

Cisco NCS 4216 Hardware Installation Guide

First Published: 2016-08-05

Last Modified: 2026-01-28

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

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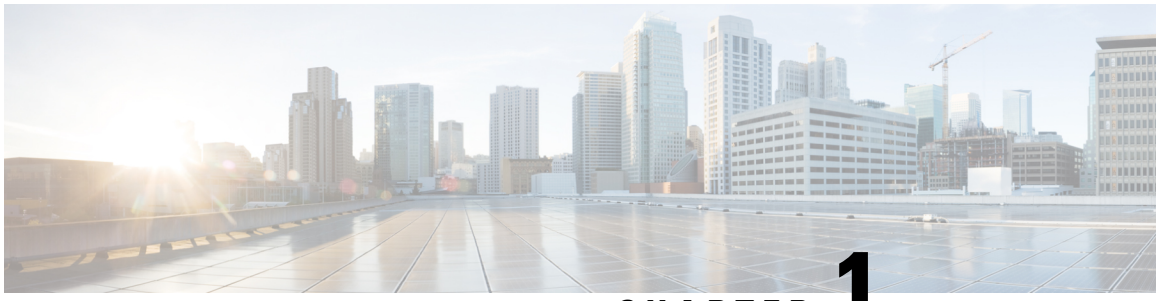
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CHAPTER 1

Cisco NCS 4216 Overview

The Cisco NCS 4216 is a seven-rack unit router that belongs to the Cisco NCS 4200 family of routers. This router complements Cisco's offerings for IP RAN solutions for the GSM, UMTS, LTE, and CDMA. Given its form-factor, interface types and GigabitEthernet density the Cisco NCS 4216 can also be positioned as a Carrier Ethernet aggregation platform.

The Cisco NCS 4216 is a cost optimized, fully redundant, centralized forwarding, extended temperature, and flexible pre-aggregation router.

- Cisco NCS 4216 Features, on page 1
- Interface Numbering, on page 26
- Regulatory Compliance, on page 27

Cisco NCS 4216 Features

The key feature of the Cisco NCS 4216 is to increase per platform and rack-unit interface density, especially when combining multiple interface types such as Gigabit Ethernet (GE), TDM, 10GE, 40GE, and 100GE.

The Cisco NCS 4216 supports the following RSP modules:

- NCS4216-RSP: A large service scale and a throughput of 400 Gbps Route Switch Processors (RSP)
- NCS4216-RSP-800: An extra large service scale and high throughput (800Gbps) Route Switch Processors (RSP)
- Flexible I/O configurations through multiple pluggable interface modules

  For more information about the supported RSP modules and interface modules, refer Table 7: NCS4216-RSP Supported Interface Modules and Part Numbers, on page 13 and Table 8: NCS4216-RSP-800 Supported Interface Modules and Part Numbers, on page 14.
- 900-Watt PSUs to power the new RSP modules.

The Cisco NCS 4216 includes the following specific components:

- Chassis—Seven rack unit in height while still maintaining a shallow depth and side-to-side air flow.
- Fan-tray with removable dust filter
- Following are the new form factor and high-performance RSP

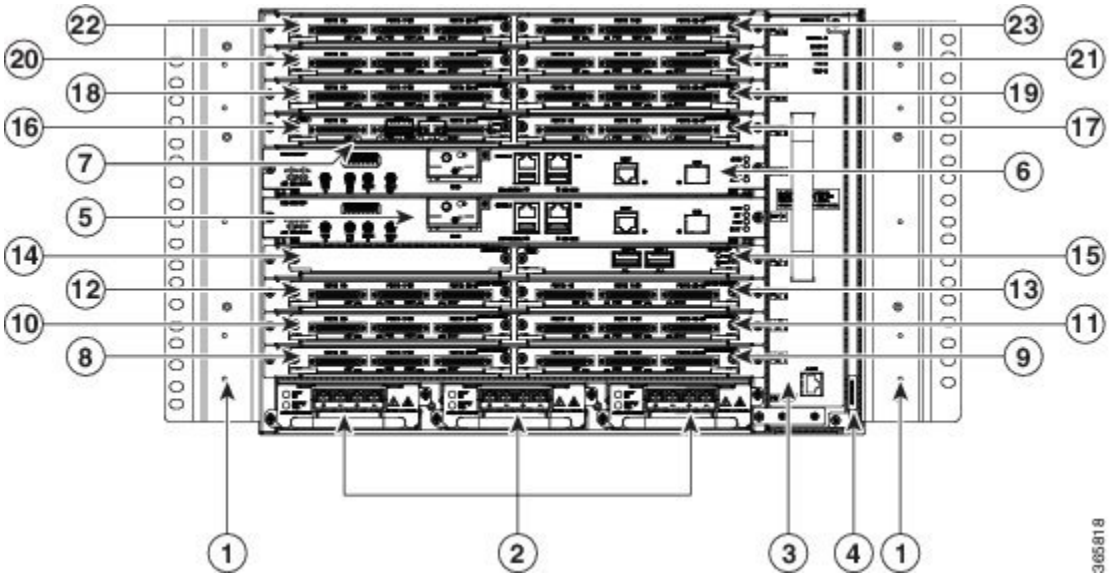
  - NCS4216-RSP: This high-performance RSP has aggregate switching capacity of 480 Gbps in oversubscribed mode.
  - NCS4216-RSP-800: This high throughput RSP has aggregate switching capacity of 800 Gbps.

- The backplane and the RSP together have the provision to support higher density 10GE modules like 8x10GE and 100GE modules.
- Air flow baffle to allow a system to redirect air and allow front-to-back airflow for cooling.
- Flexible I/O configurations through 16 hot pluggable interface modules (single width). For example, with NCS4216-RSP in oversubscribed mode:
  - 16x10G + 2x100G + 80x1G
  - 48x10G
  - 48 T1/E1 TDM Interface Module (48XT1/E1)
  - 48 T3/E3 TDM Interface Module (48XT3/E3)
  - OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)
- Flexible I/O configurations through 16 hot pluggable interface modules (single width). For example, with NCS4216-RSP-800:
  - 16x10G + 4x100G + 80x1G
  - 48x10G + 4x100G
  - TDM Interface Module and CEM Interface Module are not supported
- Metro ENET switching features along with TDM pseudowire support.
- Network processor provides flexibility to off-load control plane CPU processing for select OAM and management packets (for example, CCM, BFD, LBM).
- Flexible ENET processing through table-driven packet processing engines.
- On-line insertion/removal (OIR) of all FRUs except GPS module, while the system is operational.
- Power supply (2+1)—Support for DC power supply. Two PSUs should be powered-on at a time. If all the three PSUs are powered on, they work in a load-sharing mode.
- Fully-redundant system with redundant combined control plane and data plane (excluding interfaces), timing support, power supplies, and fans.
- Active and standby support of redundant control plane and data plane, and timing
- Intra-chassis IOS redundancy (requires both RSPs)
- Stateful-switchover between active and standby RSPs (for protocols supported by IOS).
- In-service software upgrade (ISSU) supported with same RSPs.
- Timing support for receipt and distribution of network frequency and time including SyncE, BITS, 1PPS/10MHz I/O, IEEE 1588-2008, and NTP.
- Support for ENET OAM.

- T1/E1 and T3/E3 line protection compliant with NEBS GR-1089.
- Patch Panel for the Interface Modules

The following figure illustrates the Cisco NCS 4216 chassis design.

Figure 1: Cisco NCS 4216 Chassis Design



1	Mounting Bracket	2	Redundant power units (three DC power units are shown)
3	Fan tray	4	Fan tray filter
5	RSP Slot 0	6	RSP Slot 1
7	IM Carrier plates	8	Slot 0 for Interface Module
9	Slot 1 for Interface Module	10	Slot 2 for Interface Module
11	Slot 3 for Interface Module	12	Slot 4 for Interface Module
13	Slot 5 for Interface Module	14	Slot 6 for Interface Module
15	Slot 7 for Interface Module	16	Slot 8 for Interface Module
17	Slot 9 for Interface Module	18	Slot 10 for Interface Module
19	Slot 11 for Interface Module	20	Slot 12 for Interface Module
21	Slot 13 for Interface Module	22	Slot 14 for Interface Module
23	Slot 15 for Interface Module		

System Specifications

The following table summarizes the system specifications and environmental requirements for the Cisco NCS 4216.

Table 1: Cisco NCS 4216 System Specifications

Dimensions (Height x Width x Depth)	12.224 inches x 17.426 inches x 9.33 inches
Dimensions with FRUs	12.224 inches x 17.426 inches x 10.705 inches **Note** The additional depth is due to the projection of the handle from Chassis face.
Weight	
Chassis with back-plane	15.868 kg
Fan tray	3.618 kg
900W DC PSU	0.924 kg
RSP (NCS4216-RSP)	2.8 kg
Operating Temperature	The Cisco NCS 4216 supports the following temperature ranges at 1800 m operating altitude: • -40º C to 65º C with side-to-side air flow • -40º C to 55º C with front to back air flow **Note** Refer to Datasheets for system configuration.
Nonoperating Temperature	-40º F to 158º F (-40º C to +70º C) storage temperature
Operating Humidity	5–95% operating non-condensing relative humidity
Operating Altitude	-60 m to 1800 m operating altitude for full operating temperature range; up to 4000 m at up to 40º C.
Nonoperating Altitude	-60 m to 4570 m storage altitude
Vibration	1.0 g from 1.0 to 150 Hz
Shock	30 G half sine 6 ms and 11 ms
Nonoperating Vibration	Random: 1.15 g RMS 3 to 200 Hz, 30 minutes/axis Sine: 10 to 500 Hz at 0.8 G peak / 5 sweep cycles/axis
Operating Acoustics	< 76 dBA at 27ºC as per NEBS standard GR-63

GNSS Module (NCS4216-CM-GNSS)

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

Note Using a single GPS antenna input for both RSPs requires usage of external splitters.

Warning 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

- The GNSS module requires an active GPS/GNSS antenna with built-in Low-Noise Amplifier (LNA) for optimal performance. The antenna LNA amplifies the received satellite signals for two purposes:
  - Compensation of losses on the cable
  - Lifting the signal amplitude in 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 (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 being connected, to meet the regulations and standards for lightning protection in the 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 (Protective Earth).

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 should see as much as possible from the total 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.

Power Supply Features

The Cisco NCS 4216 supports DC power supplies. The DC power supplies support:

- -40 VDC to -72 VDC

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 900W (~75A at +12VDC) to the other FRUs in the system. The DC power supply has dual input feeds.

The following table shows the DC power supply specifications.

Table 2: DC Power Supply Specifications

Part numbers	A900-PWR900-D2
Input power specification	48V, GND, -48V
Minimum input voltage	-40.0 V
Maximum input voltage	-72 VDC
Output voltage	+12 VDC
Wire gauge for DC input power connections	10 AWG minimum for -48/-60 VDC. Connector accepts 6AWG maximum.
Maximum power output	900 W

Note For normal operation, only one power feed is sufficient but an alarm is generated if only one power feed is present. You can suppress this alarm using the alarm profile configuration.

For more information about installing the Cisco NCS 4216 power supplies, see the Installing the Power Supply .

Redundancy

Three power supplies can be plugged in the NCS 4216 chassis that works in the 2+1 redundancy mode. For the normal operation of the chassis, at least two power supplies should be powered on. When all the three power supplies are plugged in, they work in a current sharing mode.

Each power supply has dual feed. It is recommended to connect each power feed to a separate input source.

Dying Gasp

The Cisco NCS 4216 DC power supply does not support the Dying Gasp feature.

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 NCS 4216, see Troubleshooting section.

The *DC Power Supply Specifications* table summarizes the input power specifications for the Cisco NCS 4216 DC power supply units.

Fan Tray

The fan tray module supported on the router is:

- A907-FAN-E (NCS4216-RSP)
- A907-FAN-H (NCS4216-RSP-800)

The fan tray has:

- Four dual rotor fans—for the PSU area cooling
- 12 fans (three columns for four fans)—60x60x38mm fans for the RSP and IM area

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

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

Fan Tray (A907-FAN-E)

The A907-FAN-E has:

- Four dual rotor fans—for the PSU area cooling
- 12 fans (three columns for four fans)—60x60x38mm fans for the RSP and interface modules

This fan tray has redundant fans and provides side-to-side forced air cooling. A907-FAN-E is a field replaceable unit (FRU).

The following table describes the fan speed when used with the NCS4216-RSP route processor.

Table 3: Ambient Temperature and Fan Speed

No.	Temperature (°C) at 1800m		System Fan Speed (% PWM)	PSU Fan Speed (% PWM)
	Minimum	Maximum		
1	-40	-11	30	30
2	-10	15	40	40
3	16	30	55	55
4	31	40	80	80
5	41	50	100	100

Note The system considers the temperature of the fan inlet for the appropriate fan speed.

For information about the installation of the fan tray, see the *Installing the Fan Tray* section.

Fan Tray (A907-FAN-H)

The A907-FAN-H has:

- Four dual rotor fans—for the PSU area cooling
- 12 fans (three columns for four fans)—60x60x38mm fans for the RSP and interface modules

This fan tray has redundant fans and provides side-to-side forced air cooling. A907-FAN-H is a field replaceable unit (FRU).

The following table describes the fan speed when used with the NCS4216-RSP-800 route processor.

Table 4: Ambient Temperature and Fan Speed

No.	Temperature (°C)		System and PSU Fan Speed (% PWM)
	Minimum	Maximum	
1	-40	-31	20
2	-30	-11	30
3	-10	30	45
4	31	40	65
5	41	50	85
6	>50		100

Note The system considers the temperature of the fan inlet for the appropriate fan speed.

For information about the installation of the fan tray, see the *Installing the Fan Tray* section.

Online Insertion and Removal

The Cisco routers, interface modules, FAN-H, and FAN-E are designed to support online insertion and removal (OIR). However, time-to-OIR for FAN-H and FAN-E fan tray is dependent on the temperature of the chassis. At room temperature of up to 30° C, fan tray OIR should be done within two minutes.

Note Before replacing the card, you must perform a graceful shutdown of the card to avoid disk corruption.

Table 5: Ambient Teperature and Fan Tray OIR

Ambient Temperature (in Celsius)	Fan Operation	Time	Remarks
30°	All fans are working	2 minutes	Fans working as expected
40°	All fans are working	1 minute 30 seconds	Fans working as expected
40°	Single fan failure	1 minute 30 seconds	Single fan failure and all other fans running at maximum speed

Note It is not recommended to perform fan tray OIR above the ambient temperature of 40° C.

The following table describes the parameters for the OIR of the various modules in the router.

Note Before replacing the card, you must perform a graceful shutdown of the card to avoid disk corruption.

Table 6: Online Insertion and Removal - Parameters

OIR Module	Ambient[1]	Fan Speed	OIR Time	Comments
Fan Tray[2]	30°C	100% PWM	3 mins	Single Fan Fail, Other Fans running at 100% PWM
	40°C	100% PWM	1 minute 30 seconds	
PSU	40°C	As per the fan algorithm	5 mins	Fans running at normal speed
Interface Module[3]				
RSP				

1 It is not recommended to perform OIR of any module above 40°C ambient
2 Fan Tray OIR should be performed only when a fan's failed condition is encountered and other fans are spinning at max speed.
3 It is recommended to shut down the interface modules before attempting to remove them from the chassis.

Note Consecutive IMs insertions, consecutive IMs reload or removal, and subsequent IM re-insertion should be done while waiting at least 180s between the actions.

Dust Filter (A907-FAN-F)

The dust filter on the fan tray is a quadrafoam 45PPI filter which is 85 percent dust resistant. For installing the fan filter, see Removing and Replacing the Dust Filter section.

Air Plenum (A907-F2B-AIR)

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 air flow front-back pattern provides a rack installation bay with a cool front zone and hot rear zone. For installing the plenum, see Installing the Air Plenum (A907-F2B-AIR) in the Rack section.

Note When the air plenum and the fan filter are installed in the chassis, the system operating temperature is 55º C.

Door

The door provides access to the shelf, and acts as a protective panel.

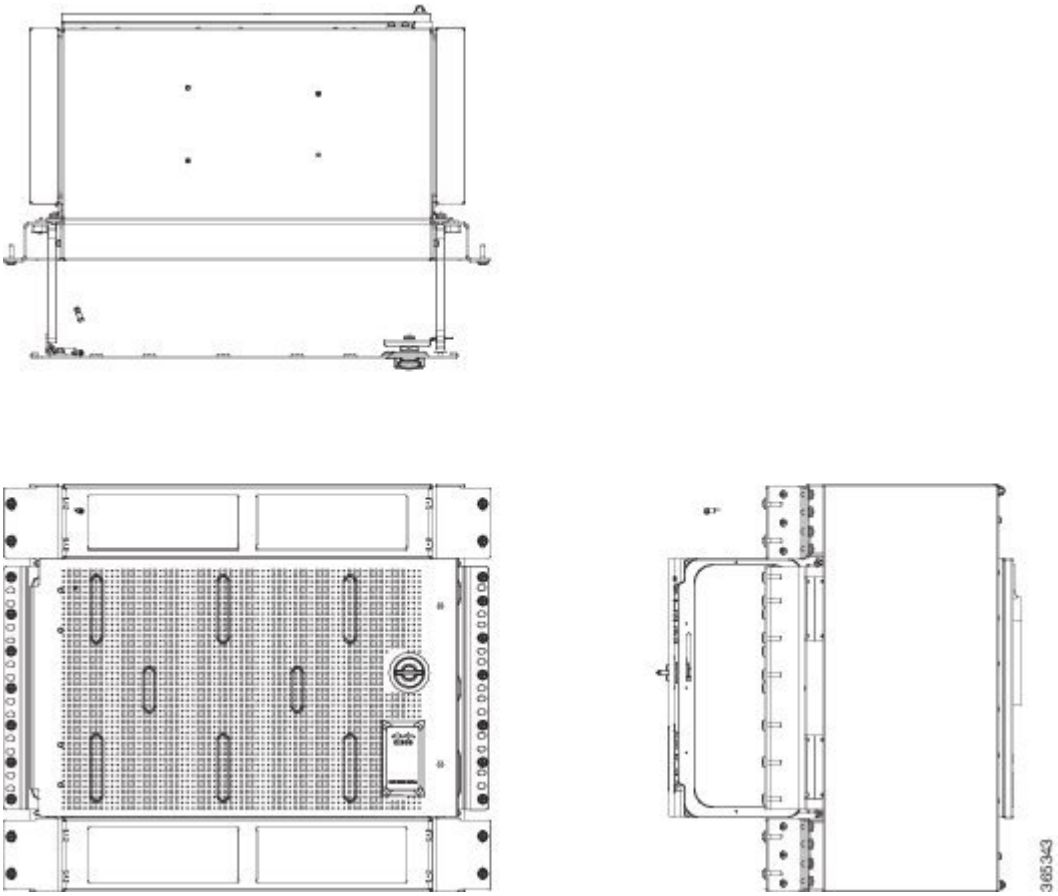
Front Door

The front door of NCS 4216 provides access to the shelf, and fan-tray assembly.

The front door acts as protective panels. The laser warning label is placed on the rear of the chassis.

The following figure illustrates the door design showing the front and back of the door.

Figure 2: Door Design



RSP Modules

The Cisco NCS 4216 is designed to use up to two RSP modules 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, redundancy, external management, and system status indications on the router.

The following sections describe the Cisco NCS 4216 RSP:

- Supported RSP Features
- RSP Redundancy
- Network Timing Interfaces
- RSP Interfaces

RSP features include:

- Loading software onto processor-based interface modules
- Redundant RSP management—The RSP manages detection of RSPs, exchange of health and status information, role negotiation, function for detection, health and status exchange, role negotiation
- Packet processing
- Traffic management, including buffering, queuing, and scheduling, Ethernet MAC functions
- Network clocking functions including phase and time-of-day for BITS, 1 PPS, 10 MHz, and 1588 PTP clock references
- Storage of software images, system configuration, 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 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

Cisco NCS 4216 supports the following RSP:

- NCS4216-RSP—Provides 8 GB of SDRAM, 20 Mb of TCAM memory on every ASIC.
- NCS4216-RSP-800—Provides 32 GB of CPU DRAM memory.

The RSP does not provide external network interfaces for user traffic. All network interfaces are provided through separate IMs.

Supported RSP Features

The RSP provides the following features on the Cisco 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 Cisco IOS XR software and platform control software runs
- 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 and hot-swap capabilities

Swapping of Interface Modules

The following Ethernet interface modules support swapping on the Cisco NCS4216-RSP module:

Use the **hw-module subslot default** command before performing a swap of the modules to default the interfaces on the interface module.

- SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)
- 2-port 40 Gigabit Ethernet Interface Module (2X40GE)
- 8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module
- 8-port 10 Gigabit Ethernet Interface Module (8X10GE)
- 1-port 100 Gigabit Ethernet Interface Module (1X100GE)
- 2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)

Use of **hw-module subslot default** command is not supported on the following interface modules.

- 1-port OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)
- 48 T1/E1 TDM Interface Module (48XT1/E1)
- 48 T3/E3 TDM Interface Module (48XT3/E3)
- 1-port OC48/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-Port T1/E1 + 4-Port T3/E3 CEM Interface Module (NCS4200-3GMS)
- NCS 4200 Combo 8-Port SFP GE and 1-Port 10 GE 20G Interface Module (NCS 4200-1T8S-20CS)

The following Ethernet interface modules support swapping on the Cisco NCS4216-RSP-800 module:

- 8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module
- 8-port 10 Gigabit Ethernet Interface Module (8X10GE)
- 2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)



Note If the **license feature service-offload enable** command is configured, then the NCS4200-1T8LR-PS IM is not supported in the router for RSP3.



Note There are certain restrictions in using the interface modules on different slots in the chassis. Contact Cisco Sales/Support for the valid combinations.

Table 7: NCS4216-RSP Supported Interface Modules and Part Numbers

RSP Module	Interface Modules	Part Number	Slot
NCS4216-RSP	SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)	NCS4200-1T8LR-PS	2,5,6,9,10,13,14,15
	1-port 100 Gigabit Ethernet Interface Module (1X100GE)	NCS4200-1H-PK	7, 8
	2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)[4]	NCS4200-2H-PQ	7, 8
	2-port 40 Gigabit Ethernet QSFP Interface Module (2X40GE)	NCS4200-2Q-P	3,4,7,8,11,12
	8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	NCS4200-1T16G-PS	All slots
	1-port OC48[5]/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-port T1/E1 + 4-Port T3/E3 CEM Interface Module	NCS4200-3GMS	All slots
	8-port 10 Gigabit Ethernet Interface Module (8X10GE)	NCS4200-8T-PS	3,4,7,8,11,12

	1-port OC-192 Interface Module with 8-port Low Rate CEM Interface Module (5G/ 10G HO / 10G LO)	NCS4200-1T8S-10CS	3,4,7,8,11,12 (10G mode)
			0,1,2,5,6,9,10,13,14,15 (5G mode)
			Note
			To enable this IM on slot 0 or slot 1, do the following and reload the router:
			`Router# configure t`
			`Router(config)# license feature service-offload enable`

	NCS 4200 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module	NCS4200-1T8S-20CS	3,4,7,8,11,12 (20G mode)
			0,1,2,5,6,9,10,13,14,15 (10G mode)
			Note
			To enable this IM on slot 0 or slot 1, do the following and reload the router:
			`Router# configure t`
			`Router(config)# license feature service-offload enable`

	48-port T1/E1 Interface module	NCS4200-48T1E1-CE	2,3,4,5,6,7,8,9,10,13,14,15
	48-port T3/E3 Interface module	NCS4200-48T3E3-CE	2,3,4,5,6,7,8,9,10,13,14,15

[4] IM supports only one port of 100G with RSP3 as QSFP28 on Port 0 in both slots 7 and 8.
[5] If OC48 is enabled, then the remaining 3 ports are disabled.

Table 8: NCS4216-RSP-800 Supported Interface Modules and Part Numbers

RSP Module	Interface Modules	Part Number	Slot
NCS4216-RSP-800	2-port 100 Gigabit Ethernet (QSFP) Interface Module (2 x 100GE)	NCS4200-2H-PQ	[6] [7]7, 9
	8-port SFP/8-port CSFP Gigabit Ethernet (8/16 x 1GE) and 1-port 10 Gigabit Ethernet (1 x 10GE) Interface Module	NCS4200-1T16G-PS	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15
	8-port 10 Gigabit Ethernet Interface Module (8 x 10GE)	NCS4200-8T-PS	4,5,7,9,10,11 2,3,12,13[8]

[6] 40G optics are supported on both slots.
[7] Slots 7 and 9 are supported on 200G mode with 4 x 100G, 2 x 100G and 2 x 40G, and 4 x 40G combinations.
[8] NCS4200-8T-PS IM is supported on slots 2, 3, 12, and 13 as partial ports (4 ports).

RSP Redundancy

The Cisco NCS 4216 chassis includes two RSP slots to allow for redundant RSPs. When the router uses redundant RSPs, one RSP operates in the active mode and the other operates in the hot standby mode. Removal or failure of the active RSP results in an automatic switchover to the standby RSP.

Note Interface Module Slot support will vary based on Interface Modules used in other slots. For more information, refer the Configuration Guides for details.

Network Timing Interfaces

The RSP supports the following network timing interfaces:

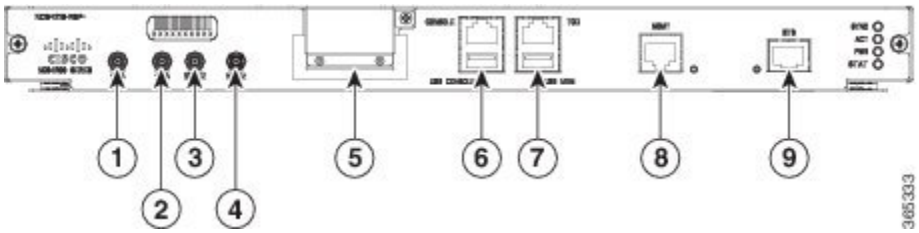
- BITS input/output port—RJ48 jack
- Wire Wrap Interface Through an Adapter
- 1 PPS input and output—Mini coax connectors
- 2.048 or 10 MHz input and output—Mini coax connectors
- Time of Day (ToD) or input/output port and 1 PPS input port—Shielded RJ45 jack

Network timing interfaces support redundancy in a redundant RSP configuration. Network timing interfaces on a redundant RSP remain in operation while the RSP is in hot standby mode.

RSP Interfaces

The following figure summarizes the interfaces on the RSP module.

Figure 3: Interfaces on the RSP Module



Label	Interface
1	1 PPS input timing port
2	1 PPS output timing port
3	10 MHz input timing port
4	10 MHz output timing port
5	GNSS RF IN (SMA Threaded Connector)
6	USB console port
7	USB memory port
8	Ethernet management port
9	BITS timing port

Interface Modules

The network interfaces are provided through pluggable interface modules.

The following list describes the various IM port density:

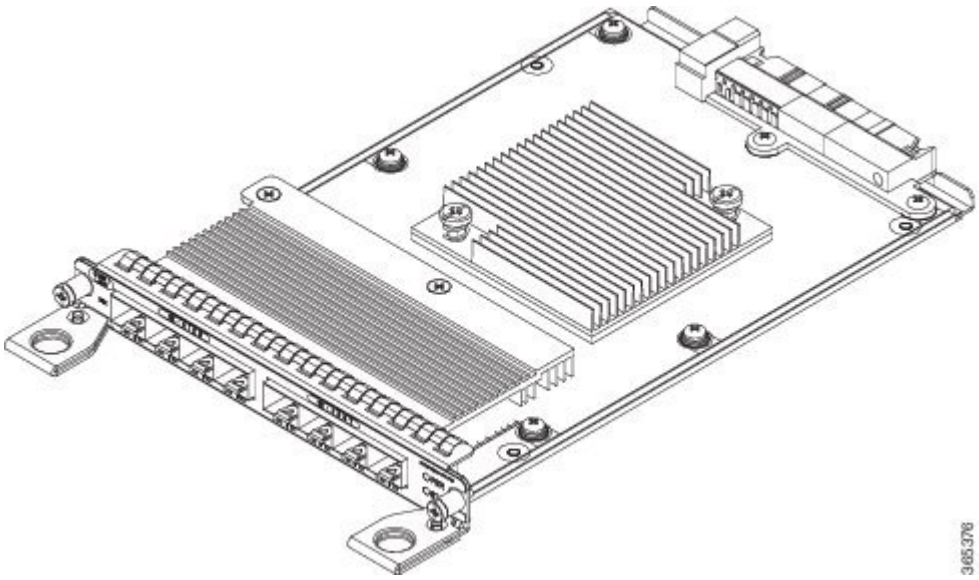
- GE SFP ports—Supports 100/1000 modes
- GE C-SFP ports—Supports 100/1000BASE-BX modes
- 100GE CPAK ports using 1x100G IM
- 100GE QSFP port using 2x100G IM
- 10GE ports through SFP+
- 2X40 GE interface module—Supports QSFP mode
- T1/E1 ports with integrated inter-office surge protection—Supports TDM channelized, PWE3 processing
- T3/E3 ports - Supports TDM channelized, PWE3 Processing
- OC3/OC12/OC48/OC192 - Supports TDM channelized, PWE3 Processing

Note For information about supported interface modules, see the data sheet for the Cisco NCS 4200 Series Aggregation Services Routers .

The Cisco NCS 4216 interface modules are a field-replaceable units. In addition to the ports provided on an RSP, the Cisco NCS 4216 supports the interface modules.

8-port 10 Gigabit Ethernet Interface Module (8X10GE)

Figure 4: 8x10 Gigabit Ethernet Interface Module



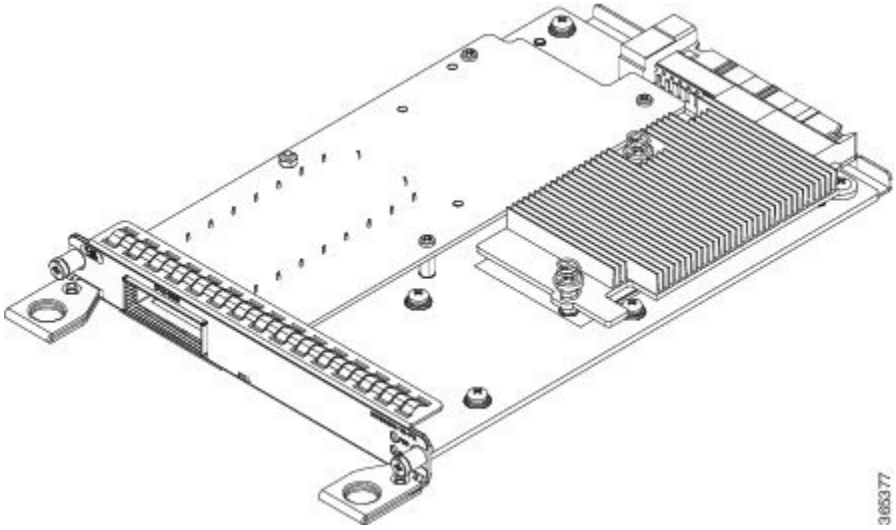
The high density 8x10 Gigabit Ethernet interface module supports eight 10 Gigabit Ethernet ports using SFP+ transceivers cages on the faceplate.

Note It does not support XFP transceivers on the ports.

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

1-port 100 Gigabit Ethernet Interface Module (1X100GE)

Figure 5: 1x100 Gigabit Ethernet Interface Module



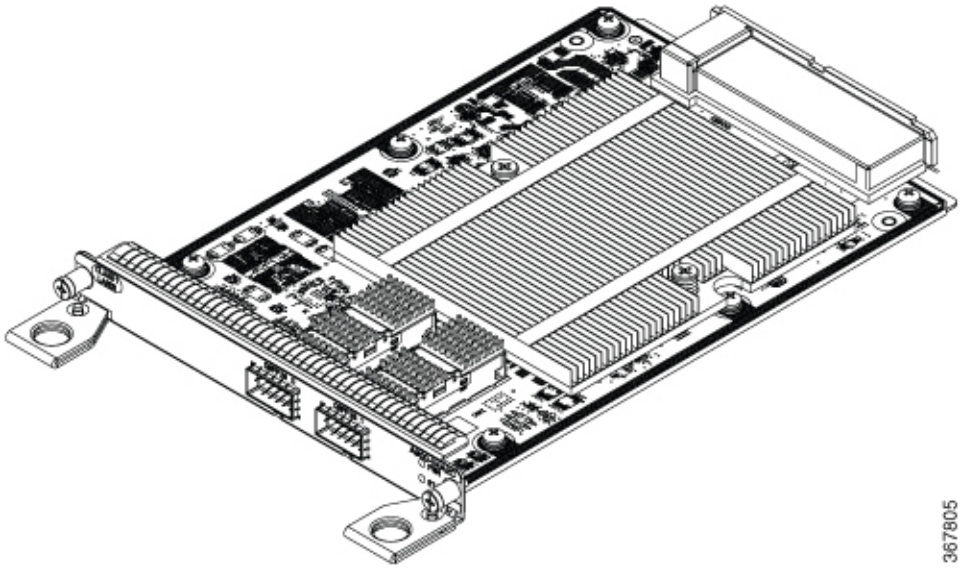
The single port 100 Gigabit Ethernet interface module supports100 Gigabit Ethernet port. The figure above shows the interface module.

For more information about installing a 1X100GE module, see the Interface Module Installation section.

2-Port 100 Gigabit Ethernet Interface Module (2X100GE)

The 2-port 100 Gigabit Ethernet Interface Module (NCS4200-2H-PQ) design supports only one 100G QSFP28 optics on Port 0. Port 1 is disabled with RSP3. It currently supports only one mode of operation with 100Gbps of traffic with RSP3.

Figure 6: 2-Port 100 Gigabit Ethernet Interface Module (2X100GE)



For more information about installing a 1X100GE module, see the Interface Module Installation section.

Limitations

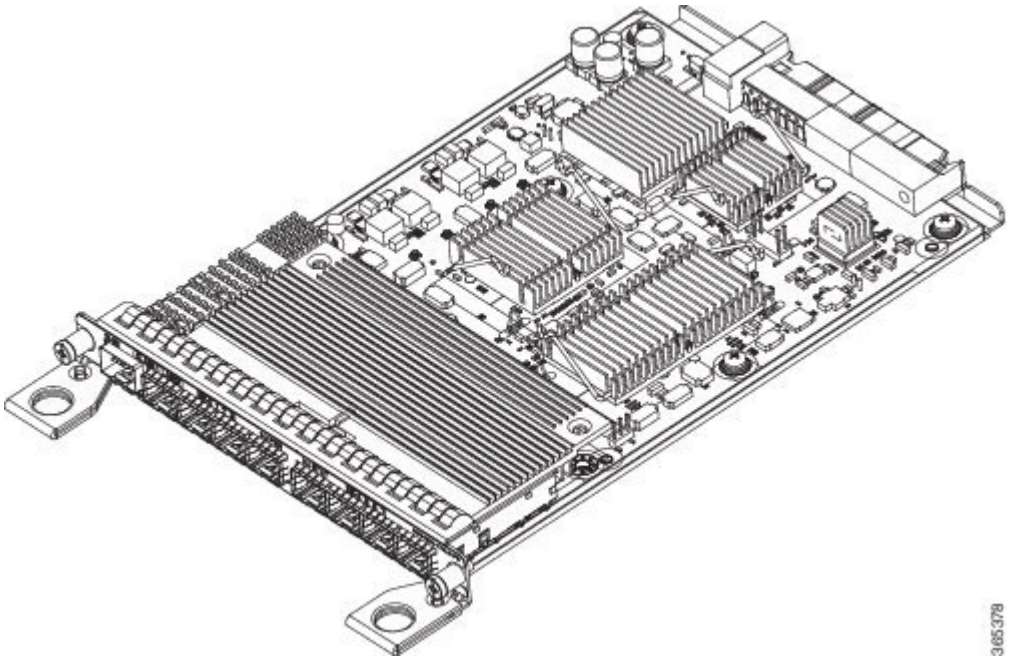
After any QSFP28 100G optics is inserted, it approximately takes around 10 seconds for the optics to be detected and link to come up. The optics requires this time delay to be complete the initiation and operation.

After inserting the cable or after unshutting the 100G interface, the 100G link may approximately take about 2 seconds to come up.

Note QSFP-100G-SR4-S and QSFP-100G-LR4-S are the optics supported in the 2X100GE IM for the 16.10.1 release.

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

Figure 7: 8x1 GE SFP+ 1x10 GE SFP Interface Module

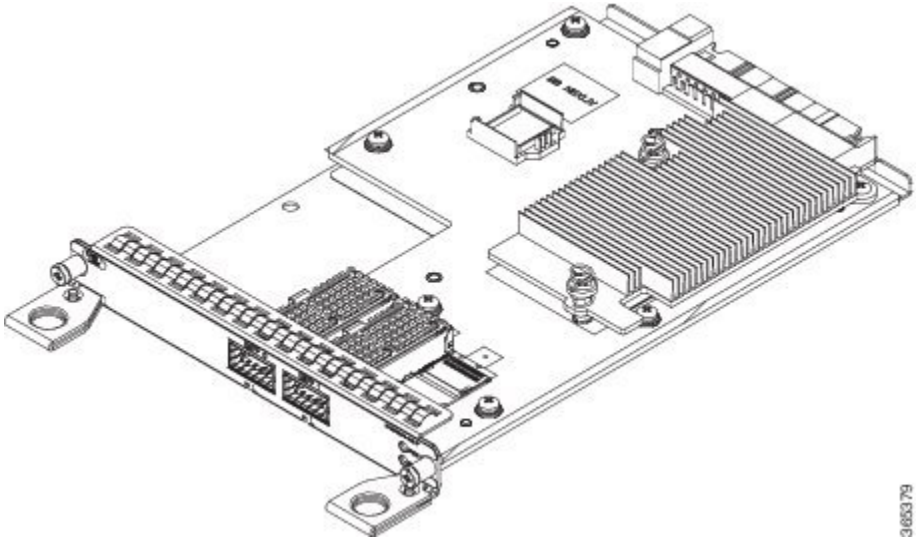


The 8-port 1 Gigabit Ethernet SFP interface module with the 1-port 10 Gigabit Ethernet interface module is a high density combination interface module. This module supports 8 Gigabit Ethernet SFP ports and 1 10 Gigabit Ethernet SFP+ port.

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

2-port 40 Gigabit Ethernet QSFP Interface Module (2X40GE)

Figure 8: 2x40 Gigabit Ethernet Interface Module



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

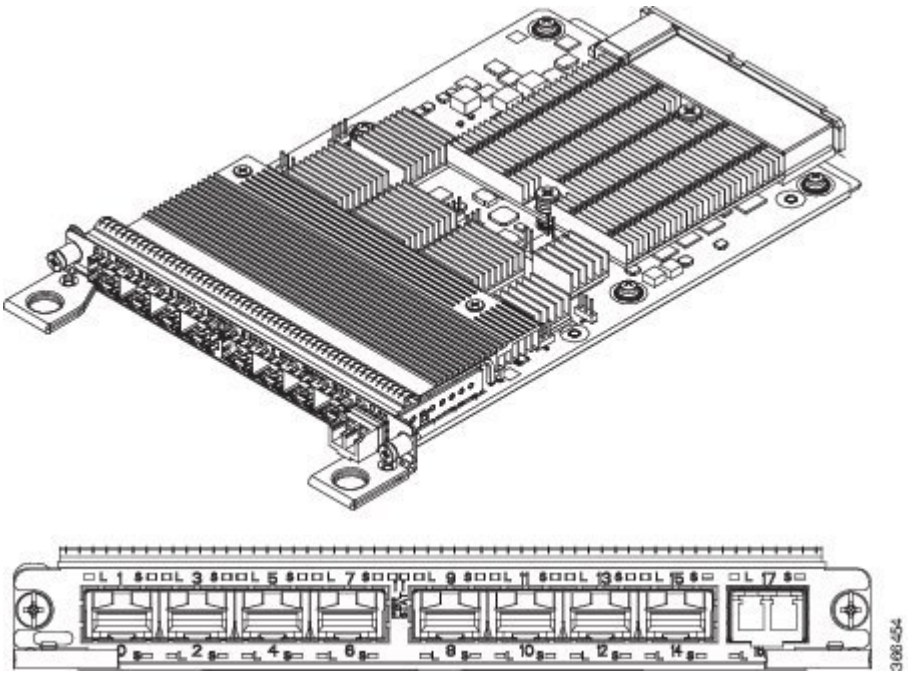
For more information about installing a 2X40 GE module, see the Interface Module Installation section.

8/16-Port 1 Gigabit Ethernet (SFP / SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module

The NCS4200-1T16G-PS interface module has the flexibility to support SFP+/SFP/CSFP on the modules as mentioned below:

- 1-Port 10 Gigabit Ethernet Small Form-Factor Pluggable (SFP+) interface supports one of three modules as 1xSFP+, 1xSFP or 1xCSFP.
- 8-Port Gigabit Ethernet Small Form-Factor Pluggable (SFP) interface supports as either 8xSFP, or 8xCSFP.

Figure 9: NCS4200-1T16G-PS Gigabit Ethernet Interface Module



The following modes are supported for the Interface Module, based on slot capacity:

- 8 x 1GigE (SFP) Fully subscribed mode (FS)
- 8 x 1GigE (SFP) + 1 x 10GigE (SFP+) Fully subscribed mode (FS)
- 16 x 1GigE (C-SFP) + 1 x 10GigE (SFP+) Fully subscribed mode (FS)
- 16 or 18 x 1GigE (C-SFP) Oversubscribed mode (OS)
- 16 x 1GigE (C-SFP) + 1 x 10GigE (SFP+) Oversubscribed mode (OS)
- 8 or 9 x 1GigE (SFP) Fully subscribed mode (FS)
- 1 x 10GigE (SFP+) Fully subscribed mode (FS)

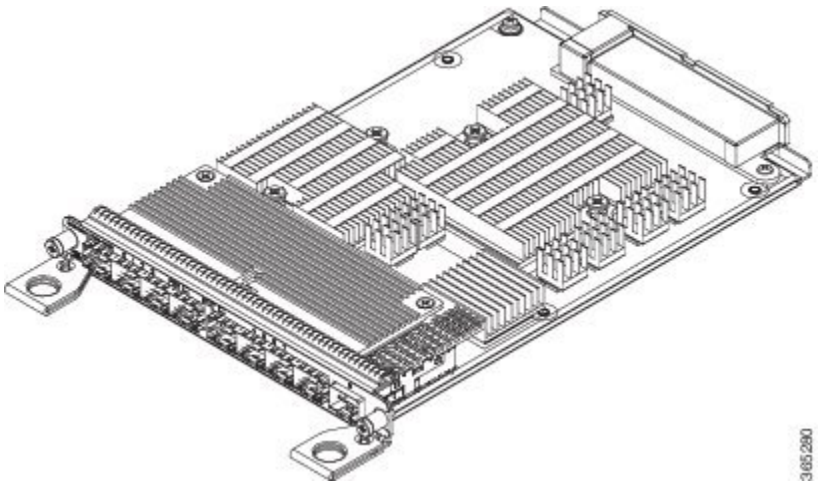
For more information about installing a 1xSFP or CSFP and 8xSFP or CSFP, see Installing an Interface Module.

For more information on port numbering, see Configuring 8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module chapter of the Cisco NCS 4200 Series Software Configuration Guide, Cisco IOS XE Fuji 16.7.x.

OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)

The OC-192 interface module with 8-port low rate CEM interface module is a high density combination interface module. This module supports 1 OC-192 port and 8 low rate CEM or 1 Gigabit Ethernet port.

Figure 10: OC-192 Interface Module



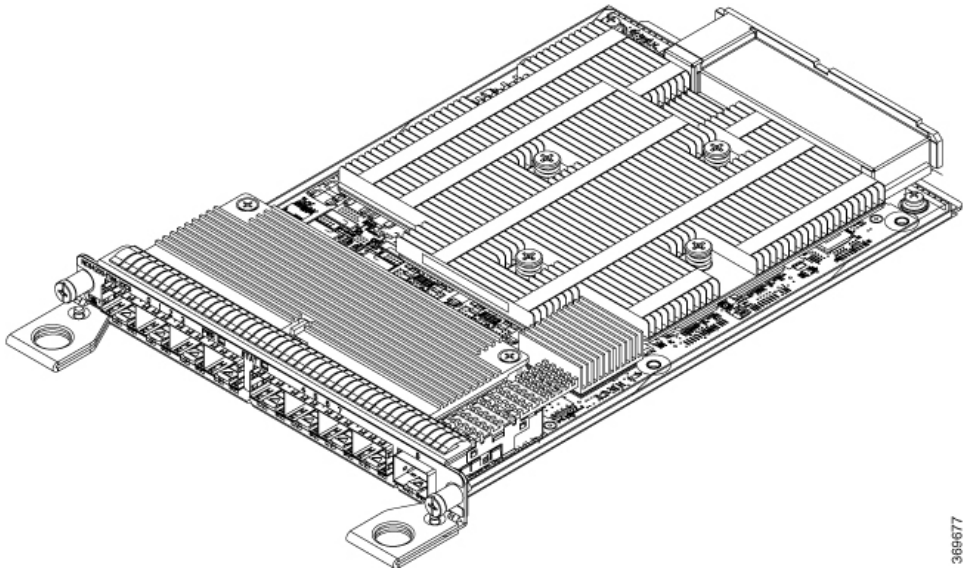
For more information about installing the OC-192 interface module, see the Interface Module Installation section.

NCS 4200 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module (NCS4200-1T8S-20CS)

The NCS 4200 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module, iMSG is a cost-effective interface module (IM) that supports CEM and Multiservice Gateway features on the OCn interfaces.

Note The Multiservice Gateway features are not supported on this IM on Cisco IOS XE Release 16.12.1.

Figure 11: CEM and iMSG Interface Module



The NCS 4200 1-Port OC-192 or 8-Port Low Rate CEM 20G Bandwidth Interface Module, iMSG IM supports eight SFP optical interfaces supporting at OC-3/OC-12/OC-48/1G rates and a single SFP+ optical interface supporting at OC-192/10G.

This IM operates in two modes:

- 20G mode; uses two XFI lanes towards the system
- 10G mode; uses single XFI lane towards the system

The benefits of this IM are:

- Improves backplane efficiency
- Increases system capacity
- Increases client flexibility

The most important feature of the NCS 4200 1x10G MR + 8x20G LR CEM, iMSG IM is it provides more flexibility from the interface, which allows you to configure any interface speed on the OCn port irrespective of the IM bandwidth. The bandwidth restriction comes into effect only when the circuit is configured.

For example, you can configure the SFP+ port as an OC-192 and the other eight optical ports as OC-48 to have the total interface speed of 30G. However, if you configure only one STS-1 HO CEP on each port that will take only 9xSTS-1, which is equivalent to 500 Mbps (9 x 52Mbps x1.06) of the backplane traffic.

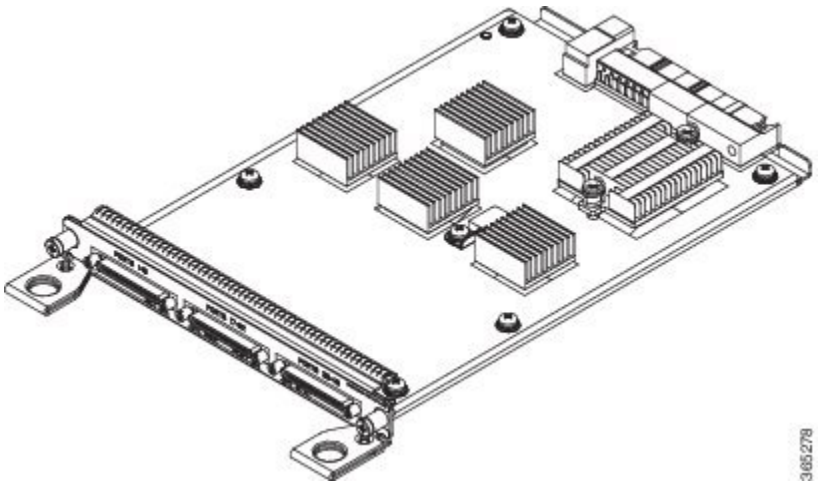
Restrictions

- On the port capable of OC-192 speed, lower speed such as, OC-3, OC-12, or OC-48 are not supported.
- No license is required to enable the Ethernet, OTN and Sonet/SDH functionalities.
- The SFP port supports OC-3, OC-12, and OC-48. SFP+ port supports OC-192.

48 X T1/E1 CEM Interface Module

The 48 X T1/E1 interface module provides connectivity for up to 48 x T1/E1 ports through 3 high-density connectors on the front panel. Each port supports 16 TX and RX ports. For information on LEDs, see the Troubleshooting section.

Figure 12: 48 x T1/E1 Interface Module

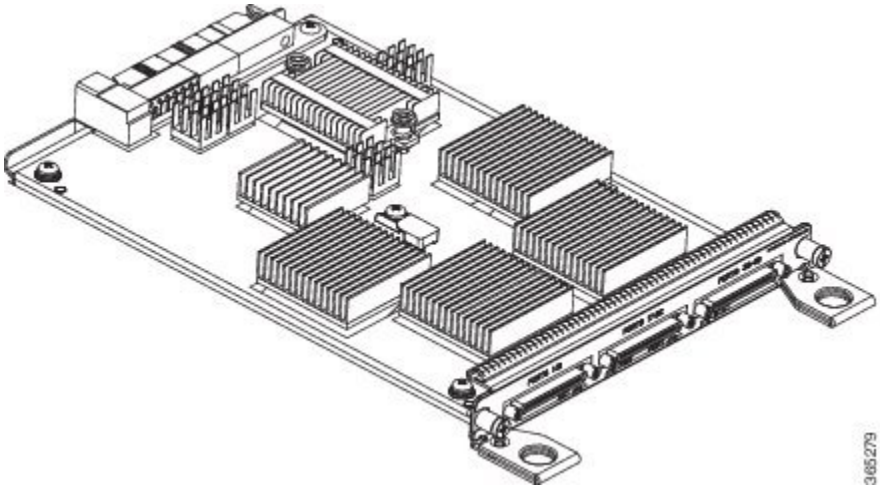


For more information about installing the 48 X T1/E1 interface module, see the Interface Module Installation section.

48 X T3/E3 CEM Interface Module

The 48 X T3/E3 interface module provides connectivity for up to 48 x T3/E3 ports through 3 high-density connectors on the front panel. Each port supports 16 TX and RX ports. For information on LEDs, see the Troubleshooting section.

Figure 13: 48 x T3/E3 Interface Module



For more information about installing the 48 X T3/E3 interface module, see the Interface Module Installation section.

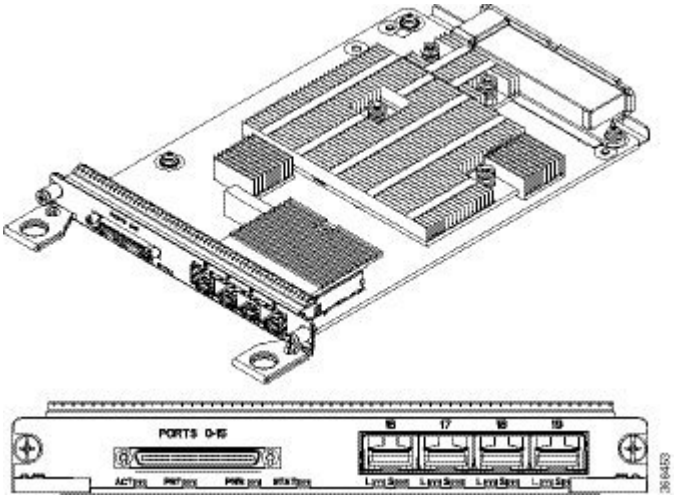
1-Port OC48/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-port T1/E1 + 4-Port T3/E3 CEM Interface Module

The NCS4200-3GMS interface module supports:

- 12xDS1/E1 + 4xDS3/E3/STS-1e interface over the high-density port.
- 1xOC48/12/3 or 1GE interface and 3xOC12/3 or 1GE interface.

Note If OC48 is enabled, then the remaining 3 ports are disabled.

Figure 14: NCS4200-3GMS Gigabit Ethernet Interface Module



For more information on the supported SFP modules, see the Cisco NCS 4200 Series Network Convergence System Interface Modules Data Sheet.

Temperature Sensor

The Cisco NCS 4216 has a temperature sensor to detect ambient overtemperature conditions inside the chassis. The operating temperature range is between –40 C to +65 C. Temperatures outside this range are reported to the processor as an interrupt, and the software takes action to generate the appropriate alarms.

Patch Panels

The Cisco NCS 4206 has patch panels modules that provide interconnections with the interface modules.

The following table shows different types of patch panel:

Table 9: T1/E1 Patch Panel

Patch Panel	Description
PANEL-48-1-DIN	48X75 ohm E1/DS1 termination, through DIN 1.0/2.3 connectors
PANEL-48-1-RJ48	48X120 ohm E1/110 ohm DS1 termination, through RJ 48C connector
PANEL-48-1-AMP64	48X120 ohm E1/110 ohm DS1 termination, through 4xAMP 64-pin

Patch Panel	Description
PANEL-144-1-AMP64	144X120 ohm E1/110 ohm DS1 termination, through 12XAMP64-pin

Table 10: T3/E3 Patch Panel

Patch Panel	Description
PANEL-48-3-DIN	48X75 ohm E3/DS3 termination, through DIN 1.0/2.3 connectors
PANEL-48-3-HDBNC	48X75 ohm E3/DS3 termination, through HDBNC connectors

The 48 X T1/E1 TDM interface module and 48 X T3/E3 TDM interface module supports a maximum of 48 TDM ports. These ports are available on the interface modules through three Very-High-Density Cable Interconnect (VHDCI) 16-port connectors. The patch panels listed above make these 48 ports available to the customer via different port densities (48- or 144-port patch panels) with standard Telco connectors (DIN, RJ48, and AMP64 for T1/E1 and DIN, HDBNC for T3/E3).

Figure 15: VHDCI 16-port Connectors Interface View

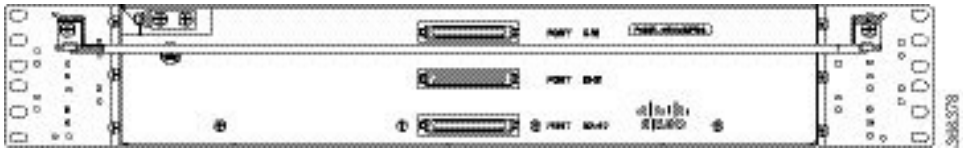


Figure 16: PANEL-48-1-RJ48 Interface View

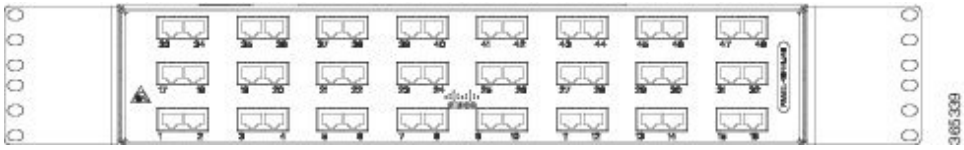


Figure 17: PANEL-48-1-AMP64 Interface View



Figure 18: PANEL-48-1-DIN or PANEL-48-3-DIN Interface View

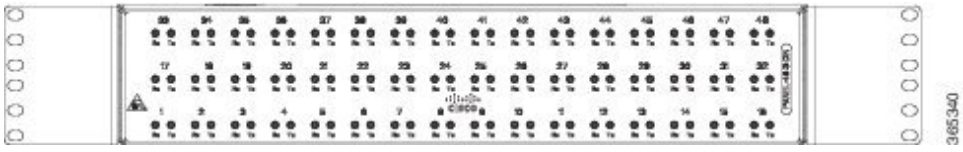


Figure 19: PANEL-144-1-AMP64 Interface View

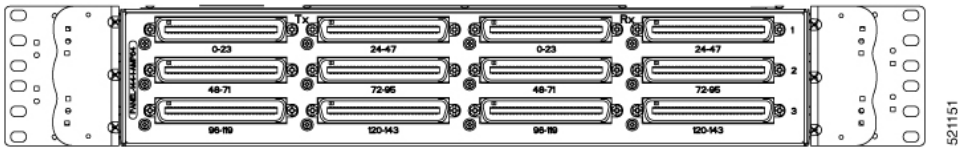


Figure 20: PANEL-48-3-HDBNC InterfaceView

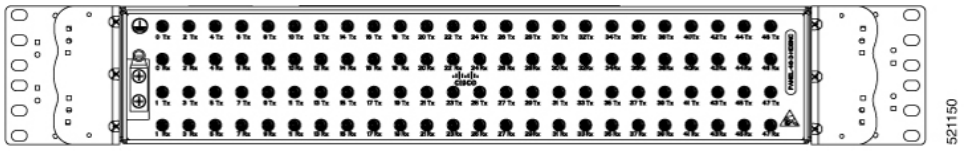
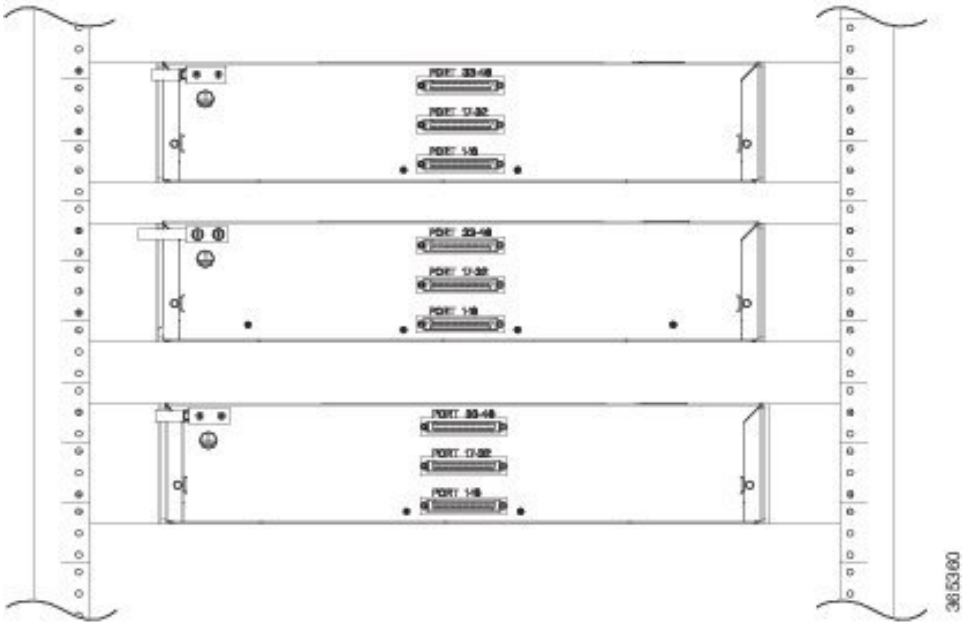


Figure 21: Patch Panel System Interface View



Interface Numbering

Following is an explanation of the slot or port numbering:

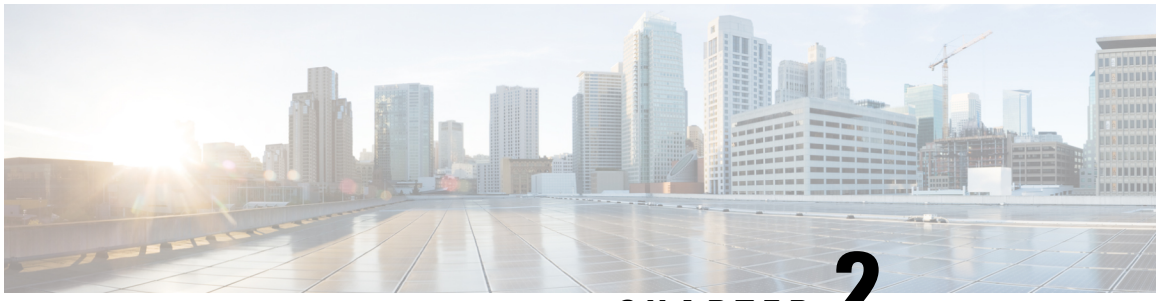
- The numbering format is **Interface type slot or interface number**. Interface (port) numbers begin at logical 0 for each interface type.
- Interface module slots are numbered from bottom to top, with logical interfaces on each module numbered from left to right. Interfaces are hard-wired. Therefore,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

The following commands display the active RP slot number. The interface module is referenced as 1/x instead of 0/x:

- **show diag all eeprom detail**
- **show platform software trace message iomd**
- **show platform software agent iomd**
- **show platform software peer shell-manager brief**
- **show platform software peer chassis-manager**
- **show platform software memory iomd**
- **set platform software trace iomd**

Regulatory Compliance

For regulatory compliance and safety information, see the Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series Aggregation Routers document.



CHAPTER 2

Preparing for Installation

The sections describe how to prepare for the installation of the Cisco NCS 4216 at your site.

- Safety Guidelines, on page 29
- Site Planning, on page 43
- Receiving the Cisco NCS 4216, on page 54

Safety Guidelines

Before you begin the installation of the Cisco NCS 4216, review the safety guidelines in this chapter to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco NCS 4216, review the safety warnings listed in Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series Aggregation Routers.

The sections describe the safety guidelines for the Cisco NCS 4216.

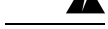
Standard Warning Statements

To see translations of the warnings that appear in this publication, see the Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series for this device.

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



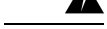
Warning If the symbol of suitability with an overlaid cross appears above a port, you must not connect the port to a public network that follows the European Union standards. Connecting the port to this type of public network can cause severe injury or damage your router. Statement 1031



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



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



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.

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.

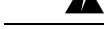
Safety Precautions for Module Installation and Removal

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

To see translations of the warnings that appear in this publication, see the Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series for this device.

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 Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. Statement 1056



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



Warning Invisible laser radiation present. Statement 1016



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

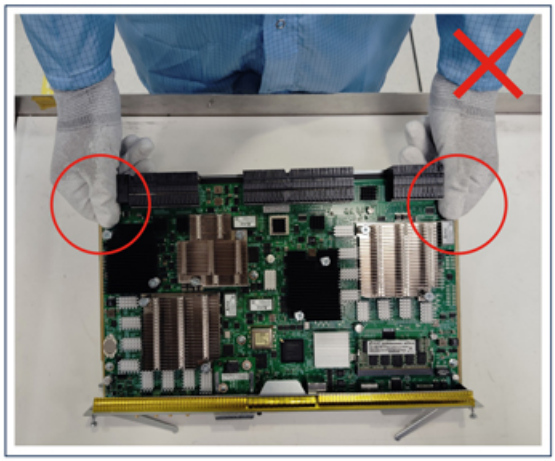


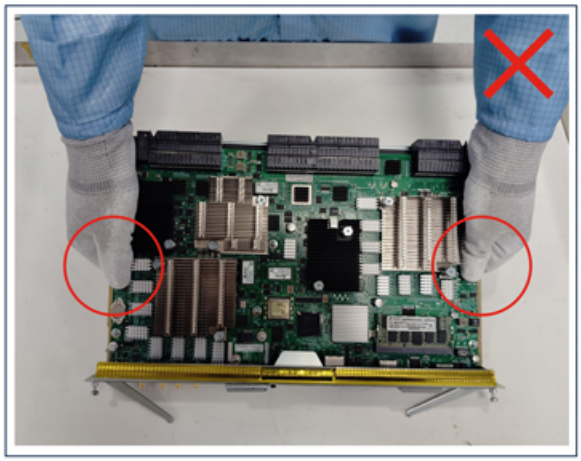
Important

NCS4216-RSP Safe Handling Procedures

- We recommend that you hold the RSP card with the front panel and base plate support.
- Avoid contacting PCBA components during unboxing and regular handling to avoid accidental damage to PCBA edge components.

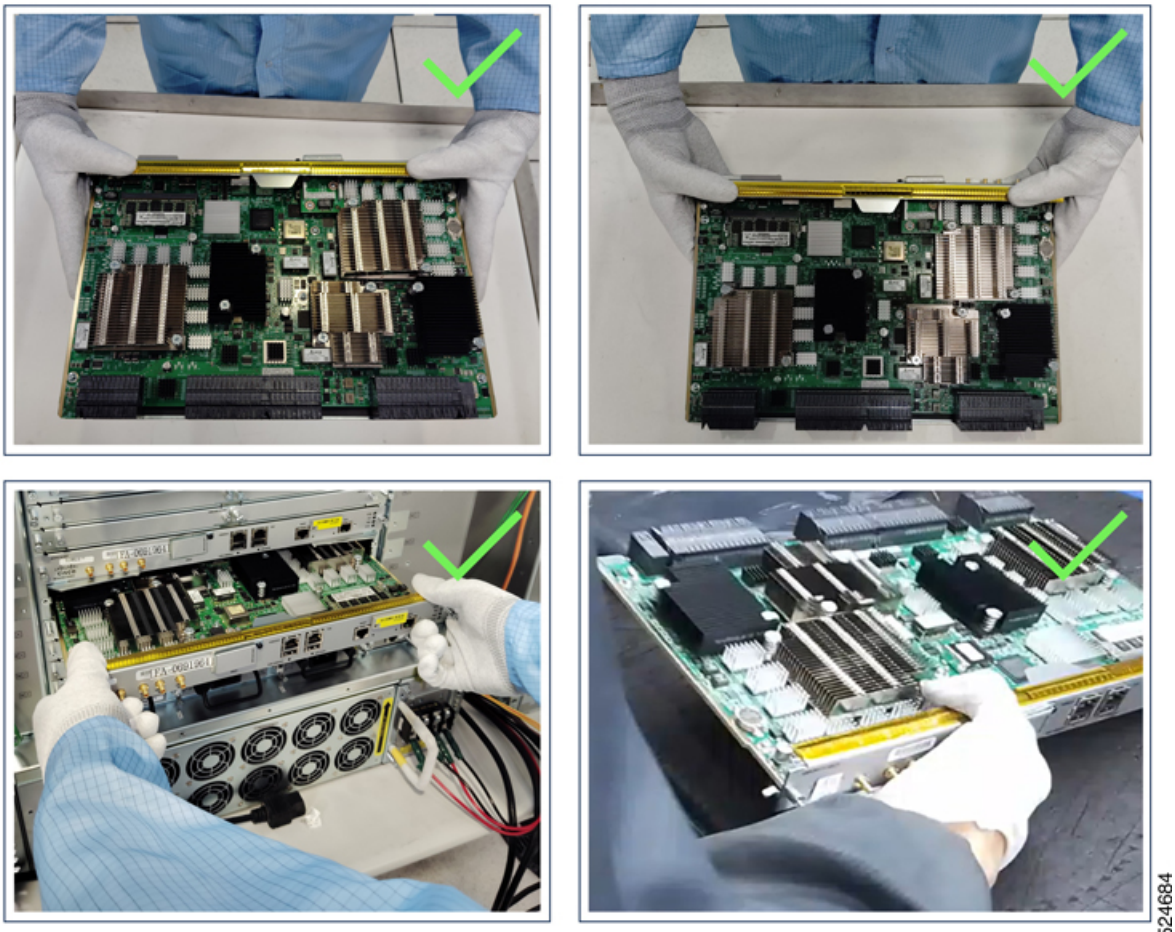
Figure 22: Don'ts





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Figure 23: Do's



NCS4216-RSP Card Insertion Safe-Handling Procedure

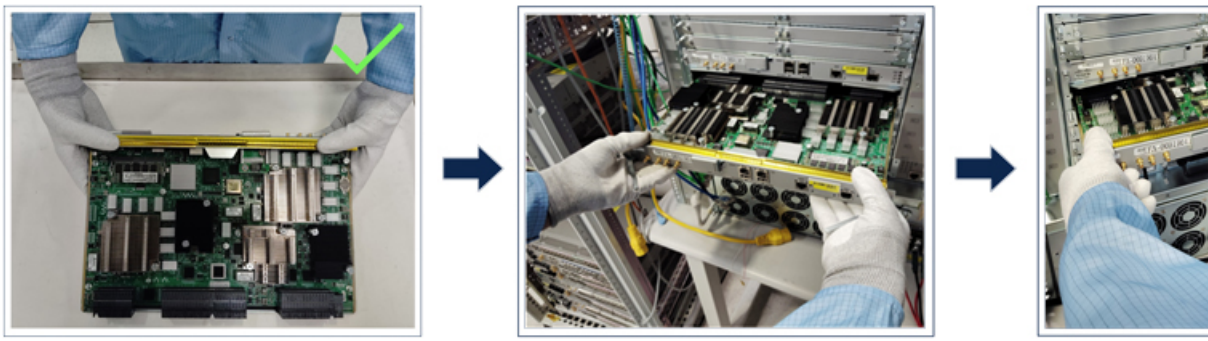
1. Remove the NCS4216 -RSP card from the packaging and place the card on a flat surface. Ensure that the card is handled as per the above ***NCS4216-RSP Safe Handling Procedures***.

Figure 24: Card Insertion Procedure



2. Lift the RSP card and insert the card into the chassis by aligning it to the chassis slot. Once the card is aligned, insert the card slowly to the end and engage the locking lever.

Figure 25: Card Insertion Procedure in RSP Slots



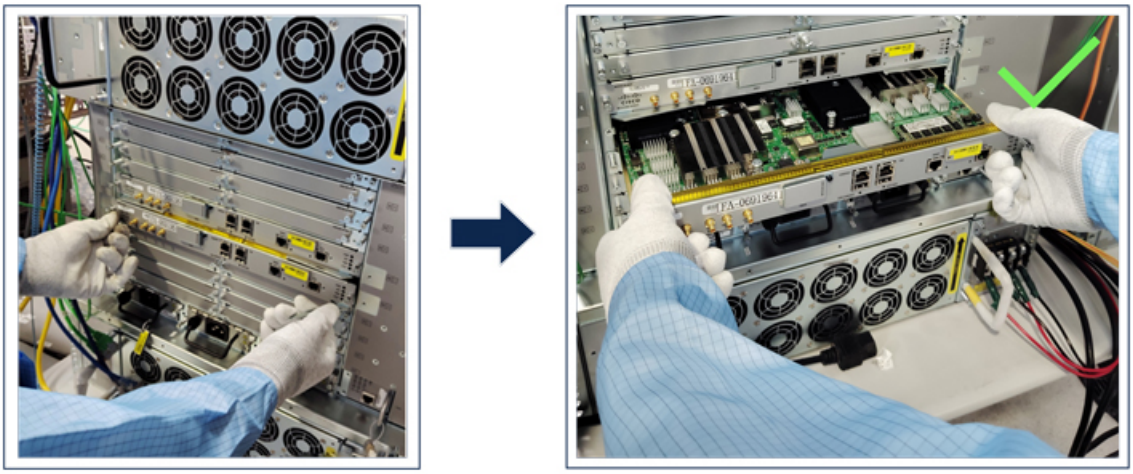
Note

- While inserting the RSP card into the RSP slot 0, ensure that the PCBs have engaged into the card guides and end of the card rests on the bottom card and then slide into the chassis.
- While inserting the RSP card into the RSP slot 1 with RSP slot 0 empty, ensure that the card is engaged into the card guide slots before sliding into the chassis.

NCS4216-RSP Card Safe-Handling Removal Procedure

1. Disengage the locking lever of the RSP card and slowly pull out the RSP card to remove it from the chassis and place it on a flat surface.

Figure 26: Card Removal Procedure from the Slot



Note Ensure that you take proper care so that the edge or any part of the RSP card should not have any impact with the locking levers during card insertion or removal procedures.

Figure 27: Caution while RSP Card Insertion or Removal Procedures with respect to Impact to the Locking Levers



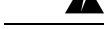
Safety with Electricity

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

Warning When installing the unit, always make the ground connection first and disconnect it last. Statement 42

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects 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 during 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 Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001



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. For -48/-60 VDC installation, the wire shall be 6 AWG and 8 AWG minimum with a 40 A circuit breaker. Statement 1005



Warning This product relies on the building's installation for short-circuit (overcurrent) protection.



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 by using a special tool, lock and key, or other means of security. Statement 1017



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 When you connect or disconnect the power and relay connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that power is removed from the switch and alarm circuit. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed. Statement 1058



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



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



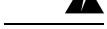
Warning To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit. Statement 1032



Warning 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 equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. Statement 1043



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 disconnected last. Statement 1046



Warning Failure to securely tighten the power and relay connector captive screws can result in an electrical arc if the connector is accidentally removed. Statement 1058



Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. Statement 39



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. To verify switch operation, perform POST on the switch in a nonhazardous location before installation. Statement 1065



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



Warning Hazardous voltage or energy may be present on DC power terminals. Always replace cover when terminals are not in service. Be sure uninsulated conductors are not accessible when cover is in place. Statement 1075

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 working 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.

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.

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 can 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 physically 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 sections describe how to plan for the installation of the Cisco NCS 4216.

General Precautions

Observe the following general precautions when using and working with your Cisco NCS 4216 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 cables carefully. Route system cables and the power supply cable and plug so that they cannot be 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 system component damage.

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 NCS 4216.
- The floor space that the Cisco NCS 4216 occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the Cisco NCS 4216 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 NCS 4216 Ethernet cabling distances are within limitations.
- The equipment rack in which you plan to install the Cisco NCS 4216 complies with requirements.

- In selecting the location of the rack, careful consideration has been given to safety, ease of maintenance, and proper airflow.

Site Selection Guidelines

The Cisco NCS 4216 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 NCS 4216 is designed to meet the industry EMC, safety, and environmental standards described in the Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series Aggregation Routers.

Environmental Requirements

The Cisco NCS 4216 is Telcordia GR-63-Core Indoor compliant.

Environmental monitoring in the Cisco NCS 4216 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 section.

For an outside plant installation (cell site cabinet, hut etc.), it is required that the Cisco NCS 4216 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 for side-side and within –40ºC to 55ºC with Air Plenum.

Physical Characteristics

Be familiar with the physical characteristics of the Cisco NCS 4216 to assist you in placing the system in the proper location. For more information, see the System Specifications section.

Assembly Guidelines

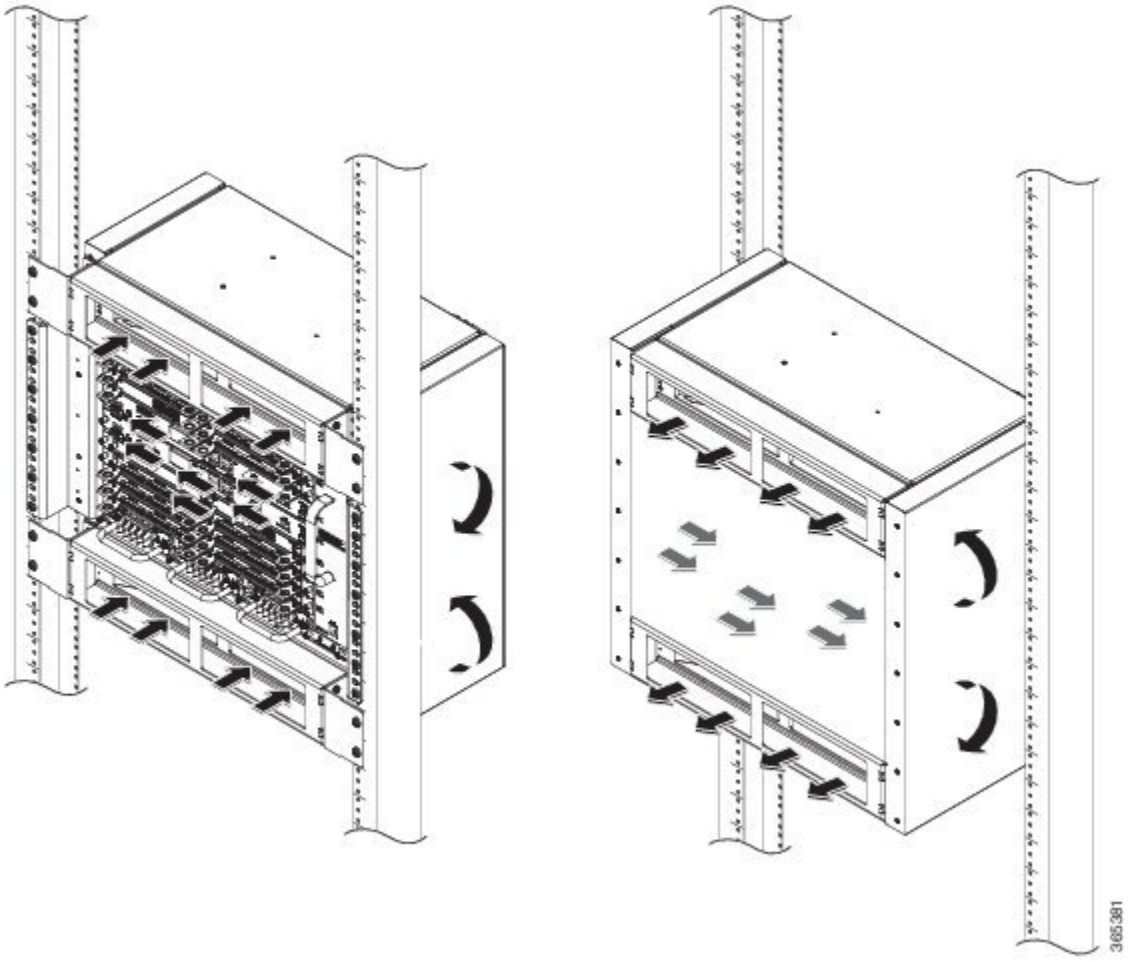
Interface module carriers must first be assembled in the Cisco NCS 4216 followed by RSP3. Then, IMs must be installed from the lower slot to the upper slot in the following order—slot 0, slot 1 and so on.

All empty slots should be assembled with A900-IMA-BLANK.

Air Flow Guidelines

Cool air is circulated through the Cisco NCS 4216 by a fan tray located along the right side of the router. Air flow is side-to-side, front to back, as shown in the figure below.

Figure 28: Cisco NCS 4216 Chassis Air Flow



To ensure adequate airflow, it is recommended that you maintain a minimum clearance distance always, as mentioned in the following figure.

Figure 29: Front View of Cisco A907-F2B-AIR Clearance

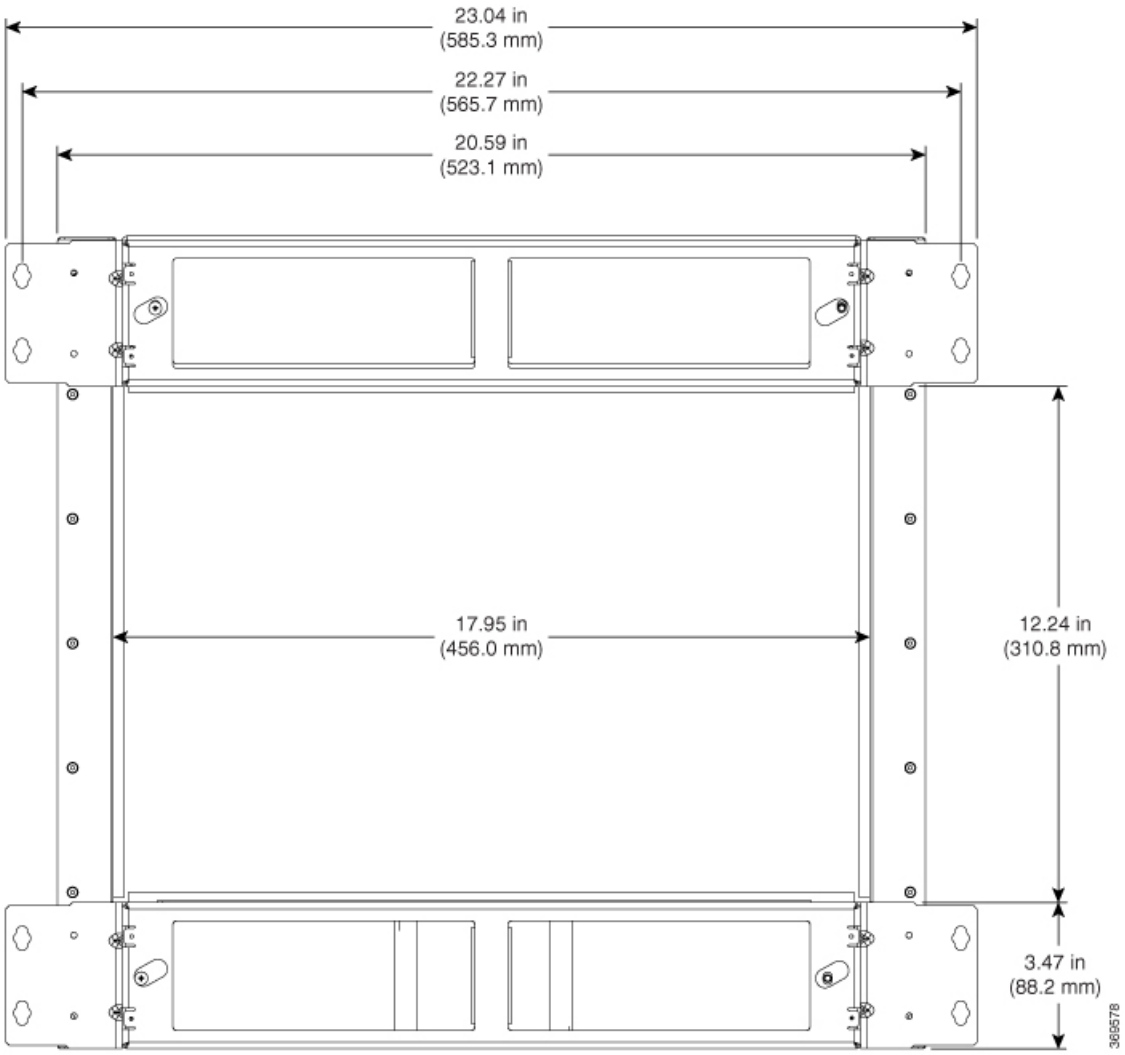
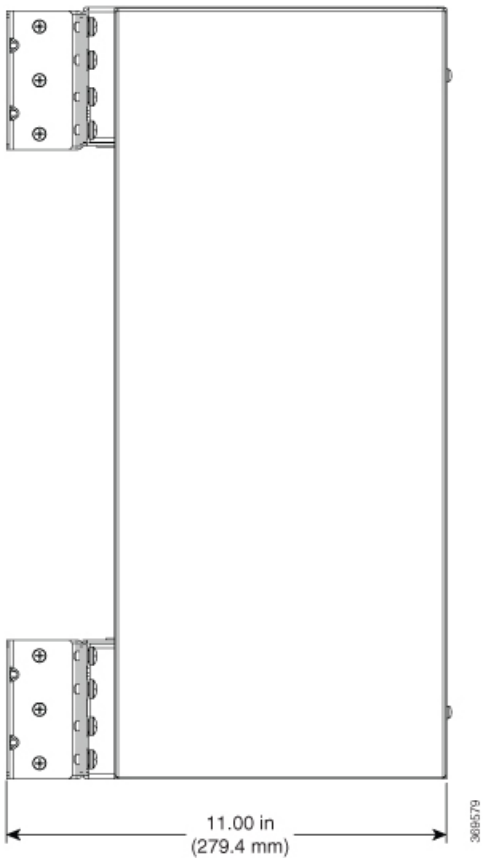


Figure 30: Side View of Cisco A907-F2B-AIR Clearance



The fan trays maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the chassis.

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

- 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.
- 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 can 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.
- Avoid locating the Cisco NCS 4216 in a location in which the chassis air intake vents may draw in the exhaust air from adjacent equipment.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco NCS 4216 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 800mm 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 NCS 4216 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 NCS 4216, refer to the System Specifications section.

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

Site Power Guidelines

The Cisco NCS 4216 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 NCS 4216:

- The redundant power option ensures 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 feed of the power supplies to a separate input 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 NCS 4216 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 maximum power draw of the Cisco NCS 4216 chassis and its configurable hardware components are listed in the following table. The maximum power draw values are not affected by the number of PSUs installed in the chassis.

Hardware component(s)	Maximum power draw value
Router chassis with 2 power supplies, 1 fan tray, and 1 RSP3C-400W	(approx.) 500W
NCS4216-RSP (active)	230 W
NCS4216-RSP (standby)	219 W
NCS4200-1T8LR-PS (8-port 1GE SFP + 1-port 10 GE interface module)	29 W
NCS4200-8T-PS (8-port 10 GE SFP interface module)	57 W
NCS4200-2Q-P (2-port 40 GE SFP interface module)	53 W
NCS4200-1H-PK (1-port 100 GE SFP interface module)	62 W
NCS4200-2H-PQ (1-port 100 GE QSFP interface module)	61 W
NCS4200-1T8S-10CS (OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO))	92 W
NCS4200-48T1E1-CE (48 T1/E1 TDM Interface Module)	35 W
NCS4200-48T3E3-CE (48 T3/E3 TDM Interface Module)	52 W
NCS4200-1T16G-PS (8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module)	44 W
NCS4200-3GMS (1-Port OC48/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-port T1/E1 + 4-Port T3/E3 CEM Interface Module)	55 W

Electrical Circuit Requirements

Each Cisco NCS 4216 requires a dedicated electrical circuit. If you equip it with dual power feeds, provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The Cisco NCS 4216s can be powered by a DC source. Ensure that equipment grounding is present and observe the power strip ratings. Make sure that the total ampere rating of all products plugged into the power strip does not exceed 80% of the rating.

For more information about the Cisco NCS 4216 power supply, see the Power Supply Features section.

Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the Cisco NCS 4216, 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 NCS 4216 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 DB-25 alarm connector on the fan tray in order to comply with FCC/EN55022/CISPR22 Class A emissions requirements. For information about the fan tray alarm port, see the Connecting the Fan Tray Alarm Port section.

Before you install the Cisco NCS 4216, 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 in planning your network connections *prior to* installing the Cisco NCS 4216.

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 can cause data errors or damage to the equipment.

The following sections describe sources of interference and how to minimize its effects on the Cisco NCS 4216 system.

Electromagnetic Interference

All equipment powered by DC 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 NCS 4216 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 electrode magnetic compliance standards supported on the Cisco NCS 4216, see Regulatory Compliance and Safety Information for the Cisco NCS 4216.

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.

Rack-Mounting Guidelines

The sections provide guidelines for rack-mounting the Cisco NCS 4216.

Precautions for Rack-Mounting

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

- Do not move large racks by yourself. Due to the height and weight of a rack, a minimum of two people are required to accomplish this task.
- 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 NCS 4216 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 NCS 4216 can be mounted in most two-post or four-post, 23-inch equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks (EIA-310-D 23-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 degrees C.

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inches ± 0.06 inch (46.50 cm ± 0.15 cm).

Consider installing the Cisco NCS 4216 in a rack with the following features:

- Network Equipment Building System (NEBS) compliant, 23-inch wide rack.

- EIA or European Telecommunications Standards Institute (ETSI) hole patterns in the mounting rails. The required mounting hardware is shipped with the Cisco NCS 4216. 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.



Note The Cisco NCS 4216 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 over temperature 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. To Install Air Plenum on 19-inch rack, select Flat Rack Post type.

Equipment Rack Guidelines

The placement of the rack can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics described in the System Specifications section. Choose a proper location for the Cisco NCS 4216 by following the guidelines.

Locating for Safety

If the Cisco NCS 4216 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 document *GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection*.

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 NCS 4216 components and perform routine maintenance and upgrades easily.

Avoid installing the Cisco NCS 4216 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 NCS 4216 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 NCS 4216 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 NCS 4216 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 NCS 4216 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		
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)		
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)		
Shared port adapters are operational		
Correct software configuration displayed after system banner appears		

Creating a Site Log

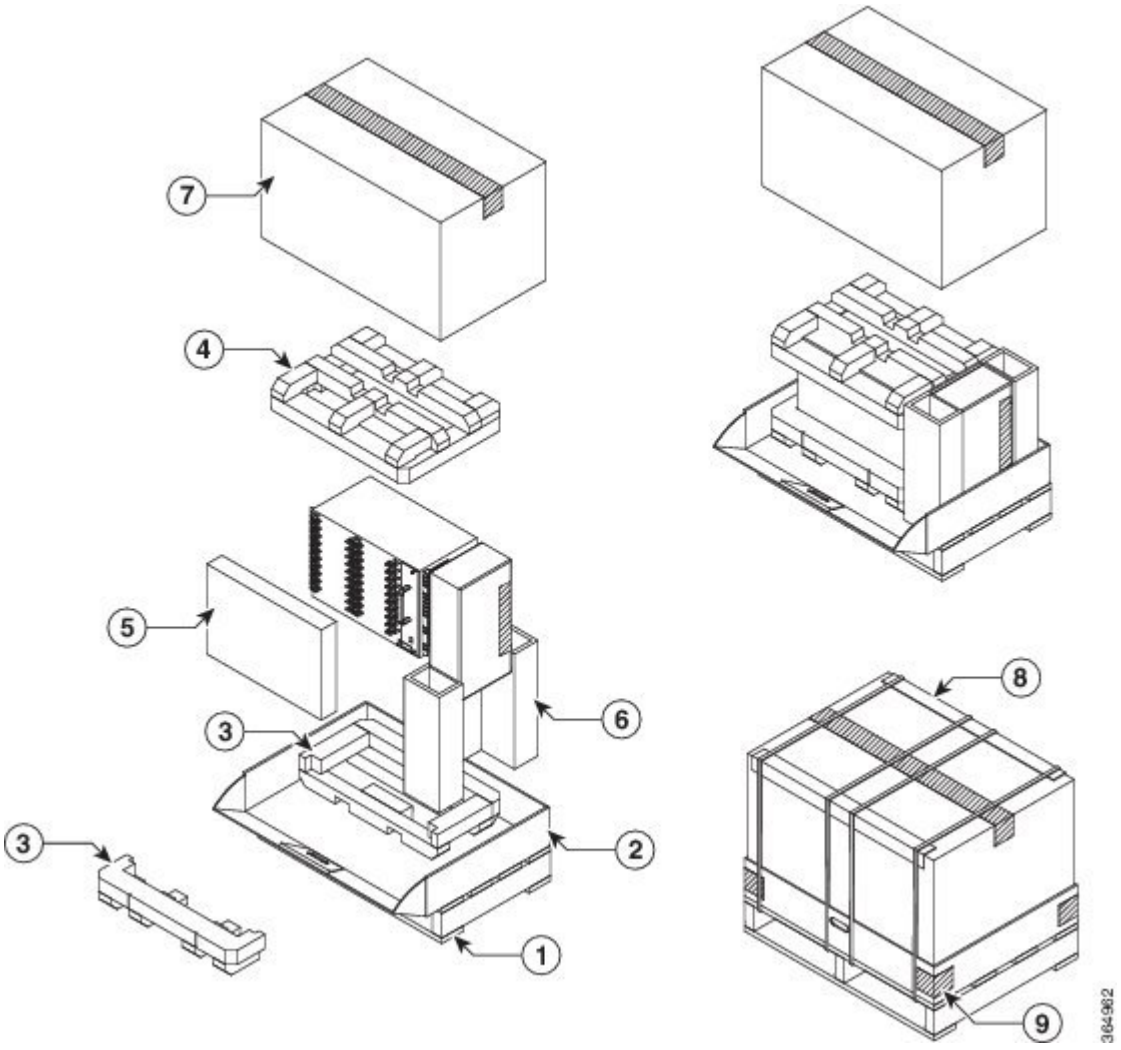
The Site Log provides a record of all the actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to the installation. (See Appendix A, Site Log and Manufactures section for more information on the Site Log as well as a sample Site Log that can be used to make copies.)

Receiving the Cisco NCS 4216

Each Cisco NCS 4216 chassis is shipped in a container. See the figure below.

Figure 31: Cisco NCS 4216 Packaged for Shipping



1	Pallet	6	Corrugated spacer

2	Pellet deck board	7	Carton
3	Bottom foam	8	Edge protector
4	Top foam	9	Tape
5	Tray	—	

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, 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. Lift the unit only by using handles that are an integral part of the chassis, or by grasping the chassis underneath its lower edge. Statement 163

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 on cable specifications, see the Troubleshooting section.

- Ethernet hub or 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) of pressure
- Crimping tool as specified by the ground lug manufacturer
- 6 or 8 AWG copper wire for the power cord
- Wire-stripping tools for stripping both 6 AWG and 8 AWG wire
- Tape measure and level
- #2 Phillips Dynamometric screwdriver
- Medium slot-head screwdriver
- Small slot-head screwdriver



Warning Only trained and qualified personnel should be allowed to install or replace this equipment. Statement 49

Unpacking and Verifying the Shipped Contents

When you receive your chassis, perform the following steps and use the Shipping Contents Checklist:

Procedure

Step 1 Inspect the box for any shipping damage. If there is obvious physical damage, contact your Cisco service representative.

Step 2 Unpack the Cisco NCS 4216.

Step 3 Perform a visual inspection of the chassis.

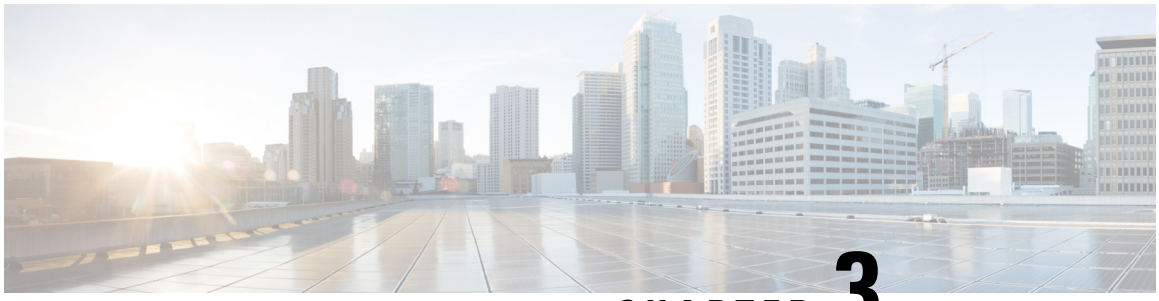
Step 4 Use the table below to check the contents of the Cisco NCS 4216 shipping container. Do not discard the shipping container. You will need the container if you move or ship the Cisco NCS 4216 in the future.

What to do next

Table 12: Cisco NCS 4216 Shipping Container Contents

Component	Description
Chassis	Cisco NCS 4216 chassis (NCS4216-SA)
	Fan tray (A907-FAN-E)
	Power supplies (A900-PWR900-D2)
	RSP (NCS4216-RSP)
	Interface modules
Accessories kit	Chassis rack-mount brackets (23-inch EIA)
	Three sets of screws: • Front and rear rack-mount bracket screws (2 sets) • Cable-management bracket screws
	Eight cable-management brackets
	One earth lug with two 10-32 screws.
	1 RJ45 to RJ45 crossover cable 1 RJ45 to DB-9 (female) adapter
	ANSI: #12-24 x 0.50 pan-head Phillips screws
	ETSI: M6.0 x 20 pan-head Phillips screws
	NCS4216-DOOR
Air Plenum Kit (A907-F2B-AIR)	One air plenum kit
ESD, wrist strap (disposable)	One disposable wrist strap (optional)
Documentation	*Regulatory Compliance and Safety Information for the* Cisco NCS 4216
Optional equipment	Check the container for the following optional equipment: • There are no cords for the DC power supply units. • Patch Panel cables (Required only for TDM Interface modules)

Note Most Cisco documentation is available online. Documentation that is shipped with your Cisco NCS 4216 includes the *Regulatory Compliance and Safety Information for the Cisco NCS 4200 Series Aggregation Service Router* document, and the *Cisco NCS 4200 Series Aggregation Service Router* Documentation Roadmap that contains information about the various documents that are available online and the links to them.



CHAPTER 3

Installing the Cisco NCS 4216

This chapter describes how to install the Cisco NCS 4216.

- Prerequisites, on page 59
- Installing the Router in a Rack, on page 59
- Installing the Chassis Ground Connection, on page 75
- Installing the Fan Tray, on page 77
- RSP Installation, on page 84
- Interface Module Installation, on page 88
- Installing the Power Supply, on page 91
- Installing the AC power Supply, on page 98
- Connecting the Cisco NCS 4216 Router to the Network, on page 101
- Remove defective chassis from the rack, on page 157

Prerequisites

Before installing the Cisco NCS 4216, 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 NCS 4216
- Gathering the tools and test equipment required to properly install the Cisco NCS 4216

For more instructions on how to prepare for the installation of the Cisco NCS 4216, see the Preparing for Installation section.

Installing the Router in a Rack

The sections describe how to install the Cisco NCS 4216 in a rack.

Note The Cisco NCS 4216 Door is not displayed in the figures below. It is only displayed in the *Installing the Cisco NCS 4216 Door* figure.

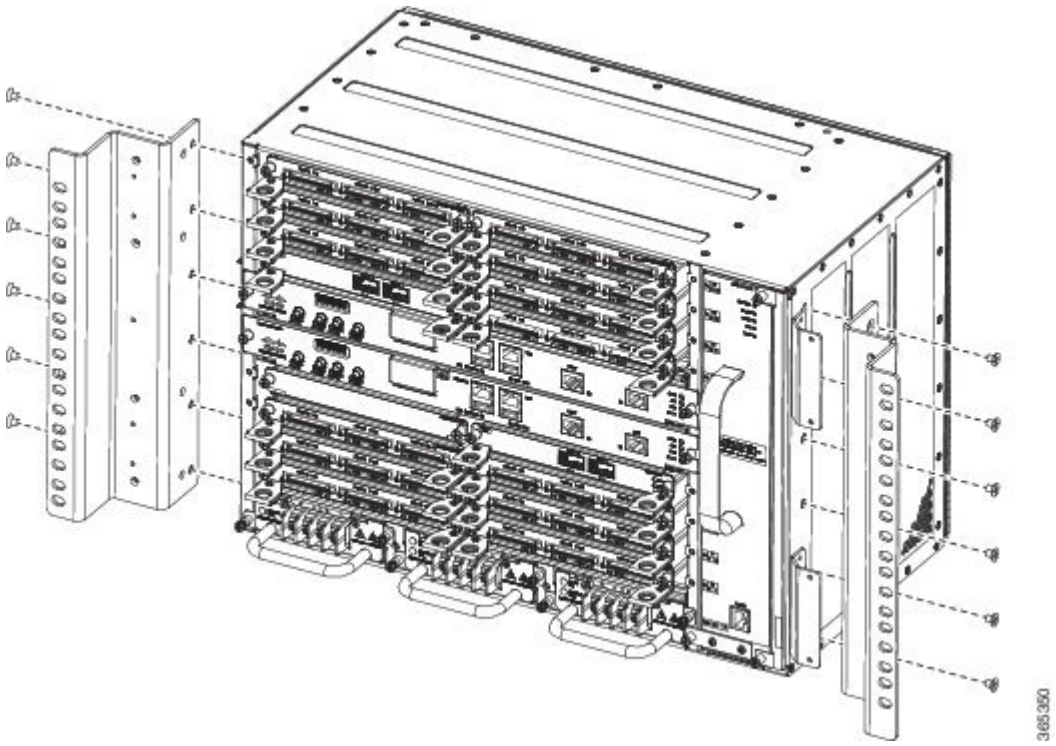
Installing the Chassis Brackets

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.

Figure 32: Attaching Mounting Brackets for a 23-inch Rack



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).

The A907-FAN-E fan tray with filter (A907-FAN-F) cannot be mounted using the mounting screws that are supported for fan tray. This is not an issue with the FAN tray filter blank panel (A907-FAN-F-B). We recommend that you use the short screws provided in the following rack mount kits to avoid interference of the air filter during rack mounting and while replacing the fan tray with the fan tray filter (A907-FAN-E):

- 23" rack mount kit (A907-RCKMT-23IN)

What to do next

Repeat Step 2 and Step 3 for the other bracket.

Installing Plenum Assembly and Chassis in the Rack

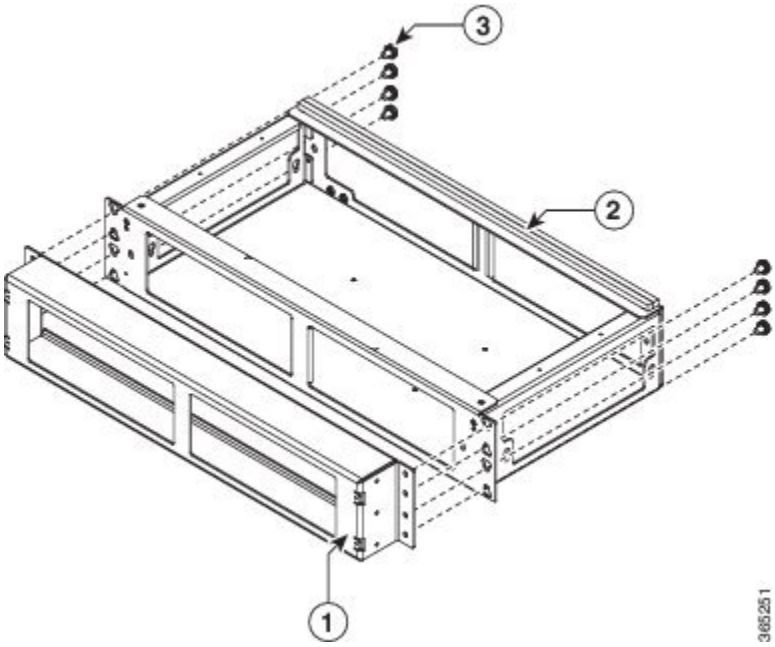
Following steps help you to install the plenum assembly irrespective of the chassis and rack size.

Note The below illustrations are for representation purpose only. The size displayed in the images may vary depending upon your chassis type and rack size but the steps remain the same. Ensure to select the 21 or 23 inches adapter for your plenum based on your rack size.

Procedure

Step 1 Position the adapter to the plenum base and secure using a maximum torque of 11.5 in.-lb (1.3 N-m). See figure below.

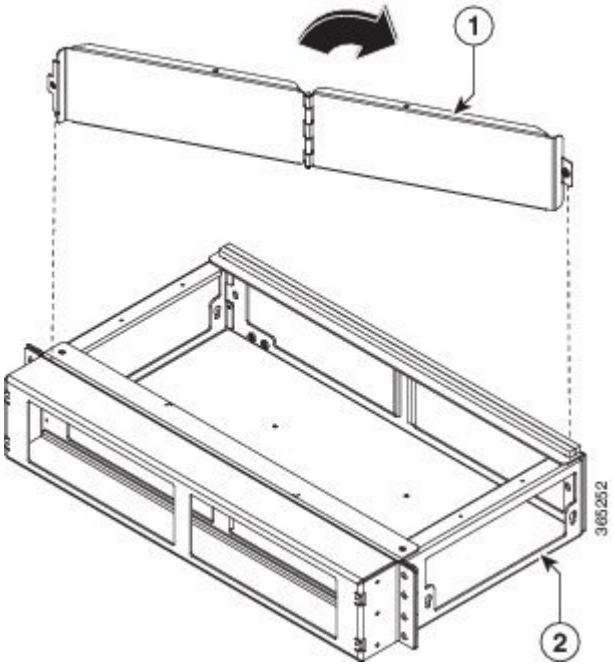
Figure 33: Adapter to Plenum



1	Plenum adapter deflector	2	Plenum
3	Securing the Plenum to the base	-	

Step 2 Position the air deflector inside the plenum and secure using a maximum torque of 11.5 in.-lb (1.3 N-m). See figure below.

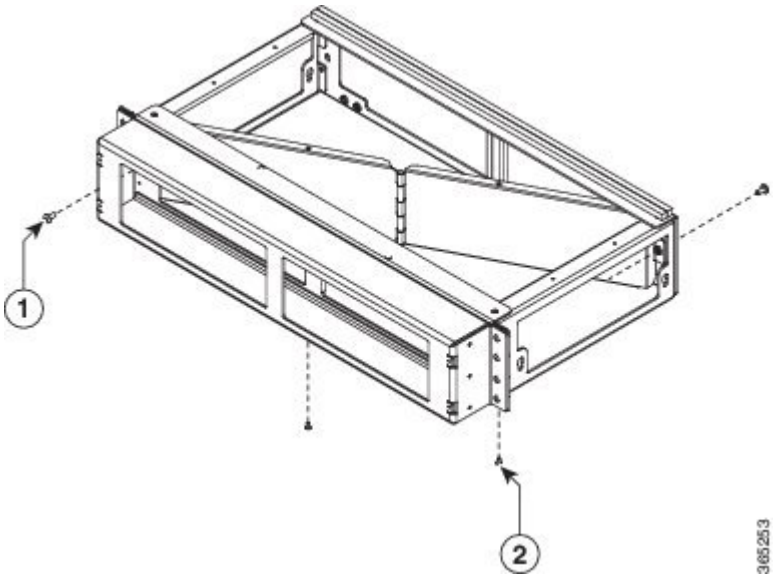
Figure 34: Deflector in Plenum



1	Air deflector	2	Plenum

Step 3 Secure the plenum deflector with a recommended torque of 11.5 in.-lb (1.3 N-m). See figure below.

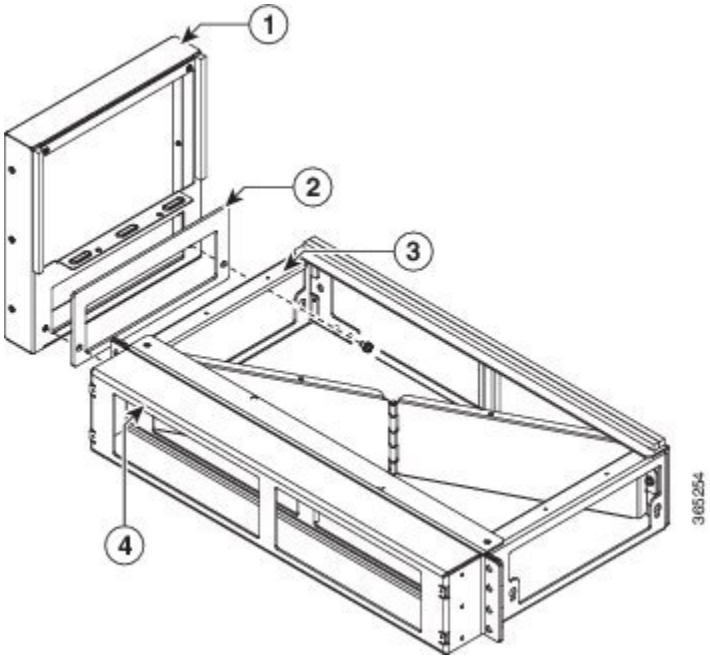
Figure 35: Plenum Deflector



1	Secure deflector to plenum base	2	Securing screws onto plenum

Step 4 Position the air baffle and the side plate to the plenum. Secure the air baffle and the side plate using a maximum torque of 11.5 in.-lb (1.3 N-m). See figure below.

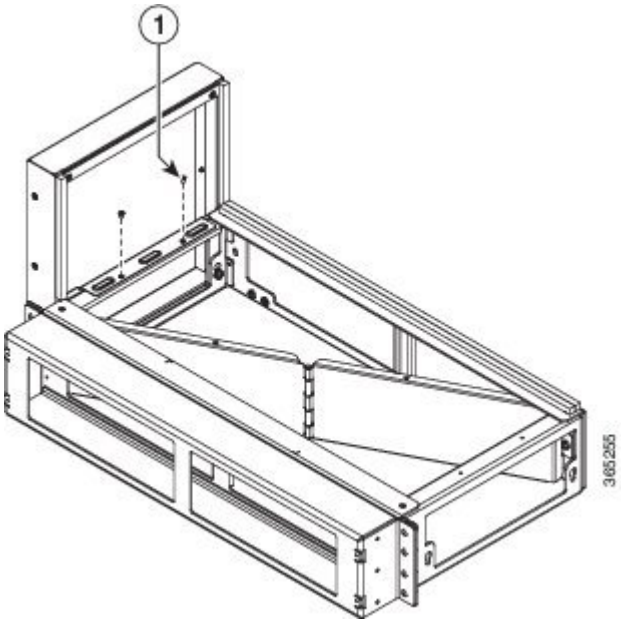
Figure 36: Assembling Air Baffle to the Plenum



1	Air baffle	2	Side plate
3	Plenum base	4	Plenum deflector

Step 5 Secure the air baffle using a maximum torque of 11.5 in.-lb (1.3 N-m). See figure below.

Figure 37: Securing the Air Baffle Tray

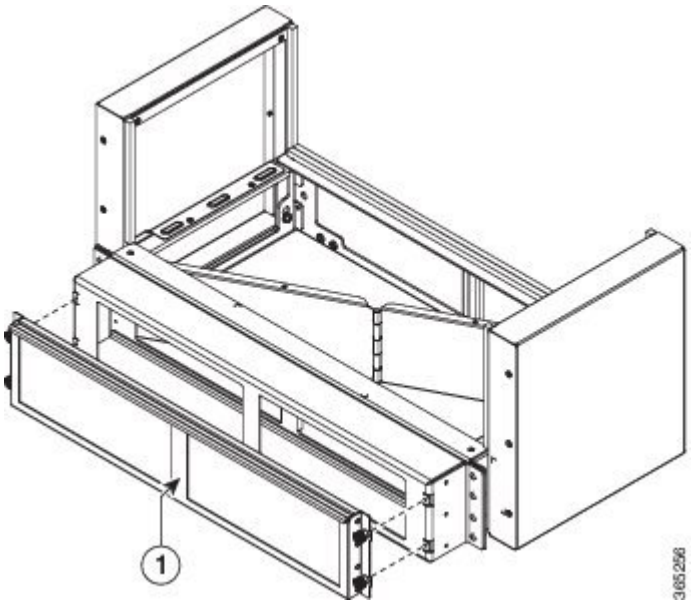


1	Securing air baffle to air plenum	-	

Step 6 Repeat Step-3 to Step-5 to complete the plenum assembly on the other side of the plenum base.

Step 7 Position the front cover hinge assembly on the plenum deflector. Secure the front cover using a recommended torque of 11.5 in.-lb (1.3 N-m). See figure below.

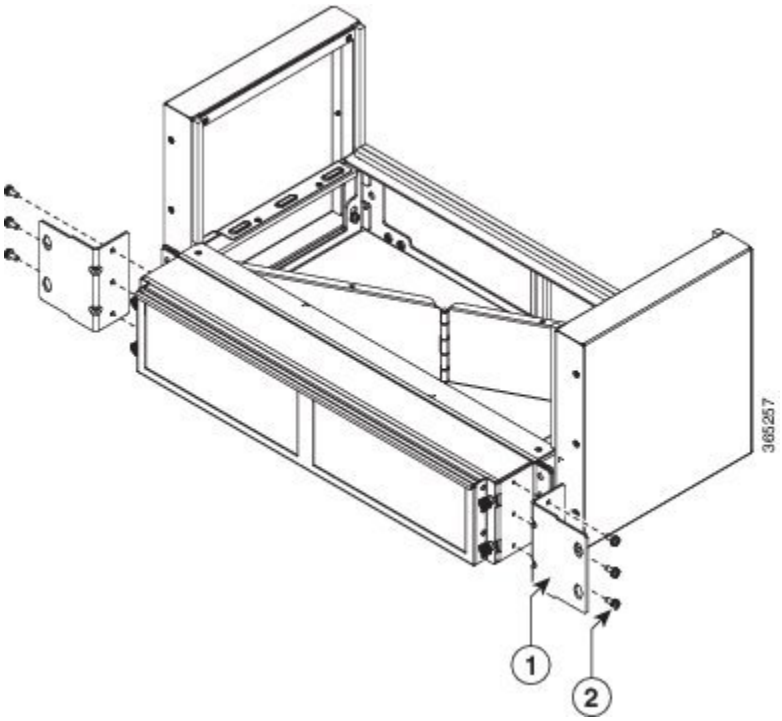
Figure 38: Front Cover Hinge Assembly on the Plenum



1	Front cover hinge assembly	-	

Step 8 Secure the cable brackets to the plenum deflector using a torque of 11.5 in.-lb (1.3 N-m). See figure below.

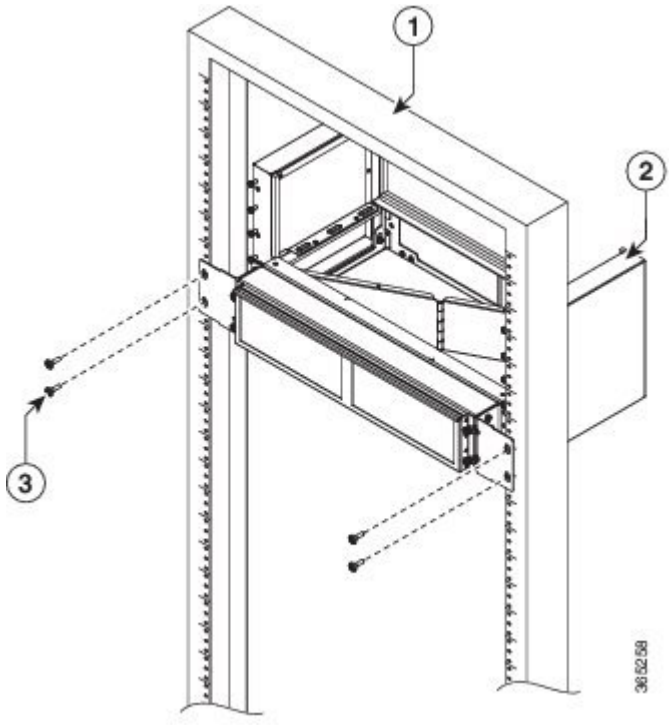
Figure 39: Cable Brackets to Plenum Deflector



1	Cable brackets	2	Screws to secure brackets

Step 9 Position the plenum assembly to the rack and secure the cable brackets to the rack using a torque of 11.5 in.-lb (1.3 N-m). See figure below.

Figure 40: Plenum Assembly to Rack

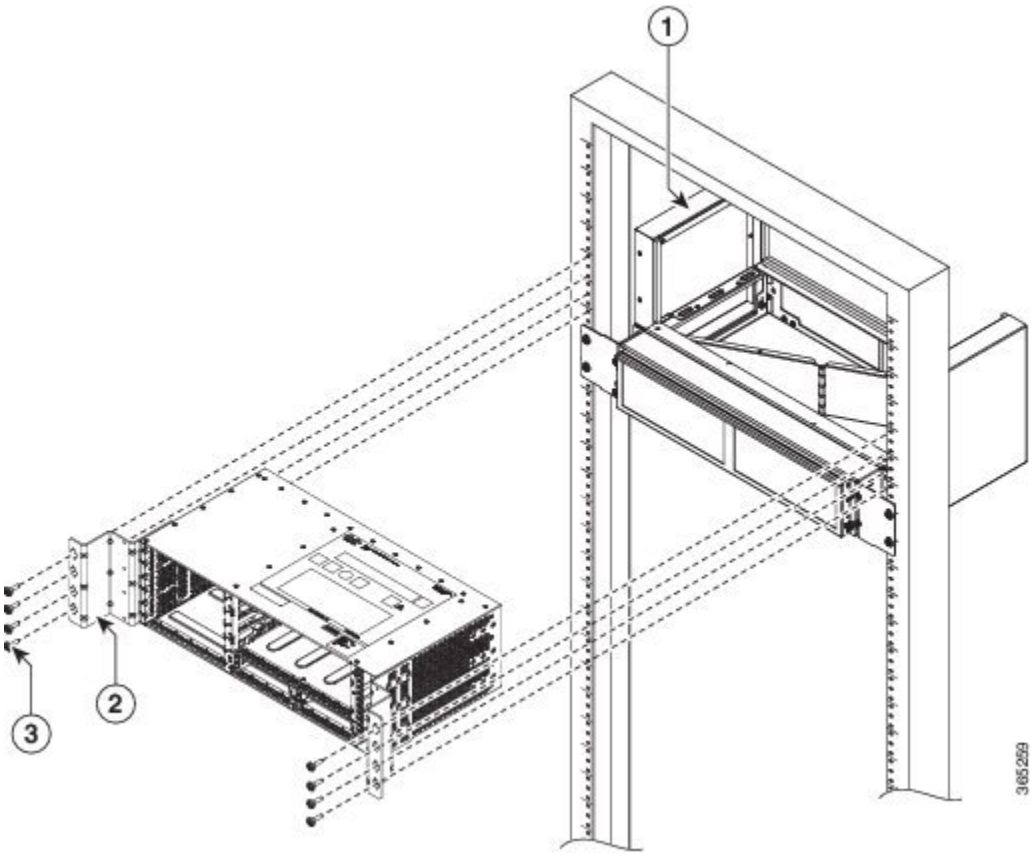


1	Rack	2	Plenum assembly
3	Securing the plenum to the brackets	-	

Step 10 Position cable guides on the router chassis.

Step 11 Guide the router chassis carefully into the plenum assembly. See figure below.

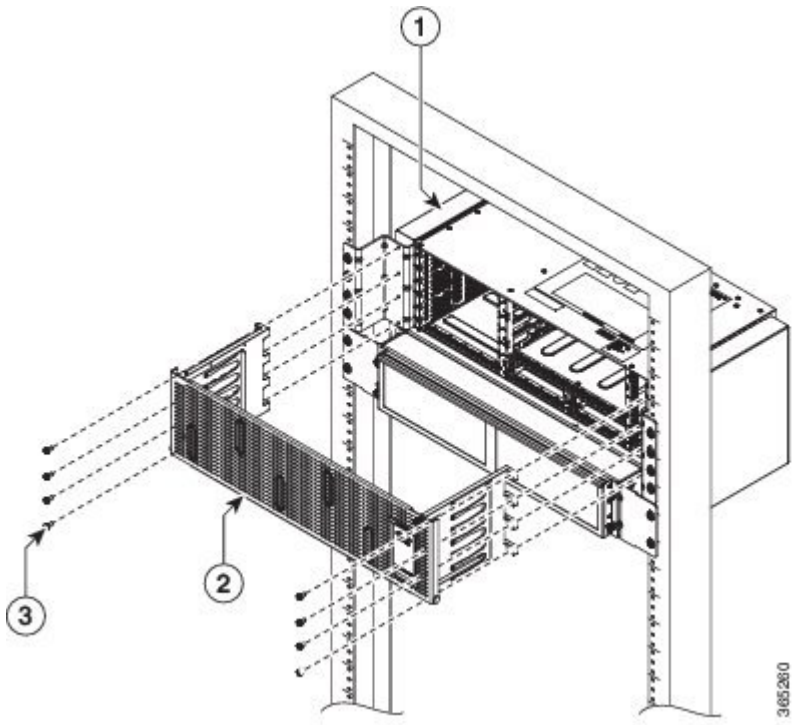
Figure 41: Chassis Assembly to Plenum in Rack



1	Plenum assembly	2	Cable guides on chassis
3	Securing screws to chassis onto rack	-	

Step 12 Position the door onto the router chassis and slide it into the rack. Secure the screws with a torque of 11.5 in.-lb (1.3 N-m). See figure below.

Figure 42: Door Assembly to Rack



1	Chassis in plenum assembly	2	Door
3	Securing door to the chassis onto rack	-	

Installing the Air Plenum (A907-F2B-AIR) in the Rack

This procedure installs the air plenum to orient the air flow in front-to- back direction in the NCS 4216 router.

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1074

Warning This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use. Statement 39

Note For nominal voltage of -60 VDC, the input voltage range is from -40 to -72 VDC.

Note Use only the fastening hardware provided with the NCS 4216 to prevent loosening, deterioration, and electromechanical corrosion of the hardware and joined material.

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

Warning The Air Plenum is installed on a rack or a cabinet using thread-forming screws that remove any paint or non-conductive coatings inside the hole threads, and establish a metal-to-metal contact. Also, clean both surfaces outside the screw points that come in contact, so that they are free of paint and other nonconductive coating. Apply an appropriate antioxidant compound to the surfaces.

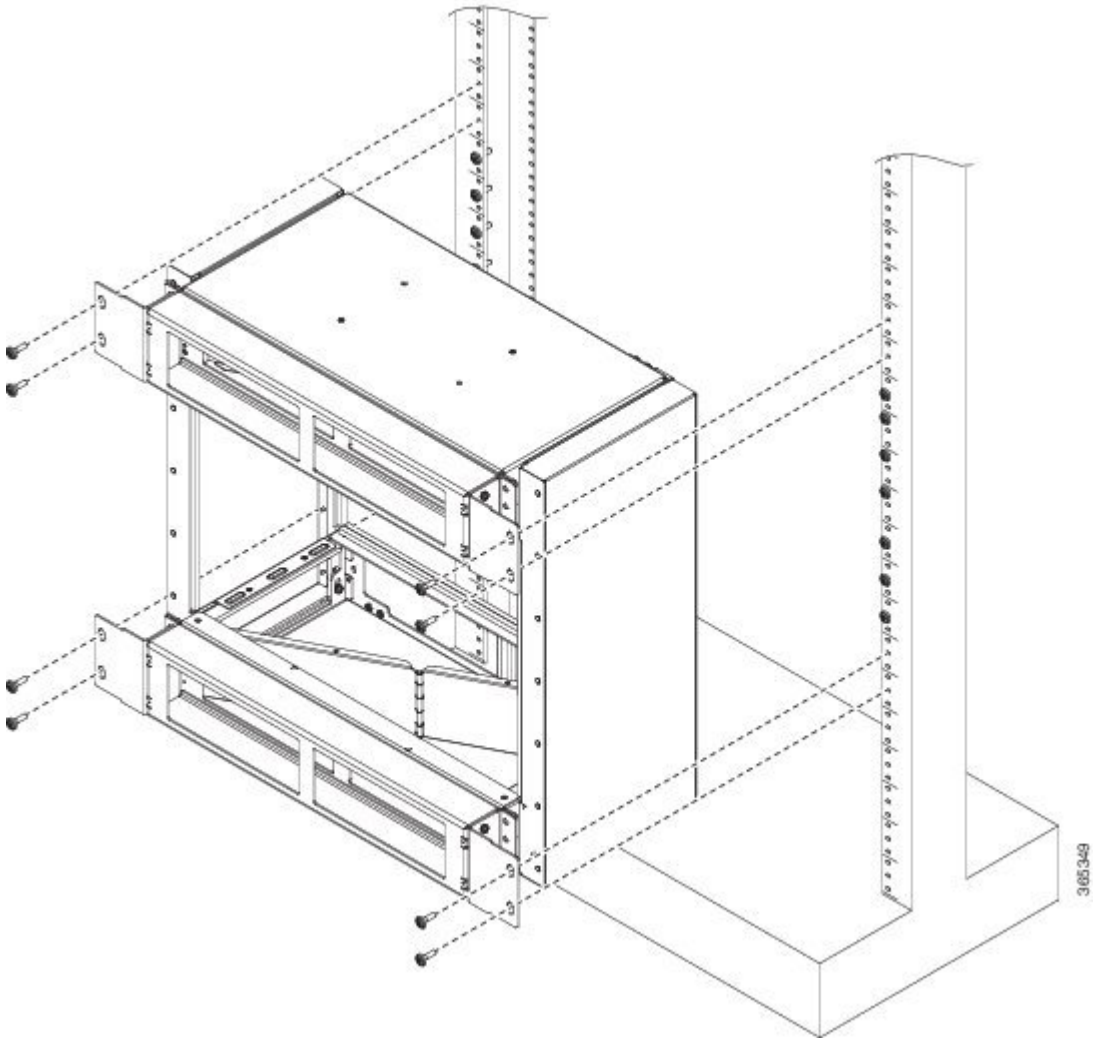
Installing Air Plenum in NCS 4216 Shelf for ANSI 23-inch Configuration

To install the Air Plenum in NCS 4216 Shelf for ANSI 23-inch configuration, follow the steps below:

Procedure

Step 1 Install the ANSI 23-inch adapter plates on the horizontal air plenums.

Figure 43: Installing the Air Plenum in the Rack



Step 2 Align the screws to fix the adapter plates to the shelf. Insert the screws and tighten them to a torque value of 11.5 in-lb (1.3 N-m).

Step 3 Place a horizontal air plenum as the base.

Step 4 Install the vertical air plenum to the left of the bottom horizontal plenum.

Step 5 Install the wing head screws from the internal side of the horizontal plenum and tighten the screws to a torque value of 11.5 in-lb (1.3 N-m).

Step 6 Install the vertical air plenum to the right of the horizontal air plenum. Follow step 5.

Step 7 Install the horizontal air plenum above the vertical air plenums. Follow step 5.

Step 8 Install the pre-assembled air plenum for ANSI 23-inch configuration.

Step 9 Install the pre-assembled air plenums in the ANSI 23-inch rack or cabinet.

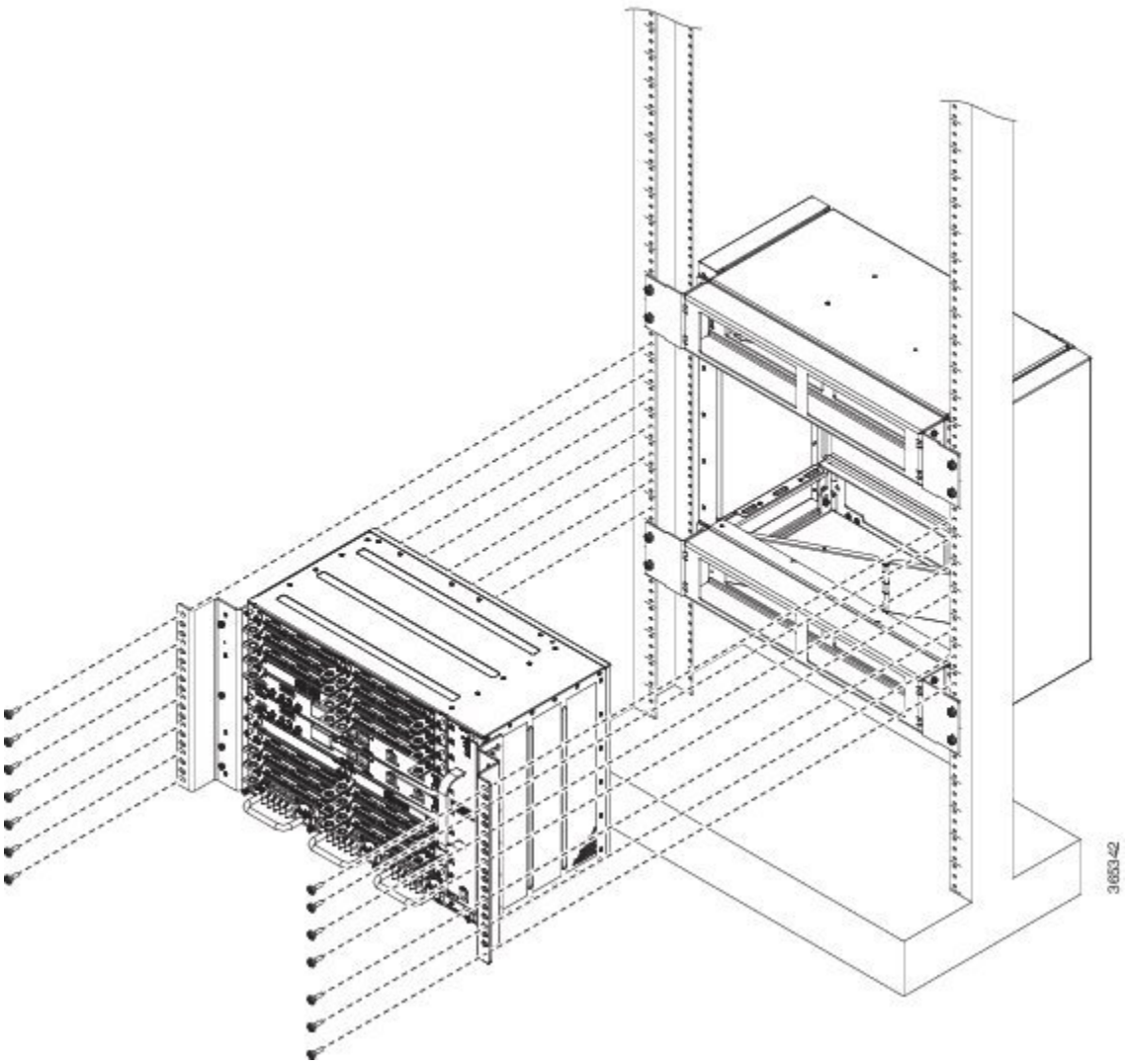
Step 10 Check the length between the top and bottom horizontal air plenums where the chassis will be installed. The length must be not less than 10.5 inches (267 mm). If the length is less, adjust the position of the top horizontal plenum.

Step 11 Install the empty NCS 4216 chassis between the horizontal plenums.

Installing the Router Chassis in the Rack

The procedures in this section apply to both horizontal and vertical mounting of the router in a rack.

Figure 44: Installing the Router Chassis in the 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 and power supply ejector handles to lift the chassis; using the handles to lift the chassis can deform or damage the handles.

Step 3 Install the 8 or 12 (4 or 6 per side) rack mount 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.

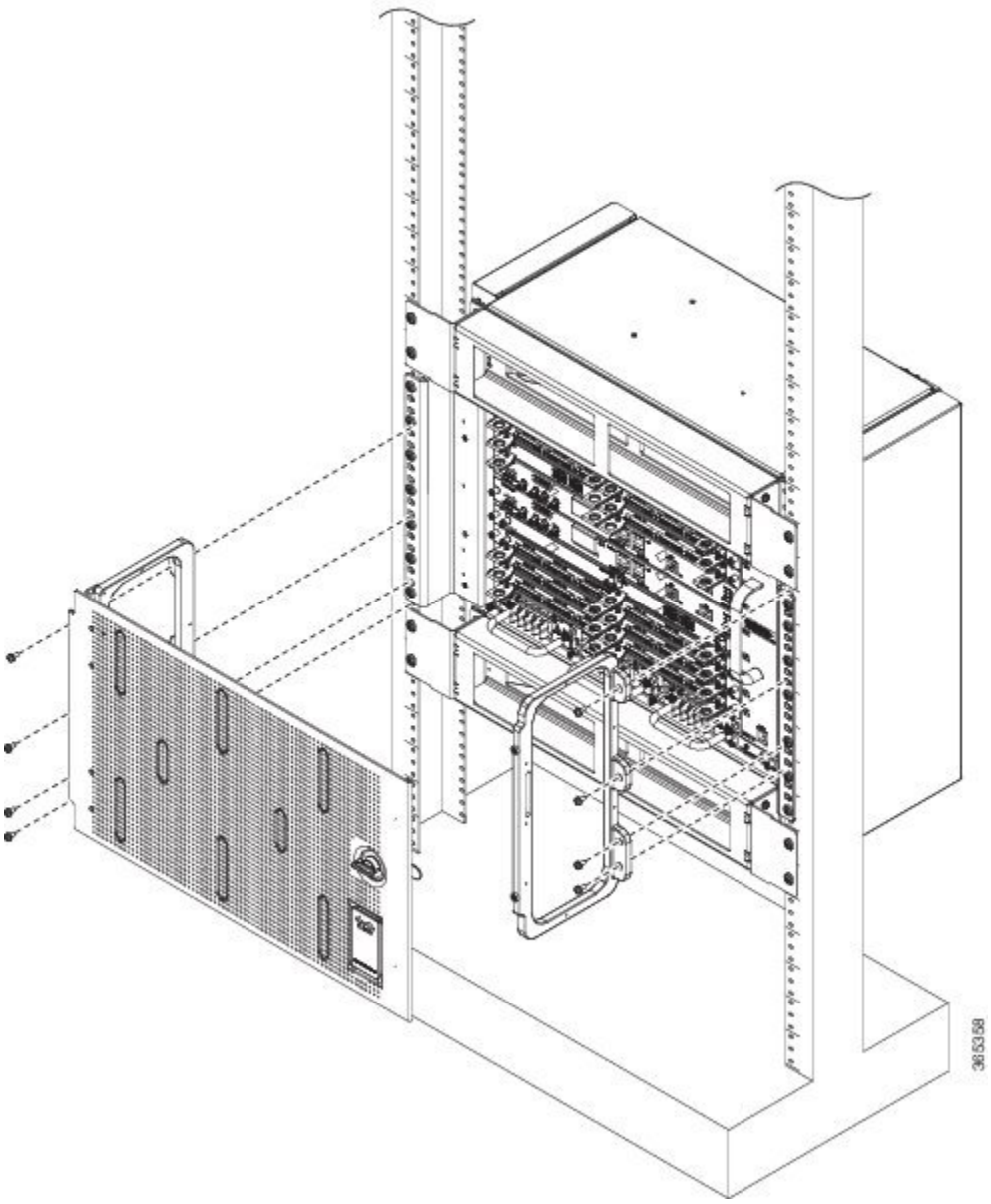
Installing the Cisco NCS 4216 Door

This section describes how to install the NCS 4216 door.



Note You cannot install the 19-inch Rack Door.

Figure 45: Installing the Cisco NCS 4216 Door



To install the door of NCS 4216 shelf, follow the steps below:

Procedure

Step 1 Align the left door bracket screw holes against the shelf screw holes.

Step 2 Insert the fasteners provided along with the packaging (three screws on the side and two screws on the bottom of the door bracket) and tighten them to a torque value of 11.5 in-lb (1.3 N-m).

Step 3 Place a safety washer on the front bottom of the door bracket and fasten it with a fastener.

Step 4 Repeat steps 1 and 2 for the door bracket on the opposite side.

Step 5 Pull the top hinge pin down on the door.

Note
The bottom hinge pin is fixed.

Step 6 Align the door hinges with the bracket hinges.

Step 7 Slide the bottom hinge pin into the bracket hinge and move the top hinge pin in the upward direction.

Note
The ground strap cable is pre-installed on the door.

Step 8 Connect the other end of the ground strap cable to a grounding point on the door bracket using a fastener.

Opening and Removing the Door of the NCS 4216 Shelf

This procedure opens and removes the door of the NCS 4216 shelf.



Note The NCS 4216 shelf has an ESD plug input and is shipped with an ESD wrist strap. The ESD plug input is located on the outside of the shelf on the right side. It is labeled “ESD” on the top and bottom. Always wear an ESD wrist strap and connect the strap to the ESD plug when working on the NCS shelf.

To open and remove the door of the NCS 4216 router, follow the steps below:

Procedure

Step 1 Turn the knob to unlock the door.

Step 2 Swing the door open.

Step 3 Remove the ground cable from the shelf by removing the screw.

Step 4 Pull the top hinge pin holding the door to the chassis, in the downward direction.

Step 5 Lift the door out of the bottom hinge pin to remove the door from its hinges.

Installing the Patch Panel on the Rack

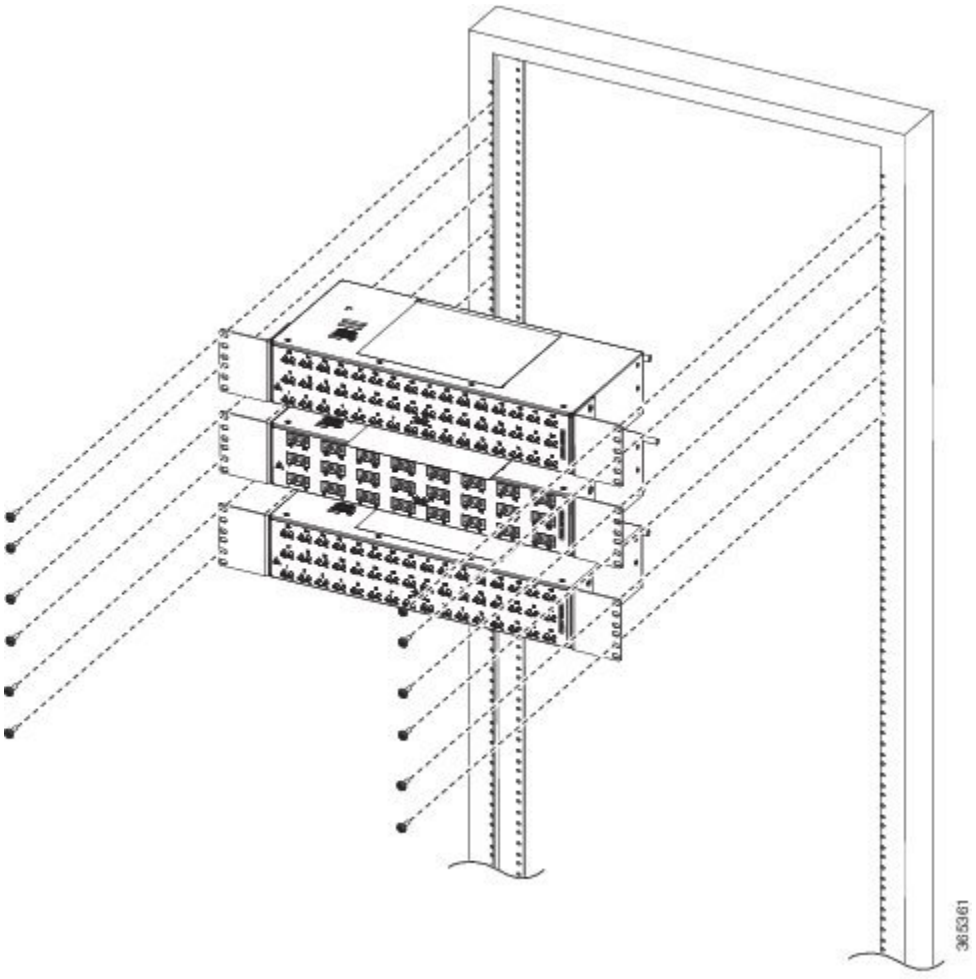
This procedure installs the Patch Panel on the Rack.

Procedure

Step 1 Assemble the patch panels on the opposite side of the rack to make the cable routing process easy.

Step 2 Fix one patch panel with a minimum of two screws on each side.

Figure 46: Installing the Patch Panel on the Rack



Installing the Chassis Ground Connection

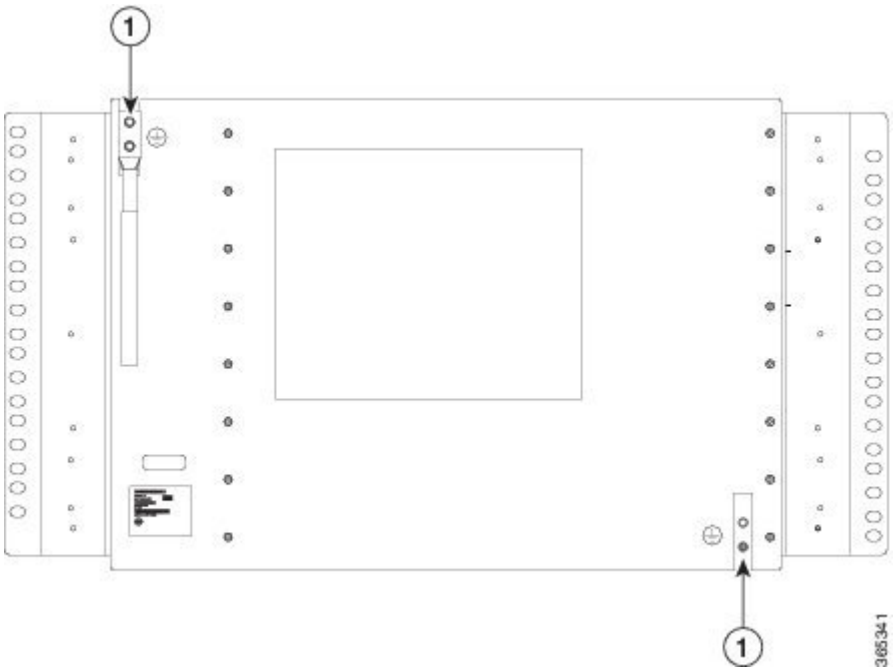
Before you connect the power or turn on the power to the Cisco NCS 4216, you must provide an adequate chassis ground (earth) connection to your router.

Ensure that you secure the lugs only with the Cisco-provided screw. Secure the screws only while assembling the lugs.

This section describes how to ground the Cisco NCS 4216 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.

Note When installing the unit, assemble grounding lug using screw and serrated washer provided along with Kit NCS4216-DOOR.

Figure 47: Attaching a Grounding Lug to the Rear of the Router



1	Grounding lug

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 20 in.-lb (2.25 N-m) of pressure for attaching the ground wire to the router
- Crimping tool as specified by the ground lug manufacturer
- 6 or 8 AWG copper wire for the power cord
- 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 NCS 4216, ensure that you disconnect the power at the circuit breaker. Otherwise, severe injury to you or damage to the router may occur.

Danger 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 the unit, the ground connection must always be made first and disconnected last. Statement 42

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

Perform the following procedure to ground the Cisco NCS 4216 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).

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.

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 23-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

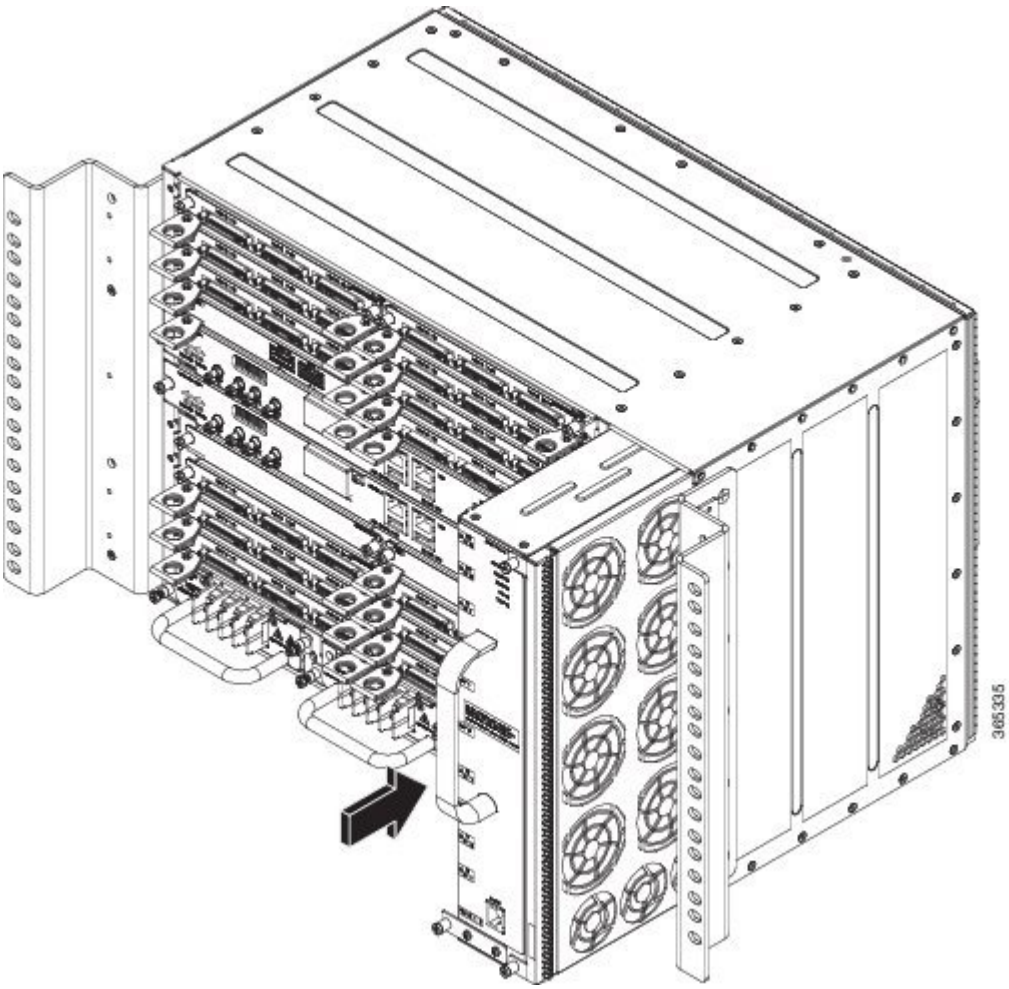
The fan tray is a modular unit that provides cooling to the Cisco NCS 4216. Follow these steps to install the fan tray in the chassis:

Note Do not introduce body parts or objects in the fan tray slot when installing or removing the fan tray module. Exposed circuitry is an energy hazard.

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 following figure shows how to orient the fan tray.

Figure 48: 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 RSPs, 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 NCS 4216.

For information about connecting cables to the fan tray alarm port, see the Connecting the Fan Tray Alarm Port section. For a summary of the LEDs on the fan tray, see the LED Summary section. For more information about air flow guidelines, see Air Flow Guidelines section.

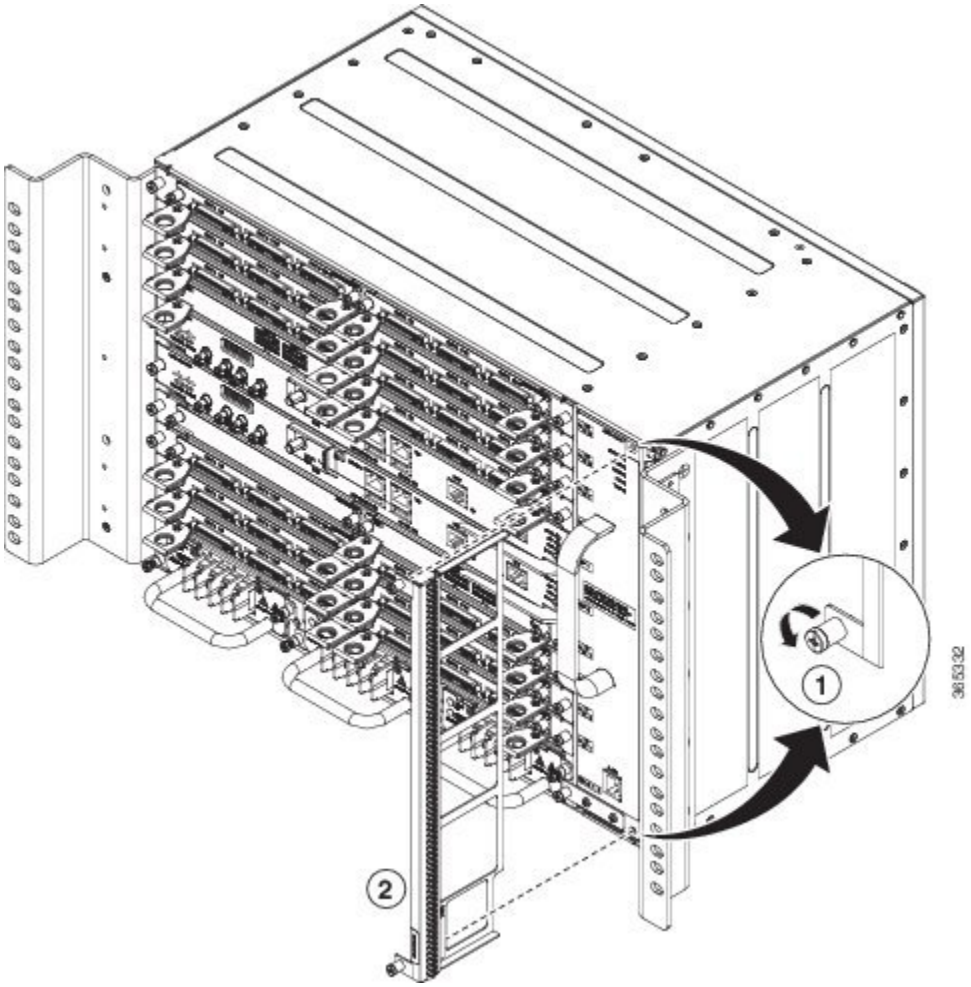
Removing and Replacing the Dust Filter

The chassis is shipped with a blank fan filter cover. To install the dust filter:

Procedure

Step 1 Remove the blank fan filter cover (A907-FAN-F=) by unscrewing the captive installation screws at the top and bottom of the dust filter frame. See the figure below.

Figure 49: Blank Fan Filter

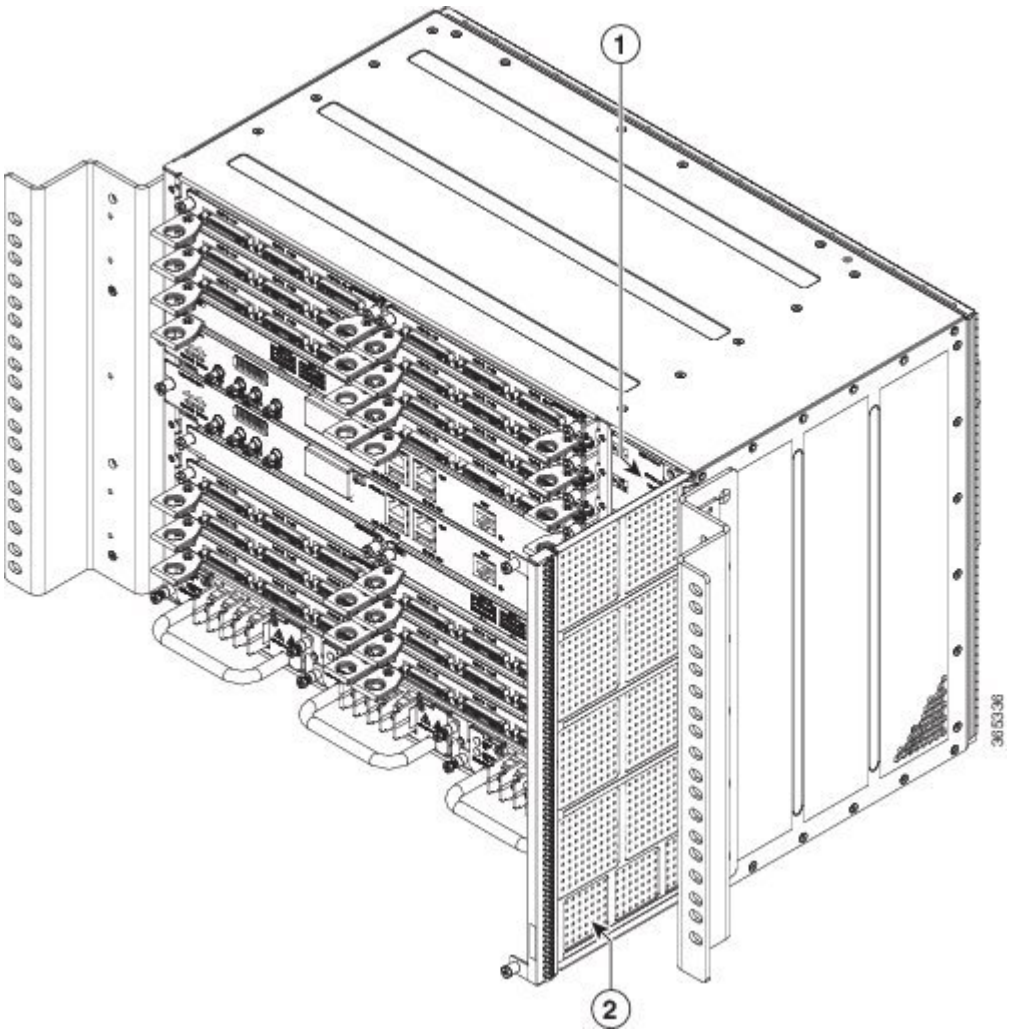


1	Captive screw	2	Dummy fan filter

Step 2 Slide the new dust filter (A907-FAN-F) onto the fan tray.

Step 3 Secure the filter with the top and bottom captive screws, in the chassis.

Figure 50: Fan Filter



1	Captive screw	2	Fan filter

Removing the Dust Filter

Remove the dust filter for a replacement.

Note

- The dust filter is a single-use component.
- Use the dust filter (A907-FAN-F) within 6 months of buying as the shelf or storage life is less than 6 months. The ideal storage condition for a filter is a cool, dry, and dark environment. Surroundings that adversely affect the dust filter are high heat, humidity at high temperatures, and ultraviolet light.

Dust Filter Maintenance

A periodic health check of the filter, every 3 months based on the level of dust in the environment helps in avoiding over clogging of the filters and provide better life. The product's filter may be used as a single use or reused depending upon the local deployment needs. If reuse of the filter is prohibited, it may be replaced every six months with PID (A907-FAN-F=) or equivalent.

Removing and Replacing the Fan Tray

The fan tray supports online insertion and removal (OIR). There is no need to power down the Cisco NCS 4216 to remove or replace the fan tray. However, the router will shut down if the fan tray is removed from the chassis for more than 90 seconds at 25º C due to thermal overload condition. Once the thermal overload condition is absent, the system attempts to power up automatically, if the Fan tray is re-inserted and the system temperature is within limits. Approximately at 25º C the system powers back in 2 minutes.

Note If a fan tray is removed and not replaced within the stipulated time the system will automatically power-off. If the system is powered with PSUs other than 900W DC or 1200W AC and if the system is powered off, then the system should be completely powered off for 30 seconds with all the PSU in the system simultaneously, and then turned on for the system to power on.

Note Do not introduce body parts or objects in the fan tray slot when installing or removing the fan tray module. Exposed circuitry is an energy hazard.

Caution The router can stay active for up to 60 seconds if the temperature is below the ambient limit. However, in the event of an overtemperature alarm, the router can shut down in less than 60 seconds. In the event of a critical temperature alarm, the router shuts down immediately.

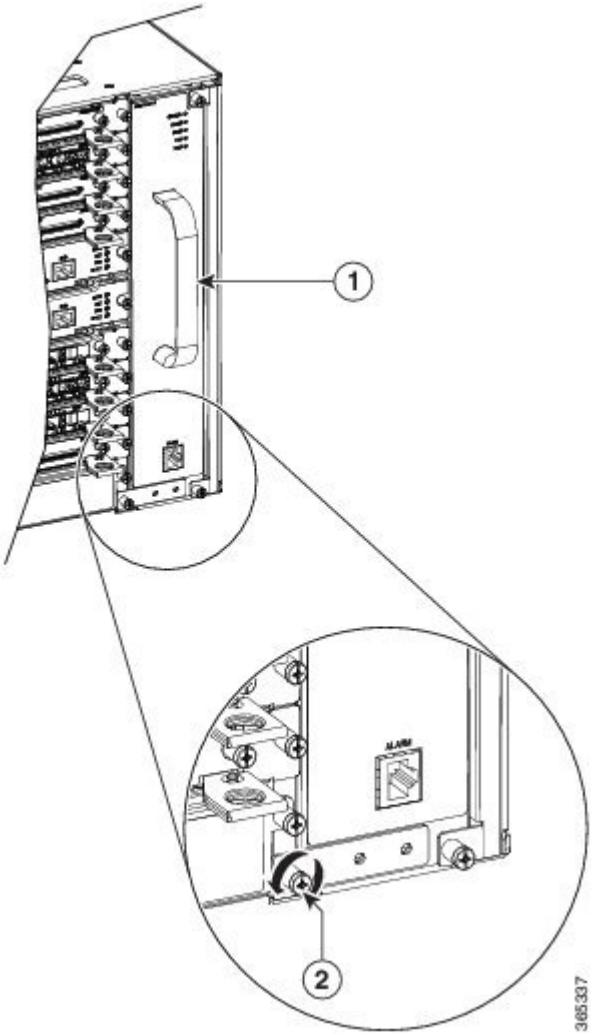
Caution To avoid erroneous failure messages, allow at least 2 minutes for the system to reinitialize after the fan tray has been removed or replaced.

Follow these steps to remove and replace the fan tray on the Cisco NCS 4216:

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 following figure shows the front of the fan tray, including the captive installation screws.

Figure 51: Detaching the Fan Tray



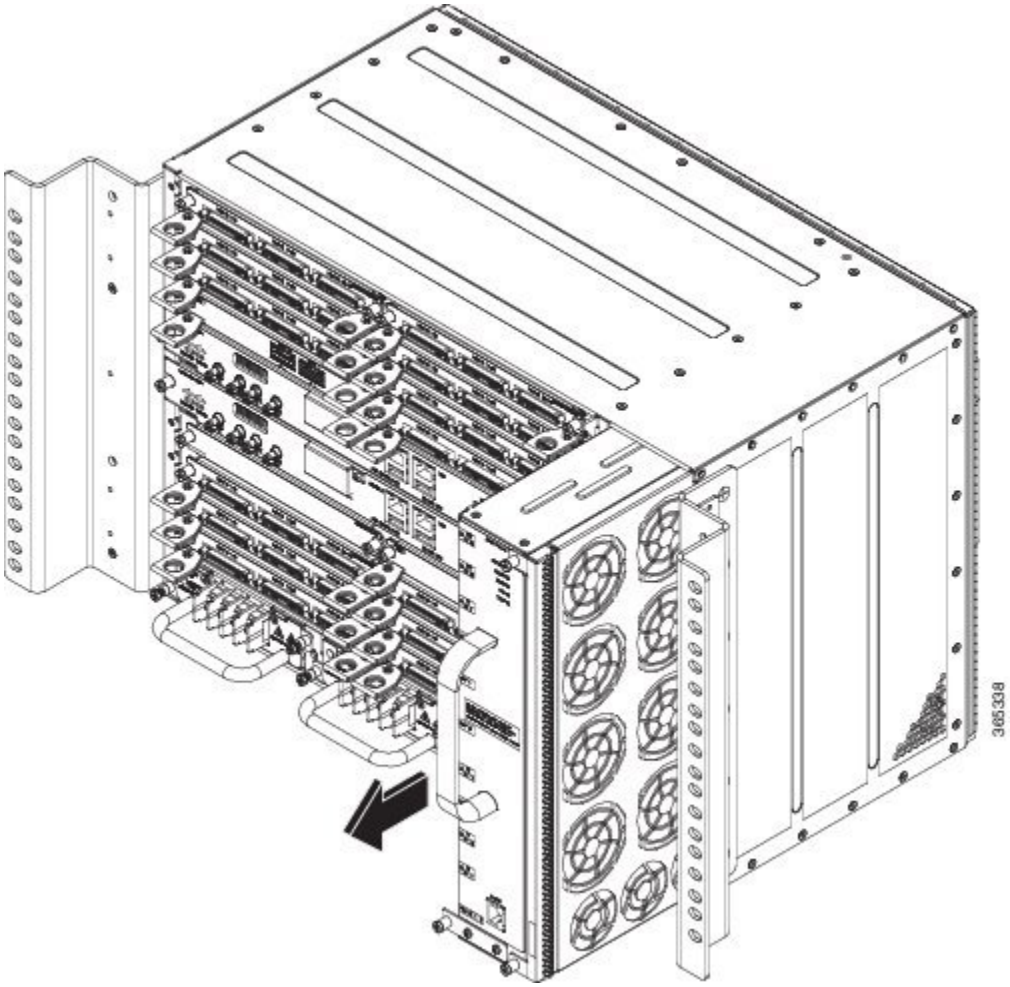
1	Fan tray handle	2	Captive screw

Step 2 Grasp the fan tray handle with one hand and the outside of the chassis with the other hand. The figure above 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 toward you no more than 1 inch to disengage it from the power receptacle on the midplane, as shown in the following figure.

Figure 52: Fan Tray Removal



Warning
When removing the fan tray, keep your hands and fingers away from the spinning fan blades. Let the fan blades completely stop before you remove the fan tray. Statement 258

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.

Note
The chassis must not be allowed to operate without functioning fans for more than 60 seconds.

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

The following table shows the fan OIR timelines.

Table 13: Fan OIR Timelines

Serial Number	Temperature º C at 1800 m	OIR Time
1	-40º C to 30º C	60 seconds
2	31º C to 40º C	30 seconds

RSP Installation

Follow the steps in the sections below on handling an RSP module in the Cisco NCS 4216:

Installing an RSP Module

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

Procedure

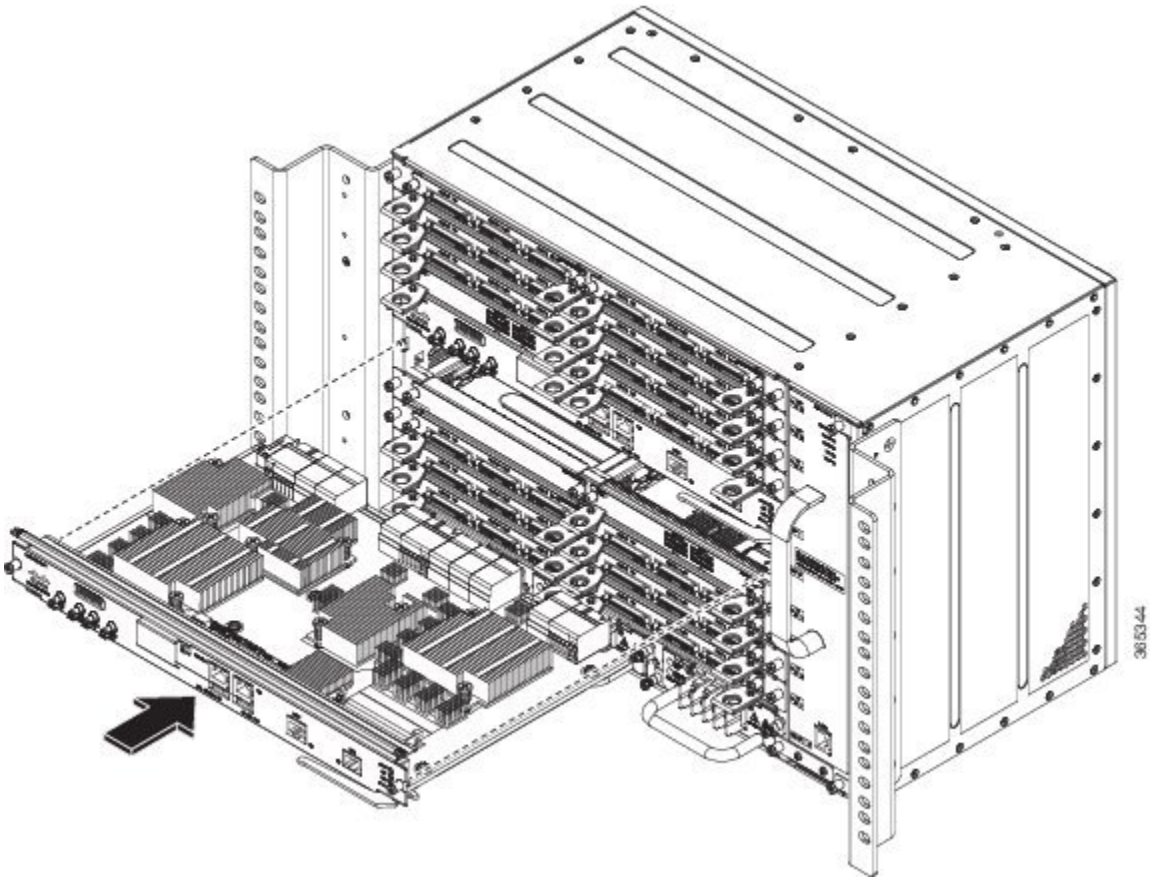
Step 1 Choose a slot for the module. Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head 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 53: Cisco NCS 4216 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.

Caution
If the top slot already has an RSP module installed, and you install a second RSP module in the slot below it, be careful not to damage the EMI gasket of the bottom RSP module against the ejector levers of the top RSP during insertion.

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 toward the open slot, which reduces the size of the opening and makes it difficult to install the new module.

Caution
Blank module filler plates (Cisco part number A90X-RSPA-BLANK-W) should be installed in any empty chassis slots to keep dust out of the chassis and to maintain consistent airflow through the chassis.

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.

Removing an RSP Module

Before you remove an RSP from the router, you should save the current configuration on a TFTP server or an external USB flash drive, using the **copy running-config** {**ftp** | **tftp** | **bootflash:**} 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 toward 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 (see *Cisco NCS 4216 RSP Installation* figure) 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, or immediately reinstall the module in another slot.

Step 7 Install blank module filler plates (Cisco part number A90X-RSPA-BLANK-W) in empty slots, if any.

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

Hot-Swapping an RSP Module

The Cisco NCS 4216 provides a feature that allows you to remove and replace a redundant RSP module without powering down the router. This feature, called hot-swapping or OIR, allows you to remove and replace a redundant module without disrupting router operation.

When two redundant modules are installed in the router, only one of the modules is active. The other one runs in standby mode, ready to take over processing if the active module fails.

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. Any newly inserted interfaces are put in the administratively shutdown state as if they were present (but unconfigured) at boot time. If you insert the same type of module into a slot, its ports are configured and brought online up to the port count of the original module.

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

- If the tests pass, 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.

Use the following guidelines when performing an OIR on an IM:

- Allow at least 2 minutes for the system to reinitialize before inserting a new IM.
- Avoid inserting a new IM during bootup until the active and standby RSPs have reached an OK state.
- When inserting multiple IMs into the chassis, wait until each IM reaches an OK state before inserting the next IM.

Interface Module Installation

The sections describe the various tasks of associated with interface module installation on the Cisco NCS 4216:

Installing an Interface Module

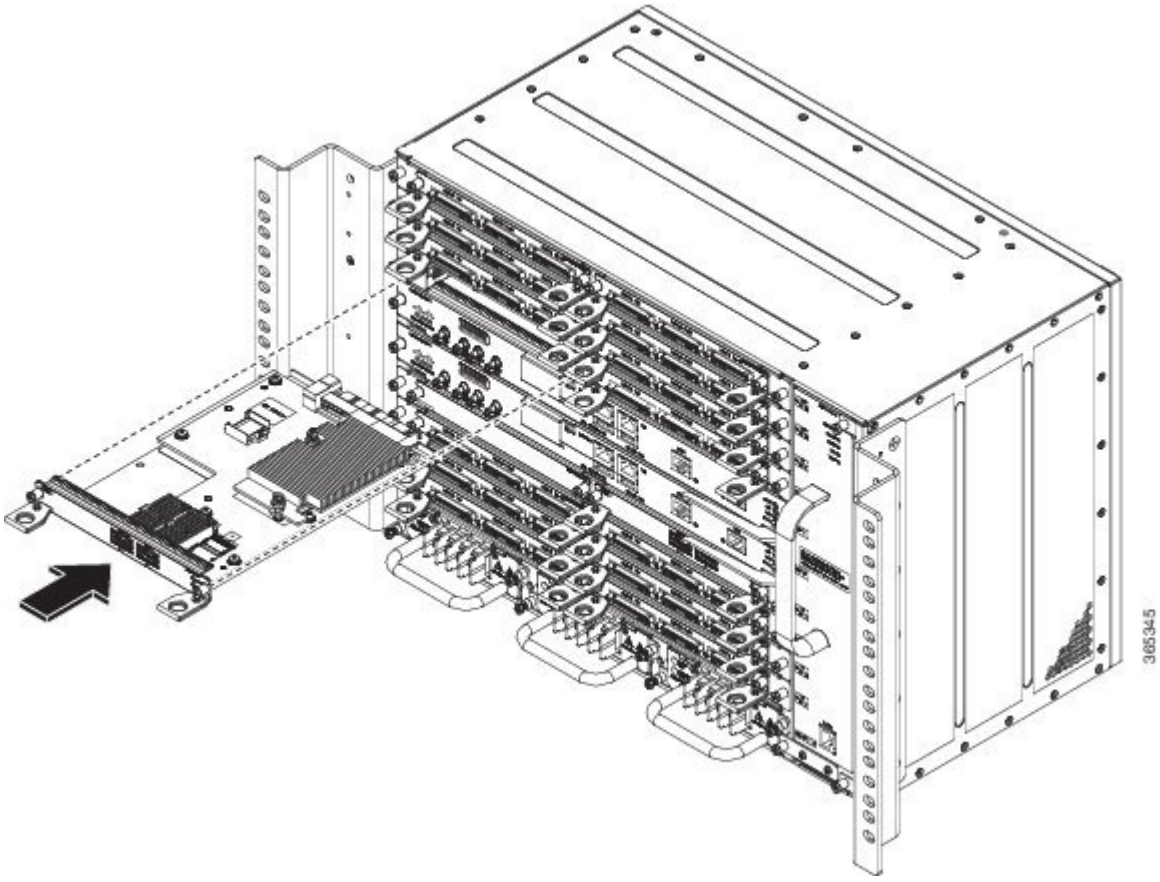
Procedure

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 following figure shows how to install the interface module.

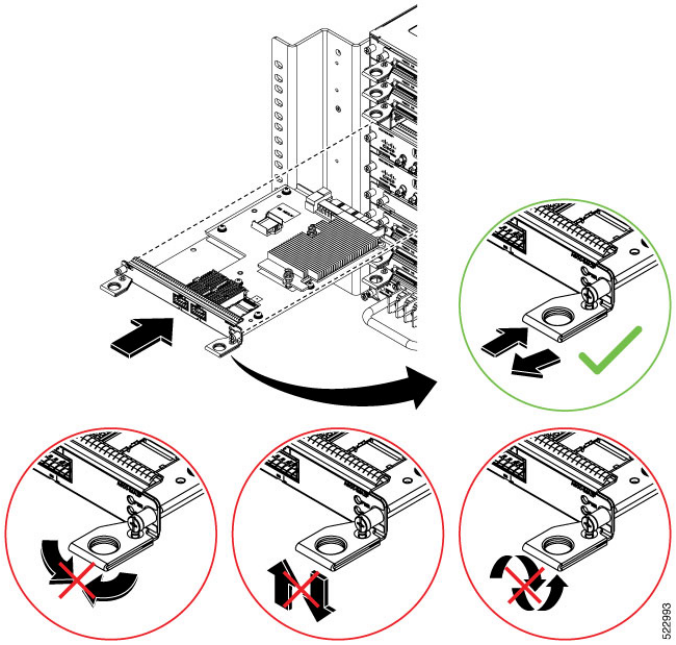
Figure 54: Inserting an Interface Module



Caution

Use the pull tab on the interface module only to insert and pull the card out straightly. Don't use the pull tab to turn on its axis or bend it up or down, which can deform or damage the pull tab.

Figure 55: Using the Pull Tab



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.

What to do next

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

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.

Step 4 If the interface module slot is meant to be empty, then ensure that blank filler plates are installed in the respective slots.

Hot-Swapping an Interface Module

The Cisco NCS 4216 provides a feature that allows you to remove and replace an interface module without powering down the router. This feature, called hot-swapping or OIR, allows you to remove and replace a redundant module without disrupting router operation.

The Cisco NCS 4216 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.

- If the TDM interface module is swapped with the Gigabit Ethernet module in the same slot or vice-versa, the router must be reloaded.

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.

Replacing a configured interface module with a different interface module in the same slot is not supported on the router.

Note Always refer to Interface Module compatibility matrix tables in the Data Sheet before you swap any IM.

Table 14: Supported Hot Swapping Combinations on Cisco NCS4216-RSP module

Interface Modules	NCS4216-RSP/Cisco IOS Release 3.18.06v.S
SFP Combo IM—8-port Gigabit Ethernet (8X1GE) + 1-port 10 Gigabit Ethernet (1X10GE)	Swapping allowed on all Ethernet interface modules
8-port 10 Gigabit Ethernet Interface Module (8X10GE)	
1-port 100 Gigabit Ethernet Interface Module (1X100GE)	
2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)[9]	
2-port 40 Gigabit Ethernet QSFP Interface Module (2X40GE)	
8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	
1-port OC48[10]/ STM-16 or 4-port OC-12/OC-3 / STM-1/STM-4 + 12-port T1/E1 + 4-Port T3/E3 CEM Interface Module	
1-port OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)	No support
48-port T1/E1 Interface Module	
48-port T3/E3 Interface Module	

[9] IM supports only one port of 100G with RSP3 as QSFP28 on Port 0 in both slots 7 and 8.
[10] Any of the 4 ports can be used as an OC48, but if a port is configured as OC48, then the remaining 3 ports are disabled.

Table 15: Supported Hot Swapping Combinations on Cisco NCS4216-RSP-800 module

Interface Modules	NCS4216-RSP-800
8-port 10 Gigabit Ethernet Interface Module (8X10GE)	Swapping allowed on all Ethernet interface modules
2-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)[11]	
8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	

[11] IM supports only one port of 100G with RSP3 as QSFP28 on Port 0 in both slots 7 and 8.

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 pass, 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 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 standby RSP.

Installing the Power Supply

The Cisco NCS 4216 router provides the choice of the following power supply:

- 900 W DC power: - 40VDC to -72VDC

The DC power supply provides option to connect with two different sources (dual feed); positive (+) and negative (-) are marked on the PSU terminals.

Caution The power supply must be wired before plugging the power supply in the chassis. Ensure the branch circuit breaker is turned off. Only after installing the power supply in the chassis, should the branch circuit breaker be turned on. The branch circuit breaker must be turned off before unplugging the power supply.

Each power supply provides a dual primary input power connection.

Warning Read the installation instructions before connecting the system to the power source. Statement 10

Caution Do not use interface module and power supply ejector handles to lift the chassis; using the 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 like the Cisco NCS 4216, which can have substantial current draw fluctuations due to bursty data traffic patterns.

Use the information in the *DC Power Supply Specifications* table to estimate the power requirements and heat dissipation of a Cisco NCS 4216 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 NCS 4216 power supplies to the site power source.

Warning 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 213

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.

Installing the DC Power Supply

The sections describe how to install a DC power supply in the Cisco NCS 4216:

Note This equipment is suitable for installation in Network Telecommunications Facilities and locations where the NEC applies.

Note This equipment is suitable for installations utilizing the Common Bonding Network (CBN).

Note 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.

Installing the DC Power Supply Module

Perform the following procedure to install the power supply module:

Procedure

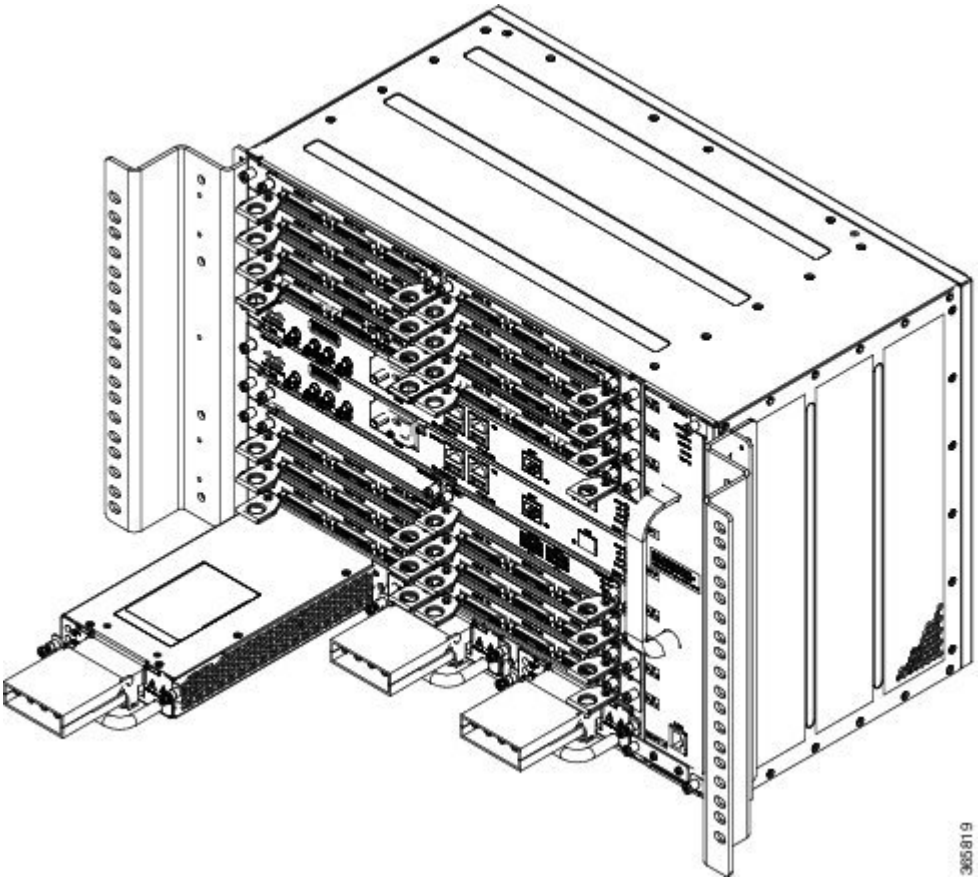
Step 1 Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the Installing the Chassis Ground Connection section.

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 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 56: Installing the 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.

Connecting DC Power Supply Unit (A900-PWR900-D2)

A900-PWR900-D2 is a dual feed 900W DC PSU. The DC power supply accepts a dual-hole type lug. The lug must be a UL listed, CSA certified and rated to accept the 8 AWG cable. The lug is assembled on the unit with two nuts.

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

Tools and Equipment

- Dual-hole lugs
- Double barrel with inspection hole

- Hole spacing is 5/8 in.
- Lug tab width max 0.46 in.
- Nuts
- PSU can accommodate 10 – 6 AWG
- Number 2 Phillips Screwdriver
- 7 mm nut driver or 7 mm socket on a torque wrench

Procedure

Step 1 Locate the terminal block on the power supply unit.

Step 2 Flap open the front protective cover on the power supply unit.

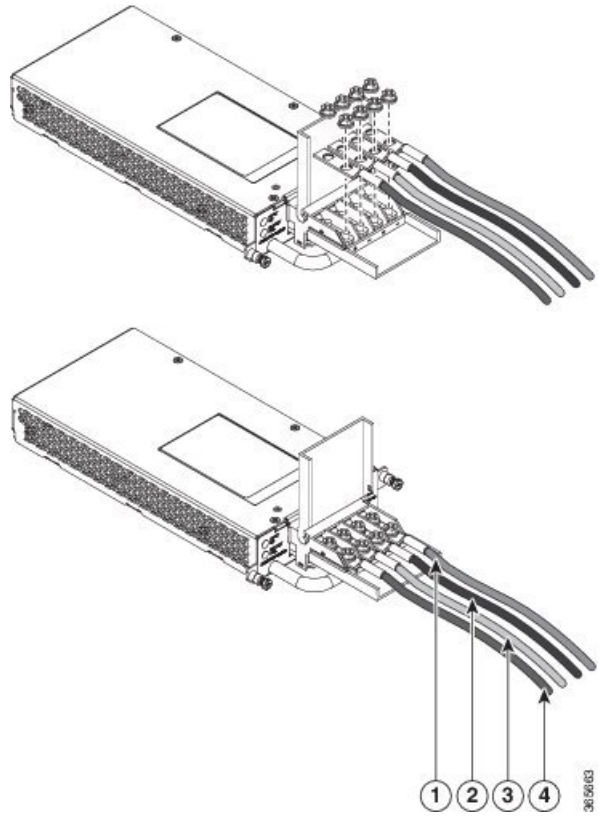
Step 3 Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source as recommended by the lug manufacturer.

Note
Stripping more than the recommended amount of wire can leave behind exposed wire from the terminal block after installation.

Step 4 Identify the positive and negative feed positions for the terminal block. The recommended wiring sequence is as in the figure below.

Step 5 Attach the lugs on the terminal block, see the figure below.

Figure 57: Power Supply with Lead Wires



1, 3	Negative (-) lead wire	2, 4	Positive (+) lead wire

Caution
Do not overtorque the fasteners of the terminal block. The recommended maximum torque is from 25 in.-lb (2.82 N-m).

Step 6 Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block by casual contact. Make sure the tie wrap allows for some slack in the wire.

Activating the DC Power Supply

Perform the following procedure to activate the 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 green

If the LEDs indicate a power problem, see the Troubleshooting section.

If you are installing a redundant DC power supply, ensure that each power supply is connected to a separate power source to prevent power loss during a power failure.

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

Removing and Replacing the DC Power Supply

This section provides information about removing and replacing the DC power supply in the Cisco NCS 4216.

Note The Cisco NCS 4216 power supplies are hot-swappable. If you have installed redundant power supply modules, 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 NCS 4216:

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 NCS4216-PWR-BLANK) over the opening, and secure it with the captive installation screws.

Installing the AC power Supply

Warning 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.

Installing the AC Power Supply Module for A900-PWR1200-A (1200 W)

Follow these steps to install the power supply module:

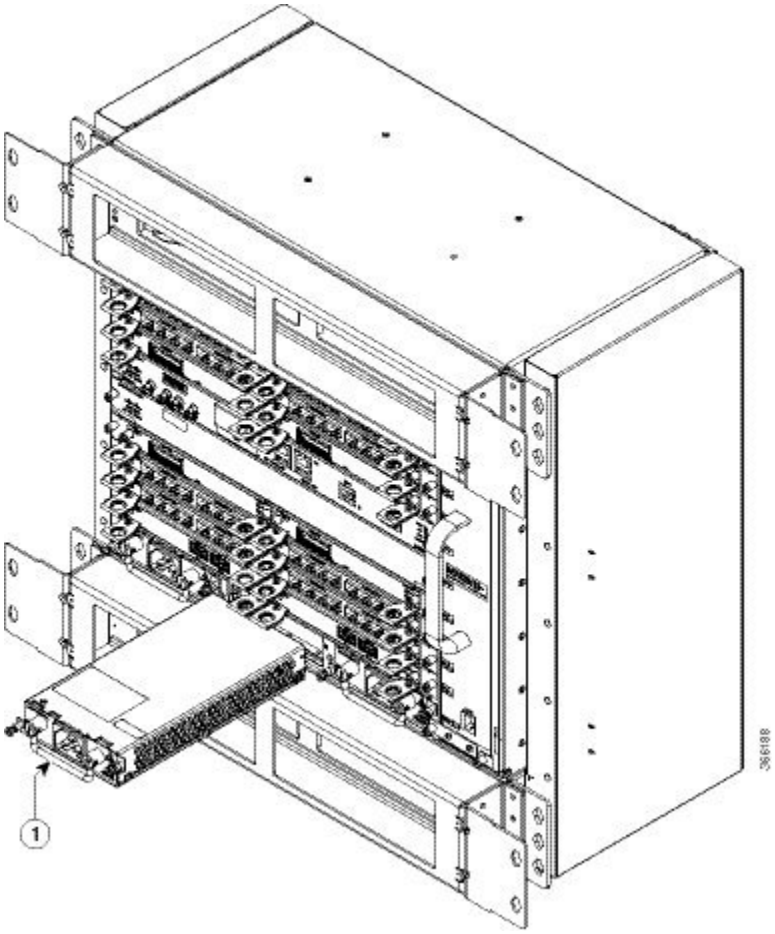
Procedure

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 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 58: Installing the 1200 Watts AC Power Supply



1	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.

Recommended Power Cables

We recommend the following power cables for Cisco NCS 4216 routers:

Table 16: Power Cable PIDs for A900-PWR1200-A (1200 W)

PID	Description
PWR-CAB-AC-USA520	US AC Power Cord for Cisco NCS4200, NEMA 5-20

PID	Description
PWR-CAB-AC-USA	Power Cord for AC V2 Power Module (USA), NEMA L6-20P
PWR-CAB-AC-AUS	Power Cord for AC V2 Power Module (Australia), AS 3112
PWR-CAB-AC-EU	Power Cord for AC V2 Power Module (Europe), CEE 7/7
PWR-CAB-AC-ITA	Power Cord for AC V2 Power Module (Italy), CEI-23-50
PWR-CAB-AC-SA	Power Cord for AC V2 Power Module (South Africa), SABS 164
PWR-CAB-AC-UK	Power Cord for AC V2 Power Module (UK), EN 60309-2
PWR-CAB-AC-ISRL	Power Cord for AC V2 Power Module (Israel), SI 32
PWR-CAB-AC-CHN	Power Cord for AC V2 Power Module (China), GB2099.1/GB1002
PWR-CAB-AC-BRA	Power Cord for AC V2 Power Module (Brazil), NBR 14136
PWR-CAB-AC-SUI	Power Cord for AC V2 Power Module (Swiss), SEV 1011
PWR-CAB-AC-JPN	Power Cord for AC V2 Power Module (Japan), JIS C8303
PWR-CAB-AC-IND	India AC Power Cord for Cisco NCS4200, IS:1293
PWR-CAB-AC-ARG	AC POWER CORD, WIRE HARNESS, Argentina, IRAM 2073, IEC60320 C21, ST, 4M, 30 AWG, STRANDED, 250.0 V, 16.0 A

Activating the AC Power Supply

Follow these steps to activate the 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 the Troubleshooting section for more 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.

Connecting the Cisco NCS 4216 Router to the Network

The sections describe how to connect cables on the Cisco NCS 4216.

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

Connecting Console Cables

The sections describe how to connect to the Cisco NCS 4216 using console cables.

Note You cannot use the USB and RS232 console ports at the same time; if you insert the USB cable into the router, the RS232 port is disabled.

Connecting to the Serial Port using Microsoft Windows

This procedure shows how to connect to the 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 Microsoft Windows USB Device Driver section.

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 Microsoft Windows XP USB Driver* section
- *Installing the Cisco Microsoft Windows 2000 USB Driver* section
- *Installing the Cisco Microsoft Windows Vista USB Driver* section

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

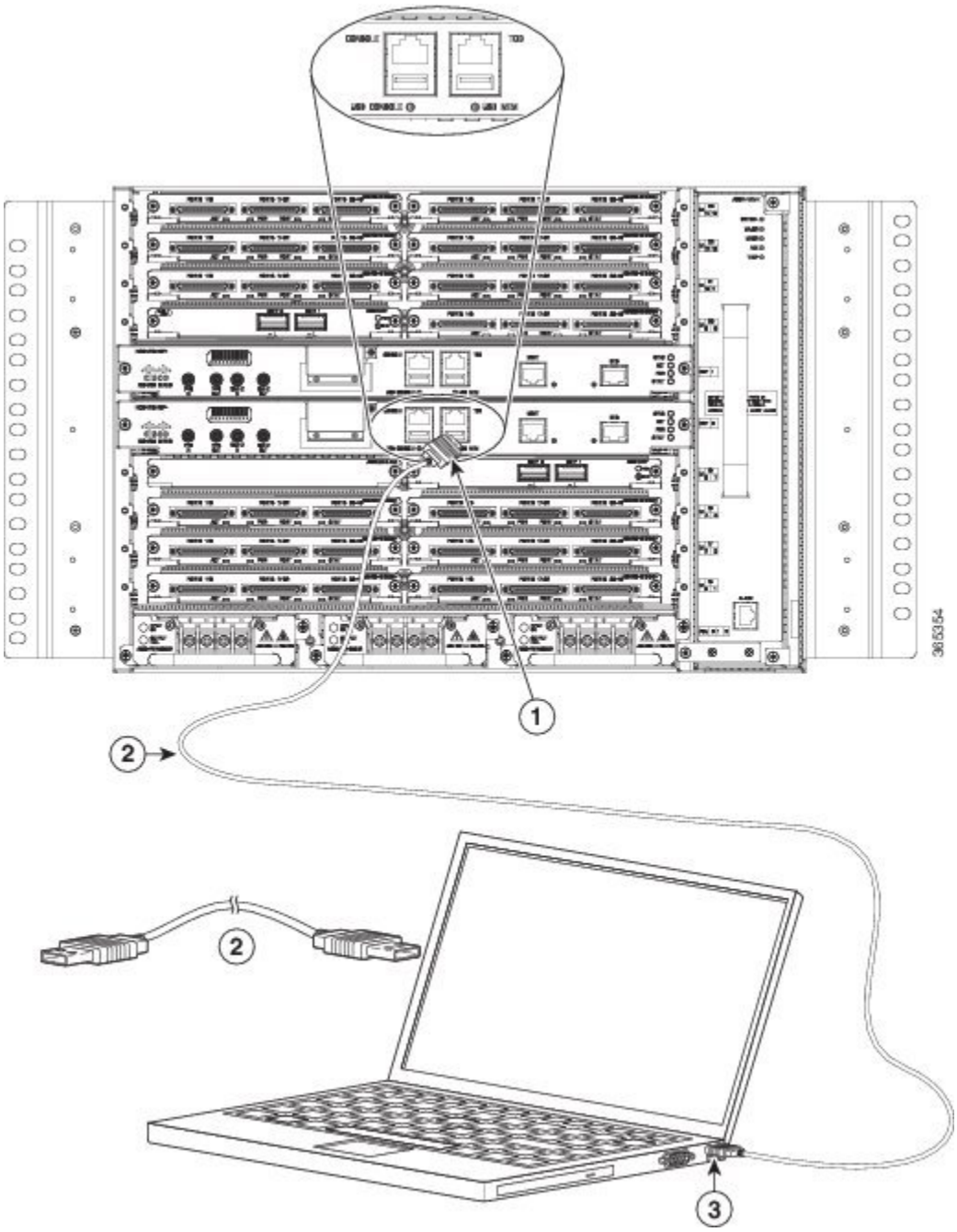
Note
The USB Type A-to-Type A cable is not included with the Cisco NCS 4216; it is ordered separately.

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 parity
- 1 stop-bit
- no flow control

Figure 59: Connecting the USB Console Cable to the Cisco NCS 4216



1	USB Type-A console port	2	USB 5-pin mini USB Type-B to USB Type-A console cable
3	USB Type-A	—	—

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 go to **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 Microsoft Windows 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.

Installing the Cisco Microsoft Windows XP USB Driver

Download the driver for your router model from the Tools and Resources Download Software site, USB Console Software category, at the following URL:

https://www.cisco.com/c/en/us/support/index.html

Procedure

Step 1 Unzip the file Cisco_usbconsole_driver_X_X.zip (where X is a revision number).

Step 2 If using 32-bit Windows XP double-click the file setup.exe from the Windows_32 folder, or if using 64-bit Windows XP double-click the file setup(x64).exe from the Windows_64 folder.

Step 3 Follow the instructions on your screen to complete the installation.

Step 4 Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments the Found New Hardware Wizard appears. Following the instructions to complete the installation of the driver.

The USB console is ready for use.

Installing the Cisco Microsoft Windows 2000 USB Driver

Procedure

Step 1 Obtain the file Cisco_usbconsole_driver.zip from the Cisco.com web site and unzip it.

Step 2 Double-click the file setup.exe.

Step 3 Follow the instructions on your screen to complete the installation.

Step 4 Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments a series of Found New Hardware Wizard windows appear. Following the instructions to complete the installation of the driver.

The USB console is ready for use.

Installing the Cisco Microsoft Windows Vista USB Driver

Procedure

Step 1 Obtain the file Cisco_usbconsole_driver.zip from the Cisco.com web site and unzip it.

Step 2 If using 32-bit Windows Vista double-click the file setup.exe from the Windows_32 folder, or if using 64-bit Windows Vista double-click the file setup(x64).exe from the Windows_64 folder.

Step 3 Follow the instructions on your screen to complete the installation.

Step 4 Connect the USB cable to the PC and router USB console ports. The EN LED for the USB console port turns green, and within a few moments a pop up window stating “Installing device driver software” appears. Following the instructions to complete the installation of the driver.

The USB console is ready for use.

Uninstalling the Cisco Microsoft Windows USB Driver

This section provides instructions for how to uninstall the Cisco Microsoft Windows USB device driver.

Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver

This procedure shows you how to uninstall both the Microsoft Windows XP and 2000 USB driver. The driver can be removed using the Windows Add Remove Programs utility or the setup.exe program.

Using the Add Remove Programs Utility



Note Disconnect the router console terminal before uninstalling the driver.

Procedure

Step 1 Click **Start > Control Panel > Add or Remove Programs**.

Step 2 Scroll to Cisco Virtual Com and click **Remove**.

Step 3 When the Program Maintenance window appears, select the **Remove** radio button. Click **Next**.

Uninstalling the Cisco Microsoft Windows Vista USB Driver

This procedure shows you how to uninstall the Microsoft Windows Vista USB driver.



Note Disconnect the router console terminal before uninstalling the driver.

Procedure

Step 1 Run the setup.exe for Windows 32-bit or setup(x64).exe for Windows-64bit. Click **Next**.

Step 2 The InstallShield Wizard for Cisco Virtual Com appears. Click **Next**.

Step 3 When the Program Maintenance window appears, select the Remove radio button. Click **Next**.

Step 4 When the Remove the Program window appears, click **Remove**.

Note
If a User Account Control warning appears, click "Allow - I trust this program..." to proceed.

Step 5 When the InstallShield Wizard Completed window appears click **Finish**.

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.

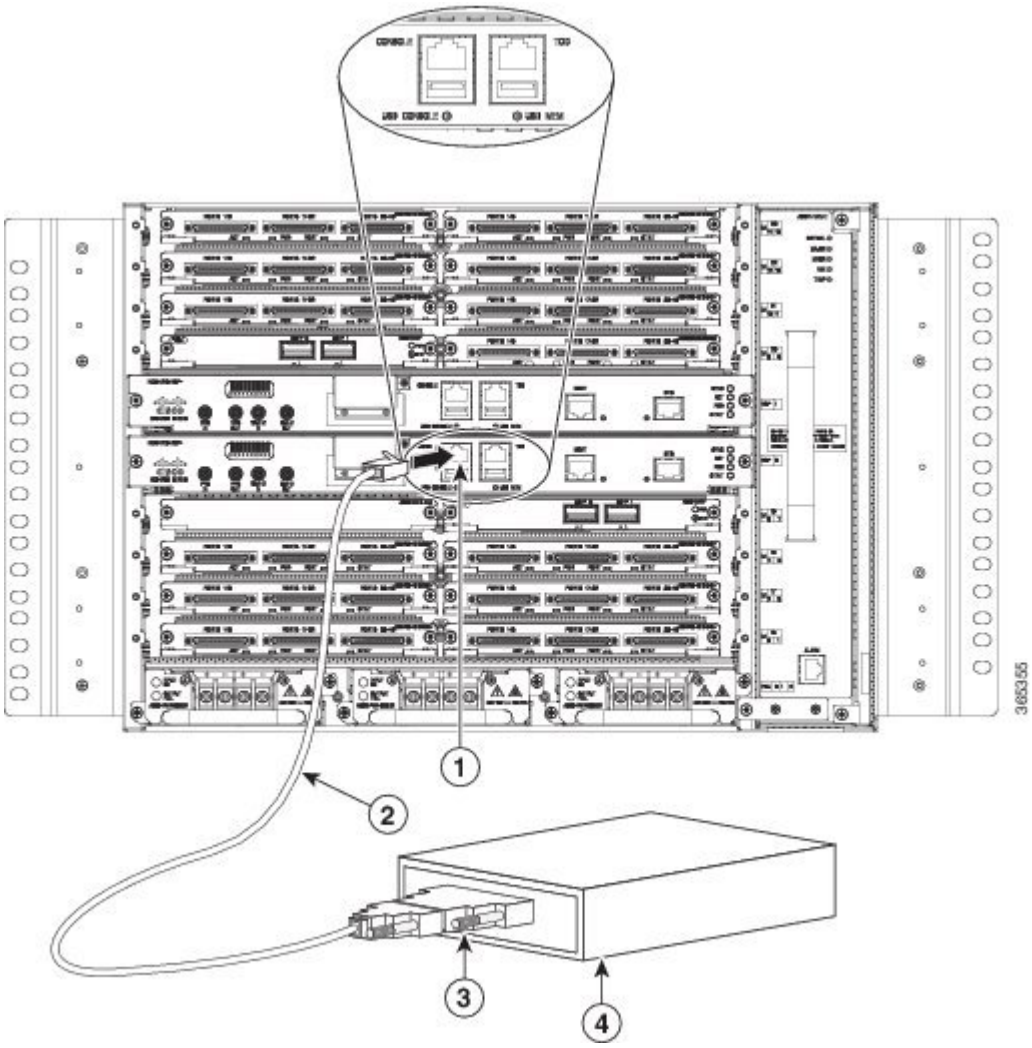
Note The console cable and DB-9-to-DB-25 connector are not included with the Cisco NCS 4216; they are ordered separately.

To connect a modem to 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 60: Connecting a Modem to the Cisco NCS 4216



1	RJ45 AUX port	3	RJ45 to DB-9
2	DB-9 to DB-25 adapter	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 115200 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 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 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.

Installing and Removing SFP

The Cisco NCS 4216 supports a variety of SFP modules, including optical and Ethernet modules. For information on how to install and remove SFP modules, see the documentation for the SFP 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

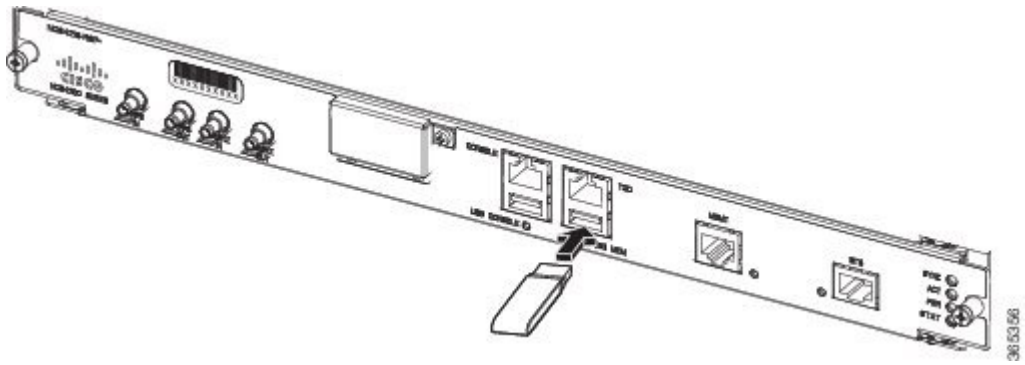
Caution We recommend that you wait 30 seconds between removal and insertion of an SFP on an interface module. This time is recommended to allow the transceiver software to initialize and synchronize with the standby RSP. Changing an SFP more quickly could result in transceiver initialization issues that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

Connecting a USB Flash Device

To connect a USB flash device to the Cisco NCS 4216, insert the memory stick in the USB port labeled MEM. The Flash memory module can be inserted in only one way, and can be inserted or removed regardless of whether the router is powered up or not.

The following figure shows the USB port connector on the Cisco NCS 4216.

Figure 61: Cisco NCS 4216 Flash Token Memory Stick



Removing a USB Flash Device

To remove and then replace a USB flash token memory stick from a Cisco NCS 4216, follow these steps:

Procedure

Step 1 Pull the memory stick from the USB port.

Step 2 To replace a Cisco USB Flash memory stick, simply insert the module into the USB port labeled MEM as shown in the *Cisco NCS 4216 Flash Token Memory Stick* figure. The Flash memory module can be inserted in 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

The sections describe how to connect timing cables to the Cisco NCS 4216:

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

Connecting Cables to the BITS Interface

The following steps describe how to connect a cable to the router 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 power to the router.

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

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

Connecting Cables to a GNSS Interface

The sections describe how to connect cables from the Cisco NCS 4216 to a GPS unit for input or output timing of frequency:

Note A Y-cable is required to connect to a primary and backup RSP in order to ensure that the router continues to transmit timing signals in the event of a network failure. For a mini-coax connection, this Y-cable can be part number CAB-BNC-7INY (7 inch BNC Y-cable). For an Ethernet connection, this Y-cable can be a RJ45 Cat5 1-to-2 splitter (3 female port RJ45 connector).

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

Connecting Cables to the Input 10Mhz or 1PPS Interface

Procedure

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

Step 2 Connect one end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the primary RSP of the Cisco NCS 4216.

Step 3 Connect the other end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the backup RSP of the Cisco NCS 4216.

Connecting Cables to the Output 10Mhz or 1PPS Interface

Procedure

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

Step 2 Connect one end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the primary RSP of the Cisco NCS 4216.

Step 3 Connect the other end of the split-side Y-cable mini-coax to the 10Mhz or 1PPS port on the backup RSP of the Cisco NCS 4216.

Connecting Cables to the ToD Interface

Procedure

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

Step 2 Connect one end of the split-side Y-cable Ethernet to the ToD port on the primary RSP of the Cisco NCS 4216.

Step 3 Connect the other end of the split-side Y-cable Ethernet to the ToD port on the backup RSP of the Cisco NCS 4216.

Note
For instructions on how to configure clocking, see the Cisco NCS 4216 *Software Configuration Guide*.

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 the Troubleshooting section.

Connecting a Cable to the GNSS Antenna Interface



Note The GNSS module is not hot swappable.

Procedure

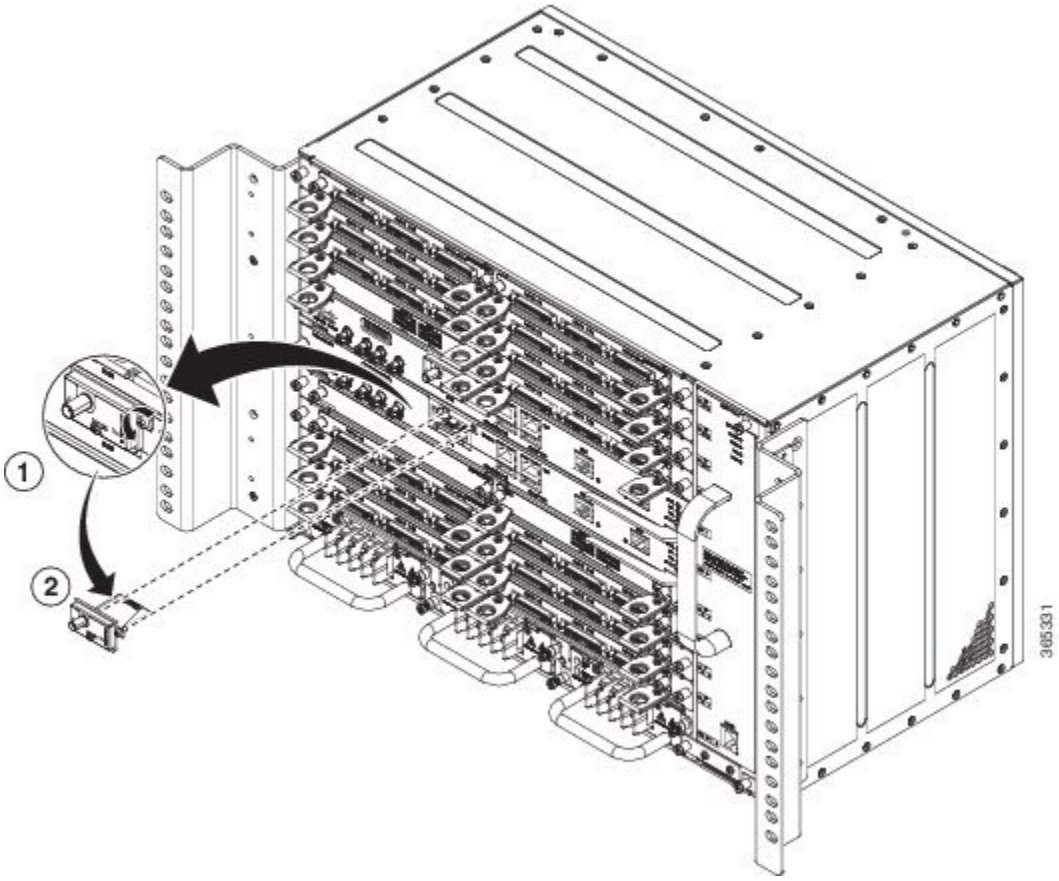
Step 1 Connect one end of a shielded coaxial cable to the GNSS RF IN port.

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 62: Installing the GNSS Module in the RSP



1	Screw on the GNSS Module	2	Inserting the GNSS Module

Connecting Ethernet Cables

The Cisco NCS 4216 interface modules support RJ45 or SFP Ethernet ports. For instructions on how to connect cables to Ethernet SFP ports, see the Connecting Cables to SFP Modules section.

The RJ45 port supports standard straight-through and crossover Category 5 unshielded twisted-pair (UTP) cables. Cisco Systems 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 cabling to the RSPs, we recommend that you leave a service loop of extra cabling sufficient to allow for fan tray removal.

Follow these steps to connect the 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

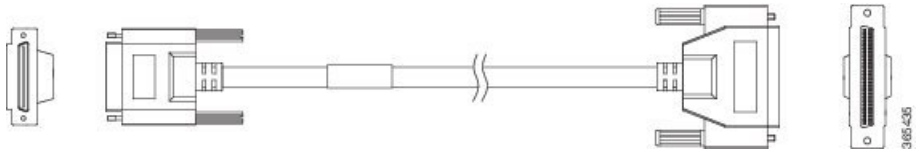
The physical layer interface for the Cisco NCS 4216 T1/E1 port is a customer-installed high-density connector. The high-density connector has thumbscrews which should be screwed into the interface when the cable is installed.

Note Patch panels are required in order to connect the high-density interface connectors to individual T1/E1 lines.

Installing the Cable Connectors

T1/E1 Cable Connectors

Figure 63: T1/E1 Cable Connector



One end of the cable (see the figure above) has a 68-pin connector that plugs into the T1/E1 interface module and the other end of the cable with a 68-pin connector is connected to a RJ48, AMP64 or a DIN patch panel. Use the thumbscrews on either side of the connector to secure the cable to the interface.

Patch Panel cables

The patch panel cable connects the interface modules with the patch panel.

Each cable connects one VHDCI connector on the interface module to the connector on the patch panel. A set of three cables is required to connect one interface module to one 48-port patch panel.

The following table shows details of the patch panel cables:

Patch Panel Cable	Description
CABLE-16TDM-C	16-port cable for TDM CEM Interface Module, no redundancy, 10 feet in length

Note CABLE-16TDM-C-R is not supported in Cisco IOS XE Release 3.18.06v.S.

Connecting Cables to the Patch Panel

Figure 64: Interface Module with the Connector

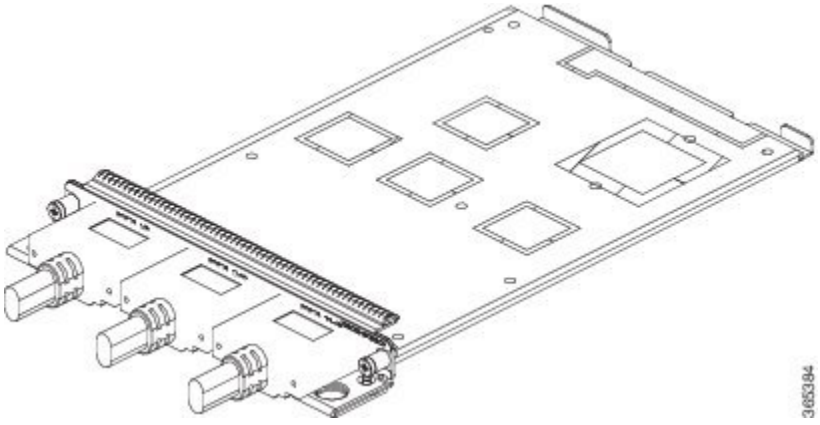
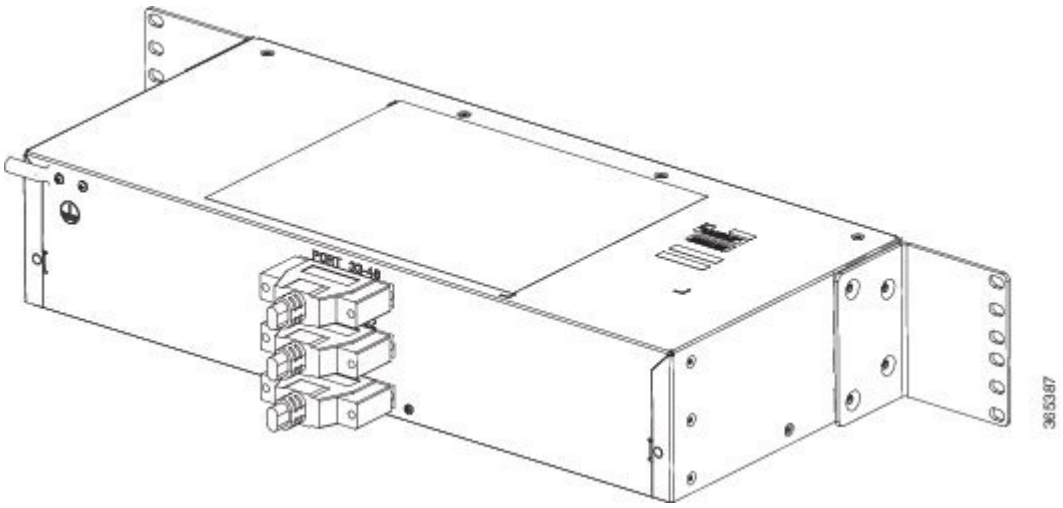


Figure 65: Patch Panel with the Connector



If you are connecting two T1/E1 interfaces to each other, you must cable both interfaces' patch panels together using a T1 straight-through shielded cables. If both T1/E1 interfaces are connected to their patch panels in a different configuration, use a T1 straight-through cable (standard RJ48C patch cable) to connect the patch panels.

Caution The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces which 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 7005

Patch Panel Connectors

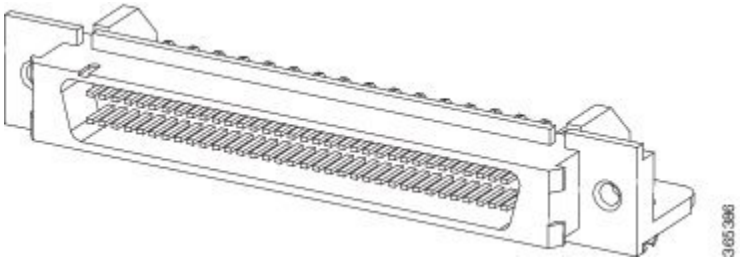
The PANEL-48-1-DIN and PANEL-48-3-DIN provide 48 DIN 1.0/2.3 connectors on the front side of the patch panel. These connectors terminate to 75 ohm coaxial cable through the DIN plug.

The PANEL-48-1-RJ48 provide 48 RJ45 connector on the front side of the patch panel. These connectors terminate to 110 ohm T1/E1 cable through a RJ45 connector.

The PANEL-48-1-AMP64 provide 48 port 110 ohm T1/E1 lines via 4 AMP64 connectors on the front of the patch panel.

The PANEL-48-3-HDBNC Provide 48 HDBNC connectors on the front of the patch panel. These connectors terminate to 75 ohm coaxial cable through the HDBNC plug.

Figure 66: Patch Panel Connector on the Patch Panel



Installing Patch Panel

To install the brackets on the rear of the patch panel, perform these steps:

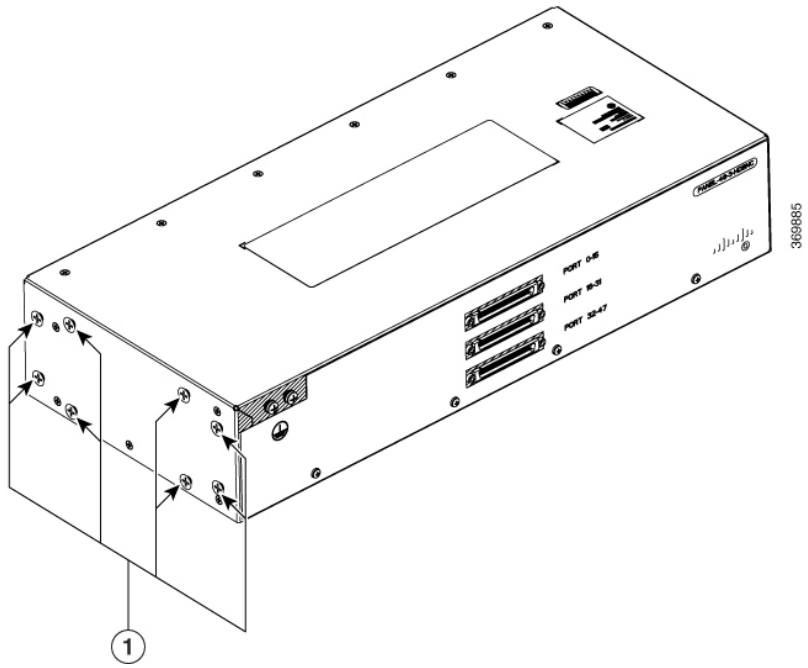
Procedure

Step 1 Remove the larger (M4) rack mount screws (as indicated in the *Rack Mount Screws* figure below) from both sides. To secure the brackets, follow the instructions in Step-3.

Step 2 Remove the patch panel rack-mount brackets from the accessory kit and position them beside the patch panel.

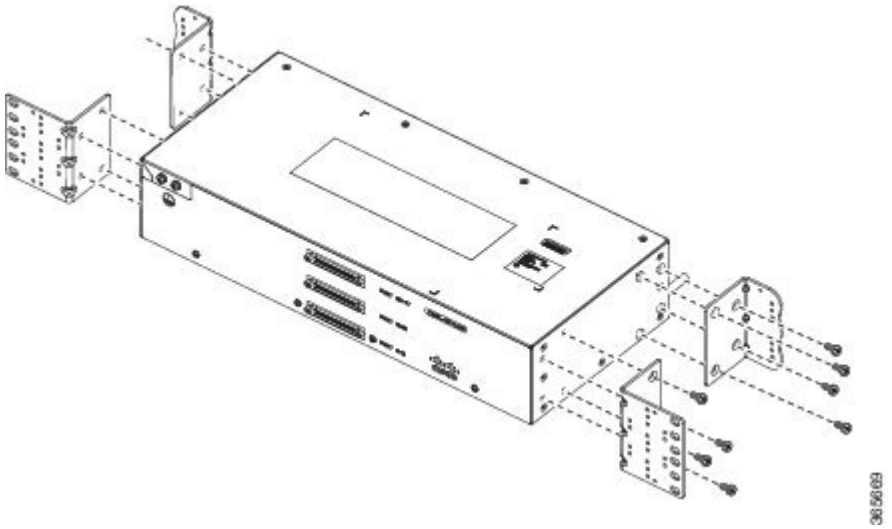
Step 3 Position the brackets against the patch panel sides, and align with the screw holes. Secure the rack mount bracket to patch panel using a torque of 13.2 in.-lb (1.5 N-m) see the figure below.

Figure 67: Rack Mount Screws



(1) Rack mount screws to secure rack mount brackets on both the sides.

Figure 68: Patch Panel Front View with Brackets



Step 4 Position the cable management guides against the mounting brackets on the patch panel, see the figure below.

Figure 69: Patch Panel Front View with Brackets and Guides

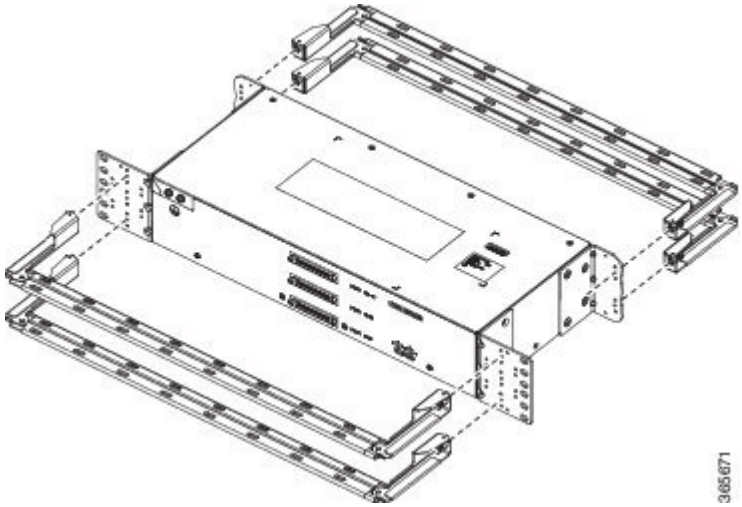
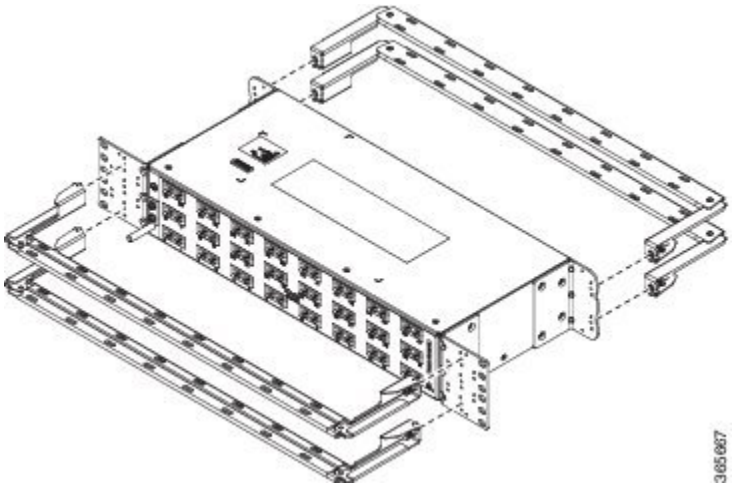


Figure 70: Patch Panel Rear View with Brackets and Guides



Step 5 Secure the guides to the brackets with the screws. The recommended maximum torque is 28 in.-lb (3.16 N-m).

Step 6 **Note**
Cable brackets should be assembled according to the PID used as different PIDs have different set and quantity of brackets. Refer figures 110 to 115 for PID and cable bracket details.

Position the patch panel with brackets and guide onto the rack and secure with screws provided. The recommended maximum torque is 28 in.-lb (3.16 N-m), see the figure below.

Figure 71: Patch Panel Front View with Brackets and Guides Installed on Rack

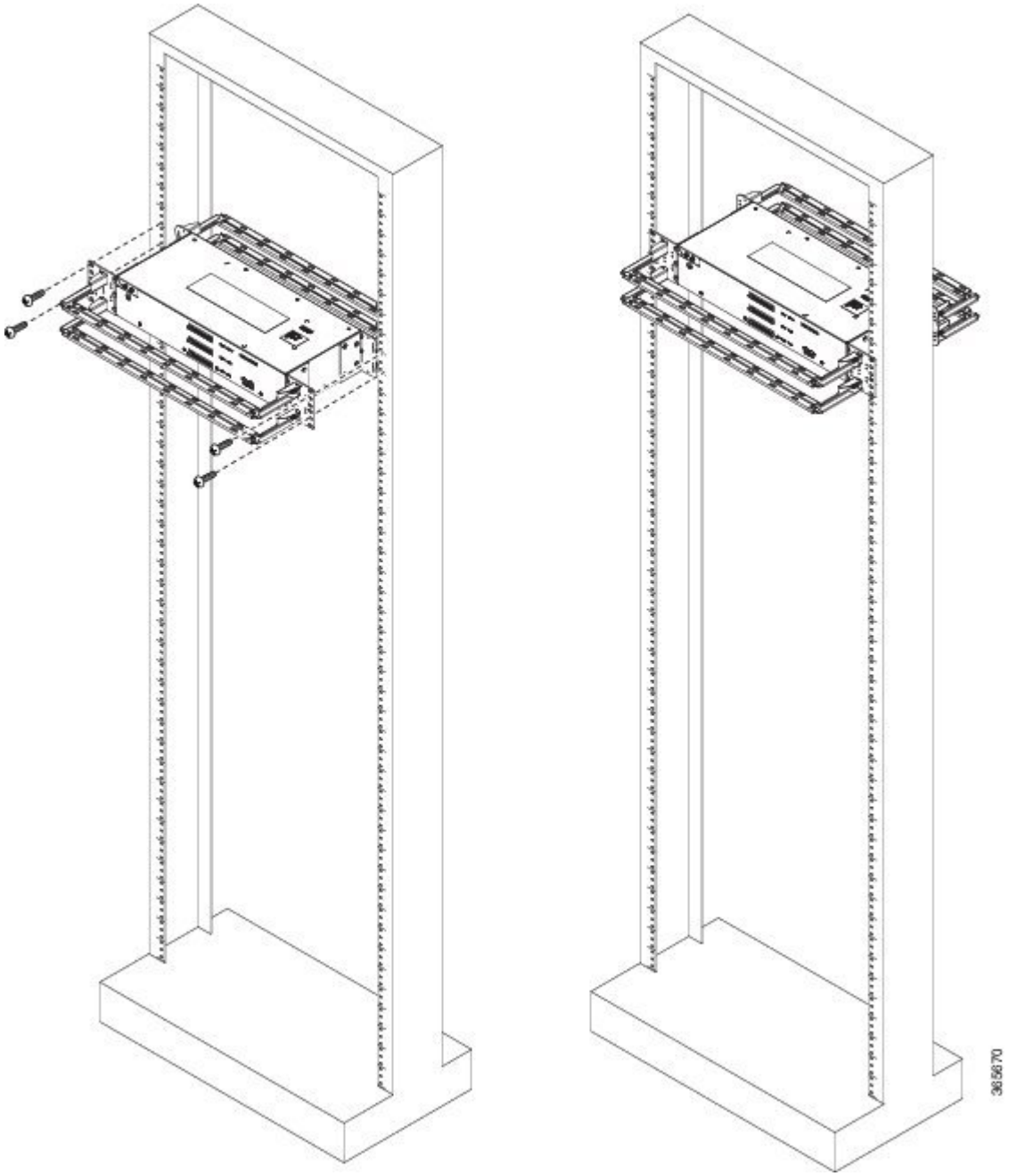


Figure 72: Patch Panel Rear View with Brackets and Guides Installed on Rack

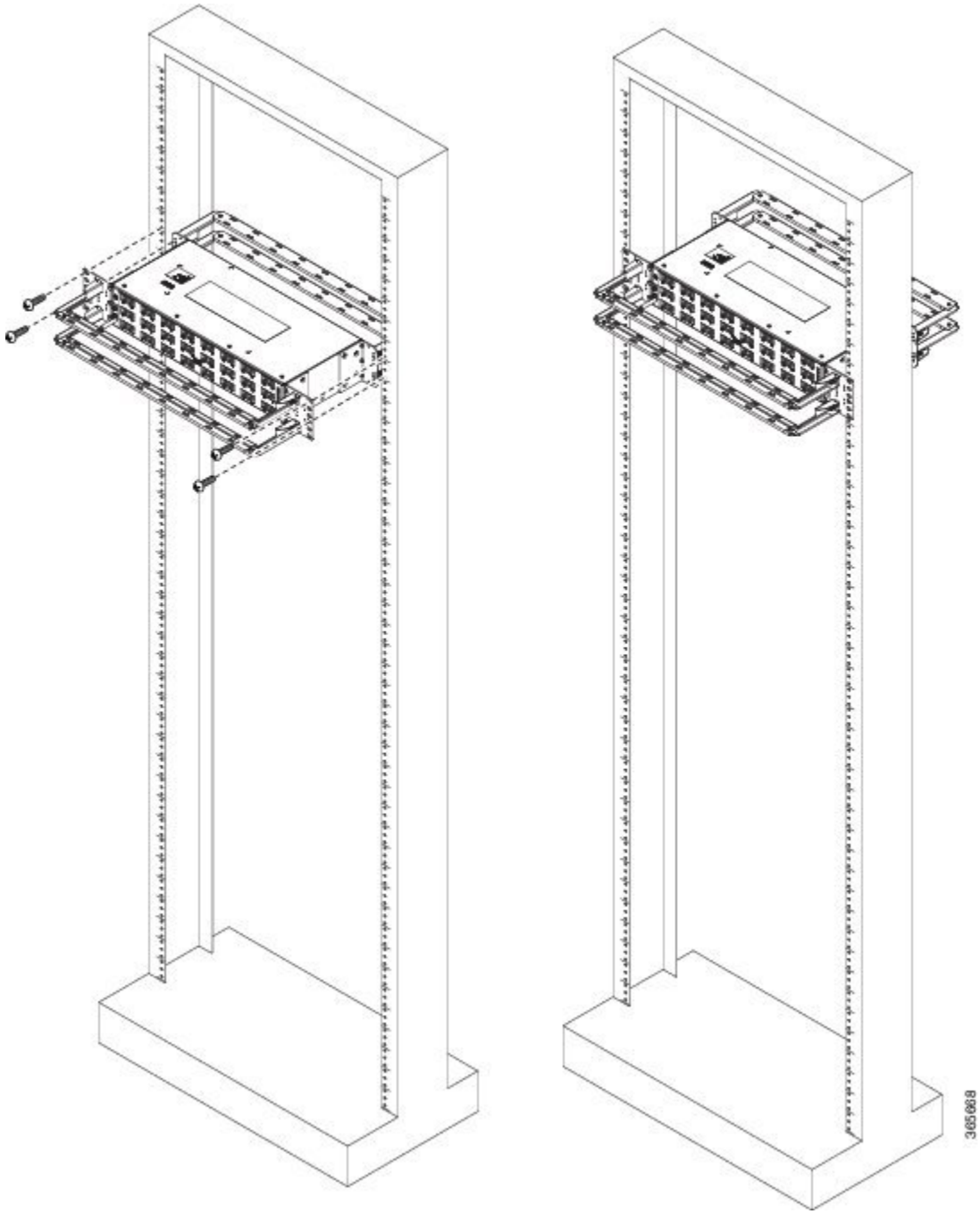


Figure 73: PANEL-16-DIN Patch Panel Mounting Installed on Rack

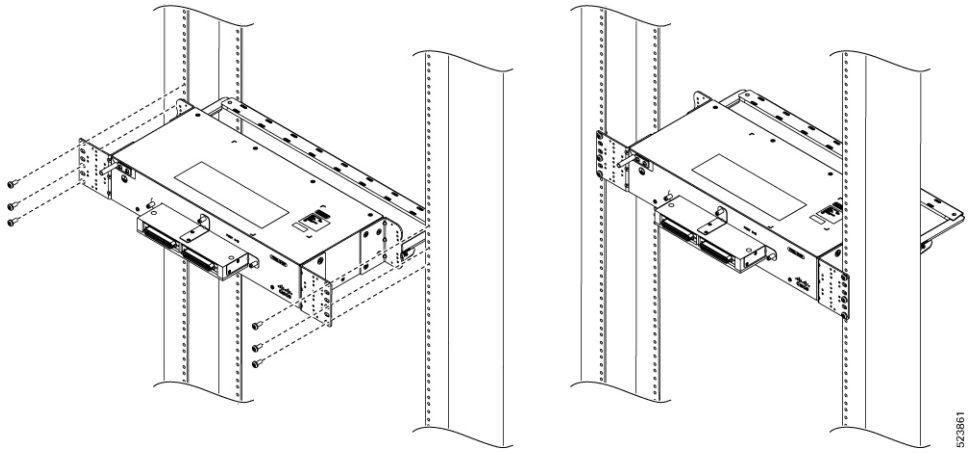


Figure 74: PANEL-48-1-AMP64

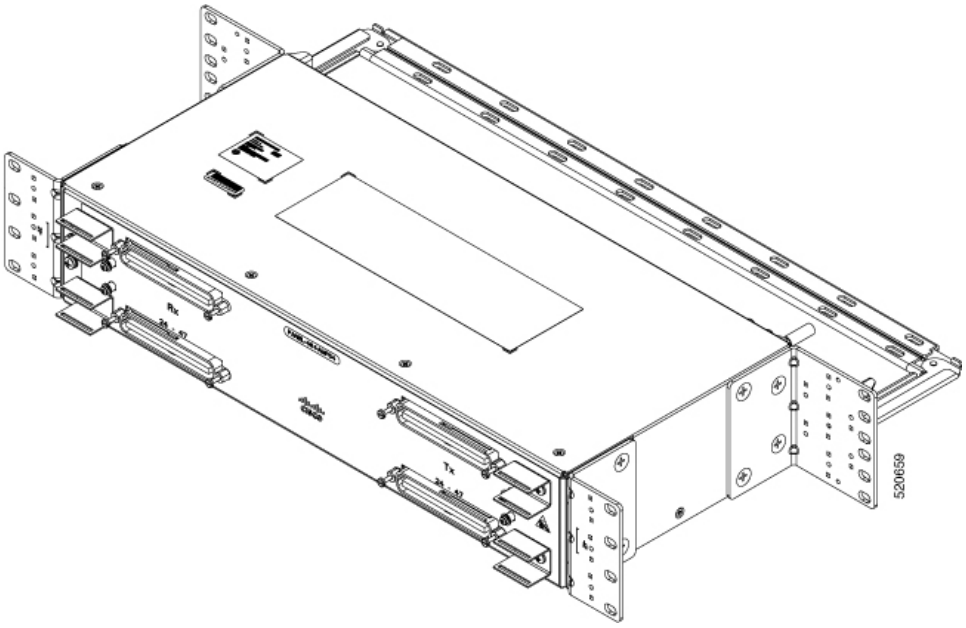


Figure 75: PANEL-48-1-DIN

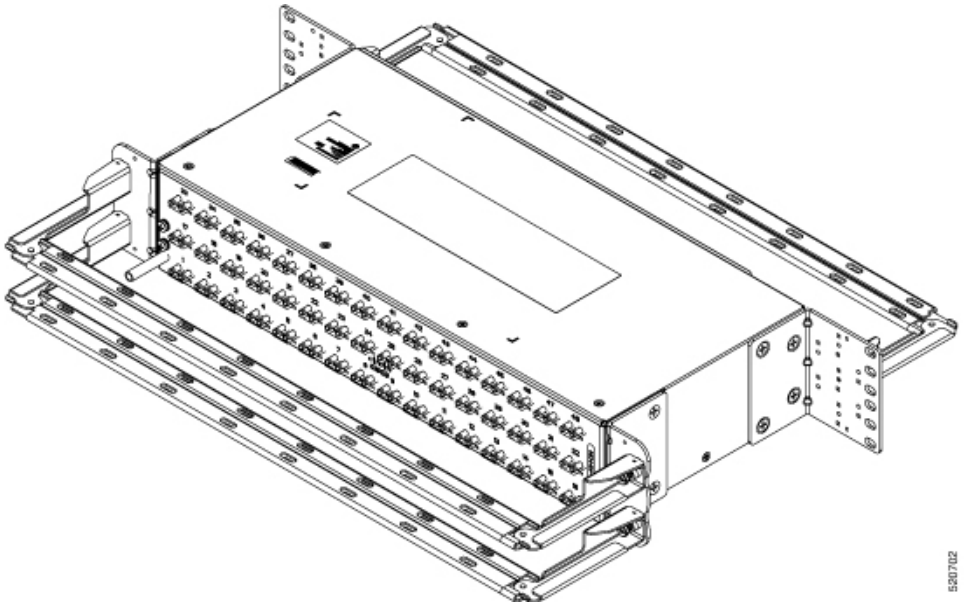


Figure 76: PANEL-48-1-RJ48

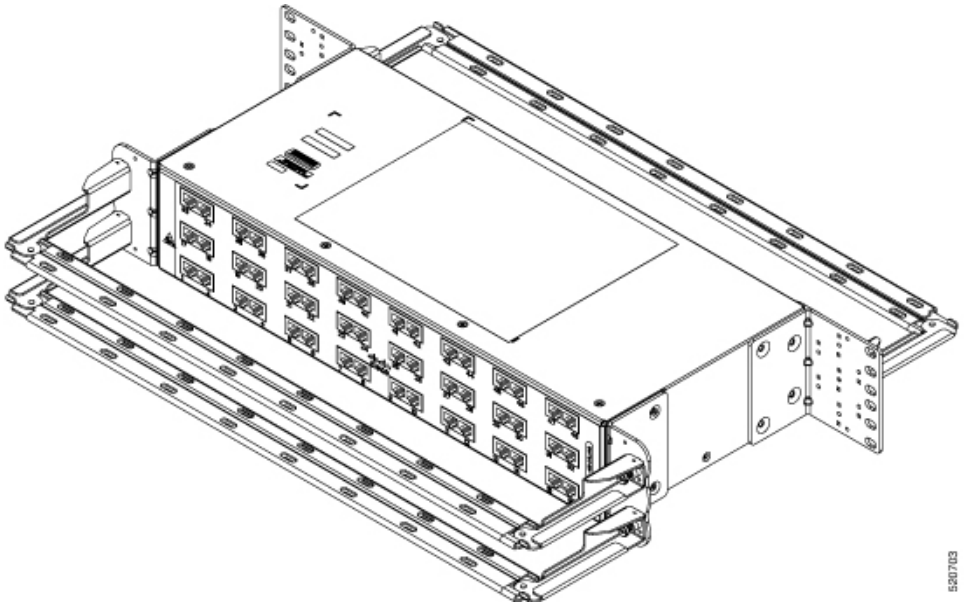
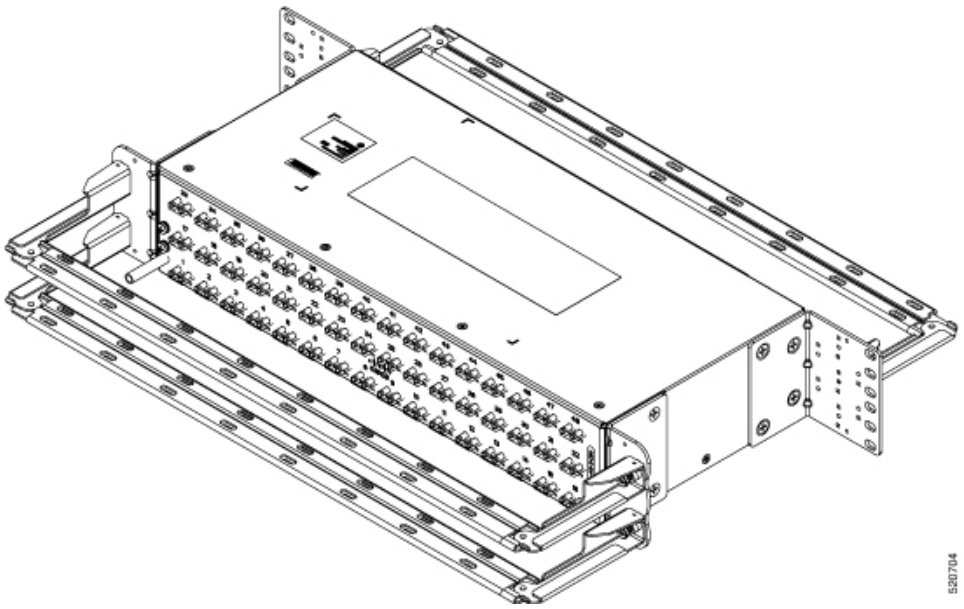


Figure 77: PANEL-48-3-DIN



Note
The installation of PANEL-48-1-AMP64, PANEL-48-1-DIN, PANEL-48-1-RJ48, and PANEL-48-3-DIN is similar to the installation steps mentioned above.

Figure 78: PANEL-48-3-HDBNC

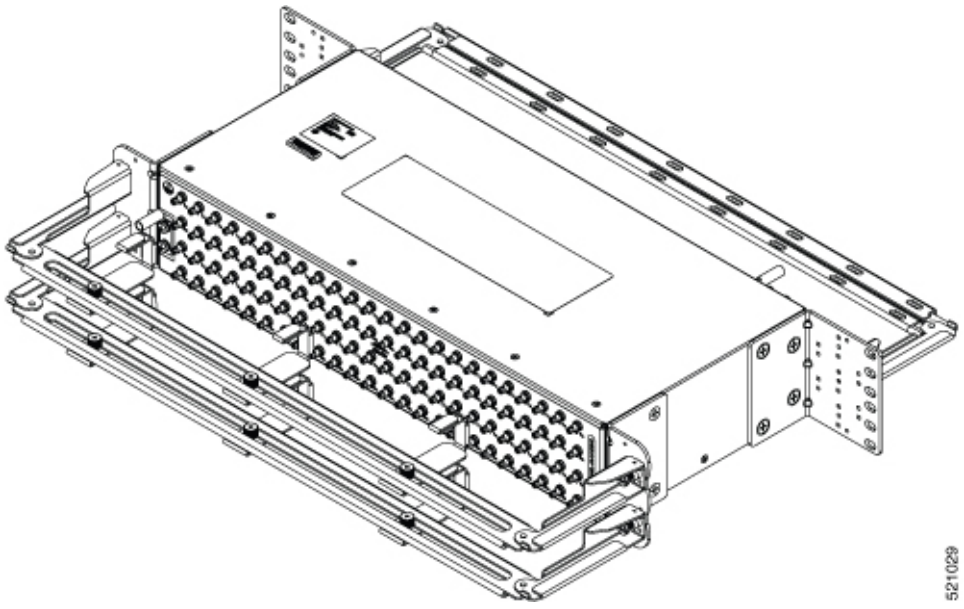


Figure 79: PANEL-144-1-AMP64

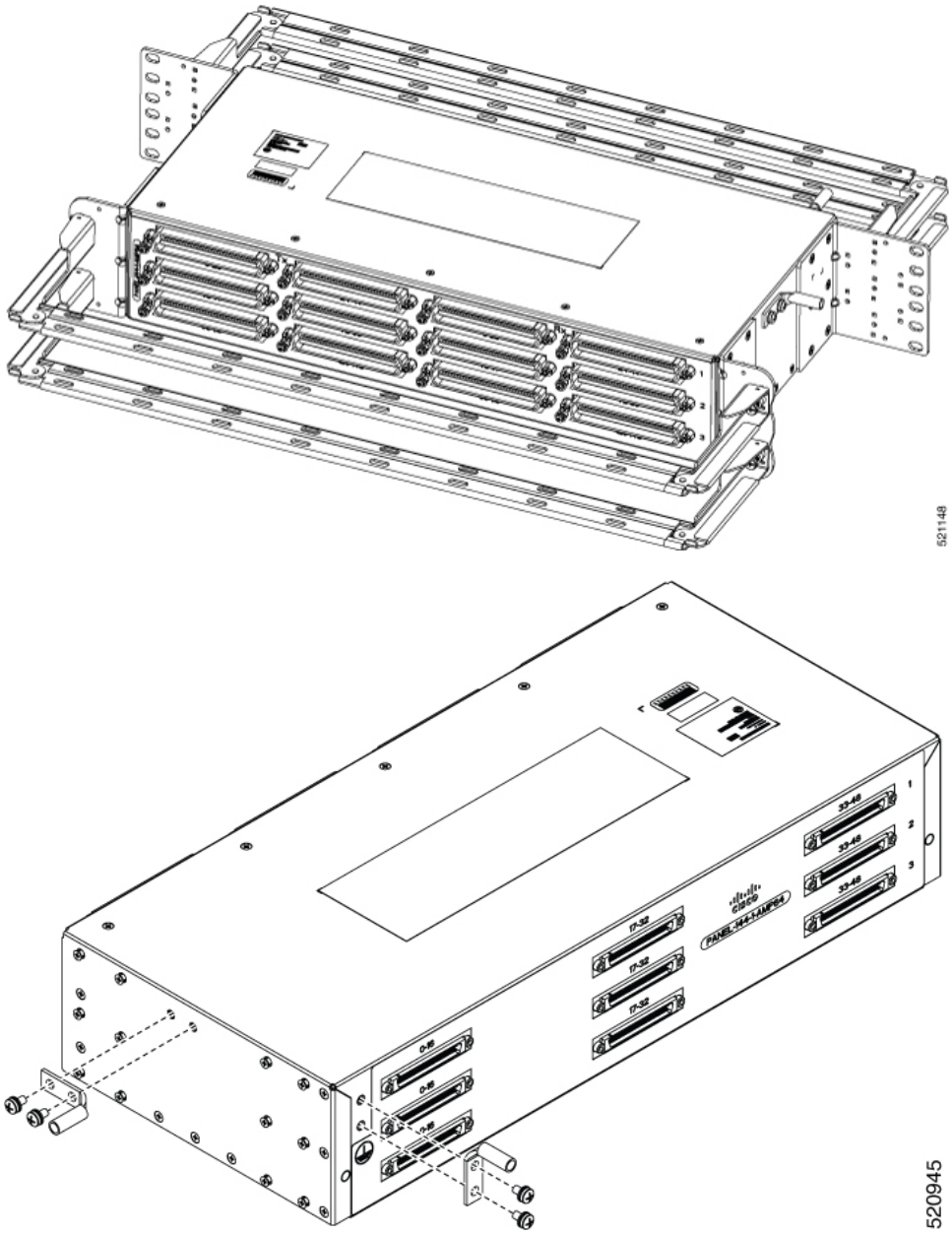
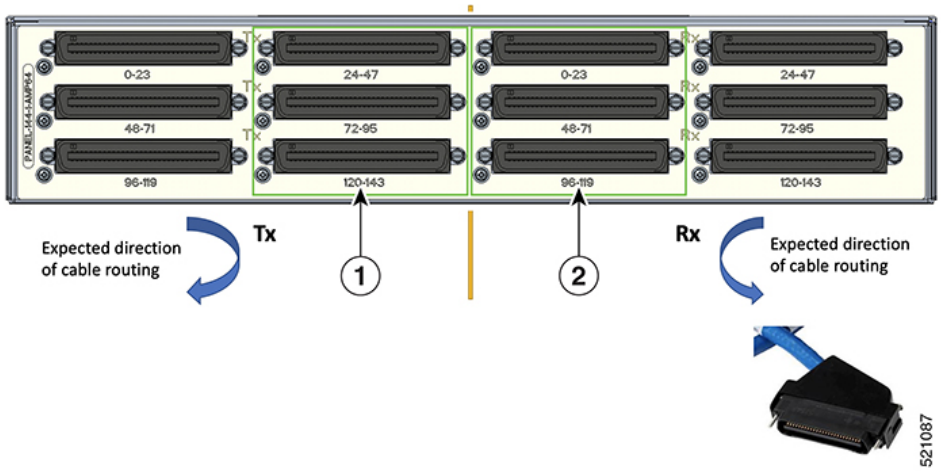


Figure 80: Example of 120° Exit Cable Hood



The following table shows details of the 120° exit cable hood:

Table 17: Cable Routing Recommendation for Panel-144-1-AMP64

1	120° exit cable hood with left routing should be used for centre ports on the Tx side.
2	120° exit cable hood with right routing should be used for centre ports on the Rx side.

Ground Connection for Patch Panel

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

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 the unit, the ground connection must always be made first and disconnected last. Statement 42

Grounding points on patch panel may vary between different PIDs.

Install 3G Patch Panel

You can choose to either set up the Cisco ASR 903 3G patch panel on a rack or wall mount it.

Install Rack Brackets

Procedure

Step 1 Connect the grounding lugs using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire.

Step 2 Use a 6 AWG ground wire to connect the other end to a suitable grounding point at your site.

Figure 81: Patch Panel Grounding - Single

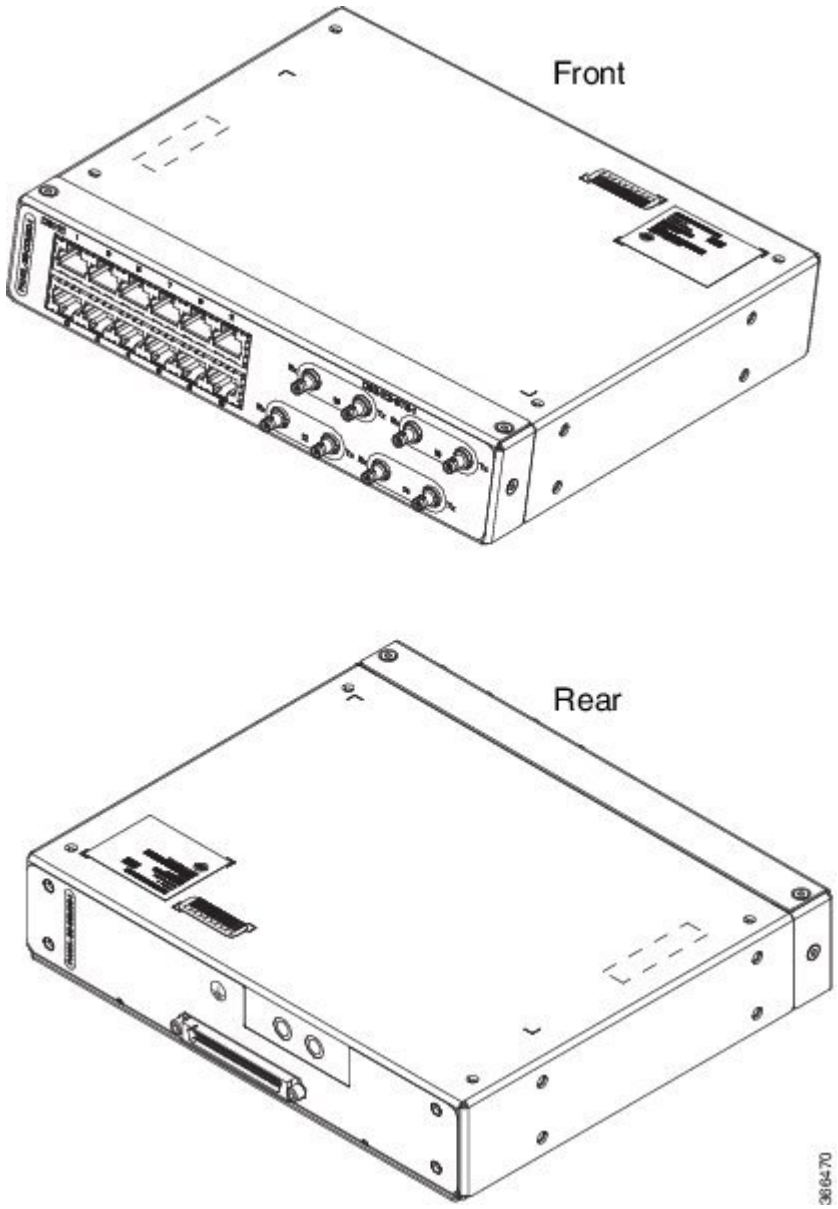
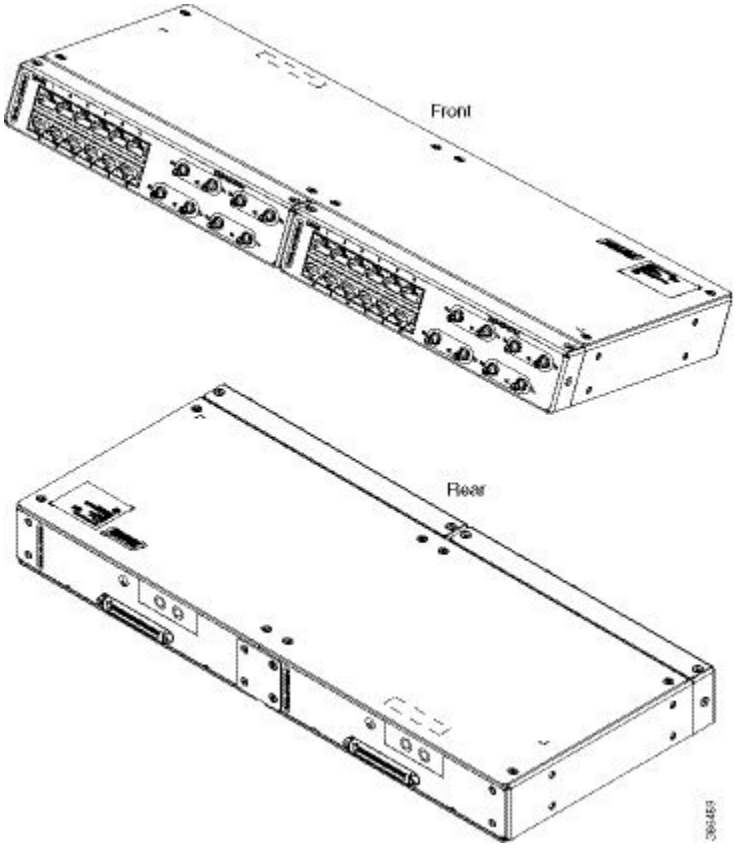


Figure 82: Patch Panel Grounding - Dual



Step 3 Position the patch panel in the rack as follows:

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

Step 4 Align the mounting holes in the bracket with the mounting holes in the equipment rack.

Figure 83: Installing the Patch Panel - Single in a 19-inch Rack

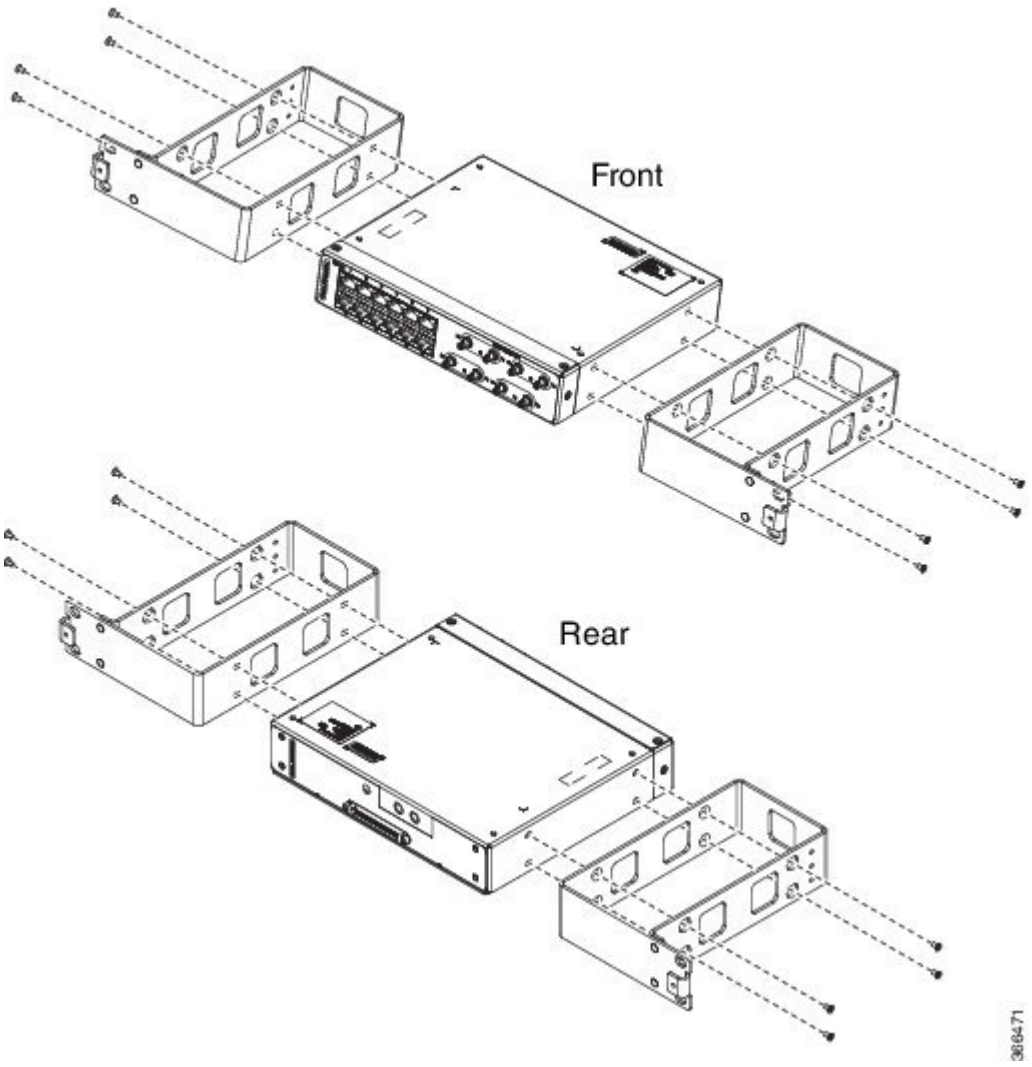


Figure 84: Installing the Patch Panel - Dual in a 19-inch Rack

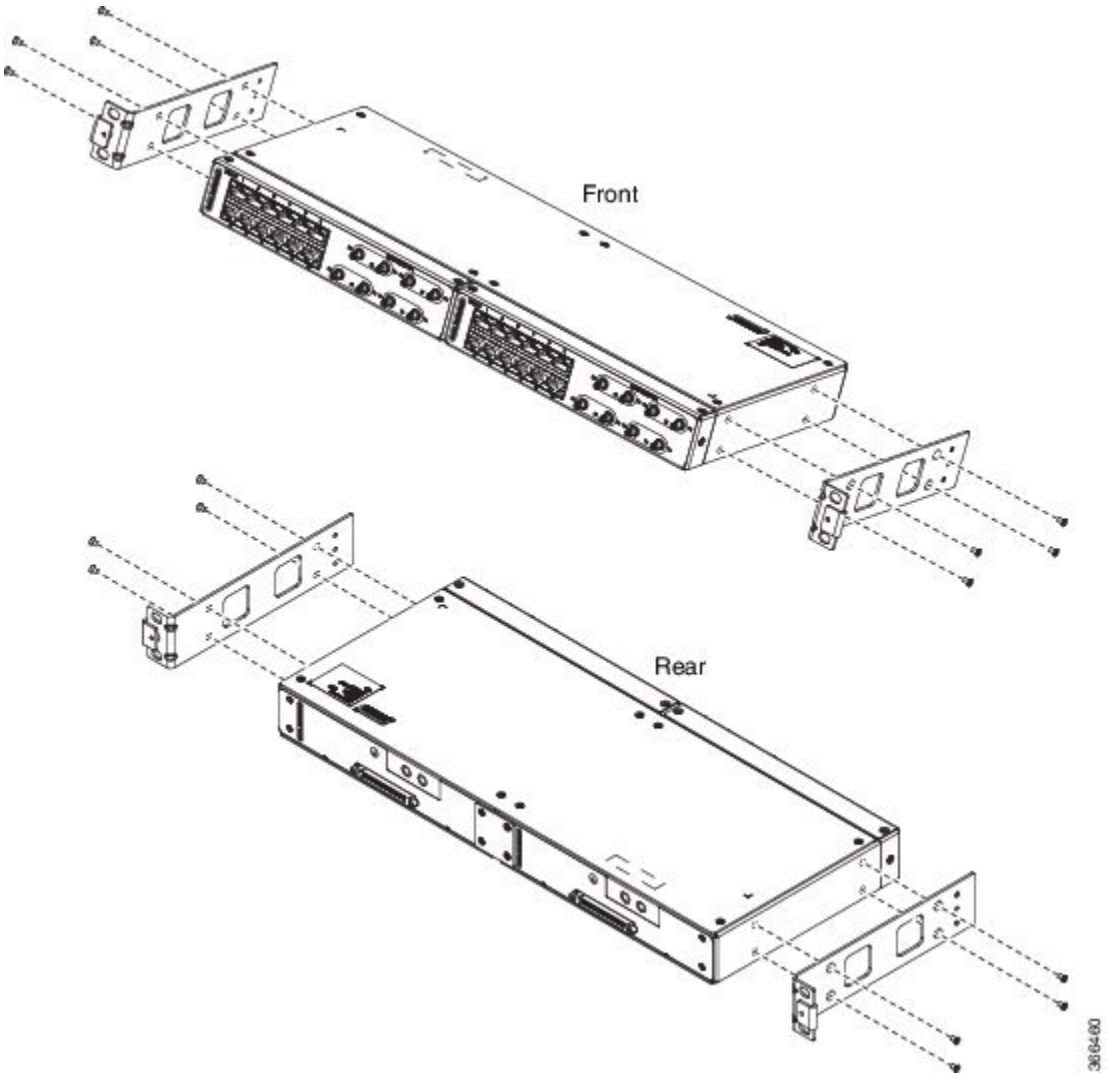


Figure 85: Installing the Patch Panel - Single in a 21-inch Rack

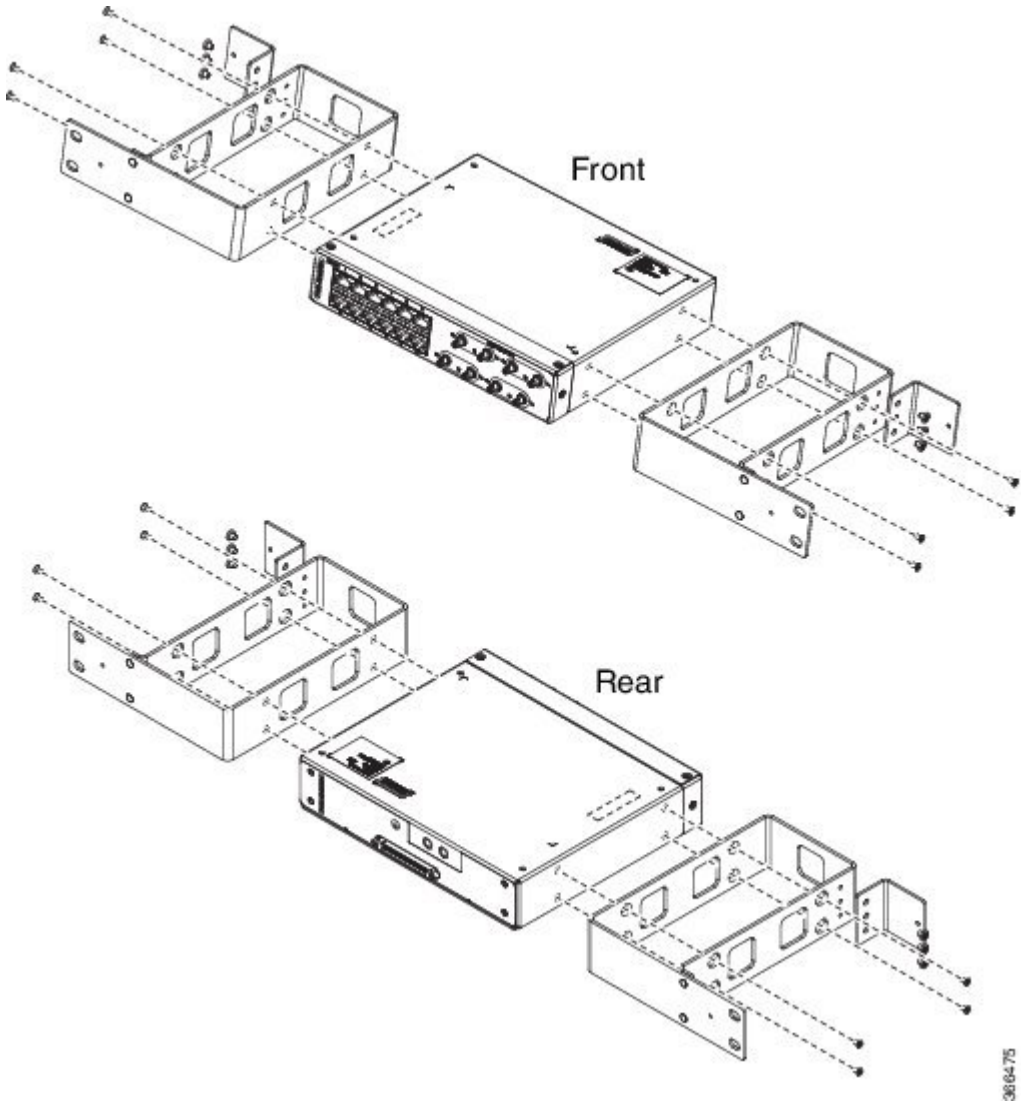


Figure 86: Installing the Patch Panel - Dual in a 21-inch Rack

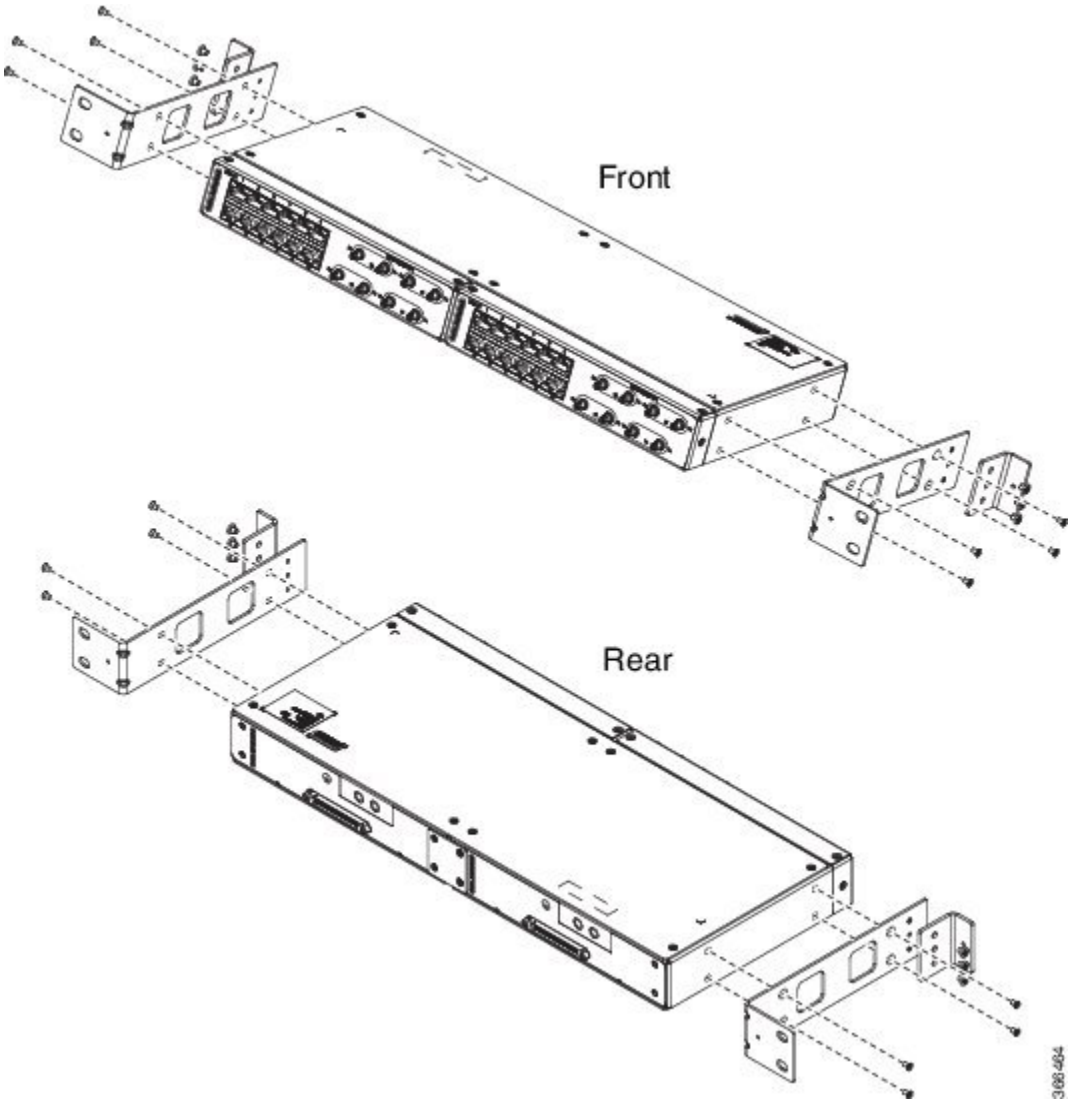


Figure 87: Installing the Patch Panel - Single in a 23-inch Rack

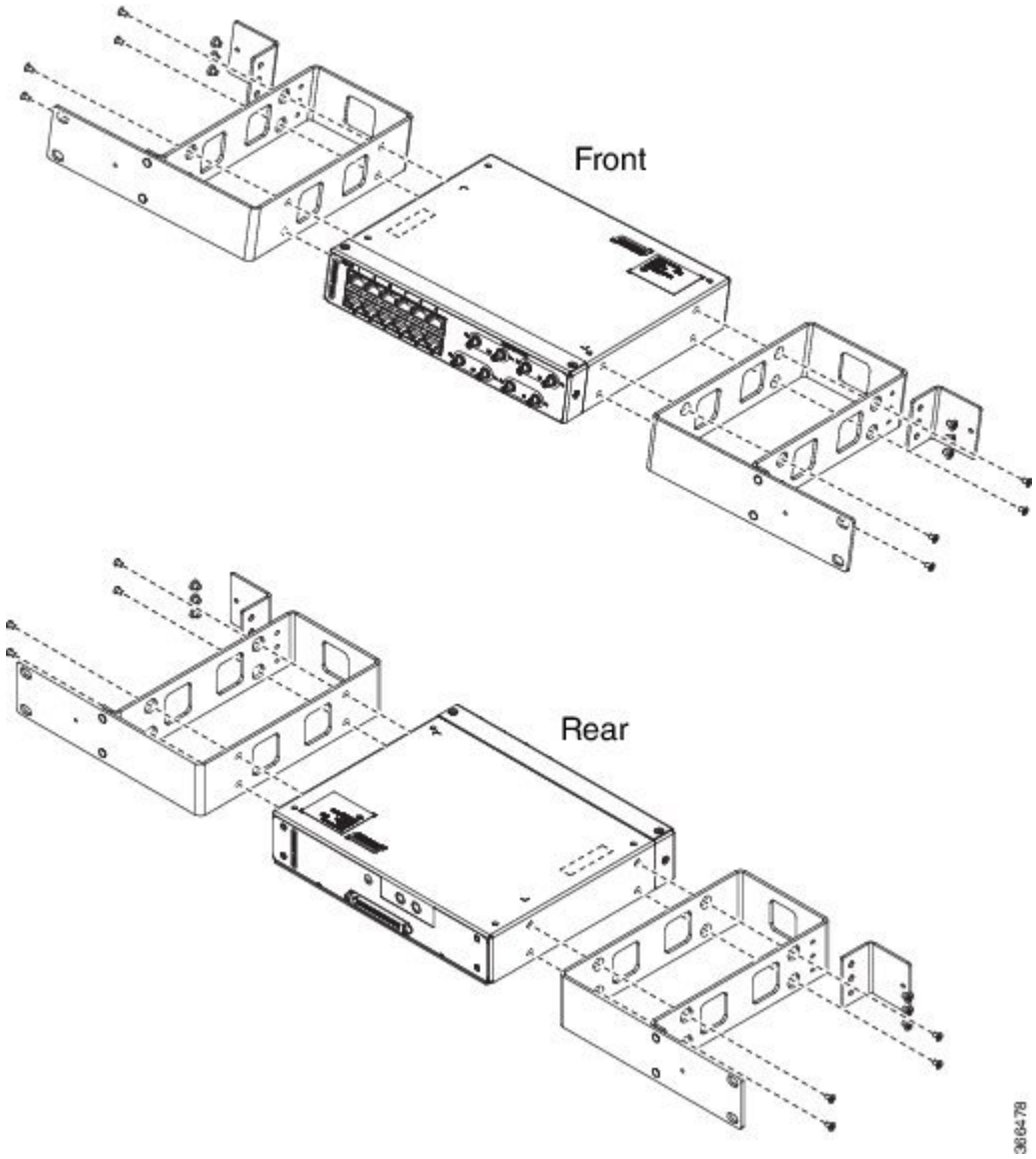
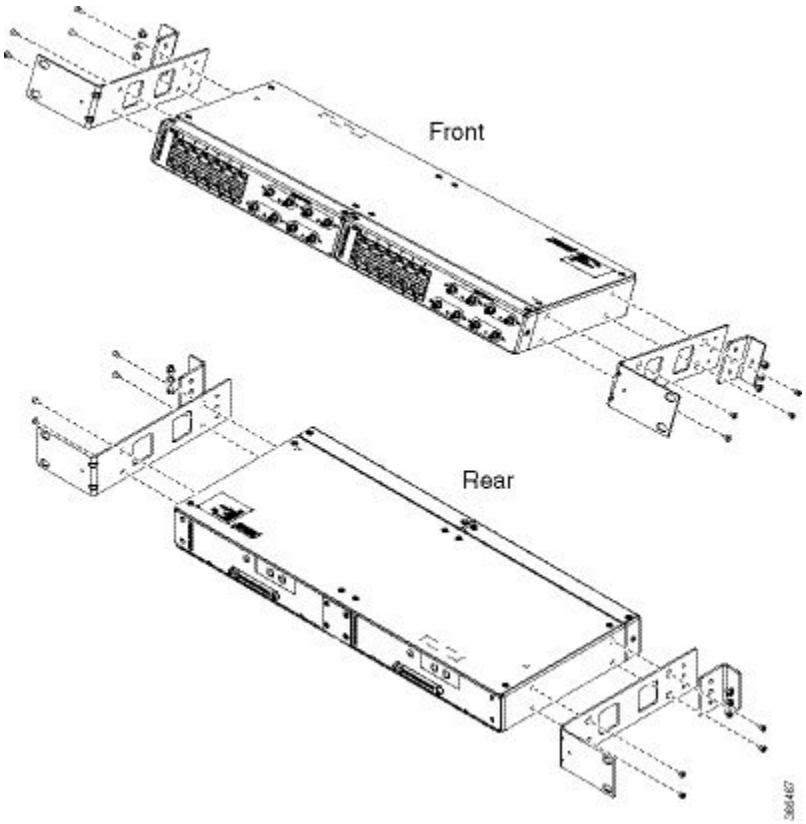


Figure 88: Installing the Patch Panel - Dual in a 23-inch Rack



Step 5 Secure the brackets to the chassis with the screws. The recommended maximum torque is 28 in.-lb (3.16 N-m).

- EIA 19 and 23 inches mounting brackets for both single and double 3G interface module patch panels.
- ETSI 21 inches mounting brackets for both single and double 3G interface module patch panels.

Set up 3G Patch Panel on Rack

To install the optional cable management brackets, perform these steps:

Procedure

Step 1 Position the cable management brackets against the front of the chassis and align the screw holes, as shown in the figure.

Step 2 Secure the cable management brackets with the screws. The recommended maximum torque is 10 in.-lb (1.12 N-m).

Figure 89: Attaching 19-inch Brackets to Patch Panel - Single

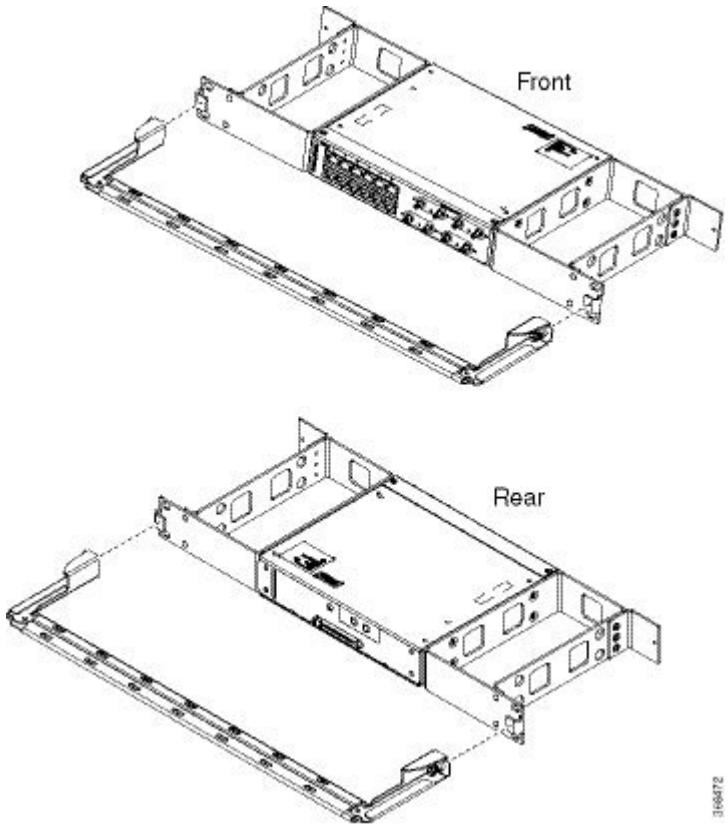


Figure 90: Installing 19-inch Brackets on to Rack - Single

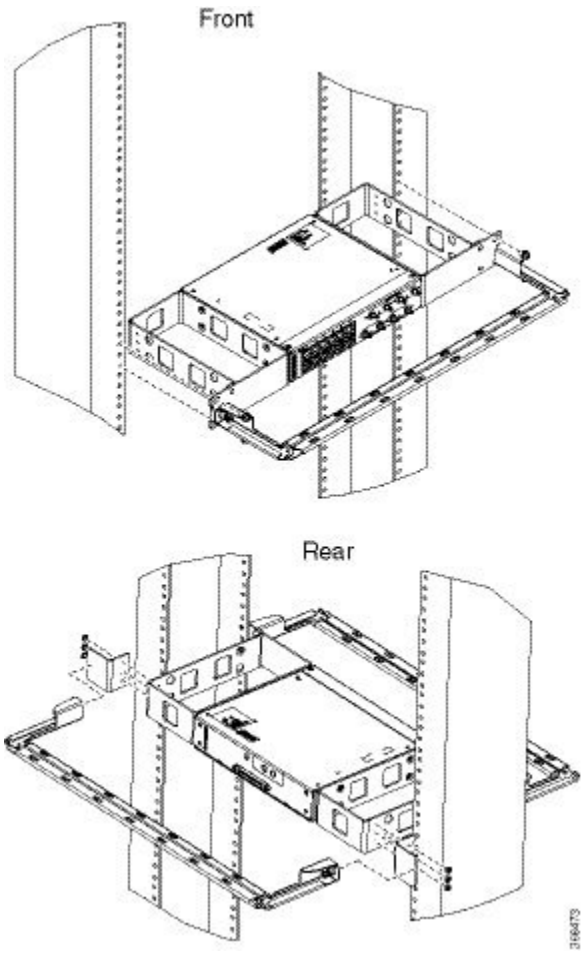


Figure 91: Attaching 19-inch Brackets to Patch Panel - Dual

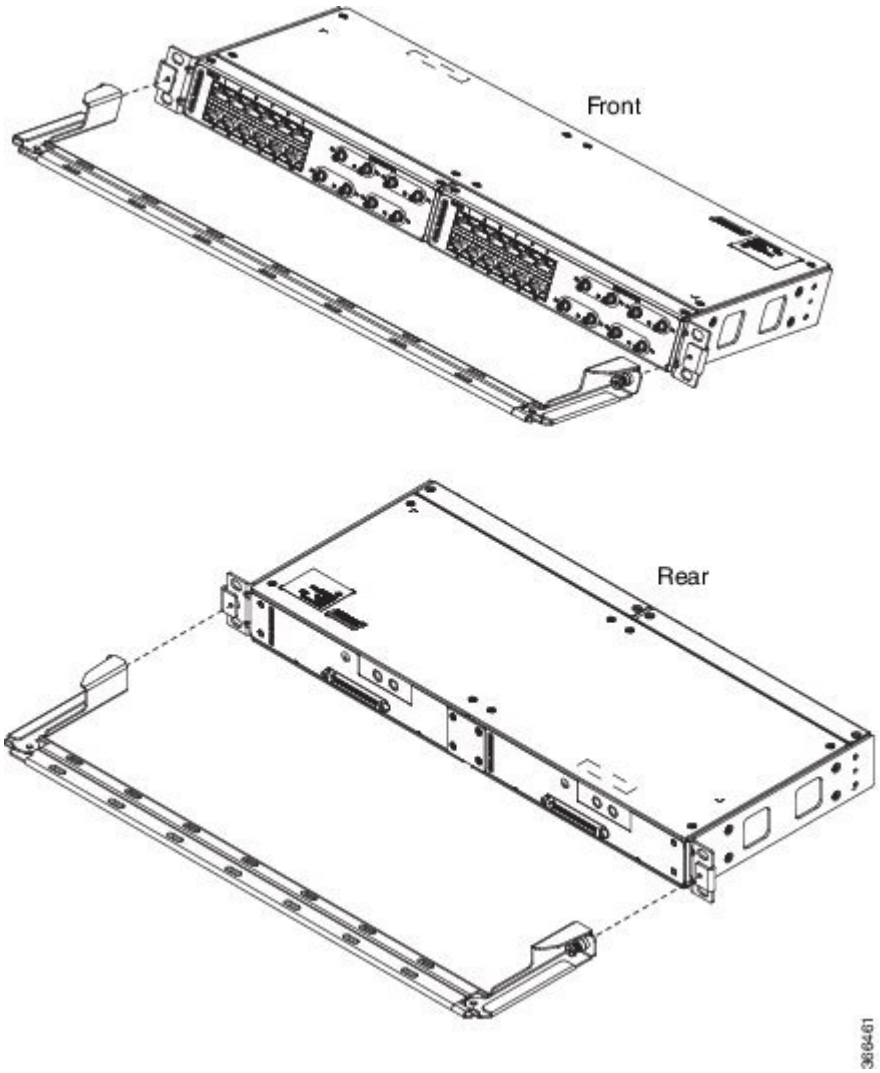


Figure 92: Installing 19-inch Brackets on to Rack - Dual

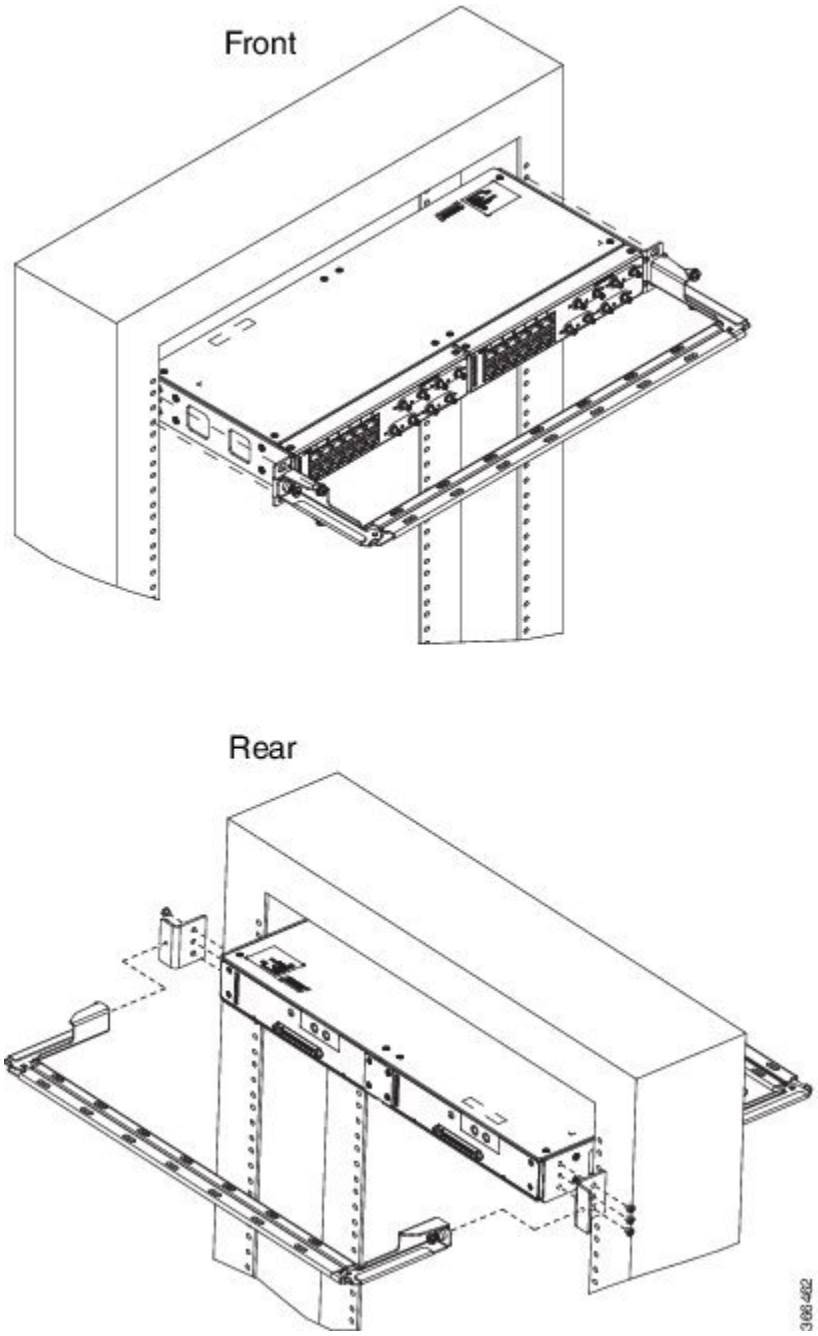


Figure 93: Attaching 21-inch Brackets to Patch Panel - Single

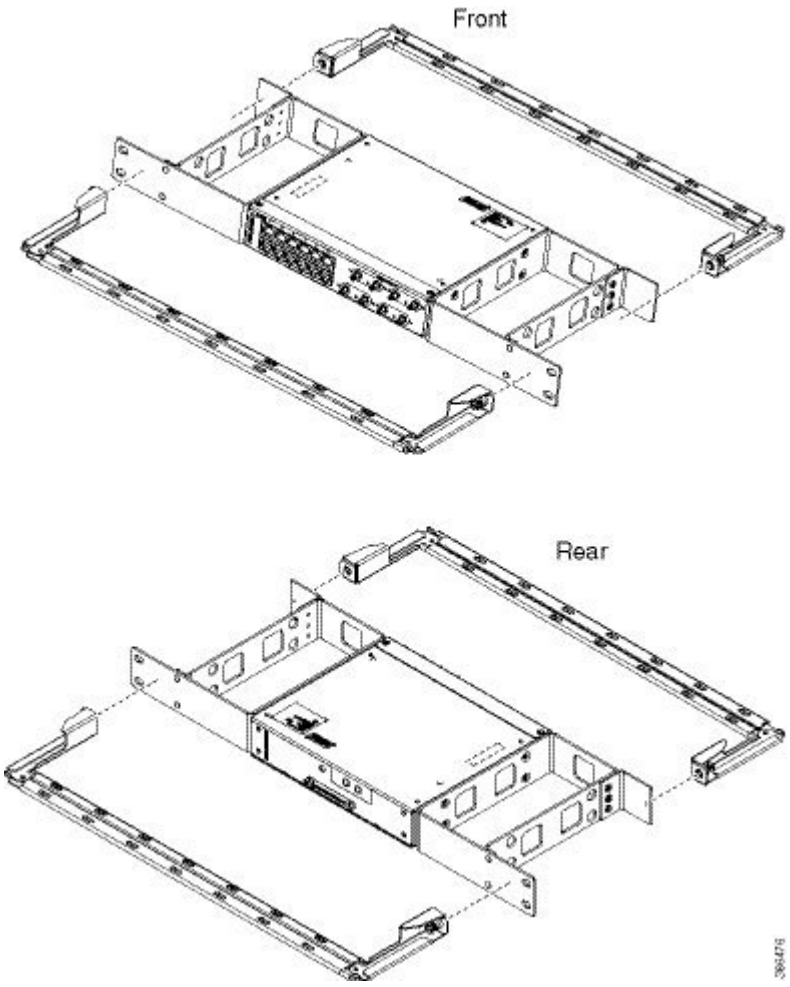


Figure 94: Installing 21-inch Brackets on to Rack - Single

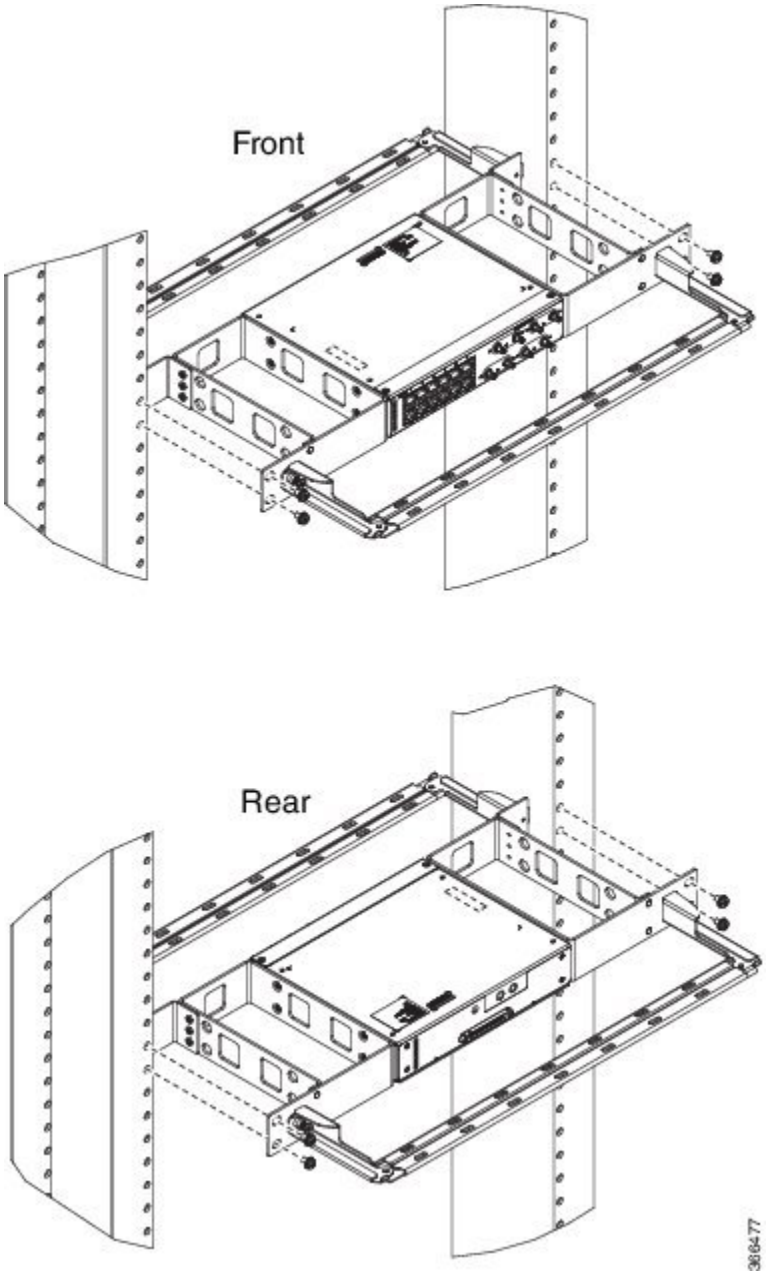


Figure 95: Attaching 21-inch Brackets to Patch Panel - Dual

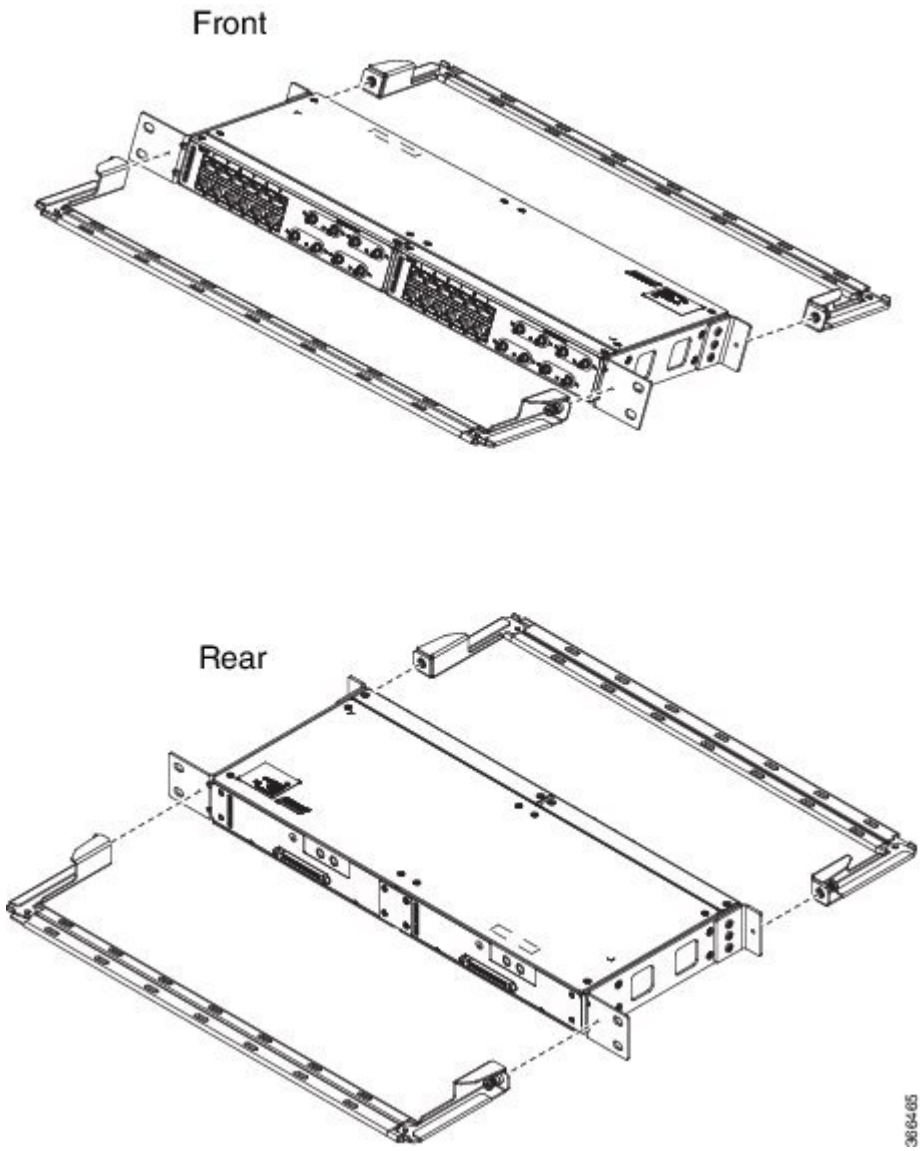


Figure 96: Installing 21-inch Brackets on to Rack - Dual

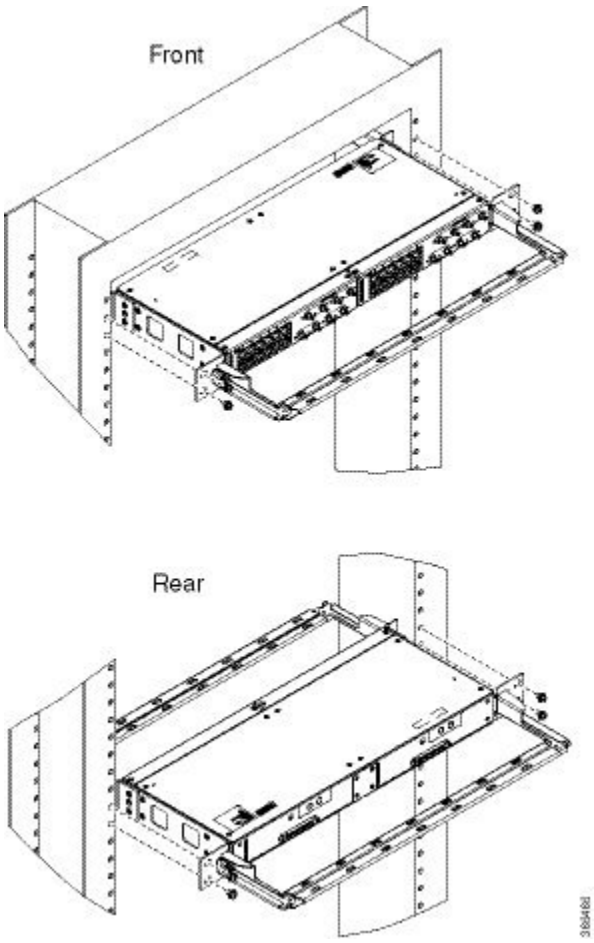


Figure 97: Attaching 23-inch Brackets to Patch Panel - Single

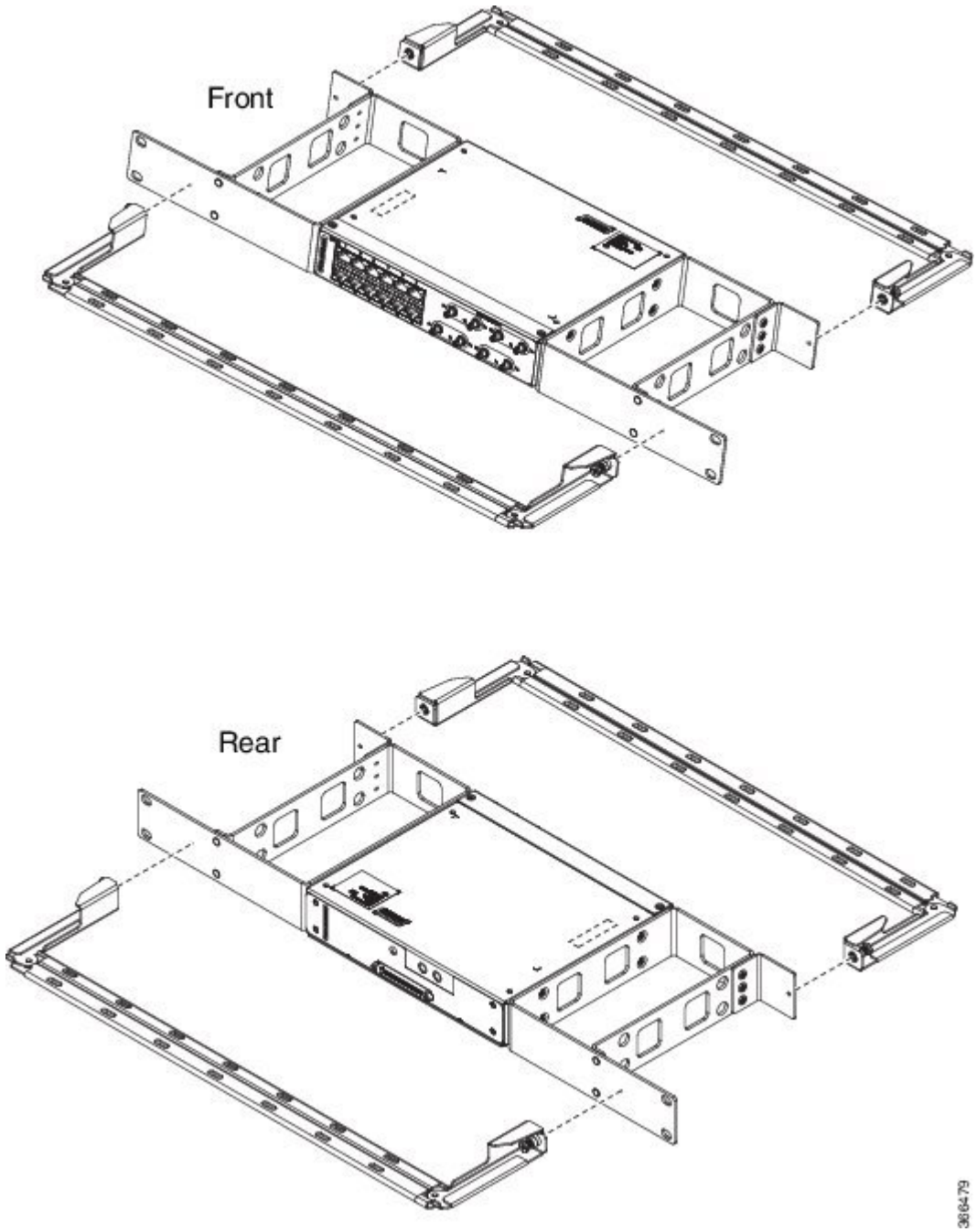


Figure 98: Installing 23-inch Brackets on to Rack - Single

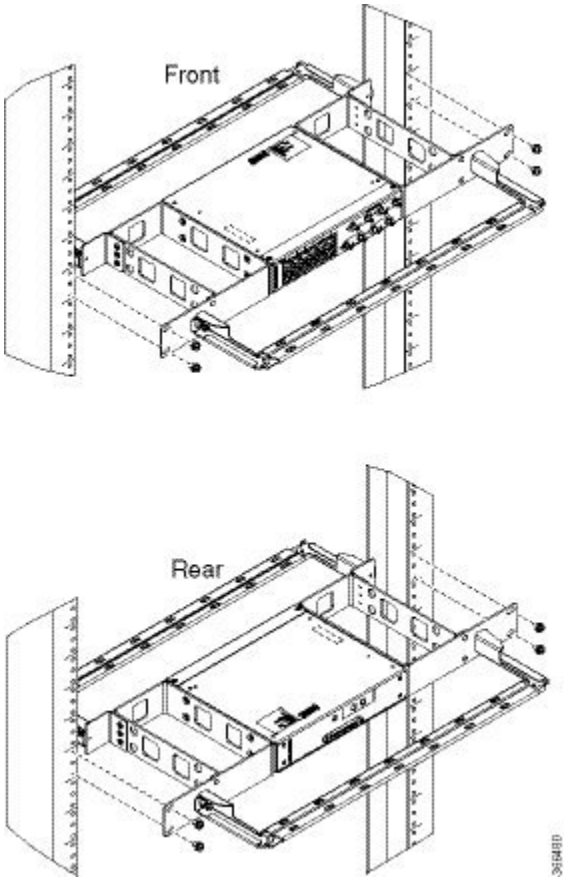


Figure 99: Attaching 23-inch Brackets to Patch Panel - Dual

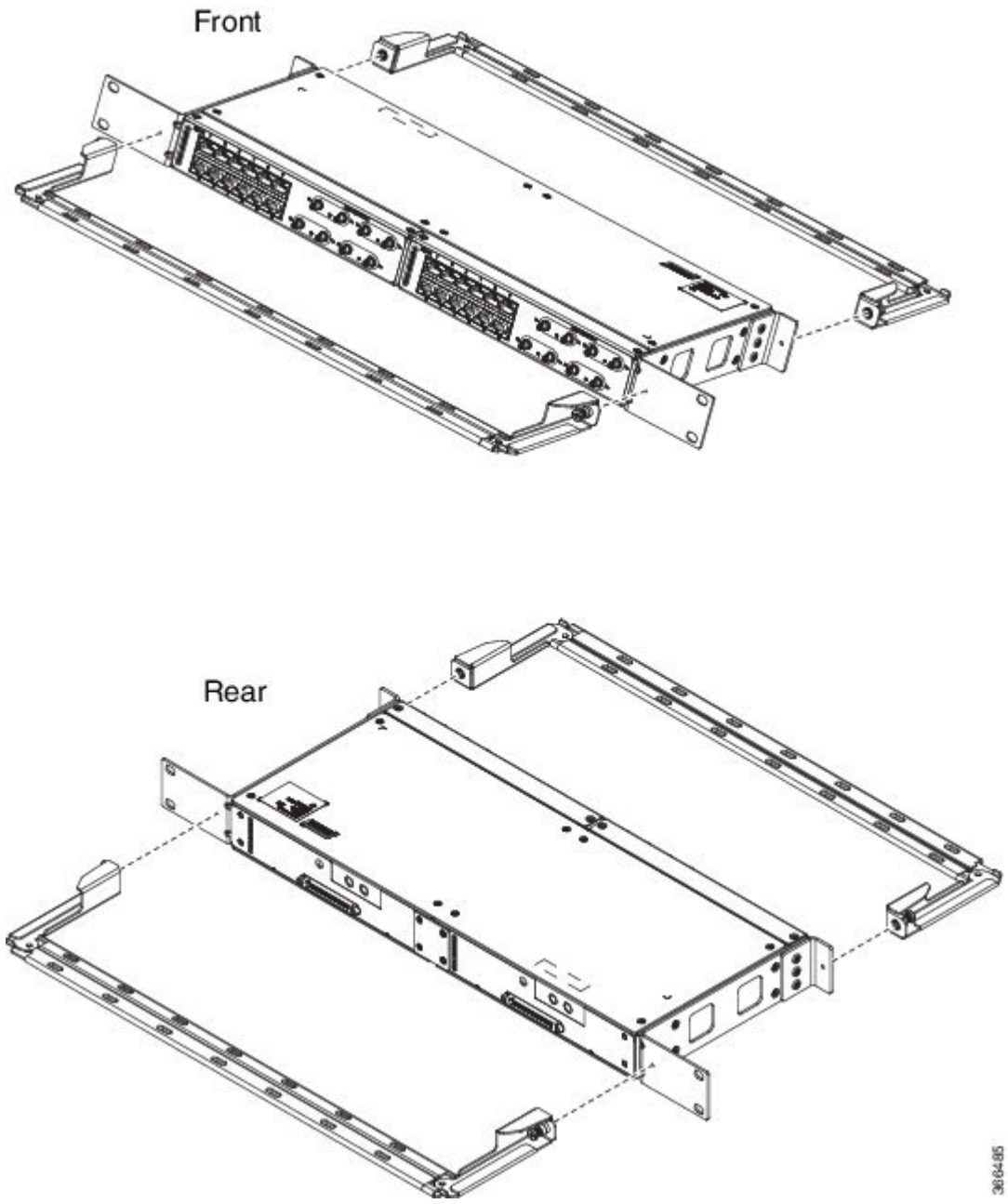
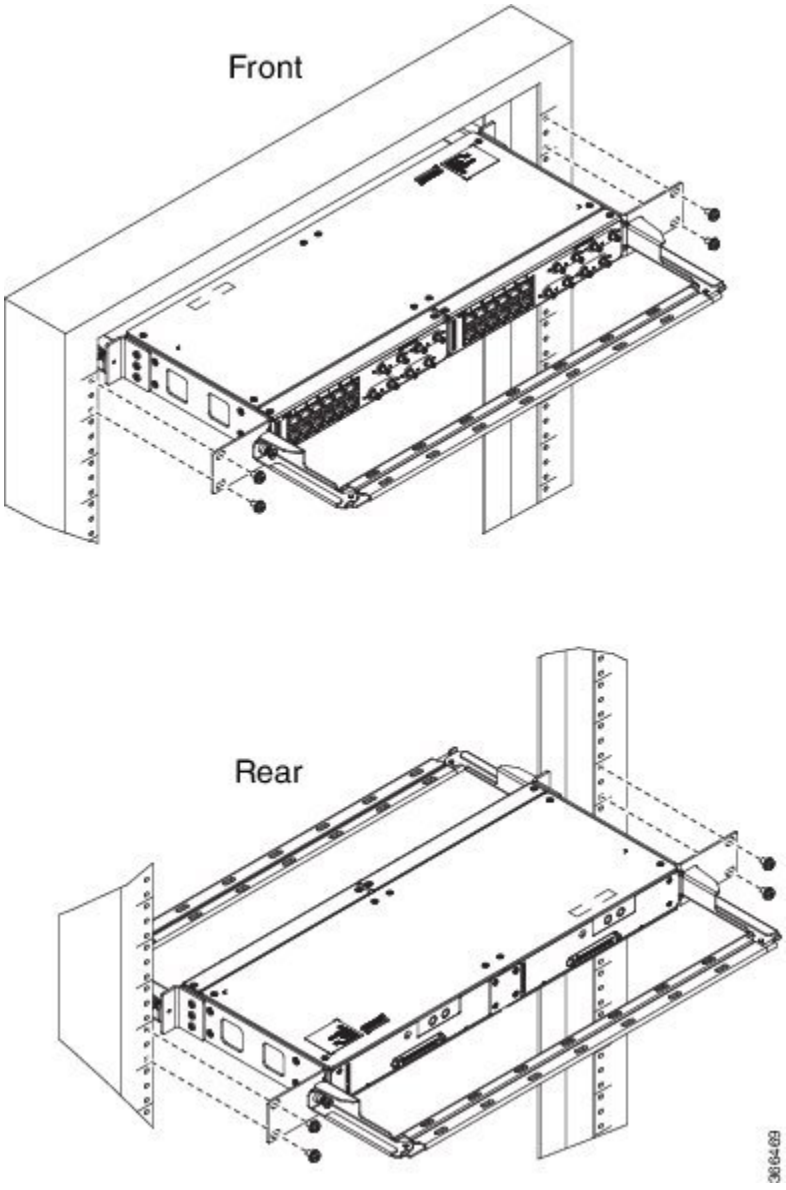


Figure 100: Installing 23-inch Brackets on to Rack - Dual



Wall Mount 3G Patch Panel

Before you begin

You must first install the mounting brackets and cable guides on to the patch panel before you mount it on the wall. You can use the same rack mount brackets (700-113653-01) for wall mount.

Procedure

Step 1 Remove the mounting brackets from the accessory kit and position them beside the device.

Note
You can install the brackets as shown in the figure.

Figure 101: Wall Mount - Single

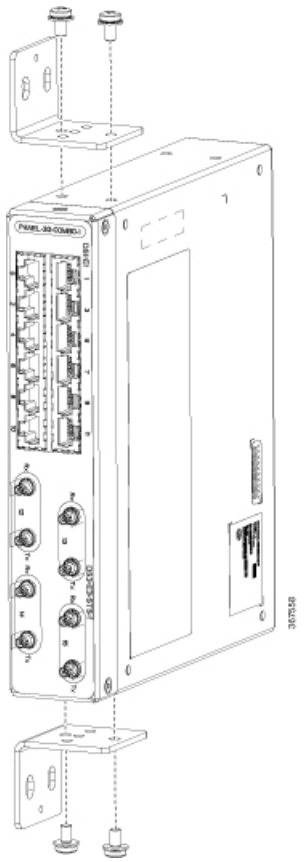
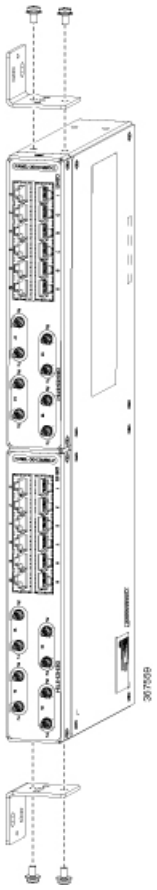


Figure 102: Wall Mount - Dual



Step 2 Secure the bracket to the device with the recommended maximum torque of 10 inch-pounds (1.1 newton meters).

Step 3 Position the device vertically on the wall.

Caution
Before mounting the device, ensure that all unused holes at the sides of the device are protected with screws.

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

Patch Panel Dimensions

Following are the various patch panel dimensions.

Figure 103: Patch Panel Without Brackets

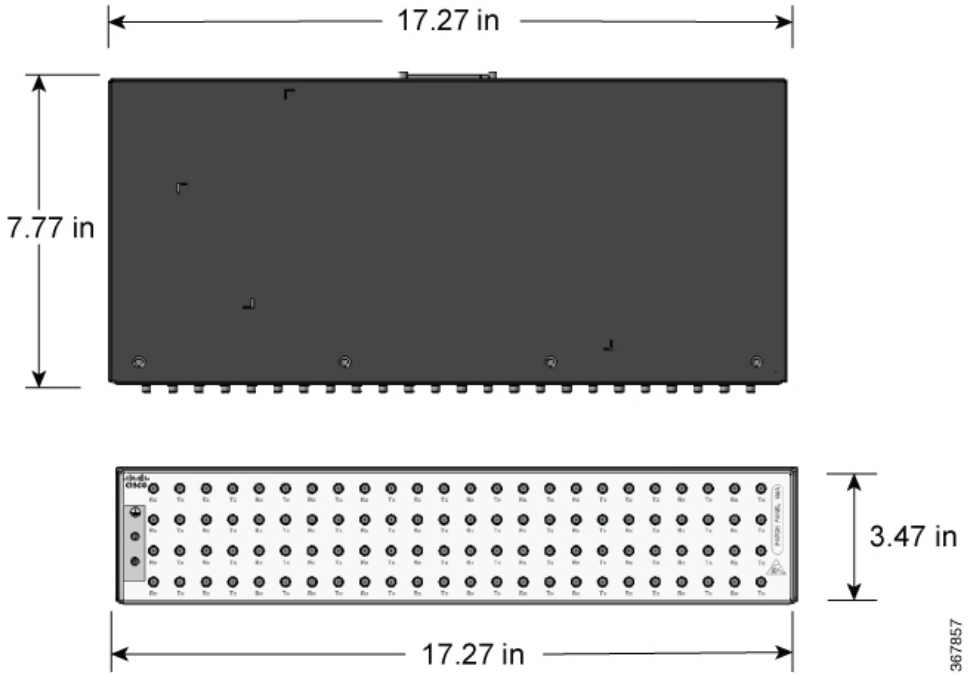


Figure 104: Patch Panel With Brackets

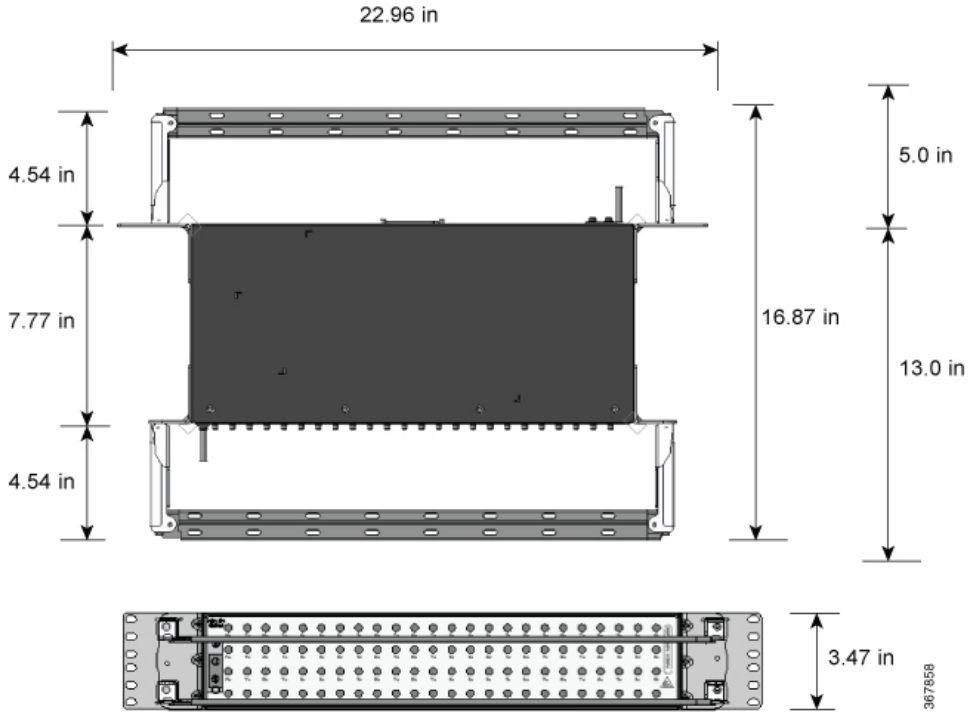


Figure 105: AMP64 Patch Panel With Brackets

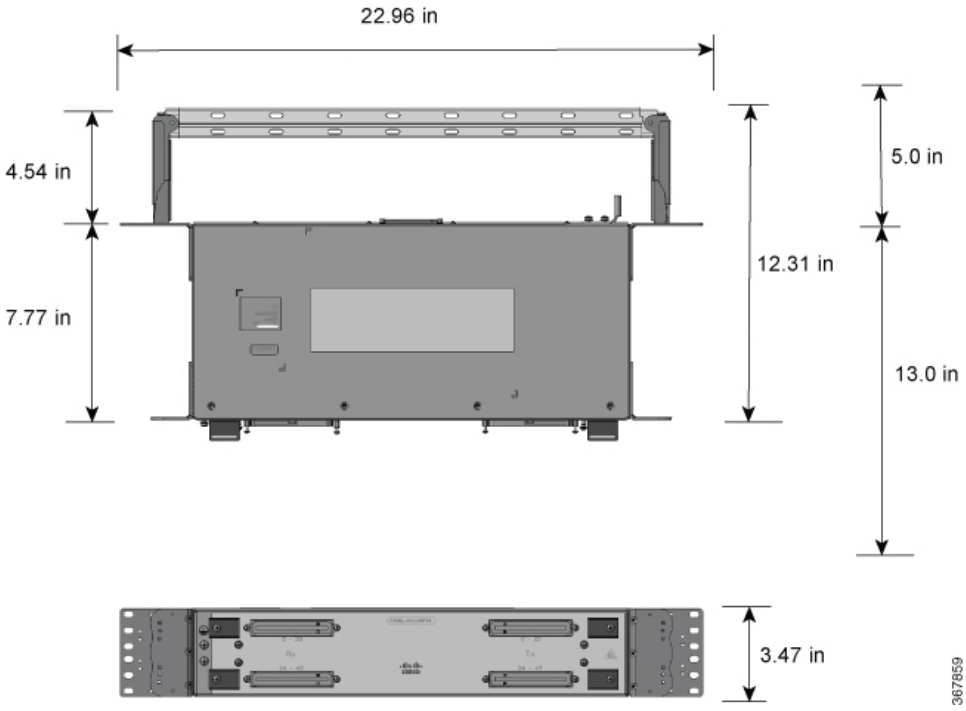


Figure 106: 3G Patch Panel Without Brackets - Single

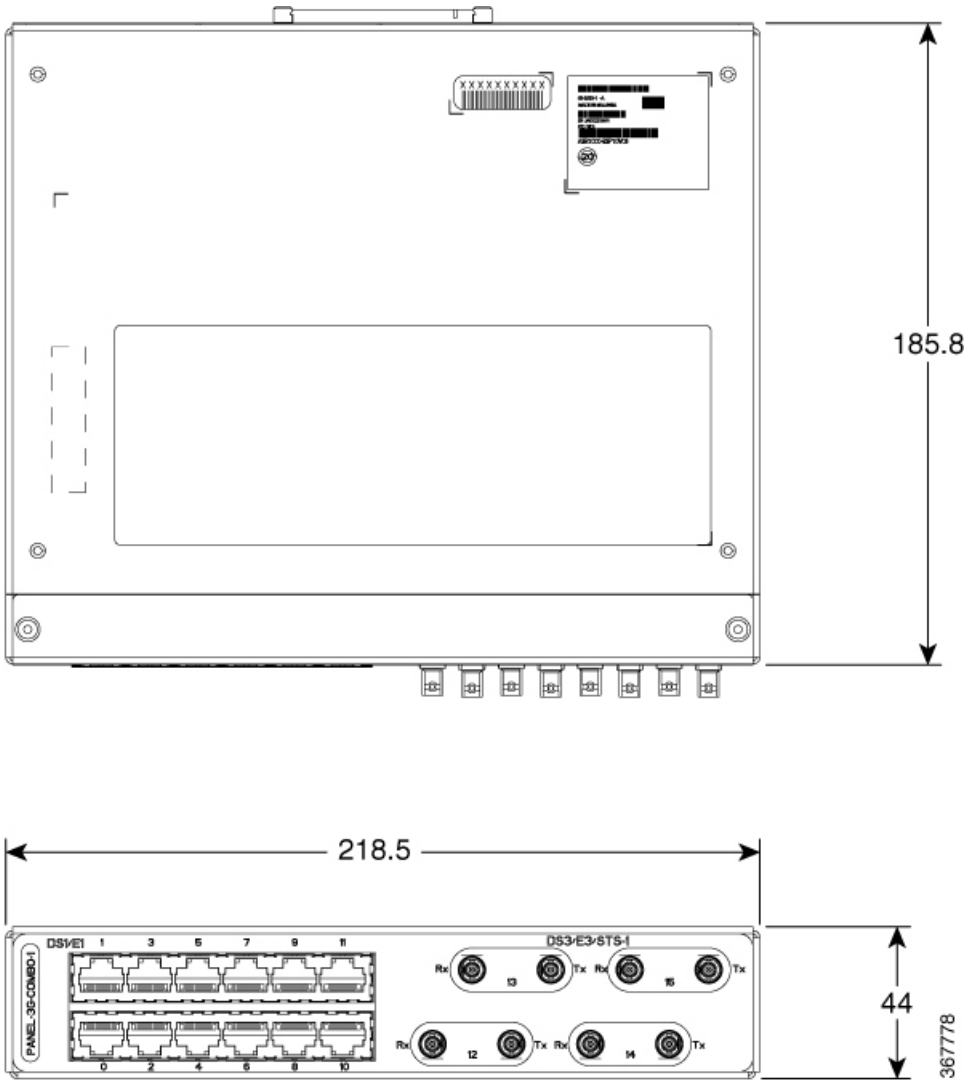
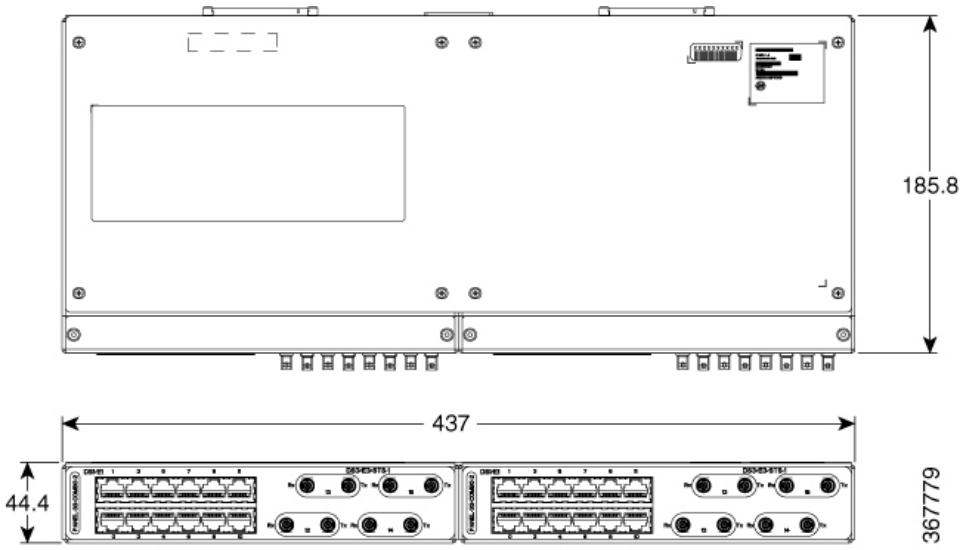


Figure 107: 3G Patch Panel Without Brackets - Dual



Patch Panel Pinout

Given below are the pinout information for the regular crossover and the straight-through cable patch panel.

Table 18: Pinout Details

Pin #	Crossover	Straight-through
1	Receive Tip	Transmit Tip
2	Receive Ring	Transmit Ring
3	—	—
4	Transmit Tip	Receive Tip
5	Transmit Ring	Receive Ring
6	—	—
7	—	—
8	—	—

Patch Panel Cabling for Redundancy

You can connect the patch panels with the interface modules for redundancy, using the Y-cables. The Y-cable stub lengths are reduced, so that the cable does not exceed from the rack spacer. The Y-cables are numbered based on the different stub length. Cable lengths differ for even numbered and odd numbered slots in the chassis.

Note Do not try to interchange the cables as the length may vary based on odd and even slots.

Table 19: Y-Cable for Redundancy

Bundle PID	Y-Cable Hood Marking	Description
CABLE-16TDM-R1EL1	T1/E1-Cable S-3	16-port cable for TDM CEM Interface Module, 42 inches cable length and 10 inches stub length, even slot
	T1/E1 Cable S-2	16-port cable for TDM CEM Interface Module, 42 inches cable length and 7.5 inches stub length, even slot
	T1/E1 Cable S-1	16-port cable for TDM CEM Interface Module, 42 inches cable length and 6.5 inches stub length, even slot
CABLE-16TDM-R1EL2	T1/E1-Cable M-3	16-port cable for TDM CEM Interface Module, 62 inches cable length and 10 inches stub length, even slot
	T1/E1-Cable M-2	16-port cable for TDM CEM Interface Module, 62 inches cable length and 7.5 inches stub length, even slot
	T1/E1-Cable M-1	16-port cable for TDM CEM Interface Module, 62 inches cable length and 6.5 inches stub length, even slot
CABLE-16TDM-R1EL3	T1/E1-Cable L-3	16-port cable for TDM CEM Interface Module, 78 inches cable length and 10 inches stub length, even slot
	T1/E1-Cable L-2	16-port cable for TDM CEM Interface Module, 78 inches cable length and 7.5 inches stub length, even slot
	T1/E1-Cable L-1	16-port cable for TDM CEM Interface Module, 78 inches cable length and 6.5 inches stub length, even slot

Bundle PID	Y-Cable Hood Marking	Description
CABLE-16TDM-R3EL1	T3/E3-Cable S-3	16-port cable for TDM CEM Interface Module, 42 inches cable length and 10 inches stub length, even slot
	T3/E3-Cable S-2	16-port cable for TDM CEM Interface Module, 42 inches cable length and 7.5 inches stub length, even slot
	T3/E3-Cable S-1	16-port cable for TDM CEM Interface Module, 42 inches cable length and 6.5 inches stub length, even slot
CABLE-16TDM-R3EL2	T3/E3-Cable M-3	16-port cable for TDM CEM Interface Module, 62 inches cable length and 10 inches stub length, even slot
	T3/E3-Cable M-2	16-port cable for TDM CEM Interface Module, 62 inches cable length and 7.5 inches stub length, even slot
	T3/E3-Cable M-1	16-port cable for TDM CEM Interface Module, 62 inches cable length and 6.5 inches stub length, even slot
CABLE-16TDM-R3EL3	T3/E3-Cable L-3	16-port cable for TDM CEM Interface Module, 78 inches cable length and 10 inches stub length, even slot
	T3/E3-Cable L-2	16-port cable for TDM CEM Interface Module, 78 inches cable length and 7.5 inches stub length, even slot
	T3/E3-Cable L-1	16-port cable for TDM CEM Interface Module, 78 inches cable length and 6.5 inches stub length, even slot
CABLE-16TDM-R1OL1	T1/E1-Cable S-3	3 x 16-port cables for TDM CEM Interface Module, 42 inches cable length and 10 inches stub length, odd slot
CABLE-16TDM-R1OL2	T1/E1-Cable M-3	3 x 16-port cables for TDM CEM Interface Module, 62 inches cable length and 10 inches stub length, odd slot
CABLE-16TDM-R1OL3	T1/E1-Cable L-3	3 x 16-port cables for TDM CEM Interface Module, 78 inches cable length and 10 inches stub length, odd slot
CABLE-16TDM-R3OL1	T3/E3-Cable S-3	3 x 16-port cables for TDM CEM Interface Module, 42 inches cable length and 10 inches stub length, odd slot

Bundle PID	Y-Cable Hood Marking	Description
CABLE-16TDM-R3OL2	T3/E3-Cable M-3	3 x 16-port cables for TDM CEM Interface Module, 62 inches cable length and 10 inches stub length, odd slot
CABLE-16TDM-R3OL3	T3/E3-Cable L-3	3 x 16-port cables for TDM CEM Interface Module, 78 inches cable length and 10 inches stub length, odd slot

Connecting the Fan Tray Alarm Port

The fan tray includes an alarm port that maps to 4 dry contact alarm inputs.

The pins on the alarm port are passive signals and can be configured as Normally Open (an alarm 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 any appropriate third-party relay controller. The open/close configuration is an option controlled in 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, 4, 6, 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. *External Alarm Input Pinout* table summarizes the pinouts on the alarm port in the Troubleshooting section.

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.

What to do next

For information about how to map alarm inputs to critical, major, and minor alarm conditions, see the Cisco NCS 4216 *Software Configuration Guide*.

Connector and Cable Specifications

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

Remove defective chassis from the rack

This procedure provides steps to remove defective chassis from the rack.

Procedure

Step 1 Power off the unit and ensure that the AC or DC power cord is disconnected and set aside as per general safety guidelines.

Warning
Ensure there is no live power running through these cables.

Note
Ensure that there is an electrostatic discharge (ESD) sheet or ESD mat where the removed electronic items can be placed.

Step 2 Remove the Ethernet and optic fiber cables and label them to allow easy re-installation.

Step 3 Disassemble all the optical modules and place them in order so that it allows easy re-installation. It is recommended to tag them according to their respective line cards or RSP.

Step 4 Once all the modules are removed and labelled or tagged, start to disassemble the line cards, RSP, fan trays and power supplies by unfastening their captive screws (fasteners used to secure the unit).

Step 5 If the grounding cable is long enough, disassemble it after disassembling the shelf from the rack. Ensure that the ground connection is removed only after the shelf is placed on an ESD-discharged surface.

Step 6 Disassemble the shelf from the rack by unfastening the screws and set them aside for use while installing the replacement unit.

Note
To re-install the shelf, refer Installing the Cisco NCS 4216.

What to do next

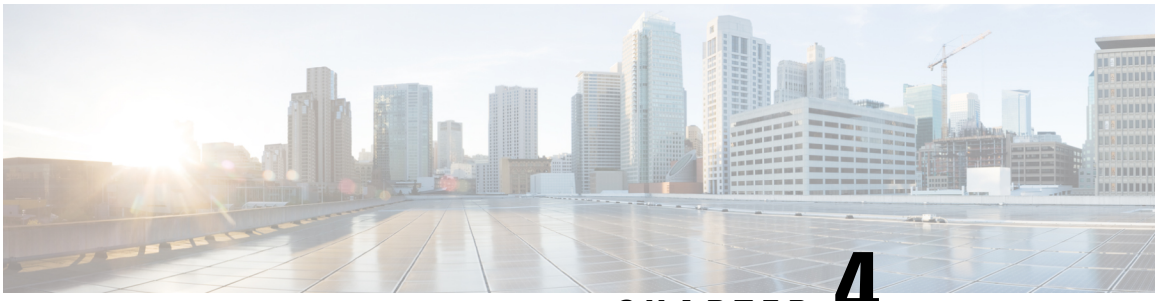
Ensure that you follow these steps after you disassemble the shelf from the rack:

- If the Cisco-provided packaging box is available, you can use the box to pack and return the unit to Cisco Systems, Inc.



Important It is critical to ensure that the unit reaches Cisco without any damages for better analysis of the returned unit.

- If the Cisco-provided packaging box is not available, then you can use an appropriate packaging box and ensure that packaging is intact and the unit is not damaged.



CHAPTER 4

Cisco NCS 4216 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 NCS 4216 from a console, you need to connect a terminal to the router console port.

- Checking Conditions Prior to System Startup , on page 159
- Powering Up the Cisco NCS 4216, on page 160
- Configuring the Cisco NCS 4216 at Startup, on page 161
- Safely Powering Off the Cisco NCS 4216, on page 165

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 NCS 4216

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

Note This equipment is designed to boot up in less than 30 minutes, depending on its neighboring devices be fully up and running.

After installing your Cisco NCS 4216 and connecting cables, start the router and follow these steps:

Procedure

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

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 NCS 4216 RSP begins to initialize.

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 the Troubleshooting section.

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 NCS 4216, Cisco maintains the Software Advisor 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 Advisor, click **Login** at Cisco.com, type **Software Advisor** in the search box, and click **G**o. Click the link for the Software Advisor Tool.

Choose a product family or enter a specific product number to search for the minimum supported software needed for your hardware.

Configuring the Cisco NCS 4216 at Startup

This section explains how to create a basic running configuration for your Cisco NCS 4216.

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 NCS 4216 from the console, you must connect a terminal or terminal server to the console port on the Cisco NCS 4216 RSP. To configure the Cisco NCS 4216 using the management Ethernet port, you must have the router's IP address available.

Using the Console Interface

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

Procedure

Step 1 Your system is booting and if you answer No, at the prompt:

Example:

The following example is for IOS XE software

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

Example:

The following example is for IOS XR software

```
!!!!!!!!!!!!!!!!!!! NO root-system username is configured. Need to configure root-system
username. !!!!!!!!!!!!!!!!!!!

--- Administrative User Dialog ---


Enter root-system username:
% Entry must not be null.

Enter root-system username: root
Enter secret:
Use the 'configure' command to modify this configuration.
User Access Verification

Username: root
Password:
```

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

Router>

Note
IOS XR software does not support the user EXEC mode. The system will directly enter privileged EXEC mode CLI.

Step 3 From 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. If an enable password has not been set on your system, this step may be skipped. The following example shows entry of the password called *enablepass* :

Password: enablepass

Step 5 When your enable password is accepted, the privileged EXEC mode prompt appears: Router#

Step 6 You now have access to the CLI in privileged EXEC mode and you can enter the necessary commands to complete your desired tasks. 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.

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

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

Example:

```
Restricted Rights Legend

Use, duplication, or disclosure by the Government is
subject to restrictions as set forth in subparagraph
(c) of the Commercial Computer Software - Restricted
Rights clause at FAR sec. 52.227-19 and subparagraph
(c) (1) (ii) of the Rights in Technical Data and Computer
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 asked if you would like 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 NCS 4216 *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
```



Note The show running-config command is not supported for IOS XR software.

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.

The ROMMON variable is set from factory to boot the IOS as ?"BOOT="bootflash:Image/packages.conf"?. However, the boot command is not pre-configured.

As the boot command is not configured, the router boots to ROMMON mode after the first power cycle, and the following message is displayed:

```
no valid BOOT image found
Final autoboot attempt from default boot device...
Located tracelogs.030
Image size 6181 inode num 13, bks cnt 2 blk size 8*512
Boot image size = 6181 (0x1825) bytes
Unknown image structure
boot: cannot determine first file name on device "bootflash:/"
rommon1>.
```

To avoid the router booting into ROMMON state, it's highly recommended that you set the boot command prior to the first reload.

```
Router(config)# boot system flash bootflash:/Image/asr900rsp3-universalk9.x.x.x.-ext.bin
```

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 NCS 4216

This section explains how to shut down the Cisco NCS 4216. 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 NCS 4216 can be powered off safely.

To remove power from the Cisco NCS 4216 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.
Sep 7 09:01:02.649 R1/0:%PMAN-5-EXITACTION: Process manager is exiting: process exit with
reload chassis code
```

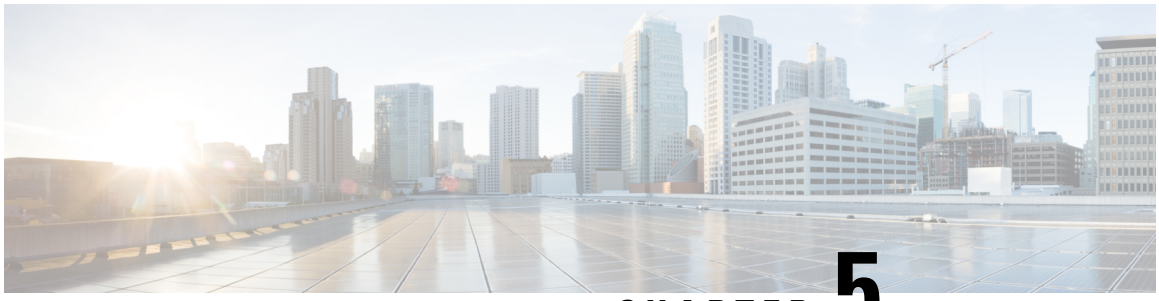
Step 4 After confirming the reload command, wait until the system bootstrap message displays before powering off the system.

Step 5 Remove any power cables from the Cisco NCS 4216.

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.

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



CHAPTER 5

Troubleshooting

The sections provide information for troubleshooting problems on the Cisco NCS 4216.

- Pinouts, on page 167
- LED Summary, on page 184

Pinouts

The sections describe the pinouts for the Cisco NCS 4216 interfaces.

BITS Port Pinout

The following table summarizes the BITS port pinout of the Front Panel "Building Integrated Timing Supply" RJ48 port.

Table 20: BITS Port Pinout

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

Wire Wrap Adapter Pinouts

The wire wrap adapter is used to support the wire wrap interface for the BITS port on the RSP3 module. This adapter is plugged into the existing RJ-45 connector on the RSP3 module.

Figure 108: Wire Wrap Adapter

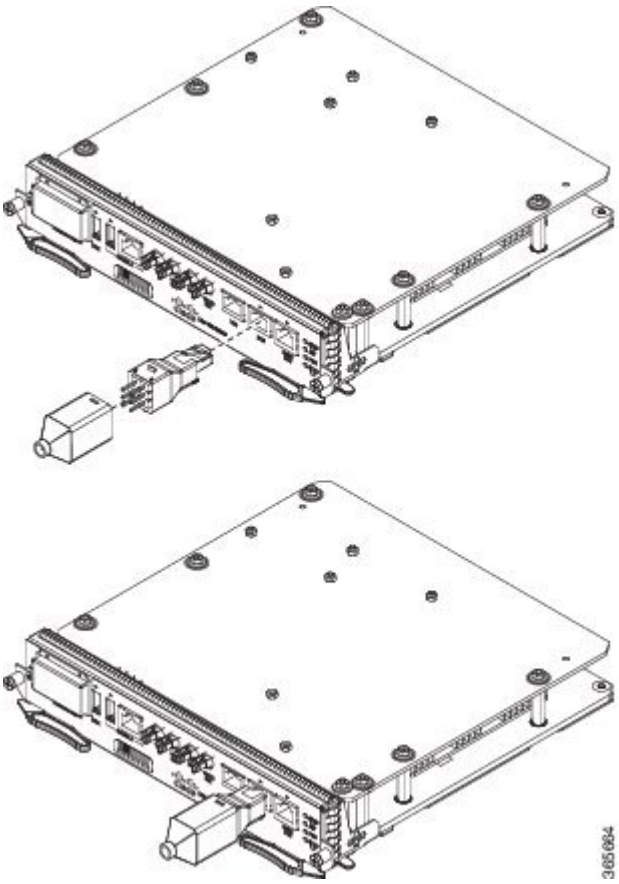


Table 21: Wire Wrap Adapter Pinouts

Wire Wrap Pin Numbers	Signals
1	RX_RING
2	RX_TIP
3	GND
4	GND
5	TX_RING
6	TX_TIP

GPS Port Pinout

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 22: GPS Port Pinout

	10 Mhz (input and output)	**1PPS (input and output)**
Waveform	Input—Sine wave Output—Square wave	Input—Pulse shape Output—Pulse shape
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

Alarm Port Pinout

The table below summarizes the external alarm input pinout.

Table 23: External Alarm Input Pinout

Pin	**Signal Name**	**Description**
1	ALARM0_IN	Alarm input 0
2	ALARM1_IN	Alarm input 1
3	—	No connect
4	ALARM2_IN	Alarm input 2
5	ALARM3_IN	Alarm input 3
6	—	No connect
7	—	No connect
8	COMMON	Alarm common

Console/Aux RJ45 RS232 Serial Port Pinout

The following table summarizes the console/aux RJ45 RS232 serial port pinout.

Table 24: Console/Aux RJ45 RS232 serial port

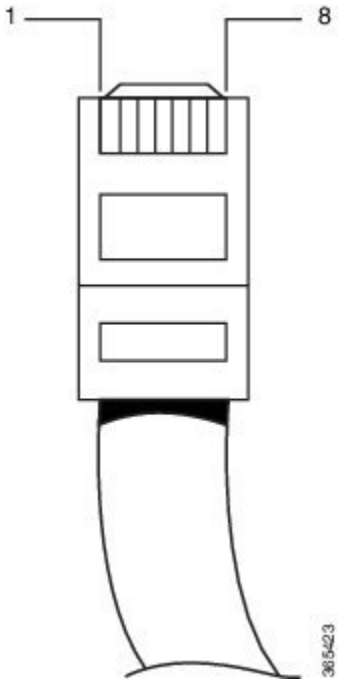
Pin	Signal Name	Direction	Description
1	RTS	Not Used	—
2	DTR	Not Used	—
3	TXD	Output	Transmit data
4	RI	Not Used	—
5	GND	—	—
6	RXD	Input	Receive data
7	DSR/DCD	Not Used	—
8	CTS	Not Used	—

T1/E1 Port Pinouts (RJ-48)

The figure below shows the RJ-48C connector wiring for the T1/E1 cable for the Cisco 2-port T1/E1-RAN interface card. The table shows the pinout configuration for the RJ-48C connectors on the Cisco 2-port T1/E1-RAN interface card for both the shielded and unshielded cables for either T1 or E1.

Note Cisco recommends using a shielded cable for your RJ-48C connectors.

Figure 109: RJ-48C Connector Wiring



Shielded		Unshielded	
Pin	Description	Pin	Description
1	Receive Ring	1	Receive Ring
2	Receive Tip	2	Receive Tip
3	Receive Shield	3	—
4	Transmit Ring	4	Transmit Ring
5	Transmit Tip	5	Transmit Tip
6	Transmit Shield	6	—
7	Not Used	7	—
8	Not Used	8	—

AMP64 Pinouts

Table 25: Port 0-23 RX

Pin Number	Signal Name	Pin	Signal
1	RX Ring Port 0	33	RX Tip Port 0

Pin Number	Signal Name	Pin	Signal
2	RX Ring Port 1	34	RX Tip Port 1
3	RX Ring Port 2	35	RX Tip Port 2
4	RX Ring Port 3	36	RX Tip Port 3
5	RX Ring Port 4	37	RX Tip Port 4
6	RX Ring Port 5	38	RX Tip Port 5
7	RX Ring Port 6	39	RX Tip Port 6
8	RX Ring Port 7	40	RX Tip Port 7
9	RX Ring Port 8	41	RX Tip Port 8
10	RX Ring Port 9	42	RX Tip Port 9
11	RX Ring Port 10	43	RX Tip Port 10
12	RX Ring Port 11	44	RX Tip Port 11
13	RX Ring Port 12	45	RX Tip Port 12
14	RX Ring Port 13	46	RX Tip Port 13
15	RX Ring Port 14	47	RX Tip Port 14
16	RX Ring Port 15	48	RX Tip Port 15
17	RX Ring Port 16	49	RX Tip Port 16
18	RX Ring Port 17	50	RX Tip Port 17
19	RX Ring Port 18	51	RX Tip Port 18
20	RX Ring Port 19	52	RX Tip Port 19
21	RX Ring Port 20	53	RX Tip Port 20
22	RX Ring Port 21	54	RX Tip Port 21
23	RX Ring Port 22	55	RX Tip Port 22
24	RX Ring Port 23	56	RX Tip Port 23
25	Open	57	Open
26	Open	58	Open
27	Open	59	Open
28	Open	60	Open
29	Open	61	Open

Pin Number	Signal Name	Pin	Signal
30	Open	62	Open
31	Open	63	Open
32	Open	64	Open

Table 26: Port 24-47 RX

Pin Number	Signal Name	Pin	Signal
1	RX Ring Port 24	33	RX Tip Port 24
2	RX Ring Port 25	34	RX Tip Port 25
3	RX Ring Port 26	35	RX Tip Port 26
4	RX Ring Port 27	36	RX Tip Port 27
5	RX Ring Port 28	37	RX Tip Port 28
6	RX Ring Port 29	38	RX Tip Port 29
7	RX Ring Port 30	39	RX Tip Port 30
8	RX Ring Port 31	40	RX Tip Port 31
9	RX Ring Port 32	41	RX Tip Port 32
10	RX Ring Port 33	42	RX Tip Port 33
11	RX Ring Port 34	43	RX Tip Port 34
12	RX Ring Port 35	44	RX Tip Port 35
13	RX Ring Port 36	45	RX Tip Port 36
14	RX Ring Port 37	46	RX Tip Port 37
15	RX Ring Port 38	47	RX Tip Port 38
16	RX Ring Port 39	48	RX Tip Port 39
17	RX Ring Port 40	49	RX Tip Port 40
18	RX Ring Port 41	50	RX Tip Port 41
19	RX Ring Port 42	51	RX Tip Port 42
20	RX Ring Port 43	52	RX Tip Port 43
21	RX Ring Port 44	53	RX Tip Port 44
22	RX Ring Port 45	54	RX Tip Port 45

Pin Number	Signal Name	Pin	Signal
23	RX Ring Port 46	55	RX Tip Port 46
24	RX Ring Port 47	56	RX Tip Port 47
25	Open	57	Open
26	Open	58	Open
27	Open	59	Open
28	Open	60	Open
29	Open	61	Open
30	Open	62	Open
31	Open	63	Open
32	Open	64	Open

Table 27: Port 0-23 TX

Pin Number	Signal Name	Pin	Signal
1	TX Ring Port 0	33	TX Tip Port 0
2	TX Ring Port 1	34	TX Tip Port 1
3	TX Ring Port 2	35	TX Tip Port 2
4	TX Ring Port 3	36	TX Tip Port 3
5	TX Ring Port 4	37	TX Tip Port 4
6	TX Ring Port 5	38	TX Tip Port 5
7	TX Ring Port 6	39	TX Tip Port 6
8	TX Ring Port 7	40	TX Tip Port 7
9	TX Ring Port 8	41	TX Tip Port 8
10	TX Ring Port 9	42	TX Tip Port 9
11	TX Ring Port 10	43	TX Tip Port 10
12	TX Ring Port 11	44	TX Tip Port 11
13	TX Ring Port 12	45	TX Tip Port 12
14	TX Ring Port 13	46	TX Tip Port 13
15	TX Ring Port 14	47	TX Tip Port 14

Pin Number	Signal Name	Pin	Signal
16	TX Ring Port 15	48	TX Tip Port 15
17	TX Ring Port 16	49	TX Tip Port 16
18	TX Ring Port 17	50	TX Tip Port 17
19	TX Ring Port 18	51	TX Tip Port 18
20	TX Ring Port 19	52	TX Tip Port 19
21	TX Ring Port 20	53	TX Tip Port 20
22	TX Ring Port 21	54	TX Tip Port 21
23	TX Ring Port 22	55	TX Tip Port 22
24	TX Ring Port 23	56	TX Tip Port 23
25	Open	57	Open
26	Open	58	Open
27	Open	59	Open
28	Open	60	Open
29	Open	61	Open
30	Open	62	Open
31	Open	63	Open
32	Open	64	Open

Table 28: Port 24-47 TX

Pin Number	Signal Name	Pin	Signal
1	TX Ring Port 24	33	TX Tip Port 24
2	TX Ring Port 25	34	TX Tip Port 25
3	TX Ring Port 26	35	TX Tip Port 26
4	TX Ring Port 27	36	TX Tip Port 27
5	TX Ring Port 28	37	TX Tip Port 28
6	TX Ring Port 29	38	TX Tip Port 29
7	TX Ring Port 30	39	TX Tip Port 30
8	TX Ring Port 31	40	TX Tip Port 31

Pin Number	Signal Name	Pin	Signal
9	TX Ring Port 32	41	TX Tip Port 32
10	TX Ring Port 33	42	TX Tip Port 33
11	TX Ring Port 34	43	TX Tip Port 34
12	TX Ring Port 35	44	TX Tip Port 35
13	TX Ring Port 36	45	TX Tip Port 36
14	TX Ring Port 37	46	TX Tip Port 37
15	TX Ring Port 38	47	TX Tip Port 38
16	TX Ring Port 39	48	TX Tip Port 39
17	TX Ring Port 40	49	TX Tip Port 40
18	TX Ring Port 41	50	TX Tip Port 41
19	TX Ring Port 42	51	TX Tip Port 42
20	TX Ring Port 43	52	TX Tip Port 43
21	TX Ring Port 44	53	TX Tip Port 44
22	TX Ring Port 45	54	TX Tip Port 45
23	TX Ring Port 46	55	TX Tip Port 46
24	TX Ring Port 47	56	TX Tip Port 47
25	Open	57	Open
26	Open	58	Open
27	Open	59	Open
28	Open	60	Open
29	Open	61	Open
30	Open	62	Open
31	Open	63	Open
32	Open	64	Open

Patch Panel Pinout

The table below summarizes the patch panel pinouts of the connectors from the 48 port T1/E1 DIN, RJ48, AMP64, and 48 port T3/E3 DIN, HDBNC connectors that connects to the interface module (IM).

Table 29: Patch Panel Pinout

Pin	Signal Name Connector (0-15)	Signal Name Connector (16-31)	Signal Name Connector (32-47)
1	TX_PORT15_RING	TX_PORT31_RING	TX_PORT47_RING
2	TX_PORT15_TIP	TX_PORT31_TIP	TX_PORT47_TIP
3	TX_PORT14_RING	TX_PORT30_RING	TX_PORT46_RING
4	TX_PORT14_TIP	TX_PORT30_TIP	TX_PORT46_TIP
5	TX_PORT13_RING	TX_PORT29_RING	TX_PORT45_RING
6	TX_PORT13_TIP	TX_PORT29_TIP	TX_PORT45_TIP
7	TX_PORT12_RING	TX_PORT28_RING	TX_PORT44_RING
8	TX_PORT12_TIP	TX_PORT28_TIP	TX_PORT44_TIP
9	TX_PORT11_RING	TX_PORT27_RING	TX_PORT43_RING
10	TX_PORT11_TIP	TX_PORT27_TIP	TX_PORT43_TIP
11	TX_PORT10_RING	TX_PORT26_RING	TX_PORT42_RING
12	TX_PORT10_TIP	TX_PORT26_TIP	TX_PORT42_TIP
13	TX_PORT9_RING	TX_PORT25_RING	TX_PORT41_RING
14	TX_PORT9_TIP	TX_PORT25_TIP	TX_PORT41_TIP
15	TX_PORT8_RING	TX_PORT24_RING	TX_PORT40_RING
16	TX_PORT8_TIP	TX_PORT24_TIP	TX_PORT40_TIP
17	—	—	—
18	—	—	—
19	TX_PORT7_RING	TX_PORT23_RING	TX_PORT39_RING
20	TX_PORT7_TIP	TX_PORT23_TIP	TX_PORT39_TIP
21	TX_PORT6_RING	TX_PORT22_RING	TX_PORT38_RING
22	TX_PORT6_TIP	TX_PORT22_TIP	TX_PORT38_TIP
23	TX_PORT5_RING	TX_PORT21_RING	TX_PORT37_RING
24	TX_PORT5_TIP	TX_PORT21_TIP	TX_PORT37_TIP
25	TX_PORT4_RING	TX_PORT20_RING	TX_PORT36_RING
26	TX_PORT4_TIP	TX_PORT20_TIP	TX_PORT36_TIP

Pin	Signal Name Connector (0-15)	Signal Name Connector (16-31)	Signal Name Connector (32-47)
27	TX_PORT3_RING	TX_PORT19_RING	TX_PORT35_RING
28	TX_PORT3_TIP	TX_PORT19_TIP	TX_PORT35_TIP
29	TX_PORT2_RING	TX_PORT18_RING	TX_PORT34_RING
30	TX_PORT2_TIP	TX_PORT18_TIP	TX_PORT34_TIP
31	TX_PORT1_RING	TX_PORT17_RING	TX_PORT33_RING
32	TX_PORT1_TIP	TX_PORT17_TIP	TX_PORT33_TIP
33	TX_PORT0_RING	TX_PORT16_RING	TX_PORT32_RING
34	TX_PORT0_TIP	TX_PORT16_TIP	TX_PORT32_TIP
35	RX_PORT15_RING	RX_PORT31_RING	RX_PORT47_RING
36	RX_PORT15_TIP	RX_PORT31_TIP	RX_PORT47_TIP
37	RX_PORT14_RING	RX_PORT30_RING	RX_PORT46_RING
38	RX_PORT14_TIP	RX_PORT30_TIP	RX_PORT46_TIP
39	RX_PORT13_RING	RX_PORT29_RING	RX_PORT45_RING
40	RX_PORT13_TIP	RX_PORT29_TIP	RX_PORT45_TIP
41	RX_PORT12_RING	RX_PORT28_RING	RX_PORT44_RING
42	RX_PORT12_TIP	RX_PORT28_TIP	RX_PORT44_TIP
43	RX_PORT11_RING	RX_PORT27_RING	RX_PORT43_RING
44	RX_PORT11_TIP	RX_PORT27_TIP	RX_PORT43_TIP
45	RX_PORT10_RING	RX_PORT26_RING	RX_PORT42_RING
46	RX_PORT10_TIP	RX_PORT26_TIP	RX_PORT42_TIP
47	RX_PORT9_RING	RX_PORT25_RING	RX_PORT41_RING
48	RX_PORT9_TIP	RX_PORT25_TIP	RX_PORT41_TIP
49	RX_PORT41_TIP	RX_PORT24_RING	RX_PORT40_RING
50	RX_PORT8_TIP	RX_PORT24_TIP	RX_PORT40_TIP
51	—	—	—
52	—	—	—
53	RX_PORT7_RING	RX_PORT23_RING	RX_PORT39_RING

Pin	Signal Name Connector (0-15)	Signal Name Connector (16-31)	Signal Name Connector (32-47)
54	RX_PORT7_TIP	RX_PORT23_TIP	RX_PORT39_TIP
55	RX_PORT6_RING	RX_PORT22_RING	RX_PORT38_RING
56	RX_PORT6_TIP	RX_PORT22_TIP	RX_PORT38_TIP
57	RX_PORT5_RING	RX_PORT21_RING	RX_PORT37_RING
58	RX_PORT5_TIP	RX_PORT21_TIP	RX_PORT37_TIP
59	RX_PORT4_RING	RX_PORT20_RING	RX_PORT36_RING
60	RX_PORT4_TIP	RX_PORT20_TIP	RX_PORT36_TIP
61	RX_PORT3_RING	RX_PORT19_RING	RX_PORT35_RING
62	RX_PORT3_TIP	RX_PORT19_TIP	RX_PORT35_TIP
63	RX_PORT2_RING	RX_PORT18_RING	RX_PORT34_RING
64	RX_PORT2_TIP	RX_PORT18_TIP	RX_PORT34_TIP
65	RX_PORT1_RING	RX_PORT17_RING	RX_PORT33_RING
66	RX_PORT1_TIP	RX_PORT17_TIP	RX_PORT33_TIP
67	RX_PORT0_RING	RX_PORT16_RING	RX_PORT32_RING
68	RX_PORT0_TIP	RX_PORT16_TIP	RX_PORT32_TIP

The table below summarizes the 3G patch panel pinouts of the connectors that connects to the interface module (IM).

Table 30: 3G Patch Panel Pinout

Pin	Signal Name Connector (0-15)	Signal
1	TX_PORT15_RING	DS3
2	TX_PORT15_TIP	DS3
3	TX_PORT14_RING	DS3
4	TX_PORT14_TIP	DS3
5	TX_PORT13_RING	DS3
6	TX_PORT13_TIP	DS3
7	TX_PORT12_RING	DS3

Pin	Signal Name Connector (0-15)	Signal
8	TX_PORT12_TIP	DS3
9	TX_PORT11_RING	DS1
10	TX_PORT11_TIP	DS1
11	TX_PORT10_RING	DS1
12	TX_PORT10_TIP	DS1
13	TX_PORT9_RING	DS1
14	TX_PORT9_TIP	DS1
15	TX_PORT8_RING	DS1
16	TX_PORT8_TIP	DS1
17	—	—
18	—	—
19	TX_PORT7_RING	DS1
20	TX_PORT7_TIP	DS1
21	TX_PORT6_RING	DS1
22	TX_PORT6_TIP	DS1
23	TX_PORT5_RING	DS1
24	TX_PORT5_TIP	DS1
25	TX_PORT4_RING	DS1
26	TX_PORT4_TIP	DS1
27	TX_PORT3_RING	DS1
28	TX_PORT3_TIP	DS1
29	TX_PORT2_RING	DS1
30	TX_PORT2_TIP	DS1
31	TX_PORT1_RING	DS1
32	TX_PORT1_TIP	DS1
33	TX_PORT0_RING	DS1
34	TX_PORT0_TIP	DS1

Pin	Signal Name Connector (0-15)	Signal
35	RX_PORT15_RING	DS3
36	RX_PORT15_TIP	DS3
37	RX_PORT14_RING	DS3
38	RX_PORT14_TIP	DS3
39	RX_PORT13_RING	DS3
40	RX_PORT13_TIP	DS3
41	RX_PORT12_RING	DS3
42	RX_PORT12_TIP	DS3
43	RX_PORT11_RING	DS1
44	RX_PORT11_TIP	DS1
45	RX_PORT10_RING	DS1
46	RX_PORT10_TIP	DS1
47	RX_PORT9_RING	DS1
48	RX_PORT9_TIP	DS1
49	RX_PORT8_RING	DS1
50	RX_PORT8_TIP	DS1
51	—	—
52	—	—
53	RX_PORT7_RING	DS1
54	RX_PORT7_TIP	DS1
55	RX_PORT6_RING	DS1
56	RX_PORT6_TIP	DS1
57	RX_PORT5_RING	DS1
58	RX_PORT5_TIP	DS1
59	RX_PORT4_RING	DS1
60	RX_PORT4_TIP	DS1
61	RX_PORT3_RING	DS1

Pin	Signal Name Connector (0-15)	Signal
62	RX_PORT3_TIP	DS1
63	RX_PORT2_RING	DS1
64	RX_PORT2_TIP	DS1
65	RX_PORT1_RING	DS1
66	RX_PORT1_TIP	DS1
67	RX_PORT0_RING	DS1
68	RX_PORT0_TIP	DS1

Management Ethernet Port Pinout

A single management copper ENET port supporting 10/100/1000Base-T operation exists on each RSP. There is no direct access to the CPU of the other RSP. It uses a standard RJ45 jack.



Note This is not a data plane port.

The table below summarizes the Management Ethernet port pinout.

Table 31: Management Ethernet Port Pinout

Pin	Signal Name
1	TRP0+
2	TRP0-
3	TRP1+
4	TRP1-
5	TRP2+
6	TRP2-
7	TRP3+
8	TRP3-

USB Console Port Pinout

Two individual Type-A USB connector are used for USB console and USB mass storage. One single USB 2.0 Type-A receptacle is provided on the RSP front panel for providing console access to ROMMON, IOS-XE and diagnostics. It operates as a USB peripheral only for connection to an external host PC. This 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. While 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, etc. It supports operation up to 12Mbps.

The table below summarizes the USB console port pinout.

Table 32: Single USB Console Port

Pin	Signal Name	Direction	Description
A1	Vcc	—	+5VDC (500mA)
A2	D-	—	Data -
A3	D+	—	Data +
A4	Gnd	—	Ground

Note The USB Console port +5VDC is input and operates as an USB peripheral device.

USB Flash/MEM Port Pinout

The table below summarizes the USB flash/MEM port pinout.

Table 33: Single USB Flash/MEM Port

Pin	Signal Name	Direction	Description
A1	Vcc	—	+5VDC (500mA)
A2	D-	—	Data -
A3	D+	—	Data +

Pin	Signal Name	Direction	Description
A4	Gnd	—	Ground



Note USB TYPE-A receptacle used.



Note The USB flash/MEM port +5VDC is output. We provide power for USB flash/MEM, and it operates as a USB host device.

Fiber-Optic Specifications

The specification for optical fiber transmission defines two types of fiber:

- single-mode
- 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 sections describe the meanings of the LEDs on the Cisco NCS 4216.

RSP LEDs

The *RSP LEDs* table below summarizes the RSP 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 NCS 4216 software adjusts the fan speed to prevent excessive heat within the chassis.

NCS4216-RSP LED

Table 34: 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

NCS4216-RSP-800 LED

Table 35: 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
BITS	Off	Out of service/not configured
	Amber	Fault or loop condition
	Green	In frame/working properly

Table 36: RSP4 LED Details

PWR	STATS	Active/Standby	SYNC LED	PWR DWN LED	Indication
Light Green	—	—	—	—	Power OK
OFF	Flashing Red	—	—	—	Secure Jtag error

PWR	STATS	Active/Standby	SYNC LED	PWR DWN LED	Indication
OFF	Amber	—	—	—	BIOS Image validation failure
—	OFF	Yellow	—	—	Micro-controller Sub-system not ready
—	OFF	Amber	—	—	TAM init failure
OFF	OFF	Blinking Yellow	—	—	TAM not ready
OFF	Red	—	—	—	FPGA PLL failure
OFF	OFF	OFF	—	Flashing Yellow	Thermal Shutdown
OFF	OFF	OFF	—	Yellow	Software triggered shutdown
OFF	OFF	OFF	—	Green	Peer RSP shutdown

NCS4216-RSP LED Fault Condition

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 37: NCS4216-RSP 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.

PWR LED State	STAT LED State	Indication	Comment
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

This LED summary applies to the following interface modules:

- 8x1 Gigabit Ethernet SFP + 1x10 Gigabit Ethernet SFP+ Interface Module
- 1-port OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO)
- 2-port 40 Gigabit Ethernet Interface Module (2X40GE)
- 1-port 100 Gigabit Ethernet (QSFP) Interface Module (2X100GE)
- 1-port 100 Gigabit Ethernet Interface Module (1X100GE)
- 8-port 10 Gigabit Ethernet Interface Module (8X10GE)
- 48-port T1/E1 TDM Interface Module (48XT1/E1)
- 48-port T3/E3 TDM Interface Module (48XT3/E3)
- 8/16-port 1 Gigabit Ethernet (SFP/SFP) + 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module

The Status LED is Amber for the 10 Gigabit Ethernet ports when operating in WAN mode for the following IMS:

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

Table 38: 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)
	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-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO) Interface Module LEDs

The table below summarizes the LEDs for the OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO) interface module.

Table 39: OC-192 Interface Module with 8-port Low Rate CEM Interface Module (10G HO / 10G LO) Interface Module LEDs

LED	Color or State	Description
Power (PWR)	Green	All power rails are within specification
	Red	Disabled
	Off	No power to IM
Status (STAT)	Green	Operational
	Red	Failure
	Off	Disabled
SFP Link (left LED)	Green	Link is up
	Yellow	Fault/Error/Alarm
	Off	Disabled

LED	Color or State	Description
SFP speed mode (right LED)	Yellow	SONET/SDH
	Off	Disabled
10G SFP+ Link (left LED)	Green	Link is up
	Yellow	Fault/Error/Alarm
	Off	Disabled
10G SFP+ Speed mode (right LED)	Yellow	SONET/SDH
	Off	Disabled

48 T1/E1 and 48 T3/E3 Interface Module LEDs

The table below summarizes the LEDs for the 48 T1/E1 and 48 T3/E3 interface module.

Table 40: 48 T1/E1 and 48 T3/E3 Interface Module LEDs

LED	Color/State	Meaning (Default=off)
Power (PWR)	Green	All power rails are within spec
	Red	Disabled
	Off	No power to Interface Module
Operating Status (STATUS)	Green	Operational
	Red	Failure
	Off	Disabled or power-down
Port Status (PORT)	Green	All ports are UP
	Amber	All least one port is down
	Off	All ports are disabled or shut down
Activity Status (ACT)	Green	Interface Module is Active or Standby
	Off	Interface Module is disabled or shut down

8-port 10 Gigabit Ethernet Interface Module LEDs

The table below summarizes the 8-port 10 Gigabit ethernet interface module.

Table 41: 8-port 10 Gigabit ethernet Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Green	All power rails are within specification
	Red	Disabled
	Off	No power to Interface Module
Operating Status (STAT)	Red	Failure
	Off	Disabled or Power-Down
	Green	Operational
10G SFP+ Link (Left LED)	Off	Disabled or No link
	Yellow	Fault or Error
	Green	Link with no activity
	Green	Link with activity
10G SFP+ Speed/Mode (Right LED)	Yellow	10Gbps WAN
	Green	10 Gbps LAN
	Alternating Yellow or Green	10 Gbps OTN
	Off	Disabled

1-port 100 Gigabit Ethernet Interface Module LEDs

The table below summarizes the 1-port 100 Gigabit ethernet interface module.

Table 42: 1-port 100 Gigabit Ethernet Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Green	All power rails are within specification
	Red	Disabled
	Off	No power to Interface Module
Operating Status (STAT)	Red	Failure
	Off	Disabled or Power-Down
	Green	Operational

LED	Color/State	Description
100G CPAK Link LED	Off	Disabled or No link
	Yellow	Fault or Error
	Green	Link with activity
	Green	Link with no activity

2-port 40 Gigabit Ethernet Interface Module LEDs

The table below summarizes the 2-port 40 Gigabit ethernet interface module.

Table 43: 2-port 40 Gigabit Ethernet Interface Module LEDs

LED	Color/State	Description
Power (PWR)	Green	All power rails are within spec
	Red	Disabled
	Off	No power to Interface Module
Operating Status (STAT)	Red	Failure
	Off	Disabled or Power-Down
	Green	Operational
40G QSFP+ Link LED	Off	Disabled or No link
	Yellow	Fault or Error
	Green	Link with activity
	Green	Link with no activity

Power Supply LEDs

The table below summarizes the power supply LEDs for both the AC and DC power supplies.

Table 44: Power Supply LEDs

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
	Blinking Red	Output ORING FET Failed

Table 45: Power Supply LEDs

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

Fan Tray LEDs

The table below summarizes the fan tray LEDs.

Table 46: Fan Tray LEDs

LED	Color/State	Description
Status (TEMP)	Off	Disabled/power down
	Amber	Over temperature
	Green	OK
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)

LED	Color/State	Description
Fan 1 (FAN-1)	Green	Fan rotation in range
	Red	One or more fan fault
Fan 2 (FAN-2)	Green	Fan rotation in range
	Red	One or more fan fault
Fan 3 (FAN-3)	Green	Fan rotation in range
	Red	One or more fan fault
-48V_A feed (-48V_A)	Green	Feed is in range
	Red	Feed failure
-48V_B feed (-48V_B)	Green	Feed is in range
	Red	Feed failure

Alarm Conditions

The table below summarizes the meaning of alarm conditions on the Cisco NCS 4216.

Table 47: Alarm Condition Summary

Alarm Type	Alarm Meaning
Critical	RSP OIR
	Power supply OIR
	Port in down state
	Environmental sensor threshold exceeded (voltage, temperature)
	IM OIR
	IM crash
Major	Standby RSP in ROMmon mode
	RSP removed
	RSP failure
Info	Port administratively shut down



APPENDIX A

Site Log and Manufactures

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 performs tasks have access to it. Use the Installation Checklist (see the Site Planning section) to verify the steps in the installation and maintenance of your router. Site Log entries might include the following:

- Installation progress—Make a copy of the Cisco NCS 4216 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 NCS 4216, 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 needs of your site and equipment.

Table 48: Site Log

Date	Description of Action Performed or Symptom Observed	Initials

- Manufactures, on page 196

Manufactures

The table below lists the manufacturers for equipment used with the Cisco NCS 4216 router.

Table 49: Manufactures

Manufacturer	Web Site or Phone Number	Products/Model
Foxconn	Foxconn Technology Group Website: www.foxconn.com	Air Plenum
Burndy	http://www.burndy.com	Lugs