



Overview and Physical Description

This chapter provides an overview of the Cisco ASR 9000 Series Aggregation Services Routers and description of the system components.

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- [Rack-Mounting Specifications, on page 8](#)
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Chassis Physical Overview

The Cisco ASR 9000 Series Routers are next-generation edge access routers optimized for service provider applications, designed to fulfill various roles in:

- Layer 2 and Layer 3 Ethernet aggregation
- Subscriber-aware broadband aggregation

The Cisco ASR 9000 Series Routers meet carrier-class requirements for redundancy, availability, packaging, power, and other requirements traditional to the service provider.

The Cisco ASR 9000 Series consists of the following routers:

- Cisco ASR 9001 Router
- Cisco ASR 9001-S Router
- Cisco ASR 9010 Router
- Cisco ASR 9006 Router
- Cisco ASR 9904 Router
- Cisco ASR 9906 Router
- Cisco ASR 9910 Router

- Cisco ASR 9922 Router
- Cisco ASR 9912 Router

This chapter briefly describes the chassis configuration and components of the Cisco ASR 9000 Series Routers. For information on the Cisco ASR 9001 and Cisco ASR 9001-S Routers, see the [Cisco ASR 9001 and Cisco ASR 9001-S Routers Hardware Installation Guide](#).

Cisco ASR 9010 Router

The Cisco ASR 9010 Router chassis is centered around a redundant pair of RSP cards, along with eight line cards. The 10-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets.

The chassis has two power trays. The version 1 power system has AC or DC power modules (six total) in each tray. The version 2 and version 3 power system has four AC or DC power modules (eight total) in each tray .

Figure 1: Cisco ASR 9010 Router Chassis Components—Version 1 Power Trays

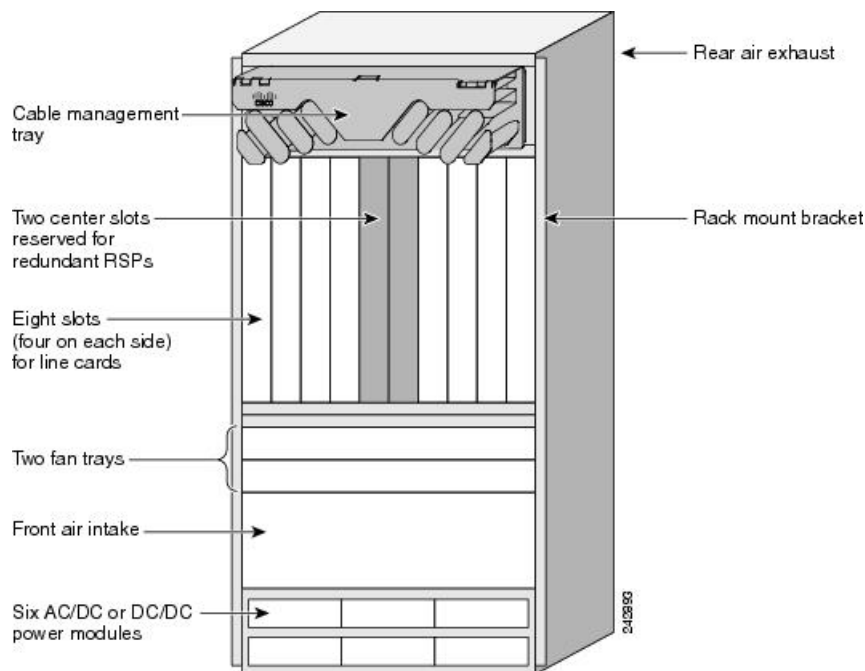
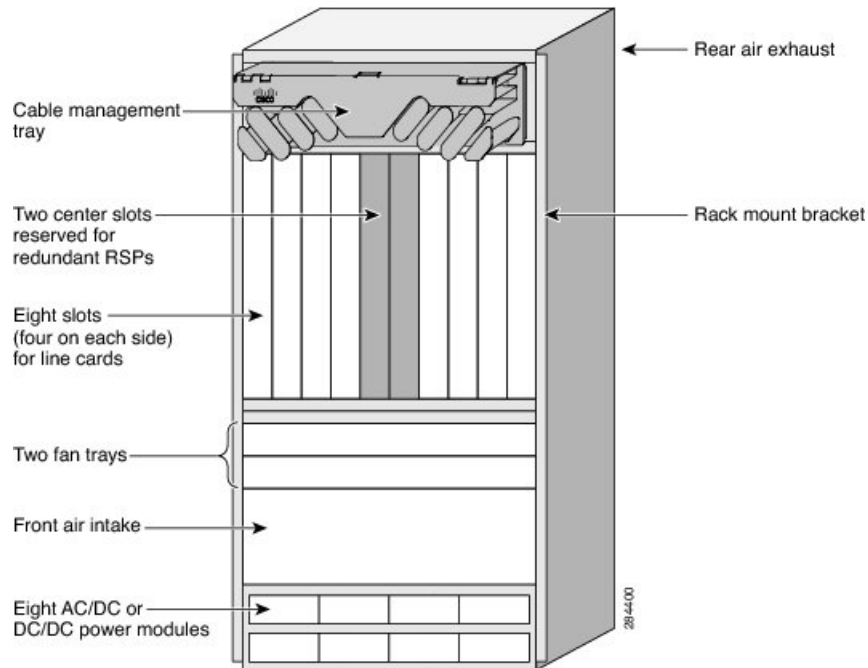


Figure 2: Cisco ASR 9010 Router Chassis Components—Version 2 and 3 Power Trays

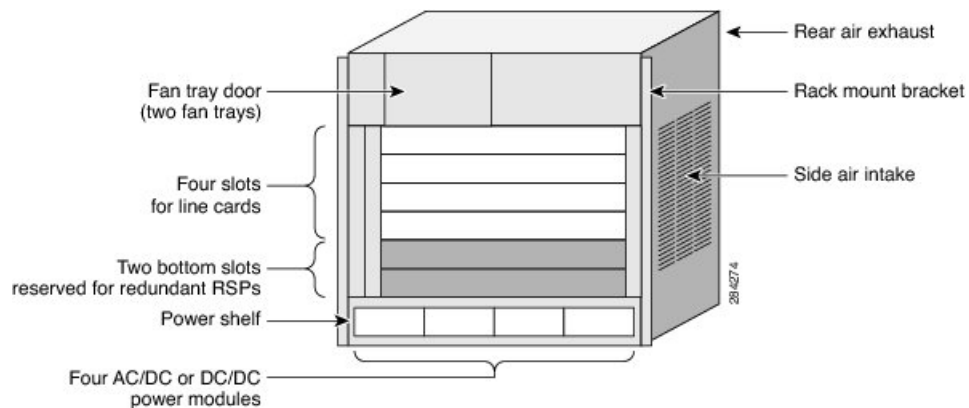


Cisco ASR 9006 Router

The Cisco ASR 9006 Router chassis is centered around a redundant pair of RSP cards, along with four line cards. The 6-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets.

The chassis has a single power tray for AC or DC power modules. The version 1 power system has three power modules in the single power tray. The version 2 power system has four power modules in the single power tray.

Figure 3: Cisco ASR 9006 Router Chassis Components—Version 2 Power Tray Shown

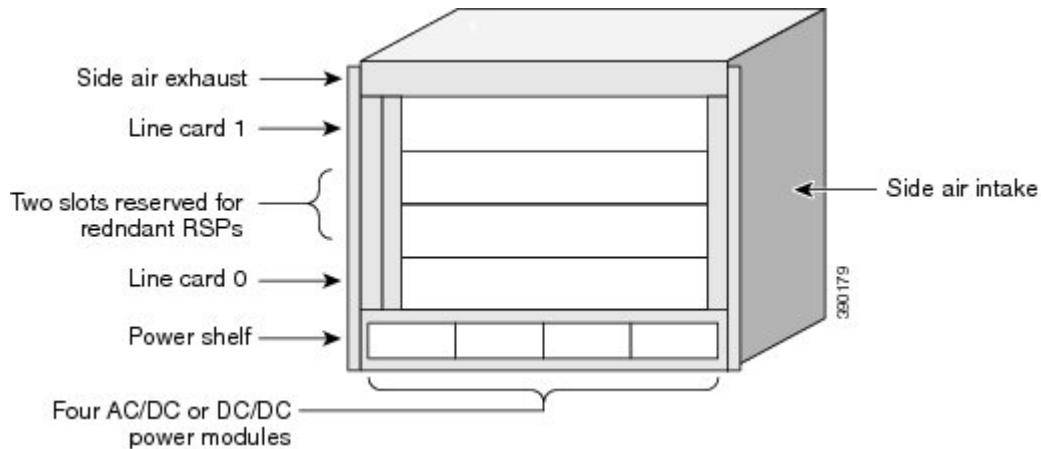


Note The ASR 9006 chassis does not support version 3 power modules.

Cisco ASR 9904 Router

The Cisco ASR 9904 Router chassis is centered around a redundant pair of RSP cards, along with two line cards. The 4-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets. The chassis has a single version 2 power tray for AC or DC power modules.

Figure 4: Cisco ASR 9904 Router Chassis Components—Version 2 Power System



Cisco ASR 9906 Router

The Cisco ASR 9906 Router chassis is centered on a redundant pair of Route Switch Processor (RSP) cards, four line cards, and five Fabric Cards (FC). The 6-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets. The chassis has version 3 power tray. The version 3 power system has three AC or four DC power modules in each tray. The ASR 9906 Router is supported with the RSP4-S (A99-RSP-SE, A99-RSP-TR) and the SFC-T fabric card.

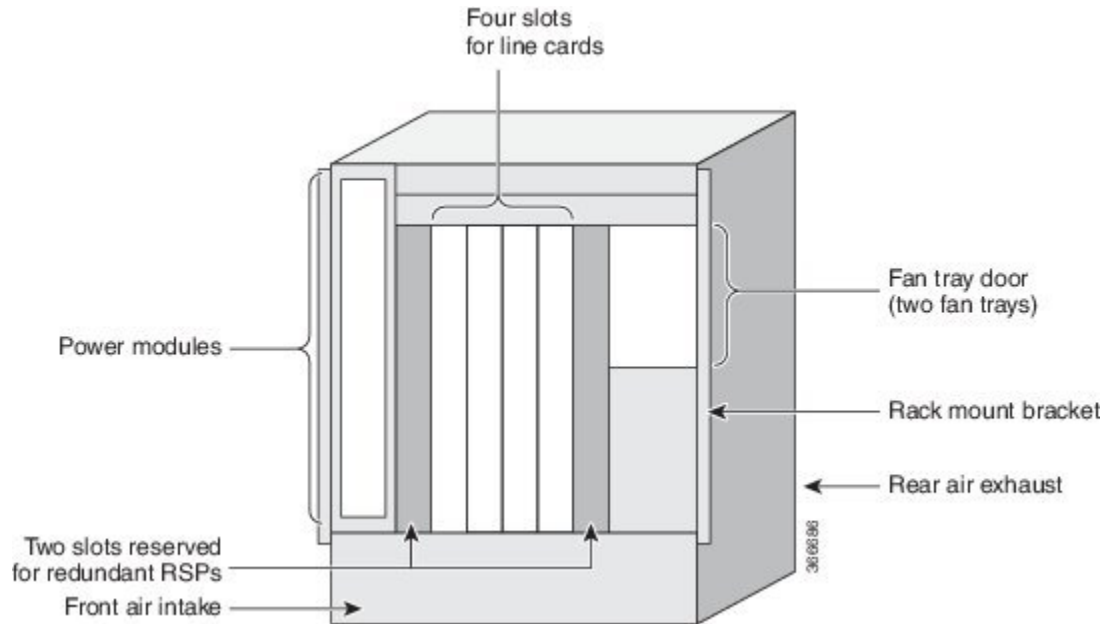


Note The RSP4-S shipped with IOS XR 6.3.1 supports IOS XR 32-bit and 64-bit on the Cisco ASR 9906 Router. If you are installing a previously shipped RSP4-S (for example, from an Cisco ASR 9910 Router) in a Cisco ASR 9906 Router, you need to perform a Field Programmable Device (FPD) upgrade (available in IOS XR 6.3.1) in order to support IOS XR 64-bit. For more information, refer to field notice FN-70022.



Note The Cisco ASR 9906 supports A9K-VSM-500 and Tomahawk-based line cards; it does not support SIP-700, A9K-ISM-100, Trident-based, or Typhoon-based line cards. Refer to [ASR 9000 Series Line Card Types](#) for information on line card types.

Figure 5: Cisco ASR 9906 Router Chassis Components—Version 3 Power System



Cisco ASR 9910 Router

The Cisco ASR 9910 chassis is centered around a redundant pair of RSP cards, along with eight line cards and five fabric cards (FCs). The 10-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets.

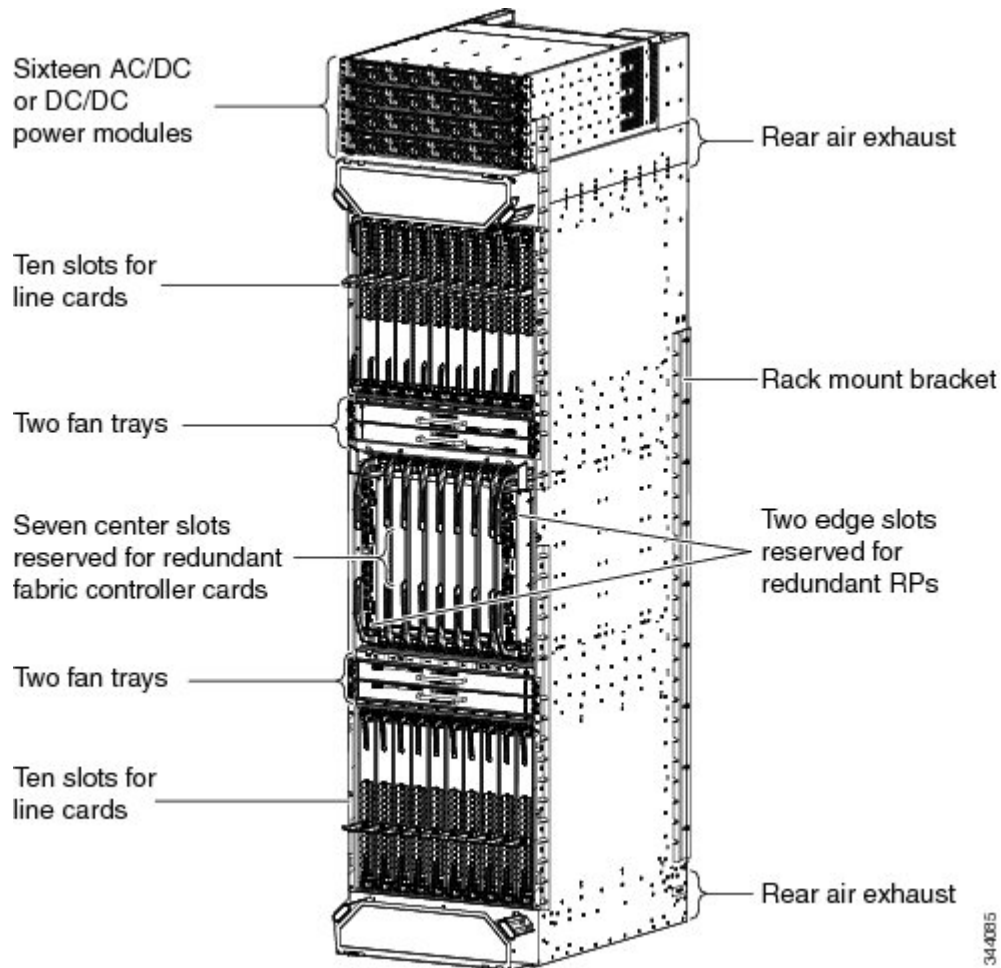
The chassis has version 3 power tray. The version 3 power system has three AC or four DC power modules in each tray.

Cisco ASR 9922 Router

The Cisco ASR 9922 Router chassis is centered around a redundant pair of RP cards, seven redundant FC cards, and twenty line cards. The 22-slot chassis size fits in Telco, EIA, and ETSI racks and cabinets. The chassis has two backplanes connected via up to seven fabric cards and two RP cards. The upper backplane connects to its one backplane identification (BPID) card, ten line cards, two fan trays, and four power trays. The lower backplane connects to its BPID card, ten line cards, and two fan trays.

The chassis has four power trays. The version 2 power system has four AC or DC power modules in each power tray. The version 3 power system has three AC power modules or four DC power modules in each power tray.

Figure 6: Cisco ASR 9922 Router Chassis Components—Version 2 Power Tray

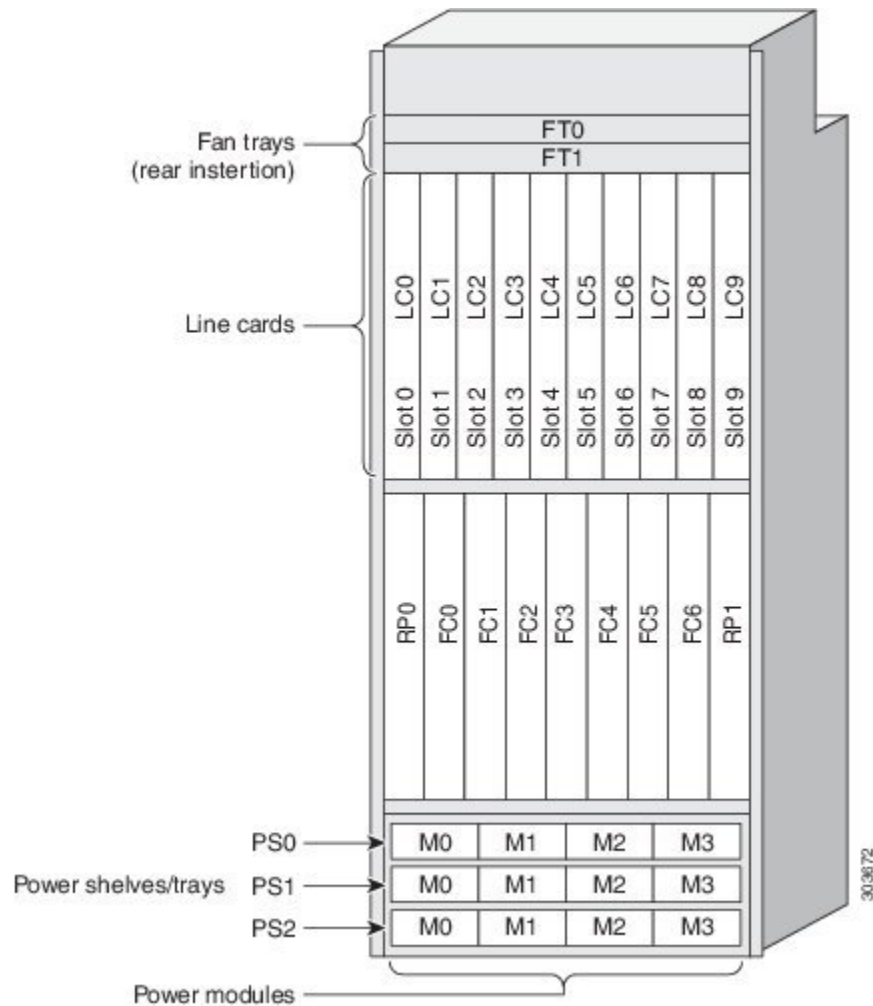


Cisco ASR 9912 Router

The Cisco ASR 9912 Router chassis is centered around a redundant pair of RP cards, seven redundant FC cards, and ten line cards. The chassis fits in Telco, EIA, and ETSI racks and cabinets.

The chassis has three power trays. The version 2 power system has four AC or DC power modules in each power tray. The version 3 AC power system has three AC power modules in each power tray. The version 3 DC power system has four DC power modules in each power tray.

Figure 7: Cisco ASR 9912 Router Chassis Components—Version 2 Power Tray



Field Replaceable Units

In the Cisco ASR 9010 Router, Cisco ASR 9006 Router, and Cisco ASR 9904 Router, the following components are field replaceable units (FRUs):

- All line cards
- RSP cards
- Power modules
- Fan trays
- Air filters
- Line card and RSP blank fillers
- Compact flash disk
- Gigabit Ethernet small form-factor pluggable (SFP) transceiver modules

- 10-Gigabit Ethernet small form-factor pluggable (SFP+) transceiver modules
- 10-Gigabit Ethernet small form-factor pluggable (XFP) transceiver modules
- Optional card cage doors (Cisco ASR 9010 Router only)



Note The backplane and BPID are not FRUs.

In the Cisco ASR 9922 Router, Cisco ASR 9906 Router, Cisco ASR 9910 Router, and the Cisco ASR 9912 Router, the following components are FRUs:

- All line cards
- RP cards (only for Cisco ASR 9922 and Cisco ASR 9912)
- RSP cards (only for Cisco ASR 9906 Router and Cisco ASR 9910 Router)
- FC cards
- Power modules
- Fan trays and covers
- Air filters and foam media
- Line card and RP/RSP blank fillers
- Gigabit Ethernet small form-factor pluggable (SFP) transceiver modules
- 10-Gigabit Ethernet small form-factor pluggable (SFP+) transceiver modules
- 100-Gigabit Ethernet small form-factor pluggable (CFP) transceiver modules
- Optional card cage doors (only for Cisco ASR 9922 and Cisco ASR 9912)



Note The backplanes, midplane, PEM (only for Cisco ASR 9910 Router) and BPID cards are not FRUs.

Rack-Mounting Specifications

The following table lists the rack-mounting specifications for the Cisco ASR 9000 Series Routers.

Table 1: Cisco ASR 9000 Series Routers Rack Mounting Specifications

Chassis Type	Rack Mounting Specifications
Cisco ASR 9010 Router	<p>Chassis height is 36.75 inches (93.35 cm) or 21 RU (rack units), which includes a rack/tray mounting option. Two chassis fit into a commonly used 42 RU rack, and therefore will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.50 inches (44.54 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>
Cisco ASR 9006 Router	<p>Chassis height is 17.50 inches (44.45 cm) or 10 RU (rack units), which includes a rack/tray mounting option. Four chassis fit into a commonly used 42 RU rack, and therefore will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.75 inches (45.09 cm)</p> <p>EIA racks 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>
Cisco ASR 9904 Router	<p>Chassis height is 10.38 inches (26.36 cm) or 6 RU (rack units), which includes a rack/tray mounting option. Seven chassis fit into a commonly used 42 RU rack, and therefore will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.75 inches (45.09 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>
Cisco ASR 9906 Router	<p>Chassis height is 24.39 inches (61.95 cm) or 14 RU (rack units), which includes a rack/tray mounting option. Three chassis fit into a commonly used 42 RU rack, and therefore will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.60 inches (44.70 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>

Chassis Type	Rack Mounting Specifications
Cisco ASR 9910 Router	<p>Chassis height is 36.70 inches (93.218 cm) or 21 RU (rack units), which includes a rack/tray mounting option. Two chassis fit into a commonly used 42 RU rack, and therefore will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.50 inches (44.54 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>
Cisco ASR 9912 Router	<p>Chassis height is 52.50 inches (133.35 cm) or 30 RU (rack units). The rail mounting option height is 1.00 inch. The Cisco ASR 9912 Router chassis will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.75 inches (45.09 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>
Cisco ASR 9922 Router	<p>Chassis height is 77.00 inches (195.58 cm) or 44 RU (rack units). The rail mounting option height is 1.00 inch. The Cisco ASR 9922 Router chassis will fit into an ETSI 45 RU rack with a height of 78.74 inches (200.00 cm).</p> <p>Telco racks: Rail-to-rail dimension is 17.75 inches (45.09 cm)</p> <p>EIA racks: 19 inches (48.26 cm) wide</p> <p>Adaptable to 23 inches (58.42 cm) to fit into ETSI racks 23.62 inches (60.00 cm) wide</p>

The chassis depth for all Cisco ASR 9000 Series Routers fits into a 31.50 inch (80.00 cm) deep EIA rack or an equivalent 80.00 cm deep rack. This space includes cable management space front and rear. The chassis has fixed rack mount rails that are set back 5.00 inches (12.7 cm), including front cable management space.



Note Racks and cabinets require adjustable front rails if the rack/cabinet doors must be able to close with the chassis installed.

Chassis Top-Down View Dimensions

- [Figure 8: Cisco ASR 9010 Router Chassis Footprint Dimensions—Top Down View](#), on page 11 shows the top-down view dimensions of the Cisco ASR 9010 Router.
- [Figure 9: Cisco ASR 9006 Router Chassis Footprint Dimensions—Top Down View](#), on page 12 shows the top-down view dimensions of the Cisco ASR 9006 Router.
- [Figure 10: Cisco ASR 9904 Router Chassis Footprint Dimensions—Top Down View](#), on page 13 shows the top-down view dimensions of the Cisco ASR 9904 Router.

- [Figure 11: Cisco ASR 9906 Router Chassis Footprint Dimensions—Top Down View](#) shows the top-down view dimensions of the Cisco ASR 9906 Router.
- [Figure 12: Cisco ASR 9910 Router Chassis Footprint Dimensions—Top Down and Side View](#), on page 15 shows the top-down view dimensions of the Cisco ASR 9910 Router.
- [Figure 13: Cisco ASR 9922 Router Chassis Footprint Dimensions—Top Down View](#), on page 16 shows the top-down view dimensions of the Cisco ASR 9922 Router.
- [Figure 14: Cisco ASR 9912 Router Chassis Footprint Dimensions—Top Down View](#), on page 17 shows the top-down view dimensions of the Cisco ASR 9912 Router.

Figure 8: Cisco ASR 9010 Router Chassis Footprint Dimensions—Top Down View

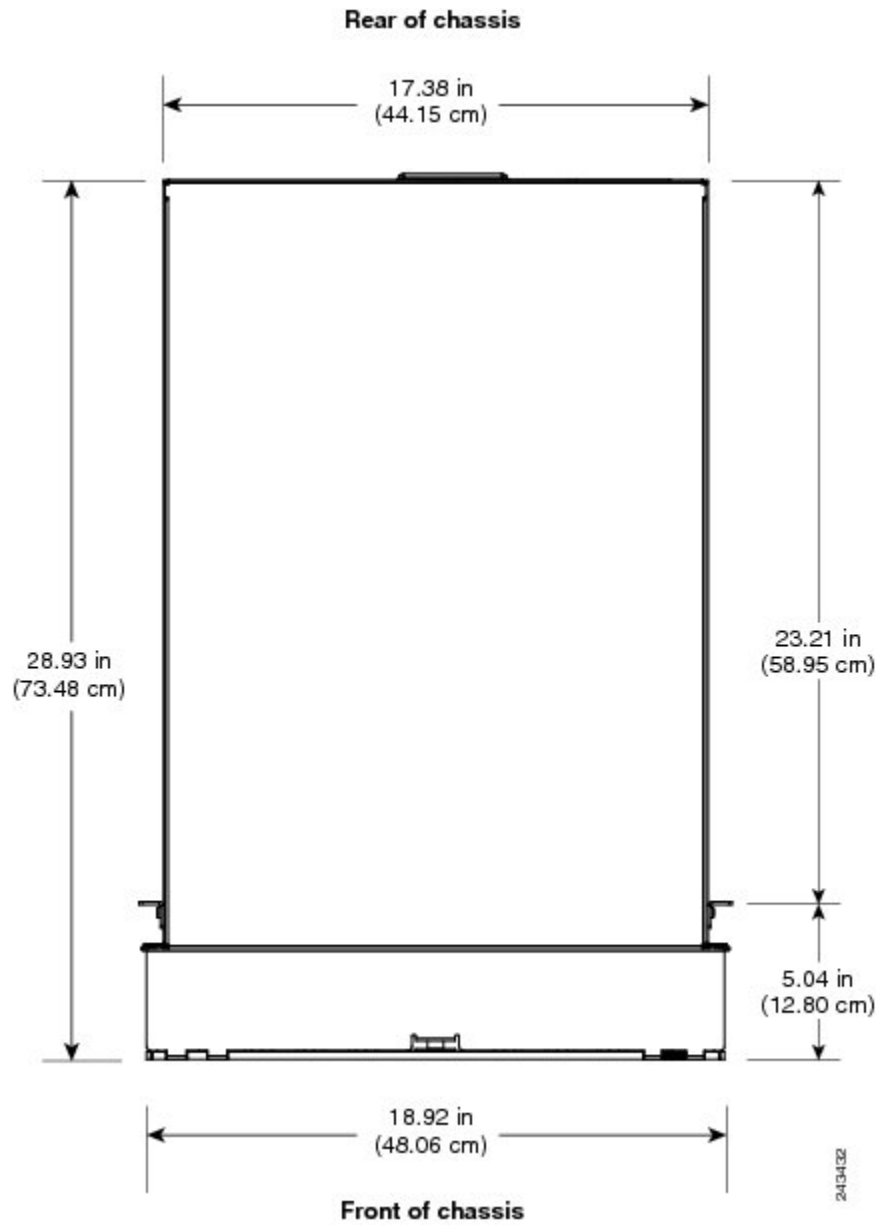


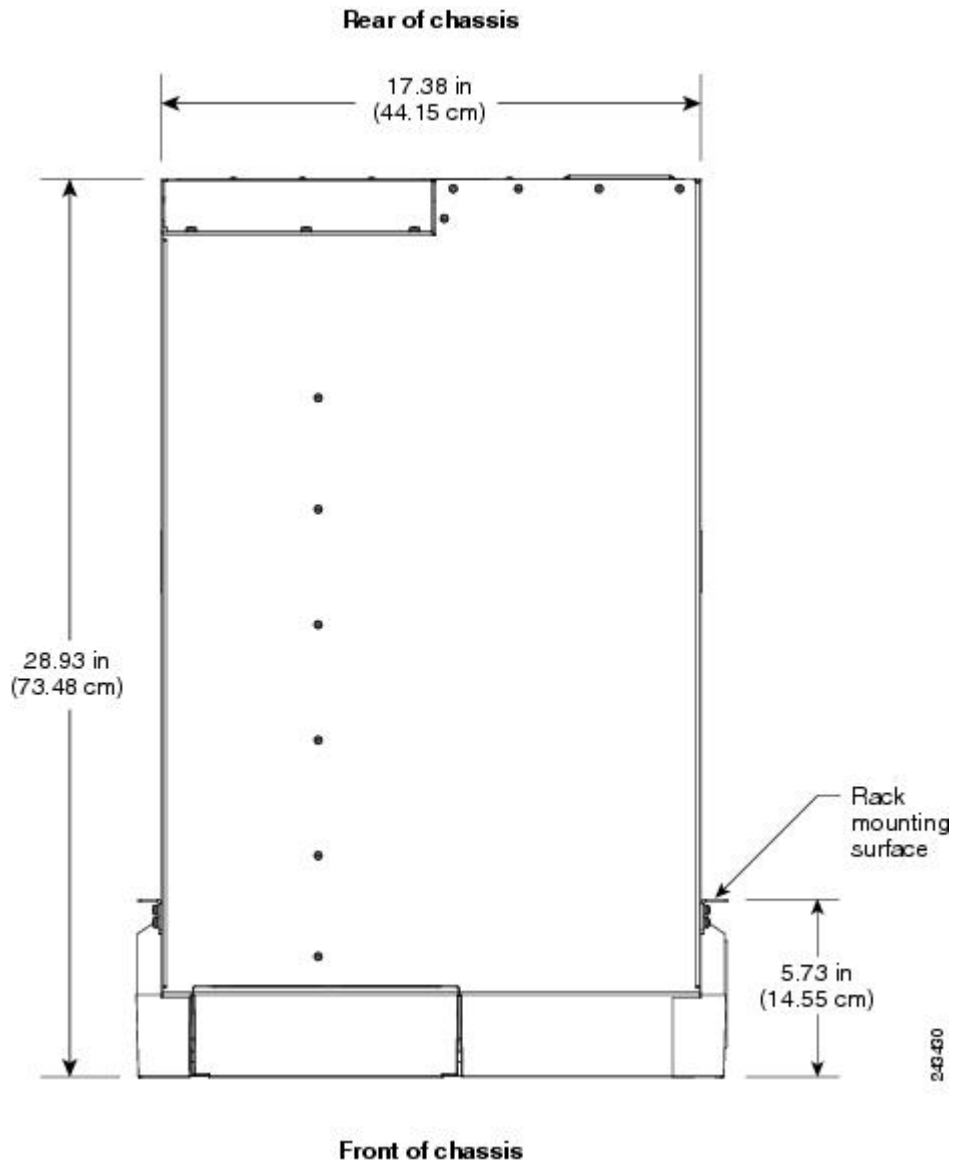
Figure 9: Cisco ASR 9006 Router Chassis Footprint Dimensions—Top Down View

Figure 10: Cisco ASR 9904 Router Chassis Footprint Dimensions—Top Down View

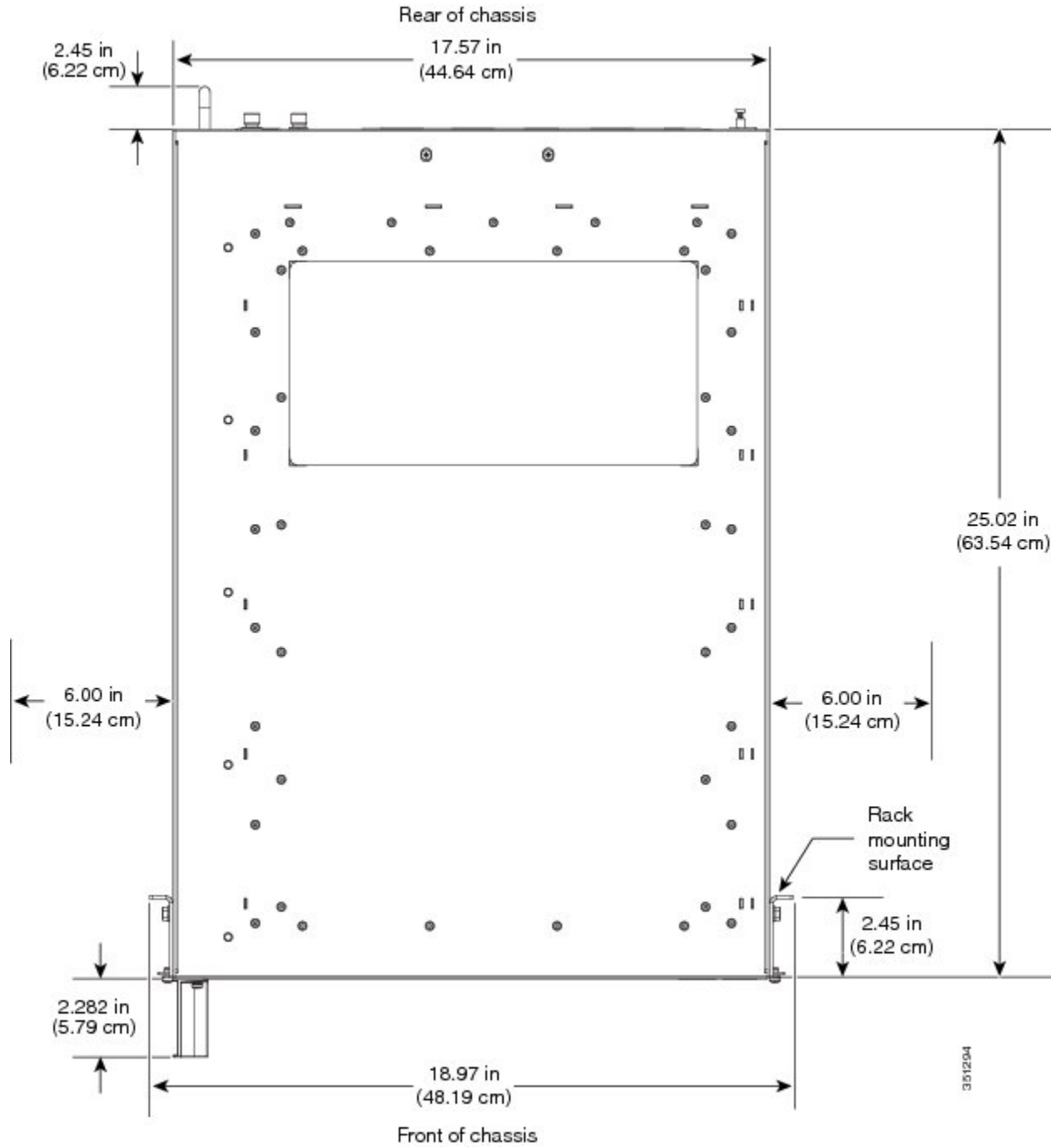


Figure 11: Cisco ASR 9906 Router Chassis Footprint Dimensions—Top Down View

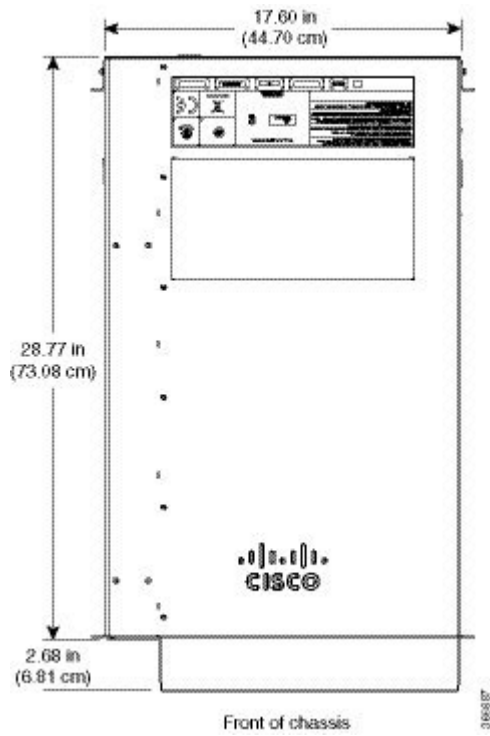


Figure 12: Cisco ASR 9910 Router Chassis Footprint Dimensions—Top Down and Side View

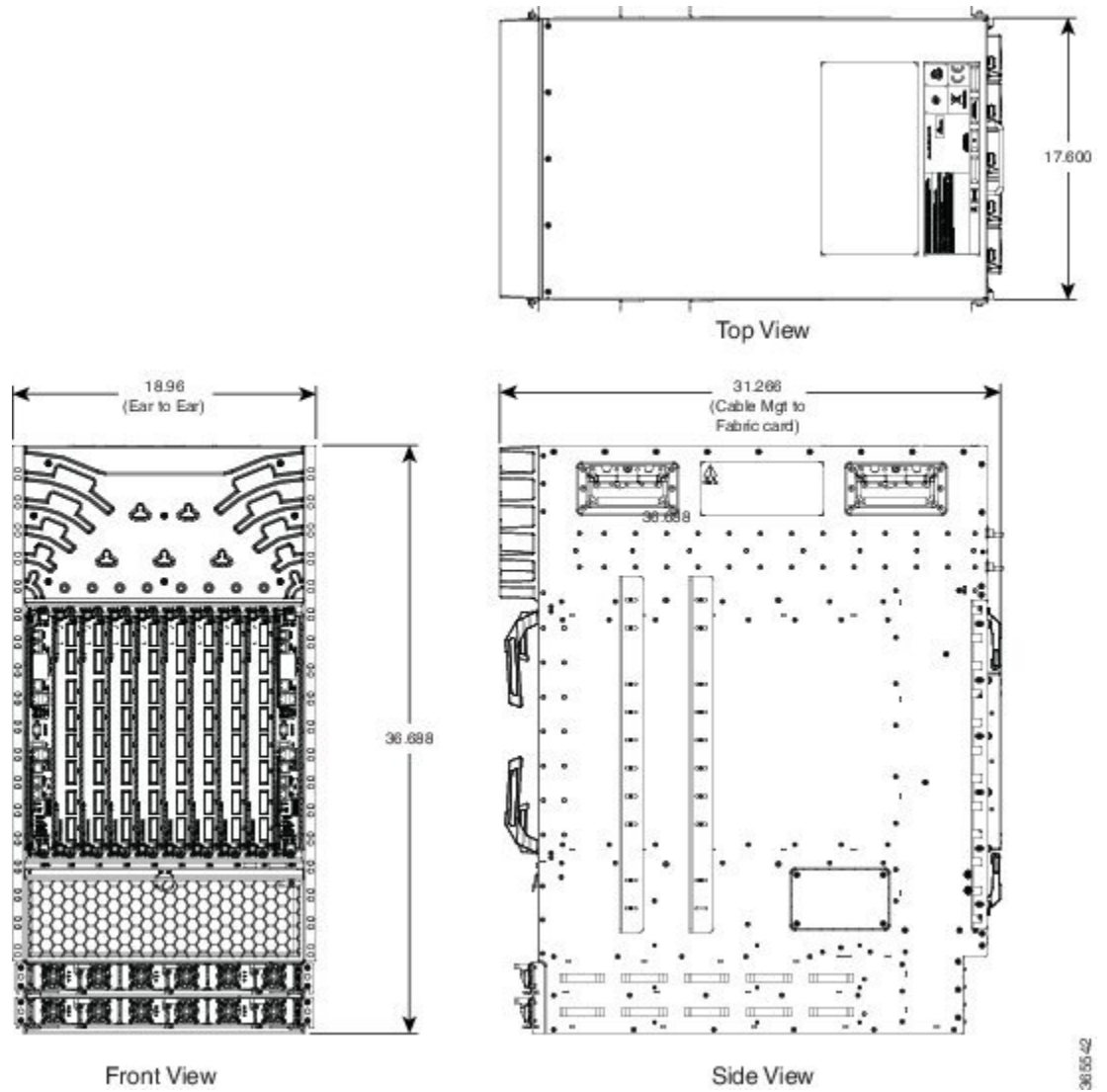


Figure 13: Cisco ASR 9922 Router Chassis Footprint Dimensions—Top Down View

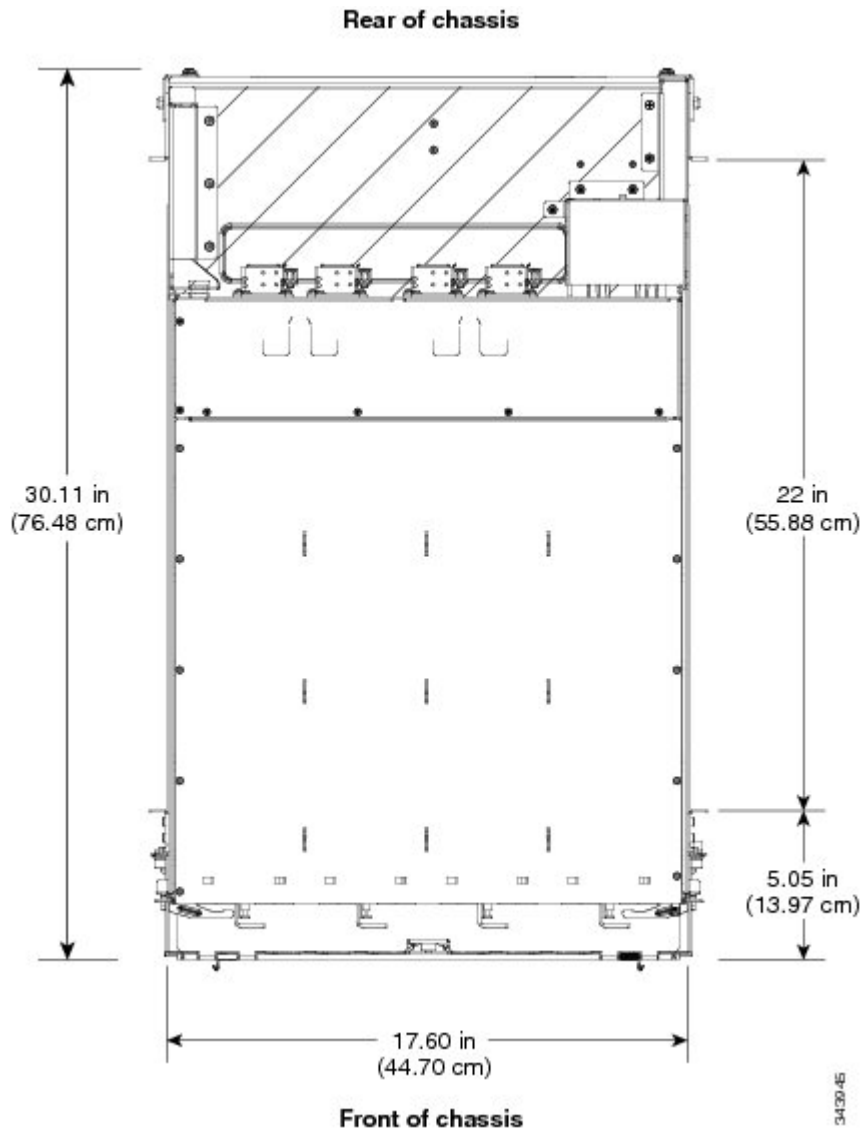
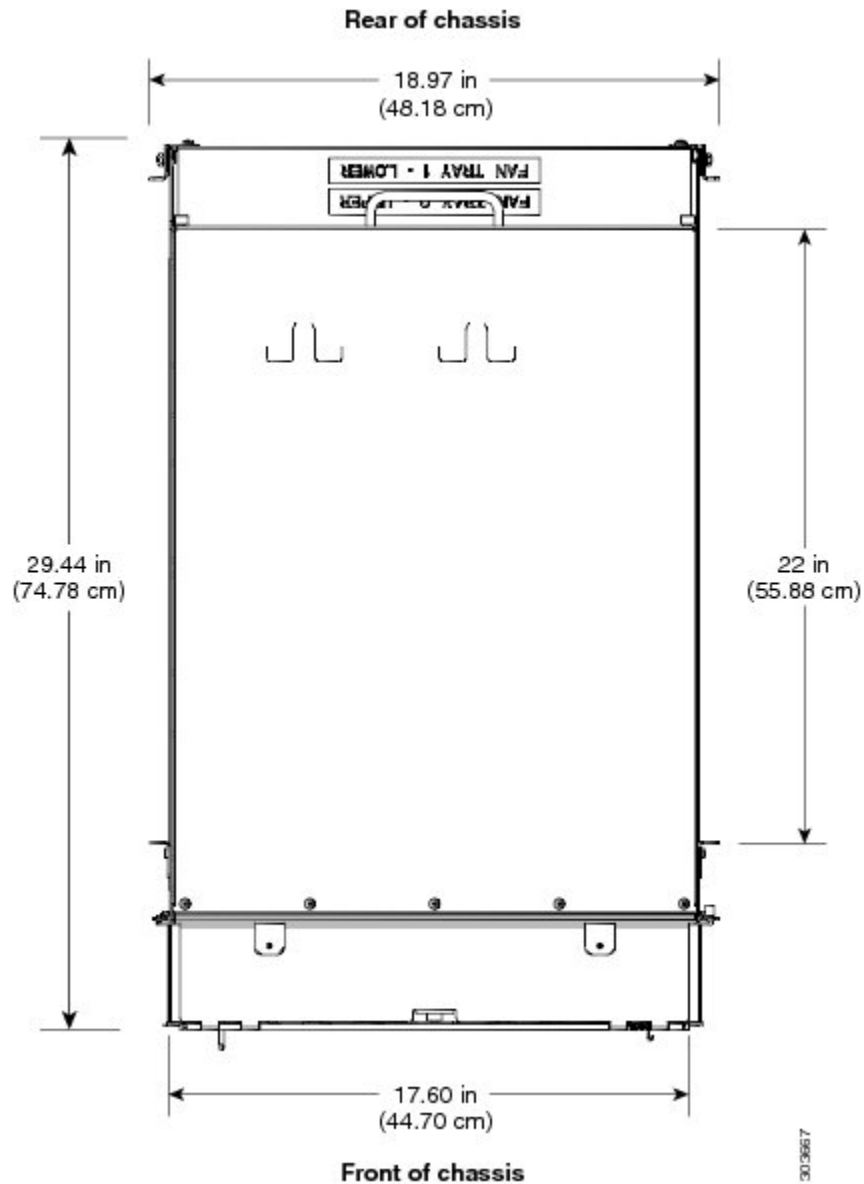


Figure 14: Cisco ASR 9912 Router Chassis Footprint Dimensions—Top Down View



Chassis Slots

- Cisco ASR 9010 Router: All line cards and RSP cards are front-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card.
- Cisco ASR 9006 Router and Cisco ASR 9904 Router: All chassis line cards and RSP cards are front-facing and mounted horizontally, with ejector levers and captive screws at the left and right ends of each card.
- Cisco ASR 9906 Router: All line cards and RSP cards are front-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card. All FCs are rear-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card.

- Cisco ASR 9910 Router: All line cards and RSP cards are front-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card.
- Cisco ASR 9922 Router: All RP, FCs, and LCs are front-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card.
- Cisco ASR 9912 Router: All RP, FCs, and LCs are front-facing and mounted vertically, with ejector levers and captive screws at the top and bottom of each card.

The chassis components include:

- Two RSP cards in the Cisco ASR 9010 Router, Cisco ASR 9006 Router, Cisco ASR 9904 Router, Cisco ASR 9906 Router, and Cisco ASR 9910 Router.
- Two RP and seven FC cards in the Cisco ASR 9922 Router and Cisco ASR 9912 Router
- Five FC cards in the Cisco ASR 9906 Router and Cisco ASR 9910 Router.
- Ethernet line cards
 - Cisco ASR 9010 Router—Up to eight
 - Cisco ASR 9006 Router—Up to four
 - Cisco ASR 9904 Router—Up to two
 - Cisco ASR 9906 Router—Up to four
 - Cisco ASR 9910 Router—Up to eight
 - Cisco ASR 9922 Router—Up to twenty
 - Cisco ASR 9912 Router—Up to ten
- Backplane(s)
 - Cisco ASR 9010 Router—One
 - Cisco ASR 9006 Router—One
 - Cisco ASR 9904 Router—One
 - Cisco ASR 9922 Router—Two
 - Cisco ASR 9912 Router—One
- Midplane(s)
 - Cisco ASR 9906 Router—One
 - Cisco ASR 9910 Router—One
- BPID card(s)
 - Cisco ASR 9010 Router—One
 - Cisco ASR 9006 Router—One
 - Cisco ASR 9904 Router—One
 - Cisco ASR 9906 Router—One

- Cisco ASR 9910 Router—One
- Cisco ASR 9922 Router—Two
- Cisco ASR 9912 Router—One

- Fan tray controllers
 - Cisco ASR 9010 Router—Two
 - Cisco ASR 9006 Router—Two
 - Cisco ASR 9904 Router—One
 - Cisco ASR 9906 Router—Two
 - Cisco ASR 9910 Router—Two
 - Cisco ASR 9922 Router—Four
 - Cisco ASR 9912 Router—Two

- Power trays
 - Cisco ASR 9010 Router—Two AC power trays in AC-powered systems or two DC power trays in DC-powered systems
 - Cisco ASR 9006 Router—One AC power tray in AC-powered systems or one DC power tray in DC-powered systems
 - Cisco ASR 9904 Router—One AC power tray in AC-powered systems or one DC power tray in DC-powered systems
 - Cisco ASR 9906 Router—One AC power tray in AC-powered systems or one DC power tray in DC-powered systems
 - Cisco ASR 9910 Router—Two AC power trays in AC-powered systems or two DC power trays in DC-powered systems
 - Cisco ASR 9922 Router—Four AC power trays in AC-powered systems or four DC power trays in DC-powered systems
 - Cisco ASR 9912 Router—Three AC power trays in AC-powered systems or three DC power trays in DC-powered systems

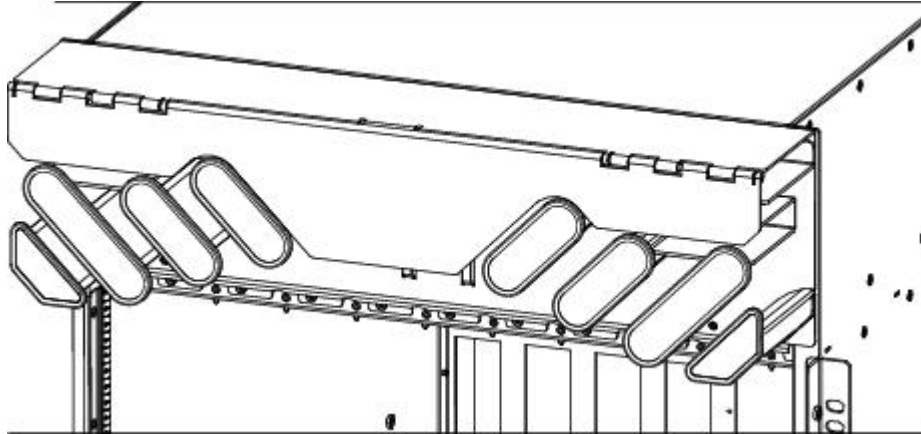


Note The line card slots are dedicated to only line cards; RSP/RP/FC cards cannot occupy these slots. The RSP/RP/FC slots are dedicated to only RSP/RP/FC cards; line cards cannot occupy these slots. A keying mechanism keeps line cards from entering RSP/RP/FC slots and RSP/RP/FC cards from entering line card slots; the keying mechanism pins engage before the card alignment pins engage.

Fiber and Interface Cable Management

The following image shows how card interface cables are managed at the front of the Cisco ASR 9010 Router chassis using a cable management tray.

Figure 15: Cable Management Tray



The Cisco ASR 9922 Router and Cisco ASR 9912 Router have a cable management tray located above the card cage and a cable management tray below the bottom card cage that do not interfere with the insertion or removal of cards. A hinged cover at the top of the tray can be raised for ease of access for routing cables.

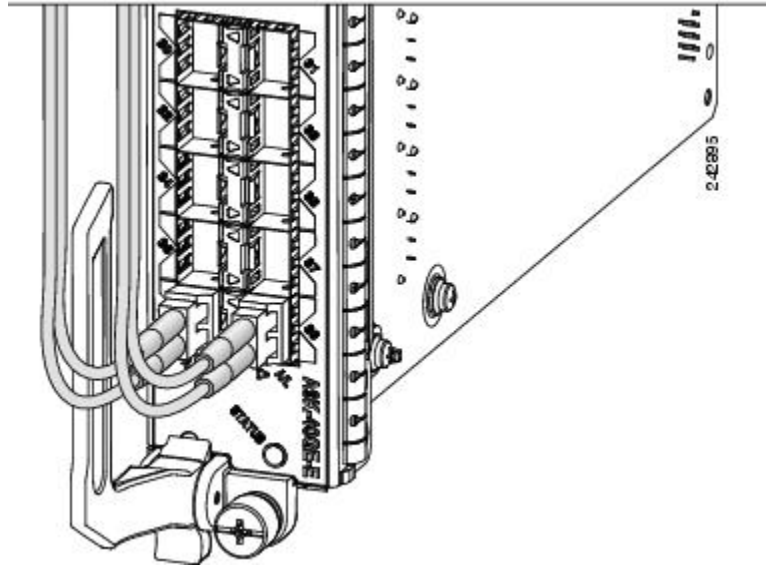
Line cards and RSP/RP cards share the same cable management tray. Cables to a card must be disconnected before its removal (this does not affect adjacent cards). Removal of a line card or RSP/RP card does not require removal or adjustment of cables other than those associated with the card itself.

A cable management bend radius of 1.5 inches (3.81 cm) is accommodated. Line card slots at the extreme ends of the cable management trays use space outside of the chassis width to accommodate the 1.5-inch (3.81-cm) radii due to limited space per slot.

Space for the fiber bend radii and strain relief is 3.75 inches (9.53 cm) in front of the faceplate.

The following figure shows how the fiber and cables are routed upward away from slot number labels. Therefore slot number labels, located at the lower part of the card cage, are not obscured by the cables.

Figure 16: Fiber/Cable Routing in the Cisco ASR 9010 Router

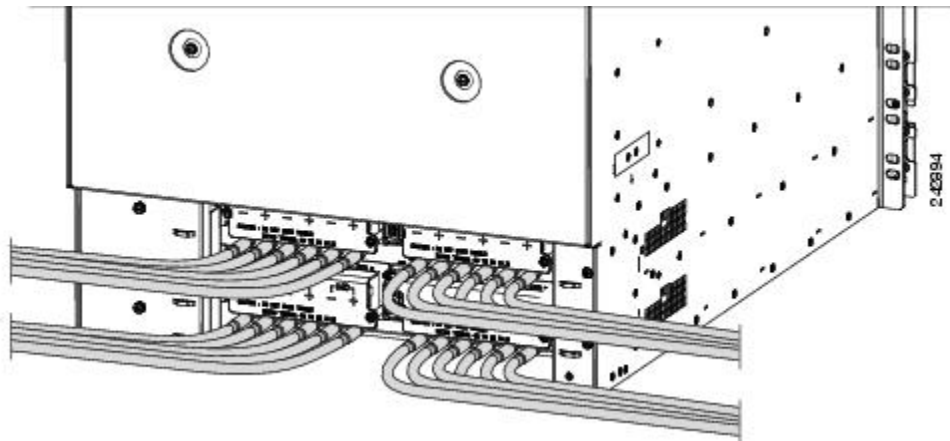


Routing of DC Power Tray Source Cables

Power cables are located in the rear. The A and B source feeds to the DC power supply modules are separated so the cables route to opposite sides of the chassis. A cable tie down point is provided.

The following figure shows the DC power cable routing on the power trays.

Figure 17: Routing of DC Power Tray Source Cables



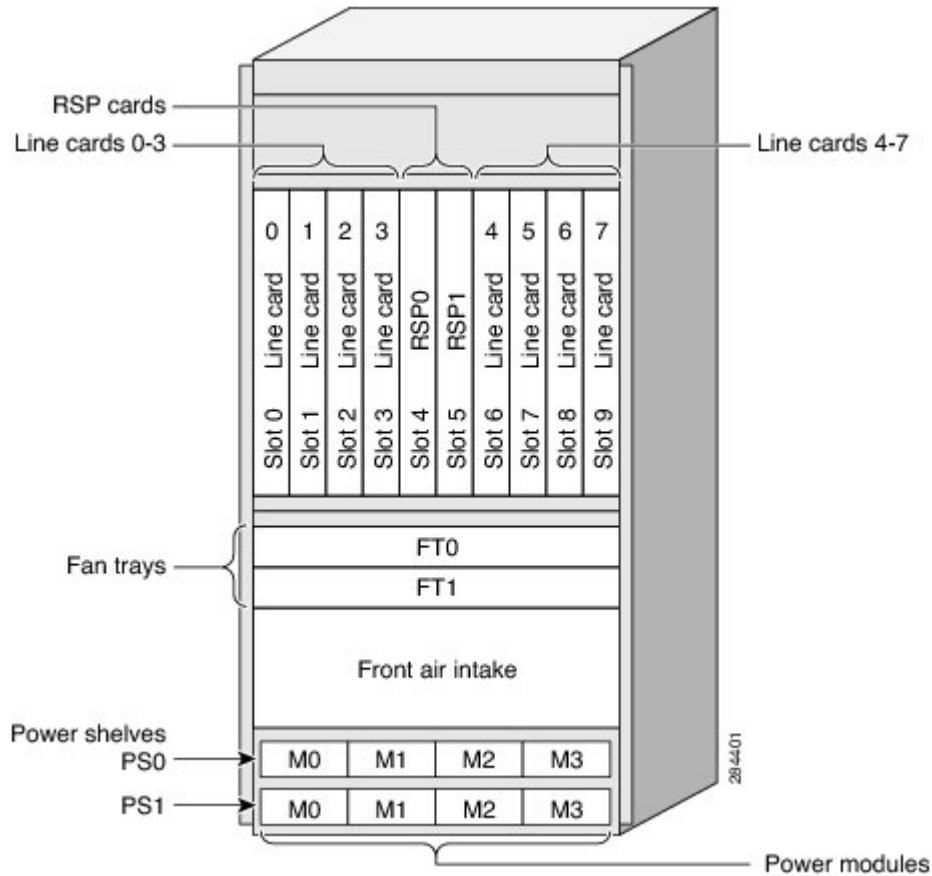
Slot ID Numbering

All card slots are clearly numbered. Labels identifying slots are visible from the front of the chassis and are clearly numbered below each slot. As mentioned previously, fiber and cables are routed upward and do not obscure the slot ID labels.

Cisco ASR 9010 Router

The following figure shows slot ID numbering for the Cisco ASR 9010 Router with the DC power system. The numbering for the AC power system is the same but each power tray only holds three power modules.

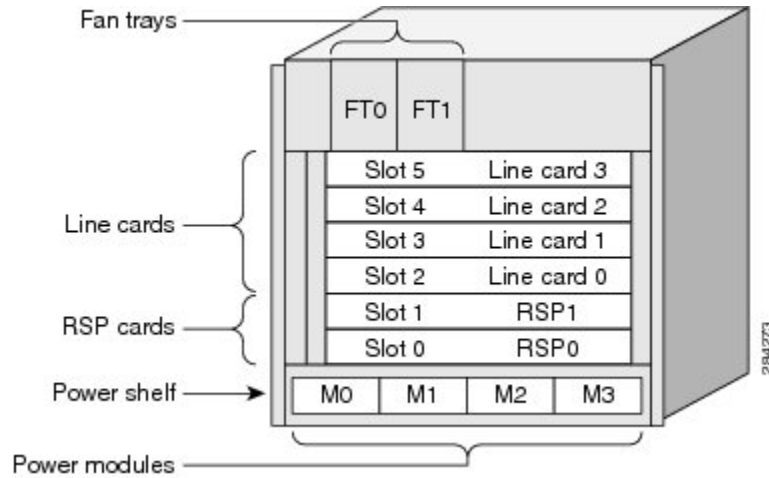
Figure 18: Cisco ASR 9010 Router Slot ID Numbering



Cisco ASR 9006 Router

The following figure shows the slot ID numbering for the Cisco ASR 9006 Router with the DC power system. The numbering for the AC power system is the same but each tray only holds three power modules.

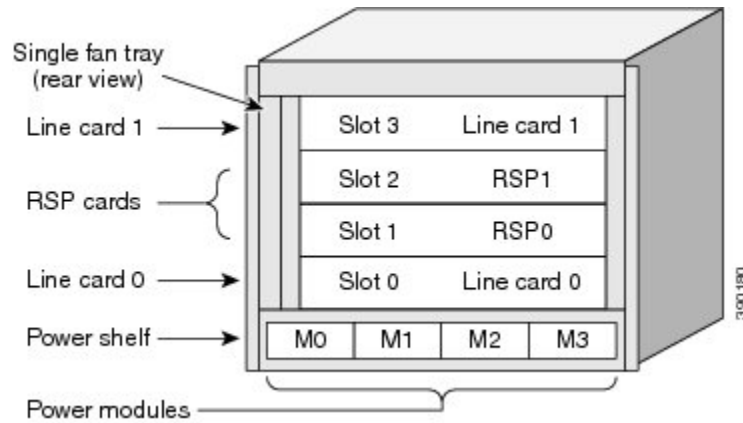
Figure 19: Cisco ASR 9906 Router Slot ID Numbering



Cisco ASR 9904 Router

The following figure shows the slot ID numbering for the Cisco ASR 9904 Router.

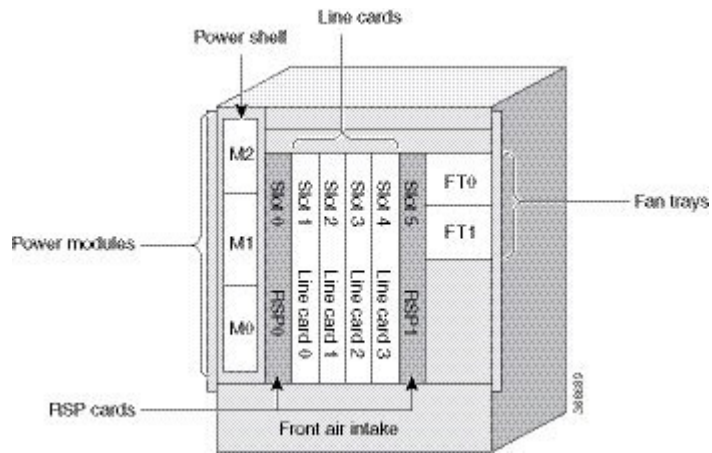
Figure 20: Cisco ASR 9904 Router Slot ID Numbering



Cisco ASR 9906 Router

The following figure shows the slot ID numbering for the Cisco ASR 9906 Router.

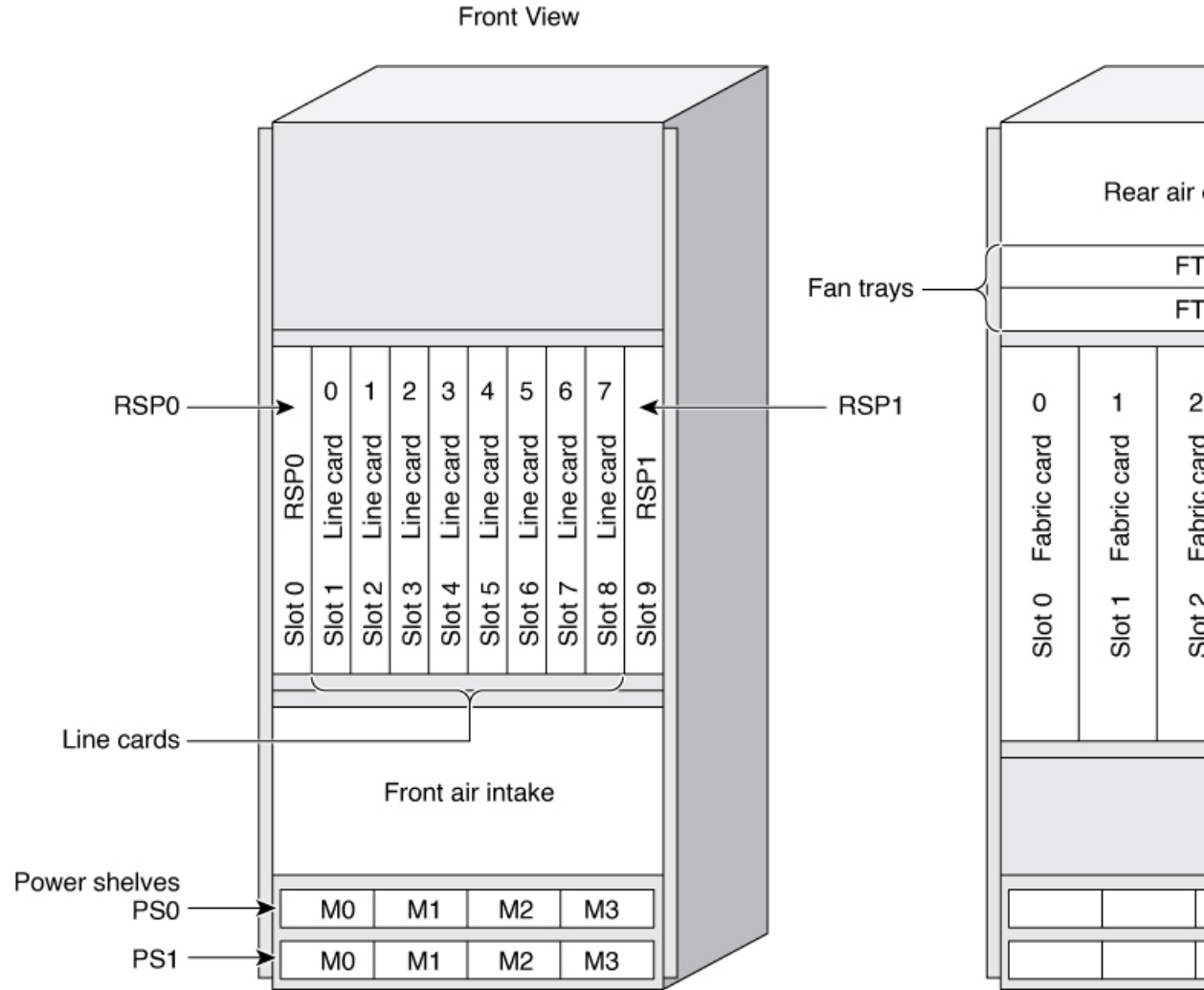
Figure 21: Cisco ASR 9906 Router Slot ID Numbering



Cisco ASR 9910 Router

The following figure shows the slot ID numbering for the Cisco ASR 9910 Router

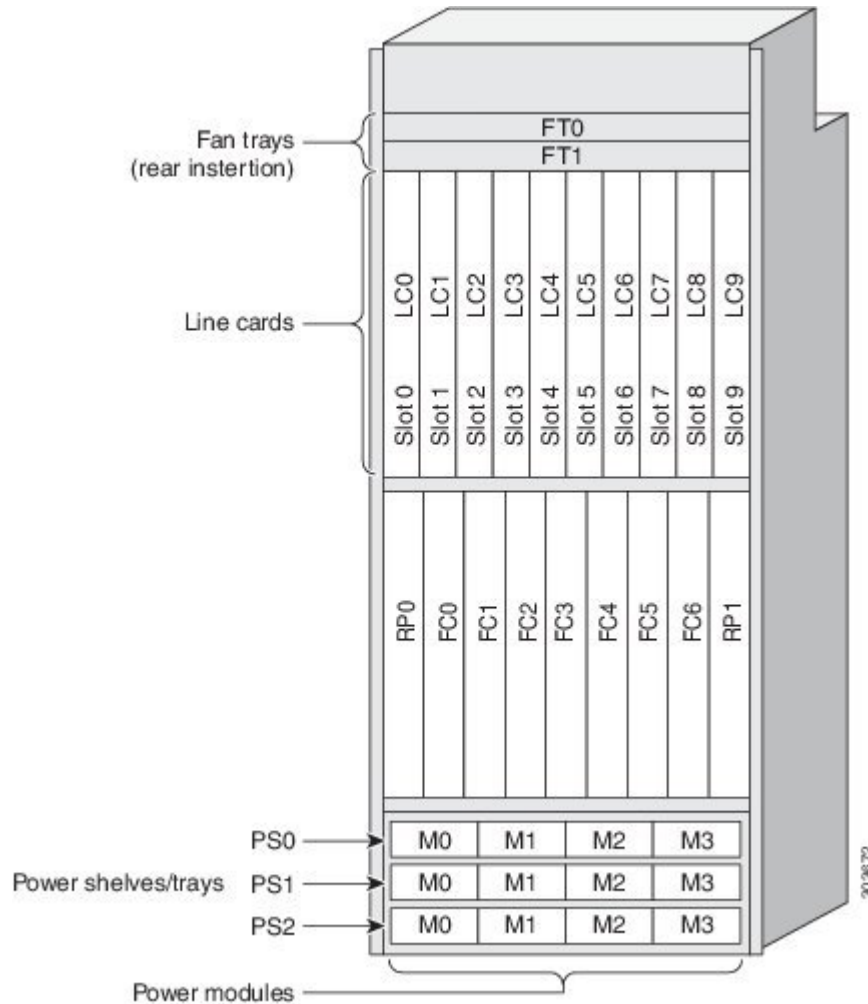
Figure 22: Cisco ASR 9910 Router Slot ID Numbering



Cisco ASR 9912 Router

The following figure shows slot numbering for the Cisco ASR 9912 Router with the DC power system. The numbering for the AC power system is the same but each tray only holds three power modules.

Figure 23: Cisco ASR 9912 Router Slot Numbering



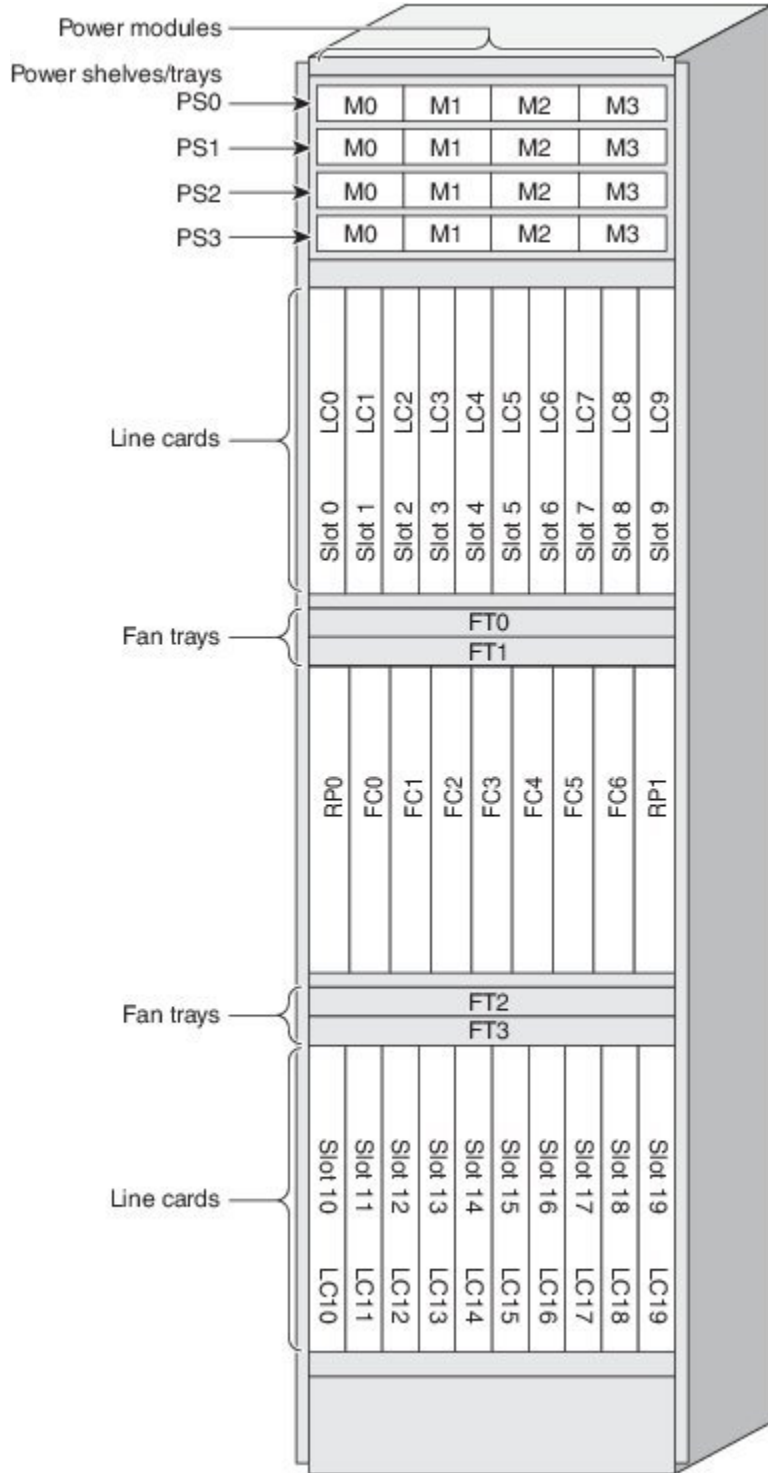
Cisco ASR 9922 Router

The following figure shows slot numbering for the Cisco ASR 9922 Router with version 2 or version 3 DC power trays. The numbering for the AC power system is the same but each tray only holds three power modules.



Note For the Cisco ASR 9922 Router, line cards must be installed upside down in slots 10 through 19 of the bottom card cage, whereas in slots 0 through 9 of the top card cage, the line cards are installed right side up.

Figure 24: Cisco ASR 9922 Router Slot Numbering



Route Switch Processor and Route Processor Cards

This section describes the Route Switch Processor (RSP) card and Route Processor (RP) card for the Cisco ASR 9000 Series Routers and includes the following sections:

Overview

The Route Switch Processor (RSP) card is the main control and switch fabric element in the Cisco ASR 9010 Router, Cisco ASR 9006 Router, Cisco ASR 9904 Router, Cisco ASR 9906 Router, and Cisco ASR 9910 Router. To provide redundancy, there can be two RSP cards in each router, one as the active control RSP and the other as the standby RSP. The standby RSP takes over all control functions if the active RSP fails.

The Route Processor (RP) card is the main control element in the Cisco ASR 9922 Router and Cisco ASR 9912 Router. The RP card provides centralized chassis control, management, and data-plane switching. To provide redundancy, there are two RP cards in each router, one as the active control RP and the other as the standby RP. The standby RP takes over all control functions should the active RP fail.

System alarms reside on the RSP. Alarms consist of visual indicators with three levels: Critical (red), Major (red), and Minor (yellow for RSP, amber for RP). There is a console interface for remote viewing of alarms and fault information.



Note The generic term RSP card refers to the RSP-440, RSP-440 Lite, RSP-880, RSP880-LT, RSP5, RSP5X and RSP4-S cards, unless otherwise specified. The generic term RP card refers to the RP card and RP2/RP3/RP3X card, unless otherwise specified.

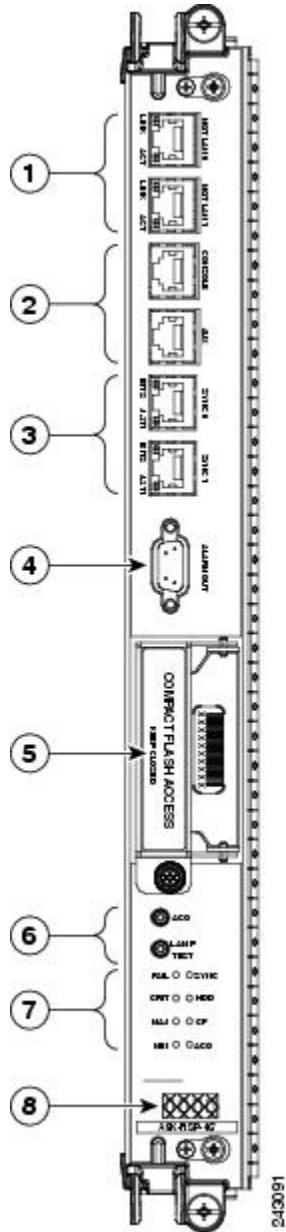
RSP Card Front Panel and Access Ports

The RSP has the following features:

- Two dual-speed 100/1000 Mbit Ethernet Management ports
- Two EIA/TIA-232 RJ232 serial RJ-45 ports—one each for Console and Auxiliary modem ports, with Manufacturing Test connections to the backplane
- Two RJ-45 Sync timing ports with Link and Fault LEDs built into the RJ-45
- Alarm Output DB9 port with three alarm outputs
- One external Compact Flash type I/II
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Eight discrete Status LED indicators
- One 4 character 5x7 LED dot matrix display and discrete status LEDs

The following figure shows the front panel and connectors of the RSP card.

Figure 25: RSP Card Front Panel Indicators and Connectors



1	Management LAN ports	5	Compact Flash type I/II
2	CONSOLE and AUX ports	6	Alarm Cutoff (ACO) and LAMP TEST p
3	SYNC (BITS/J.211) ports	7	Eight discrete LED indicators
4	Alarm Out DB9 connector	8	LED matrix display

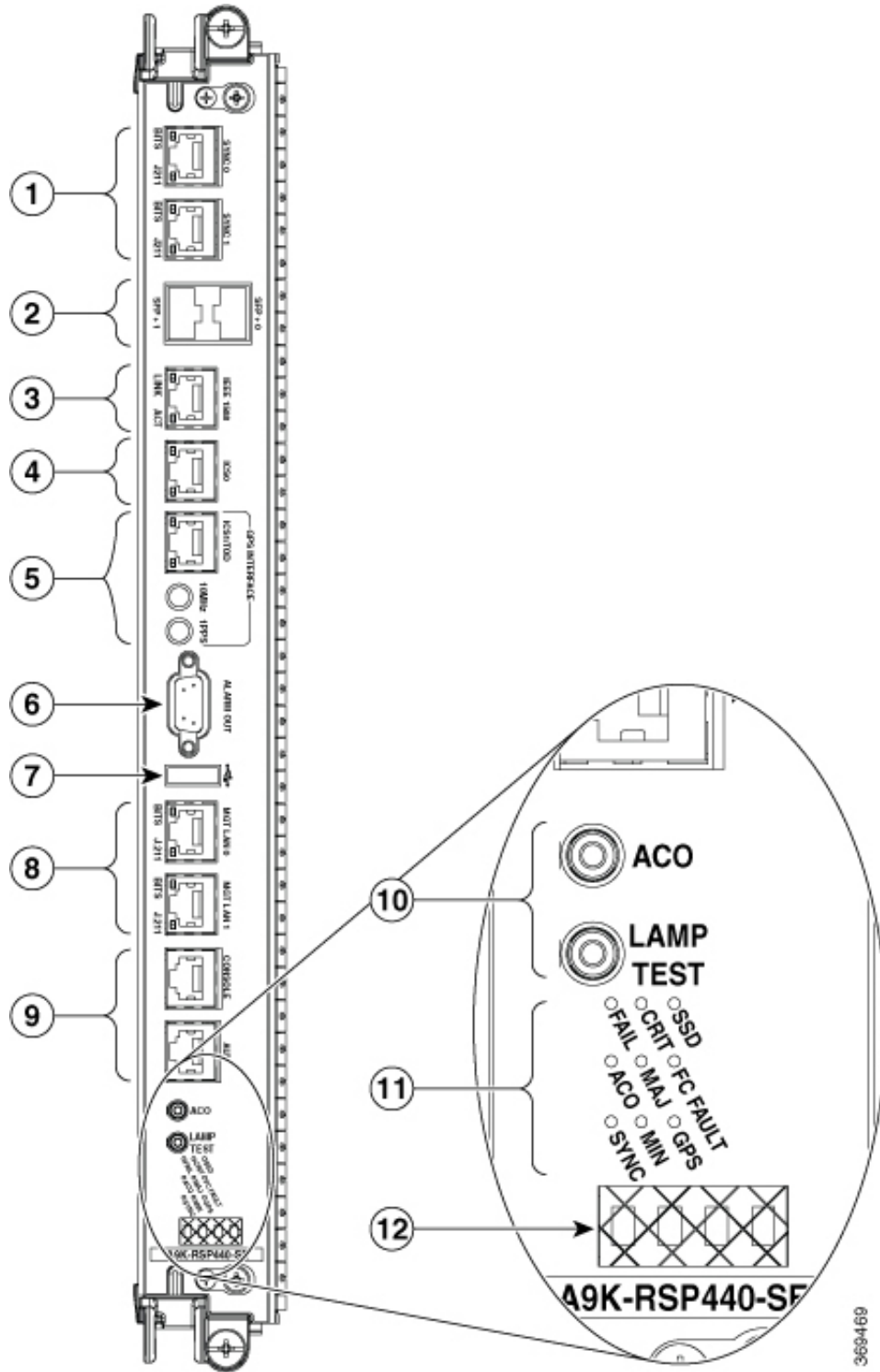
RSP-440 and RSP-440 Lite Front Panel and Access Ports

The RSP-440 and RSP-440 Lite cards have the following features:

- Two RJ-45 Sync timing ports with Link and Fault LEDs built into the RJ-45
- Two 10-GE Small Form-Factor Pluggable (SFP/SFP+) virtualization cluster ports
- IEEE1588 RJ-45 Timestamp port
- Two Inter-Chassis Sync ports—ICS1 is shared with RS232/422 GPS TOD RJ-45 port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two dual-speed 100/1000 Mbit Ethernet Management ports
- Two EIA/TIA-232 RJ232 serial RJ-45 ports—one each for Console and Auxiliary modem ports, with Manufacturing Test connections to the backplane
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display and discrete status LEDs

The following figure shows the front panel of the RSP-440 card.

Figure 26: RSP-440 Card Front Panel

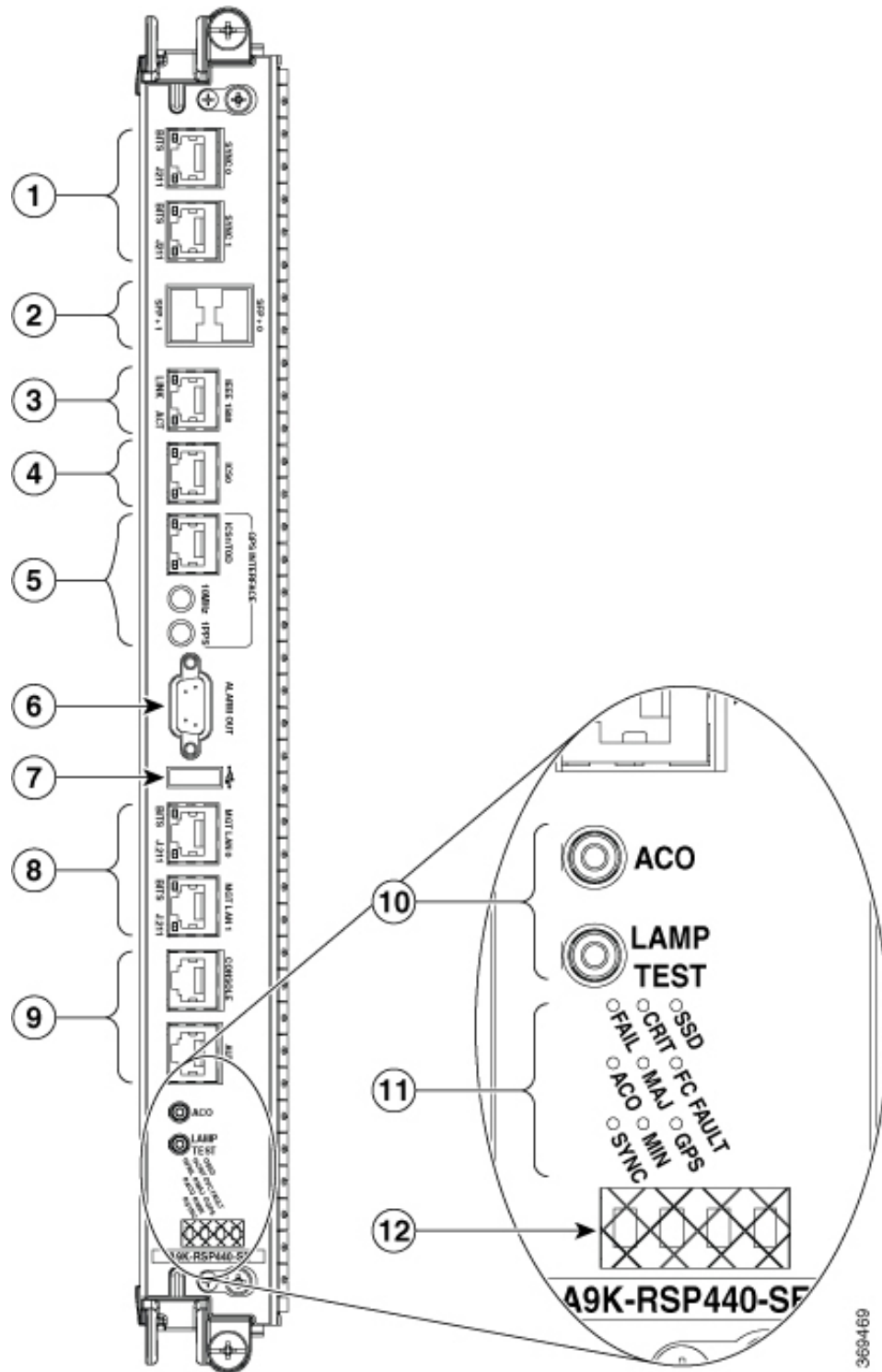


1	SYNC (BITS/J.211) ports	7	External USB port
---	-------------------------	---	-------------------

2	SFP/SFP+ ports	8	Management LAN ports
3	IEEE 1588 port	9	CONSOLE and AUX ports
4	ToD port	10	Alarm Cutoff (ACO) and LAMP TEST push
5	10 MHz and 1 PPS indicators	11	Nine discrete LED indicators
6	Alarm Out DB9 connector	12	LED matrix display

The following figure shows the front panel of the RSP-440 Lite card.

Figure 27: RSP-440 Lite Card Front Panel



1	SYNC (BITS/J.211) ports	7	External USB port
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2	SFP ports	8	Management LAN ports
3	IEEE 1588 port	9	CONSOLE and AUX ports
4	ToD port	10	Alarm Cutoff (ACO) and LAMP TEST push
5	10MHz and 1PPS indicators	11	Nine discrete Status LED indicators
6	Alarm Out DB9 connector	12	LED matrix display

RSP-880 and RSP880-LT Card Front Panel and Access Ports

The RSP-880 and RSP880-LT has the following features:

- Two RJ-45 Sync timing ports with Link and Fault LEDs built into the RJ-45
- Four 10-GE Small Form-Factor Pluggable (SFP/SFP+) virtualization cluster ports on the RSP-880

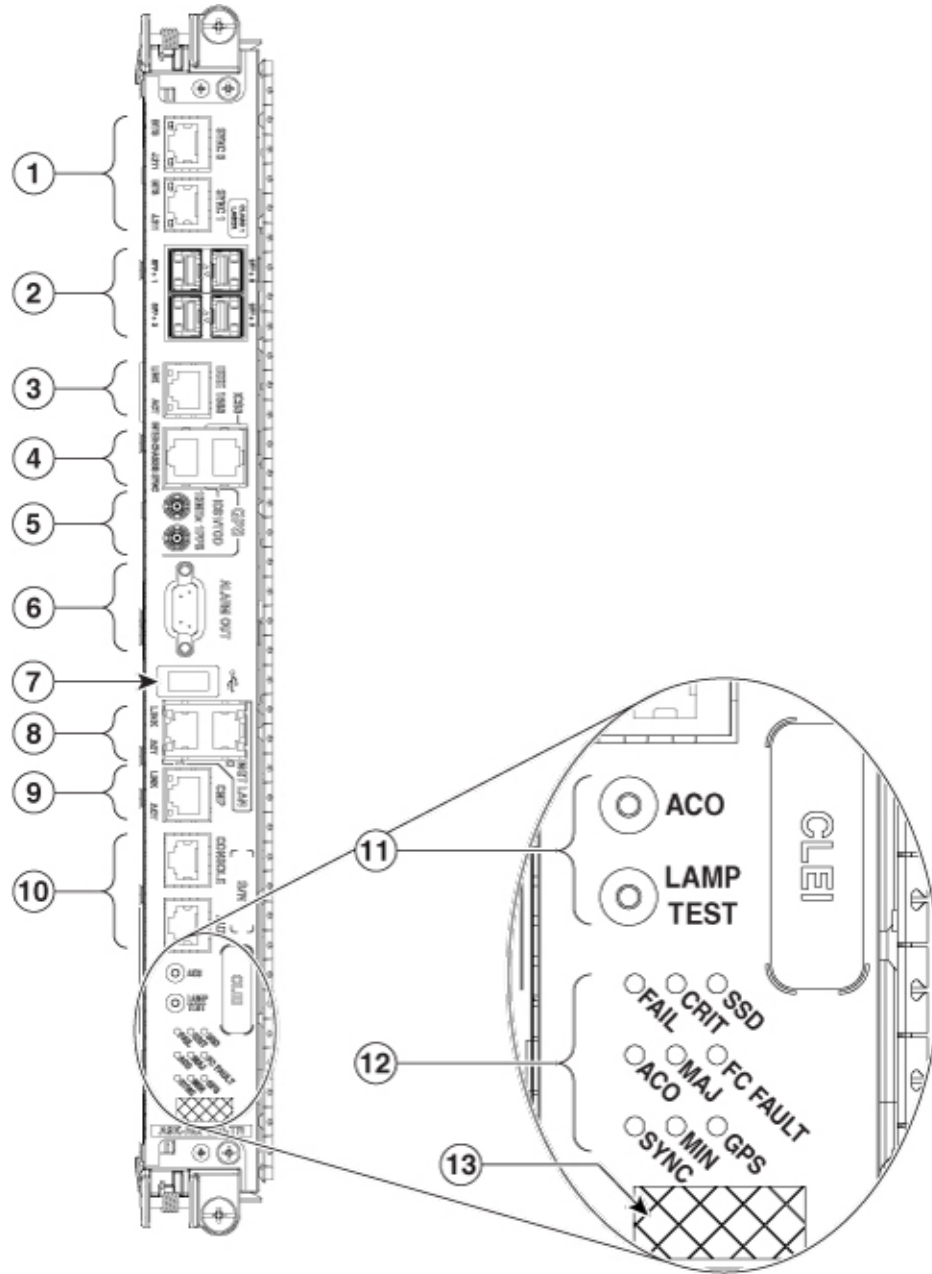


Note The RSP880-LT does not have cluster ports.

- IEEE1588 RJ-45 Timestamp port
- Two Inter-Chassis Sync ports—nVSync1 is shared with RS232/422 GPS TOD RJ-45 port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two dual-speed 100/1000 Mbit Ethernet Management ports
- One Connectivity Management Processor (CMP) port
- Two EIA/TIA-232 RJ232 serial RJ-45 ports—one each for Console and Auxiliary modem ports, with Manufacturing Test connections to the backplane
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display and discrete status LEDs

The following figure shows the front panel of the RSP-880 card.

Figure 28: RSP-880 Card Front Panel

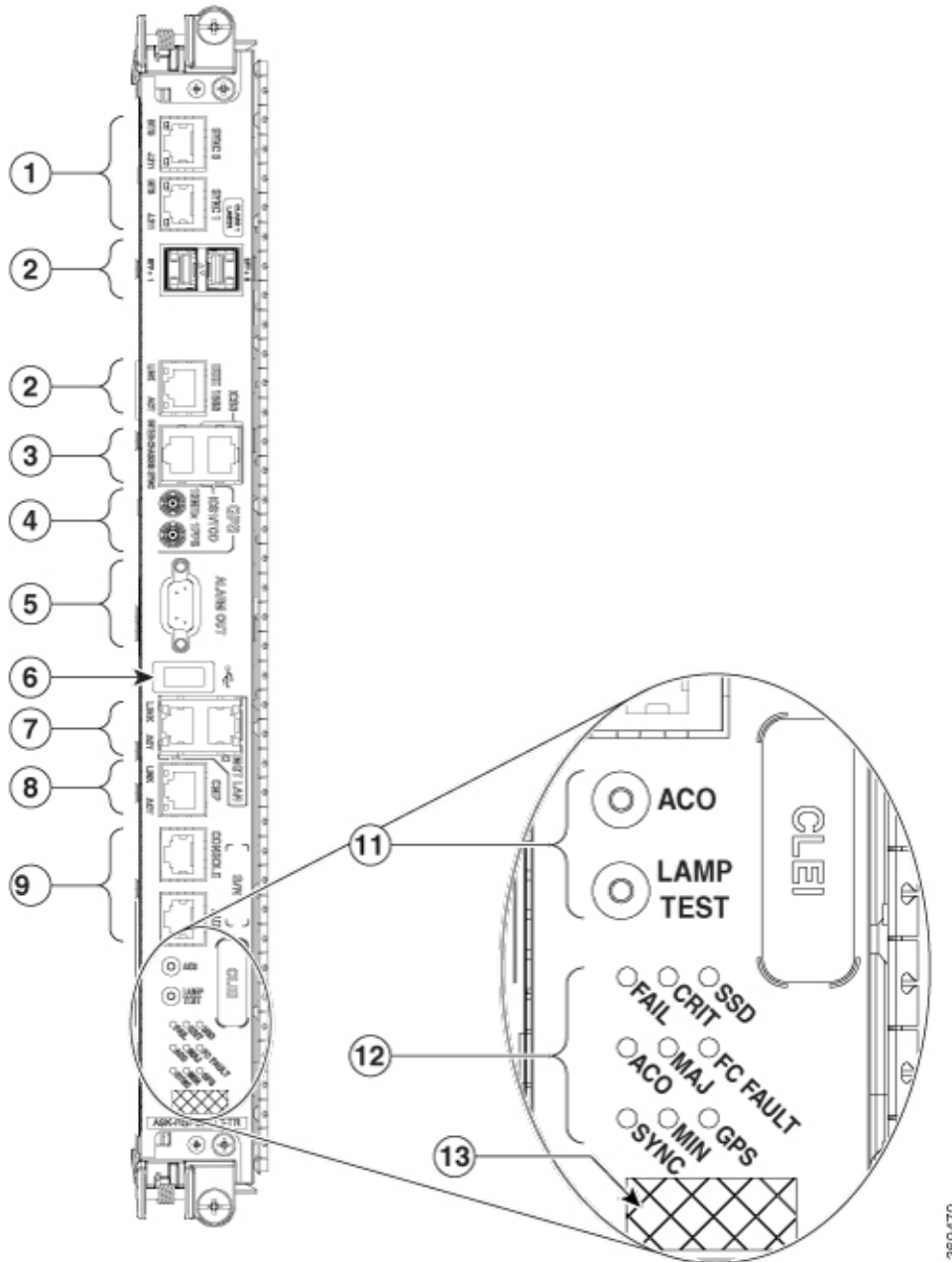


1	SYNC (BITS/J.211) ports	8	Management LAN ports
2	SFP/SFP+ ports	9	CMP port
3	Service LAN port	10	Console and Auxiliary (AUX) ports
4	Inter Chassis Sync ports and ToD port	11	Alarm Cutoff (ACO) and Lamp Test push
5	10 MHz and 1 PPS indicators	12	Nine discrete LED indicators

6	Alarm Out DB9 connector	13	LED matrix display
7	External USB port		

The following figure shows the front panel of the RSP880-LT card.

Figure 29: RSP880-LT Card Front Panel



1	SYNC (BITS/J.211) ports	7	Management LAN ports
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2	Service LAN port	8	CMP port
3	Inter Chassis Sync ports and ToD port	9	Console and Auxiliary (AUX) ports
4	10 MHz and 1 PPS indicators	10	Alarm Cutoff (ACO) and Lamp Test push
5	Alarm Out DB9 connector	11	Nine discrete LED indicators
6	External USB port	12	LED matrix display

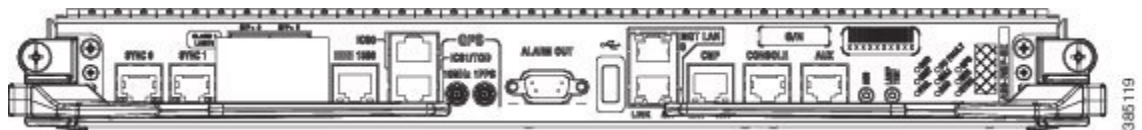
RSP4-S Card Front Panel and Access Ports

The RSP4-S has the following features:

- Two RJ-45 Sync timing ports with Link and Fault LEDs built into the RJ-45
- Four 10-GE Small Form-Factor Pluggable (SFP/SFP+) virtualization cluster ports
- IEEE1588 RJ-45 Timestamp port
- Two Inter-Chassis Sync ports—nVSync1 is shared with RS232/422 GPS TOD RJ-45 port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two dual-speed 100/1000 Mbit Ethernet Management ports
- One Connectivity Management Processor (CMP) port
- Two EIA/TIA-232 RJ232 serial RJ-45 ports—one each for Console and Auxiliary modem ports, with Manufacturing Test connections to the backplane
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display and discrete status LEDs

The following figure shows the front panel of the RSP4-S card.

Figure 30: RSP4-S Card Front Panel



RSP5 Card Front Panel and Access Ports

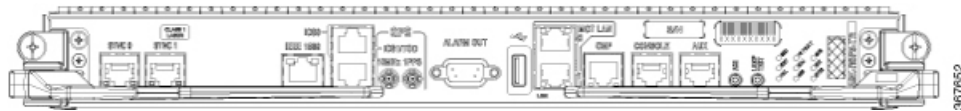
The RSP5 has the following features:

- Two RJ-45 Sync timing ports with Link and Fault LEDs built into the RJ-45

- IEEE1588 RJ-45 Timestamp port
- Two Inter-Chassis Sync ports—nVSync1 is shared with RS232/422 GPS TOD RJ-45 port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two dual-speed 100/1000 Mbit Ethernet Management ports
- One Connectivity Management Processor (CMP) port
- Two EIA/TIA-232 RJ232 serial RJ-45 ports—one each for Console and Auxiliary modem ports, with Manufacturing Test connections to the backplane
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons, which can be used to eject the RSP5 card.
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display and discrete status LEDs

The following figure shows the front panel of the RSP5 card.

Figure 31: RSP5 Card Front Panel



RSP5-X Card Front Panel and Access Ports

Table 2: Feature History Table

Hardware	Release Information	Description
RSP5-X Route Switch Processor	Release 7.6.2	<p>This release introduces the following 5th generation Route Switch Processor RSP5-X cards:</p> <ul style="list-style-type: none"> • A9K-RSP5-X-TR • A9K-RSP5-X-SE <p>RSP5-X card functions as the main control, switch fabric and timing synchronization entity for the following routers:</p> <ul style="list-style-type: none"> • ASR 9006 • ASR 9010 • ASR 9904 • ASR 9906 • ASR 9910 <p>RSP5-X is the first RSP to support Class-C timing performance and is backward compatible with RSP5, it also supports Cisco Secure Boot and can operate with 25% lower power consumption over RSP5.</p> <p>For information regarding the migration procedure, see Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide.</p>

The RSP5-X card has the following features:

- Two RJ-45 SYNC (BITS) ports with Link and Fault LEDs built into the RJ-45
- One 10-GbE Small Form-Factor Pluggable (SFP/SFP+) port
- RS-422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS input and output DIN ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two 100/1000 Mbit Ethernet Management LAN ports

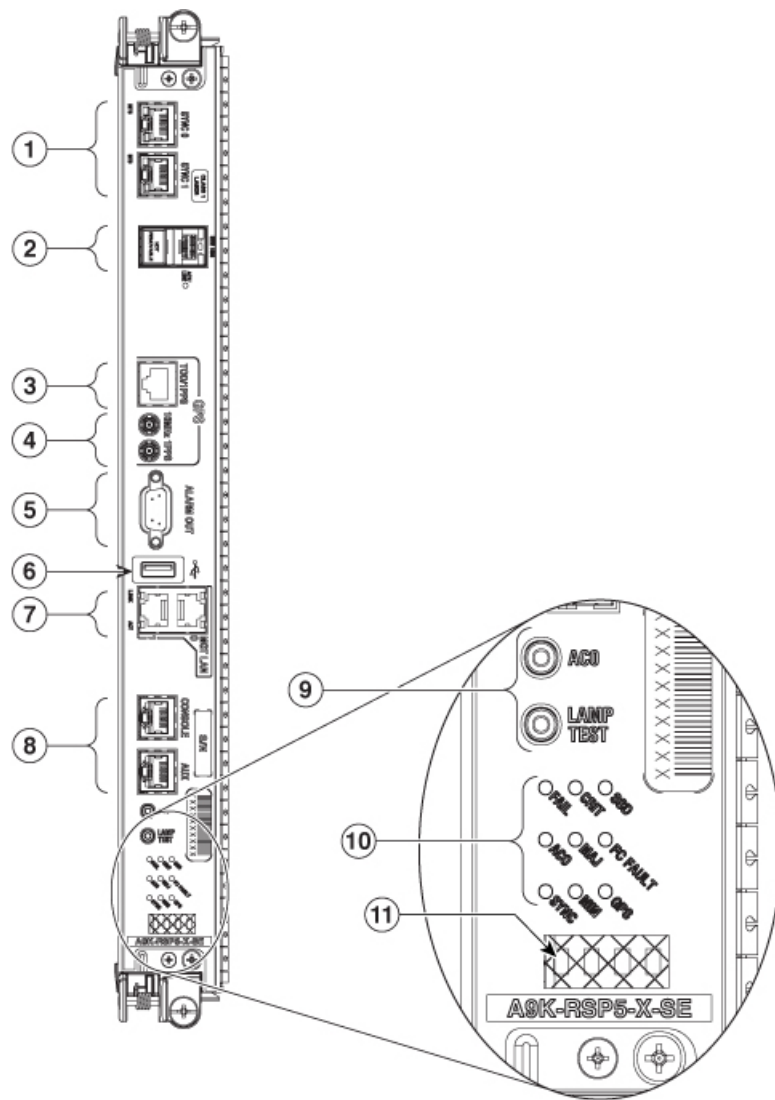
- Two EIA/TIA-232 RS-232 serial RJ-45 ports - one each for Console and Auxiliary modem ports
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display



Note 10-GbE SFP/SFP+ port is not supported with the IOS XR release 7.6.2.

The following figure shows the front panel of the RSP5-X card.

Figure 32: RSP5-X Card Front Panel



1	SYNC (BITS) ports	7	Management LAN ports
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2	SFP/SFP+ port	8	CONSOLE and AUX ports
3	ToD port	9	Alarm Cutoff (ACO) and LAMP TEST p
4	10 MHz and 1 PPS ports	10	Nine discrete LED indicators
5	Alarm Out DB9 connector	11	LED matrix display
6	External USB port		

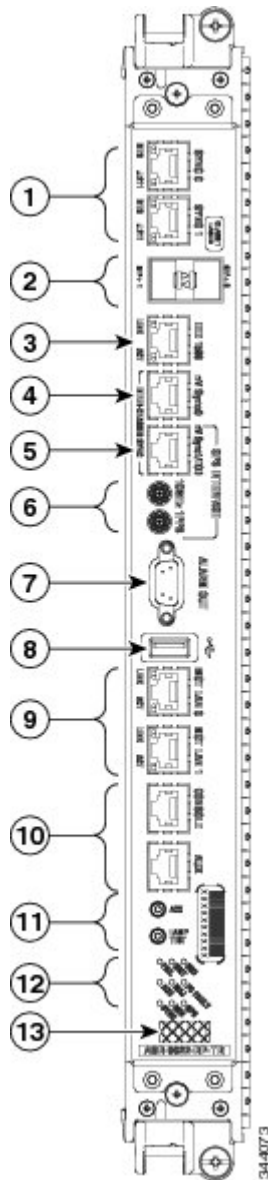
RP Card and RP2 Card Front Panel and Access Ports

The RP and RP2 front panel has the following information and alarm LEDs and connectors:

- Two BITS RJ-45 Sync timing ports
- Two 10 GE SFP/SFP+ ports
- IEEE1588 RJ-45 Timestamp port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two RJ-45 100/1000 Mbit Ethernet Management ports
- One Connectivity Management Processor (CMP) port (RP2 card only)
- RJ-45 Console port
- RJ-45 Auxiliary (AUX) port
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- RP Discrete Status LEDs
 - SSD LED
 - FC Fault LED
 - GPS LED
 - Critical Alarm LED (red)
 - Major Alarm LED (red)
 - Minor Alarm LED (amber)
 - Power Fail LED
 - ACO LED (amber)
 - SYNC LED (green and amber)
- One 4-character 5x7 LED dot-matrix display

The following figure shows the front panel of the RP card.

Figure 33: RP Card Front Panel

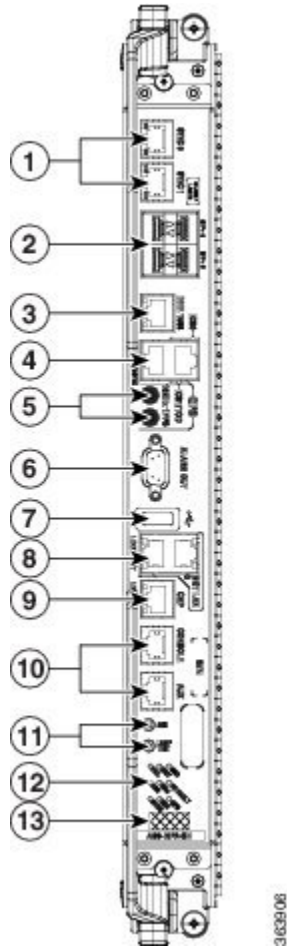


1	SYNC (BITS/J.211) ports	8	External USB port
2	SFP/SFP+ ports	9	Management LAN ports
3	IEEE 1588 port	10	CONSOLE and AUX ports
4	Inter-chassis nv Sync0	11	Alarm Cutoff (ACO) and Lamp Test push buttons
5	Inter-chassis nv Sync1 GPS ToD	12	Nine discrete LED indicators
6	10 MHz and 1 PPS indicators	13	LED matrix display

7	Alarm Out DB9 connector		
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The following figure shows the front panel of the RP2 card.

Figure 34: RP2 Card Front Panel



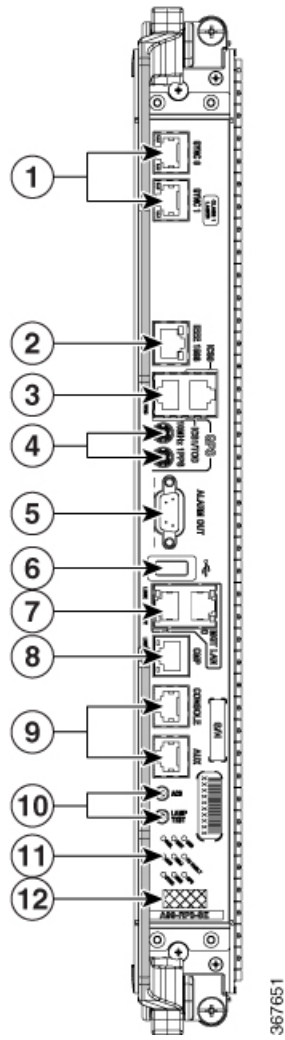
1	SYNC (BITS/J.211) ports	8	Management LAN ports
2	SFP/SFP+ ports	9	CMP Port
3	IEEE 1588 port	10	CONSOLE and AUX ports
4	Inter-chassis nv Sync0 and 1	11	Alarm Cutoff (ACO) and Lamp Test push
5	10 MHz and 1 PPS indicators	12	Nine discrete Status LED indicators
6	Alarm Out DB9 connector	13	LED matrix display
7	External USB port		

RP3 Card Front Panel and Access Ports

The RP3 front panel has the following information and alarm LEDs and connectors:

- Two BITS RJ-45 Sync timing ports
- IEEE1588 RJ-45 Timestamp port
- RS232/422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS clock input SMB ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two RJ-45 100/1000 Mbit Ethernet Management ports
- One Connectivity Management Processor (CMP) port (RP2 card only)
- RJ-45 Console port
- RJ-45 Auxiliary (AUX) port
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- RP Discrete Status LEDs
 - SSD LED
 - FC Fault LED
 - GPS LED
 - Critical Alarm LED (red)
 - Major Alarm LED (red)
 - Minor Alarm LED (amber)
 - Power Fail LED
 - ACO LED (amber)
 - SYNC LED (green and amber)
- One 4-character 5x7 LED dot-matrix display

The following figure shows the front panel of the RP3 card.



1	SYNC (BITS/J.211) ports	7	Management LAN ports
2	IEEE 1588 port	8	CMP Port
3	Inter-chassis nv Sync0 and 1	9	CONSOLE and AUX ports
4	10 MHz and 1 PPS indicators	10	Alarm Cutoff (ACO) and Lamp Test push
5	Alarm Out DB9 connector	11	Nine discrete Status LED indicators
6	External USB port	12	LED matrix display

RP3-X Card Front Panel and Access Ports

Hardware	Release Information	Description
RP3-X Route Processor	Release 7.6.2	<p>This release introduces the following 3rd generation Route Processor RP3-X cards:</p> <ul style="list-style-type: none"> • A99-RP3-X-TR • A99-RP3-X-SE <p>RP3-X card functions as the main control and timing synchronization entity for the following routers:</p> <ul style="list-style-type: none"> • ASR 9912 • ASR 9922 <p>RP3-X is the first RP to support Class-C timing performance and is backward compatible with RP3, it also supports Cisco Secure Boot and can operate with 20% lower power consumption over RP3.</p> <p>For information regarding the migration procedure, see Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide.</p>

The RP3-X front panel has the following information and alarm LEDs and connectors:

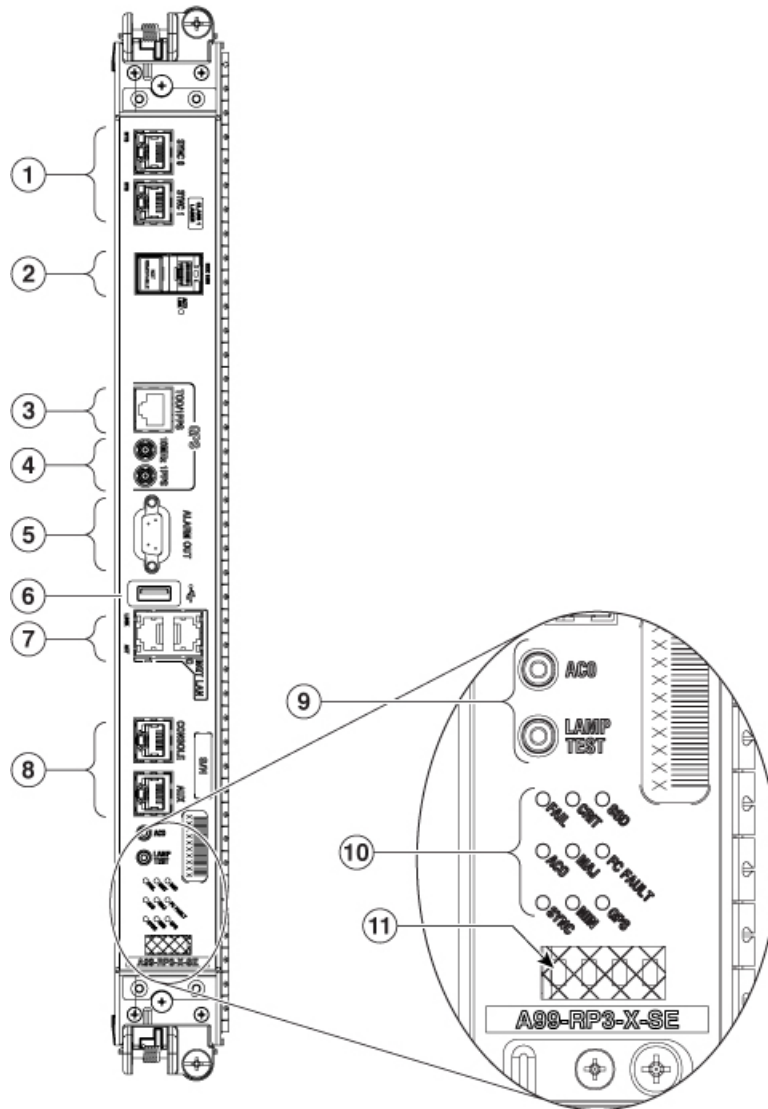
- Two RJ-45 SYNC (BITS) ports with Link and Fault LEDs built into the RJ-45
- One 10-GbE Small Form-Factor Pluggable (SFP/SFP+) port
- RS-422 GPS TOD RJ-45 port for system timing input
- 10 MHz and 1 PPS input and output DIN ports
- Alarm Output DB9 port with three alarm outputs
- External USB2, class-A port
- Two 100/1000 Mbit Ethernet Management LAN ports
- Two EIA/TIA-232 RS-232 serial RJ-45 ports - one each for Console and Auxiliary modem ports
- Alarm Cut Off (ACO) and Lamp Test momentary push buttons
- Nine discrete Status LED indicators
- One four-character 5x7 LED dot matrix display



Note 10-GbE SFP/SFP+ port is not supported with the IOS XR release 7.6.2.

The following figure shows the front panel of the RP3-X card.

Figure 35: RP3-X Card Front Panel



1	SYNC (BITS) ports	7	Management LAN ports
2	SFP/SFP+ port	8	CONSOLE and AUX ports
3	ToD port	9	Alarm Cutoff (ACO) and LAMP TEST p
4	10 MHz and 1 PPS ports	10	Nine discrete LED indicators

5	Alarm Out DB9 connector	11	LED matrix display
6	External USB port		

RSP and RP Front Panel Connectors

Management Ports

Two dual-speed management LAN ports (MGT LAN 0, MGT LAN 1) are triple-speed RJ-45 connectors for use as out-of-band management ports. The speed of the management LAN is auto-negotiated.



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

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

Auxiliary (AUX) Port and Console Port

An RJ-45 Auxiliary (AUX) port and RJ-45 Console port are EIA/TIA-232 (also known as RS-232) asynchronous serial ports for connecting external devices to monitor and manage the system.

The console port provides a Data Circuit-Terminating Equipment (DCE) interface for connecting a console terminal. The default port settings are:

- For RP2 and RSP4, the console settings are baud rate 9600 bps, no parity, 1 stop bits and 8 data bits
- For RP3 and RSP5, the console settings are baud rate 115200 bps, no parity, 1 stop bits and 8 data bits.

For chassis with RSP4, RP2 cards, the console settings are baud rate 9600 bps, no parity, 1 stop bits and 8 data bits. The user can change this baud rate. For next generation RP3, RSP5 cards, the console settings are baud rate 115200 bps, no parity, 1 stop bits and 8 data bits, the default baud rate can't be changed for RP3 and RSP5.

The auxiliary port provides a data circuit-terminating equipment (DCE) interface that supports flow control. Use this port to connect a modem, a channel service unit (CSU), or other optional equipment for Telnet management. This port defaults to 9600 Baud, 8 data, no parity, 1 stop bit with software handshake.

Synchronization Ports

The RSP/RP card front panel also has a two synchronization (SYNC) timing ports that can be configured as BITS or J.211 ports. These ports provide connections for external timing and synchronization sources

The SYNC 0 and SYNC 1 ports are timing ports that can be configured as Building Integrated Timing System (BITS) ports. A BITS port provides a connection for an external synchronization source to establish precise frequency control at multiple network nodes, if required for your application. The RSP/RP card contains a Synchronous Equipment Timing Source (SETS) that can receive a frequency reference from an external BITS timing interface or from a clock signal recovered from any incoming interface, such as a Gigabit Ethernet,

10-Gigabit Ethernet, or SONET interface. The RSP/RP SETS circuit filters the received timing signal and uses it to drive an outgoing Ethernet interface or BITS output port.

The timing port(s) can also be configured as J.211 or DTI ports. A DOCSIS Timing Interface (DTI) port is used to connect to an external DTI server to synchronize timing and frequency across multiple routers. The timing function allows precise synchronization of real-time clocks in a network for measurements of network performance, for example, measuring delay across a VPN. The frequency reference acts like a BITS input.

Alarm Connector

Each RSP/RP card drives a set of three alarm output contacts. Alarm circuitry on the RSP/RP activates dry contact closures that are accessible through the nine-pin Alarm Out connector on the RSP/RP front panel. Each RSP/RP card drives a set of three alarm output contacts. Both normally-open and normally-closed contacts are available.

Only the active RSP/RP drives the alarm outputs. Should a switchover to the standby RSP/RP occur, the newly active RSP/RP drives the alarm outputs.

SFP/SFP+ Port

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

GPS Interface

The RSP-440, RSP-440 Lite, RSP880-LT, and RSP-880 have a Time of Day (ToD) port, 10-MHz connector, and 1-PPS connector that allow you to configure input or output clocking with a GPS device.

Inter Chassis Synchronization Port

The nV Sync 0 and nV Sync 1 ports on the RSP-440, RSP-440 Lite, RSP880-LT, and RSP-880 are the RJ-45 inter-chassis synchronization clock interfaces for synchronizing frequency and time.

CMP Port

The Connectivity Management Processor (CMP) on the RSP-880 card, RSP880-LT, and RP2 card is a secondary, lightweight processor that provides a second network interface to the system. Each CMP contains its own RAM, bootflash, and front panel management Ethernet port.

The CMP port provides the following functions:

- RSP-880, RSP880-LT, and RP2 ROMMON console access through the CMP port. This eliminates the need to use external terminal servers.
- SSH/telnet into a designated CMP port.

USB Port

The RSP-440, RSP-440 Lite, RSP-880, RSP880-LT, and RP cards have a single external Universal Serial Bus (USB) port. A USB flash memory device can be inserted to load and transfer software images and files. This memory device can be used to turboboot the system or as the installation source for Package Information Envelopes (PIE) and Software Maintenance Upgrades (SMU). This memory device can also be used for users' data files, core files, and configuration backups.

Push Buttons

Two push buttons are provided on the RSP/RP card front panel.

- Alarm Cutoff (ACO)—ACO activation suppresses alarm outputs. When the ACO button is pushed while critical alarms are active, the ACO LED turns on, and the corresponding alarm output contacts revert to the normally open (non-alarm) state, thus suppressing the alarm. If subsequent critical alarms are detected and activated after the ACO activation, the ACO function is deactivated to notify the user of the arrival of the new alarm(s). In this case, the ACO LED will turn off and any active alarms are again indicated by driving their alarm output contacts to the alarm state.
- Lamp Test—When the Lamp Test button is pushed, the RSP/RP status LED, line card status and port LEDs, and Fan Tray LEDs light until the button is released. The LED matrix display is not affected.

RSP and RP Front Panel Indicators

The RSP card has eight discrete LED indicators and an LED dot-matrix display for system information. The RSP-440, RSP-440 Lite, RSP880-LT, RSP5 and RSP-880 have nine discrete LED indicators, a LED dot-matrix display for system information, and three USB-specific LEDs. The RP has nine discrete LED indicators and a LED dot-matrix display for system information.

The following table lists the display definitions of the discrete LEDs on the various RSP front panels and the three USB LEDs on the RSP-440, RSP-440 Lite, RSP5, and RSP-880.

Table 3: RSP, RSP-440, RSP-440 Lite, RSP-880, RSP880-LT, RSP4-S, RSP5 Discrete LED Display Definitions

Indicator (Label)	Color	Description
Power Fail (FAIL)	Red	Standby Power Fail LED. The LED is turned off by the CAN bus controller after it is up and running.
	Off	Standby power is normal.
Critical Alarm (CRIT)	Red	Critical Alarm LED. A critical alarm has occurred.
	Off (Default after reset)	No critical alarm has occurred.
Major Alarm (MAJ)	Red	Major alarm LED. A major alarm has occurred.
	Off (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Amber	Minor alarm LED. A minor alarm has occurred.
	Off (Default after reset)	No minor alarm has occurred.
Synchronization (SYNC)	Green	System timing is synchronized to an external timing source.
	Amber	System timing is free running.
	Off	No system timing is configured.
Alarm Cutoff (ACO)	Amber	Alarm Cutoff has been enabled. The ACO push button was pressed after at least one alarm has occurred.
	Off (Default after reset)	Alarm Cutoff is not enabled.

Indicator (Label)	Color	Description
Internal Hard Disk Drive (HDD) [RSP only]	Green	Hard Disk Drive is busy/active. The LED is driven by the SAS controller.
	Off (Default after reset)	Hard Disk Drive is not busy/active
External Compact Flash (CF) [RSP only]	Green	Compact Flash is busy/active.
	Off (Default after reset)	Compact Flash is not busy/active.
Internal Solid State Hard Disk Drive (SSD) RSP-440/RSP-440 Lite, RSP-880/RSP880-LT,RSP5	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD/SAS controller.
	Off (Default after reset)	Internal Solid State Hard Disk Drive is not busy/active.
GPS RSP-440/RSP-440 Lite, RSP-880/RSP880-LT, RSP5	Green	GPS interface provisioned and ports are turned on. ToD, 1 PPS, 10 Mhz are all valid.
	Off(Default after reset)	Either the interface is not provisioned, or the ports are not turned on. ToD, 1 PPS, 10 Mhz are not valid.
External USB 2.0 RSP-440/RSP-440 Lite, RSP-880/RSP880-LT, RSP5	Green	External USB is busy/active.
	Off (Default after reset)	External USB is not busy/active.
Internal USB 2.0 A RSP-440/RSP-440 Lite, RSP-880/RSP880-LT, RSP5	Green	Internal USB is busy/active.
	Off (Default after reset)	Internal USB is not busy/active.
Internal USB 2.0 B RSP-440/RSP-440 Lite, RSP-880/RSP880-LT, RSP5	Green	Internal USB is busy/active.
	Off (Default after reset)	Internal USB is not busy/active.

The following table lists the display definitions of the nine discrete LEDs on the RP front panel.

Table 4: RP and RP2/RP3 Discrete LED Display Definitions

Indicator (Label)	Color	Description
Power Fail (FAIL)	Red (Default after power on)	Standby Power Fail LED. The LED is turned off by the CAN bus controller after it is up and running.
	Off	Standby power is normal.
Critical Alarm (CRIT)	Red	Critical Alarm LED. A critical alarm has occurred.
	Off (Default after reset)	No critical alarm has occurred.

Indicator (Label)	Color	Description
Major Alarm (MAJ)	Red	Major alarm LED. A major alarm has occurred.
	Off (Default after reset)	No major alarm has occurred.
Minor Alarm (MIN)	Amber	Minor alarm LED. A minor alarm has occurred.
	Off (Default after reset)	No minor alarm has occurred.
Alarm Cutoff (ACO)	Amber	Alarm Cutoff has been enabled. The ACO push button was pressed after at least one alarm has occurred.
	Off (Default after reset)	Alarm Cutoff is not enabled.
Synchronization (SYNC)	Green	System timing is synchronized to an external timing source including IEEE 1588.
	Amber	System timing is free running.
	Off (Default after reset)	LED never turns off.
Internal Solid State Hard Disk Drive (SSD)	Green	Internal Solid State Hard Disk Drive (SSD0) is busy/active. The LED is driven by the SSD controller.
	Off (Default after reset)	Internal Solid State Hard Disk Drive is not busy/active.
FC Fault	Amber	A fault has occurred on any or all of the FC cards installed. This LED will be on during the boot phase of the FC.
	Off (Default after reset)	FC cards are booted up and ready.
GPS	Green	GPS interface provisioned and ports are turned on. ToD, 1 PPS, 10 Mhz are all valid.
	Off (Default after reset)	Either the interface is not provisioned, or the ports are not turned on. ToD, 1 PPS, and 10 Mhz are not valid.

LED Matrix Display

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

LED Matrix Boot Stage and Runtime Display

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

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

Table 5: (Cisco IOS XR 32-Bit Software) RSP-440, RSP-440 Lite, RSP-880, RSP880-LT, RSP4-S, RP/RP2 LED Matrix Boot Stages and Runtime Displays

LED Matrix Display	Description
INIT	Card is inserted and microcontroller is initialized.
BOOT	Card is powered on and CPU is booting.
IMEM	Starting initialization of memory.
IGEN	Starting initialization of card.
ICBC	Initializing communication with the microcontroller.
SCPI	Board is not plugged in properly.
STID	CBC was unable to read slot ID pins correctly.
PSEQ	CBC detected power sequencer failure.
DBPO	CBC detected an issue during board power up.
KPWR	CBC detected an issue during board power up.
LGNP	CBC detected an issue during board power up.
LGNI	CBC detected an issue during board power up.
IPNP (RSP-880/RSP880-LT/RP2 only)	CBC detected an issue during board power up.
IPNI (RSP-880/RSP880-LT/RP2 only)	CBC detected an issue during board power up.
RMN	All tests finished and ROMMON is ready for commands.
LOAD	Downloading Minimum Boot Image (MBI) image to CPU.
RRST	ROMMON rebooting board after MBI validation timeout.
MVB	ROMMON trying MBI validation boot.
MBI	Starting execution of MBI.
IOXR	Cisco IOS XR Software is starting execution.
LDG	The RSP/RP is loading (MBI started and card preparing for activity).
INCP	The software or configuration is incompatible with the RSP/RP.
OOSM	The RSP/RP is in Out of Service, Maintenance mode.
ACT	The RSP/RP is active (IOS-XR completely up and ready for traffic)

LED Matrix Display	Description
STBY	The RSP/RP is standby (IOS-XR completely up and ready)
AUTH	The RSP-880/RSP880-LT card or RP2 card failed anti-counterfeiting authentication and rebooted. If authentication continues to fail, the card will be in a continuous reboot loop.

Table 6: (Cisco IOS XR 64-Bit Software) RP2/RP3, RSP880, RSP4-Lite, RSP4-S, RSP5 LED Matrix Boot Stages and Runtime Displays

LED Matrix Display	Description
INIT	Card is inserted and microcontroller is initialized.
BOOT	Card is powered on and CPU is booting.
IMEM	Starting initialization of memory.
IGEN	Starting initialization of card.
ICBC	Initializing communication with the microcontroller.
SCPI	Board is not plugged in properly.
STID	CBC was unable to read slot ID pins correctly.
PSEQ	CBC detected power sequencer failure.
DBPO	CBC detected an issue during board power up.
KPWR	CBC detected an issue during board power up.
LGNP	CBC detected an issue during board power up.
LGNI	CBC detected an issue during board power up.
IPNP (RSP-880/RSP880-LT/RSP5/RP2/RP3 only)	CBC detected an issue during board power up.
IPNI (RSP-880/RSP880-LT/RSP5/RP2/RP3 only)	CBC detected an issue during board power up.
AUTH	The RSP-880/RSP880-LT/RSP5 card or RP2/RP3 card failed anti-counterfeiting authentication and rebooted. If authentication continues to fail, the card will be in a continuous reboot loop.
OPER	The RP admin plane is up and operational
LOCK	The RP is either upgrading an FPD on a local board or on a non-CPU based board. Reload cannot be executed during this time.
OFF	RP is currently shutdown.

LED Matrix Display	Description
EJCT	RP Ejector button pressed (applicable to RSP5).
SINI	RP admin plane software init state. This would be seen just before the admin plane goes OPERATIONAL.
PXE	RP is pxe booting image.
DISK	RP is booting image from disk.

LED Matrix CAN Bus Controller Error Display

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

Table 7: RSP LED Matrix CAN Bus Controller Status Display

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

RSP and RP Card Ejector Levers

Ejector levers are provided for inserting and removing the RSP/RP cards. The insertion and removal force of the card ejector levers is about 16 lbs (7.27 kg). Longer ejector levers are provided for the RSP/RP cards than for the line cards due to the higher pin count of the RSP/RP card.

Serviceability

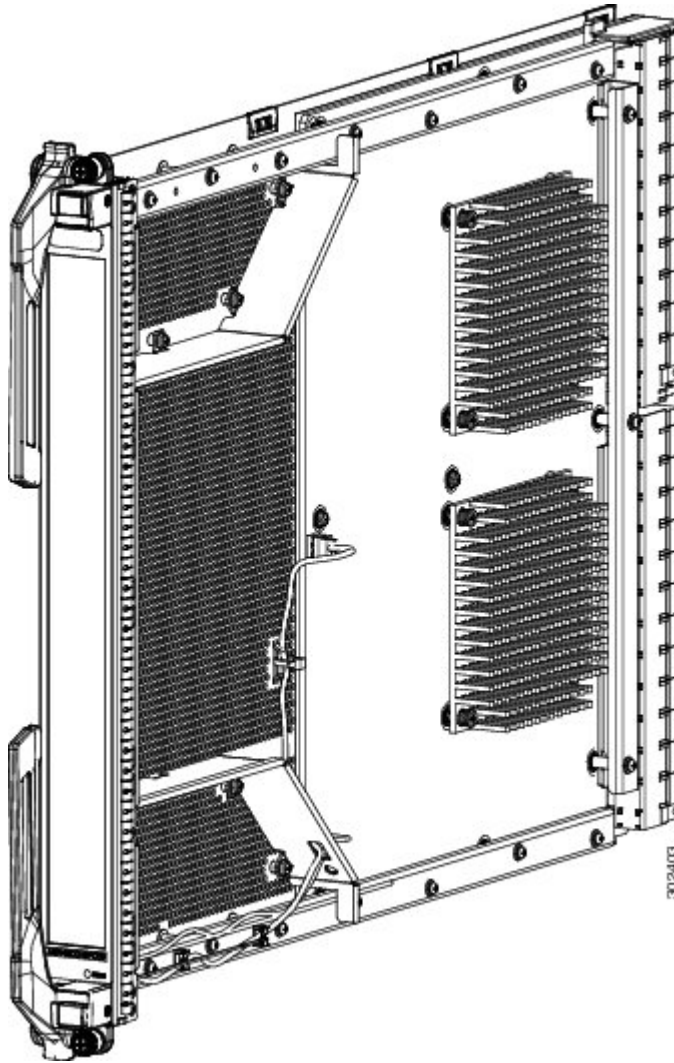
RSP/RP cards can be inserted or removed when adjacent (cabled) RSP/RP or line cards are installed. Compact Flash is serviceable without the need to remove the RSP card. Servicing the hard drive requires removal of the RSP/RP card.

Fabric Controller Card

On the Cisco ASR 9906 Router, Cisco ASR 9910 Router, Cisco ASR 9922 Router and Cisco ASR 9912 Router, the switch fabric resides on the FC cards.

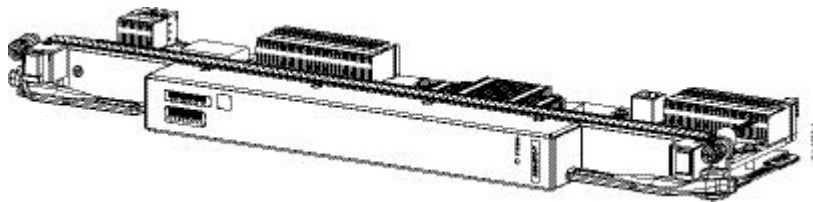
The following figure shows the FC card. The FC2/A99-SFC3 card is similar.

Figure 36: FC Card



The following figure shows the SFC-T card (for the ASR 9906).
A99-SFC3-T card is similar.

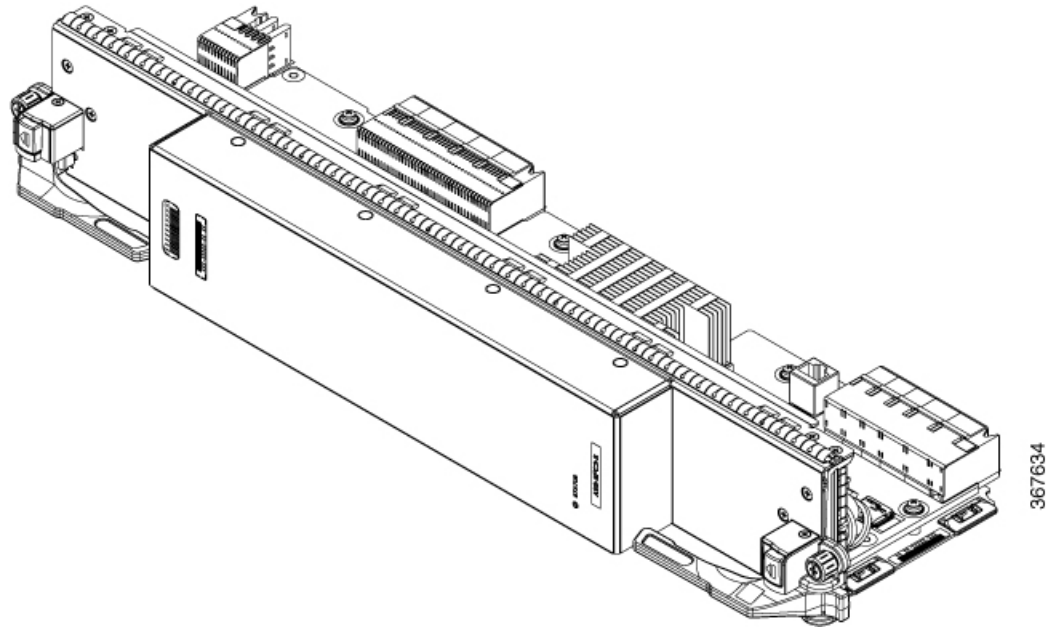
Figure 37: SFC-T Card



The following figure shows the front panel of the FC card. The front panel has a status LED, ejector levers, ejector lever release buttons, and mounting screws. The FC2/A99-SFC3 and SFC-T /A99-SFC3-Tcard is similar.

Figure 38: FC Card Front Panel

The following figure shows the front panel of the A99-SFC3-S card. The front panel has a status LED, ejector levers, ejector lever release buttons, and mounting screws.

Figure 39: A99-SFC3-S Card

FC Card Front Panel Indicator

The front panel of the FC card has one tri-color LED indicator for system information.

The following table lists the display definitions of the discrete LED on the FC card front panel.

Table 8: FC Card LED Display Definitions

Indicator (Label)	Color	Description
STATUS	Green	FC card powered on and FPGA is programmed. Note Fabric Data Link failure is not detected so LED remains green. Monitor CLI messages for status.
	Red	Fault or malfunction in FC card power up or FPGA programming. Note Once any ejector lever release button is pushed in, the FC card must be physically removed and reinserted (OIR) to restart the FC card. During this time before the FC card is restarted, the LED is red.
	Amber	FC card powered on but fabric not active.
	Off (Default after reset)	FC card powered off via CLI.

FC Card Ejector Levers

Ejector levers are provided for inserting and removing the FC cards from the backplane connectors. The insertion and removal force of the card ejector levers is about 16 lbs (7.27 kg). To release the ejector levers, push in the ejector lever release buttons.



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

Ethernet Line Cards

For line card installation information, see the [Cisco ASR 9000 Series Aggregation Services Routers Ethernet Line Card Installation Guide](#).

In addition, a SPA Interface Processor (SIP) and Shared Port Adapters (SPA) are supported on the Cisco ASR 9000 Series Routers. For information about these components, see the [Cisco ASR 9000 Aggregation Services Router SIP and SPA Hardware Installation Guide](#).

Line Card Serviceability

Line cards can be inserted or removed when adjacent (cabled) RSP or line cards are installed.

Line Card Ejector Levers

Ejector levers are provided for inserting and removing line cards from the backplane connectors. Insertion and removal force of the card ejector levers is about 16 lbs (7.27 kg).

Power System

The Cisco ASR 9000 Series Routers can be powered with an AC or DC source power. The power system provides power for the cards and fan trays. Depending on the router, version 1, version 2, and version 3 power systems are supported.



Note The type (AC or DC) and version (1, 2, or 3) of the power tray (PEM) and power supply must match.

The power system is based on a distributed power architecture centered around a –54 VDC printed circuit power bus on the system backplane.

The –54 VDC system backplane power bus can be sourced from one of two options:

- AC systems—AC/DC bulk power supply tray connected to the user 200 to 240 VAC +/- 10 percent (180 to 264 VAC) source
- DC systems—DC/DC bulk power supply tray connected to the user Central Office DC battery source –48 VDC/–60 VDC (–54 VDC nominal)

DC output power from each power tray is connected to the router by two power blades that mate to the power bus on the backplane. The system backplane distributes DC power through connectors on the backplane to each card and the fan trays. Each card has on-board DC–DC converters to convert the –54 VDC from the distribution bus voltage to the voltages required by each particular card.

AC and DC Power Modules

Each AC or DC power tray houses up to four power modules. The power trays drive a single output bus that delivers –54 V to all cards and fan trays that are plugged into the backplane.



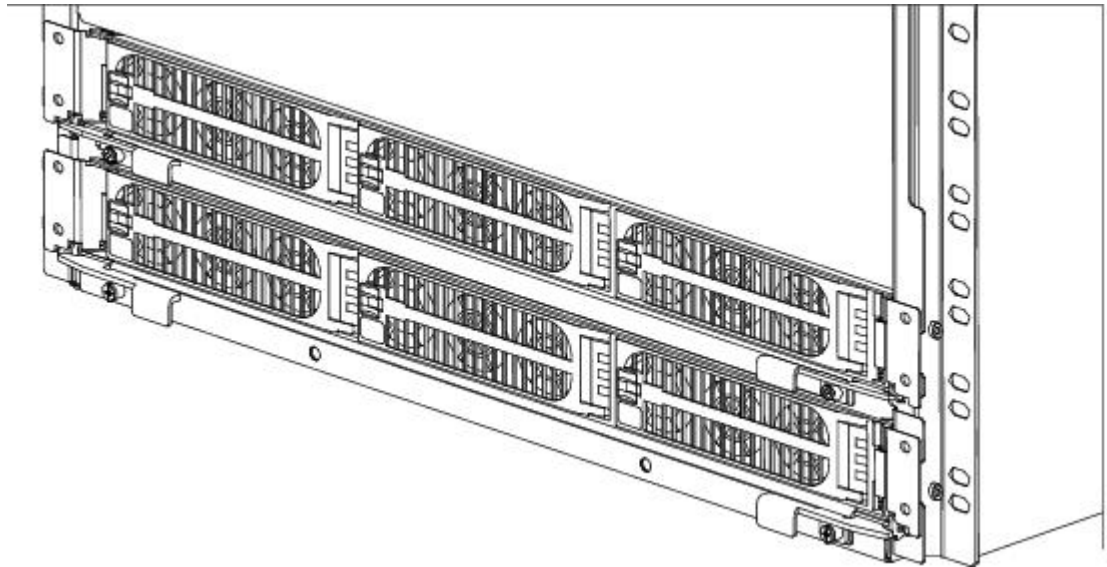
Caution While performing a FPD upgrade of the ASR 9000 6kW AC Power Module Version 3 (PWR-6KW-AC-V3) and the ASR 9000 4.4kW DC Power Module Version 3 (PWR-4.4KW-DC-V3), ensure that you connect both input power cords to the power supply. If the power cords are not connected, the FPD upgrade for the power module will fail.

Cisco ASR 9010 Router Power Modules

The following figure shows a front view of six version 1 power modules in the Cisco ASR 9010 Router.

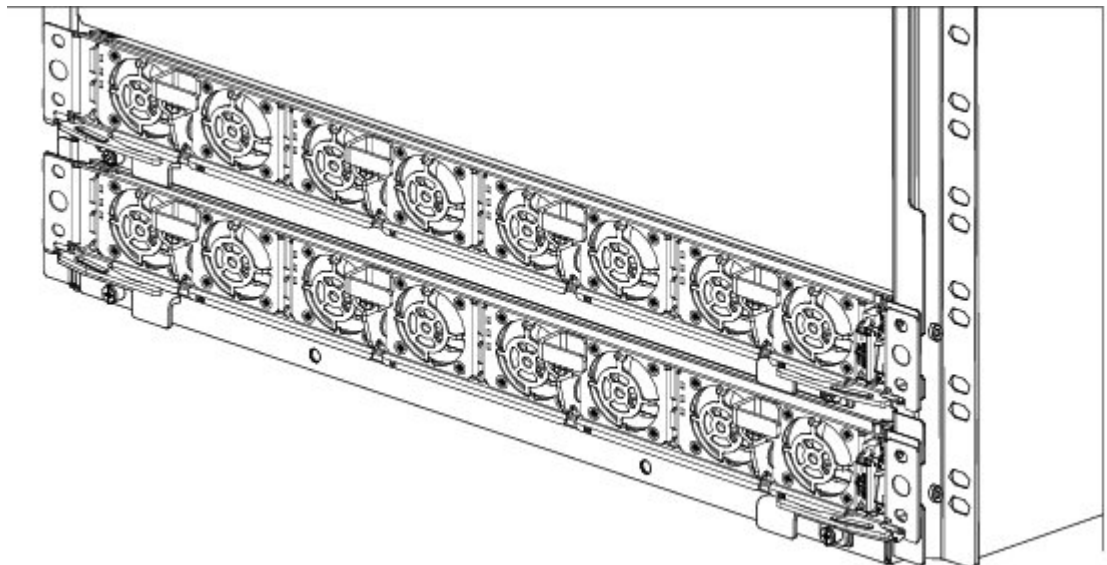
The AC power trays in the Cisco ASR 9010 Router provide N+N redundancy. The DC power trays provide N+1 redundancy.

Figure 40: Front System View of Power Trays—Cisco ASR 9010 Router with Version 1 Power Trays



The following figure shows a front view of eight version 2 power modules in the Cisco ASR 9010 Router. The front view of eight version 3 DC power modules in the Cisco ASR 9010 Router is similar.

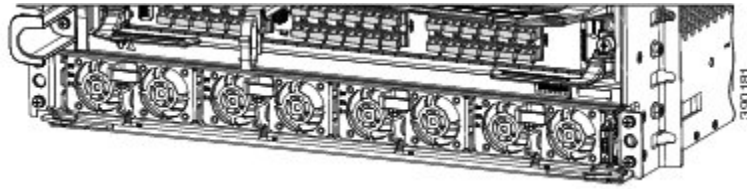
Figure 41: Front System View of Power Trays—Cisco ASR 9010 Router with Version 2 Power Trays



Cisco ASR 9904 Router Power Modules

The AC and DC power trays in the Cisco ASR 9006 Router and Cisco ASR 9904 Router provide N+1 redundancy.

The Cisco ASR 9006 Router supports one power tray with up to three version 1 power modules or four version 2 power modules. The Cisco ASR 9904 Router supports one power tray with up to four version 2.



Cisco ASR 9906 Router Power Modules

The AC and DC power trays in the Cisco ASR 9906 Router provide N+1 redundancy.

The Cisco ASR 9906 Router supports one power tray with up to three version 3 AC power modules or four version 3 DC power modules.

Figure 42: Front System View of Power Tray—Cisco ASR 9906 Router with Version 3 AC Power Tray

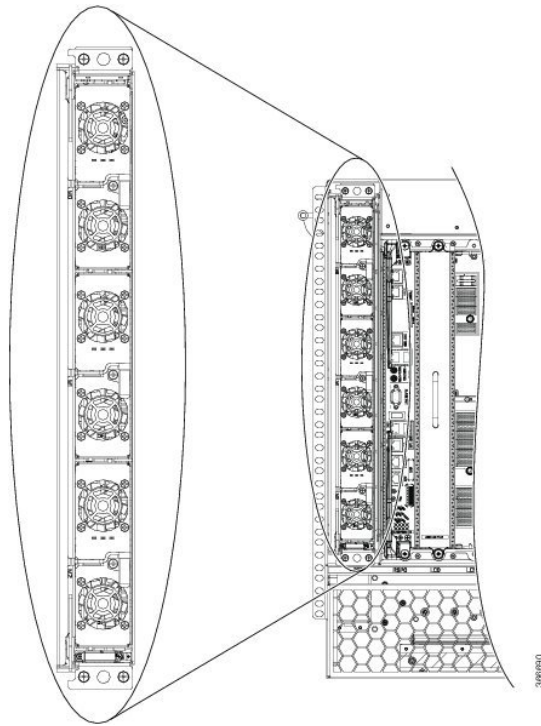
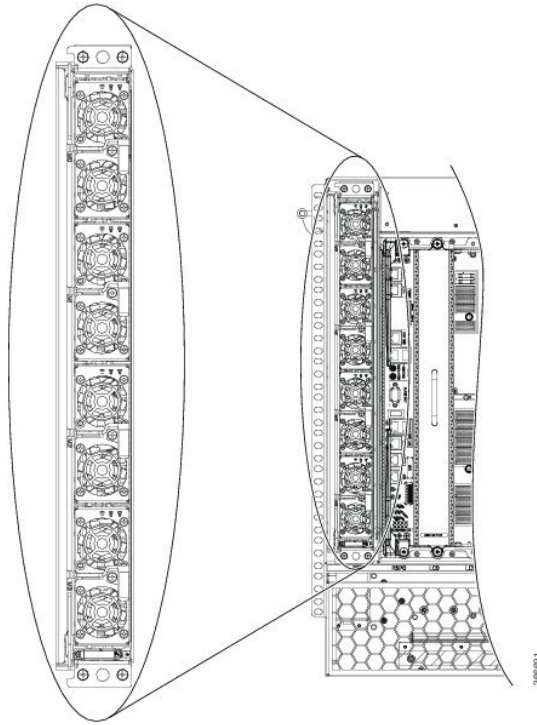


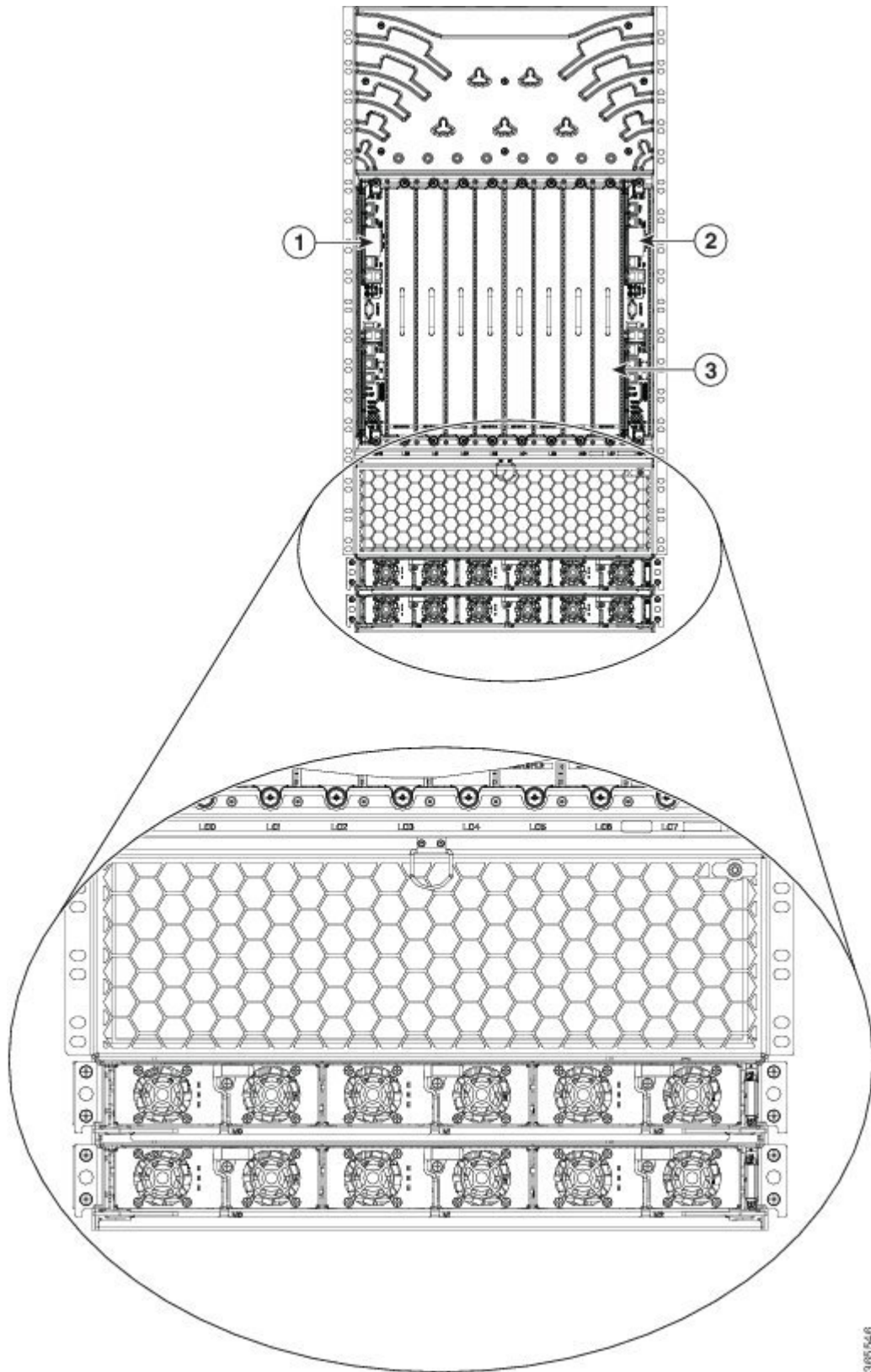
Figure 43: Front System View of Power Tray—Cisco ASR 9906 Router with Version 3 DC Power Tray



Cisco ASR 9910 Router Power Modules

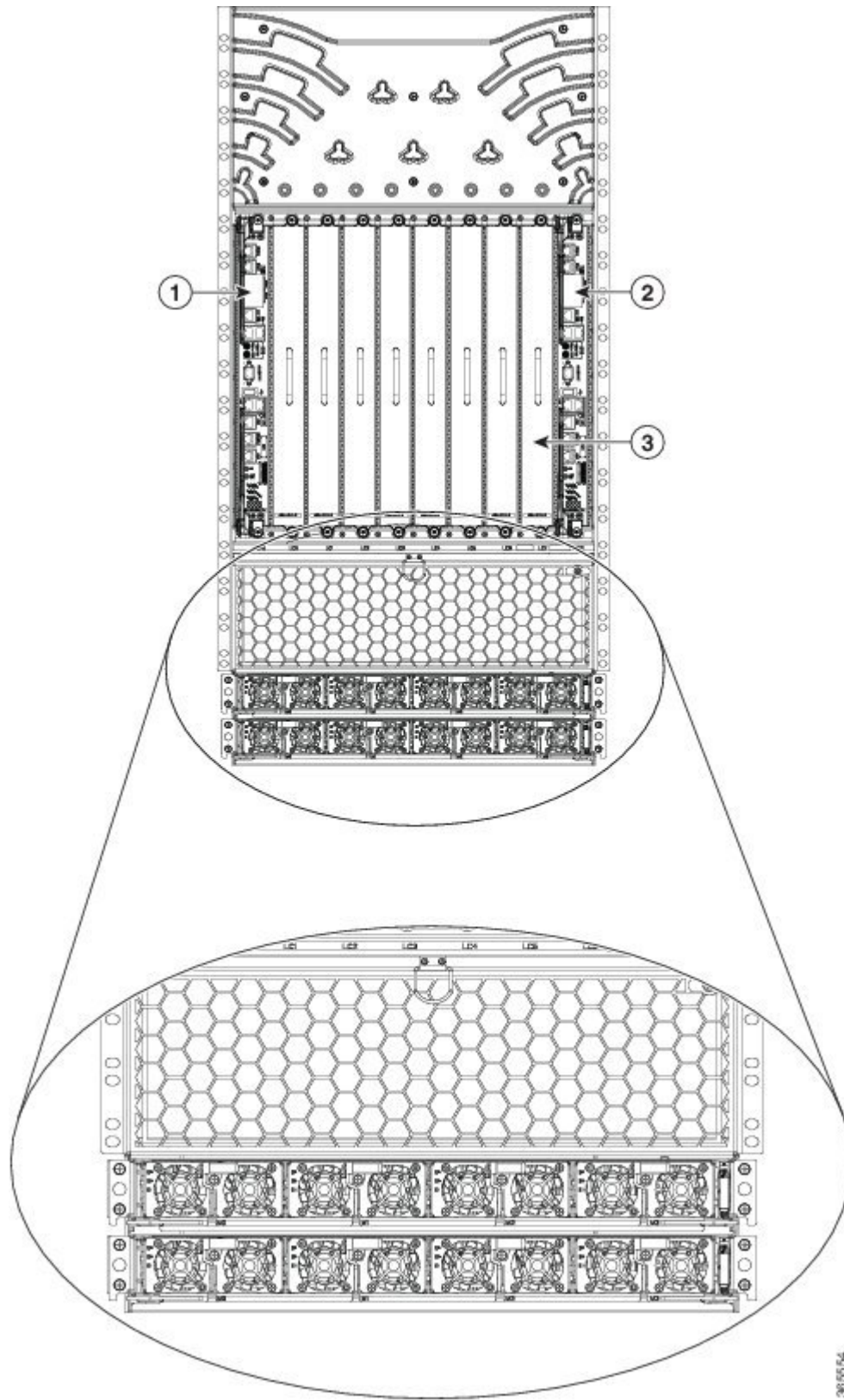
The power trays in the Cisco ASR 9910 Router provide 4+2 redundancy. The DC power trays provide 5+3 redundancy. The Cisco ASR 9910 Router supports two power tray with up to six version 3 AC power modules or up to eight version 3 DC power modules.

Figure 44: Front System View of Power Trays—Cisco ASR 9910 Router with Version 3 AC Power Trays



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Figure 45: Front System View of Power Trays—Cisco ASR 9910 Router with Version 3 DC Power Trays



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Cisco ASR 9922 Router Power Modules

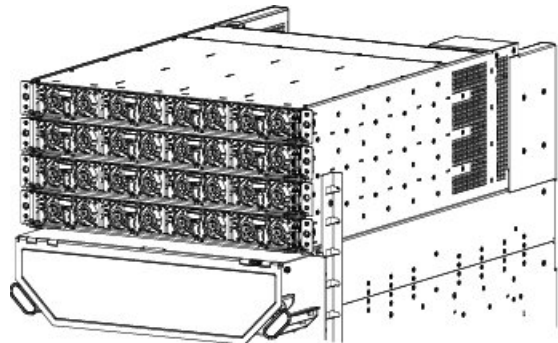
The power trays in the Cisco ASR 9922 Router provide N+N for AC and N+1 for DC power redundancy.

ASR-9922 supports:

- Four AC PEMs (power shelves). Version 2 supports four power supplies and version 3 supports three power supplies.
- Two different AC power configurations:
 - Version 2 power which uses ASR9K-AC-PEM-V2 power entry modules and PWR-3KW-AC-V2 single-phase 220-V 20-A power supplies.
 - Version 3 power which uses ASR9K-AC-PEM-V3 power entry modules and PWR-6KW-AC-V3 single-phase 220-V 20-A power supplies.
- N+N redundancy is dependent on card load. Refer to the [power calculator](#) to determine the required power to populate the entire chassis for version 2 and version 3.
- Fewer power modules can be used if the chassis is populated with fewer line cards. Refer to the [power calculator](#) to determine the required power modules for the populated line cards of a chassis.

The following figure shows an example of version 2 power modules installed in the Cisco ASR 9922 Router.

Figure 46: Front System View of Power Trays —Cisco ASR 9922 Router with Version 2 Power Trays



ASR-9922 supports:

- Four DC PEMs. Each PEM supports up to four power supplies.
- Two different DC power configurations:
 - Version 2 power which uses ASR9K-DC-PEM-V2 power entry modules and PWR-2KW-DC-V2 power supplies.
 - Version 3 power which uses ASR9K-DC-PEM-V3 power entry modules and PWR-4.4KW-DC-V3 power supplies.
- N+1 redundancy is dependent on card load. Refer to the [power calculator](#) to determine the required power to populate the entire chassis for version 2 and version 3.
- Fewer power modules can be used if the chassis is populated with fewer line cards. Refer to the [power calculator](#) to determine the required power modules for the populated line cards of a chassis.

Cisco ASR 9912 Router Power Modules

The power trays in the Cisco ASR 9922 Router provide N+N redundancy. The DC power trays provide N+1 redundancy.

To operate the Cisco ASR 9912 Router on AC power:

- Three power trays must be installed, each with up to four version 2 power modules or up to three version 3 power modules.
- Each version 2 power module is fed by a single-phase 220-V 20-A circuit. Each version 3 power module is fed by two single-phase 220-V 20-A circuits.
- Six power modules are enough to power a fully-populated chassis.
- Twelve version 2 or nine version 3 power modules are required for N+N redundancy. Fewer power modules can be used if the chassis is populated with fewer line cards.

To operate the Cisco ASR 9912 Router on DC power:

- Three DC power trays must be installed, each with up to four version 2 or version 3 power modules
- Eleven power modules are enough to power a fully-populated chassis.
- Twelve power modules are required for N+1 redundancy. Fewer power modules can be used if the chassis is populated with fewer line cards.

Cooling System

The Cisco ASR 9000 Series chassis is cooled by removable fan trays. The fan trays provide full redundancy and maintain required cooling if a single fan failure should occur.

The Cisco ASR 9000 Series Routers are configured in such a way that a fan failure or its subsequent replacement does not cause a significant outage. During either a fan replacement or a fan failure, the airflow is maintained and no outage occurs. Also, the fan trays are hot swappable so that no outage occurs during replacement.



Note Due to air leakage, the chassis should not be operated with any of the fan trays completely missing. The system shuts itself off if all fan trays are removed and the system crosses the Shutdown Temperature Threshold (STT). Replace any missing fan tray within five minutes. Any fan tray replacement should be performed when the chassis is back to room temperature.

The following figure shows the fan tray locations and cooling redundancy information for the Cisco ASR 9000 Series Routers.

Table 9: Cisco ASR 9000 Series Routers Fan Tray Locations and Redundancy Information

Router	Fan Tray Locations
Cisco ASR 9010 Router	<p>The chassis contains two fan trays for redundancy (Figure 2-33). The fan trays are located one above the other below the card cage and are equipped with handles for easy removal. The chassis has a front-to-rear cooling path (Figure 2-27). The inlet is at the bottom front of the chassis, and the exhaust is at the upper rear.</p> <p>Each fan tray has 12 fans arranged in three groups of four fans each. Two fans of each group share a fan controller. The power supplied to the fan controller is 1:3 protected. A single fan failure has no impact on air flow because the other 11 fans will compensate for it. If the fan controller fails, there is a possibility of up to two fans failing; however, the design always has two fans operating in a row (three rows of fans) to compensate for the air speed.</p>
Cisco ASR 9006 Router	<p>The chassis contains two fan trays for redundancy (Figure 2-34). The fan trays are located at the top left of the chassis. They are covered by a fan tray door hinged at the bottom, which must be opened before removing the fan trays. The chassis has a side-to-top-to-rear cooling path (Figure 2-28). The inlet is at the right side of the chassis, and the exhaust is at the upper rear.</p> <p>Each fan tray has six fans arranged in three groups of two fans each. The two fans in a group share a fan controller. The power supplied to the fan controller is 1:3 protected. A single fan failure has no impact on air flow because the other five fans will compensate for it. If the fan controller fails, there is a possibility of up to two fans failing; however, the design always has two fans operating to compensate for the air speed.</p>
Cisco ASR 9904 Router	<p>The chassis contains a single fan tray. The fan tray is located at the left side of the chassis and is accessible from the rear (Cisco ASR 9904 Router Fan Tray). The chassis has a side-to-side cooling path (Cisco ASR 9904 Router Chassis Cooling Path). The inlet is at the right side of the chassis, and the exhaust is at the left side.</p> <p>The fan tray has 12 fans. Every two fans share a fan controller. The power supplied to the fan controller is 1:1 protected. A single fan failure has no impact on air flow because the other eleven fans will compensate for it. I.</p> <p>If the router is installed in a 2-post 23-inch rack, air flow is circulated front-to-back. An optional air baffle accessory kit (ASR-9904-BAFFLE=) is available for mounting the router chassis in this configuration. For air baffle installation information, see the Cisco ASR 9000 Series Aggregation Services Router Hardware Installation Guide.</p>
Cisco ASR 9906 Router	<p>The chassis contains two fan trays for redundancy. The fan trays are located at the top right of the chassis. They are covered by a fan tray door hinged at the left, which must be opened before removing the fan trays. The chassis has a front-to-top-to-rear cooling path (Cisco ASR 9906 Router Chassis Cooling Path). The inlet is at the bottom of the chassis, and the exhaust is at the lower rear.</p> <p>Each fan tray has seven fans. The two fans in a group share a fan controller. The power supplied to the fan controller is 1:3 protected. A single fan failure has no impact on air flow because the other six fans will compensate for it. If the fan controller fails, there is a possibility of up to two fans failing; however, the design always has two fans operating to compensate for the air speed.</p>

Router	Fan Tray Locations
Cisco ASR 9910 Router	<p>The chassis contains two fan trays for redundancy. The two fan trays are located at the top of the chassis below the exhaust and are equipped with handles for easy removal. The chassis has a front-to-rear cooling path (Cisco ASR 9910 Router Chassis Cooling Path—Side View). The inlet is at the bottom front of the chassis, and the exhaust is at the upper rear.</p> <p>Each fan tray has 12 fans arranged in three groups of four fans each. Two fans of each group share a fan controller. The power supplied to the fan controller is 1:3 protected. A single fan failure has no impact on air flow because the other 11 fans will compensate for it. If the fan controller fails, there is a possibility of up to two fans failing; however, the design always has two fans operating in a row (three rows of fans) to compensate for the air speed.</p>
Cisco ASR 9912 Router	<p>The chassis contains two fan trays for redundancy (Cisco ASR 9922 Router and Cisco ASR 9912 Router Fan Tray). The fan trays are located above the line card cage. The chassis has a front-to-rear cooling path (Cisco ASR 9912 Router Chassis Cooling Path—Side View). The inlet is at the front of the RP/FC card cage, and the exhaust is at the upper rear.</p> <p>Each fan tray holds 12 axial fans and includes a controller that reduces the speed of the fans when the chassis temperature is within limits, thereby reducing the generation of acoustic noise. The fan controller also senses and reports individual fan failures.</p> <p>The power supplied to the fan controller is 1:3 protected. A single fan failure has no impact on air flow because the other 11 fans will compensate for it. If the fan controller fails, there is a possibility of up to two fans failing; however, the design always has two fans operating in a row (three rows of fans) to compensate for the air speed.</p>
Cisco ASR 9922 Router	<p>The chassis contains four fan trays (Cisco ASR 9922 Router and Cisco ASR 9912 Router Fan Tray). Two top fan trays are located between the top and middle cages, whereas the two bottom fan trays are located between the middle and bottom cages. The two bottom fan trays are inserted upside down compared to the two top fan trays. The cages of the chassis have a front-to-rear cooling path (Cisco ASR 9922 Router Chassis Cooling Path—Side View). The inlet is at the front of the middle cage, and the exhaust is at the upper and lower rear.</p> <p>The fan tray has an LED indicator to indicate fan tray status. If a fan fails, it is possible to swap a single fan tray assembly while the system is operational. Fan tray removal does not require removal of any cables</p>

Management and Configuration

The Cisco ASR 9000 Series Routers run IOS XR software and use the system manageability architecture of that operating system. The system management interfaces consist of the following three protocols running on the Cisco ASR 9000 Series Routers:

- CLI—Command-line interface
- XML—Extensible Markup Language
- SNMP—Simple Network Management Protocol

By default, only CLI on the console is enabled.

Craft Works Interface (CWI), a graphical craft tool for performance monitoring, is embedded with the Cisco IOS XR software and can be downloaded through the HTTP protocol. You can use CWI to edit the router configuration file, open Telnet/SSH application windows, and create user-defined applications.

