

Cisco NCS 560-4 Router Hardware Installation Guide

First Published: 2019-05-24

Last Modified: 2025-02-26

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

© 2019–2025 Cisco Systems, Inc. All rights reserved.



CONTENTS

CHAPTER 1 **Cisco NCS 560-4 Router Overview** 1

- Cisco NCS 560-4 Router Features 1
- System Specifications 3
  - Thermal limitations 4
  - EMC compliance 5
- Cisco NCS 560-4 Router Conformal Coating 6
- Fan Trays 7
- Interface Modules 11
- Digital Optical Monitoring 14
- RSP Modules (N560-4-RSP4 and N560-4-RSP4E) 15
- GNSS Module (A900-CM-GNSS) 16
- Power Supply 17
- Network Timing Interfaces 21
- Online Insertion and Removal 21
- Regulatory Compliance 23

CHAPTER 2 **Preparing for Installation** 25

- Safety Guidelines 25
  - Standard Warning Statements 25
  - Safety Guidelines for Personal Safety and Equipment Protection 27
  - Safety With Electricity 27
  - Power Supply Considerations 31
  - Preventing ESD Damage 31
- Site Planning 32
  - General Precautions 32
  - Site Planning Checklist 32

Site Selection Guidelines 33
Environmental Requirements 33
Physical Characteristics 33
Assembly Guidelines 33
Air Flow Guidelines 33
Air Flow Guidelines for Enclosed Rack Installation 35
Floor Loading Considerations 35
Site Power Guidelines 36
Electrical Circuit Requirements 37
Site Cabling Guidelines 37
Asynchronous Terminal Connections 38
Interference Considerations 38
Rack-Mounting Guidelines 39
Precautions for Rack-Mounting 39
Rack Selection Guidelines 39
Cabinet Selection Guidelines 40
Equipment Rack Guidelines 41
Rack Compatibility 42
Rack Types 42
Installation Checklist 44
Creating a Site Log 45
Receiving the Cisco NCS 560-4 Router 45
Chassis-Lifting Guidelines 47
Tools and Equipment 47
Unpack and Verify Shipped Contents 48

CHAPTER 3 **Installing the Cisco NCS 560-4 Router 51**
Prerequisites 51
Installing the Router in a Rack 51
Assembling the Plenum (N560-4-F2B-AIR-U=) 54
Installing the Plenum on the Rack When Router is Not Installed on the Rack 57
Installing the Plenum on the Rack When Router is Installed on the Rack 64
Installing the Cisco NCS 560 Router Vertically 67
Attaching the Cable Management Brackets 74

Installing the Chassis Ground Connection 75
Installing the Power Supply 78
Preventing Power Loss 79
Power Connection Guidelines 79
Guidelines for DC-Powered Systems 79
Guidelines for AC-Powered Systems 80
Installing the N560-PWR1200-D-E DC Power Supply Module 80
Installing the A900-PWR1200-D DC Power Supply Module 82
Activating the DC Power Supply 84
Removing and Replacing the DC Power Supply 84
Installing the AC Power Supply Module for A900-PWR1200-A (1200 W) 86
Recommended Power Cables 87
Activating the AC Power Supply 87
Removing and Replacing the AC Power Supply 88
Installing the Fan Trays 89
Removing and Replacing the Air Filter 91
Air Filter Maintenance 92
Removing and Replacing the Fan Trays 93
RSP Installation 94
Installing an RSP Module 94
Removing an RSP Module 96
Removing the IM Center Brackets 97
Interface Module Installation 98
Installing an Interface Module 99
Removing an Interface Module 100
Hot-Swapping an RSP or Interface Module 100
Installing Dust Caps 101
Securing the Cables Around the Cable Management Brackets 102
Connecting the Router to the Network 104
Connecting Console Cables 104
Connecting to the Serial Port using Microsoft Windows 104
Connecting to the Console Port using Mac OS X 106
Connecting to the Console Port using Linux 106
Installing the Cisco Microsoft Windows USB Device Driver 107

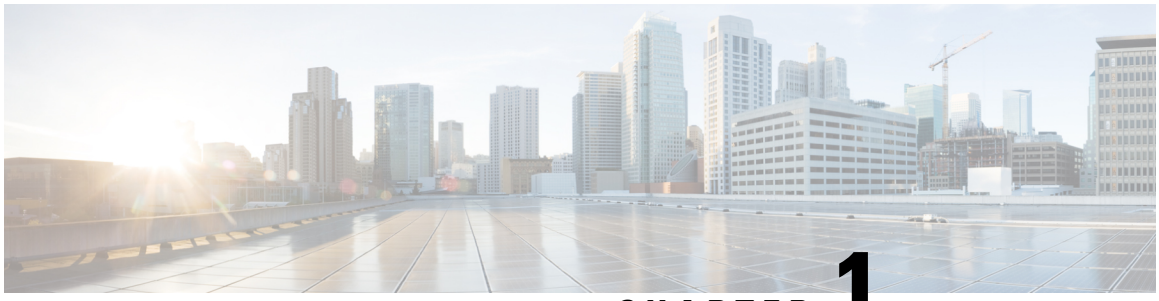
Installing the Cisco Microsoft Windows XP USB Driver 107
Installing the Cisco Microsoft Windows 2000 USB Driver 107
Uninstalling the Cisco Microsoft Windows USB Driver 108
Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver Using the Setup.exe Program 108
Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver Using the Add Remove Programs Utility 108
Uninstalling the Cisco Microsoft Windows Vista USB Driver 108
Connecting to the Auxiliary Port 109
Connecting a Management Ethernet Cable 110
Connecting Cables to SFP Modules 111
Installing and Removing SFP Modules 111
Connecting a USB Flash Device 112
Removing a USB Flash Device 112
Connecting Timing Cables 112
Connecting Cables to the BITS Interface 113
Connecting Cables to the Input 10Mhz or 1PPS Interface 113
Connecting Cables to the Output 10Mhz or 1PPS Interface 113
Connecting Cables to the ToD Interface 114
Connecting Cables to a GNSS Interface 114
Connecting a Cable to the GNSS Antenna Interface 115
Connecting Ethernet Cables 115

CHAPTER 4 **Cisco Router Initial Configuration** 117

APPENDIX A **Pinout and LED Details** 119
Pinouts 119
BITS Port Pinout 119
GPS Port Pinout 120
Time of Day Pinout 120
Alarm Port Pinout 121
Console/Aux RJ45 RS232 Serial Port Pinout 121
Management Ethernet Port Pinout 122
USB Console Port Pinout 123

USB Flash/MEM Port Pinout 123
Fiber-Optic Specifications 124
Alarm Conditions 124
LED Summary 124
RSP LEDs 125
RSP4 LEDs 126
Interface Module LEDs 127
Fan Tray LEDs 129
Power Supply LEDs 129

APPENDIX B **Site Logs and Manufacturers** 131
Manufacturers 131



CHAPTER 1

Cisco NCS 560-4 Router Overview

The Cisco NCS 560-4 (4RU) router, is a full-featured, modular and programmable aggregation router. It is designed for the cost-effective delivery of converged mobile (IP RAN, Mobile xHaul), residential, and business services (MEF CE 3.0, layer 2/layer 3 and EVPN). The Cisco NCS 560-4 router provides redundancy, shallow depth, low power consumption, high Ethernet interface density, and high services scale, is optimized for aggregation and remote Point-Of-Presence (POP) applications.

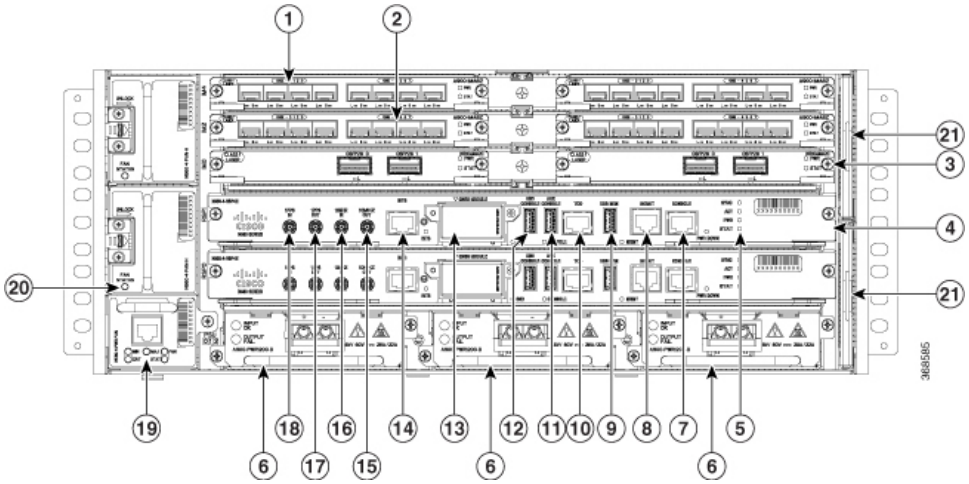
- Cisco NCS 560-4 Router Features, on page 1
- System Specifications, on page 3
- Cisco NCS 560-4 Router Conformal Coating, on page 6
- Fan Trays, on page 7
- Interface Modules, on page 11
- Digital Optical Monitoring , on page 14
- RSP Modules (N560-4-RSP4 and N560-4-RSP4E), on page 15
- GNSS Module (A900-CM-GNSS), on page 16
- Power Supply, on page 17
- Network Timing Interfaces, on page 21
- Online Insertion and Removal , on page 21
- Regulatory Compliance, on page 23

Cisco NCS 560-4 Router Features

- Fully redundant and centralized forwarding
- Six Interface Module (IM) slots
- Aggregate backplane capacity of 1.8Tbps
- Support for 1:1 and 2:1 power supply redundancy configurations, capable of delivering approximately 1.5KW to the router
- Three fan trays working in pull-mode and drawing air from right to left

The image below illustrates the Cisco NCS 560-4 Router chassis design.

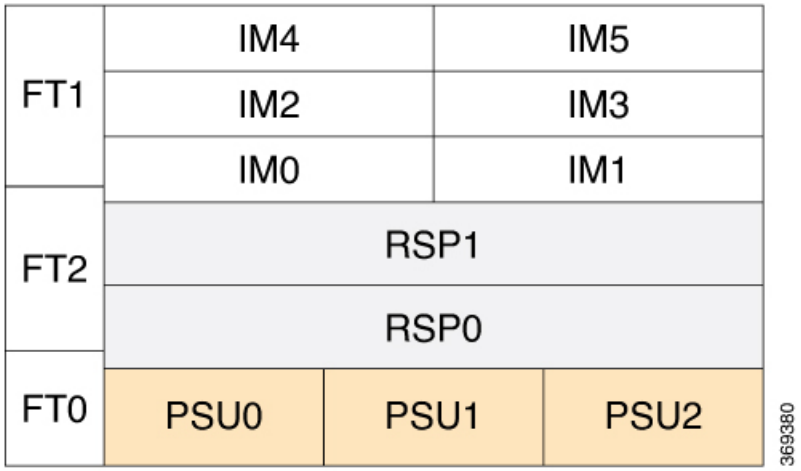
Figure 1: Cisco NCS 560-4 Router Front Panel



1	Interface module slot	2	Interface module slot
3	Interface module slot	4	Route Switch Processor (N560-4-RSP4E or N560-4-RSP4)
5	System LEDs	6	Power Supplies (three)
7	RJ-45 Console	8	Management Port
9	USB memory port	10	Time of day timing (ToD) port
11	Auxiliary console	12	USB console
13	GNSS module	14	BITS timing port
15	10 MHz Out	16	10 MHz In
17	1PPS Out	18	1PPS In
19	Primary fan tray	20	Secondary fan tray
21	Fan Filters	—	

The cabling for all interfaces (power, data and control) are on the front side of the chassis. The chassis grounding point is located on the rear side of the chassis.

The following image illustrates the slot numbering scheme for the FRUs in Cisco NCS 560-4 router in case of single width IMs.



System Specifications

Table 1: System Specifications - Abridged

Component	Specification
Cisco NCS 560-4 Router - Physical	Height: 7 in. (177.88 mm) - 4RU Width: 17.44 in. (443 mm) Depth: 9.5 in. (241.3 mm) Weight: • 55.56 lb (25.2 kg) with two RSPs, three DC power supplies, and loaded with a typical combination of interface module cards • 18 lb (8.12 kg) for an empty chassis
Power consumption	Maximum input power 975W (including loss) with 3 power supplies. This is equivalent to 3327 BTU per hr.
AC input voltage and frequency	Voltage range: 85 to 264 VAC, nominal 115 to 230 VAC Frequency Range: 47 to 63 Hz, nominal 50 to 60 Hz
AC Power Supply MTBF at 40ºC operating temperature	300,000 hours
DC input voltage	For 1200W DC power supply, voltage range: –40.8V to –72V DC, nominal –48V/–60V DC

For the complete set of specifications, see the Cisco Network Convergence System 560-4 Router Data Sheet.

Thermal limitations

This table describes the maximum operating temperature range that the NCS 560 chassis supports when specific optics modules, identified by their Product IDs (PIDs), are used.

- Optics module: The model of the optics module.
- Chassis PID: The specific chassis or system product IDs that support these optics modules.
- IM or MPA card PID: The PID for the Interface Module (IM) or Modular Port Adapter (MPA) cards.
- System maximum operating temperature supported at MSL: Maximum operating temperature supported by the NCS 560 system at Mean Sea Level (MSL).
- Supported slots: The physical or logical locations within the chassis where an IM or MPA card can be installed.
- Supported ports: The specific ports on the chassis where the optics modules can be installed.

Table 2: Thermal limitations

Optics module	Chassis PID	IM/MPA card PID	Maximum operating temperature at MSL	Supported slots	Supported ports
QSFP-100G-SR1.2	NCS560-4	• N560-IMA2C • N560-IMA2C-DD	-5°C to +45°C	0, 1, 2, 3	• Slot 0: P0, P1 • Slot 1: P0, P1
QDD-400G-ZRP-S	NCS560-4	N560-IMA2C-DD	-5°C to +45°C	0, 1, 2, 3	• Slot 0: P0, P1 • Slot 1: P0, P1

Optics module	Chassis PID	IM/MPA card PID	Maximum operating temperature at MSL	Supported slots	Supported ports
DP04QSDD-HE0	NCS560-4	N560-IMA2C-DD	-5°C to +40°C	0, 1	• Slot 0: P0, P1 • Slot 1: P0, P1
		N560-IMA2C-DD		0, 1, 2, 3	• Slot 0: P0 • Slot 1: P0 • Slot 2: P0 • Slot 3: P0 • 1x module each
QSFP-100G-ERL-S	NCS560-4	• N560-IMA2C • N560-IMA2C-DD	-5°C to +50°C	0, 1	Slot 0: P0, P1
					Slot 1: P0, P1

EMC compliance

This table describes EC compliant ports and the maximum operating temperature range that the NCS 560 chassis supports when specific optics modules, identified by their product IDs (PIDs), are used.

- Optics module: The model of the optics module.
- Chassis PID: The specific chassis or system product IDs that support these optics modules.
- IM or MPA card PID: The Product ID (PID) for the Interface Module (IM) or Modular Port Adapter (MPA) cards.
- System maximum operating temperature supported at MSL: Maximum operating temperature supported by the NCS 560 system at Mean Sea Level (MSL).
- Supported slots: The physical or logical locations within the chassis where an IM or MPA card can be installed.
- Maximum number of EMC/EMI compliant ports: The highest number of ports on a chassis that can be supported to meet electromagnetic compatibility (EMC) and electromagnetic interference (EMI) compliance.

Table 3: EMC compliance

Optics module	Chassis PID	IM/MPA card PID	System maximum operating temperature supported at MSL	Slots supported	Maximum number of EMC/EMI compliant ports
DWDM-SFP10G-C-I	NCS560-4	• A900-IMA8Z • A900-IMA8CS1Z • A900-IMA-8Z-L	-40°C to +65°C at MSL	All slots	24

Cisco NCS 560-4 Router Conformal Coating

Table 4: Conformal Coating PIDs

PIDs	Description
NCS560-4-CC	NCS 560 Series Router Chassis 4RU Conformal Coated
N560-4-RSP4E-CC	NCS 560 Series Router 4RU Route Switch Processor 4E, Conformal Coated
N560-4-RSP4-CC	NCS 560 Series Router 4RU Route Switch Processor 4, Conformal Coated
N560-4-FAN-H-CC	NCS 560 Series Router 4RU High Speed Fan Conformal Coated
N560-4-PWR-FAN-CC	NCS 560 Series Router 4RU Power Fan Tray Conformal Coated
N560-IMA-2C-CC	NCS 560 2 x 100GE Interface Module, QSFP28 optics, Conformal Coated
A900-IMA8Z-CC	ASR 900 8-port 10GE SFP+ Interface Module, Conformal Coated
A900-IMA8CS1Z-CC	ASR 900 Combo 16 port GE C-SFP + 1 port 10GE SFP+ IM, Conformal Coated
A900-IMA-8Z-L-CC	ASR 900 8 x 10GE Interface Module, Lite,Conformal Coated

Fan Trays

The fan trays are located on the left side of the chassis, while the air filters are located on the right side of the chassis.

There are three fan tray field replaceable units (FRUs) in the chassis: two secondary fan trays (top two fan trays) and one primary fan tray (at the bottom left of the router).

Figure 2: Fan Trays On the Left Side of Router

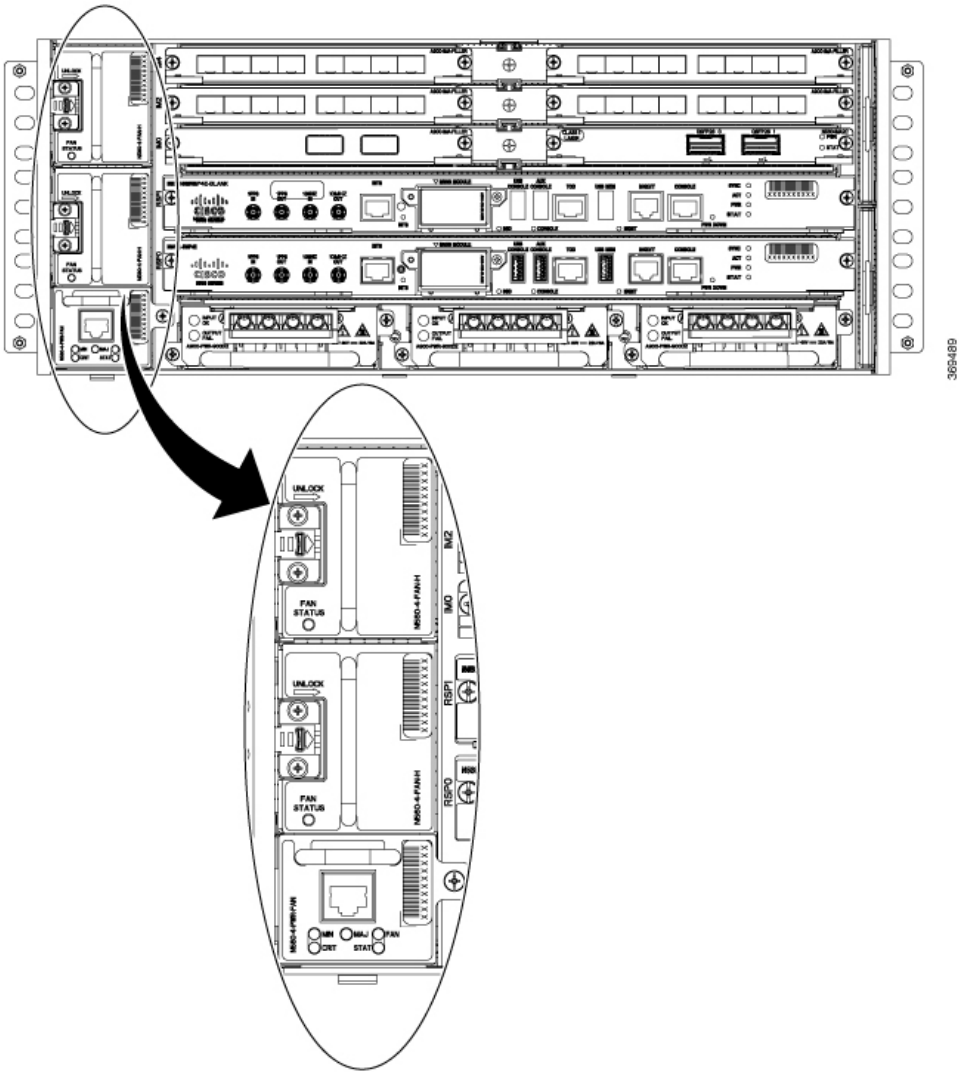


Figure 3: N560-4-PWR-FAN-R (Reverse Air Flow Primary Fan Module)

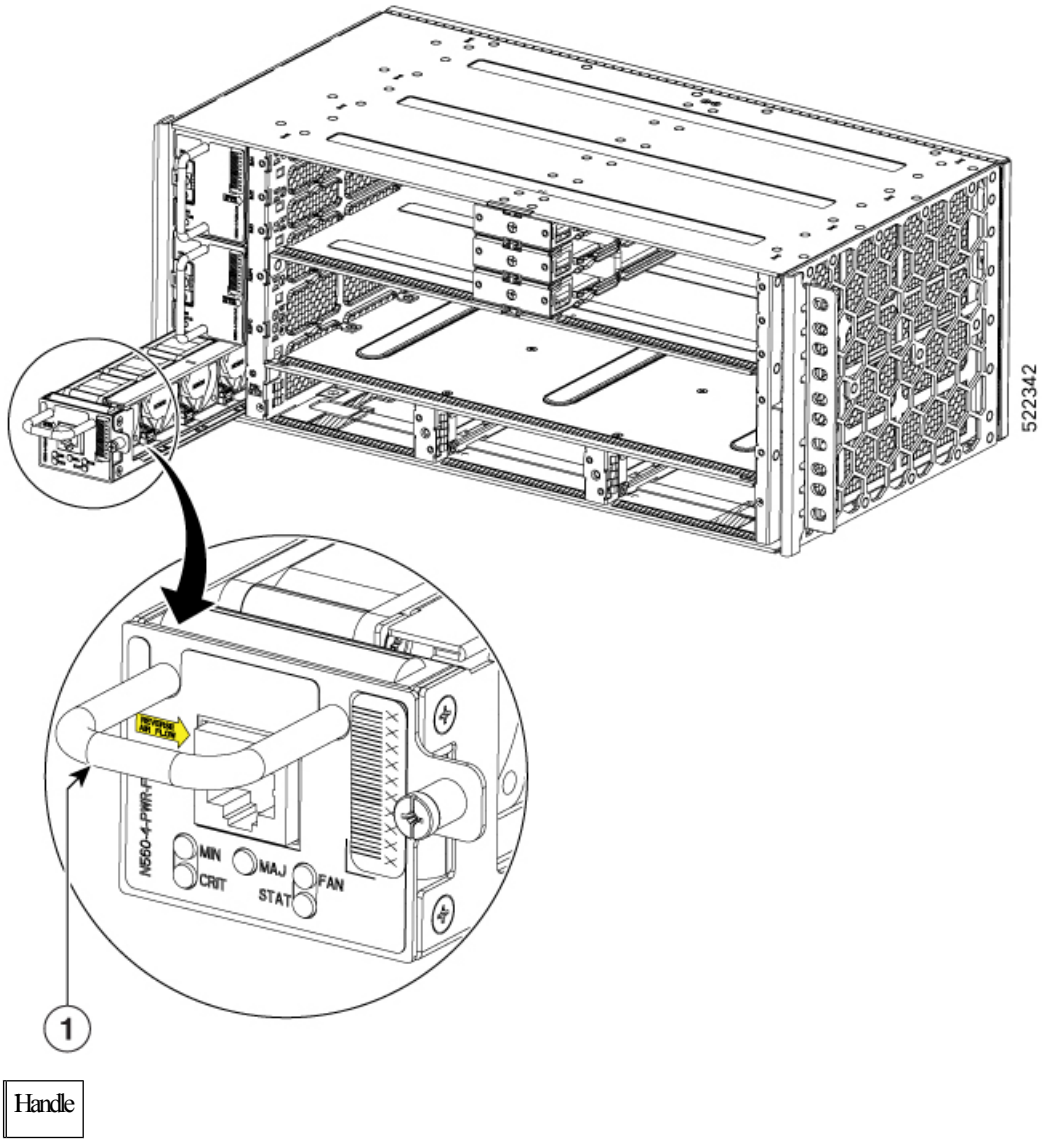
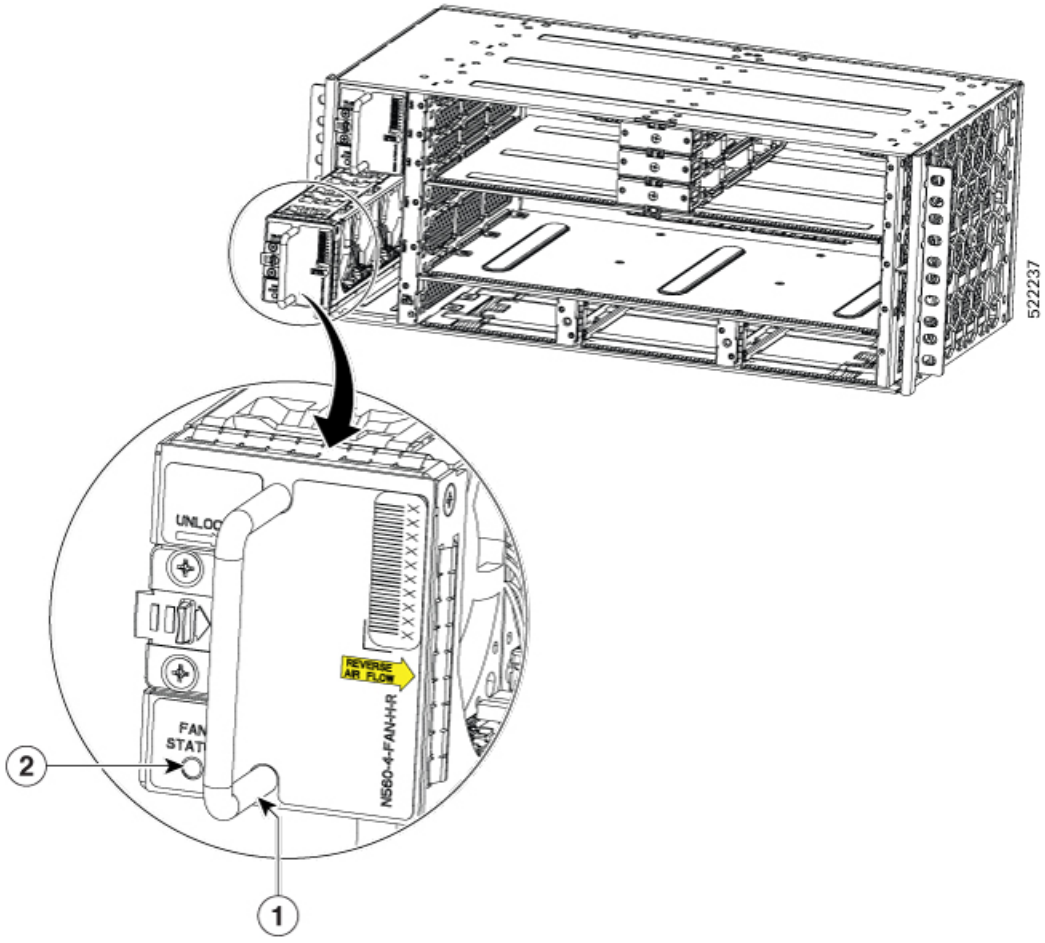


Figure 4: N560-4-FAN-H-R (Reverse Air Flow Secondary Fan Module)



Handle	LED

Fan redundancy is supported on the following conditions:

- The router can work indefinitely on a single fan failure. And the time to replace the fan tray may depend upon the temperature levels of the critical components.
- During two or more fan failures, the router does continue to work as long as all the critical components in the router are within the specified temperature limits.
- If any fan tray is pulled out of the router during operation, then the remaining fans automatically run at full speed.

Caution At boot time, the Cisco NCS 560-4 router doesn't support fan tray redundancy. Ensure all the three fan trays are installed to allow the router to boot up.

The RSP checks for the following conditions before booting up the router:

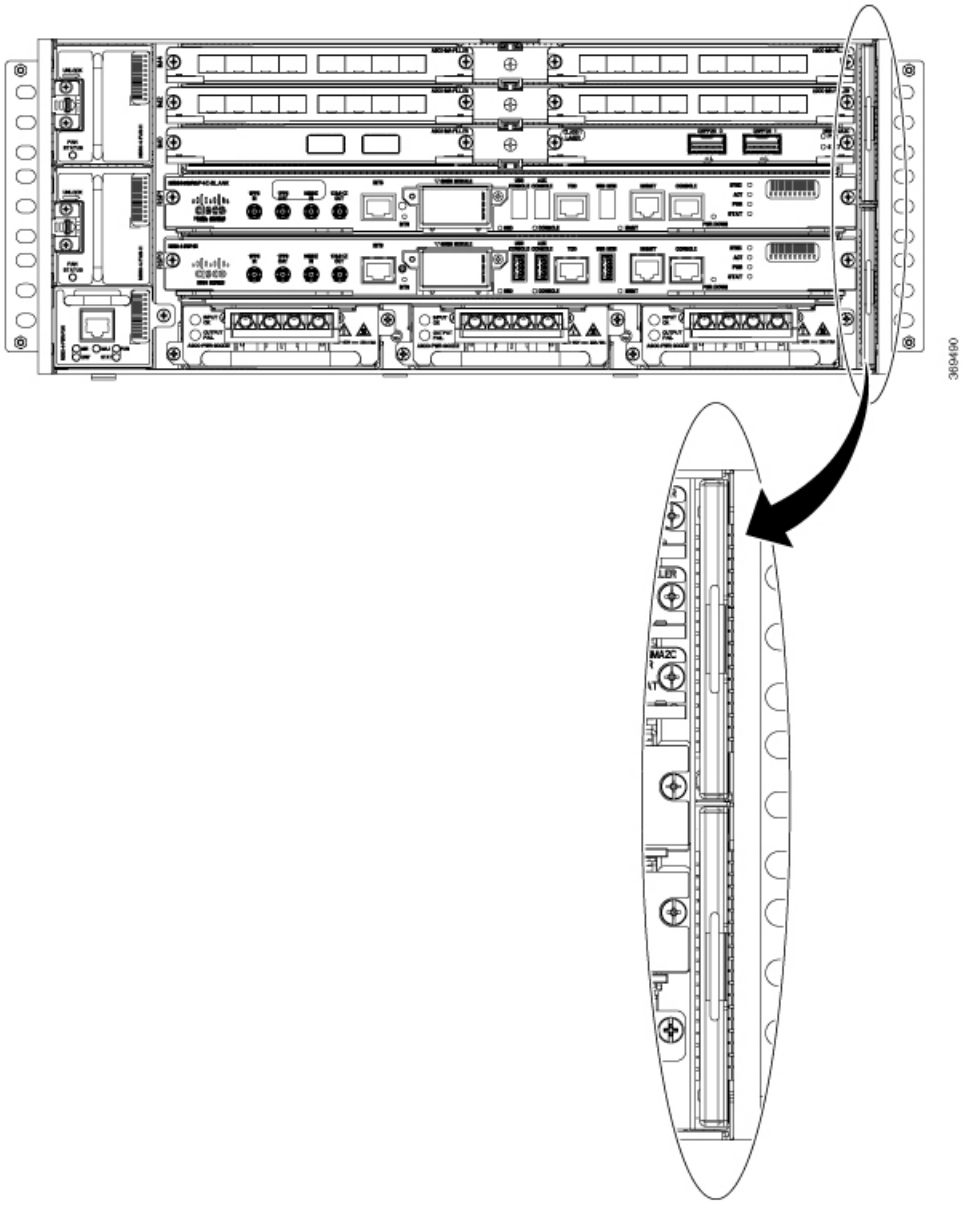
Note The onboard FPGA continuously monitors for these conditions and allows the RSP to boot up, only if these conditions are satisfied.

- All three fan trays are plugged in.
- Router ambient temperature is less than 73ºC.
- RSP Outlet temperature is less than 95ºC.
- ASIC temperature is less than 110ºC.
- On-board FPGA temperature is less than 105ºC.

Air Filter (N560-4-FILTER)

The air filters (set of two filters) are located on the right side of the chassis and prevent dust from entering the chassis.

Figure 5: Air Filters On the Right Side of the Router



Note When you use the reverse air flow fan modules, N560-4-PWR-FAN-R, and N560-4-FAN-H-R, use the N560-4-FLTR-BLNK.

Interface Modules

Effective Cisco IOS XR Release 7.9.1, the following interface module is supported:

- 8-port 10GE / 25GE / 50 Gigabit Ethernet Interface Module (N560-IMA-8Q/4L) is a single-width-single-height IM. The 8 ports of the IM are split into two modes of 4 ports each based on speed.

Effective Cisco IOS XR Release 7.5.2, the following interface module is supported:

- ASR 900 8 x 10 Gigabit Ethernet Interface Module, Lite, Conformal Coated (A900-IMA-8Z-L-CC): The capabilities of this interface module are same as A900-IMA8Z-L interface module with conformal coating.

Effective Cisco IOS XR Release 7.5.1, 1G mode is supported on A900-IMA8Z-L interface module.

Use the following command to configure A900-IMA8Z-L interface module in 1G mode:

- **hw-module quad** *1* **slot** *0* **mode** *1g*

Effective Cisco IOS XR Release 7.3.1, the following Ethernet interface modules are supported:

- 2-port 100 Gigabit Ethernet QSFP-28 Module (NCS4200-2H-PQ): The capabilities of this interface module are same as N560-IMA-2C interface module.
- 8-port 10 Gigabit Ethernet SFP+ Module (NCS4200-8T-PS): The capabilities of this interface module are same as A900-IMA8Z interface module.
- 8/16-port 1 Gigabit Ethernet and 1-port 10 Gigabit Ethernet Module (NCS4200-1T16G-PS): The capabilities of this interface module are same as A900-IMA8CS1Z-M interface module.

Table 5: Supported Interface Modules and Part Numbers for the Supported Route Processors

RSP Module	Interface Modules	Part Number	Slot
N560-4-RSP4 and N560-4-RSP4E OR N560-4-RSP4-CC and N560-4-RSP4E-CC	2-port 100 Gigabit Ethernet Interface Module (2 x 100GE)	N560-IMA-2C NCS4200-2H-PQ N560-IMA-2C-DD N560-IMA-2C-CC	[1][2][3][4][5]0,1,2,3
	8/16-port 1 Gigabit Ethernet (SFP/SFP) and 1-port 10 Gigabit Ethernet (SFP+) / 2-port 1 Gigabit Ethernet (CSFP) Interface Module	A900-IMA8CS1Z-M NCS4200-1T16G-PS A900-IMA8CS1Z-CC	0, 1, 2, 3, 4, 5
	8-port 10 Gigabit Ethernet Interface Module (8 x 10GE)	A900-IMA8Z NCS4200-8T-PS A900-IMA8Z-CC A900-IMA8Z-L A900-IMA-8Z-L-CC	[6]0, 1, 2, 3, 4, 5
	1-port 100 Gigabit Ethernet / 200 Gigabit Ethernet CFP2 DCO Module (1 x 100/200GE)	N560-IMA-1W	[7]0, 1, 2, 3
	8-port 10 Gigabit Ethernet / 25 Gigabit Ethernet / 50 Gigabit Ethernet Interface Module (8 x 10/25/50GE)	N560-IMA-8Q/4L	0,1[8] 2,3[9] 4,5[10]

1 Starting with Cisco IOS XR Release 7.2.1, N560- IMA-2C is also supported in slots 2 and 3. In these slots, 100G optics is supported only on port 0. Also, 40G optics are supported in slots 0–3.

2 The maximum bandwidth that can be achieved on slots 0–3 is (6 x 100G and 2 x 40G) or (8 x 40G).

3 Starting with Cisco IOS XR Release 7.3.1, only QSFP-28 100G is supported on the N560-IMA-2C-DD and only on slots 0 and 1 of NCS560-4.

4 Starting with Cisco IOS XR Release 7.4.1, only QSFP-28 100G is supported on the N560-IMA-2C-DD and only on slots 0, 1, 2 and 3 of NCS560-4. In NCS560-4, only one interface, corresponding to port 0 is created when N560-IMA-2C-DD is inserted on slots 2 and 3 and port 1 isn't effective. Only 100G mode is supported on port 0 of slots 2 and 3.

5 Starting with Cisco IOS XR Release 7.8.1, QSFP-DD 100G ZF1 is supported on the N560-IMA-2C-DD on slots 0, 1, 2 and 3 of NCS560-4. In NCS560-4, on slot 2 and 3 only one interface, corresponding to port 0 is created.

6 Starting with Cisco IOS XR Release 7.5.1, 1G mode is supported on A900-IMA8Z-L. 0, 1, 2, 3, 4, 5 can be in 10G or 1G mode.

7 100G mode is enabled by default. Slots 0 and 1 are supported on 100G and 200G mode. Slots 2 and 3 are supported only on 100G mode.

8 Starting with Cisco IOS XR Release 7.9.1, N560-IMA-8Q/4L is supported on these slots, with a speed combination of 8 x 10G, 4 x 50G, 4 x 10G and 4 x 25G, 4 x 10G and 2 x 50G, or 4 x 25G and 2 x 50G. The default is 8 x 25G.

9 Starting with Cisco IOS XR Release 7.9.1, N560-IMA-8Q/4L is supported on these slots, with a speed combination of 8 x 10G, 2 x 50G and 4 x 10G. The default is 4 x 25G and 4 x 10G.

[10] Starting with Cisco IOS XR Release 7.9.1, N560-IMA-8Q/4L is supported on these slots, with a default speed combination of 8x10G.

Table 6: Slot and Port Support for A900-IMA8Z-L for 1G Mode

Slot	Port 0	Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port 7
0	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G
1	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G
2	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP
3	10G/1G	10G/1G	10G/1G	10G/1G	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP
4	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP
5	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP	10G/1G CU SFP

The *interface-path-id* is *rack*/*slot*/*module*/*port*. The slash between values is required as part of the notation.

- For IM N560-IMA-2C, N560-A-2C-CC, NCS4200-2H-PQ, and N560-IMA-2C-DD the port numbering is **HundredGigE**— 0/0/0/0 - 0/0/0/1
- For IM A900-IMA8Z, A900-IMA8Z-CC, NCS4200-8T-PS, A900-IMA-8Z-L-CC, and A900-IMA8Z-L the port numbering is **TenGigE**— 0/0/0/1 - 0/0/0/7
- For IM A900-IMA8CS1Z-M, A900-IMA8CS1Z-CC, and NCS4200-1T16G-PS, the port numbering is:
  - **GigE** — 0/0/0/0 - 0/0/0/15
  - **TenGigE** — 0/0/0/16
- For IM N560-IMA-1W, **HundredGigE** (R/S/I/P/i) is created and mapped based on the port-mode configuration of **controller optics** (R/S/I/P).

  For more information, see the **port-mode** command in the *Interface and Hardware Component Command Reference Guide*.

Digital Optical Monitoring

Digital Optical Monitoring (DOM) is supported for the SFP, SFP+, and XFP transceiver modules.

For information on DOM supported transceivers, see Cisco Optics Compatibility Matrix.

For a list of modules, see Cisco NCS 560 Series Routers Interface Modules Data Sheet.

Real time DOM data is collected from SFPs, SFP+, periodically and compared with warning and alarm threshold table values.

The DOM data collected are transceiver transmit bias current, transceiver transmit power, transceiver receive power, and transceiver power supply voltage.

RSP Modules (N560-4-RSP4 and N560-4-RSP4E)

The Cisco NCS 560-4 router supports both, N560-4-RSP4 and N560-4-RSP4E. Each RSP has 32GB CPU memory.

When redundant RSPs are installed, the control and data plane are 1:1 redundant and the standby RSP components are in hot-standby state, ready to take over as active in the event of a failover.

Note A failover indicates a failure in the software or in the card due to reasons, such as RSP card OIR, host kernel crash or virtual machine crash triggering heartbeat failure.

Whereas, switchover is a graceful operator-initiated task that leads to the RSP being brought down.

The RSP modules handle the data plane, network timing, and control plane functionalities for the router. The RSP configuration allows you to use Cisco IOS XR software to control chassis management, redundancy, external management, and system status indications on the router.

RSP features include:

- 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
- 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, and SysLog
- In Service Software Upgrade (ISSU) capability with zero topology loss and minimum packet loss (50 msec)
- External management interfaces (RS232 console, management ENET, USB console, USB storage) and system status LED indicators
- 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 IOS-XR and platform control software runs

Note If your system includes redundant RSPs, both RSPs should be of the same type and have the same memory size. We strongly recommend that you avoid configuring your router using mixed route processor cards.

GNSS Module (A900-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:

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

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

Power Supply

The Cisco NCS 560-4 Router supports three 1200W DC and AC power supplies in PSU0, PSU1, and PSU2, in 2+1 mode or 1+1 mode.

The AC and DC power supplies support:

- -40.8 VDC to -72 VDC
- 85 VAC to 264 VAC

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 1200W (~100A at +12VDC) to the other FRUs in the system and are rated for operation at 5ºC above the chassis operating temperature.

- A900-PWR1200-A : EN61000-4-5: Surge AC (2KV CM/2KV DM)
- A900-PWR1200-D: EN61000-4-5: Surge DC (2KV CM/1KV DM)
- N560-PWR1200-D-E: EN61000-4-5: Surge DC(2KV CM/DM), ITU K.21 enhanced test level for mains power port (6KV CM/DM) Criteria B



Note We highly recommend you to use an external surge protector device for the deployments where there is a risk of higher surge than specified for these PSUs.

See the below tables for the AC and DC power supply specifications.

Figure 6: DC Power Supply - A900-PWR1200-D

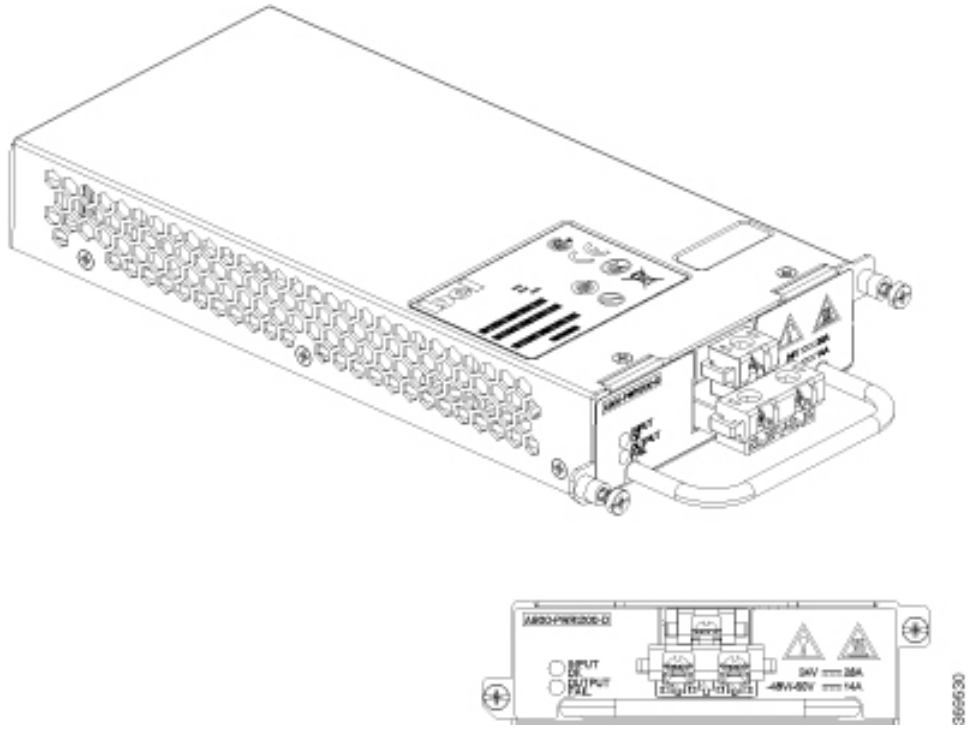


Figure 7: DC Power Supply - N560-PWR1200-D-E

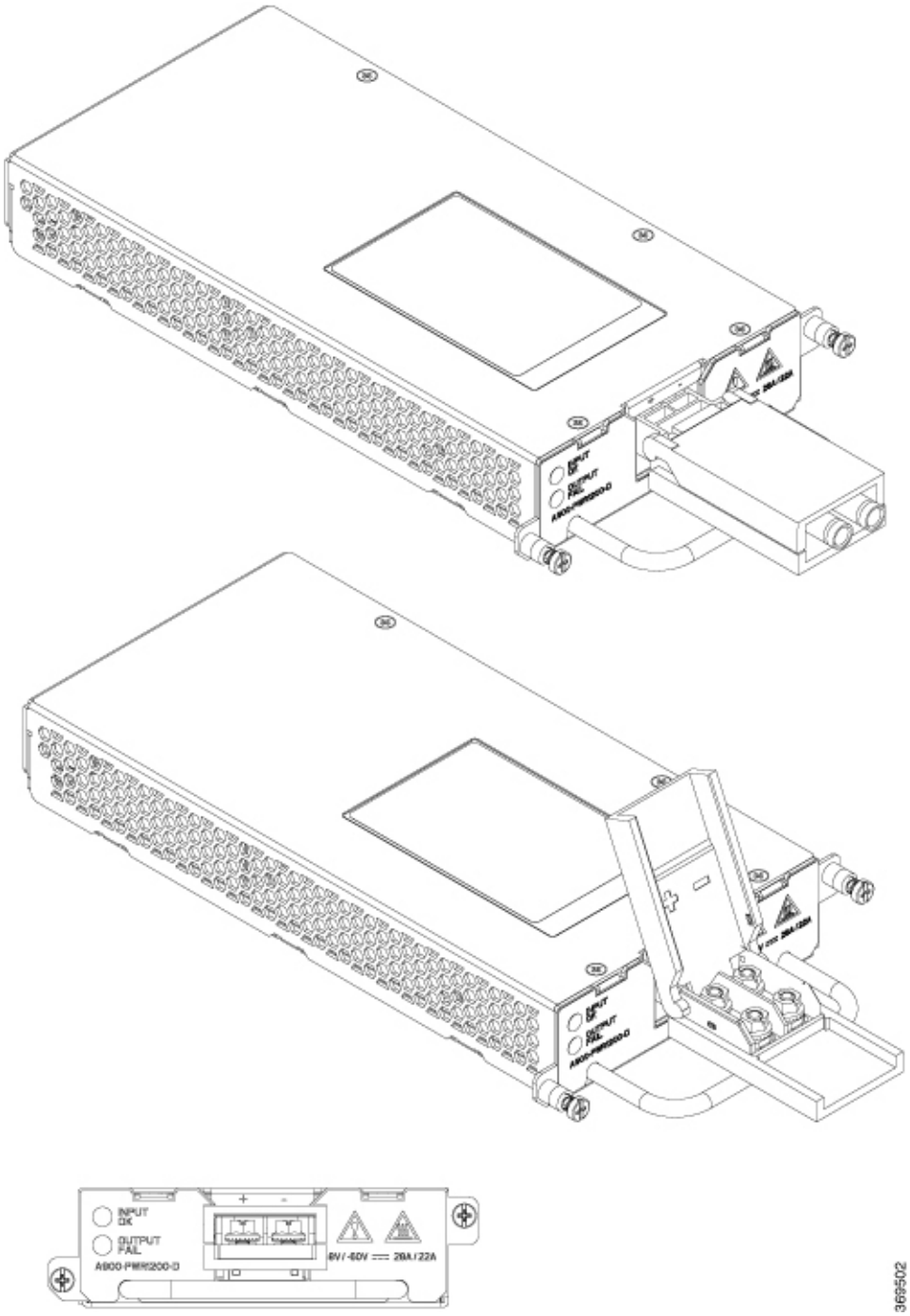


Table 7: DC Power Supply Specifications

Part numbers	A900-PWR1200-D, N560-PWR1200-D-E

Input power specification	RTN, -48V
Minimum input voltage	-40.8 VDC
Maximum input voltage	-72 VDC
Output voltage	+12 VDC
Wire gauge for DC input power connections	8 AWG minimum for -48/-60 VDC. Connector accepts 8 AWG maximum.
Maximum power output	1200 W

Figure 8: AC Power Supply - A900-PWR1200-A

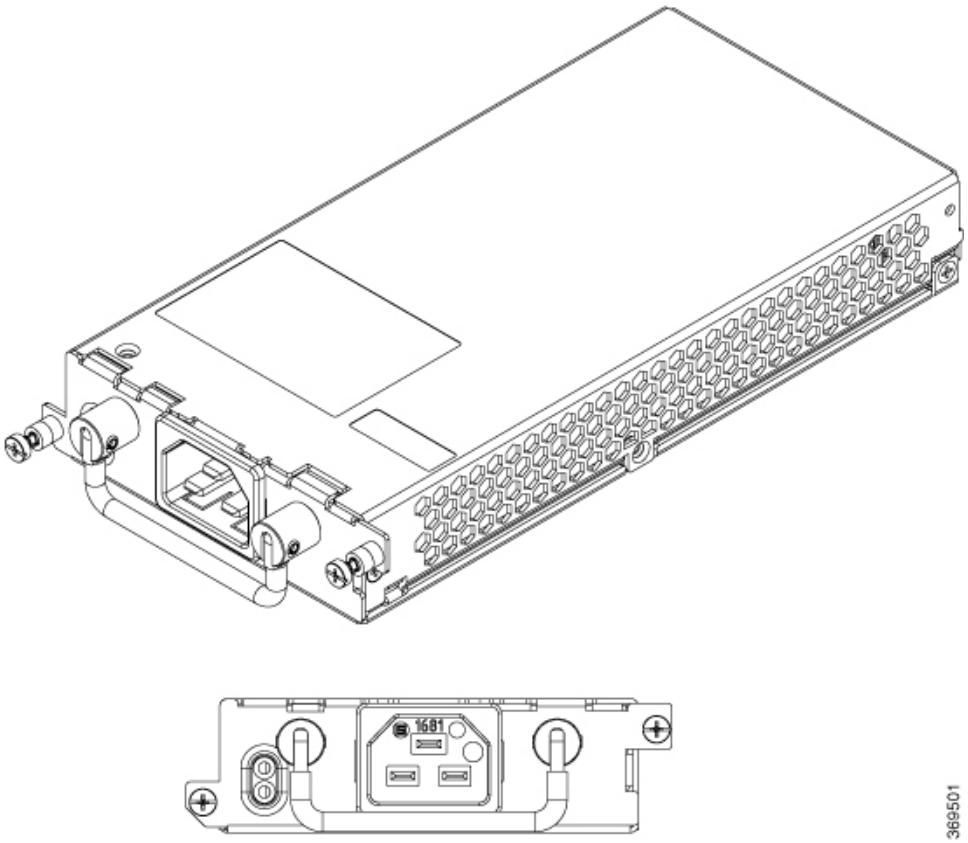


Table 8: AC Power Supply Specifications

Part number	A900-PWR1200-A
Input power specification	115VAC/ 230VAC
Input voltage	85/264 VAC
Minimum input voltage	85 VAC

Maximum input voltage	264 VAC
Minimum output voltage	12V
Maximum output voltage	12.4V
Maximum power output	1200 W

Redundancy

The router supports three power supply units that can be used either in 2+1 or 1+ 1 modes, depending on the overall power requirement of the system.

The Cisco NCS 560-4 Router supports current sharing between the power supplies.

If you install a redundant power supply on the Cisco NCS 560-4 Router, we recommend that you connect each power supply to a separate input power source in order to ensure that the router maintains power in the event of a power interruption that is caused by an electrical failure, a wiring fault, or a tripped circuit breaker.

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.

Network Timing Interfaces

The route processor supports the following network timing interfaces:

- BITS input/output port—RJ48 jack
- 1PPS input and output—Mini coaxial connectors
- 2.048 or 10 MHz input and output—Mini coaxial connectors
- 1PPS input or output 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.

Online Insertion and Removal

The Cisco routers, interface modules, and FAN-H are designed to support online insertion and removal (OIR). However, time-to-OIR for FAN-H 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 9: 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	2 minutes	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 10: Online Insertion and Removal - Parameters

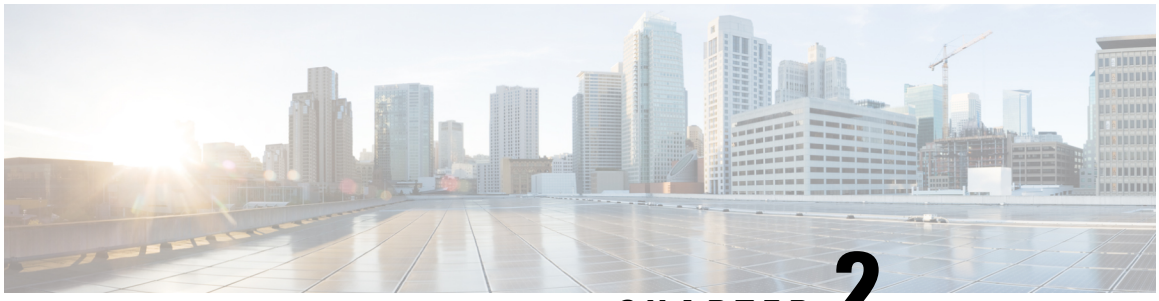
OIR Module	Ambient[11]	Fan Speed	OIR Time	Comments
Fan Tray[12]	30°C	100% PWM	5 mins	Single Fan Fail, Other Fans running at 100% PWM
	40°C	100% PWM	3 mins	
PSU	40°C	As per the fan algorithm	5 mins	Fans running at normal speed
Interface Module[13]				
RSP				

11 It is not recommended to perform OIR of any module above 40°C ambient
12 Fan Tray OIR should be performed only when a fan's failed condition is encountered and other fans are spinning at max speed.
13 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-oinsertion should be done while waiting at least 180s between the actions.

Regulatory Compliance

For regulatory compliance and safety information, see Regulatory Compliance and Safety Information — Cisco NCS 500 Series Routers document.



CHAPTER 2

Preparing for Installation

The following sections describe how to prepare for the installation of the router at your site:

- Safety Guidelines, on page 25
- Site Planning, on page 32
- Site Power Guidelines, on page 36
- Site Cabling Guidelines, on page 37
- Rack-Mounting Guidelines, on page 39
- Rack Compatibility, on page 42
- Installation Checklist, on page 44
- Creating a Site Log, on page 45
- Receiving the Cisco NCS 560-4 Router, on page 45
- Chassis-Lifting Guidelines, on page 47
- Tools and Equipment, on page 47
- Unpack and Verify Shipped Contents, on page 48

Safety Guidelines

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

In addition, before replacing, configuring, or maintaining the router, review the safety warnings listed in *Regulatory Compliance and Safety Information for the Cisco NCS 500 Series Routers*.

Standard Warning Statements

To see translations of the warnings that appear in this publication, refer to the Regulatory Compliance and Safety Information document that accompanied this device.

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



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



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



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



Warning 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 With Electricity



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



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



Warning 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 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. For an AC installation, ensure that the branch circuit breaker is rated a maximum 20A.



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



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



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



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



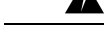
Warning This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Warning Use copper conductors only. Statement 1025



Warning 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 Never install an AC power module and a DC power module in the same chassis. Statement 1050



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.

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.
- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Turn off power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.
  - Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

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

- Never install telephone wiring during a lightning storm.

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

Power Supply Considerations

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

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 electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, ground yourself by touching a metal part of the chassis.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use available ejector levers or captive installation screws, if any, to release the bus connectors from the backplane or midplane.
- Handle components by their handles or edges only; do not touch the printed circuit boards or connectors.
- Place a removed component board side up on an antistatic surface or in a static-shielding container. If you plan to return the component to the factory, immediately place it in a static-shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.



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

Site Planning

The following sections describe how to plan for the installation of the router.

General Precautions

Observe the following general precautions when using and working with your router:

- 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 router.
- The floor space that the router occupies can support the weight of the system.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the router complies with the requirements.
- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The router Ethernet cabling distances are within limitations.
- The equipment rack in which you plan to install the router 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 router requires specific environmental operating conditions. Temperature, humidity, altitude, and vibration can affect the performance and reliability of the router. The following sections provide specific information to help you plan for the proper operating environment.

The router is designed to meet the industry EMC, safety, and environmental standards described in the *Regulatory, Safety, and Compliance Information for the Cisco NCS 500 Series Routers*.

Environmental Requirements

The Cisco NCS 560 Router is Telcordia GR-3108 (Class-1 for non-coated PIDs and Class-2 for conformal coated PIDs) or GR-63-Core Indoor compliant.

Environmental monitoring in the router protects the system and components from damage caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration *before* installation. After installation, make sure that the site maintains the environmental characteristics described in the *Cisco NCS 560 Series Routers Datasheet*.

For an outside plant installation (cell site cabinet, hut, and so on), it is required that the router be protected against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements present in the outside air. To achieve this level of protection, we recommend that the unit be installed in a fully sealed enclosure or cabinet. Examples of such cabinets include IP65 cabinets with heat exchanger complying with Telcordia GR487. Temperature must be maintained within –40ºC to 65ºC. When you use the reverse air flow fan modules, N560-4-PWR-FAN-R, and N560-4-FAN-H-R, the ambient temperature must be maintained within 0ºC to 40ºC.

Physical Characteristics

Be familiar with the physical characteristics of the Cisco NCS 560 Router to assist you in placing the system in the proper location. For more information, see the *System Specifications* section.

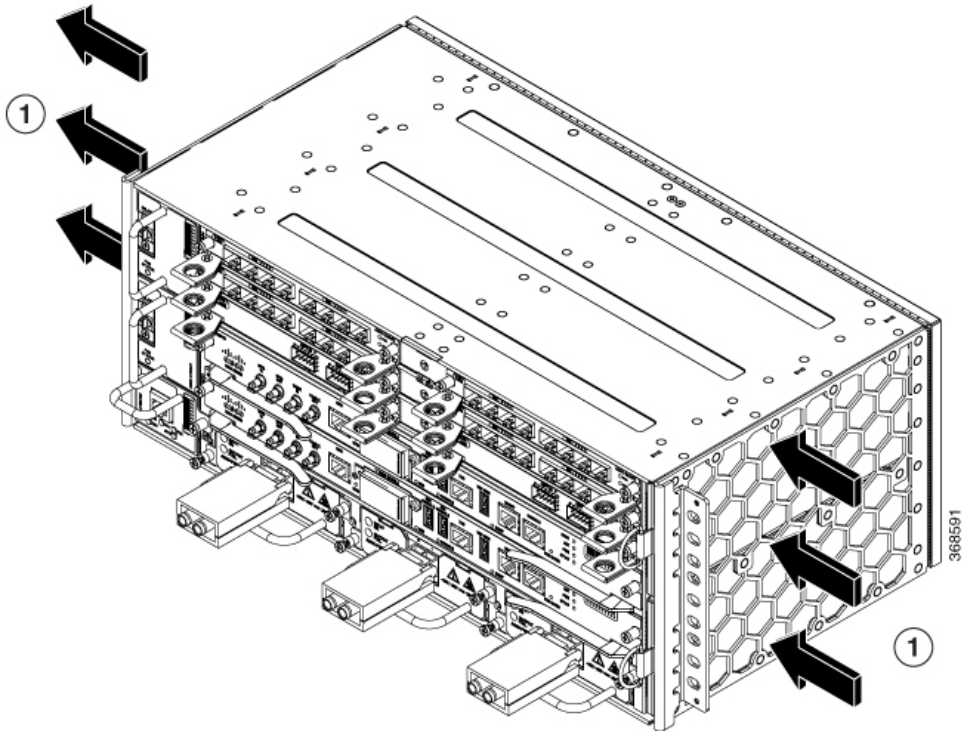
Assembly Guidelines

First, assemble the route switch processor (RSP). Then, IMs must be installed from the lower slot to the upper slot in the following order—slot 0, slot 1 and so on.

Air Flow Guidelines

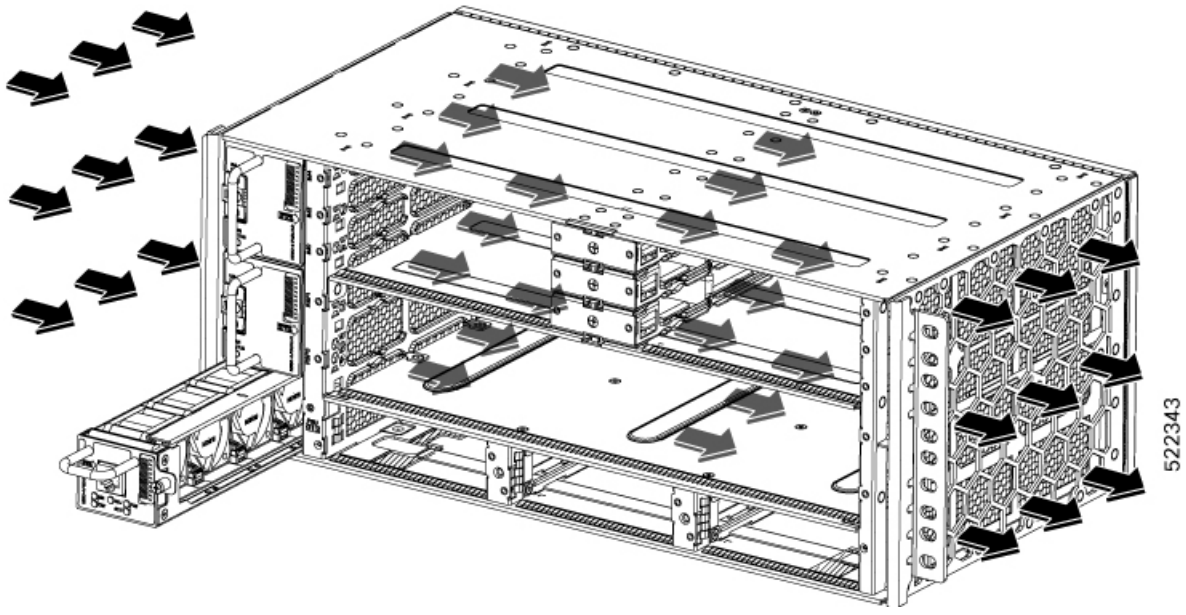
Cool air is circulated through the Cisco NCS 560-4 Router by three fan trays located along the left side of the router. Air flow is side-to-side, right to left, as shown in the figure below.

Figure 9: Cisco NCS 560-4 Router Chassis Air Flow



1	Direction of air flow — from the right side of the router to the left side

Figure 10: Cisco NCS 560-4 Router Chassis Air Flow With N560-4-PWR-FAN-R and N560-4-FAN-H-R



N560-4-PWR-FAN-R and N560-4-FAN-H-R fan modules allow the air to flow from the left side of the router to the right side.

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 (3.15 inches) 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.
- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off all other equipment in the rack (and in adjacent racks) to give the router maximum cooling air and clean power.
- Avoid setting up the router in a location in which the router air intake vents may draw in the exhaust air from adjacent equipment. Consider how the air flows through the router; the airflow direction is side to side, with ambient air drawn in from the vents located on the front right of the router.

Air Flow Guidelines for Enclosed Rack Installation

To install a Cisco NCS 560-4 Router in a 4-post enclosed cabinet, the front and rear doors of the cabinet must be removed or be perforated with a minimum of 65% open area (70% for 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 560-4 Routers are capable of supporting the combined weight of the rack and all the other installed equipment.

To assess the weight of a fully-configured router, refer to System Specifications, on page 3 or the *Product Specifications* section in the Cisco Network Convergence System 560-4 Router Data Sheet.

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 560-4 Router has specific power and electrical wiring requirements. Adhering to these requirements ensures reliable operation of the system. Follow these precautions and recommendations when planning your site power for the Cisco NCS 560-4 Router:

- The redundant power option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails.
- In systems configured with the redundant power option, connect each of the two power supplies to 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 560-4 Router installation must comply with all the applicable codes and is approved for use with copper conductors only. The ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with a 6 AWG gauge wire, copper ground conductor at a minimum.

The maximum power draw of the Cisco NCS 560-4 Router chassis and its configurable hardware components are listed in the following table. The maximum power draw values are not affected by whether the router chassis contains 1 or 2 power supplies AC or DC.

Hardware Component(s)	Maximum Power Draw Value
Router chassis with 2 power supplies, 3 fan trays, and 1 RSP4	(approx.) 500 W
N560-4-PWR-FAN	54 W
N560-4-FAN-H	80 W
N560-4-RSP4 and N560-4-RSP4E (active)	164 W
N560-4-RSP4 and N560-4-RSP4E (standby)	164 W
N560-4-RSP4-CC and N560-4-RSP4E-CC (active)	164 W

Hardware Component(s)	Maximum Power Draw Value
N560-4-RSP4-CC and N560-4-RSP4E-CC (standby)	164 W
N560-IMA-2C-DD (2-port 100 GigabitEthernet lite interface module)	75 W
A900-IMA8Z (NCS4200-8T-PS) (8-port 10 Gigabit Ethernet Interface Module)	55 W
A900-IMA8CS1Z-M (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)	55 W
A900-IMA2C (2-port 100 Gigabit Ethernet Interface Module)	75 W
A900-IMA8Z-L (8-port 10 GigabitEthernet lite SFP+ Interface Module)	24 W
A900-IMA2C-CC (2-port 100 Gigabit Ethernet Interface Module)	75 W
N560-IMA-8Q/4L (8-port 10 Gigabit Ethernet / 25 Gigabit Ethernet / 50 Gigabit Ethernet Interface Module)	50 W

Electrical Circuit Requirements

Each Cisco NCS 560-4 Router 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 560-4 Routers can be powered by a DC source or an AC source. Ensure that equipment grounding is present and observe the power strip ratings. Make sure that the total ampere rating of all products plugged into the power strip does not exceed 80% of the rating.

For more information about the Cisco NCS 560-4 Router power supply, see the Power Supply 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 560-4 Router, consider the type of cable required for each component, and the cable limitations. Consider the distance limitations for signaling, electromagnetic interference (EMI), and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.

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

Before you begin, read these important notes about cabling:

- Shielded cables must be used to connect to the RJ-45 alarm connector on the fan tray in order to comply with FCC/EN55022/CISPR22 Class A emissions requirements.

Before you install the Cisco NCS 560-4 Router, have all the additional external equipment and cables on hand. For information about ordering, contact a Cisco customer service representative.

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

- Signal type
- Signal speed
- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline in planning your network connections prior to installing the Cisco NCS 560-4 Router.

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

Asynchronous Terminal Connections

The RSP4 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 560-4 Router system.

Electromagnetic Interference

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

Strong EMI can destroy the signal drivers and receivers in the Cisco NCS 560-4 Router and even create an electrical hazard by causing power surges through the power lines into installed equipment. These problems are rare but could be catastrophic.

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

For information about the electrode magnetic compliance standards supported on the Cisco NCS 560-4 Router, see *Regulatory Compliance and Safety Information for the Cisco NCS 500 Series Routers*.

Radio Frequency Interference

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

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

Lightning and AC Power Fault Interference

If signal wires exceed the recommended cabling distances, or if signal wires pass between buildings, you should consider the effect that a lightning strike in your vicinity might have on the Cisco NCS 560-4 Router.

The electromagnetic pulse (EMP) generated by lightning or other high-energy phenomena can couple enough energy into unshielded conductors to damage or destroy electronic equipment. If you have previously experienced such problems, you should consult with RFI and EMI experts to ensure that you have adequate electrical surge suppression and shielding of signal cables in your Cisco NCS 560-4 Router operating environment.

Rack-Mounting Guidelines

The following sections provide guidelines for rack-mounting the Cisco NCS 560-4 Router:

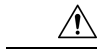
Precautions for Rack-Mounting

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 560-4 Router in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Rack Selection Guidelines

The Cisco NCS 560-4 Router can be mounted in most two-post or four-post, EIA 19-inch, EIA 23-inch and ETSI equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks. 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). The rack-mounting hardware included with the chassis is suitable for most 19-inch equipment racks.

Consider installing the Cisco NCS 560-4 Router in a rack with the following features:

- Network Equipment Building System (NEBS) compliant, 19-inch (48.3 cm) 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 560-4 Router. If the rack that you plan to install the system in has metric-threaded rails, you must provide your own metric-mounting hardware.
- Perforated top and open bottom for ventilation to prevent overheating.
- Leveling feet for stability.

Note The Cisco NCS 560-4 Router should not be installed in an enclosed rack because the chassis requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of enclosed rack—*even with the side doors removed*—could disrupt the air flow, trap heat next to the chassis, and cause an overtemperature condition inside the router. If you use an enclosed rack, ensure that there are air vents on all sides of the rack and there is proper ventilation.

Cabinet Selection Guidelines

Equipment that is intended for installation in controlled environmental space has average yearly levels of contamination. Ventilated cabinets or racks can be used if pollutant levels are maintained within allowable limits.

Equipment intended for installation in outside plant (OSP) areas must have sealed cabinets with heat exchanger that meet the IP66 or IP65 protection and low average yearly levels of concentration of contaminants inside the cabinet.

Note Ventilated cabinets and racks are not recommended for OSP applications.

Table 11: Cabinet Type for Indoor and Outdoor Installation

Cabinet Type	Suitable for Indoor Installation?	Suitable for Outdoor Installation?
Open rack with no front and rear doors	Yes	No
Ventilated cabinets with normal air filter at intake and fans	Yes	No
Sealed cabinets with heat exchanger that meet NEMA -4 or protection	Yes	Yes

Cabinet Type	Suitable for Indoor Installation?	Suitable for Outdoor Installation?
Sealed cabinets with air-conditioners that meet NEMA -4 or IP65 protection	Yes	Yes

Allowable limits for Environmental Pollutants

Concentration of pollutant levels in outdoor and indoor environment must be less than pollutant levels mentioned in Table 2.3 and Table 2.4 of *NEBS GR-63-CORE Issue 5 Dec 2017*, respectively. High concentrations of pollutants have a negative impact on the equipment life time.

Allowable Temperature and Humidity

Maximum allowable temperature and humidity levels must be within the values that are mentioned in the data sheets. Do not install in places where condensation may occur, or where equipment is exposed to high humidity for long time, such as near the sea, rivers, and large water bodies.

Installations in Highly-corrosive Environment

Installation in highly corrosive area is not recommended. Examples of highly corrosive areas are seashore, less than 10 meters from high traffics roadway, and areas having high industrial pollutants.

Periodic Measurement of Environmental Pollutants

We recommend that you check concentration of pollutants periodically. Necessary protection should be provided to ensure the equipment is not exposed to high concentration level of pollutants.

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 *Cisco NCS 560-4 Routers Datasheet*. Choose a proper location for the Cisco NCS 560-4 Router by following the guidelines listed below.

Locating for Safety

If the Cisco NCS 560-4 Router is the heaviest or the only piece of equipment in the rack, consider installing it at or near the bottom to ensure that the rack's center of gravity is as low as possible.

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

Locating for Easy Maintenance

Keep at least three feet (36 inches) of clear space at the front and two feet (24 inches) at the back of the rack. This space ensures that you can remove the Cisco NCS 560-4 Router components and perform routine maintenance and upgrades easily.

Avoid installing the Cisco NCS 560-4 Router in a congested rack and consider how routing of cables from other pieces of equipment in the same rack could affect access to the router cards.

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

Allow the following clearances for normal system maintenance:

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

Note If you are installing the chassis in a plenum, the air flow direction changes from right-to-left of router to front-to-back of the router. In this case, the side space is not required.

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 560-4 Router off the floor and out of areas that collect dust.
- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Locating for Proper Airflow

Ensure that the Cisco NCS 560-4 Router location has enough airflow to keep the system operating within the environmental characteristics and the air temperature is sufficient to compensate for the heat dissipated by the system.

Rack Compatibility

We recommend that you follow these rack specifications.

Rack Types

Figure 11: Rack specification EIA (19 inches and 23 inches)

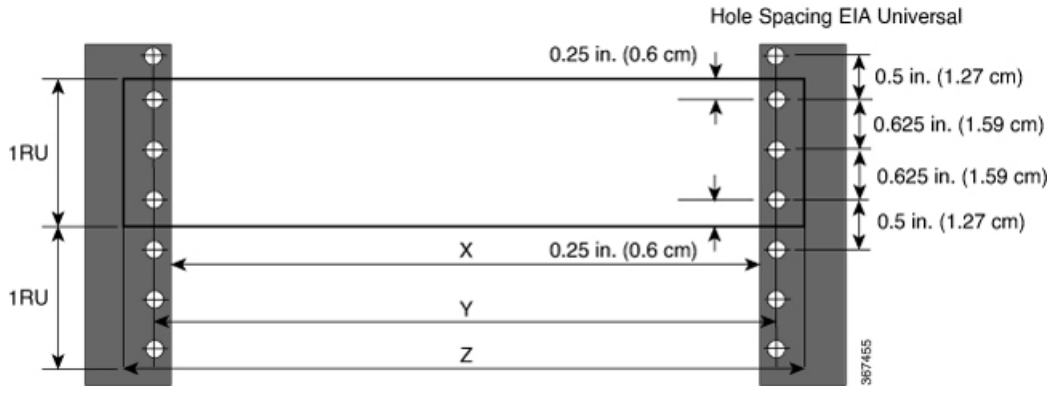


Table 12: Rack specification EIA (19 inches and 23 inches) for the Cisco NCS 560-4 Router

Post Type	Rack Type	Rack Front Opening (X)	Rack Mounting Hole Centre-Centre (Y)	Mounting Flange Dimension (Z)
4 Post	19 inches (48.3 centimeters)	450.8mm (17.75”)	465mm (18.312”)	482.6mm (19”)
2 Post				
4 Post	23 inches (58.4 centimeters)	552.45mm (21.75”)	566.7mm (22.312”)	584.2mm (23”)
2 Post				

Figure 12: Four Post Rack Type

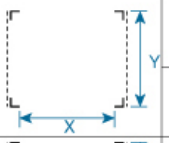
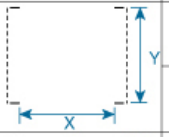
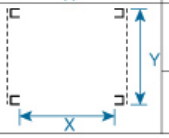
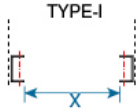
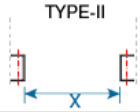
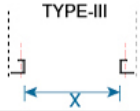
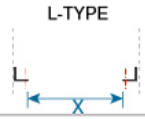
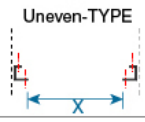
4 – Post Type (Hole EIA Universal)	Width Available (X)	Compatibility with Chassis	Compatibility with Plenum
All 23” Type rack	21.75” (552.45mm)	Yes	Yes
All ETSI rack (21” rack)	19.68” (500.0mm)	Yes	Yes
19” Type rack L-Type Post 	17.75” (450.8mm)	Yes	Yes
	17.50” (444.5mm)	Yes	Yes
19” Type Racks Flat-Post 	17.75” (450.8mm)	Yes	Yes
	17.50” (444.5mm)	Yes	Yes
19” Type racks C- Type Post 	17.75” (450.8mm)	No	No
	17.50” (444.5mm)	No	No

Figure 13: Two Post Rack Type

2 – Post Type (Hole EIA Universal)	X – 19" Rack	Compatibility with Chassis	Compatibility with Plenum	X-23" Rack	Compatibility with Chassis and Plenum
 TYPE-I	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
 TYPE-II	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
 TYPE-III	17.75" (450.8 mm)	No	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	No	No	21.75" (552.45mm)	Yes
 L-TYPE	17.75" (450.8 mm)	Yes	Yes	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	Yes	Yes	21.75" (552.45mm)	Yes
 Uneven-TYPE	17.75" (450.8 mm)	Yes	No	21.75" (552.45mm)	Yes
	17.50" (444.5 mm)	Yes	No	21.75" (552.45mm)	Yes

369503

Installation Checklist

Use the Installation Checklist that is shown in the following table to provide a record of what was done by whom and when. Use this list 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 13: 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 that is 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		

Task	Verified By	Date
Required tools available		
Network connection equipment available		
Cable-management brackets that are installed (optional, but recommended).		
AC power cables that are connected to AC sources and router.		
DC power cables that are connected to DC sources and router.		
Network interface cables and devices connected		
System power that is turned on.		
System boot completes (STATUS LED is on).		
Correct software configuration that is displayed after system banner appears		

Creating a Site Log

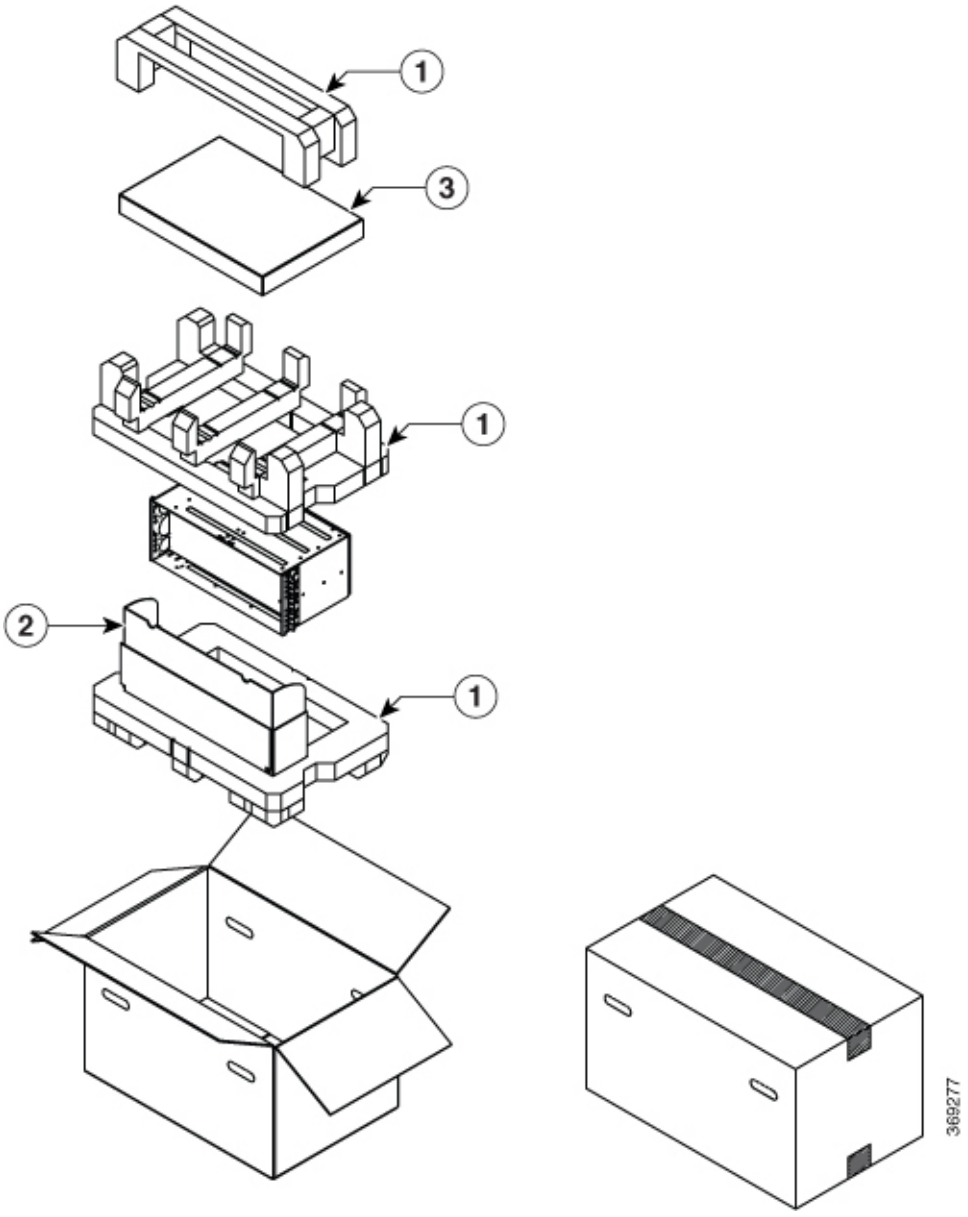
The Site Log provides a record of all the actions related to installing and maintaining the router. Keep it in an accessible place near the chassis so that anyone who performs tasks has access to it.

Create the Site Log prior to the installation. See the *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 560-4 Router

Each Cisco NCS 560-4 Router chassis is shipped in a container.

Figure 14: Cisco NCS 560-4 Router Packaged for Shipping



1	Bottom and Top foam	2	Tray
3	Roll End Lock Front (RELF)	—	—

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)
- 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 115200 baud, 8 data bits, no parity, and two 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
- 8 AWG copper wire for the power cord
- Wire-stripping tools for stripping both 6 AWG and 8 AWG wire
- Tape measure and level

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

Unpack and Verify Shipped Contents

Procedure

Step 1 Inspect the shipping container for any shipping damage. If there is obvious physical damage, contact your Cisco service representative, else continue with the remaining steps.

Step 2 Unpack the router.

Step 3 Inspect the router.

Step 4 Use the following table to verify the contents of the container. Do not discard the shipping container. You will need the container in the future if you move or ship the router.

What to do next

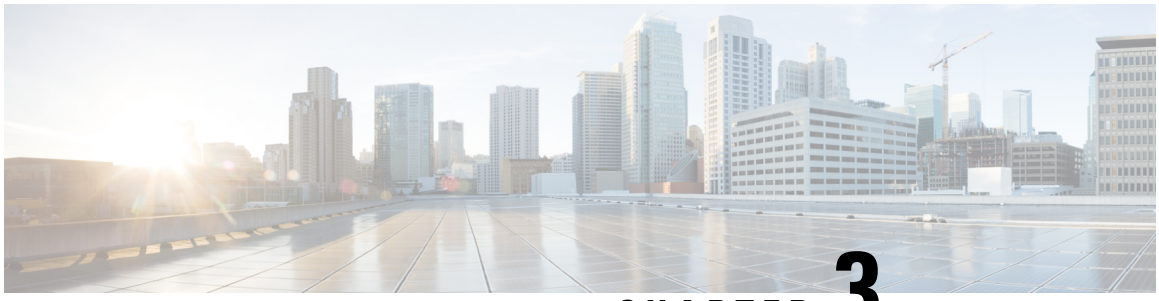
Table 14: Cisco NCS 560-4 Router Shipping Container Contents

Component	Description
Chassis	Cisco NCS560-4 Router
	Fan Trays
	Power Supplies
	RSP
	Interface Modules
	19-inch rack mount brackets

Component	Description
Accessories kit	Rack mount adapter screws (for 23-inch and ETSI adaptors) 4 cable management brackets
	Four cable-management brackets (one per bracket)
	One earth lug with two 10-32 screws.
	1 RJ45 to RJ45 crossover cable 1 RJ45 to DB-9 (female) adapter
ETSI Bracket (To be used when the router is used as a reverse flow system)	N560-4-O-BRCKT
ESD, wrist strap (disposable)	One disposable wrist strap (optional)
Documentation	*Regulatory Compliance and Safety Information for the Cisco NCS 500 Router*

Note Most Cisco documentation is available online. The chassis Pointer Card that is shipped with your Cisco NCS 560-4 Router contains links and information to other online documentation.

Note If the product is not in use, store the device in the initial packaged condition or in an ESD PE sealed bag with silica gel.



CHAPTER 3

Installing the Cisco NCS 560-4 Router

This chapter describes how to install the various components in the Cisco NCS 560-4 Router and includes the following sections:

- Prerequisites, on page 51
- Installing the Router in a Rack, on page 51
- Assembling the Plenum (N560-4-F2B-AIR-U=), on page 54
- Installing the Cisco NCS 560 Router Vertically, on page 67
- Attaching the Cable Management Brackets, on page 74
- Installing the Chassis Ground Connection, on page 75
- Installing the Power Supply, on page 78
- Installing the Fan Trays, on page 89
- Removing and Replacing the Fan Trays, on page 93
- RSP Installation, on page 94
- Removing the IM Center Brackets, on page 97
- Interface Module Installation, on page 98
- Hot-Swapping an RSP or Interface Module, on page 100
- Installing Dust Caps, on page 101
- Securing the Cables Around the Cable Management Brackets, on page 102
- Connecting the Router to the Network, on page 104

Prerequisites

Before installing the Cisco NCS 560-4 Router, it is important to prepare for the installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOP). For more information, see the *Preparing for Installation* section.
- Unpacking and inspecting the Cisco NCS 560-4 Router
- Gathering the tools and test equipment required to properly install the Cisco NCS 560-4 Router

Installing the Router in a Rack

The following sections describe how to install the Cisco NCS 560-4 Router in a rack:

The chassis is shipped with mounting brackets that can be installed on the front of the chassis. To install the brackets:

Note Mounting brackets are not required if the router is mounted on a 19-inch EIA rack.

Procedure

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

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 6.2 in.-lb (0.7 N-m).

The following figures show how to attach the brackets on the Cisco NCS 560-4 Router for a ETSI rack and a 23-inch EIA rack.

While installing reverse air flow, use the N560-4-O-BRCKT.

Figure 15: Installing the Mounting Brackets for n ETSI Rack

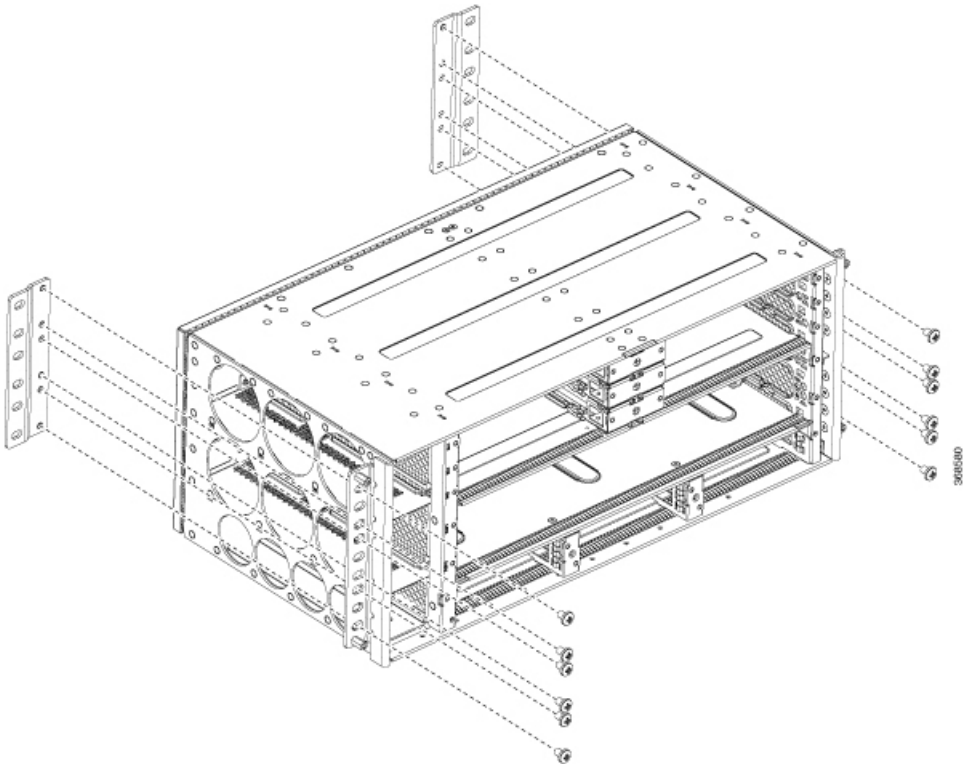
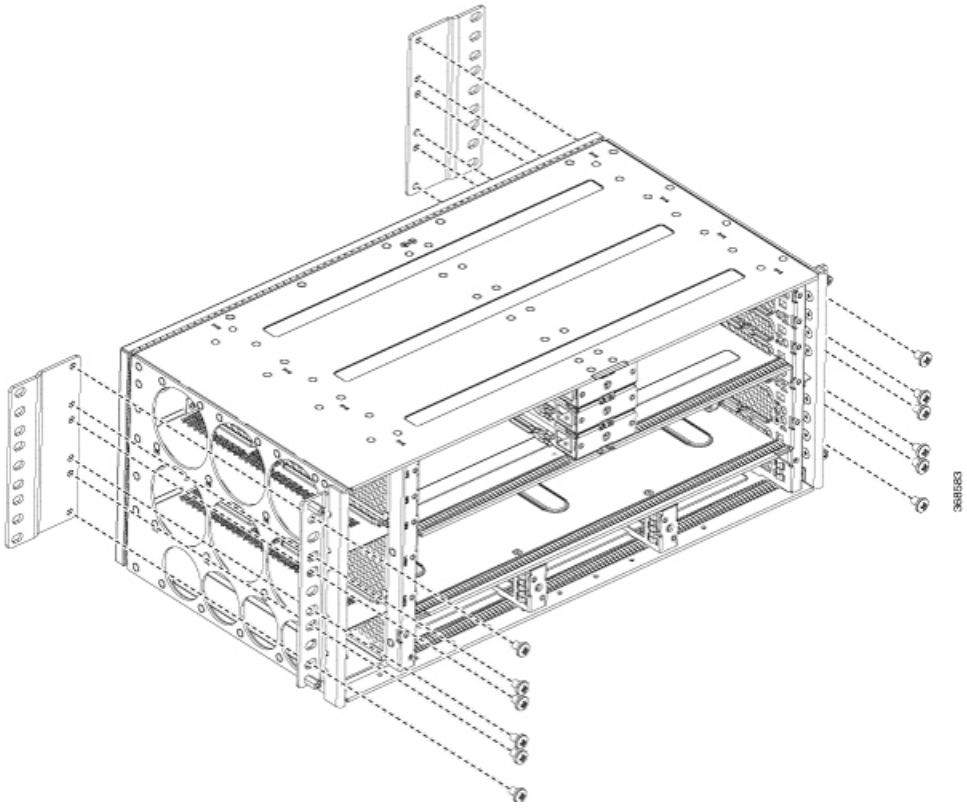


Figure 16: Installing the Mounting Brackets for the 23-inch EIA Rack



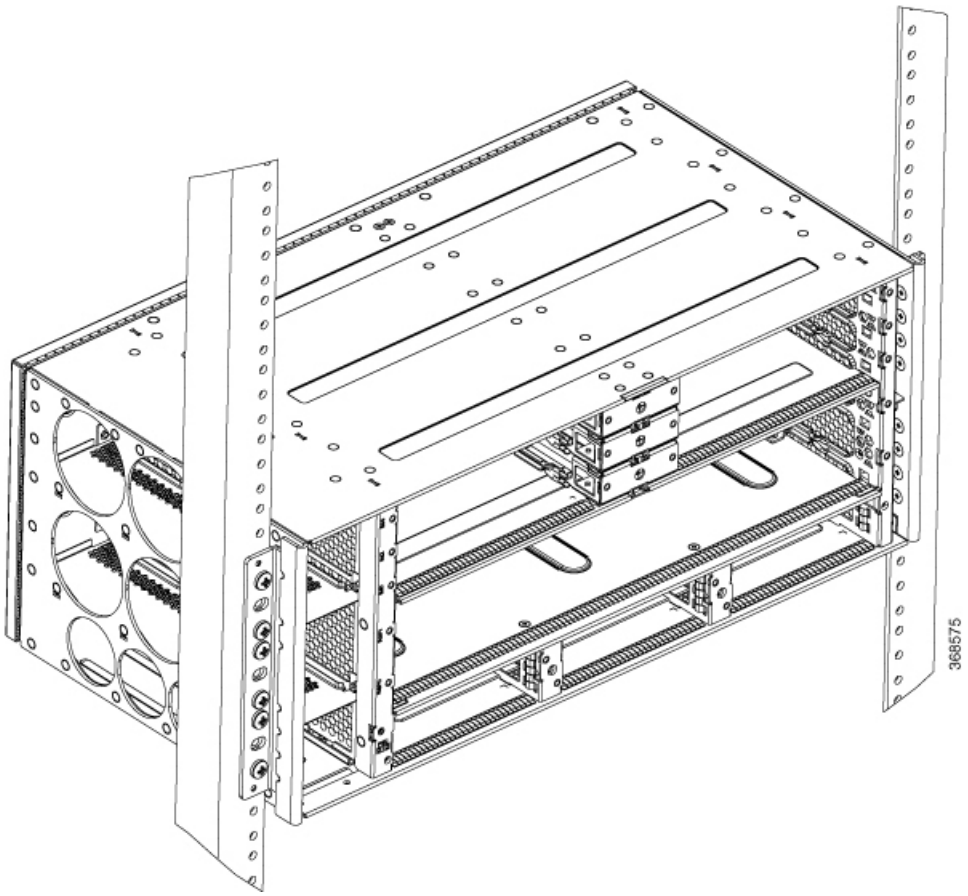
Step 4 Position the chassis in the rack as follows:

- 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 5 Align the mounting holes in the bracket with the mounting holes in the equipment rack.

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.

Figure 17: Mounting the Router on a 19-inch EIA Rack



Note
The router can be mounted in an ETSI rack but the required bend radius for the cables and fibers within the 300 mm ETSI specification cannot be maintained.

If you want to mount the router in ETSI cabinets, you need to have a custom-made cabinet front door to meet the fiber bend radius requirement.

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

Step 7 Use a tape measure and level to verify that the chassis is installed straight and level.

Assembling the Plenum (N560-4-F2B-AIR-U=)

The plenum allows the air around the router to be distributed evenly.

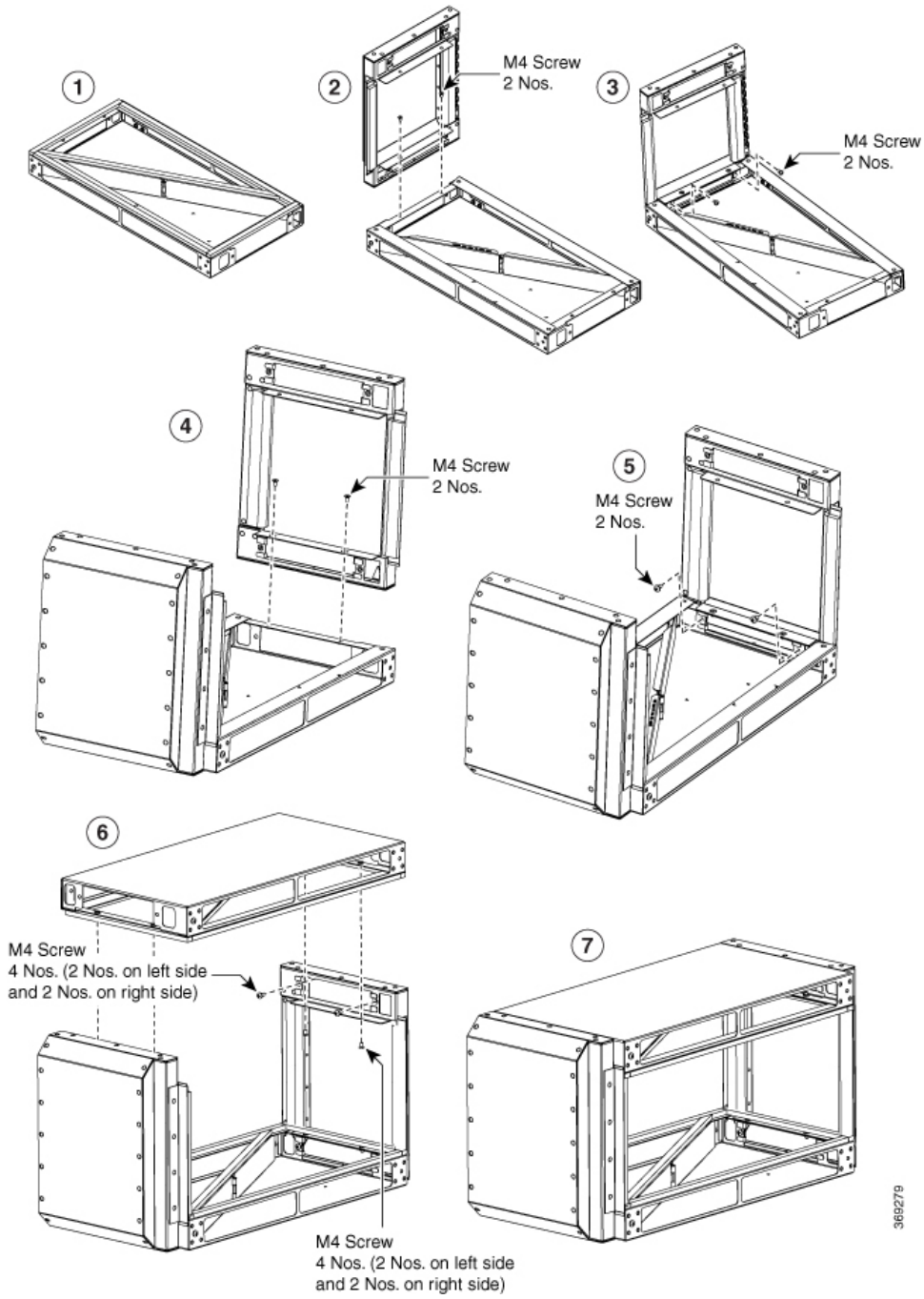
Note If a plenum is to be installed on the rack, ensure that it is first assembled before it is mounted on the rack.

Note Installing the chassis in a plenum changes the air flow direction from right-to-left of router to front-to-back of the router. When the router is used with N560-4-PWR-FAN-R and N560-4-FAN-R fan modules, plenum is not supported.

Procedure

Step 1 Refer to the figures below to assemble the plenum. Secure all screws using a torque of 11.5 in.-lb (1.3 N-m).

Figure 18: Assembling the Plenum

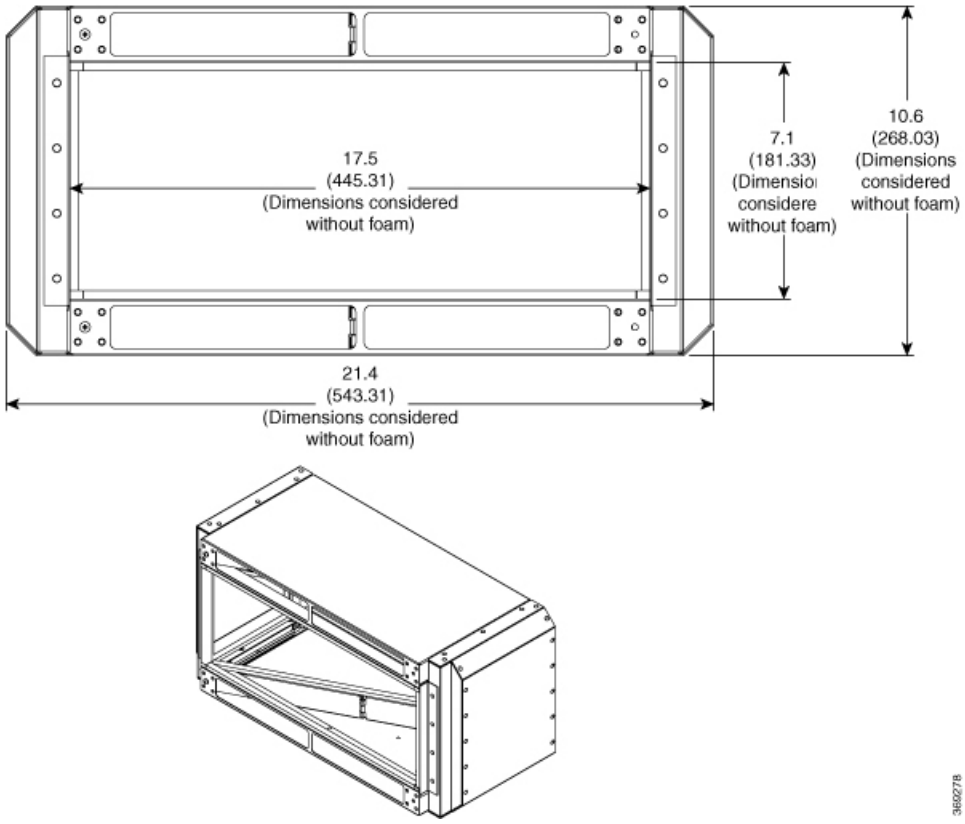


1 Air Plenum	2 Left Cover
3 Tighten Left Cover	4 Right Cover
5 Tighten Right Cover	6 Top Cover

Tighten Top Cover	

Step 2 The assembled plenum has the dimensions as shown in the figure below.

Figure 19: Dimensions of the Assembled Plenum



Installing the Plenum on the Rack When Router is Not Installed on the Rack

This procedure talks about installing the plenum when the router is *not* installed on the rack.

Procedure

Step 1 Identify the correct brackets to the plenum.

Step 2 Depending on the rack on which you are installing the plenum, identify the appropriate screws to the plenum as shown in the figures below.

Figure 20: Plenum Brackets for Installation on 19-inch Rack

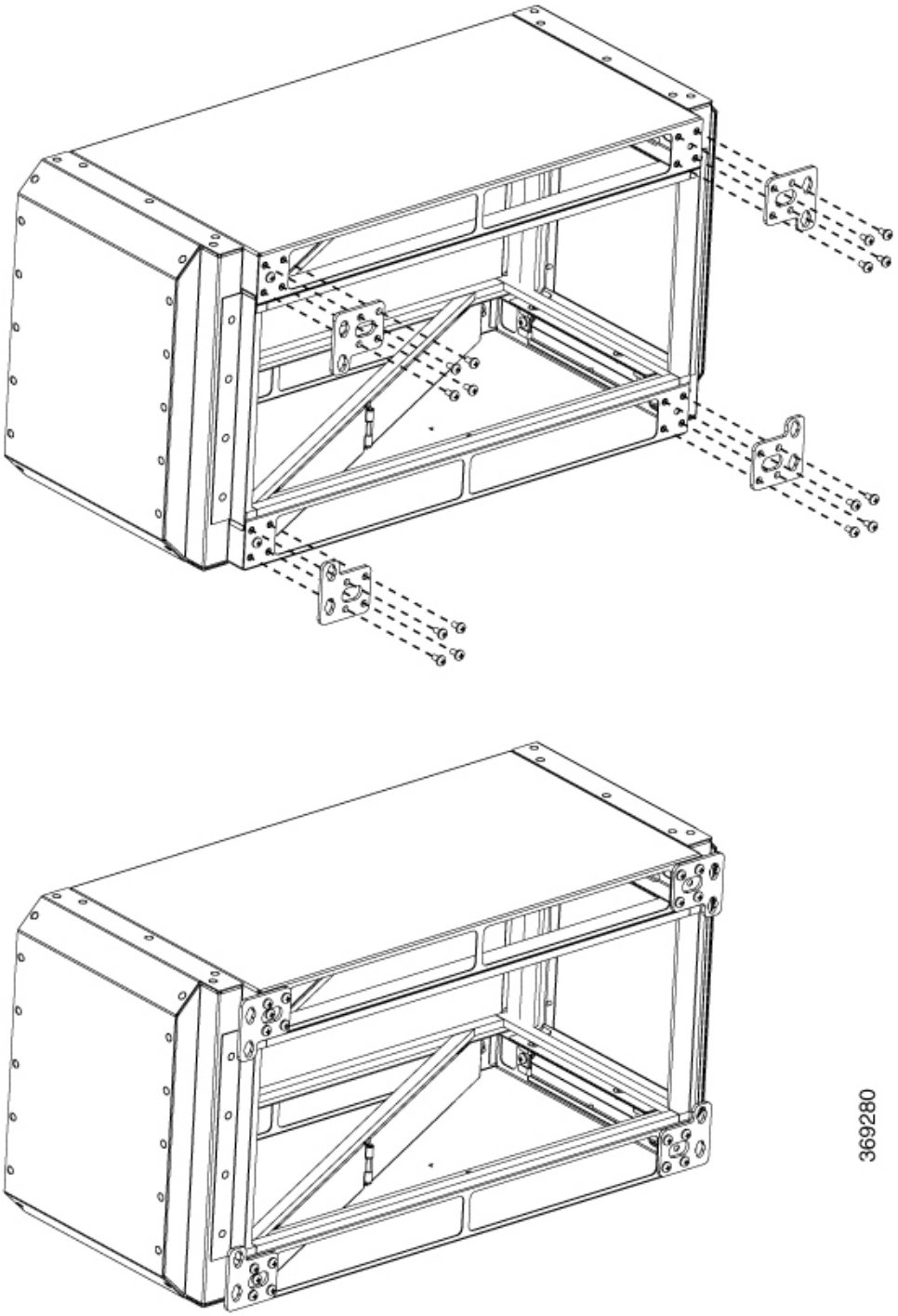


Figure 21: Plenum Brackets for Installation on 21-inch Rack

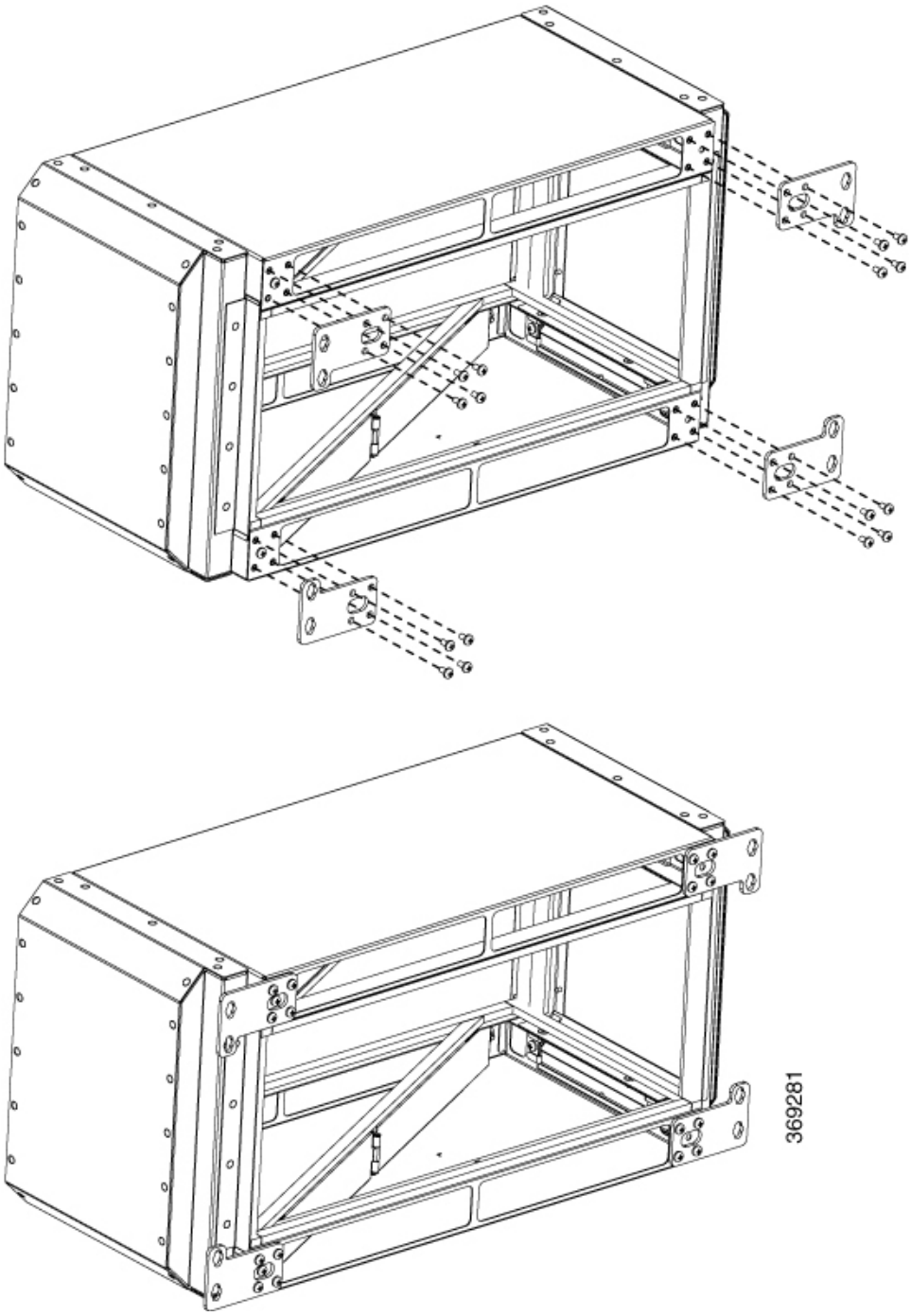
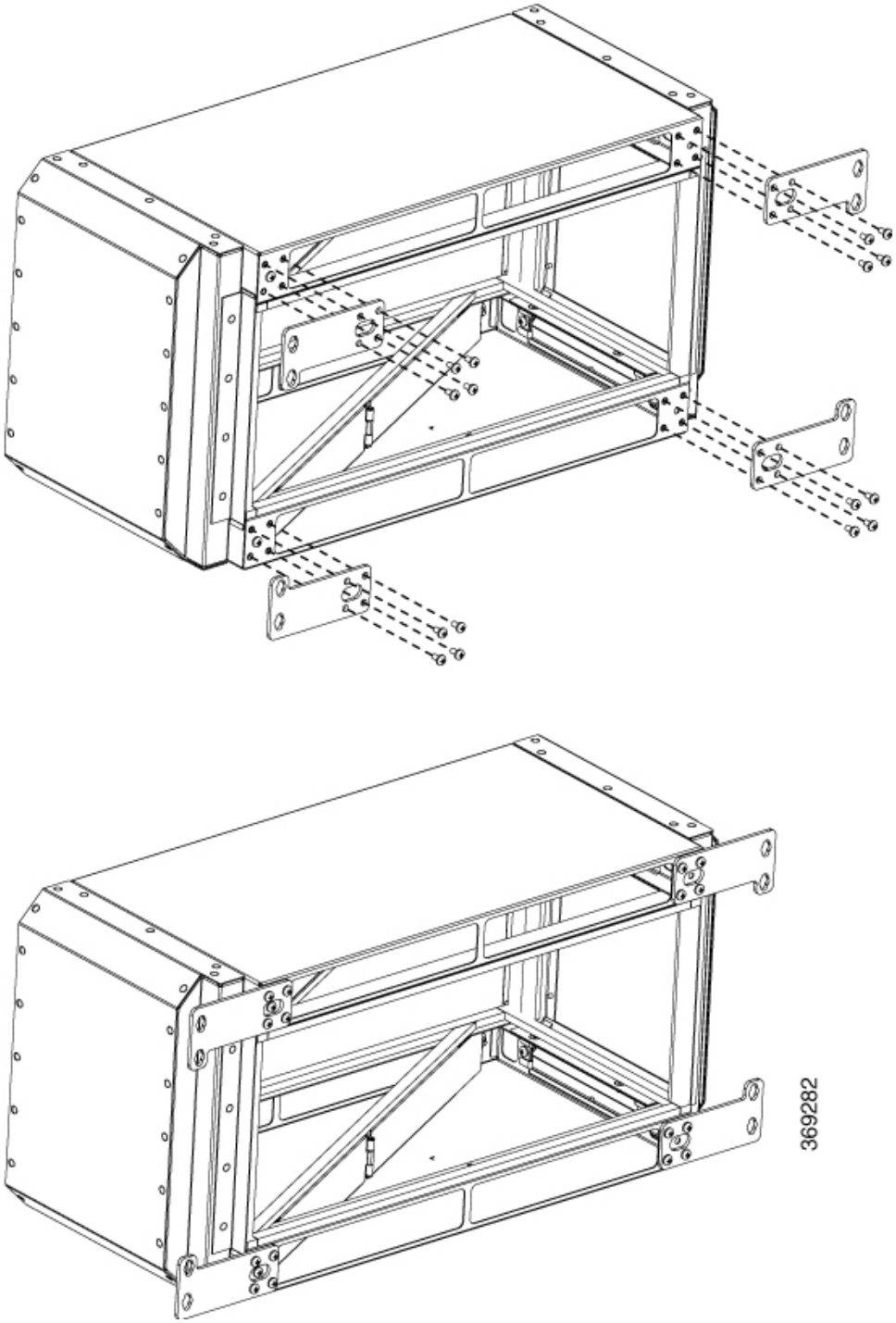


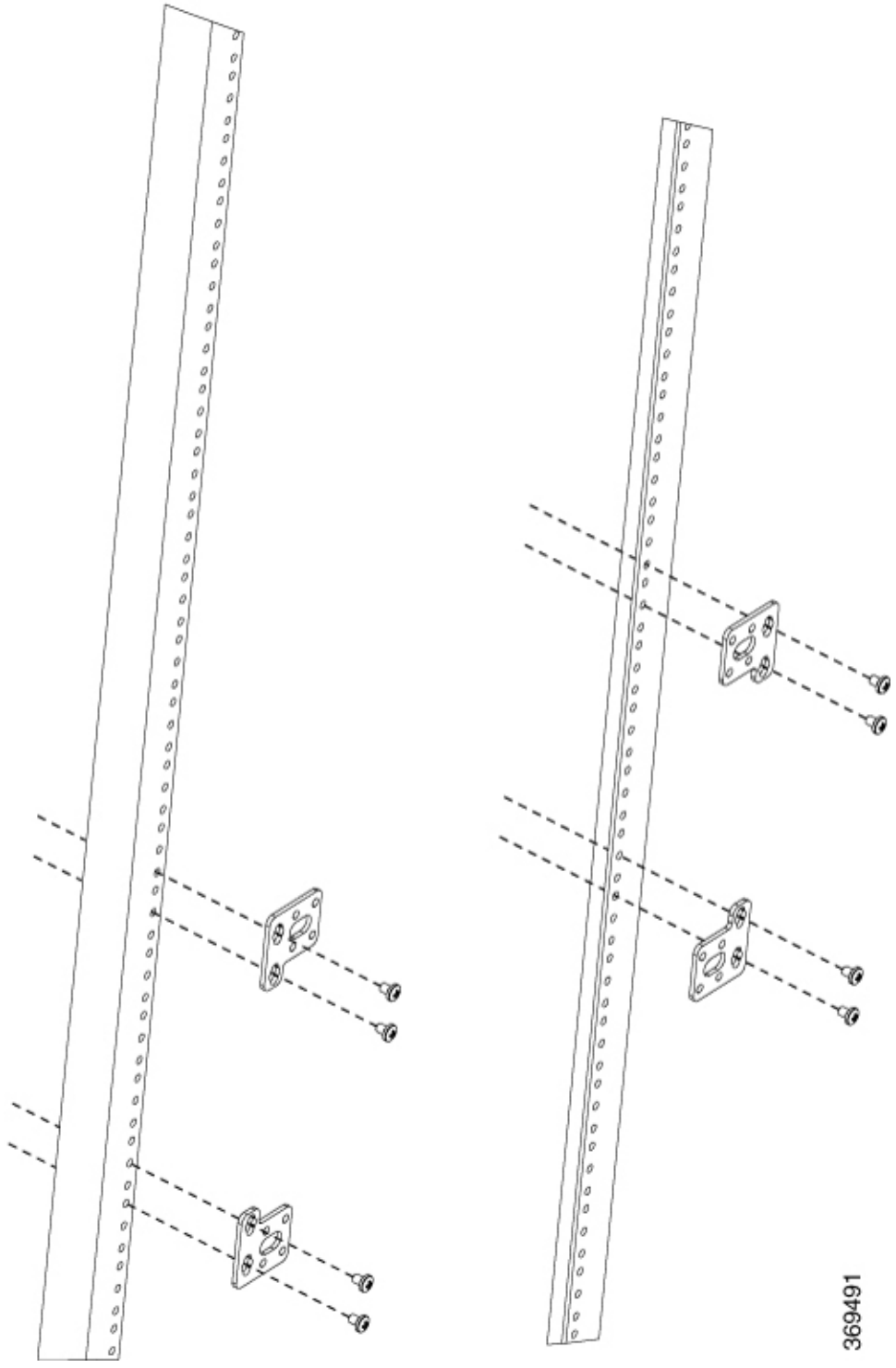
Figure 22: Plenum Brackets for Installation on 23-inch Rack

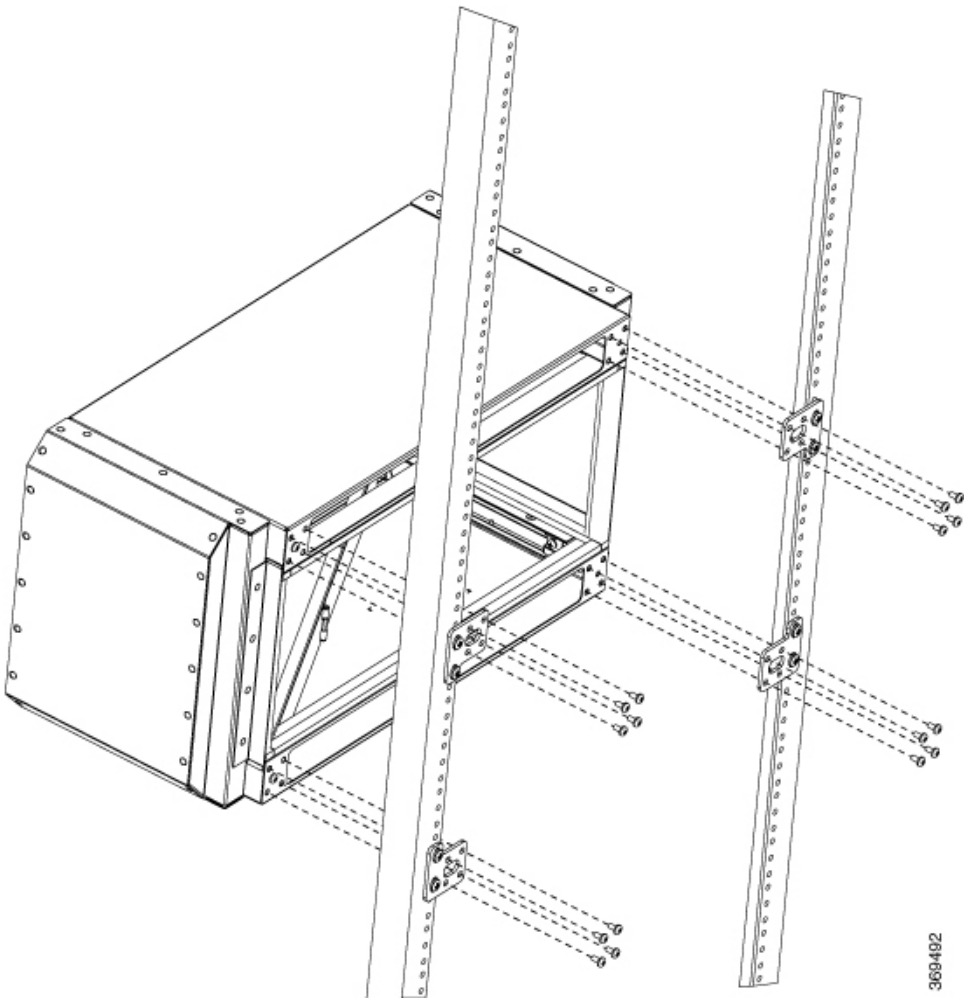


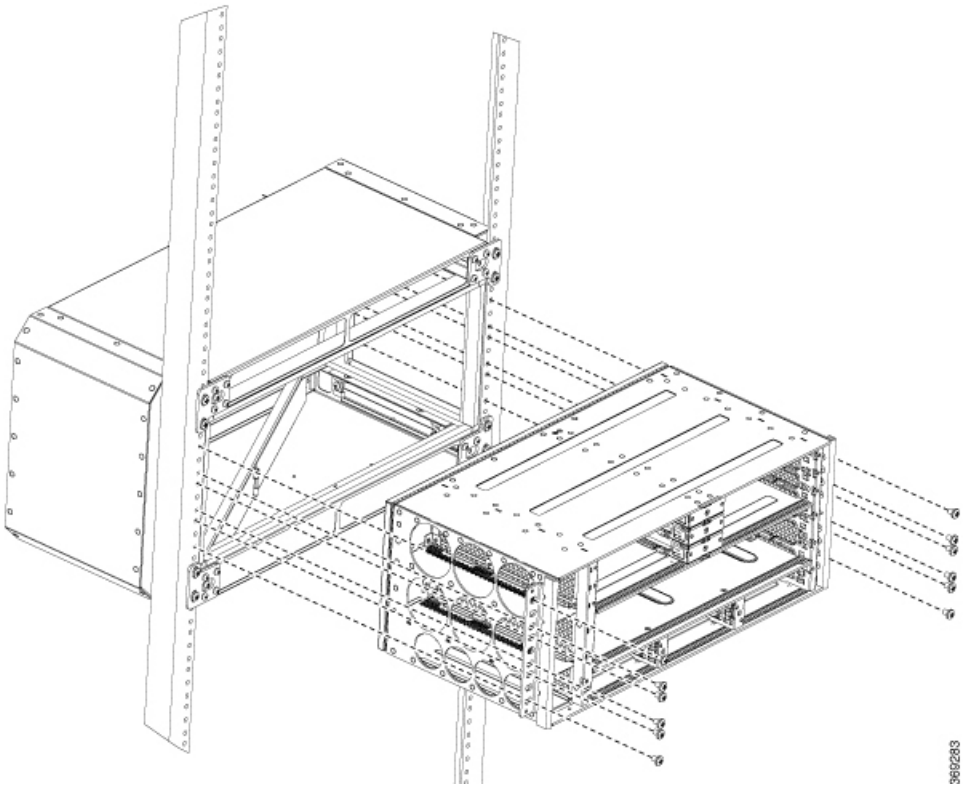
Step 3 Secure the plenum using appropriate bracket on the rack.

Step 4 Install the router in the plenum as shown in the figure below.

Figure 23: Assembling the Plenum and Router on the Rack

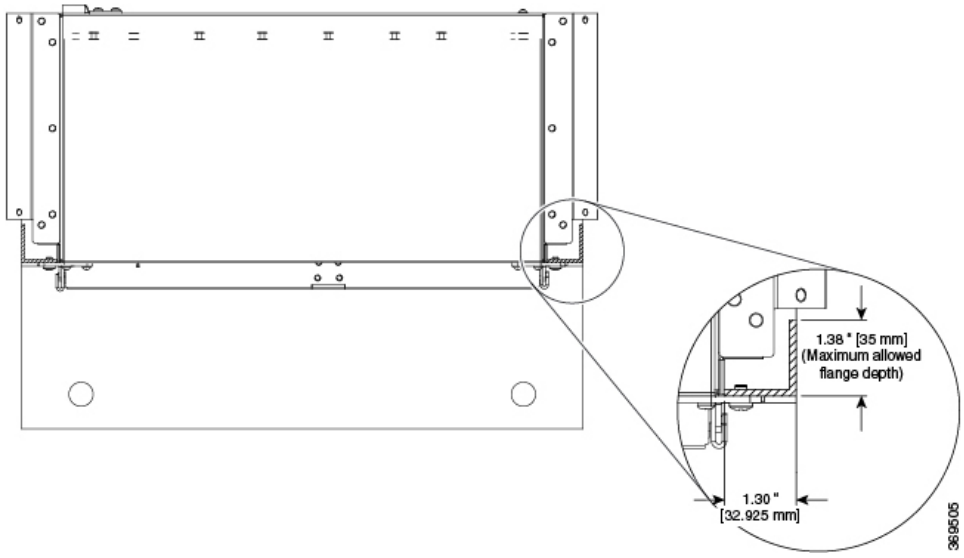



369492



Ensure that the rack post flange dimensions are maintaned as shown in the figure below.

Figure 24: Rack Post Flange Dimensions



Installing the Plenum on the Rack When Router is Installed on the Rack

This procedure talks about installing the plenum when the router is *already* installed on the rack.

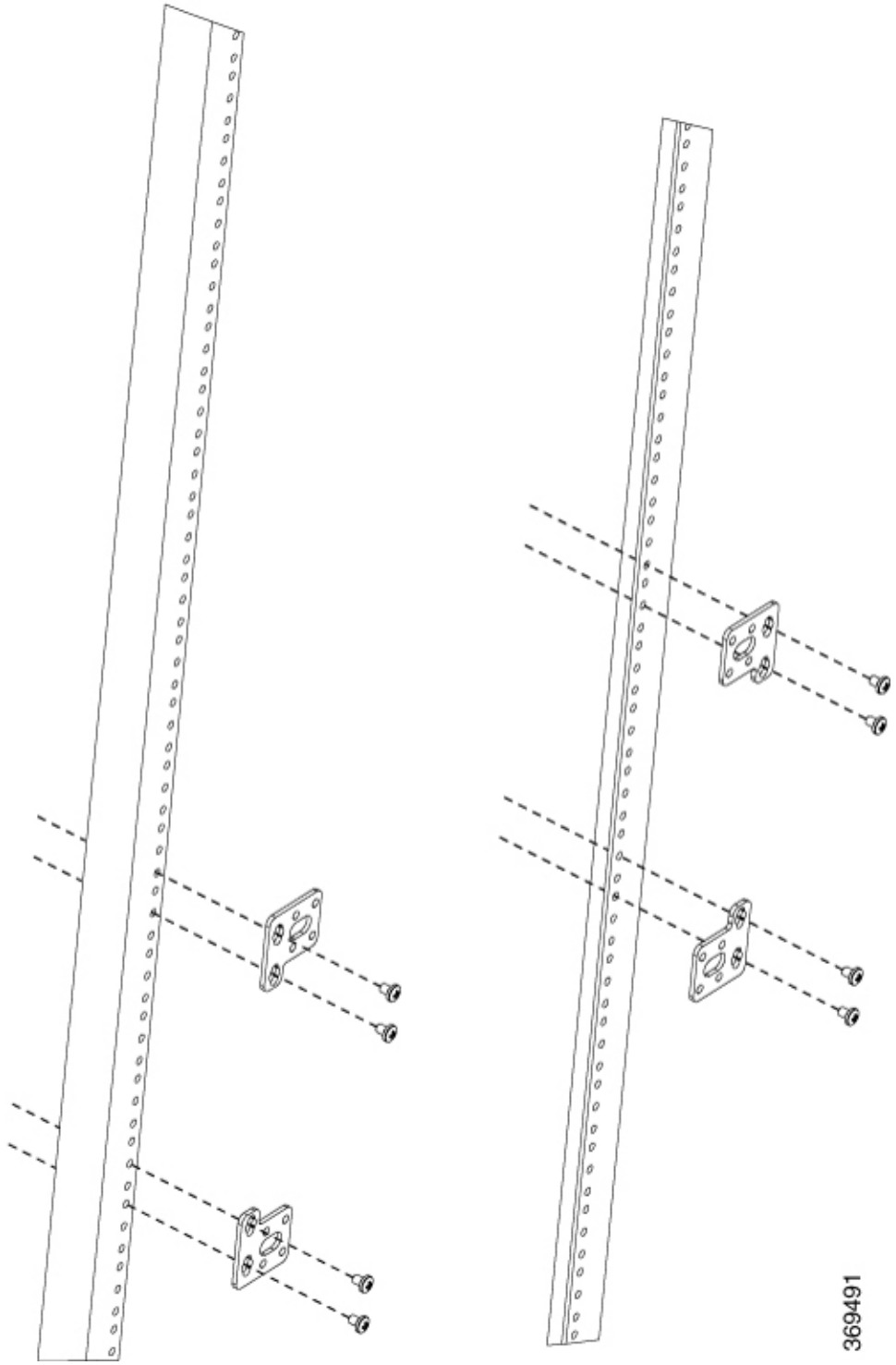
Procedure

Step 1 Identify the type of rack (19-inch, 21-inch, or 23-inch) on which the router is already installed.

Step 2 Use the assembled plenum as as shown in the figure below.

Step 3 Use the appropriate bracket for the rack and attach the brackets.

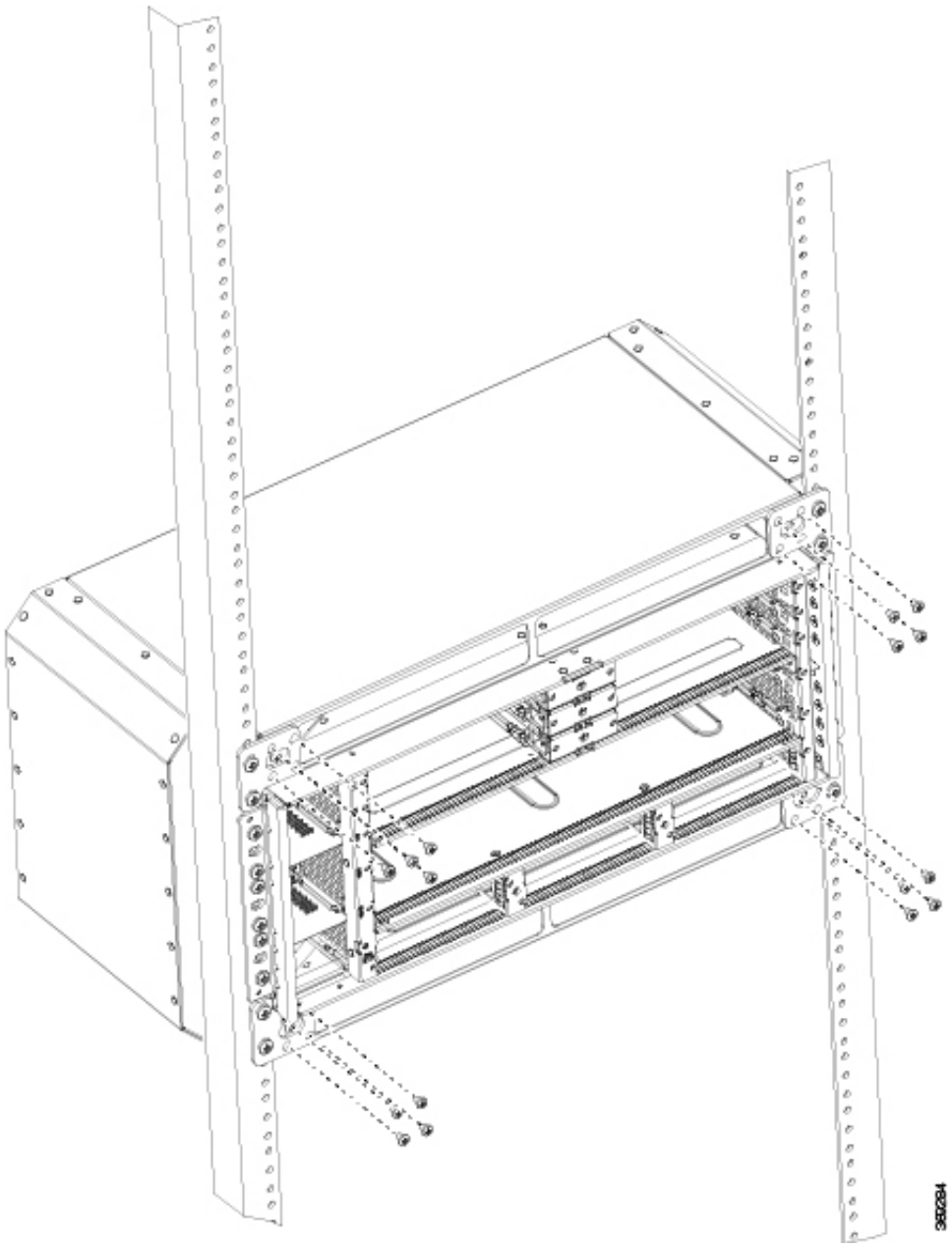
Figure 25: Attaching the Brackets on the Rack



Step 4 Slide the plenum over the router as shown in the figure below.

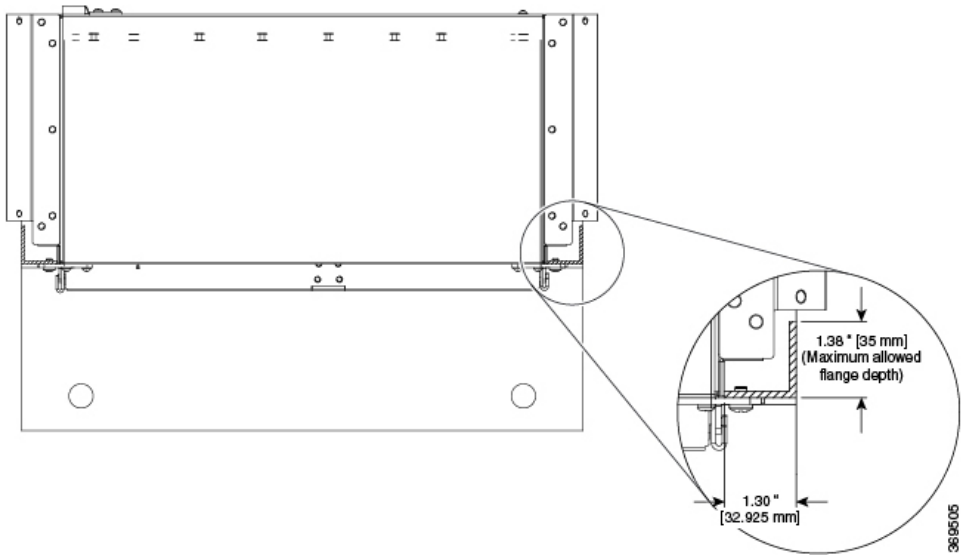
Step 5 Using the screws that came with the bracket, secure the plenum to the rack.

Figure 26: Installing the Plenum Around the Router



Ensure that the rack post flange dimensions are maintaned as shown in the figure below.

Figure 27: Rack Post Flange Dimensions



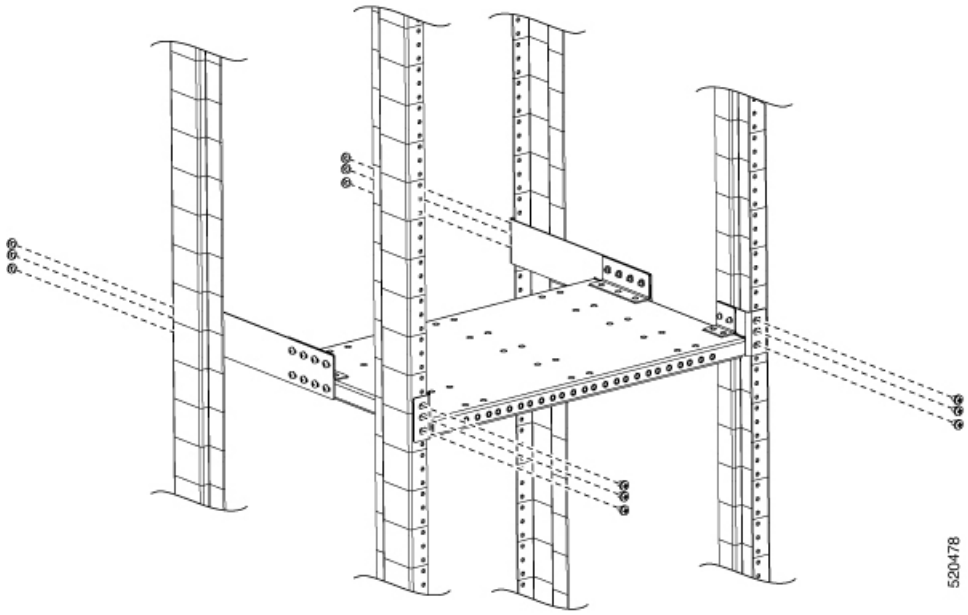
Installing the Cisco NCS 560 Router Vertically

Procedure

Step 1 Install the bottom support tray at the desired height on your ANSI 19-inch rack.

Step 2 Secure the tray to the rack using the rack-mount fasteners appropriate for your rack. Use the optimal torque prescribed for the fasteners. See the figure below.

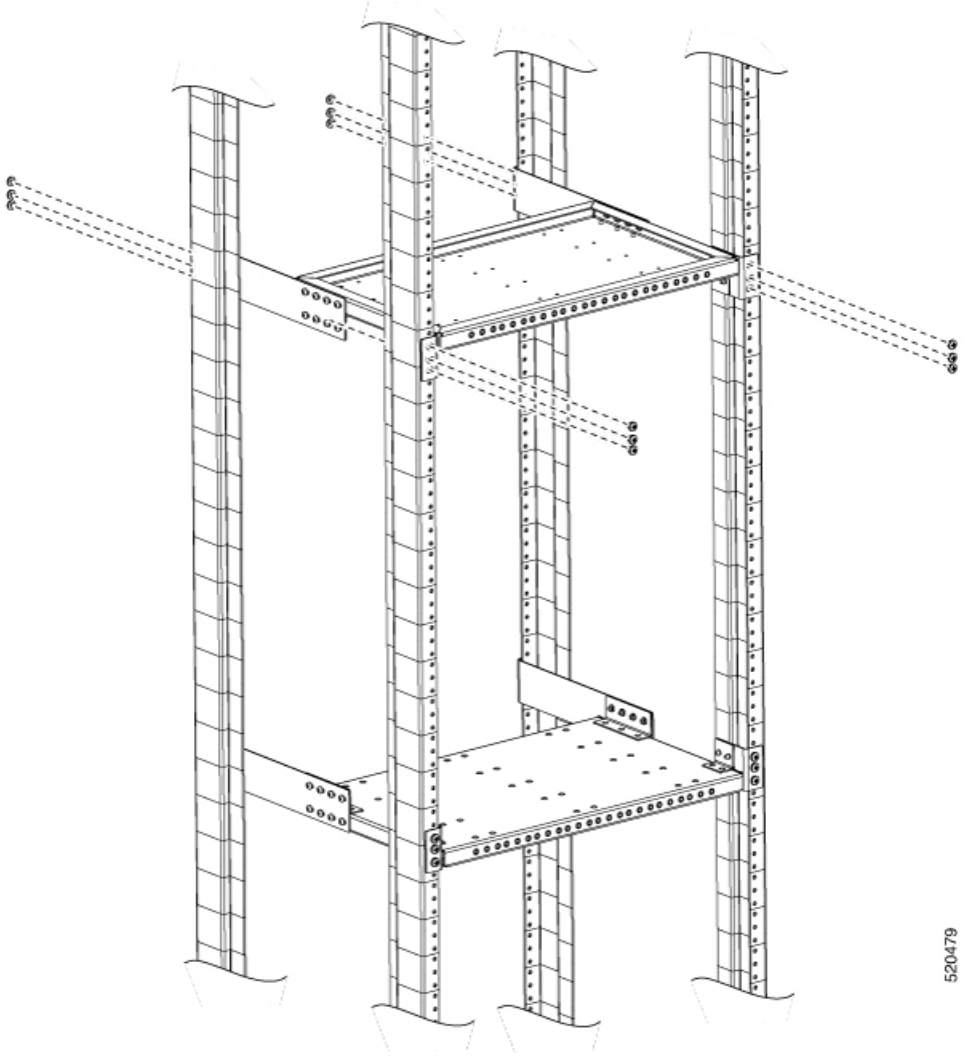
Figure 28: Assembling the Bottom Support Tray of the Plenum



Step 3 Install the top support tray at a height of 23.70 inches from the bottom tray.

Step 4 Secure tray to the rack using the rack-mount fasteners appropriate for your rack. Use the optimal torque as prescribed for the fastener. See the figure below.

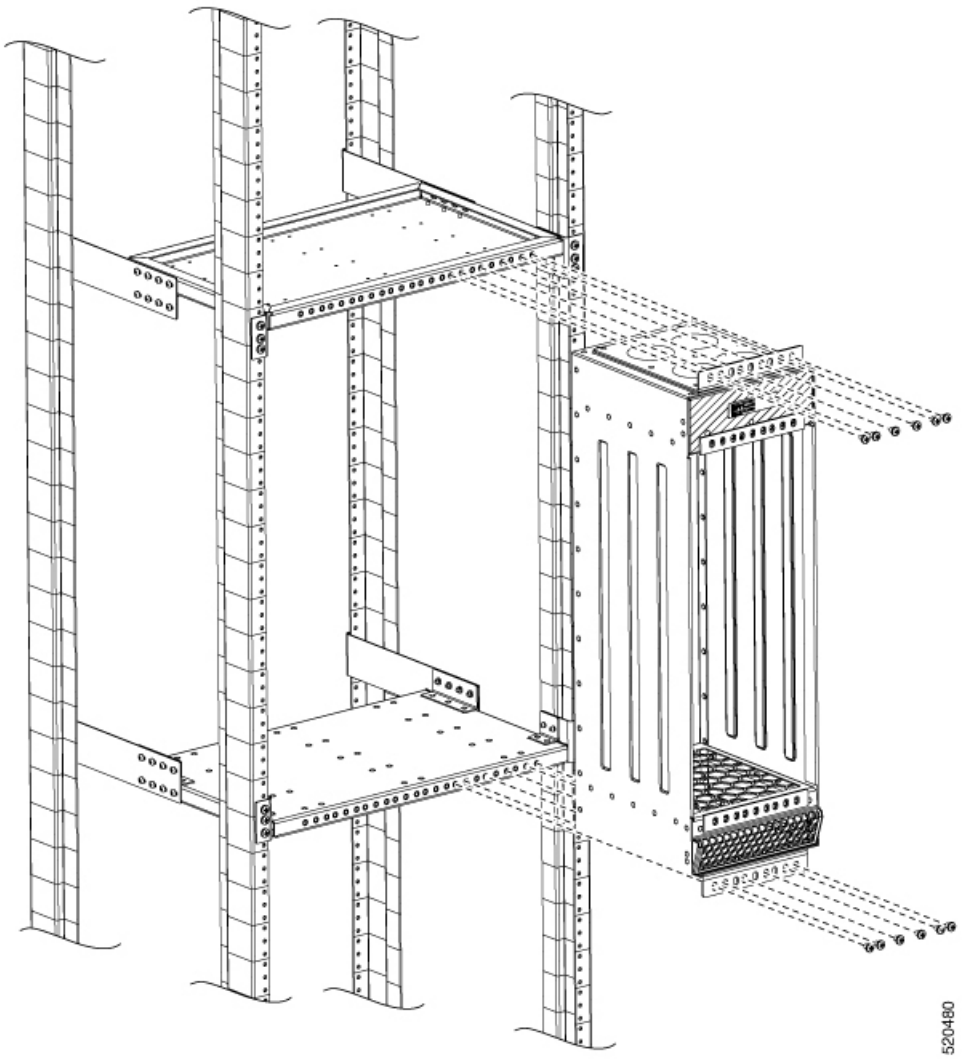
Figure 29: Assembling the Top Support Tray of the Plenum



Step 5 Assemble the vertical plenum into the slot between top and bottom support trays.

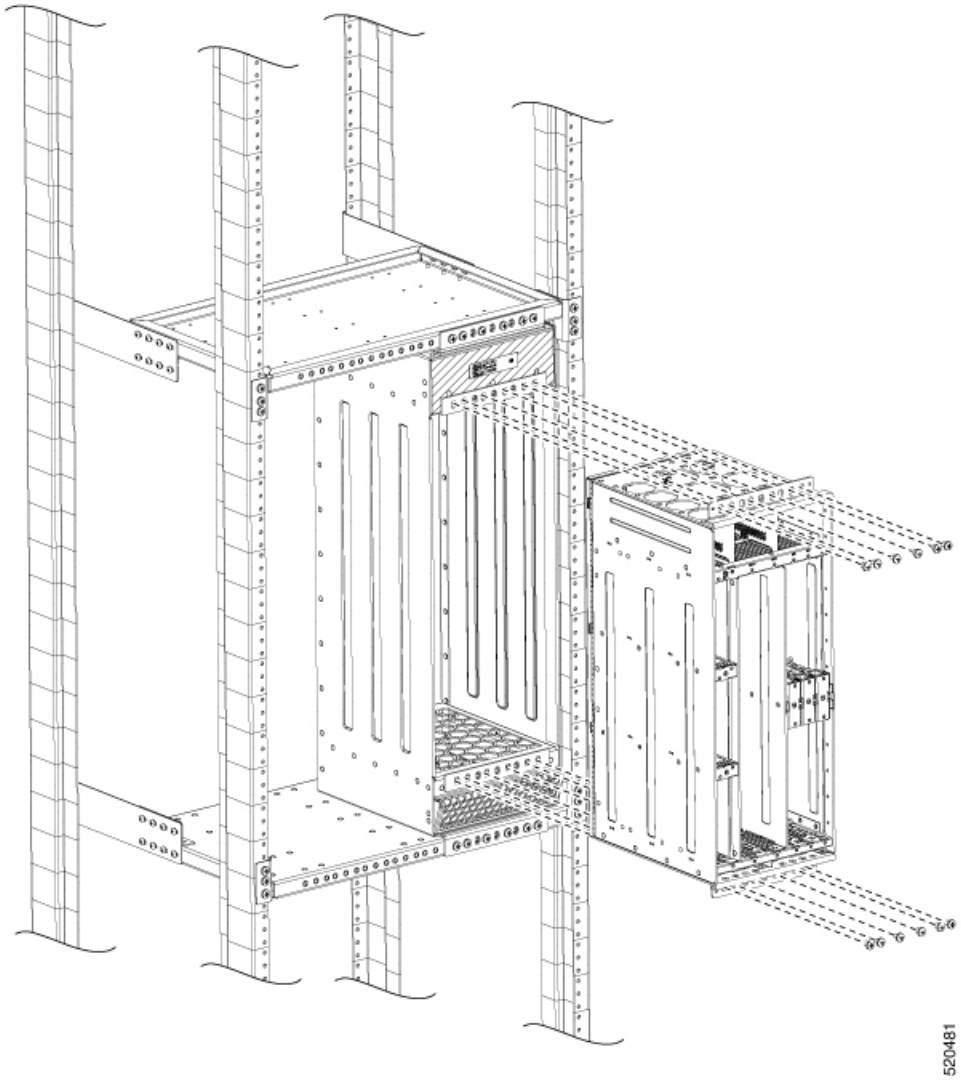
Step 6 Secure the plenum on to the trays using minimum four screws on every side. Use a torque of 25 in-lbs.

Figure 30: Assembling the Vertical Plenum Between the Support Trays



Step 7 Install the empty Cisco NCS 560 router into the vertical plenum using minimum four screws on both sides. Use a torque of 25 in-lbs.

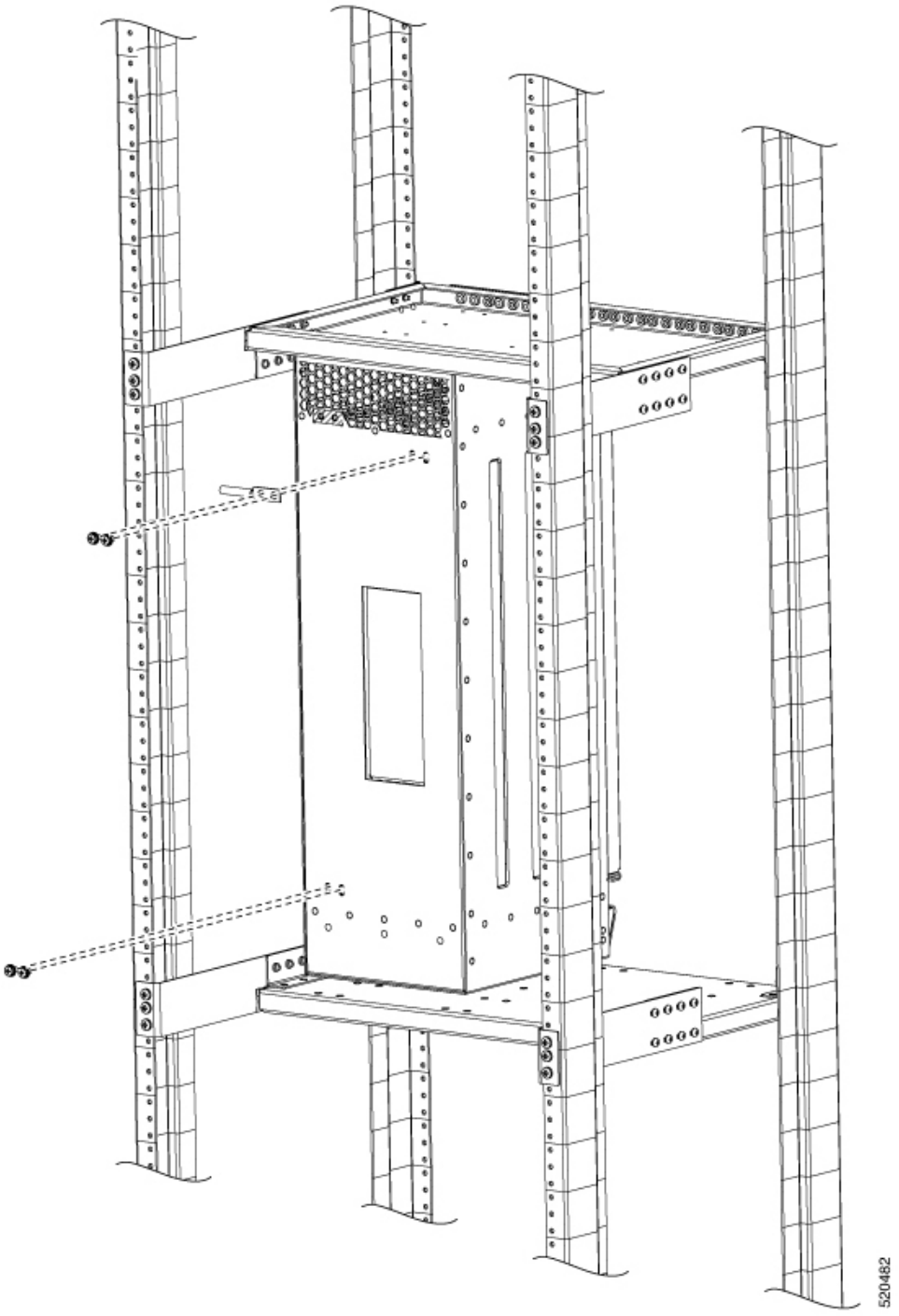
Figure 31: Installing the Router in the Plenum



Step 8 Secure the grounding lugs. Ground screws are provided as part of the router accessories kit.

Note
The Cisco NCS 560 router provides three locations for the gounding lug. Use the location that best suits your installation requirements. The following figure shows one such location.

Figure 32: Installing the Grounding Lug



Step 9 The plenum vertical support brackets are designed to handle two plenum assemblies. Follow steps 1-8 to assemble a second plenum, if required.

Figure 33: Rack with Two Plenum Vertical Assemblies

Attaching the Cable Management Brackets

The router supports the following bracket:

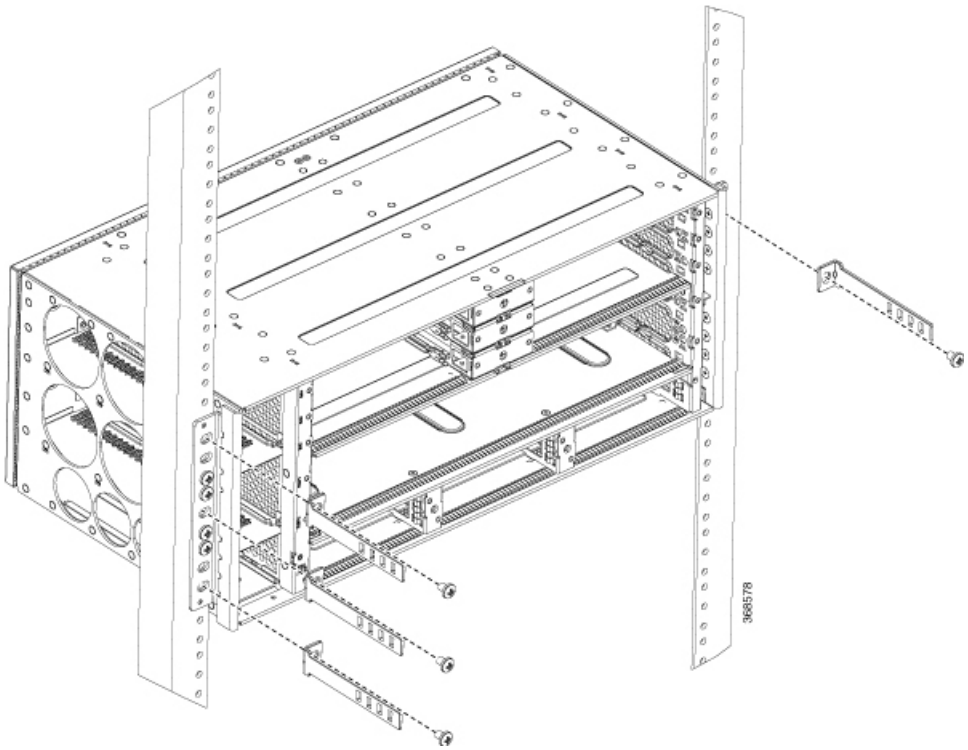
- N560-4-CAB-BRCKT —This bracket helps in routing the cables from the interface modules, router switch processors (RSPs), and power supply units; thereby enabling a proper cable bending radius.

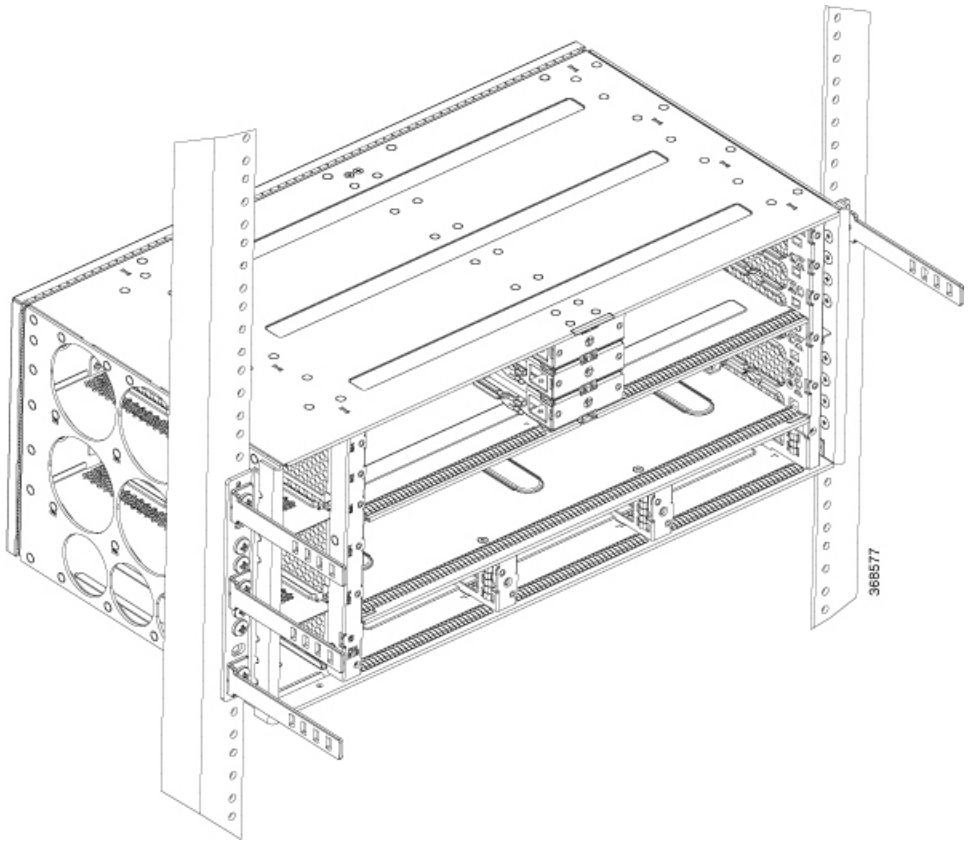
Note You can install the cable brackets along with the rack mount screws while installing the chassis. Or, you can install the cable brackets after the chassis is monted on the rack. However, ensure the brackets are positioned such that they aid cable routing and provide enough slack for fan trays and air filter removal.

Procedure

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

Figure 34: Attaching Cable Management Brackets to the 19-inch Rack





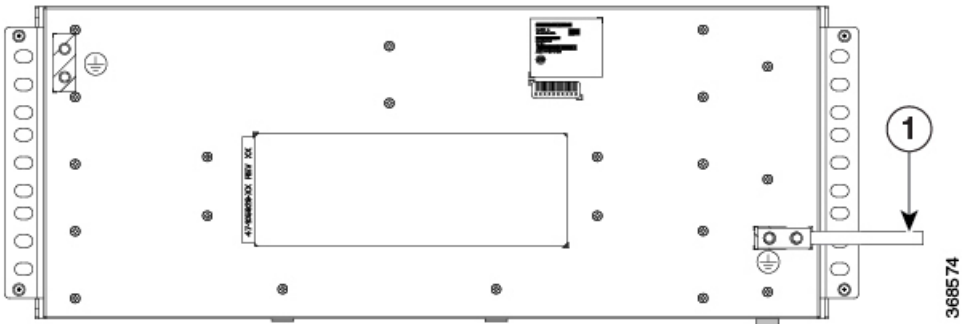
Step 2 Secure the cable management brackets with four M4 screws. The recommended maximum torque is 10 in.-lb (1.12 N-m).

Installing the Chassis Ground Connection

Before you connect the power or turn on the power to the Cisco NCS 560-4 Router, you must provide an adequate chassis ground (earth) connection to your router.

This section describes how to ground the Cisco NCS 560-4 Router. The router provides two locations for attaching a 2-hole grounding lug according to the rack-mounting brackets you use to install the router.

Figure 35: 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

Caution Ensure that you secure the lugs only with the Cisco-provided screw or a Phillips head screw with an integrated washer of 10-32 x 0.3125 inch. Secure the screws only while assembling the lugs.

- Crimping tool as specified by the ground lug manufacturer
- 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 560-4 Router, ensure that you disconnect the power at the circuit breaker. Otherwise, severe injury to you or damage to the router may occur.

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

Warning Use copper conductors only. Statement 1025

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

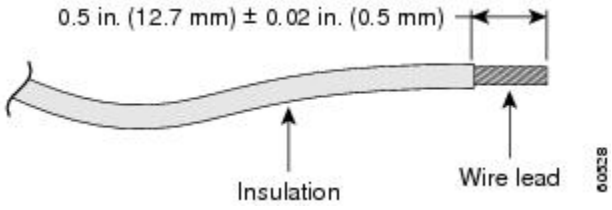
This unit is to be installed in a restrictive access location and must be permanently grounded to minimum 6 AWG copper ground wire.

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

Procedure

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

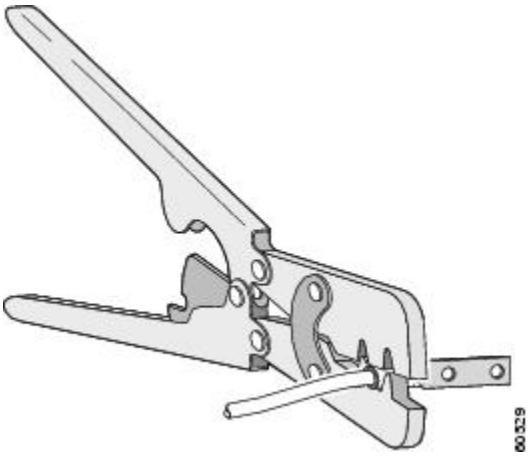
Figure 36: Stripping a Ground Wire



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

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

Figure 37: Crimping a Ground Lug onto the Ground Wire



Step 4 Use a Phillips head screwdriver to attach the 2-hole ground lug and wire assembly to the router with the 2 pan-head Phillips head screws. For all racks, 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 Power Supply

The Cisco NCS 560-4 Router router provides the choice of three different power supplies—two DC power supplies and one AC power supply:

- 1200 W DC power (N560-PWR1200-D-E and A900-PWR1200-D): - 40.8VDC to -72VDC

  The A900-PWR1200-D DC power supply uses 3 position terminal block-style connector with positive latching/securing and labeled connections for RTN and 48V.

  The N560-PWR1200-D-E DC power supply uses 2 position terminal block-style connector with positive latching/securing and labeled connections for RTN and 48V.

  The terminal block connector is of suitable size to carry the appropriate AWG wire size (6AWG to 14 AWG) to handle the input current of the power supply. No ON/OFF switch is provided.

- AC power (A900-PWR1200-A): 85VAC to 264VAC

  The AC power supply has an IEC-320-C21-type power receptacle and a 20 A service connector. You can use standard right-angle power cords with the AC power supply. The power supply includes a power cord retainer. No ON/OFF switch is provided.

Caution Unseat the power supply partially so that there is enough space to open the terminal block cover. 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 single primary input power connection. The router supports (2+1) redundancy.

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

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

Caution Do not use 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 560-4 Router, 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 NCS560-4 Router based on a given configuration of the router. Determining power requirements is useful for planning the power distribution system needed to support the router.

Power Connection Guidelines

This section provides guidelines for connecting the Cisco NCS 560-4 Router power supplies to the site power source.

Note Under light load conditions, the load sharing among the system power supplies may not be even. However, unequal load sharing does not impact the redundancy performance of the power supply modules.

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

Note The previous statement is applicable only to the AC power supplies.

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

Guidelines for DC-Powered Systems

Basic guidelines for DC-powered systems include the following:

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

Guidelines for AC-Powered Systems

Basic guidelines for AC-powered systems include the following:

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

Installing the N560-PWR1200-D-E DC Power Supply Module

The following sections describe how to install a DC power supply in the Cisco NCS 560-4 Router:

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

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.

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

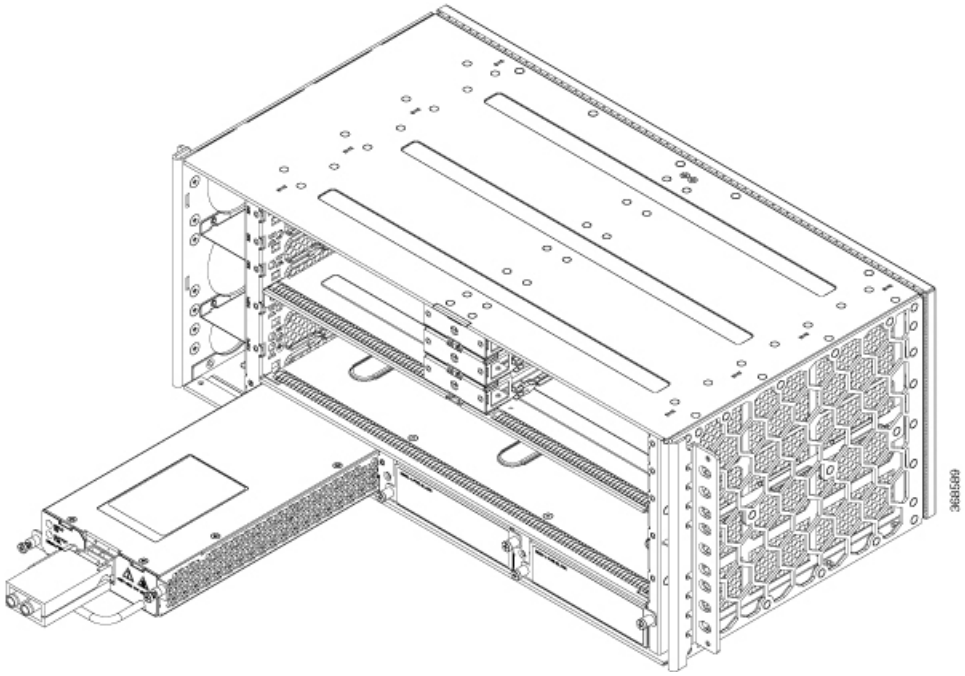
Step 3 If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.

Step 4 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.

Note
The power supplies do not have a power switch. This step is performed at the power input end.

Step 5 Grasp the power supply handle with one hand. Place your other hand underneath the power supply. Slide the power supply into the power supply slot, but do not seat the power supply completely. Provide ample room for the terminal block cover to be opened completely for the installation of the lugs.

Figure 38: Inserting the N560-PWR1200-D-E Power Supply



Step 6 Locate the terminal block plug on the power supply unit.

Step 7 Flap open the front protective cover on the power supply unit.

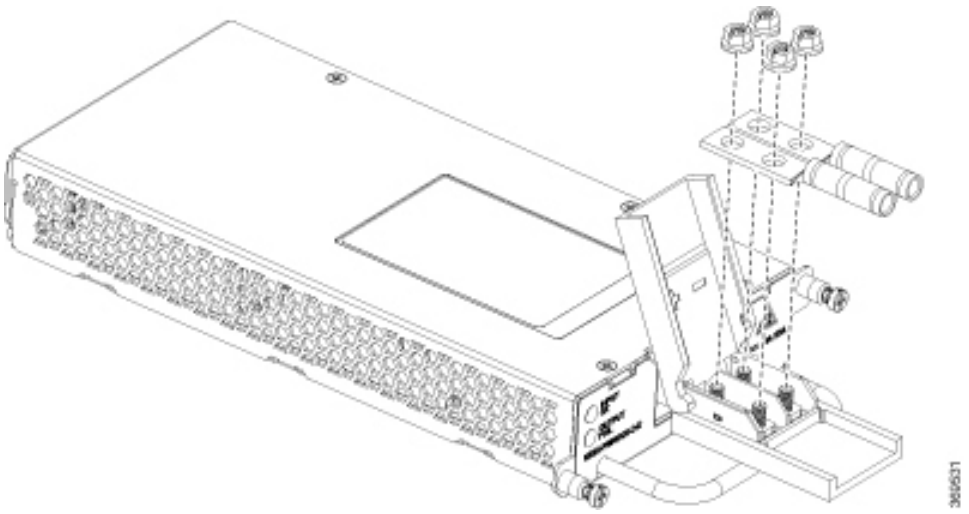
Step 8 Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source as recommended by the lug manufacturer. See steps 1 to 3 of Installing the Chassis Ground Connection, on page 75 for information on stripping and crimping the ground wires.

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

Step 9 Identify the positive and negative feed positions for the terminal block. The recommended wiring sequence is to connect the negative lead wire and then the positive lead wire.

Step 10 Attach the lugs on the terminal block, as shown in the figure below.

Figure 39: Wiring Sequence and Attaching the Lugs



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

Step 11 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.

Step 12 Slide the power supply completely until it is firmly seated.

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

Installing the A900-PWR1200-D DC Power Supply Module

The following tools are required:

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

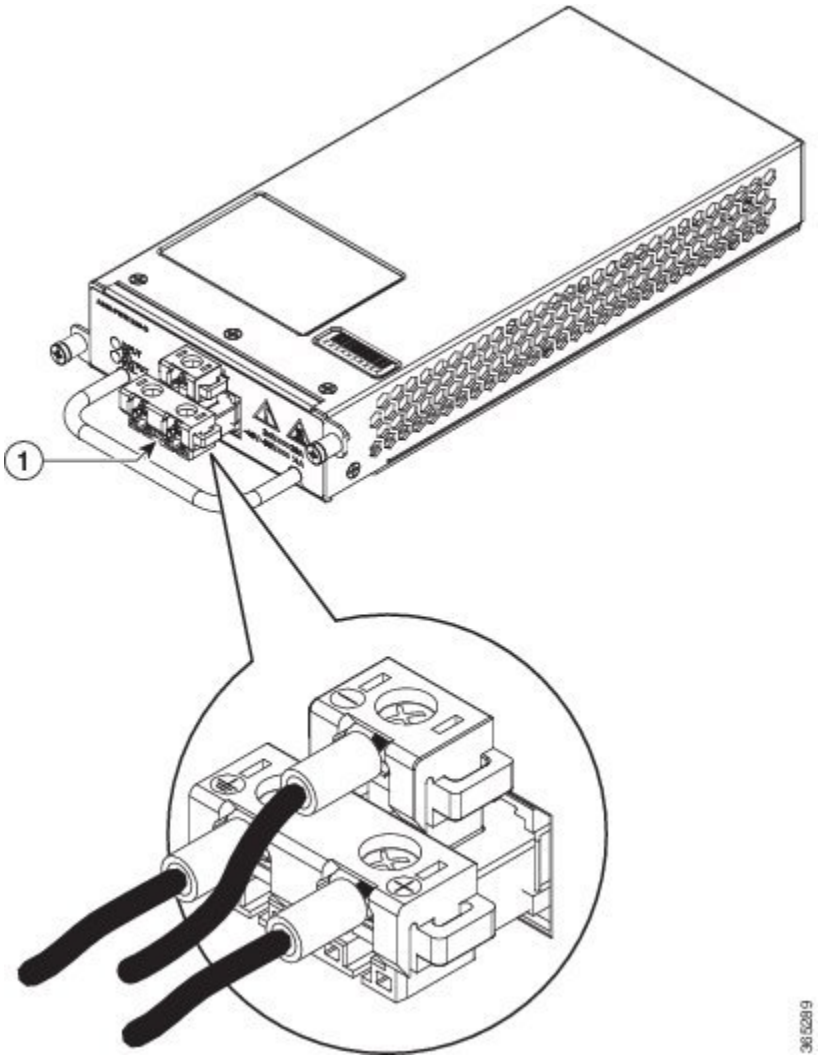
Procedure

Step 1 Follow the steps to remove the power supply unit if installed in the chassis. See the *Removing and Replacing the DC Power Supply* section.

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

Step 3 Locate the T-shaped terminal block plug on the DC power supply unit. See the figure below.

Figure 40: A900-PWR1200-D DC Power Supply



1	T-shaped connector	—	—

Step 4 Use a wire-stripping tool to strip the ends of each of the two wires coming from the DC-input power source to 0.27 inch (6.6 mm) ± 0.02 inch (0.5 mm) and the wire for grounding. Do not strip more than 0.29 inch (7.4 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave behind exposed wire from the terminal block after installation.

Step 5 Use the appropriate crimping tool as suggested by the manufacture.

Step 6 Prepare the cables by attaching the lugs to the cables.

Step 7 Identify the ground, positive, and negative feed positions for the terminal block connection. The recommended wiring sequence is:

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

Step 8 Insert the lugged end of the cables to the connector and secure the cables using the captive screws.

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

Step 9 Ensure that the terminal block plug is fully seated in the terminal block header on the DC power supply panel.

Step 10 Slide the power supply into the chassis until it is firmly seated.

Activating 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 Fan Tray LEDs, on page 129 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 560-4 Router.

Note The Cisco NCS 560-4 router 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 two 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 560-4 Router:

Before you begin

See the table below for OIR parameters for the power supply.

Table 15: Online Insertion and Removal - Parameters

OIR Module	Ambient[14]	Fan Speed	OIR Time	Comments
PSU	40°C	As per the fan algorithm	5 mins	Fans running at normal speed

[14] It is not recommended to perform OIR of any module above 40°C ambient

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 Loosen the captive screws on the DC power supply and pull out the power supply partially so that there is enough space to open the terminal block cover.

Step 4 Open the terminal block cover to unscrew and remove the lugs.

Note
This step does not apply to the A900-PWR1200-D power supply.

Step 5 Grasping the power supply handle with one hand, pull the power supply out from the chassis while supporting it with the other hand.

Step 6 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 N560-PWR-BLANK) over the opening, and secure it with the captive installation screws.

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

Follow these steps to install the power supply module:

Procedure

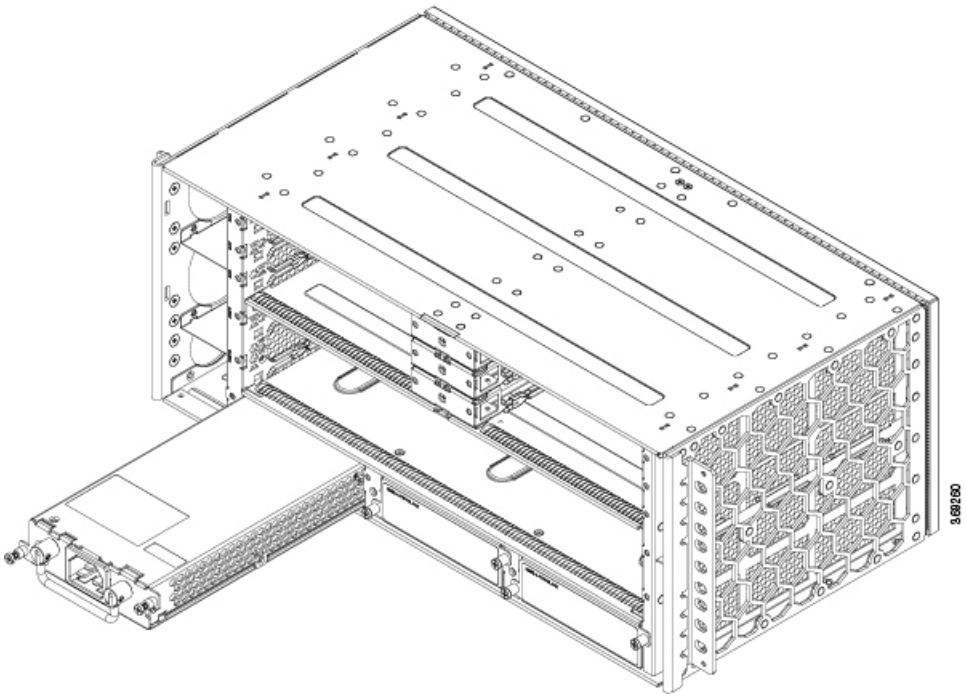
Step 1 Ensure that the system (earth) ground connection has been made. For ground connection installation instructions, see the *Installing the Chassis Ground Connection* section.

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

Step 3 If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.

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 slot. Make sure that the power supply is fully seated in the bay.

Figure 41: Inserting the A900-PWR1200-A 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).

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

Recommended Power Cables

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

PID	Description
PWR-CAB-AC-USA520	US AC Power Cord for Cisco ASR 900, NEMA 5-20
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 ASR 900, 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 for troubleshooting information.

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

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

Removing and Replacing the AC Power Supply

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

Note The Cisco NCS 560-4 Router 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 two 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 AC 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 AC power supply:

Before you begin

See the table below for OIR parameters for the power supply.

Table 17: Online Insertion and Removal - Parameters

OIR Module	Ambient[15]	Fan Speed	OIR Time	Comments
PSU	40°C	As per the fan algorithm	5 mins	Fans running at normal speed

[15] It is not recommended to perform OIR of any module above 40°C ambient

Procedure

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

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

Step 3 Loosen the captive installation screws.

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

Step 5 If the power supply bay is to remain empty, install a blank filler plate (Cisco part number N560-PWR-BLANK) over the opening, and secure it with the captive installation screws.

Installing the Fan Trays

The fan trays are modular units that provides cooling to the Cisco NCS 560-4 Router.

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.

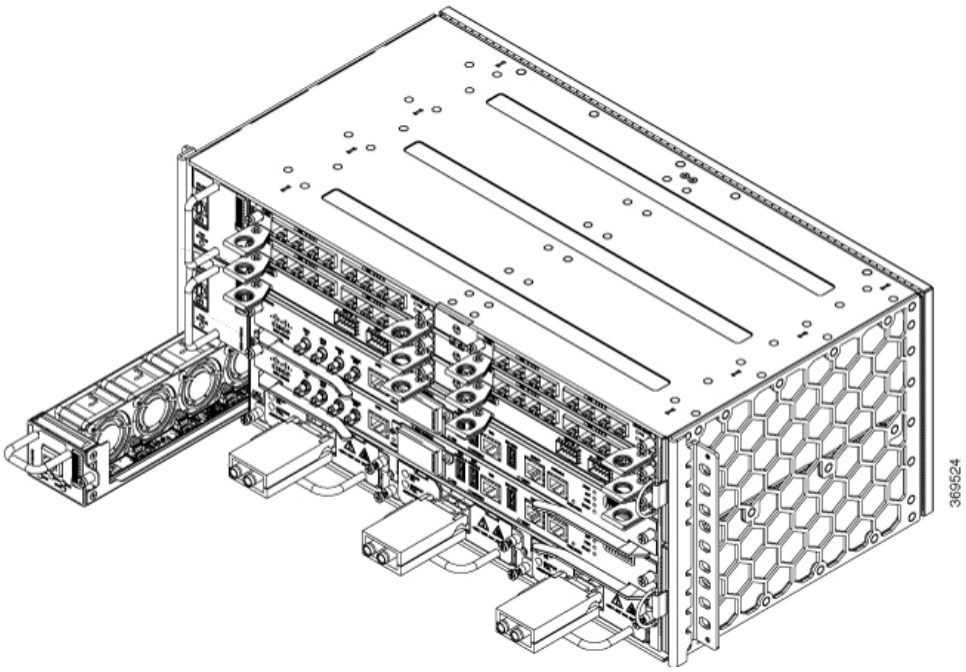
Follow these steps to install the primary fan tray in the chassis:

Procedure

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

Step 2 Orient the primary fan tray (N560-4-PWR-FAN) so that the captive screws are on the right side of the fan tray's front panel. The figure below shows how to orient the fan tray.

Figure 42: Installing the Primary Fan Tray (N560-4-PWR-FAN)



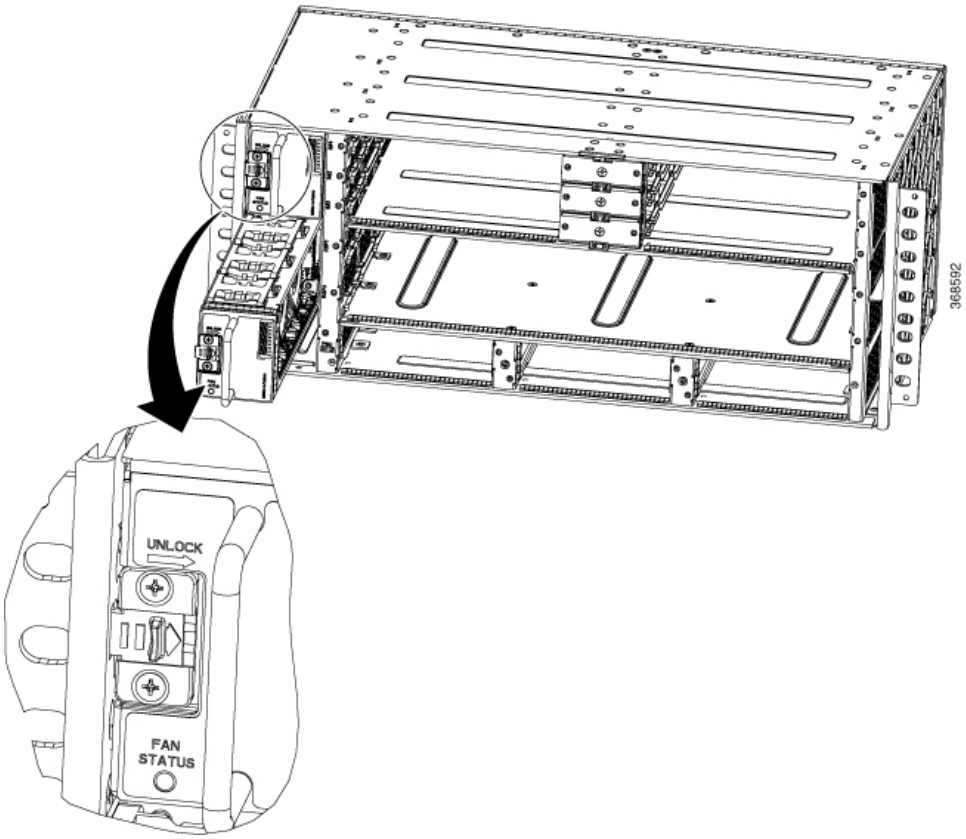
Step 3 Guide the primary fan tray into the chassis until it is fully seated.

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

Step 4 Secure the primary fan tray to the chassis using the attached captive installation screws. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Step 5 Orient the secondary fan tray (N560-4-FAN-H) so that the fan tray is upright. See the figure below.

Figure 43: Installing the Secondary Fan Tray (N560-4-FAN-H)



Step 6 Slide the secondary fan tray until the snap lock clicks in to place and the fan tray is seated completely.

Step 7 Repeat steps 4 and 5 for the second secondary fan tray.

This completes the procedure for installing the fan trays in a Cisco NCS 560-4 Router.

For a summary of the LEDs on the fan tray, see the *Pinout and LED Details* section. For more information about air flow guidelines, see the *Air Flow Guidelines* section.

Removing and Replacing the Air Filter

The chassis is shipped with two blank fan filter covers with the same product identifier (N560-4-FILTER). To install the air filter:

Before you begin

If the cables from the interface modules on the right of the chassis cross over the air filters, gently lift the cables to clear enough space to remove the air filters from the chassis.

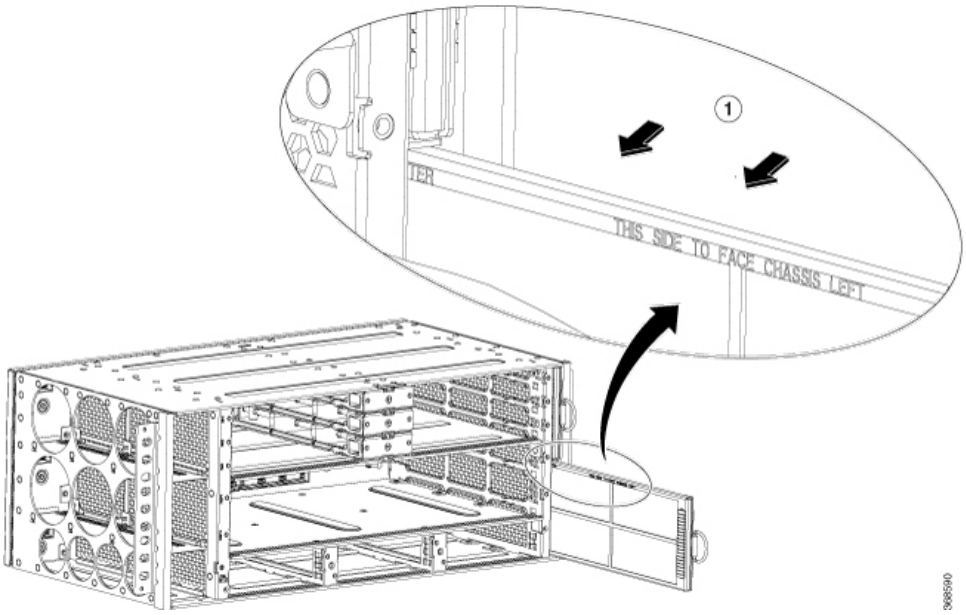
Procedure

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

Step 2 Pull out the blank fan filter covers.

Step 3 Slide the new air filters onto the fan tray as shown in the figure below.

Figure 44: Air Filter



Note
The air filter is a single-use component.

Air 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 provides a better life. This product's filter is used as a single-use component. If the product is installed in a controlled environment, check and replace the filter every three months, otherwise replace the filter every month with PID (N560-4-FILTER) or equivalent.

Note Air filters are consumable items and must be ordered separately by customers. Customers may contact TAC for assistance in identifying the correct air filter PID to order. We recommend having spare air filters in stock.

Removing and Replacing the Fan Trays

This section describes the removal and replacement of both, the primary fan tray and the secondary fan trays.

When any fan tray is removed, the other fans run at maximum speed. When a fan tray is re-inserted in the chassis, all fans run at normal speed within two minutes.

Note If a fan tray is removed and not replaced within the stipulated time the system will automatically power-off. There should be a minimum time period of 15 seconds between fan tray removal and re-insertion of the fan trays during the operation of the system. See the OIR section.

Note Ensure that you keep your fingers, clothing, and jewelry away from the fans when installing or removing the fan tray module. Exposed circuitry is an energy hazard.

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

Before you begin

To remove the primary fan tray when the cables from the power supplies cross over and across the fan tray, gently lower the cables to clear enough space and remove the fan tray from the chassis as mentioned in steps 1–4.

To remove the secondary fan tray when the cables from the interface module and the RSP cross over and across the fan trays, gently lift the cables to clear enough space and remove the fan trays from the chassis as mentioned in steps 5–8.

Table 18: Online Insertion and Removal - Parameters

OIR Module	Ambient[16]	Fan Speed	OIR Time	Comments
Fan Tray[17]	30°C	100% PWM	5 mins	Single Fan Fail, Other Fans running at 100% PWM
	40°C	100% PWM	3 mins	

16 It is not recommended to perform OIR of any module above 40°C ambient
17 Fan Tray OIR should be performed only when a fan's failed condition is encountered and other fans are spinning at max speed.

Procedure

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

Step 2 Using a No. 2 Phillips screwdriver, loosen the captive installation screw that secures the primary fan tray to the router.

Step 3 Grasp the fan tray handle of the primary fan tray (N560-4-FAN) with one hand and the outside of the chassis with the other hand.

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

Step 4 Pull the fan tray toward you no more than 1 inch to disengage it from the power receptacle on the midplane.

Step 5 Wait at least 5 seconds to allow the fans to stop spinning. Then, pull the fan trayrout toward you and out of the router.

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.

Note
The chassis must not be allowed to operate without functioning fans for more than 5 minutes.

Step 6 To remove the secondary fan tray (N560-4-FAN-H), move the **UNLOCK** slider to the right to unlocl the secondary fan tray from the router.

Step 7 Grasp the secondary fan tray handle with one hand and the outside of the chassis with the other hand.

Step 8 Pull the fan tray toward you no more than 1 inch to disengage it from the power receptacle on the midplane.

Step 9 Wait at least 5 seconds to allow the fans to stop spinning. Then, pull the fan tray toward you and out of the router.

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

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

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

RSP Installation

This section describes the installation and removal of the RSP.

Installing an RSP Module

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

Procedure

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

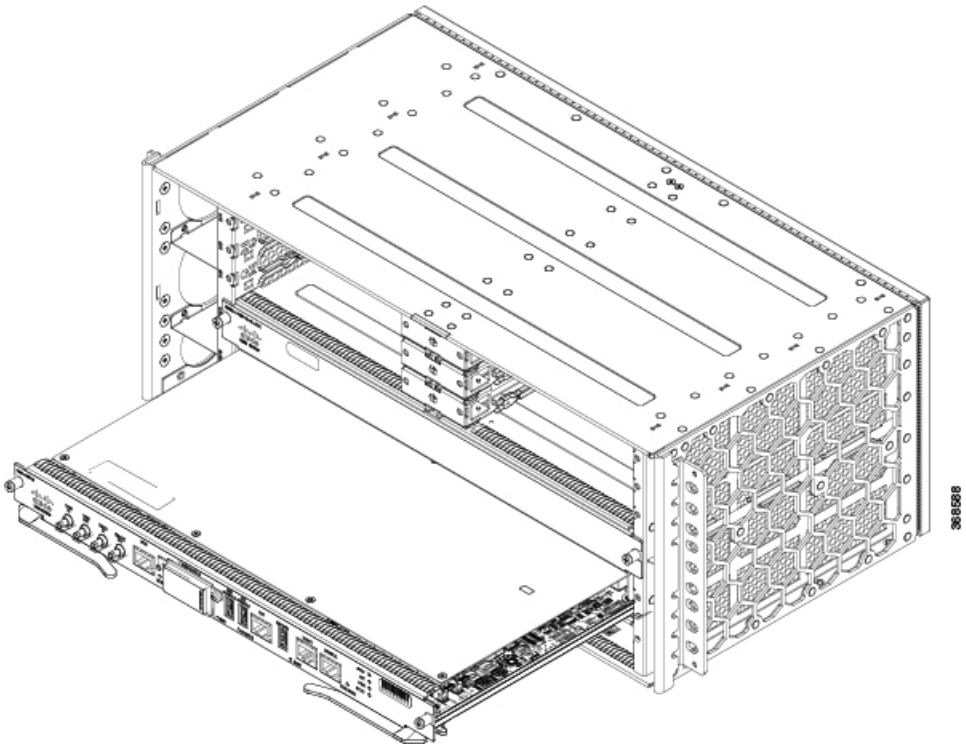
Step 2 Choose a slot for the module. Make sure that there is enough clearance to accommodate any equipment that will be connected to the ports on the module. If a blank module filler plate is installed in the slot in which you plan to install the module, remove the plate by removing its 2 Phillips pan-head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

Step 3 Fully open both the ejector levers on the new module.

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

Step 4 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 45: RSP Installation



Step 5 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 6 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 7 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 8 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 N560-4-RSP-BLANK) 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.

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

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** | **harddisk:**} command. This saves you time when bringing the module back online.

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:

Before you begin

See the table below for the OIR parameters for RSPs.

Table 19: Online Insertion and Removal - Parameters

OIR Module	Ambient[18]	Fan Speed	OIR Time	Comments
RSP	40°C	As per the fan algorithm	5 mins	Fans running at normal speed

[18] It is not recommended to perform OIR of any module above 40°C ambient

Procedure

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

Step 2 Disconnect any cables attached to the ports on the module.

Step 3 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 4 Loosen the two captive installation screws on the module you plan to remove from the chassis.

Step 5 Place your thumbs on the ejector levers (see) and simultaneously rotate the ejector levers outward to unseat the module from the backplane connector.

Step 6 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 7 Place the module on an antistatic mat or antistatic foam, or immediately reinstall the module in another slot.

Step 8 Install blank module filler plates (Cisco part number N560-4-RSP-BLANK) 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

Removing the IM Center Brackets

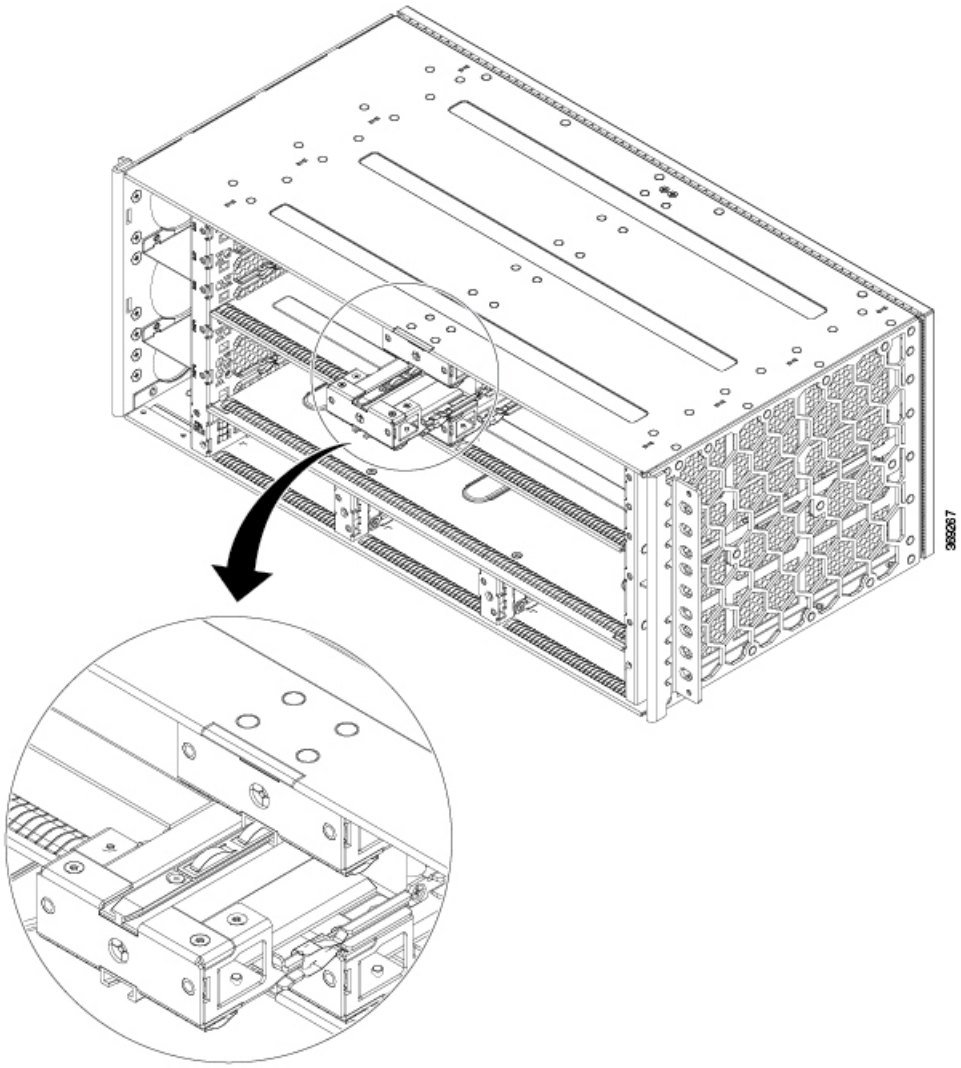
The IM center brackets are already installed in the chassis. They allow for installing two interface modules of half-width side-by-side. By removing the IM center bracket, full-width Interface Modules with higher capacity and interface density can be installed in the chassis.

Procedure

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

Step 2 Grasp the IM center bracket from its sides and slide it straight out of its slot.

Figure 46: Removing the IM Center Bracket from the IM Slot



This completes the removal of the IM center brackets.

Interface Module Installation

The following sections describe the various tasks associated with interface module installation on the Cisco NCS 560-4 Router:

Installing an Interface Module

Procedure

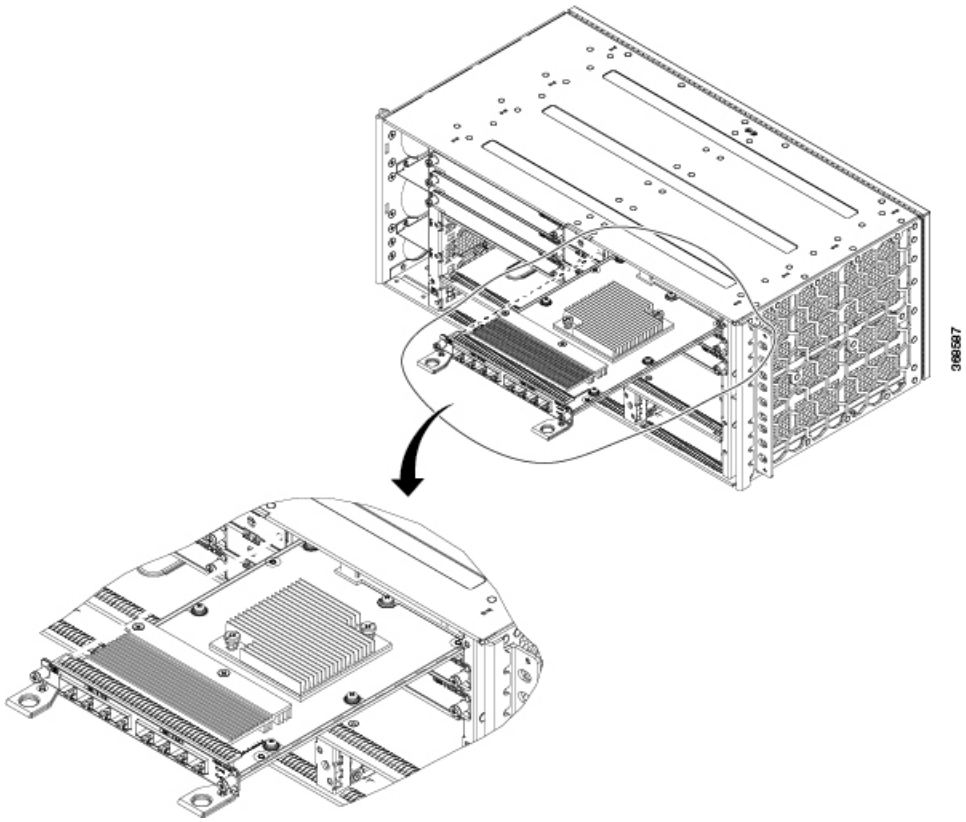
Step 1 Slip on the ESD-preventive wrist strap that was included in the accessory kit.

Step 2 Before inserting an interface module (IM), make sure that the chassis is grounded.

Step 3 To insert the IM, carefully align the edges of the IM between the upper and lower edges of the IM slot.

Step 4 Carefully slide the IM into the slot until the IM makes contact with the backplane.

Figure 47: Inserting an Interface Module



Step 5 Tighten the locking thumbscrews on both sides of the interface module. The recommended maximum torque is 5.5 in.-lb (.62 N-m).

Step 6 Connect all the cables to each interface module when ready for test and turn-up.

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

Note

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

Removing an Interface Module

Procedure

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

Step 2 To remove an interface module, disconnect all the cables from each interface module.

Step 3 Press the ORS (online removal switch) button available on the front panel to shut down the IM.

Note
This step is applicable *only* if the router is running Cisco IOS XR Release 7.2.2 and later release.

Note
Effective Cisco IOS XR Release 7.2.2, the ORS functionality is available on the N560-IMA-1W interface module.

Note
Effective Cisco IOS XR Release 7.3.1, the ORS functionality is available on the N560-IMA-2C-DD interface module.

Step 4 Loosen the locking thumbscrews on both sides of the interface module.

Step 5 Slide the interface module out of the IM slot by pulling on the handles. If you are removing a blank filler plate, pull the blank filler plate completely out of the IM slot using the captive screws.

Hot-Swapping an RSP or Interface Module

The Cisco NCS 560-4 Router 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.

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

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 two 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.

Installing Dust Caps

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

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

To install the dust cap:

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

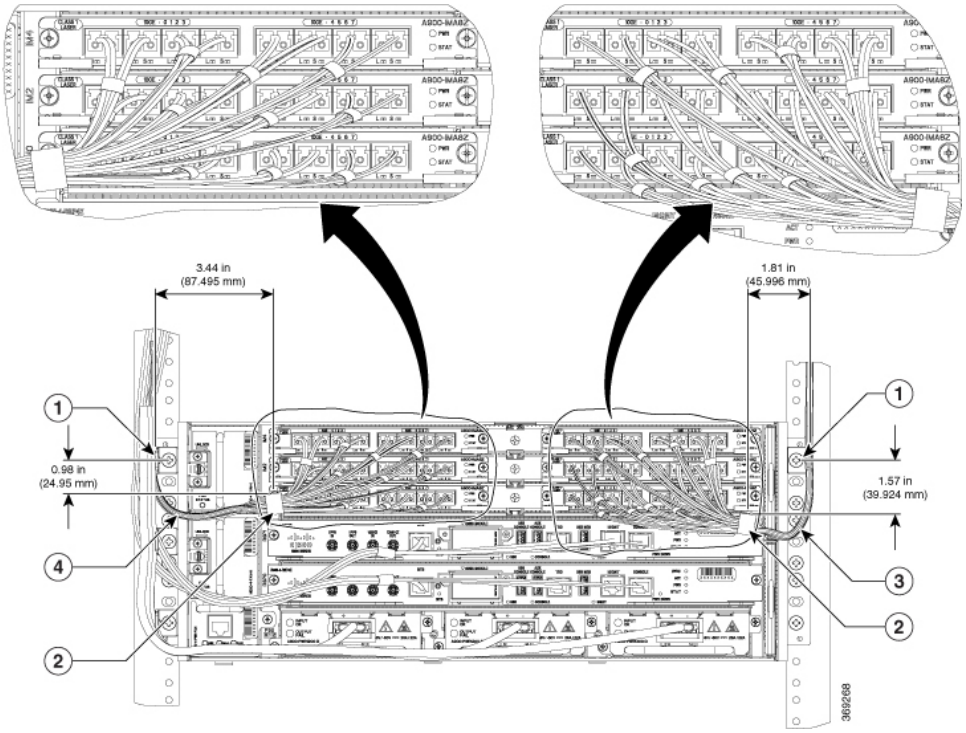
Securing the Cables Around the Cable Management Brackets

Procedure

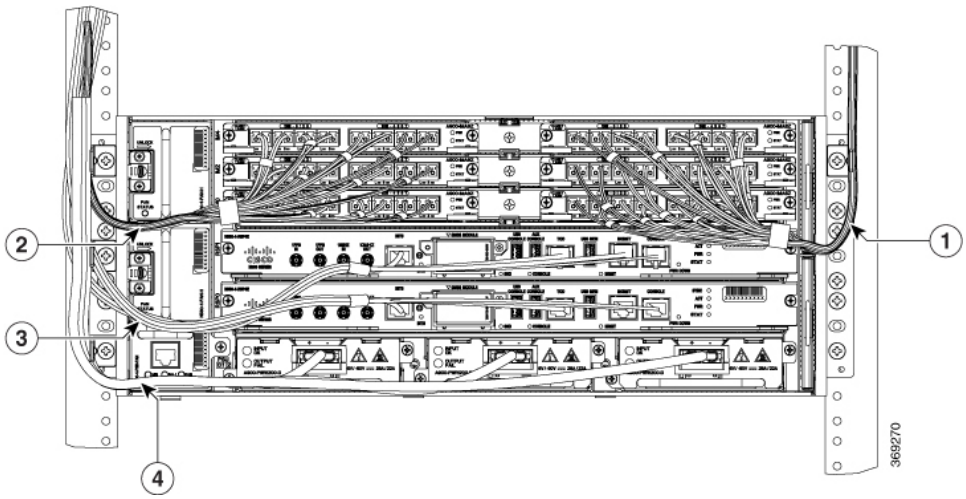
Step 1 Gather cables from the interface modules (IM) on the left side of the chassis and secure them with velcro. Repeat this process with the IMs s on the right side, the cables from the RSPs and the cables from the power supply units.

Step 2 Secure the cables around the cable management brackets as shown in the figures below.

Figure 48: Gathering and Securing the Cables - Front View

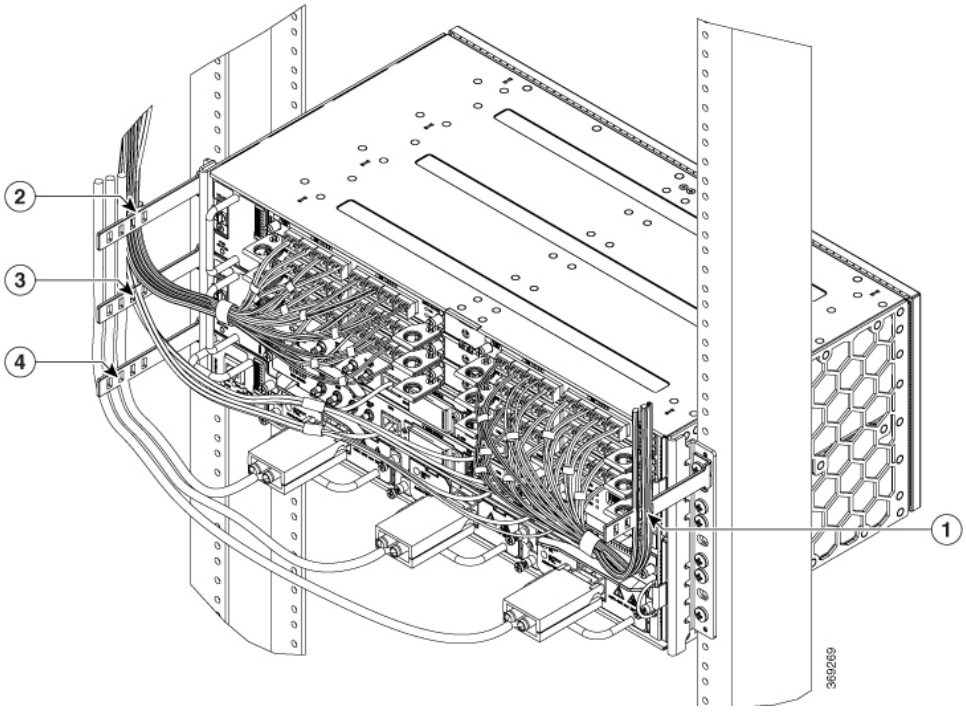


1	Point A	2	Point B
3	Curved cable length 95mm from point A to point B	4	Curved cable length 120mm from point A to point B



1	Cables from the interface modules on the right side of chassis	2	Cables from the interface modules on the left side of chassis
3	Cables from the active and standby RSPs	4	Cables from the active and standby RSPs

Figure 49: Securing the Cables – Side View



1	Position of the IM Card cables (air filter side) on the cable management bracket	2	Position of the IM Card cables (fan tray side) on the cable management bracket

3	Postion of the RSP cables on the cable management bracket	4	Postion of the power supply cables on the cable management bracket

Connecting the Router to the Network

This section describes the various ways to connect the router to the network.

Connecting 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.

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. 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
- Installing the Cisco Microsoft Windows 2000 USB Driver
- *Installing the Cisco Microsoft Windows Vista USB Driver*

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

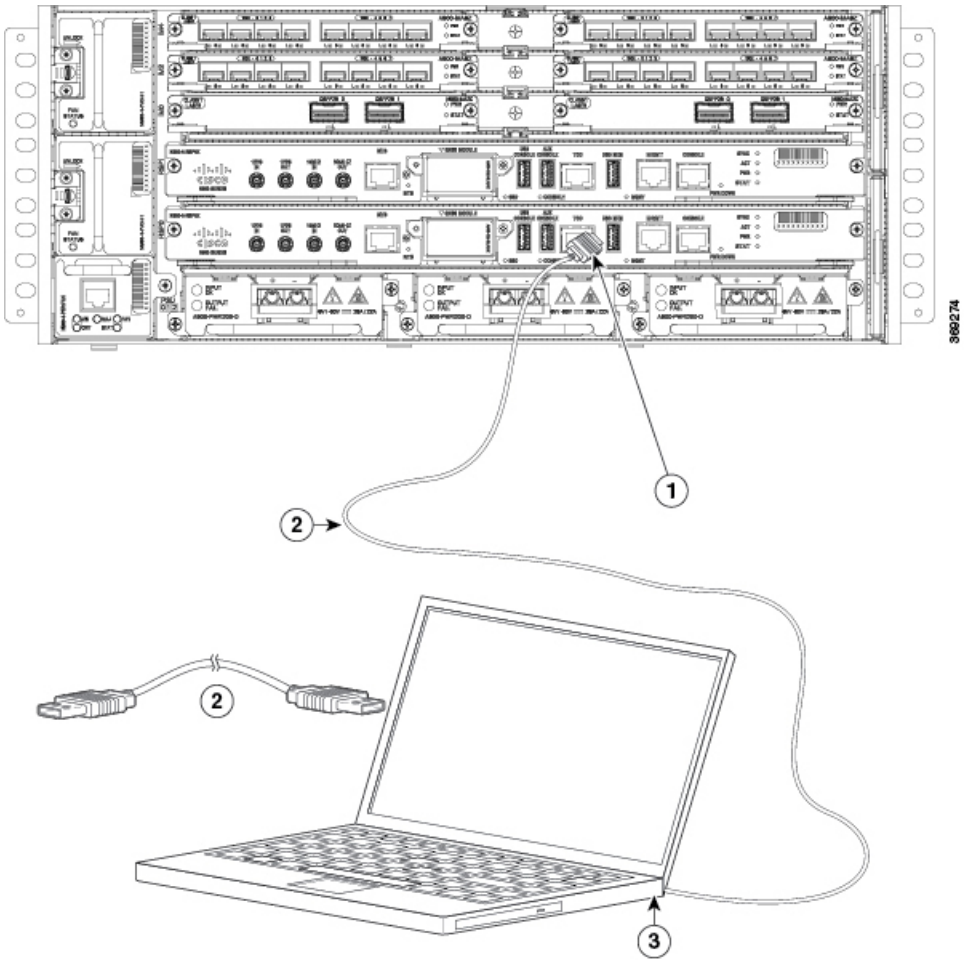
Note
The USB Type A-to-Type A cable is not included with the Cisco NCS 560-4 Router; it is ordered separately.

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

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

- 115200 baud
- 8 data bits
- no parity
- 1 stop-bit
- no flow control

Figure 50: Connecting the USB Console Cable to the Cisco NCS 560-4 Router



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

This procedure shows how to install the 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 The Cisco Virtual Com InstallShield Wizard begins. Click **Next**.

Step 4 The Ready to Install the Program window appears. Click **Install**.

Step 5 The InstallShield Wizard Completed window appears. Click **Finish**.

Step 6 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. Follow the instructions to complete the installation of the driver.

The USB console is ready for use.

Installing the Cisco Microsoft Windows 2000 USB Driver

This procedure shows how to install the 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 The Cisco Virtual Com InstallShield Wizard begins. Click **Next**.

Step 4 The Ready to Install the Program window appears, Click **Install**.

Step 5 The InstallShield Wizard Completed window appears. Click **Finish**.

Step 6 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. Follow 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 Using the Setup.exe Program

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**.

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

Uninstalling the Cisco Microsoft Windows XP and 2000 USB Driver Using the Add Remove Programs Utility

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.

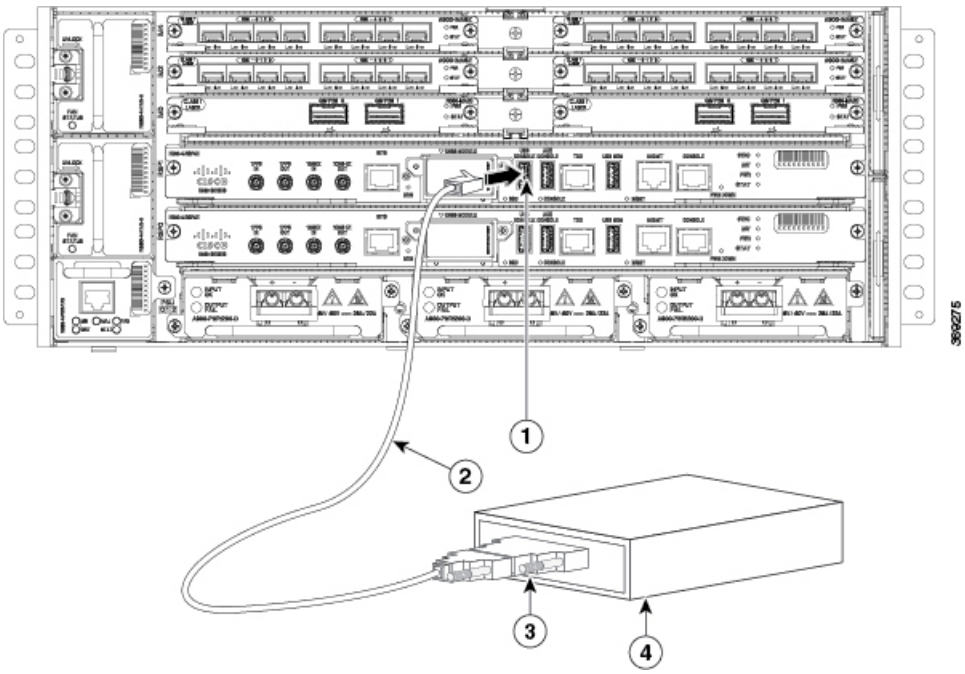
Note The console cable and DB-9-to-DB-25 connector are not included with the Cisco NCS 560-4 Router; they are ordered separately.

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 51: Connecting a Modem to the Cisco NCS 560-4 Router



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.

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.

Installing and Removing SFP Modules

The Cisco NCS 560-4 Router 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.

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

Warning There are no serviceable parts inside. To avoid risk of electric shock, do not open. Statement 1073

Warning An instructed person is someone who has been instructed and trained by a skilled person and takes the necessary precautions when working with equipment.

A skilled person or qualified personnel is someone who has training or experience in the equipment technology and understands potential hazards when working with equipment. Statement 1089

Warning Only a skilled person should be allowed to install, replace, or service this equipment. Refer to statement 1089 for the definition of a skilled person. Statement 1090

Warning Only an instructed person or skilled person should be allowed to install, replace, or service this equipment. See statement 1089 for the definition of an instructed or skilled person. Statement 1091

Warning Hot surface. Use care when handling. Statement 1092

Connecting a USB Flash Device

To connect a USB flash device to the Cisco NCS 560-4 Router, 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.

Removing a USB Flash Device

To remove and then replace a USB flash token memory stick from a Cisco NCS 560-4 Router, 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 USB 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.

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 following sections describe how to connect timing cables to the Cisco NCS 560-4 Router:

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 Troubleshooting.

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 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 router.

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 router.

Connecting Cables to the Output 10Mhz or 1PPS Interface

Procedure

Step 1 Connect one end of a mini-coax Y-cable to the secondary 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 router.

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 router.

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 router.

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

Note
For instructions on how to configure clocking, see the *Network Synchronization Configuration for the Cisco NCS 560 Series Routers*.

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 *LED Details* section.

Connecting Cables to a GNSS Interface

The following sections describe how to connect cables from the Cisco NCS 560-4 Router 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 a Cable to the GNSS Antenna Interface

Note The GNSS module is not hot swappable.

Procedure

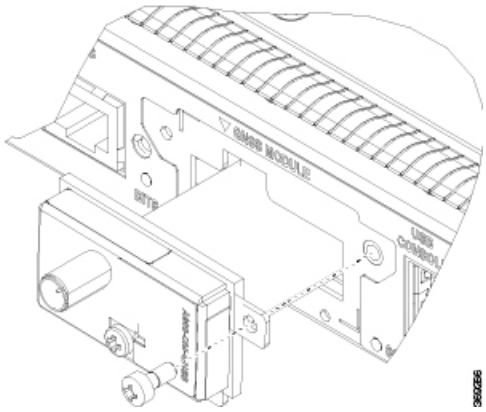
Step 1 Connect one end of a shielded coaxial cable to the GNSS RF IN port.

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.

Note
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 52: Inserting the GNSS Module in the RSP



Connecting Ethernet Cables

The interface modules support RJ45 or SFP Ethernet ports. For instructions on how to connect cables to Ethernet SFP ports, see *Connecting Cables to SFP Modules*.

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.

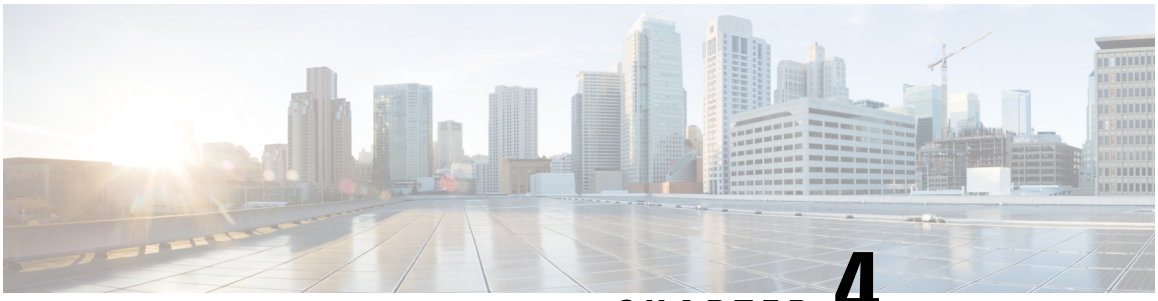
Follow these steps to connect the cable to a copper Gigabit Ethernet port:

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.

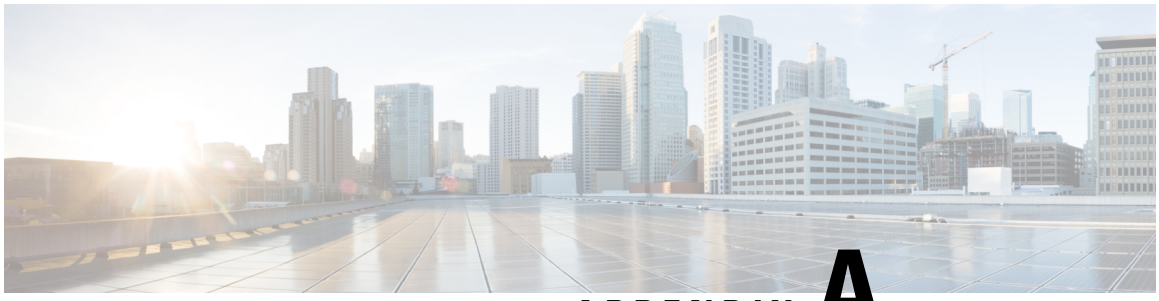
Step 3 Connect the other end to the BTS patch or demarcation panel at your site.



CHAPTER 4

Cisco Router Initial Configuration

For information on setting up your router, see the *System Setup and Software Installation Guide for Cisco NCS 560 Series Router*.



APPENDIX A

Pinout and LED Details

The following sections provide information for troubleshooting problems on the Cisco NCS 560-4 Router.

- Pinouts, on page 119
- Fiber-Optic Specifications, on page 124
- Alarm Conditions, on page 124
- LED Summary, on page 124

Pinouts

The following sections describe the pinouts for the Cisco NCS 560-4 Router interfaces:

BITS Port Pinout

The table below summarizes the BITS port pinout of the Front Panel “Building Integrated Timing Supply” RJ48 port.

Table 20: BITS Port Pinout

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

GPS Port 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 21: GPS Port Pinout

Category	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

Time of Day Pinout

Table 22: ToD pinouts

Pin Number	Signal Name	Direction	Description
1	RESERVED	Output or Inputs	Do Not Connect
2	RESERVED	Output or Inputs	
3	1PPS_N	Output	1PPS RS422 signal
4	GND	—	—
5		—	—
6	1PPS_P	Input	1PPS RS422 signal
7	TOD_N	Output or input	Time of Day R422 output or input signal
8	TOD_P	Output or input	Time of Day R422 output or input signal

Use a 4-port EIA-232 DCE, 10 feet, Female DB-25, and CAB-HD4-232FC. Pinout of the DB25 connector to be connected to the RS232-to-RS422 converter.

Table 23: RS422 Pinout

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

Alarm Port Pinout

The table below summarizes the external alarm input pinout.

Table 24: External Alarm Input Pinout

Pin Number	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 table below summarizes the console/aux RJ45 RS232 serial port pinout.

Table 25: Console/Aux RJ45 RS232 serial port

Pin Number	Signal Name	Direction	Description
1	RTS	Not Used	—

Pin Number	Signal Name	Direction	Description
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	—

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 26: Management Ethernet Port Pinout

Pin Number	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.

Pin Name	Signal Name	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

Table 27: Single USB Flash/MEM Port

Pin Name	Signal Name	Description
A1	Vcc	+5VDC (500mA)
A2	D-	Data -
A3	D+	Data +
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 and multimode. Within the single-mode category, three transmission types are defined: short reach, intermediate reach, and long reach. Within the multimode category, only short reach is available. For information about optical SFP modules, see the documentation for the SFP module at

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

Alarm Conditions

The table below summarizes the meaning of alarm conditions on the router.

Table 28: 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

LED Summary

The following sections describe the meanings of the LEDs on the router.

RSP LEDs

Table 29: N560-RSP4 and N560-RSP4-E 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



Note The digital code signing functionality validates the integrity and authenticity of the ROMMON image before booting it.

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.

Table 30: Power and Status LEDs Combination

PWR LED State	STAT LED State	Indication	Comment
Light Green	Red	Power is OK and the field-programmable gate array (FPGA) is nfigured successfully, but FPGA image validation failed.	Image validation failed. System is in hung state.
Flashing Light Green and Green alternatively	Off	FPGA configured and core validated successfully. FPGA image passed the control to micro-loader to boot ROMMON.	System is up with ROMMON. Both the FPGA image is validated successfully, but the booted ROMMON (primary or secondary) is undetermined.
	Amber	The digital code signing functionality reported upgrade FPGA image validation error and is continuing with the FPGA image.	System is up with ROMMON. FPGA image is validated successfully, but the booted ROMMON (primary or secondary) is undetermined.
	Red	The digital code signing functionality reported failure in the ROMMON image validation.	FPGA is up but both primary and secondary ROMMON failed. System is in hung state.
Green	Off	IOS is successfully booted	IOS writes into FPGA register to indicate that it has booted, FPGA stops flashing PWR LED and turns Green. Software now controls the STAT LED.

RSP4 LEDs

Table 31: RSP4 LED Details

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

PWR	STATS	Active/Standby	SYNC LED	PWR DWN LED	Indication
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

Interface Module LEDs

Table 32: Interface Module LED Details

LED	Color/State	Description (2x100G)	Description (8x10G / 8x25G / 8x50G)	Description (8/16x1G + 1x10G)	Description (1x100G / 200G)
—	—	N560-IMA-2C N560-IMA-2C-DD	A900-IMA-8Z A900-IMA-8Z-L	A900-IMA-8CS1Z-M	N560-IMA-1W
Power (PWR)	Off	Disabled / no power to IM	Disabled / no power to IM	Disabled / no power to IM	No power to IM
	Green	Enabled and power rails on IM in range	Enabled and power rails on IM in range	Enabled and power rails on IM in range	All power rails are in range
Status (STAT)	Off	Disabled / power-down	Disabled / power-down	Disabled / power-down	Disabled / Power down
	Red	—	—	—	IM failure
	Flashing Red	Booting (if local CPU), IM Failure, FPD upgrade in progress, FPD upgrade failure	Booting (if local CPU), IM Failure	Booting (if local CPU), IM Failure	—
	Green	Operational	Operational	Operational	Operational
Link Status (L)	Off	Inactive or no connection	Inactive or no connection	Inactive or no connection[19]	—
	Amber	Fault / loop condition	Fault / loop condition	Fault / loop condition	—
	Green	Ok with activity or no activity	Ok with activity or no activity	Ok with activity or no activity	—

LED	Color/State	Description (2x100G)	Description (8x10G / 8x25G / 8x50G)	Description (8/16x1G + 1x10G)	Description (1x100G / 200G)
Speed (S)	Off	Inactive port status	Inactive port status	Inactive port status**	—
	Green	Activity or no activity	Activity or no activity	Activity or no activity	—
CFP0	Off	—	—	—	Laser Off – Controller down / shutdown
	Yellow	—	—	—	Link Down – Controller / HuGig SubPort 0 is “Operational Down”
	Green	—	—	—	Link Up – Controller / HuGig SubPort 0 is “Operational Up”
CFP1	Off	—	—	—	Laser Off – Controller down / shutdown
	Yellow	—	—	—	Link Up – Controller / HuGig SubPort 1 is “Operational Down”
	Green	—	—	—	Link Up – Controller/HuGig SubPort 1 is “Operational Up”
ORI[20]	Off	Optics removal not initiated	—	—	Optics removal not initiated
	Yellow	Optics removal initiated	—	—	Optics removal initiated
	Green	Ready for optical removal in the next 15 seconds	—	—	Ready for optical removal in the next 15 seconds

19 ** CSFP optics is not supported in the 10G port. So the LEDs on port 17 do not function and remain off.

20 The ORI LED is functional on N560-IMA-1W only from Cisco IOS XR Release 7.2.2 and it is funcitional on N560-IMA-2C-DD only from Cisco IOS XR Release 7.3.1.

Fan Tray LEDs



Note A major alarm condition indicates the failure of a single fan in the fan tray; a critical alarm indicates the failure of multiple fans. In the event that a single fan fails, the router software adjusts the fan speed to prevent excessive heat within the chassis.

Table 33: Primary Fan Tray LED Details

LED	Color/State	Description
Status (TEMP)	Off	Disabled/power down
	Amber	Over temperature
	Green	OK
Fan (FAN)	Green	Fan rotation in range
	Amber	Fan fault
	Red	Two or more fan faults
Minor (MIN)	Off	No minor alarm
	Amber	Minor alarm
Major (MAJ)	Off	No major alarm
	Red	Major Alarm
Critical (CRIT)	Off	No critical alarm
	Red	Critical alarm (defaults to ON upon RSP reset)

Table 34: Secondary Fan Tray LED Details

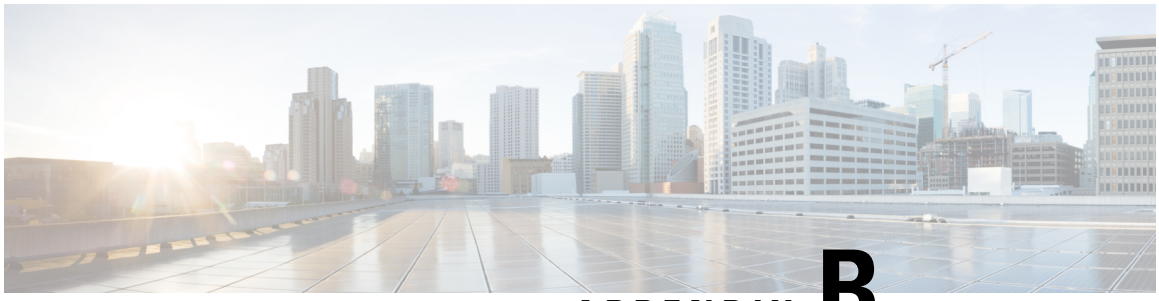
LED Color	Fan Fail Status
Green	All fans working fine
Amber	Single fan failure
Red	Two or more fans have failed

Power Supply LEDs

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

Table 35: 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
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



APPENDIX B

Site Logs and Manufacturers

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 *Preparing for Installation* chapter) 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 560-4 Router Installation Checklist, and insert it into the Site Log. Make entries as you complete each task.
- Upgrade, removal, and maintenance procedures—Use the Site Log as a record of ongoing router maintenance and expansion history. Each time a task is performed on the Cisco NCS 560-4 Router, update the Site Log to reflect the following:
  - Removal or replacement of interface modules, fan tray, power supplies, or RSPs
  - Configuration changes
  - Maintenance schedules and requirements
  - Maintenance procedures performed
  - Intermittent problems
  - Comments and notes

- Manufacturers, on page 131

Manufacturers

The table below lists the manufacturers for equipment used with the Cisco NCS 560-4 router.

Table 36: Manufacturers

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

Site Logs and Manufacturers