current configuration of all the interfaces before you remove or replace an interface module, and allow at least 2 minutes for the system to reinitialize after a module has been removed or replaced. This time is recommended in order to allow for synchronization between components within the interface module and for synchronization with the RSP.

Installing the Power Supply

The Cisco ASR 902 Router provides the choice of two different power supplies:

- DC power
  - 550 W Power Supply—19.2VDC to -72VDC

The DC power supply uses 3 position terminal block-style connector with positive latching/securing and labeled connections for +24/48V, GRD, -24/48V. The terminal block connector is of suitable size to carry the appropriate AWG wire size to handle the input current of the power supply. No ON/OFF switch is provided.

- • 1200 W Power Supply—40.8VDC to -72VDC

The power supplies are hot-swappable. They are enclosed to prevent exposure to high voltages, and therefore, no power cable interlock is required. However the power supplies are automatically shut down when removed

from the chassis. The power supplies are rated to deliver 975 W (~81 A) to the other FRUs in the system, and are rated for operation at 5ºC above the chassis operating temperature

- AC power
  - 550 W Power Supply—85VAC to 264VAC
  - 1200 W Power Supply—85VAC to 264VAC

The power supplies are hot-swappable. They are enclosed to prevent exposure to high voltages, and therefore, no power cable interlock is required. However the power supplies are automatically shut down when removed from the chassis. The power supplies are rated to deliver 975 W (~81 A) to the other FRUs in the system, and are rated for operation at 5ºC above the chassis operating temperature.

The AC power supply has an IEC 320-type power receptacle and a 15 Amp service connector. You can use standard right angle power cords with the AC power supply. The power supply includes a power cord retainer. No ON/OFF switch is provided.

LEDs are also provided on each power supply to indicate the status of the input power and the health of the power supply. Each power supply also includes a board ID EEPROM which is accessible by the active RSP.

Each power supply provides a single primary input power connection. You can install dual-power supplies for redundancy.

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

Note Products that have an AC power connection are required to have an external surge protective device (SPD) provided as part of the building installation to comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety.

Caution Do not use power supplies of different capacities together in the router for prolonged durations.

Caution Do not use interface module or power supply ejector handles to lift the chassis; using these handles to lift the chassis can deform or damage the handles.

Preventing Power Loss

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

- To prevent loss of input power, ensure that the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and breakers.
- In some systems, you can use an UPS to protect against power failures at your site. Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems such as the Cisco ASR 902 Router, which can have substantial current-draw fluctuations due to bursty data traffic patterns.

Use the information in the DC Power Specifications to estimate the power requirements and heat dissipation of a Cisco ASR 902 Router based on a given configuration of the router. Determining power requirements is useful for planning the power distribution system needed to support the router.

Power Connection Guidelines

This section provides guidelines for connecting the Cisco ASR 902 Router power supplies to the site power source.

Warning This equipment is intended to be grounded to comply with emission and immunity requirements. Ensure that the switch functional ground lug is connected to earth ground during normal use. Statement 1064

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

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

Guidelines for DC-Powered Systems

Basic guidelines for DC-powered systems include the following:

- Each chassis power supply should have its own dedicated input power source. The source must comply with the safety extra-low voltage (SELV) requirements in the UL 60950, CSA 60950, EN 60950, and IEC 60950 standards.
- The circuit must be protected by a dedicated two-pole circuit breaker. The circuit breaker should be sized according to the power supply input rating and local or national code requirements.
- The circuit breaker is considered the disconnect device and should be easily accessible.
- The system ground is the power supply and chassis ground.
- Do not connect the DC return wire to the system frame or to the system-grounding equipment.
- Use the grounding lug to attach a wrist strap for ESD protection during servicing.

Guidelines for AC-Powered Systems

Basic guidelines for AC-powered systems include the following:

- Each chassis power supply should have its own dedicated branch circuit.
- The circuit breaker should be sized according to the power supply input rating and local or national code requirements.
- The AC power receptacles used to plug in the chassis must be the grounding type. The grounding conductors that connect to the receptacles should connect to protective earth ground at the service equipment.

Installing a DC Power Supply

Note This equipment is suitable for installation in Network Telecommunications Facilities and locations where the NEC applies. The equipment is suitable for installation as part of the Common Bonding Network (CBN).

Caution The grounding architecture of this product is DC-isolated (DC-I) for DC-powered products. DC-powered products have a nominal operating DC voltage of 48 VDC. Minimal steady state DC operating voltage is 19.2 VDC.

Installing a DC Power Supply Module

Perform the following procedure to install a power supply module:

Procedure

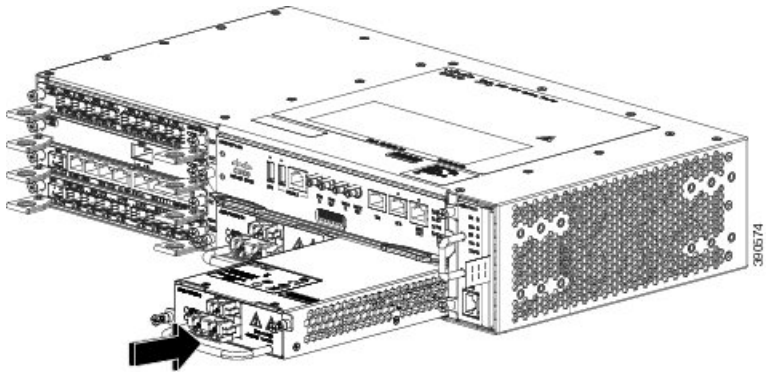
Step 1 Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the Installing the Chassis Ground Connection.

Step 2 If present, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.

Step 3 Verify that power to the DC circuit connected to the power supply you are installing is off. To ensure that power has been removed from the DC circuits, locate the circuit breakers for the DC circuits, switch the circuit breakers to the OFF position, and tape the circuit-breaker switches in the OFF position.

Step 4 Grasp the power supply handle with one hand. Place your other hand underneath the power supply, as shown in the figure below . Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.

Figure 48: Installing a DC Power Supply



Step 5 Tighten the captive installation screws of the power supply. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

If you are installing a redundant DC power supply, repeat these steps for the second power source too.

Installing DC Power Supply Unit (A900-PWR550-D)

Perform the following procedure to install the terminal block.

Procedure

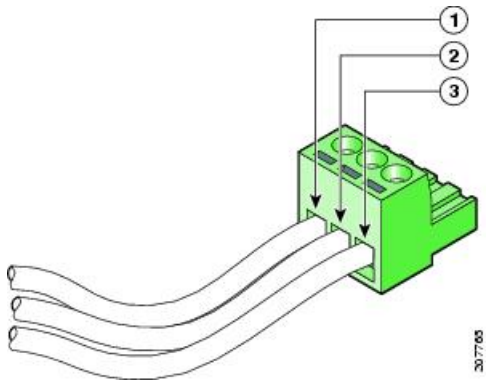
Step 1 Locate the terminal block plug.

Step 2 Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source to 0.27 inch (6.6 mm) ± 0.02 inch (0.5 mm) and the wire for grounding. Do not strip more than 0.29 inch (7.4 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave behind exposed wire from the terminal block plug after installation.

Step 3 Identify the ground, positive, and negative feed positions pertaining to the terminal block connection. The recommended wiring sequence is (the figure below):

- Ground lead wire (left)
- Negative (-) lead wire (middle)
- Positive (+) lead wire (right)

Figure 49: DC Power Supply with Lead Wires



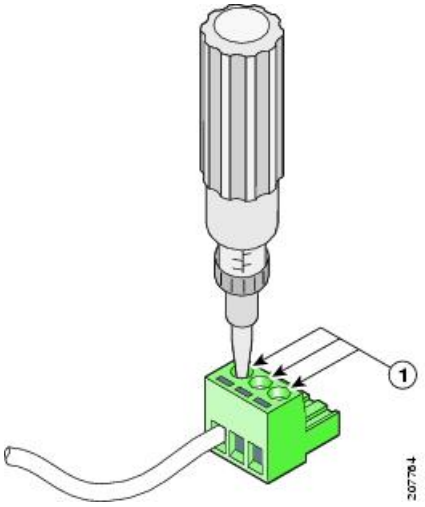
Label	Component	Label	Component
1	Ground lead wire	3	Positive (+) lead wire
2	Negative (–) lead wire	—	—

Step 4 Insert the exposed wire of one of the three DC-input power source wires into the terminal block plug. Make sure that you cannot see any wire lead. Only wires with insulation should extend from the terminal block.

Caution
Do not overtorque the plug-captive screws of the terminal block. The recommended maximum torque is from 4.425 in.-lb (.5 N-m) to 5.310 in-lb (.6 N-m).

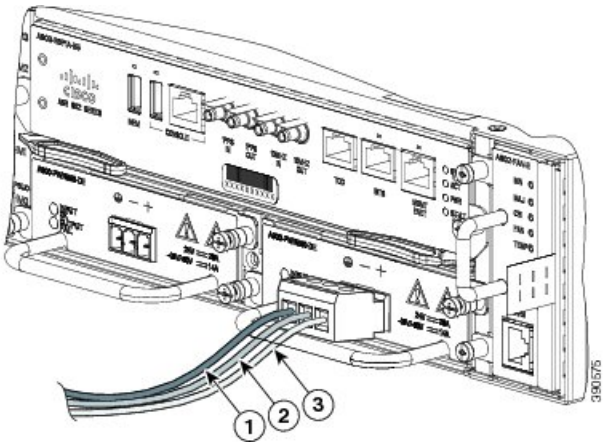
Step 5 Use a ratcheting torque screwdriver to torque the terminal block plug captive screw (above the installed wire lead) from 4.425 in.-lb (.5 N-m) to 5.310 in-lb (.6 N-m), as shown in the figure below.

Figure 50: Torquing a DC Power Supply Terminal Block Plug Screw



Step 6 Repeat Step 4 through Step 5 for the remaining DC input power source wire and the ground wire. the figure below. shows that wiring is completed for a terminal block plug.

Figure 51: Inserting the DC Power Supply Terminal Block Plug into the Block Header

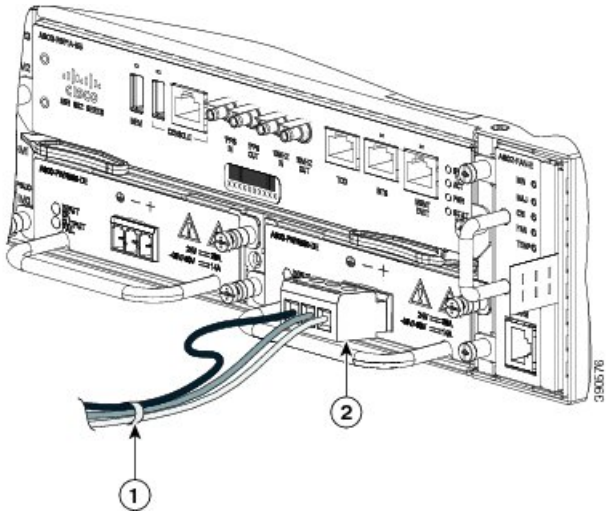


Caution
Secure the wires coming in from the terminal block plug so that they cannot be disturbed by casual contact.

Step 7 Ensure that the terminal block plug is fully seated in the terminal block header on the DC power supply panel. The plug has a locking feature. You should hear a snap or click when it is installed properly.

Step 8 Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block plug by casual contact. Make sure the tie wrap allows for some slack in the ground wire, as shown in the figure below.

Figure 52: Complete DC Terminal Block Plug Insertion and Secure Tie Wrap



Step 9 Use a tie wrap to secure the wires to the handle. Leave a service loop on the ground wire between the handle and the connector such that it is the last to receive strain if the wires are pulled.

Installing DC Power Supply Unit (A900-PWR550-D-E and A900-PWR1200-D)

Installing DC Power Supply Unit (A900-PWR550-D-E and A900-PWR1200-D)

Before you begin

The following tools are required:

- Cables of suitable gauge required for each type of PSU
  - 10 AWG to 16 AWG for 550 W PSU
  - 8 AWG to 10 AWG for 1200 W PSU)
- Lugs fork-type or ring-type (Burndy, see Troubleshooting)—TP10-6 or TP10-8F (recommended)

Procedure

Step 1 If the power supply unit is already installed in the chassis, follow the steps described in Removing and Replacing a DC Power Supply to remove the power supply unit.

Step 2 Locate the T-shaped terminal block plug on the DC power supply unit. See figure “DC PSU Module (A900-PWR550-D-E) with T-Shaped Connector” in the DC Power Specifications, on page 5 section.

Step 3 Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source to 0.27 inch (6.6 mm) ± 0.02 inch (0.5 mm) and the wire for grounding. Do not strip more than 0.29 inch (7.4 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave behind exposed wire from the terminal block after installation.

Step 4 Prepare the cables by attaching the lugs to the cables.

Step 5 Identify the ground, positive, and negative feed positions for the terminal block connection. The recommended wiring sequence is:

a. Negative (-) lead wire (top)
b. Ground lead wire (left)
c. Positive (+) lead wire (right)

Step 6 Insert the lugged end of the cables to the connector and secure the cables using the captive screws.

Note
The recommended torque for securing the captive screws is 0.7 N-m.

Step 7 Ensure that the terminal block plug is fully seated in the terminal block header on the DC power supply panel. See the Installing a DC Power Supply section for installing the power supply unit into the chassis.

Activating a DC Power Supply

Perform the following procedure to activate a DC power supply:

Procedure

Step 1 Remove the tape from the circuit-breaker switch handle, and restore power by moving the circuit-breaker switch handle to the On (|) position.

Step 2 Verify power supply operation by checking if the power supply front panel LEDs are in the following states:

- INPUT OK LED is green
- OUTPUT FAIL LED is red

If the LEDs indicate a power problem, see *Troubleshooting* section in the *Cisco ASR 902 and ASR 902U Aggregation Services Router Hardware Installation Guide*.

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

If you are installing a redundant DC power supply, repeat these steps for the second power source.

Removing and Replacing a DC Power Supply

This section provides information about removing and replacing a DC power supply in the Cisco ASR 902 Router.

Note The Cisco ASR 902 Router power supplies are hot-swappable. If you have installed redundant power supplies, you can replace a single power supply without interrupting power to the router.

Caution To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after a power supply has been removed or replaced.

Warning When you install the unit, the ground connection must always be made first and disconnected last. Statement 1046

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

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

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

Follow these steps to remove and replace the DC power supply on the Cisco ASR 902 Router:

Procedure

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

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

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

Step 4 Pull the terminal block plug connector out of the terminal block head in the power supply.

Step 5 Loosen the captive screws on the DC power supply.

Step 6 Grasping the power supply handle with one hand, pull the power supply out from the chassis while supporting it with the other hand.

Step 7 Replace the DC power supply within 5 minutes. If the power supply bay is to remain empty, install a blank filler plate (Cisco part number A900-PWR-BLANK) over the opening, and secure it with captive installation screws.

Installing an AC power Supply

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

The following sections describe how to install an AC power supply in the Cisco ASR 902 Router:

Installing an AC Power Supply Module

Follow these steps to install an AC power supply module:

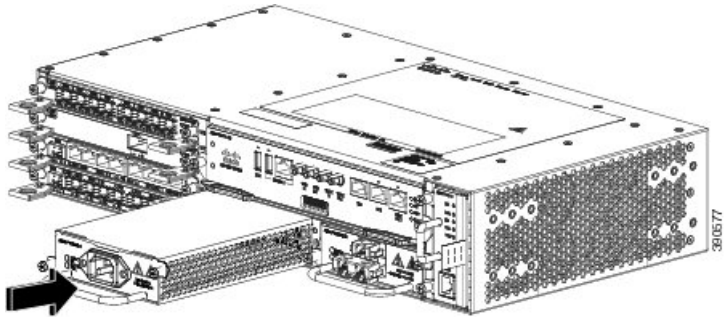
Procedure

Step 1 Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the Installing the Chassis Ground Connection section.

Step 2 If necessary, remove the blank power supply filler plate from the chassis power supply bay opening, by loosening the captive installation screws.

Step 3 Grasp the power supply handle with one hand. Place your other hand underneath the power supply, as shown in the figure below . Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.

Figure 53: Installing the AC Power Supply



Step 4 Tighten the captive installation screws of the power supply. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Warning
Power supply captive installation screws must be tight to ensure protective grounding continuity. Statement 289

Recommended Power Cables

We recommend the following power cables for Cisco ASR 902 routers:

Table 14: Power Cable PIDs for A900-PWR550-A (550 W)

PID	Description
CAB-AC	AC POWER CORD, UNITED STATES, 125V, 10A, 2.5m, C13,NEMA, 5-15P
CAB-AC-RA	AC POWER CORD, UNITED STATES, 125V, 10A, 2.5m, RA-C13, NEMA, 5-15P
CAB-ACA	AC Power Cord (Australia), C13, AS 3112, 2.5m
CAB-ACA-RA	AC Power Cord, Australian, 10A, Right Angle
CAB-ACC	AC Power Cord (China), C13, GB15934, CCC, 2.5m
CAB-ACC-RA	AC Power Cord China, Right Angle
CAB-ACE	AC Power Cord (Europe), C13, CEE 7, 1.5M
CAB-ACE-RA	AC Power Cord Europe, Right Angle
CAB-ACI	AC Power Cord (Italy), C13, CEI 23-16, 2.5m
CAB-ACI-RA	AC Power Cord, Italian, Right Angle
CAB-ACR	AC Power Cord (Argentina), C13, EL 219 (IRAM 2073), 2.5m
CAB-ACR-RA	AC POWER CORD ARGENTINA, Right Angle
CAB-ACS	AC Power Cord (Switzerland), C13, IEC 60884-1, 2.5m
CAB-ACS-RA	AC Power Cord, Switzerland, Right Angle
CAB-ACU	AC Power Cord (UK), C13, BS 1363, 2.5m
CAB-ACU-RA	AC Power Cord UK, Right Angle
CAB-IND	AC Power Cord (India), C13
CAB-IND-RA	AC Power Cord (India), RA-C13
CAB-JPN	AC Power Cord (Japan), C13, JIS C 8303, 2.5m
CAB-JPN-RA	AC Power Cord (Japan), RA-C13, JIS C 8303, 2.5m

Activating an AC Power Supply

Follow these steps to activate an AC power supply:

Procedure

Step 1 Plug the power cord into the power supply.

Step 2 Connect the other end of the power cord to an AC-input power source.

Step 3 Verify power supply operation by checking that the power supply LEDs are in the following states:

- INPUT OK LED is green
- OUTPUT FAIL LED is green

Step 4 If the LEDs indicate a power problem, see Troubleshooting for troubleshooting information.

Step 5 If you are installing a redundant power supply, repeat these steps for the second power source.

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

Removing and Replacing an AC Power Supply

This section describes how to remove and replace an AC power supply.

Note The Cisco ASR 902 Router power supplies are hot-swappable. If you have installed redundant power supplies, you can replace a single power supply without interrupting power to the router.

Caution To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after a power supply has been removed or replaced.

Warning When you install the unit, the ground connection must always be made first and disconnected last. Statement 1046

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

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

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

Follow these steps to remove and replace an AC power supply:

Procedure

Step 1 Disconnect the power cord from the power source. Do not touch the metal prongs on the power cord when it is still connected to the power supply.

Step 2 Remove the power cord from the power connection on the power supply. Do not touch the metal prongs embedded in the power supply.

Step 3 Loosen the captive installation screws.

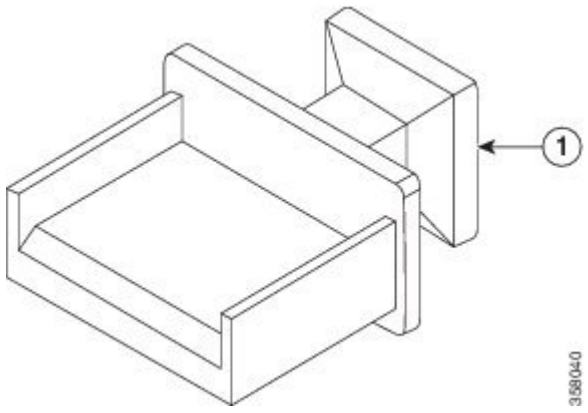
Step 4 Grasp the AC power supply with one hand, and slide it part of the way out of the chassis. Place your other hand underneath the power supply, and slide it completely out of the chassis.

Installing Dust Caps

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

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

Figure 54: Dust Cap



1	Dust cap	—

To install the dust cap:

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

Connecting a Cisco ASR 902 Router to the Network

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

The following sections describe how to connect a Cisco ASR 902 Router to the network:

Connecting Console Cables

The following sections describe how to connect to the Cisco ASR 902 Router using console cables:

Connecting to the USB Serial Port Using Microsoft Windows

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

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

Procedure

Step 1 Connect the end of the console cable with the RJ45 connector to the light blue console port on the router.

or

Connect a USB Type A-to-Type A cable to the USB console port, as shown in the figure below. If you are using the USB serial port for the first time on a Windows-based PC, install the USB driver now according to the instructions in the following sections:

- Installing the Cisco USB Device Driver
- Uninstalling the Cisco USB Device Driver

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

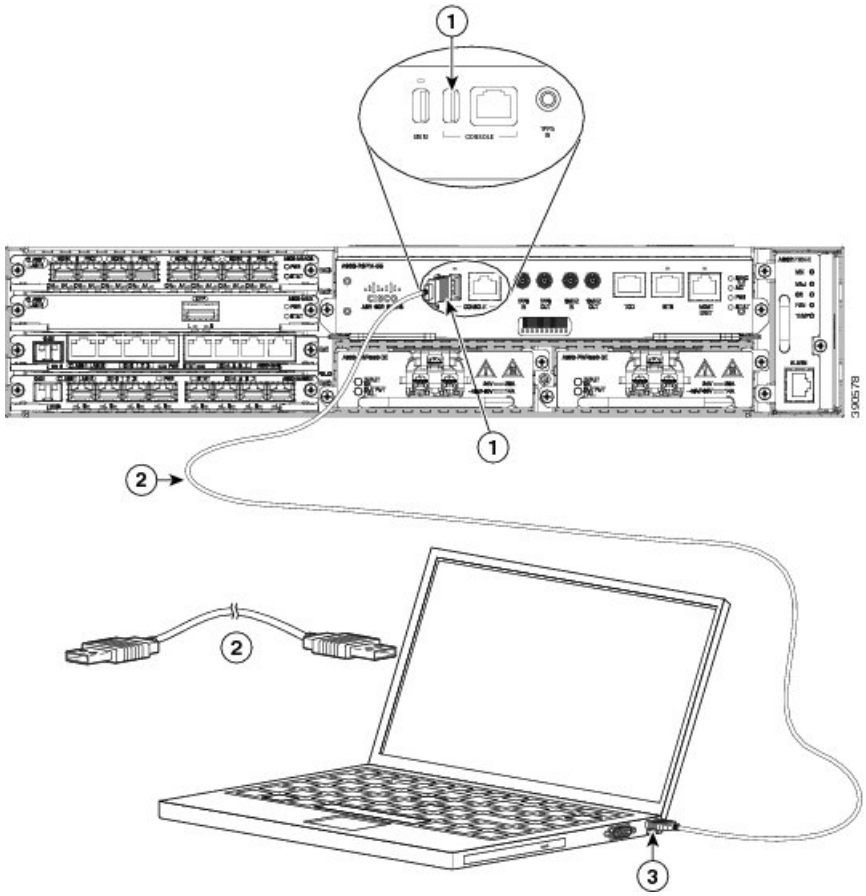
Note
The USB Type A-to-Type A cable is not included with the Cisco ASR 902 Router; it is ordered separately.

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

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

- 9600 baud
- 8 data bits
- no flow control
- no parity
- 1 stop-bit

Figure 55: Connecting the USB Console Cable to the Cisco ASR 902 Router



Connecting to the Console Port Using Mac OS X

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

Procedure

Step 1 Use the Finder to choose **Applications** > **Utilities** > **Terminal**.

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

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

Example:

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

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

Example:

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

To disconnect the OS X USB console from the terminal window, enter Ctrl-A followed by Ctrl-\

Connecting to the Console Port Using Linux

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

Procedure

Step 1 Open the Linux terminal window.

Step 2 Connect the Linux USB port to the router.

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

Example:

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

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

Example:

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

To disconnect the Linux USB console from the terminal window, enter Ctrl-A followed by : then quit.

Installing the Cisco USB Device Driver

A USB device driver must be installed the first time a Microsoft Windows-based PC is connected to the USB serial port on the router.

This procedure describes how to install the Microsoft Windows USB device driver in Microsoft Windows XP / Windows Vista / Windows 2000 / Windows 7 / Windows 8. Download the driver for your router model from the Tools and Resources Download Software site, USB Console Software category, at:

https://software.cisco.com/download/release.html?mdfid=285989906&flowid=50045&softwareid=282855122&release=3.13&relind=AVAILABLE&rellifecycle=&reltype=latest

Note To Download the driver, you must have a valid service contract associated to your Cisco.com profile.

Procedure

Step 1 Unzip the file asr-9xx_usbconsole_drivers.zip.

Step 2 Double-click xrusbser_ver2100_installer.exe in the XR21x141x-Win-DriversOnly-Vers2.1.0.0/EXE folder. Installation Wizard GUI is displayed.

Step 3 Click **Next**. The InstallShield Wizard Completed window is displayed.

Step 4 Click **Finish**.

Step 5 Connect the USB cable to the PC and router USB console ports. Follow the on-screen instructions to complete the installation of the driver.

Step 6 XR21V1401 USB UART Device driver successfully installed message is displayed.

The USB console is ready for use.

Uninstalling the Cisco USB Device Driver

This procedure describes how to uninstall the Microsoft Windows USB device driver in Microsoft Windows XP / Windows Vista / Windows 2000 / Windows 7 / Windows 8.

Note Disconnect the router console terminal before uninstalling the driver.

Procedure

Step 1 Choose **Start** > **Control Panel** > **Add or Remove Programs** (Uninstall a program).

Step 2 Scroll to Windows Driver Package - Exar corporation (xrusbser) Ports and click **Remove**. The Program Maintenance window is displayed.

Step 3 Click **Yes** to uninstall the driver.

Connecting to the Auxiliary Port

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

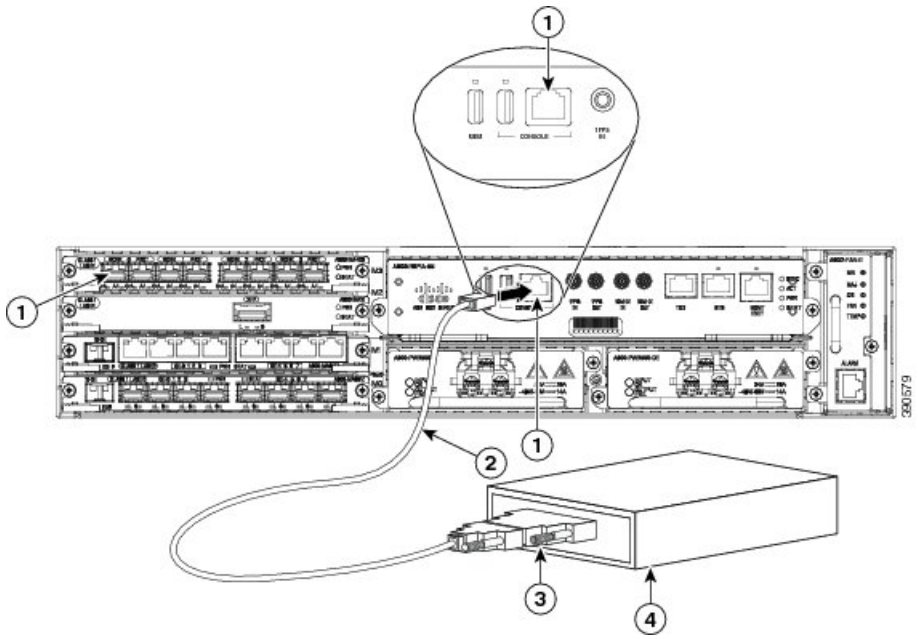
Note The console cable and DB-9-to-DB-25 connector are not included with the Cisco ASR 902 Router; they can be ordered separately from Cisco.

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

Procedure

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

Figure 56: Connecting a Modem to the Cisco ASR 902 Router



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

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

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

Step 4 Make sure that your modem and the router auxiliary port are configured for the same transmission speed (up to 115,200 bps is supported) and for mode control with data carrier detect (DCD) and data terminal ready (DTR) operations.

Connecting a Management Ethernet Cable

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

However, when the Ethernet Management port is configured to a fixed speed (10 or 100 Mbps) through command-line interface (CLI) commands, the port is forced to the MDI mode.

When in a fixed-speed configuration and MDI mode:

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

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

Installing and Removing SFP and XFP Modules

The Cisco ASR 902 Router supports a variety of SFP and XFP modules, including optical and Ethernet modules. For information on how to install and remove SFP and XFP modules, see the documentation for the SFP or XFP module at:

https://www.cisco.com/c/en/us/td/docs/interfaces_modules/transceiver_modules/installation/note/78_15160.html.

For information about inspecting and cleaning fiber-optic connections, see: https://www.cisco.com/c/en/us/support/docs/optical/synchronous-digital-hierarchy-sdh/51834-cleanfiber2.html

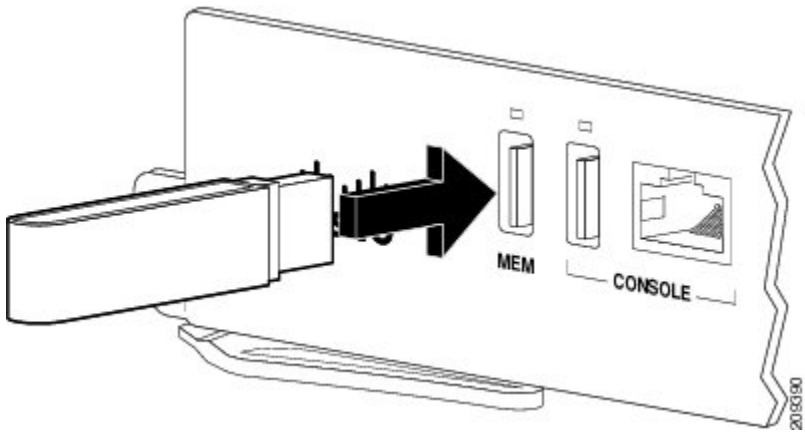
Caution We recommend that you wait for 30 seconds between the removal and insertion of an SFP on an interface module. We recommend this to allow the transceiver software to initialize and synchronize with the RSP. Changing an SFP more quickly could result in transceiver initialization issues that disable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

Connecting a USB Flash Device

To connect a USB flash device to the Cisco ASR 902 Router, insert the memory stick in the USB port labeled MEM. The Flash memory module can be inserted only one way, and can be inserted or removed regardless of whether the router is powered up or not.

The figure below shows the USB port connector on the Cisco ASR 902 Router.

Figure 57: Cisco ASR 902 Router Flash Token Memory Stick



Removing a USB Flash Device

To remove and replace a USB flash token memory stick from and into a Cisco ASR 902 Router, follow these steps:

Procedure

Pull the memory stick from the USB port.

To replace the Cisco USB Flash memory stick, simply insert the module into the USB port labeled MEM, as shown in Figure “Cisco ASR 902 Router Flash Token Memory Stick”. The Flash memory module can be inserted only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Note
You can insert or remove the memory stick whether the router is powered on or not.

This completes the USB Flash memory installation procedure.

Connecting Timing Cables

Note When installing the cables to the RSPs, we recommend that you leave a service loop of extra cable to enable fan tray removal.

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

Connecting a Cable to the BITS Interface

The following steps describe how to connect a cable to the router's BITS port:

Procedure

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the BITS port using a straight-through, shielded RJ48C-to-RJ48C cable.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

Step 4 Turn on the power to the router.

For information about the BITS port pinouts, see *Troubleshooting*.

Note
The use of two BITS sources or a Y-cable is optional. Each BITS input port is routed to both the RSPs, so that the SETS device on each RSP has visibility to both the BITS inputs.

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

Connecting Cables to a GPS Interface

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

Connecting a Cable to the Input 10MHz or 1PPS Interface

Procedure

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

Step 2 Connect the other end of the mini-coax cable to the 10MHz or 1PPS port on the RSP of the router.

Connecting a Cable to the Output 10MHz or 1PPS Interface

Procedure

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

Step 2 Connect the other end of the mini-coax cable to the 10MHz or 1PPS port of the router.

Connecting a Cable to the ToD Interface

Procedure

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

Step 2 Connect the other end of the straight-through Ethernet cable to the ToD or 1-PPS port on the RSP of the router.

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

Note
For more information about GPS-port pinouts, see *Pinouts* table.

Connecting a Cable to the GNSS Antenna Interface



Note The GNSS module is not hot swappable.

Procedure

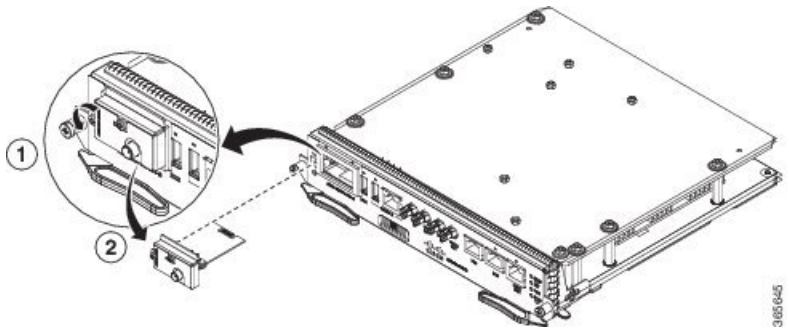
Step 1 Connect one end of a shielded coaxial cable to the GNSS RF IN port.

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

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

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

Figure 58: Installing the GNSS Module in the RSP



1	Screw on the GNSS Module	2	Inserting the GNSS Module

Connecting Ethernet Cables

The Cisco ASR 902 Router interface modules support RJ45 and Ethernet SFP ports. For instructions on how to connect cables to Ethernet SFP ports, see the Connecting Cables to SFP Modules .

The RJ45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables. Cisco does not supply Category 5 UTP cables; these cables are available commercially.

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

Note When installing the cables to the RSPs, we recommend that you leave a service loop of extra cable to enable fan tray removal.

Follow these steps to connect a cable to a copper Gigabit Ethernet port:

Procedure

Step 1 Confirm that the router is powered off.

Step 2 Connect one end of the cable to the Gigabit Ethernet port on the router.

Step 3 Connect the other end to the BTS patch or demarcation panel at your site.

Connecting Cables to SFP Modules

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

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

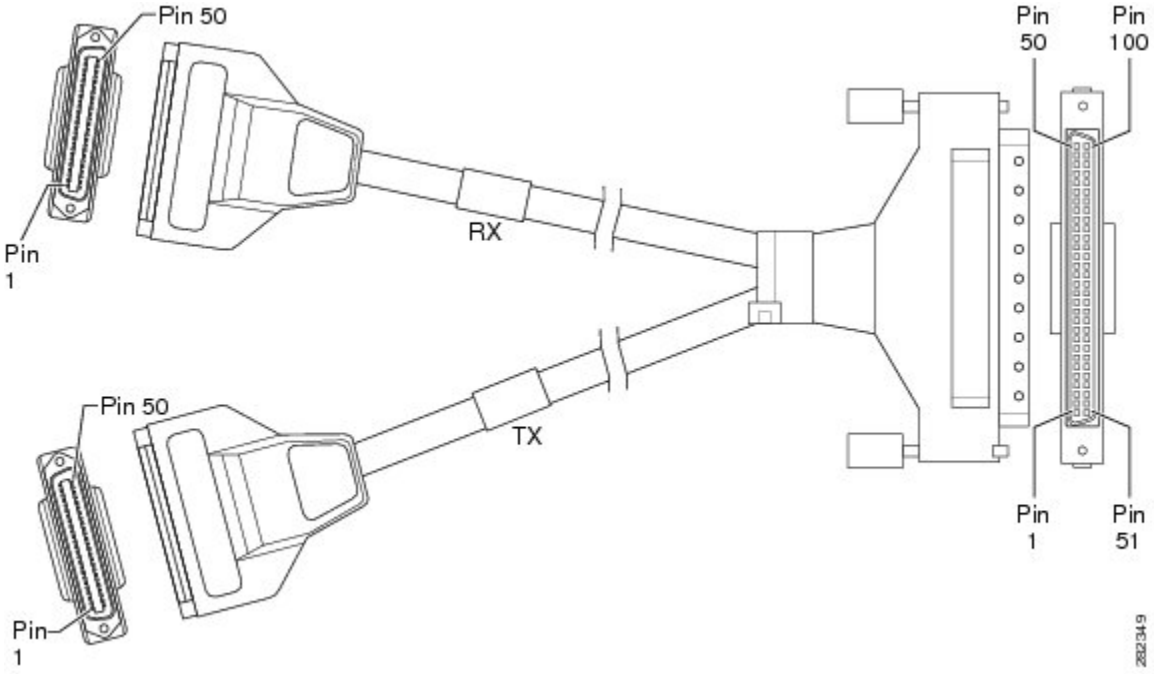
Connecting T1/E1 Cables

The physical layer interface for the Cisco ASR 902 Router T1/E1 port is a customer-installed high-density connector. The high-density connector has thumbscrews that should be screwed into the interface when the cable is installed.

The figure below shows the T1/E1 cable connector, and Figure 3-28 shows the connection between the T1/E1 interface and the patch panel.

Note A patch panel is required in order to connect the high-density interface connector to individual T1/E1 lines.

Figure 59: T1/E1 Cable Connector



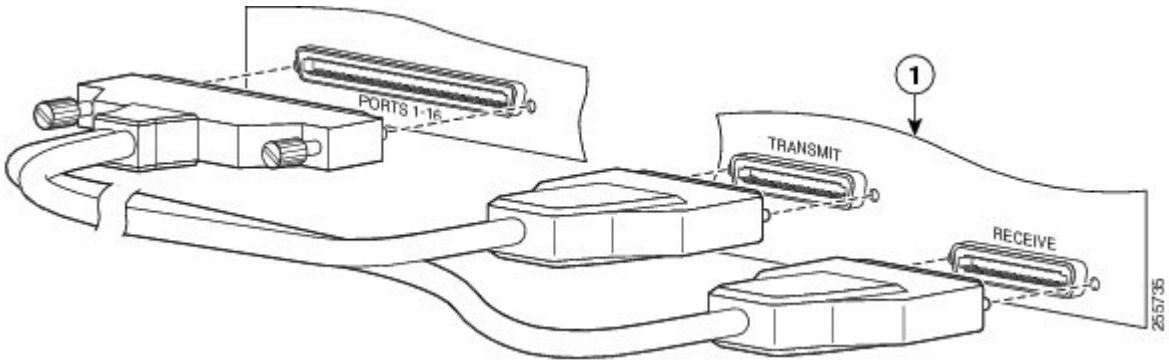
Installing the Cable Connector

One end of the cable has a 100-pin connector that plugs into the T1/E1 interface module. Use the thumbscrews on either side of the connector to secure the cable to the interface.

The other end of the cable has two 50-pin Telco connectors that are attached to the rear of a 24-port RJ45 patch panel. Both connectors are identical: one is for Transmit (TX) and the other is for Receive (RX).

The figure below shows how the cable is connected between the T1/E1 interface module and the patch panel.

Figure 60: Cable Installation Between T1/E1 Interface and Patch Panel



Label	Interface
1	Patch panel interfaces

For information about the pinout of the cable connecting the T1/E1 interface to the rear of the patch panel, see the T1/E1 Port Pinouts.

RJ45 Cable Pinouts

T1 lines from individual subscribers are attached to RJ45 connectors on the front of the 24-port patch panel. Each RJ45 port accommodates an individual T1 subscriber line.

For information about the T1/E1 ports, see the T1/E1 Port Pinouts section.

Patch Panel Dimensions

Following are the various patch panel dimensions.

Figure 61: Patch Panel Without Brackets

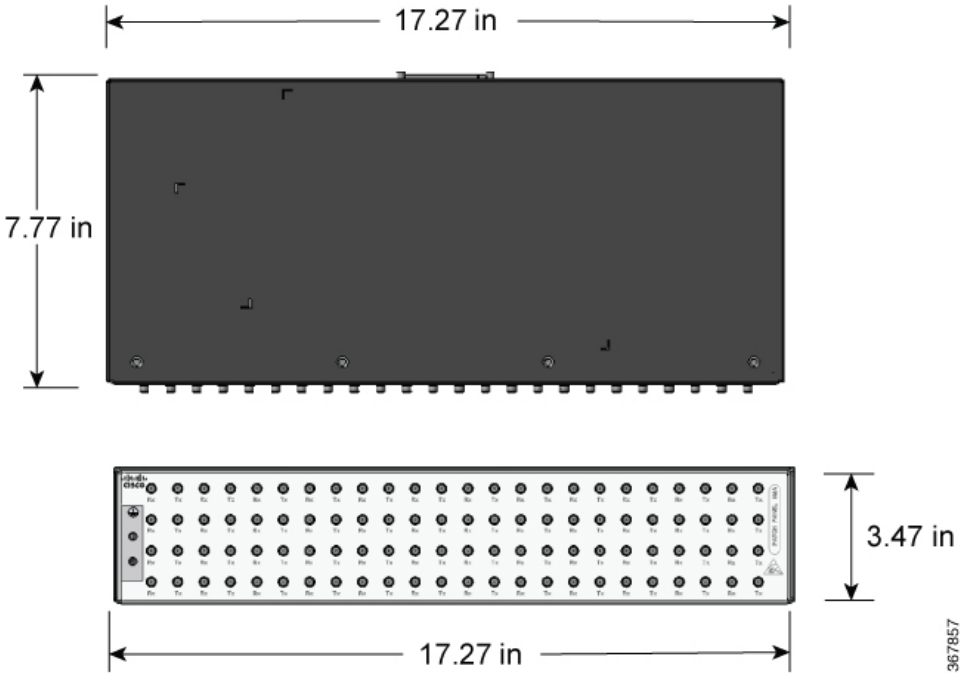


Figure 62: Patch Panel With Brackets

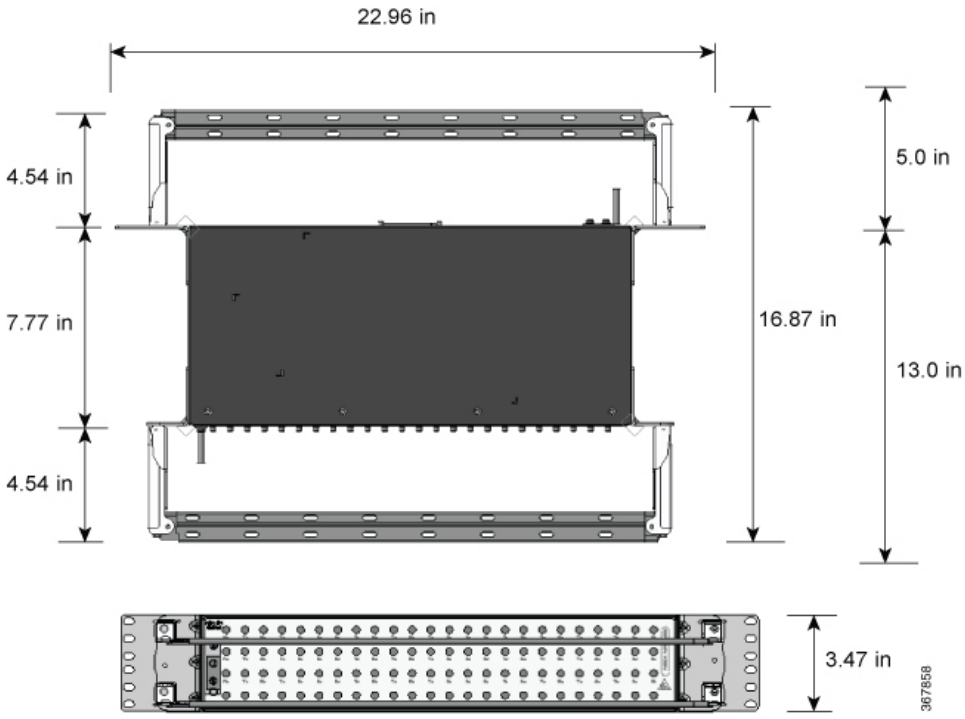
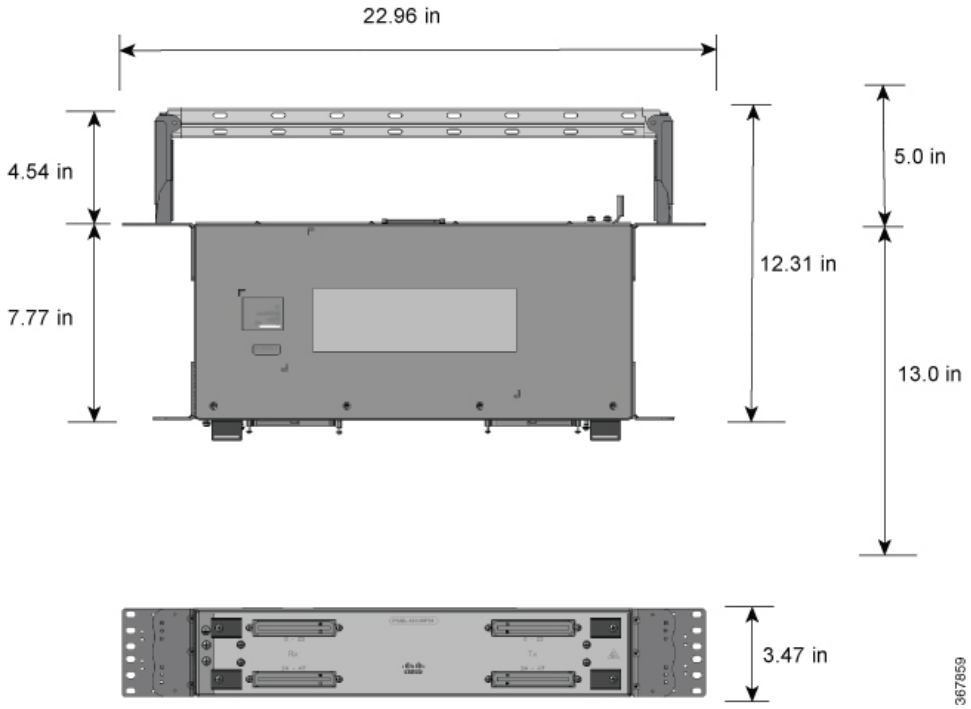


Figure 63: AMP64 Patch Panel With Brackets



Connecting Cables to the Patch Panel

If you are connecting two T1/E1 interfaces to each other, you must cable both interfaces' patch panels together using a T1 crossover cable or a T1 straight-through cable. Use shielded cables. The type of cable you use (crossover or straight-through) depends on how the T1/E1 interfaces are cabled to their patch panels:

- If both the T1/E1 interfaces are connected to their patch panels in the same manner (TX to Transmit and RX to Receive, or TX to Receive and RX to Transmit), use a T1 crossover cable to connect the patch panels.
- If both the T1/E1 interfaces are connected to their patch panels in a different configuration (TX to Transmit and RX to Receive on one interface, and TX to Receive and RX to Transmit on the other interface), use a T1 straight-through cable (standard RJ45 patch cable) to connect the patch panels.

Warning To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the T1/E1 ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Recommended Patch Panel

We recommend using the following T1/E1 patch panels:

The following patch panels are introduced:

- CABLE-16T1E1—Cable for 16-Port T1/E1 Interface Module, 12 feet
- CABLE-32T1E1—Cable for 32-Port T1/E1 Interface Module
- PANEL-16-BNC—Breakout panel with 16 T1/E1 75-ohm BNC ports
- PANEL-32-RJ4—Breakout panel with 32 T1/E1 100/120- ohm RJ48 ports8

Also, the following patch panels are available from Optical Cable Corporation (http://www.occfiber.com).

- 48-port T1 RJ45 patch panel (part number DCC4884/25T1-S)
- 16-port E1 BNC patch panel (part number DCC16BNC/25T1-S)

To order a patch panel, contact the Sales and Marketing Support staff at Optical Cable Corporation:

- • 800-622-7711 (toll-free in the U.S.A.)
  • 540-265-0690 (outside the U.S.A.)

Connecting Serial Cables

The figure below shows the supported serial connectors, and the tables below detail the supported cables with the Cisco ASR 902 Router.

Caution The Cisco ASR 902 Router currently only supports the EIA/TIA-232 connector.

Note The Cisco ASR 902 Router currently supports only the EIA/TIA-232 connector.

Table 15: Interface Cables for 12-in-1 Connector

Cable Type	Product Number	Length	Male/Female	Connector
V.35 DTE	CAB-SS-V35MT	10 ft.	Male	M34
V.35 DCE	CAB-SS-V35FC	10 ft.	Female	M34
EIA/TIA-232 DTE	CAB-SS-232MT	10 ft.	Male	DB-25
EIA/TIA-232 DCE	CAB-SS-232FC	10 ft.	Female	DB-25
EIA/TIA-449 DTE	CAB-SS-449MT	10 ft.	Male	DB-37
EIA/TIA-449 DCE	CAB-SS-449FC	10 ft.	Female	DB-37
X.21 DTE	CAB-SS-X21MT	10 ft.	Male	DB-15
X.21 DCE	CAB-SS-X21FC	10 ft.	Female	DB-15
EIA/TIA-530 DTE	CAB-SS-530MT	10 ft.	Male	DB-25
EIA/TIA-530 DTE	CAB-SS-530FC	10 ft.	Female	DB-25

Table 16: Interface Cables for 68-Pin Connector

Cable Type	Product Number	Length	Male/Female	Connector
4-port EIA-232 DTE	CAB-HD4-232MT	10 ft.	Male	DB-25
4-port EIA-232 DCE	CAB-HD4-232FC	10 ft.	Female	DB-25
4-port EIA-232 DTE	CAB-QUAD-ASYNC-F	10 ft.	Female	RJ-45
4-port EIA-232 DTE	CAB-QUAD-ASYNC-M	10 ft.	Male	RJ-45
4-port EIA-232 DTE	CAB-9AS-M	10 ft.	Male	DB-9

Connecting the Fan Tray Alarm Port

The fan tray includes an alarm port that maps to 2 dry contact alarm inputs.

The pins on the alarm port are passive signals, and can be configured as Normally Open (an alarm is generated when current is interrupted) or Normally Closed (an alarm is generated when a circuit is established) alarms. You can configure each alarm input as critical, major, or minor. An alarm triggers alarm LEDs and alarm messages. The relay contacts can be controlled through an appropriate third-party relay controller. The open/close configuration is an option controlled in Cisco IOS.

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

Only pins 1, 2 and 8 are available for customer use. The remaining pins are for Cisco manufacturing test, and should not be connected. Use a shielded cable for connection to this port for EMC protection. For a summary of pinouts on the alarm port see Troubleshooting.

Connecting a Cable to the Fan Tray Alarm Port

This procedure describes how to connect a cable to the Cisco ASR 902 Router fan tray port.

Procedure

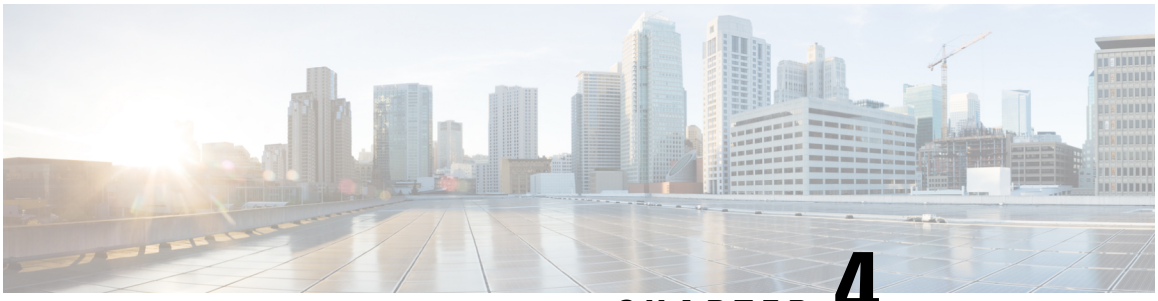
Step 1 Attach an RJ45 cable to the alarm port.

Step 2 Attach the other end of the RJ45 cable to the relay controller.

For information about how to configure alarm trigger setting and map alarm inputs to critical, major, and minor alarm conditions, see the Cisco ASR 900 Series Aggregation Services Routers Configuration Guide.

Connector and Cable Specifications

For more information on cable specifications and pinouts, see Troubleshooting.



CHAPTER 4

Cisco Router Initial Configuration

This chapter guides you through a basic router configuration, which is sufficient for you to access your network. Complex configuration procedures are beyond the scope of this publication and can be found in the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.

To configure the Cisco Router from a console, you need to connect a terminal to the router console port.

- Checking Conditions Prior to System Startup , on page 101
- Powering Up the Cisco Router, on page 102
- Configuring the Cisco Router at Startup, on page 104
- Safely Powering Off the Cisco Router, on page 107

Checking Conditions Prior to System Startup

Ensure that the following conditions are addressed before starting up the router:

- The Route Switch Processor (RSP) is installed.
- The optional Gigabit Ethernet Management port cable is installed.
- The chassis is securely mounted and grounded.
- The power and interface cables are connected.
- Your PC with terminal emulation program (HyperTerminal or equivalent) is connected to the console port and powered up.
- Your PC terminal emulation program is configured for 9600 baud, 8 data bits, 1 stop-bit, no parity, and flow control is set to none.
- You have selected passwords for access control.
- Captive installation screws are tight on all removable components.
- The console terminal is turned on.
- You have determined the IP addresses for the Ethernet and serial interfaces.
- Empty card slots or card bays are filled with card blanks. This ensures proper air flow through the chassis and electromagnetic compatibility (EMC).

Powering Up the Cisco Router

Make certain that all card slots and compartments are closed off. Install blank faceplates on any empty slots. Always have power supply slots filled. If you leave a power supply slot uncovered, then you risk exposure to hazardous voltages on the power pins on the midplane.

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

After installing your Cisco Router and connecting cables, start the router and follow these steps:

Procedure

Step 1 Activate the DC power supply using the steps described in Activating the DC Power Supply.

Caution
Do not press any keys on the keyboard until the messages stop and the SYS PWR LED is solid green. Any keys pressed during this time are interpreted as the first command typed when the messages stop, which might cause the router to power off and start over. It takes a few minutes for the messages to stop.

Note
This is only an example of what can display. The system boots differently depending upon the configuration that ships with your system.

Step 2 Observe the initialization process. When the system boot is complete (the process takes a few seconds), the Cisco Router RSP begins to initialize.

Note
The boot image is located in a partition of the bootflash directory. Post initial system boot, depending on your requirement, you must configure the system boot variable to either bootflash:/Image/packages.conf (for sub-package mode boot) or bootflash:/Image/image_name (for consolidated mode boot). For more information about software package modes, see the Installing and Upgrading Software section in the High Availability Configuration Guide, Cisco IOS XE Release 3S (ASR 900).

Example:

Loading the Default System Boot Image

```
Current image running: Boot ROM0
Last reset cause: PowerOn
UEA platform with 2097152 Kbytes of main memory

rommon 1 > boot
Located asr902.bin
Image size 240888408 inode num 13, bks cnt 58811 blk size 8*512
################################################################################################
Boot image size = 240888408 (0xe5baa58) bytes
```

```
Package header rev 0 structure detected
Calculating SHA-1 hash...done
validate_package: SHA-1 hash:
calculated fe76800b:4343b84e:3861a949:368a3710:134383bc
expected fe76800b:4343b84e:3861a949:368a3710:134383bc
Image validated
Passing control to the main image..

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cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706

Router#show version
Cisco IOS XE Software, Cisco IOS Software, ASR903 Software PPC_LINUX_IOSD-UNIVERSALK9_NPE-M),
 Version 15.4
Copyright (c) 1986-2014 by Cisco Systems, Inc.
Compiled Sun 05-Jan-14 20:59 by mcpre


Cisco IOS-XE software, Copyright (c) 2005-2014 by cisco Systems, Inc.
All rights reserved. Certain components of Cisco IOS-XE software are
licensed under the GNU General Public License ("GPL") Version 2.0. The
software code licensed under GPL Version 2.0 is free software that comes
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documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.


ROM: IOS-XE ROMMON

Router uptime is 2 minutes
Uptime for this control processor is 5 minutes
System image file is "bootflash:/asr902.bin"
Last reload reason: PowerOn
This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.
A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to
export@cisco.com.
License Level: metroservices
License Type: Default. No valid license found.
Next reload license Level: metroservices
cisco ASR-902 processor with 425945K/6147K bytes of memory.
Processor board ID
31 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
```

```
2097152K bytes of physical memory.
1328927K bytes of SD flash at bootflash:.
Configuration register is 0x2102
Router#
```

During the boot process, observe the system LEDs. The LEDs on the shared port adapter go on and off in an irregular sequence. Once the router has booted, the green STATUS LED comes on and stays on.

Verifying the Front Panel LEDs

The front-panel indicator LEDs provide power, activity, and status information useful during bootup. For more detailed information about the LEDs, see Troubleshooting.

Verifying the Hardware Configuration

To display and verify the hardware features, enter the following commands:

- **show version**—Displays the system hardware version; the installed software version; the names and sources of configuration files; the boot images; and the amount of installed DRAM, NVRAM, and flash memory.
- **show diag slot**—Displays the IDPROM information for the assemblies in the chassis.

Checking Hardware and Software Compatibility

To check the minimum software requirements of the Cisco IOS software with the hardware installed on your Cisco Router, Cisco maintains the Software Research tool on Cisco.com. The tool provides the minimum Cisco IOS requirements for individual hardware modules and components.

Note To access this tool, you must have a Cisco.com login account.

To access the Software Research tool

1. Click **Login** at Cisco.com.
2. Type **Software Advisor** in the search box and click **Go**.
3. Click the link for the Software Advisor Tool.
4. Choose a product family or enter a specific product number to search for the minimum supported software needed for your hardware.

Configuring the Cisco Router at Startup

This section explains how to create a basic running configuration for your Cisco Router.

Note You need to acquire the correct network addresses from your system administrator or consult your network plan to determine correct addresses before you can complete the router configuration.

Before continuing the configuration process, check the current state of the router by entering the **show version** command. The **show version** command displays the release of Cisco IOS software that is available on the router.

For information on modifying the configuration after you create it, see the Cisco IOS configuration and command reference guides.

To configure a Cisco Router from the console, you must connect a terminal or terminal server to the console port on the Cisco Router RSP. To configure the Cisco Router using the management Ethernet port, you must have the router's IP address available.

Accessing the CLI Using the Console

To access the command line interface using the console, follow these steps:

Procedure

Step 1 When your system is booting, type No at the prompt.

Example:

```
         --- System Configuration Dialog ---
Would you like to enter the initial configuration dialog? [yes/no]: no
```

Step 2 Press Return to enter user EXEC mode. The following prompt appears:

```
Router>
```

Step 3 From the user EXEC mode, enter the enable command as shown in the following example:

```
Router> enable
```

Step 4 At the password prompt, enter your system password, as shown in the following example. If an enable password has not been set on your system, this step may be skipped.

```
Password: enablepass
```

When your enable password is accepted, the privileged EXEC mode prompt is displayed:

```
Router#
```

You now have access to the CLI in privileged EXEC mode and you can enter the necessary commands to complete your desired tasks.

Step 5 To exit the console session, enter the quit command as shown in the following example:

Example:

```
Router# quit
```

Configuring Global Parameters

When you first start the setup program, you must configure the global parameters. These parameters are used for controlling system-wide settings. Perform the following steps to enter the global parameters:

Procedure

Step 1 Connect a console terminal to the console port, and then boot the router. For more information on connecting a console terminal, see Connecting Console Cables section.

Note
This is only an example of the output display; prompts may vary.

When you see this information, it means that you have successfully booted your router:

Example:

```
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Software clause at DFARS sec. 252.227-7013.

cisco Systems, Inc.
170 West Tasman Drive
San Jose, California 95134-1706
.
.
.
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: yes


Press RETURN to get started!
```

Step 2 The first sections of the configuration script appear only at an initial system startup. On subsequent uses of the setup facility, the script begins with a System Configuration Dialog as shown below: When you are prompted about whether you want to enter the initial configuration dialog, enter yes.

Example:

```
Would you like to enter the initial configuration dialog? [yes/no] yes

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
```

```
Basic management setup configures only enough connectivity for management of the system,
extended setup will ask you
to configure each interface on the system.
```

Basic management setup configures enough connectivity for managing the system; extended setup will ask you to configure each interface on the system. For detailed information about setting global parameters, refer to the Cisco ASR 900 Series Router Software Configuration Guide.

Checking the Running Configuration Settings

To check the value of the settings you have entered, enter the show running-config command at the Router# prompt:

```
Router# show running-config
```

To review changes you make to the configuration, use the EXEC mode **show startup-config** command to see the changes and copy run-start stored in NVRAM.

Saving the Running Configuration to NVRAM

To store the configuration or changes to your startup configuration in NVRAM, enter the copy running-config startup-config command at the Router# prompt:

```
Router# copy running-config startup-config
```

Using this command saves the configuration settings that you created in the router using configuration mode and the setup facility. If you fail to do this, your configuration will be lost the next time you reload the router.

Safely Powering Off the Cisco Router

This section explains how to shut down the Cisco Router. It is recommended that before turning off all power to the chassis, you issue the **reload** command. This insures that the operating system cleans up all the file systems. Once the reload operation is complete, then the Cisco Router can be powered off safely.

To remove power from the Cisco Router safely, follow this procedure and see the examples:

Procedure

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

Step 2 Enter the **reload** command.

Step 3 Confirm the reload command.

Example:

```
Router# reload
Proceed with reload? [confirm]
*Sep 7 09:00:40.084 IST:%SYS-5-RELOAD: Reload requested by console. Reload Reason: Reload
Command.
```

```
Aug 17 00:06:47.051 R0/0: %PMAN-5-EXITACTION: Process manager is exiting: prs exit with
reload chassis code
```

Step 4 After confirming the reload command, wait until the system bootstrap message displays before powering off the system.

Example:

```
System Bootstrap, Version 15.3(1r)S1, RELEASE SOFTWARE (fc1)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 2012 by cisco Systems, Inc.

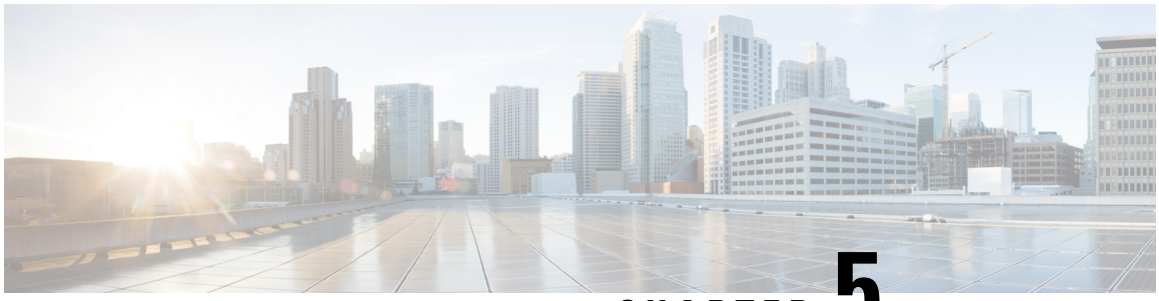
Current image running: Boot ROM0
Last reset cause: RSP-Board
UEA platform with 2097152 Kbytes of main memory
```

Step 5 Remove any power cables from the Cisco Router.

a) For power supplies with a circuit breaker switch, position the switch to the Off (O) position.

b) For power supplies with a Standby switch, place the Standby switch in the Standby position.

Note
After powering off the router, wait a minimum of 30 seconds before powering it on again.



CHAPTER 5

Troubleshooting

This chapter provides information about troubleshooting issues, if any, on the Cisco ASR 902 Router.

- Pinouts, on page 109
- LED Summary, on page 119

Pinouts

The following sections describe the pinouts for the Cisco ASR 902 Router interfaces:

BITS Port Pinouts

The table below summarizes the BITS port pinouts.

Table 17: BITS Port Pinouts

Pin	Signal Name	Direction	Description
1	RX Ring	Input	Receive Ring
2	RX Tip	Input	Receive Tip
3	—	—	Not used
4	TX Ring	Output	TX Ring
5	TX Tip	Output	TX Tip
6	—	—	Not used
7	—	—	Not used
8	—	—	Not used

GPS Port Pinouts

The platform is capable of receiving or sourcing GPS signals of 1 PPS & 10 MHz. These interfaces are provided by two mini-coax 50-Ohm, 1.0/2.3 DIN series connector on the front panel. Similarly there are two mini-coax 50-Ohm connectors provided in the front panel to output this 1PPS and 10MHz.

The table below summarizes the GPS port pinouts.

Table 18: GPS Port Pinouts

	10 MHz (Input and Output)	**1PPS (Input and Output)**
Waveform	Input—Sine wave Output—Square wave	Input—Rectangular pulse Output—Rectangular pulse
Amplitude	Input— > 1.7 volt p-p(+8 to +10 dBm) Output— > 2.4 volts TTL compatible	Input— > 2.4 volts TTL compatible Output— > 2.4 volts TTL compatible
Impedance	50 ohms	50 ohms
Pulse Width	50% duty cycle	26 microseconds
Rise Time	Input—AC coupled Output—5 nanoseconds	40 nanoseconds

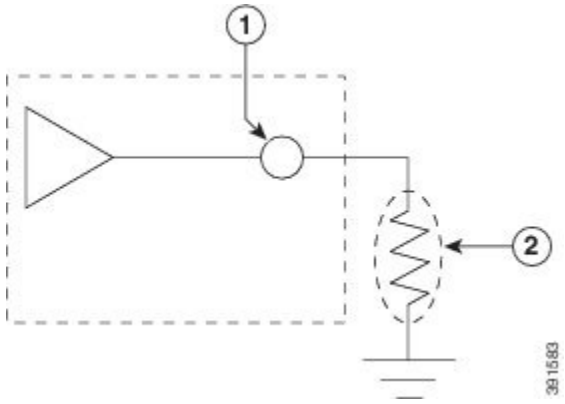
Table 19: GPS Port Pinout for ASR 900 RSP3

	10 Mhz (input and output)	**1PPS (input and output)**
Waveform	Input—Sine wave Output—Sine and Square wave	Input—Rectangular pulse Output—Rectangular pulse
Amplitude	Input— > 1.7 volt p-p(+8 to +10 dBm) Output— > 2.4 volts TTL compatible	Input— > 2.4 volts TTL compatible Output— > 2.4 volts TTL compatible
Impedance	50 ohms	50 ohms
Pulse Width	50% duty cycle	26 microseconds
Rise Time	Input—AC coupled Output—5 nanoseconds	40 nanoseconds

Time-of-Day Port Pinouts

To ensure proper signal integrity at the receiver, we recommend that you use a 50-ohm termination, as shown in the figure below. The output swing at 50-ohm load is guaranteed to be 2.9 V.

Figure 64: Terminating 1-PPS Signal



Label	Component
1	1-PPS SMB connector
2	External 50 ohm resistor

The table below summarizes the ToD/1-PPS port pinouts for ASR900-RSP2A.

Note This port requires the use of SHIELDED cable for GR-1089-core Intra-Bldg lightning surge protection. The RS422 interface is per industry-standard EIA-422 /RS422 specification.

Table 20: RJ45 1-PPS/ToD Port Pinouts

Pin	Signal Name	Direction	Description
1	RESERVED	Output	Do not connect
2	RESERVED	Input	Do not connect
3	RESERVED	—	Do not connect
4	GND	—	—
5	GND	—	—
6	RESERVED	—	Do not connect
7	TOD_N	Output or Input	Time of Day character
8	TOD_P	Output or Input	Time of Day character

Table 21: RS422 Pinout

Pin	Signal Name	Description
4	TXD+	RTS pin for RS232

Pin	Signal Name	Description
20	TXD-	DTR pin for RS232
5	RXD+	CTS pin for RS232
6	RXD-	DSR pin for RS232

Alarm Port Pinouts

The table below summarizes the external alarm input pinouts.

Table 22: External Alarm Input Pinouts

Pin	Signal Name	Description
1	ALARM0_IN	Alarm input 0
2	ALARM1_IN	Alarm input 1
3	—	No connect
4	—	No connect
5	—	No connect
6	—	No connect
7	—	No connect
8	COMMON	Alarm common

T1/E1 Port Pinouts

The table below summarizes the pinouts of the cable (Tyco part number 2163442-1, Cisco part number 72-5184-01) used to connect the T1/E1 interface module to the rear of the patch panel.

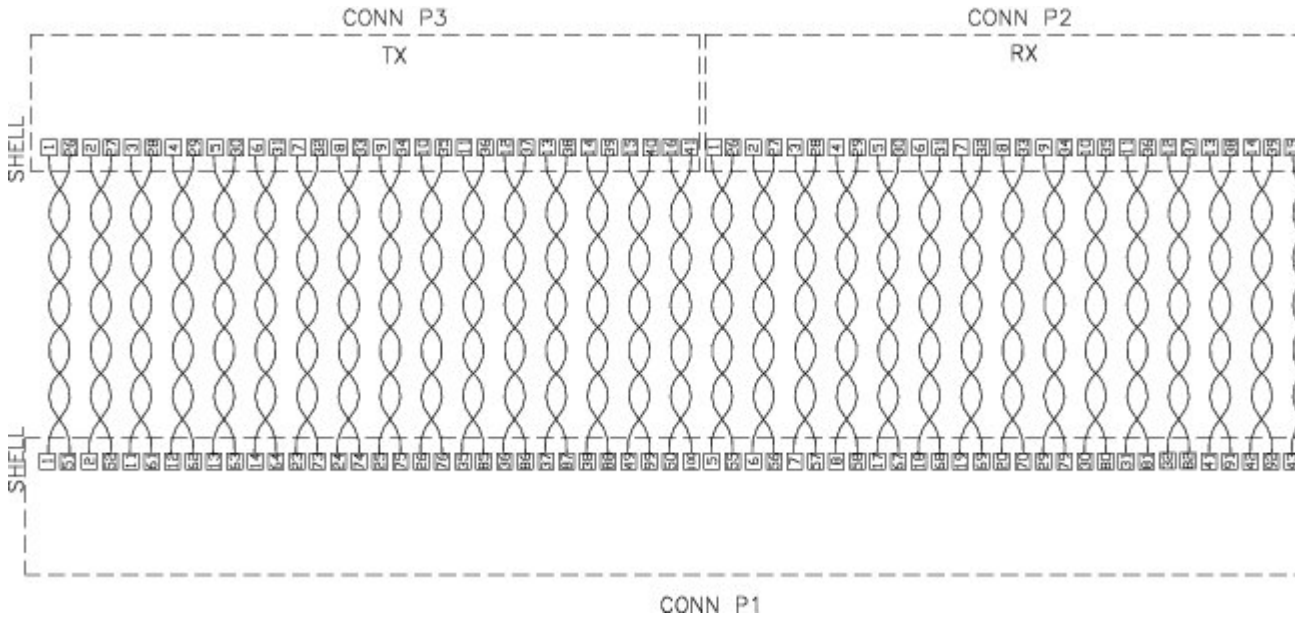
Table 23: T1/E1 Interface Pinouts

Line	Board Pin	Signal Name	Telco TX	Jack Pin	Board Pin	Signal Name	Telco RX	Jack Pin
Line 0	88	TX_RING_P1	39	1	92	RX_RING_P1	39	4
	38	TX_TIP_P1	14	2	42	RX_TIP_P1	14	5
Line 1	87	TX_RING_P2	38	1	91	RX_RING_P2	38	4
	37	TX_TIP_P2	13	2	41	RX_TIP_P2	13	5
Line 2	76	TX_RING_P3	35	1	80	RX_RING_P3	35	4
	26	TX_TIP_P3	10	2	30	RX_TIP_P3	10	5

Line	Board Pln	Signal Name	Telco TX	Jack Pin	Board Pin	Signal Name	Telco RX	Jack Pin
Line 3	75	TX_RING_P4	34	1	79	RX_RING_P4	34	4
	25	TX_TIP_P4	9	2	29	RX_TIP_P4	9	5
Line 4	100	TX_RING_P5	41	1	94	RX_RING_P5	41	4
	50	TX_TIP_P5	16	2	44	RX_TIP_P5	16	5
Line 5	99	TX_RING_P6	40	1	93	RX_RING_P6	40	4
	49	TX_TIP_P6	15	2	43	RX_TIP_P6	15	5
Line 6	86	TX_RING_P7	37	1	82	RX_RING_P7	37	4
	36	TX_TIP_P7	12	2	32	RX_TIP_P7	12	5
Line 7	85	TX_RING_P8	36	1	81	RX_RING_P8	36	4
	35	TX_TIP_P8	11	2	31	RX_TIP_P8	11	5
Line 8	64	TX_RING_P9	31	1	68	RX_RING_P9	31	4
	14	TX_TIP_P9	6	2	18	RX_TIP_P9	6	5
Line 9	63	TX_RING_P10	30	1	67	RX_RING_P10	30	4
	13	TX_TIP_P10	5	2	17	RX_TIP_P10	5	5
Line 10	52	TX_RING_P11	27	1	56	RX_RING_P11	27	4
	2	TX_TIP_P11	2	2	6	RX_TIP_P11	2	5
Line 11	51	TX_RING_P12	26	1	55	RX_RING_P12	26	4
	1	TX_TIP_P12	1	2	5	RX_TIP_P12	1	5
Line 12	74	TX_RING_P13	33	1	70	RX_RING_P13	33	4
	24	TX_TIP_P13	8	2	20	RX_TIP_P13	8	5
Line 13	73	TX_RING_P14	32	1	69	RX_RING_P14	32	4
	23	TX_TIP_P14	7	2	19	RX_TIP_P14	7	5
Line 14	62	TX_RING_P15	29	1	58	RX_RING_P15	29	4
	12	TX_TIP_P15	4	2	8	RX_TIP_P15	4	5
Line 15	61	TX_RING_P16	28	1	57	RX_RING_P16	28	4
	11	TX_TIP_P16	3	2	7	RX_TIP_P16	3	5

The figure below shows the wiring schematic of the cable used to connect the T1/E1 interface module to the rear of the patch panel.

Figure 65: Wiring Schematic of Cable Between T1/E1 Interface and Patch Panel



G.703/FXS/FXO Interface Module Pinout

Table 24: FXO RJ11 Pinout

Pin	Signal Name	Direction	Description
1	NC	-	-
2	Ring	Analog	Ring audio
3	Tip	Analog	Tip audio
4	NC	-	-

Table 25: FXS RJ45 Pinout

Pin	Signal Name	Direction	Description
1, 2, 3	NC	-	-
4	Ring	Analog	Ring audio
5	Tip	Analog	Tip audio
6, 7, 8	NC	-	-

Table 26: G.703 RJ48C Pinout

Pin	Signal Name	Direction	Description
1	Rx_Tip	Input	G.703 64 Kbps Co-Directional receive tip signal
2	Rx_Ring	Input	G.703 64 Kbps Co-Directional receive ring signal
3	NC	-	-
4	Tx_Tip	Output	G.703 64 Kbps Co-Directional transmit tip signal
5	Tx_Ring	Output	G.703 64 Kbps Co-Directional transmit ring signal
6, 7, 8	NC	-	-

Serial Interface Modules Pinouts

The following sections summarize the pinouts on the 14-port serial interface module when used with the cable types specified in Connecting Serial Cables .

DB-9 Connector Pinouts

The table below summarizes the pinouts for each serial interface type when using a DB-9 connector.

Table 27: DB-9 Pinouts

Pin	Standard DB-9	Direction	Description	RS-485	IRIG-B
1	NC	Output	Unused	NC	NC
2	RxD	Input	Receive	NC	NC
3	TxD	Output	Transmit	-	IRIG-B- (RS232)
4	DTR	Output	DTR	TxD-	IRIG-B- (RS485)
5	GND	-	GND	GND	GND
6	DSR	Input	DSR	RxD	NC
7	RTS	Output	RTS	TxD+	IRIG-B+
8	CTS	Input	CTS	RxD+	NC
9	NC/GND		Unused or Ring	NC	NC

Note Twisted pairs are 2-5, 6-8, 4-7.

Note The X.21, V.35, RS-485, EIA-449, EIA-530, and IRIG-B standards are not currently supported by software.

RJ-45 Connector Pinouts

The table below summarizes the pinouts for each serial interface type when using an RJ-45 connector.

Table 28: RJ45 Pinout

Pin	Standard DB-9	Direction	Description	RS-485	IRIG-B
1	RTS	Input	Ready to send	RxD+ (RS485)	NC
2	DTR	Input	DTR	RxD- (RS485)	NC
3	TxD	Input	Transmit	NC	NC
4	GND		Signal ground	Gnd	Gnd
5	GND		Signal ground	Gnd	Gnd
6	RxD	Output	Receive data	-	IRIG-B (RS232)
7	DST	Output	DSR	TxD-	IRIG-B- (RS485)
8	CTS	Output	CTS	TxD+	IRIG-B+ (RS485)

Note Twisted Pairs are: 1-2, 3-6, 4-5, 7-8.

Note The X.21, V.35, RS-485, EIA-449, EIA-530, and IRIG-B standards are not currently supported by software.

Management Ethernet Port Pinouts

A single management copper Ethernet port supporting 10/100/1000Base-T operation exists on each RSP. There is no direct access to the CPU of the other RSP. The Management Ethernet port uses a standard RJ45 jack.

Note This is not a data plane port.

The table below summarizes the Management Ethernet port pinouts.

Table 29: Management Ethernet Port Pinouts

Pin	Signal Name
1	TRP0+
2	TRP0-
3	TRP1+
4	TRP1-
5	TRP2+
6	TRP2-
7	TRP3+
8	TRP3-

USB Console Port Pinouts

Two individual Type A USB connectors are used for the USB console and USB mass storage. One USB 2.0 Type A receptacle is provided on the RSP front panel for providing console access to ROMMON, Cisco IOS-XE, and diagnostics. This USB 2.0 Type A receptacle operates as a USB peripheral only for connections to an external host PC. This receptacle requires the use of a Type A-to-Type A connector instead of a standard USB cable.

Note The use of the USB console is mutually exclusive with the RS232 console/AUX port. When a USB cable is inserted, access is automatically switched to this port.

The other single USB 2.0 Type A receptacle is provided on the RSP front panel for inserting external USB mass storage devices such as standard USB flash drives. It is used to load images, store configurations, write logs, and so on, and supports up to 12 Mbps of operation.

The table below summarizes the USB console port pinouts.

Table 30: Single USB Console Port Pinout

Pin	Signal Name	Description
A1	Vcc	+5 VDC (500 mA)

Pin	Signal Name	Description
A2	D-	Data -
A3	D+	Data +
A4	Gnd	Ground

Note The USB console port supports +5 VDC input, and operates as a USB peripheral device.

USB Flash or MEM Port Pinouts

The table below summarizes the USB flash or MEM port pinouts.

Table 31: Single USB Flash or MEM Port Pinouts

Pin	Signal Name	Description
A1	Vcc	+5 VDC (500 mA)
A2	D-	Data -
A3	D+	Data +
A4	Gnd	Ground

Note USB TYPE-A receptacle is used.

Note The USB flash or MEM port +5VDC is output. Cisco ASR 902 Router provides power for USB flash or MEM port. This port operates as a USB host device.

Fiber-Optic Specifications

The specification for optical fiber transmission defines two types of fiber: single mode and multimode. Within the single-mode category, three transmission types are defined: short reach, intermediate reach, and long reach. Within the multimode category, only short reach is available. For information about optical SFP modules, see the documentation for the SFP module at: http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html.

LED Summary

The following sections describe the meanings of the LEDs on the Cisco ASR 902 Router:

RSP LEDs

ASR900-RSP LED

Table 32: ASR900-RSP LEDs

LED	Color/State	Description (two LEDs for each port)
Power (PWR)	Off	Disabled/no power to RSP
	Green	Power rails on RSP in range
Status (STAT)	Off	Disabled/power down
	Red	Failure to boot (lit at reset)
	Yellow	Rommon booted
	Green	IOS booted and running
Active (ACT)	Off	Not available
	Yellow	Standby (indicates standby RSP)
	Green	Active (indicates active RSP)
Management port (MGMT)	Off	No connection
	Green	Connected with no activity
	Flashing green	Connected with activity
Sync status (SYNC)	Off	Not enabled
	Yellow	Free run
	Flashing yellow	Holdover
	Green	Locked to source
USB flash (MEM)	Flashing green	USB activity
BITS	Off	Out of service/not configured
	Amber	Fault or loop condition
	Green	In frame/working properly

ASR900-RSP2 and ASR900-RSP3 LED Information

The PWR and STAT LEDs are available on the front panel. These LEDs provide power on the board (PWR) and overall router health (STAT) status. During power up state, these LEDs provide booting status and report errors.

Note The digital code signing functionality validates the integrity and authenticity of the ROMMON image before booting it.

Table 33: A900-RSP2 and A900-RSP3 LED

PWR LED State	STAT LED State	Indication	Comment
Light Green	Red	Power is OK and the field-programmable gate array (FPGA) is nfigured successfully, but FPGA image validation failed.	Image validation failed. System is in hung state.
Flashing Light Green and Green alternatively	Off	FPGA configured and core validated successfully. FPGA image passed the control to micro-loader to boot ROMMON.	System is up with ROMMON. Both the FPGA image is validated successfully, but the booted ROMMON (primary or secondary) is undetermined.
	Amber	The digital code signing functionality reported upgrade FPGA image validation error and is continuing with the FPGA image.	System is up with ROMMON. FPGA image is validated successfully, but the booted ROMMON (primary or secondary) is undetermined.
	Red	The digital code signing functionality reported failure in the ROMMON image validation.	FPGA is up but both primary and secondary ROMMON failed. System is in hung state.
Green	Off	IOS is successfully booted	IOS writes into FPGA register to indicate that it has booted, FPGA stops flashing PWR LED and turns Green. Software now controls the STAT LED.

Interface Module LEDs

The table below summarizes the LEDs for the interface modules.

The Status LED is amber for the 10-Gigabit Ethernet ports when operating in WAN mode for the following:

- 8x1 Gigabit Ethernet SFP + 1x10 Gigabit Ethernet SFP+ Interface Module
- 8x1 Gigabit Ethernet RJ45 + 1x10 Gigabit Ethernet SFP+ Interface Module
- 2x10 Gigabit Ethernet SFP+ Interface Module

Table 34: Interface Module LEDs

	Color/State	Description
Power (PWR)	Off	Disabled/No power to IM
	Green	Enabled and power rails on IM in range
Status (STAT)	Off	Disabled/Power-down
	Red	Failure (On at reset)
	Flashing Red	Booting (if local CPU)
	Green	Operational
Link status (L)	Off	Inactive or no connection
	Amber	Fault/Loop condition
	Green	OK with activity or no activity
Speed (S)	Off	Inactive port status
	Green	Activity or no activity

OC-3/OC-12 Interface Module LEDs

The table below summarizes the LEDs for the OC-3 interface module.

Table 35: OC-3 Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Off	Disabled/No power to IM
	Green	Enabled and power rails on IM in range
Status (STAT)	Off	Disabled/Power-down
	Red	Failure (on at reset)
	Amber	Booting (if local CPU)
	Green	Operational
Carrier/Alarm (C/A)	Green	SFP receiving good remote signal
	Yellow	Remote or local alarm activated
Active/Loopback(A/L)	Green	SFP ready and operating normally
	Yellow	SFP port in loopback state

T1/E1 Interface Module LEDs

The table below summarizes the LEDs for the T1/E1 interface module.

Table 36: T1/E1 Interface Module LEDs

LED	Color/State	Description (Two LEDs for Each T1/E1 Port)
Active	Green	Active
	Blinking green	Standby
	Off	Operationally down; card is disabled or shut down
Port	Green	All ports up
	Blinking green	All ports up and one or more ports in a loopback state
	Amber	One or more configured ports are down
	Blinking amber	One or more configured ports are down and at least one configured port is in a loopback state
	Off	All ports disabled or shut down

14-Port Serial Interface Module LEDs

The table below summarizes the LEDs for the serial interface module.

Table 37: Cisco ASR 902 Router Serial IM LEDs

LED Label	Color/State	Meaning
Power (PWR)	Green	All power rails are within spec.
	Red	Disabled
	Off	No Power
Operating Status (STAT)	Red	Failure
	Yellow	Booting (if IM has a local CPU)
	Green	Operational
	Off	No Power

LED Label	Color/State	Meaning
68-Pin Connector LEDs	Green	At least one of the 4 ports is in an up state.
	Blinking Green	At least one of the 4 ports is passing traffic
	Solid Yellow	All four ports are successfully initialized and in a down state
	Blinking Yellow	At least one of the port has failed
	Off	All the ports are not enabled (at POR)
12-in-1 Connector LEDs	Green	Port is passing traffic
	Solid Yellow	Port successfully initialized and in a down state
	Blinking Yellow	Port has failed
	Off	Not Enabled (at POR)

4-Port C37.94 Interface Module LEDs

The table below summarizes the LEDs for the C37.94 interface module.

Table 38: Cisco ASR 902 Router C37.94 IM LEDs

LED Label	Color/State	Description
Power (PWR)	Green	All power rails are within spec.
	Red	Disabled
	Off	No Power
Operating Status (STAT)	Red	Failure
	Yellow	Booting
	Green	Operational
	Off	No Power
Rx LEDs	Green	Link up with activity
	Solid Yellow	Fault/Error/Alarm/No Sync
	Off	Link Down

LED Label	Color/State	Description
Tx LEDs	Green	Link up with activity
	Solid Yellow	Fault/Error/Alarm
	Off	Link Down

G.703/FXS/FXO Interface Module LEDs

The following table summarizes the LEDs for the G.703/FXS/FXO interface module.

Table 39: Cisco ASR 903 Router G.703/FXS/FXO IM LEDs

LED Label	Color or State	Description
Power (PWR)	Green	All power rails are within spec.
	Red	Disabled
	Off	No Power
Operating Status (STAT)	Red	Failure
	Yellow	Booting
	Green	Operational
	Off	No Power
Port Bi-color LEDs	Green	IM-FPGA Link/In-Frame, working properly
	Solid Yellow	Fault or Loop condition
	Off	Out of Service or not configured (default state)

Power Supply LEDs

The tables below summarize the power supply LEDs for the AC and DC power supplies.

Table 40: AC Power Supply LEDs (A900-PWR-550-A) and (A900-PWR-1200-A)

LED	Color/State	Description
Input OK	Off	No input voltage
	Amber	Input voltage out of range
	Green	Input voltage within acceptable operating range

LED	Color/State	Description
Output Fail	Off	Disabled/Forced Shut down/No input power
	Red	Power supply fault (internal failure such as over temperature)
	Green	Operational

Table 41: DC Power Supply LEDs (A900-PWR-550-D and A900-PWR-550-D-E)

LED	Color/State	Description
Input Power (PWR)	Off	No input voltage
	Amber	Input voltage out of range
	Green	Input voltage within acceptable operating range
Status (STAT)	Off	Disabled/Power-down/No power
	Red	Power supply fault (internal failure)
	Green	Operational

Table 42: DC Power Supply LEDs (A900-PWR-1200-D)

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

Fan Tray LEDs

The table below summarizes the fan tray LEDs.

Note A major alarm condition indicates the failure of a single fan in the fan tray; a critical alarm indicates the failure of multiple fans. In the event that a single fan fails, the Cisco ASR 902 Router software adjusts the fan speed to prevent excessive heat within the chassis.

Table 43: Fan Tray LEDs

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

Alarm Conditions

The table below summarizes the meaning of the alarm conditions on the Cisco ASR 902 Router.

Table 44: Alarm Condition Summary

Alarm Type	Alarm Meaning
Critical	Power supply OIR
	Port in down state
	Environmental sensor threshold exceeded (voltage, temperature)
	IM OIR
	IM crash
Major	RSP failure
Info	Port administratively shut down



APPENDIX A

Site Log

Use the Site Log to provide a record of actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that those who perform tasks have access to it. Use the Installation Checklist (see Site Planning) to verify the steps in the installation and maintenance of your router. Site Log entries can include the following:

- Installation progress—Make a copy of the Cisco ASR 902 Router Installation Checklist, and insert it into the Site Log. Make entries as you complete each task.
- Upgrade, removal, and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. Each time a task is performed on the Cisco ASR 902 Router, update the Site Log to reflect the following:
    - Removal or replacement of interface modules, fan tray, power supplies, or RSPs
    - Configuration changes
    - Maintenance schedules and requirements
    - Maintenance procedures performed
    - Intermittent problems
    - Comments and notes

The table below shows a sample site log. Make copies of the sample, or design your own site log to meet the requirements of your site and equipment.

Table 45: Site Log

Date	Description of Action Performed or Symptom Observed	Initials

- Manufacturers of Equipment Used in Cisco ASR 902 Router, on page 128

Manufacturers of Equipment Used in Cisco ASR 902 Router

The table below lists the manufacturers of the equipment used with the Cisco ASR 902 Router.

Table 46: Manufacturers

Manufacturer	Products/Model
Gaw Technology[2] A Gaw Associates, Inc. Company Toll Free: 877-429-7225 Email: info@GawTechnology.com	Air Plenum
Burndy	Lugs

[2] For ordering, visit www.GawTechnology.net