



Cisco NCS 540 Router Hardware Installation Guide

First Published: 2018-03-28 **Last Modified:** 2019-02-27

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 THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Any Internet Protocol (IP) addresses and phone numbers used in this document are not intended to be actual addresses and phone numbers. Any examples, command display output, network topology diagrams, and other figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses or phone numbers in illustrative content is unintentional and coincidental.

All printed copies and duplicate soft copies of this document are considered uncontrolled. See the current online version for the latest version.

Cisco has more than 200 offices worldwide. Addresses and phone numbers are listed on the Cisco website at www.cisco.com/go/offices.

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: www.cisco.com go trademarks. Third-party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1721R)

© 2018-2019 Cisco Systems, Inc. All rights reserved.



CONTENTS

CHAPTER 1 Safety Warnings 1

Standard Warning Statements 1

Safety Guidelines for Personal Safety and Equipment Protection 2

Safety Precautions for Module Installation and Removal 2

Safety with Electricity 3

Power Supply Considerations 5

Power Connection Guidelines 5

Guidelines for DC-Powered Systems 5

Guidelines for AC-Powered Systems 6

Prevent Power Loss 6

Preventing ESD Damage 6

CHAPTER 2 Cisco NCS 540 Router Overview 9

Features 10

Interface Naming 10

Network Timing Interfaces 11

GNSS 12

External Alarm Inputs 12

Console 12

USB Console 12

Online Insertion and Removal 12

Power Supply (N540-PWR400-A and N540-PWR400-D) 13

Fan Assembly (N540-FAN) 13

CHAPTER 3 Prepare for Installation 15

General Precautions 15

CHAPTER 4

```
Electrical Circuit Requirements 19
     Site Cabling Guidelines 19
       Asynchronous Terminal Connections
       Interference Considerations 20
          Electromagnetic Interference 20
          Radio Frequency Interference 20
          Lightning and AC Power Fault Interference 20
     Tools and Equipment 20
     Prepare Your Location
     Prepare Yourself 22
     Prepare Rack for Router Installation 23
     Unpack the Cisco NCS 540 Router 24
Install the Device 27
     Rack-Mount 27
     Ground the Device 31
     Install the AC Power Cables 32
       Activate an AC Power Supply Module 33
     Install the DC Power Cables 34
       Activate a DC Power Supply Module 35
     Port Connection Guidelines
     Connect to the Console Port 36
     Connect to the Management Ethernet Port 38
     Install and Remove Transceiver Modules
       Install and Remove SFP Modules 39
          Bale Clasp SFP or SFP+ Module 40
          Install a Bale Clasp SFP or SFP+ Module 41
          Remove a Bale Clasp SFP or SFP+ Module 41
```

Install and Remove QSFP+/QSFP28 Transceiver Modules 43

Site Planning Checklist 16

Airflow Guidelines 16
Site Power Guidelines 18

Environmental Requirements 16

Overview 43

Remove the 100-Gigabit QSFP28 Transceiver Module 47 Connect Interface Ports 48 Connect a Fiber-Optic Port to the Network Disconnect Optical Ports from the Network 48 Maintain Transceivers and Optical Cables 49 CHAPTER 5 **Configure the Device** 51 Create the Initial Router Configuration 51 Verify Device Installation 53 CHAPTER 6 Replace Fan Module and Power Supply 55 Replace Fan Module 55 Replace Power Supply 56 Remove the DC Power Supply Module 57 Install the DC Power Supply Module 57 Remove the AC Power Supply Module 58 Install the AC Power Supply Module 59 APPENDIX A LEDs 61 Router LEDs 61 Fan Assembly LEDs 62 Power Supply LEDs 63 APPENDIX B **System Specifications** 65 Weight and Power Consumption 65 Environmental Specifications 65 Transceiver and Cable Specifications 65 RJ-45 Connectors 66 Time-of-Day Port Pinouts 66 Management and PTP Ethernet Port Pinouts 67 USB Flash or MEM Port Pinouts 67

Required Tools and Equipment 44

Attach the Optical Network Cable 46

Install the 100-Gigabit Transceiver Module 44

Alarm Port Pinouts 67

Console Port Pinouts 68

Power Supply Power Cord Specifications 68



Safety Warnings

This handout topic lists the safety warnings necessary for handling this product. Before you install or service the chassis, review these safety warnings to avoid injuring yourself or damaging the equipment.

For a complete list of translated safety warnings, see the Regulatory Compliance and Safety Information — Cisco NCS 500 Series Routers document.

The safety warnings are grouped under the following sections:

- Standard Warning Statements, on page 1
- Safety Guidelines for Personal Safety and Equipment Protection, on page 2
- Safety Precautions for Module Installation and Removal, on page 2
- Safety with Electricity, on page 3
- Power Supply Considerations, on page 5
- Preventing ESD Damage, on page 6

Standard Warning Statements



Warning

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



Warning

Ultimate disposal of this product must 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 158°F (70°C). Statement 1047



Warning

Mount the device on a rack that is permanently affixed to the building. Statement 1049



Warning

This device is a Class A Device and is registered for EMC requirements for industrial use. You must be aware. If sold or purchased by mistake, do replace with a residential-use type. Statement 294



Warning

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

Safety Guidelines for Personal Safety and Equipment Protection

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

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

Safety Precautions for Module Installation and Removal

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



Warning

Class 1 laser product. Statement 1008



Warning

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



Warning

Invisible laser radiations present. Statement 1016

Safety with Electricity

| 4 | |
|---|--|
| | |

Warning

Before working on a chassis or with 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 heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. Statement 43



Warning

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



Warning

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



Warning

When you connect or disconnect the power and relay connector with power applied, an electrical arc can occur. This action can 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

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



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

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



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, ensure the ground connection first and disconnected last. Statement 1046



Warning

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



Warning

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



Warning

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

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

- Locate the room's emergency power-off switch. If an electrical accident occurs, you know where to quickly turn off the power.
- Before starting work on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.
- Disconnect all power when:
 - Working on or near power supplies
 - Installing or removing a device 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 and you are uninjured:
 - Use caution to avoid injuring yourself.
 - Turn off power to the device.

- 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 pulsing or external cardiac compressions; then take appropriate action.

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

- When installing or modifying telephone lines, use caution.
- Never install telephone jacks in wet locations unless the jack is designed to handle such locations.
- Never install telephone wiring during a lightning storm.

Power Supply Considerations

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

Power Connection Guidelines

This section provides guidelines for connecting the device power supplies to the site power source.



Warning

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



Warning

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



Warning

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

Guidelines for DC-Powered Systems

Basic guidelines for DC-powered systems include the following:

- Each chassis power supply has 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.
- Protect the circuit by a dedicated two-pole circuit breaker. Ensure that the circuit breaker is sized according to the power supply input rating and local or national code requirements.
- The circuit breaker is considered as the disconnect device and is easily accessible.

- The system ground is the power supply and chassis ground.
- Use the grounding lug to attach a wrist strap for ESD protection during servicing.
- Do not connect the DC return wire to the system frame or to the system-grounding equipment.
- Ensure that the DC return is grounded at the source side.

Guidelines for AC-Powered Systems

Basic guidelines for AC-powered systems include the following:

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

Prevent Power Loss

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

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

Determining power requirements is useful for planning the power distribution system to support the device.

Preventing ESD Damage



Warning

Ground this equipment. Use a green and yellow 6-AWG ground wire to connect the host to earth ground during normal use. Statement 383

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

- Ensure that the device 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 only their handles or edges; 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.

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

Preventing ESD Damage



Cisco NCS 540 Router Overview

The Cisco NCS 540 1RU router complements Cisco's offerings for IP RAN solutions for the GSM, UMTS, LTE, and CDMA.

The Cisco NCS 540 includes three variants.

Table 1: Cisco NCS 540 Variants

| Variant | Conformal Coating |
|----------------|-------------------|
| N540-24Z8Q2C-M | No |
| N540X-ACC-SYS | Yes ¹ |
| N540-ACC-SYS | No |

The printed circuit boards are conformal coated to provide enhanced protection against moisture, dust and corrosive gas. For additional information and deployment conditions, we recommend you to contact our Cisco support team.



Note

The Cisco N540-24Z8Q2C-M, Cisco N540X-ACC-SYS, and Cisco N540-ACC-SYS are collectively referred to as the Cisco NCS 540 Router in this document. Any differences between the routers are specifically called out.

For more information on its features and benefits, see the Cisco Network Convergence System 540 Router Data Sheet.

- Features, on page 10
- Interface Naming, on page 10
- Network Timing Interfaces, on page 11
- GNSS, on page 12
- External Alarm Inputs, on page 12
- Console, on page 12
- Online Insertion and Removal, on page 12
- Power Supply (N540-PWR400-A and N540-PWR400-D), on page 13
- Fan Assembly (N540-FAN), on page 13

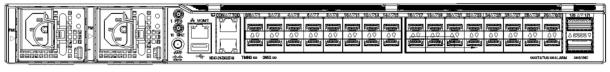
700000

Features

The Cisco NCS 540 1RU Router has the following hardware features:

- 24 x 10G SFP+ Ports
 - Support DWDM & ZR Optics
- 8 x 25G SFP+ Ports
- 2 x 100G QSFP28 Ports

Figure 1: Cisco NCS 540 Device





Note

All ports are color coded in the chassis for ease of access; for example, the 10G SFP+ Ports are in pink, the 25G SFP+ Ports are in yellow, and the 100G QSFP28 Ports are in green.

Interface Naming

The following table shows the interface naming of the Cisco N540 Router ports:

Table 2: Port Numbering

| 1G/10G Dual rate ports (SFP+) | | 1G/10G/25G Dual rate ports (SFP28) | | | 40G/100G ports (QSFP28) | |
|----------------------------------|----|------------------------------------|----|----|----------------------------|-----|
| 0/0 | to | 22 | 24 | to | 30 | 1/0 |
| 1 | | 23 | 25 | | 0/31 | 1/1 |

- Port 0 23: Dual rate ports, which can act as 1G or 10G also includes Copper and DWDM.
 - Port Numbering: Gig/Te 0/0/0/<0-23>
- Port 24-31: Dual rate ports, which can act as 1G or 10G or 25G.
 - Port Numbering: Gig/Te/Twe 0/0/0/<24-31>
 - For the ports 24-31, a quad configuration is required to bring-up the ports as 1G/10G
 - By default, all ports will come up as 25G
 - Use the command hw-module quad 0 location 0/0/CPU0 mode to change to 10G
 - Copper optics is not supported in these 8 ports, 24-31

- Do not combine 1G or 10G with 25G in a quad, quad 1: 24-27 and quad 2: 28-31
- Port 32-33: 40G or 100G ports.
 - Port Numbering: Hu 0/0/1/<0-1>



Note

Dual-Rate functionality is supported only with the Supported SFP.

Table 3: Maximum Number of Inerfaces

| Category | Maximum Interface | Port Number | |
|-----------------|----------------------|------------------------|--|
| 100ME copper | 24 | 0/0 - 23 | |
| 1GE | 32 | 0/0 - 31 | |
| 10GE | 32 / 40*2 | 0/0 - 31, 1/0 - 1* | |
| 25GE | 8 / 16* | 0/24 - 31, 1/0 - 1* | |
| 40GE | 2 | 1/0 - 1 | |
| 100GE | 2 | 1/0 - 1 | |

² *4x10GE or 4x25GE option

Network Timing Interfaces

- BITS input or output—The BITS interfaces support clock recovery from either a T1 at 1.544MHz or an E1 at 2.048MHz, configurable by software. BITS interface is provided through a standard RJ-48 connector on the front panel.
- 1PPS input or output and ToD input or output—This shielded RJ-45 interface is used for input or output of time-of-day (ToD) and 1PPS pulses. ToD format includes both NTP and IEEE 1588-2008 time formats.

The same RS422 pins for 1PPS and TOD are shared between input and output directions. The direction for each can be independently configurable through software.

Use an SMB connector on the front panel for the following:

- GPS 10Mhz input and output—10MHz input for GPS Synchronization.
- GPS 1 PPS input and output—1 PPS input for GPS Synchronization.

GNSS

The GNSS port is present on the front panel and indicates the status of the module.

GNSS module has an in-built ESD protection on all pins, including the RF-input pin. However, additional surge protection is required if an outdoor antenna is being connected. The Lightning Protector must support a low clamping voltage (less than 600V).

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 arrestor must support DC-pass and suitable for the GPS frequency range (1.575GHz) with low attenuation.

External Alarm Inputs

The router supports four dry contact alarm inputs through an RJ-45 jack at the rear panel.

• Normally Open—indicates that no current flows through the alarm circuit and the alarm is generated when the current is flowing.

Each alarm input can be provisioned as critical, major, or minor.

Console

The RS232 console port provides transmission (Tx), reception (Rx), and ground (Gnd).

USB Console

A single USB 2.0 Type-A receptacle on the front panel of the router provides console access to ROMMON, Cisco IOS-XR and diagnostics. While it uses the Type-A connector, it operates as a USB peripheral only for connection to an external host computer. This interface requires the use of a Type-A to Type-A connector instead of a standard USB cable.



Note

Use of the USB console is mutually exclusive of the RS232 console port. This interface requires the use of a Type-A to Type-A USB cable.

Online Insertion and Removal

The router supports the following OIR operations:

• When an SFP is removed, there is no effect on traffic flowing on other ports.

- When an SFP is installed, the system initializes that port for operation that is based on the current configuration. If the inserted SFP is incompatible with the current configuration for that port, the port does not become operational until the configuration is updated.
- Both power supplies are installed and active, the load may be shared between them or a single PSU could support the whole load. When a power supply is not working or the input cable is removed, the remaining power supply takes the entire load without disruption.

Power Supply (N540-PWR400-A and N540-PWR400-D)

The Cisco NCS 540 router supports two AC or DC power supplies, which power the router. The second power supply ensures redundancy in the system. Both power supplies support hot swapping capabilities.

Fan Assembly (N540-FAN)

Cisco NCS 540 Router comes with four individual fan modules. Fans are located at the rear panel and support hot swapping. Fan flow is supported only on the forward direction from front to back. Airflow is port side intake and fan side exhaust, depending on how the modules were ordered. For proper airflow, install the router with air intake that is positioned in a cold aisle and the air exhaust is positioned in a hot aisle.



Note

The system can function with a single fan failure but if more than one fan is faulty then the system shuts down.

Fan Assembly (N540-FAN)



Prepare for Installation

Before you install the Cisco NCS 540, you must prepare your site for the installation.

Preparing your site involves these tasks:

- General Precautions, on page 15
- Site Planning Checklist, on page 16
- Environmental Requirements, on page 16
- Airflow Guidelines, on page 16
- Site Power Guidelines, on page 18
- Site Cabling Guidelines, on page 19
- Tools and Equipment, on page 20
- Prepare Your Location, on page 21
- Prepare Yourself, on page 22
- Prepare Rack for Router Installation, on page 23
- Unpack the Cisco NCS 540 Router, on page 24

General Precautions

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

- Keep your system components away from radiators and heat sources, and do not block cooling vents.
- Do not spill food or liquids on your system components, and never operate the product in a wet environment.
- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and power supply cable carefully. Route system cables and the power supply cable and plug so that they are not stepped on or tripped over. Ensure that nothing is 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 to avoid damage of system components, wait at least 30 seconds before turning it on again.

Site Planning Checklist

Use the following checklist to carry out all site planning tasks:

- The site meets environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the chassis.
- The floor space that the chassis occupies can support the weight of the system.
- Electrical service to the site complies with the safety with electricity requirements.
- The electrical circuit servicing the chassis complies with the power supply requirements.
- Console port wiring and cabling limitations have been considered in accordance to TIA/EIA-232F.
- The chassis Ethernet cabling distances are within prescribed limits.
- The equipment rack where the chassis is to be installed complies with prescribed requirements.
- When selecting rack location, safety, ease of maintenance, and proper airflow requirements have been considered.

Environmental Requirements

For an outside plant installation (cell site cabinet, hut, and so on), you must protect the router against airborne contaminants, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements. Sealed equipment chamber with air-conditioning or a heat exchanger is recommended for OSP deployments. The equipment chamber must comply with the temperature and clearance requirements.

The equipment shall be placed inside a space that is protected from direct outside weather and environmental stresses by an enclosure, and where the operating climate, as defined by Class 3 of GR-3108-CORE, is between:

- -40 to 158°F (-40 to 70°C)
- 5% to 95% (noncondensing)

For more information on Environmental properties and Regulatory standards, see the Cisco Network Convergence System 540 Router Data Sheet.

Airflow Guidelines

Cool air is circulated through the router by fans that are located along the back side of the router. The internal fans maintain acceptable operating temperatures for the internal components by drawing in cool air through the vents, and circulating the air through the router.

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

- Front clearance—5 inches (12.7 centimeters)
- Rear clearance—2 inches (5.08 centimeters)

Figure 2: Top View of Clearance

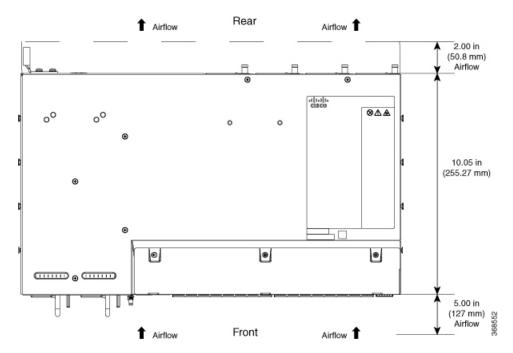
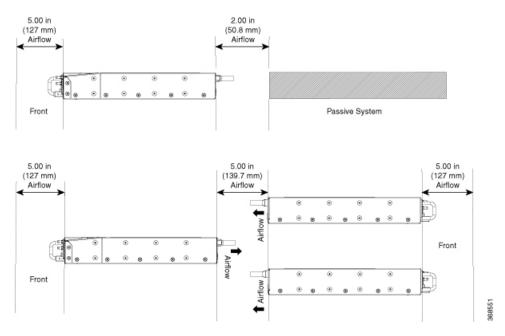


Figure 3: Side View of Clearance



Note the following points:

- When installing the router in a back-to-back position with another device, ensure that there is a minimum of 3.9 inches (10 centimeters) airflow clearance between the two devices.
- If airflow through the equipment rack and the routers that occupy it is blocked or restricted, or if the ambient air being drawn into the rack is too warm, an overtemperature condition may occur within the rack and the routers that occupy it.

- The site must 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 must have louvered sides and a fan to provide cooling air. The equipment generates heat near the bottom of the rack, which can be drawn upward into the intake ports of the equipment above.
- When mounting a router in an open rack, ensure that the rack frame does not block the exhaust fans.
- When rack-installed equipment fails, especially equipment in an enclosed rack, try operating the equipment by itself, if possible. Power off all the other equipment in the rack (and in adjacent racks) to give the router maximum cooling air and clean power.
- Avoid installing 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 front to back, with ambient air drawn in from the vents located on the sides of the router.

Site Power Guidelines

The chassis 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 chassis:

- The redundant power option provides a second, identical power supply to ensure uninterrupted power supply.
- Connect each power supply to a separate input power source. Otherwise, it results in total power failure to the system due to a fault in the external wiring or a tripped circuit breaker.
- To prevent loss of input power, ensure that the maximum load on each circuit 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. If necessary, install a power conditioner.
- Provide proper grounding to avoid personal injury and damage to the equipment due to power surges or lightning striking power lines. 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.



Caution

This product requires external surge protection device for both AC and DC power feeds to the equipment. For DC power feed, the surge protective device (SPD) must handle common mode and differential mode surge as per the local standards.



Note

The chassis installation must comply with all the applicable codes, and is approved for use with only copper conductors. The ground bond-fastening hardware must be compatible 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.

Electrical Circuit Requirements

Each chassis requires a dedicated electrical circuit. If you equip the device with dual-power feeds, provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The chassis supports both DC source or an AC source. Ensure that equipment grounding is present and observe power-strip ratings. Make sure that the total ampere rating of all the products plugged into the power strip does not exceed 80% of the rating.

Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the chassis, consider the type of cable that is required for each component and 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 that you need, such as transceivers, hubs, switches, modems, channel service units (CSU), or data service units (DSU).

Before you install the chassis, have on hand all additional external equipment and cables. 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 that are referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline when planning your network connections *before* installing the chassis.

If wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the possibility of a lightning strike in your vicinity. The electromagnetic pulse due to 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 chassis provides a console port to connect a terminal or computer for local console access. The port has an RJ-45 connector and supports RS-232 asynchronous data with distance recommendations that are specified in the IEEE RS-232 standard.

Interference Considerations

When wires are run for any significant distance, there is a risk of receiving stray signals on the wires as interference. If interference signals are strong, it results in data errors or equipment damage.

The following sections describe the sources of interference and how to minimize their effects on the chassis.

Electromagnetic Interference

All the equipment that is 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 utilities.

Strong EMI can destroy the signal drivers and receivers in the chassis. It can 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.

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 a 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 may encounter a lightning strike on the chassis.

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



Warning

This product requires surge protection as part of the building installation. To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, an external surge protective device (SPD) is required at the AC or DC power service equipment.

Tools and Equipment

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

- ESD-preventive cord and wrist strap
- · Antistatic mat or antistatic foam

- Number 1 and Number 2 Phillips-head screwdrivers
- #12-24 pan-head screws to secure the device to the equipment rack
- Cables for connecting to network ports (based on the configuration)
- Ethernet hub, switch, or PC with a network interface card for connecting to the Ethernet ports
- Console terminal that is configured for 115200 baud, 8 data bits, no parity, no flow control, and 2 stop bits
- Console cable for connecting to the console port
- Ratcheting torque screwdriver with a Phillips head that exerts up to 30-pound force per square inch (0.02-kilograms force per square millimeter (kgf/mm2)) of pressure
- Crimping tool as specified by the ground lug manufacturer
- Wire-stripping tools for stripping both 6 and 14-AWG wires
- Tape measure and level
- Ratcheting torque screwdriver with a Phillips head that exerts up to 15 inch-pounds (1.69 newton meters) of torque for attaching the ground wire to the device

Prepare Your Location

This section illustrates how the building that houses the chassis must be properly grounded to the earth ground.

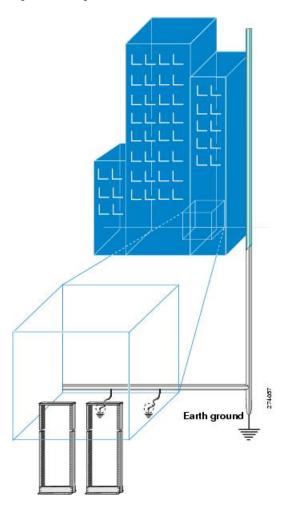


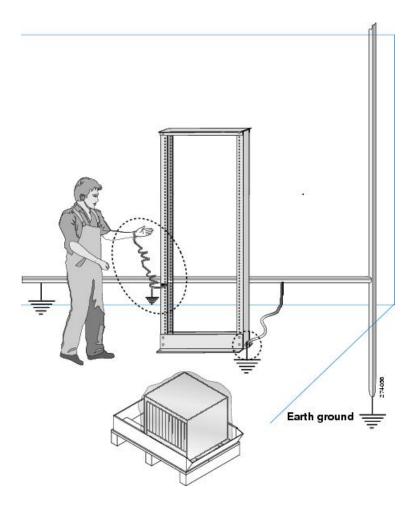
Figure 4: Building with Rack Room Connected to Earth Ground

Prepare Yourself

This section illustrates how to prepare yourself before removing the chassis from the sealed antistatic bag. The figures show how to wear the ESD strap around the wrist and how to connect the other end of the strap to the ground. ESD wrist straps are the primary means of controlling static charge on personnel.

Figure 5: Wearing the ESD Strap

Note: These images are for only representation purposes. The chassis' actual appearance and size would vary.



Prepare Rack for Router Installation

Install the chassis into a two-post standard rack with standard horizontal mounting rails. Before you mount the chassis into the rack, we recommend that you do the following:

- **Step 1** Place the rack where you plan to install the chassis. Ensure that the rack is grounded to earth.
- **Step 2** Secure the rack to the floor.

To bolt the rack to the floor, a floor bolt kit (also called an anchor embedment kit) is required. For information on bolting the rack to the floor, consult a company that specializes in floor mounting kits (such as Hilti; see Hilti.com for details). Make sure that floor mounting bolts are accessible, especially if an annual retorquing of bolts is required.

Unpack the Cisco NCS 540 Router

Before you begin

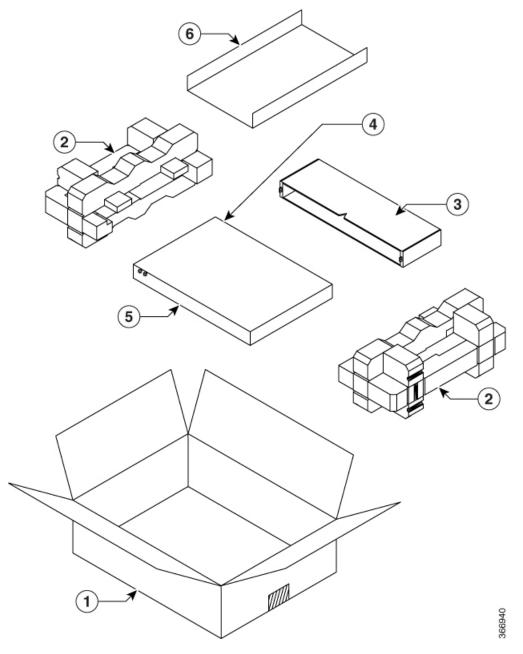
Ensure that there is sufficient room around the chassis pallet for unpacking.

- **Step 1** Remove the accessory tray and the packing material.
- **Step 2** Carefully set the packing material aside.

Tip Be sure to save the packaging in case you need to return any of the components products.

Note These images are for only representation purposes. The chassis' actual appearance and size would vary.

Figure 6: Unpacking the Device



| 1 | Regular Slotted Container (shipping box) | 2 | Foam end caps |
|---|--|---|--------------------------|
| 3 | Front corrugated cap | 4 | Front end of the product |
| 5 | Back end of the product | 6 | Accessory tray |

Unpack the Cisco NCS 540 Router



Install the Device

Before you begin this task, ensure that you have read and understood the safety warnings in the Standard Warning Statements section of the Safety Warnings handout topic.

Installing the Cisco NCS 540 involves these tasks:

- Rack-Mount, on page 27
- Ground the Device, on page 31
- Install the AC Power Cables, on page 32
- Install the DC Power Cables, on page 34
- Port Connection Guidelines, on page 35
- Connect to the Console Port, on page 36
- Connect to the Management Ethernet Port, on page 38
- Install and Remove Transceiver Modules, on page 39
- Connect Interface Ports, on page 48
- Maintain Transceivers and Optical Cables, on page 49

Rack-Mount

The device is shipped with rack mounting brackets that are to be secured on the sides of the device.



Caution

If the rack is on wheels, ensure that the brakes are engaged or the rack is otherwise stabilized.

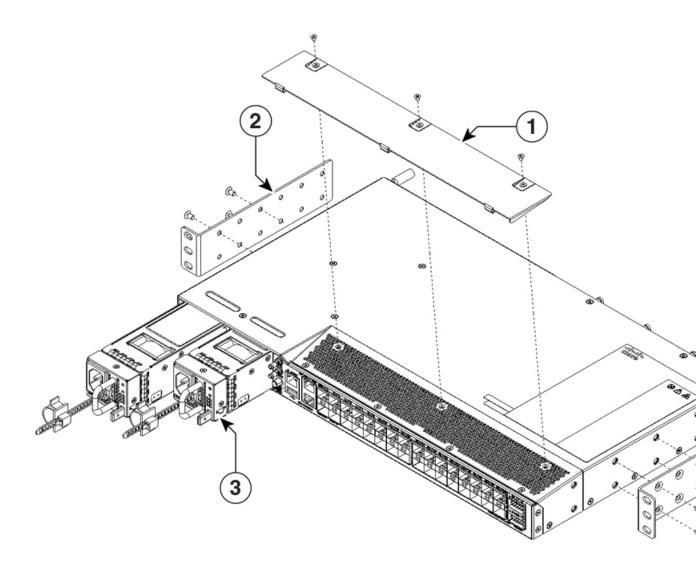
Table 4: Cisco NCS 540 Router Rack-Mount Kit

| Quantity | Part Description | |
|-------------------|---|--|
| 2 | Rack-mount brackets | |
| 8 | M4 x 0.7 x 6-mm Phillips flat-head screws | |
| $3^{\frac{3}{2}}$ | M3 x 0.5 x 4-mm Phillips countersink screws | |

³ Top cover or the NEBs kit is an optional accessory to improve the air flow, hence it may not be a part of your standard package.

- **Step 1** (Optional) Attach the top cover or the NEBs kit by using the M3 screws to the chassis.
- **Step 2** Attach the rack-mount brackets and the cable guides to the router as follows:
 - a) The router has port-side intake modules, position the router so that its ports are facing the cold aisle.
 - b) Position the bracket ears facing front or middle rack-mount, on the side of the chassis so that the holes are aligned.
 - c) Use four M4 screws to attach the brackets to the chassis.
 - d) Repeat Steps 1b and 1c with the other rack-mount bracket on the other side of the router.

Figure 7: Installing Rack-mount Brackets



| 1 | Top cover or the NEBs kit | 2 | Rack-mount brackets |
|---|---------------------------|---|---------------------|
| 3 | Power supply unit | - | - |

Figure 8: Installing 19-inch Rack-mount Brackets in the Front

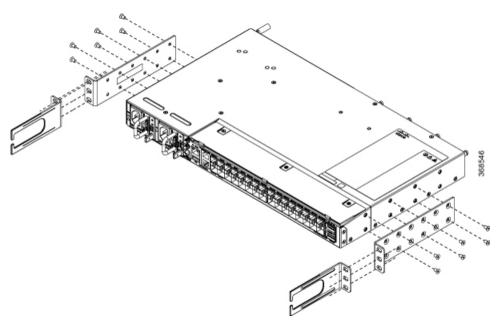


Figure 9: Installing 19-inch Rack-mount Brackets in the Middle

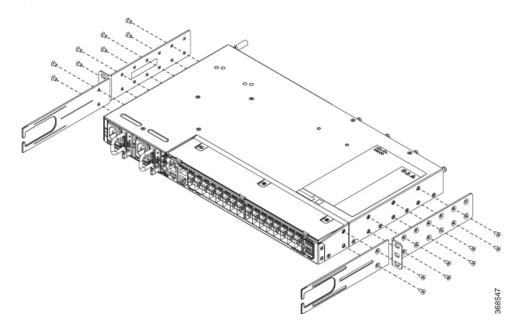


Figure 10: Installing 23-inch Rack-mount Brackets in the Front

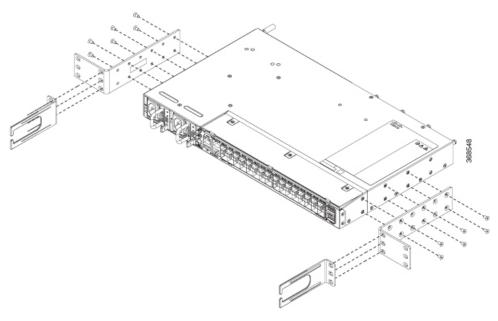
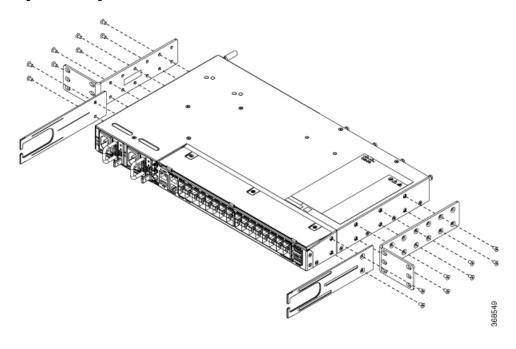


Figure 11: Installing 23-inch Rack-mount Brackets in the Middle



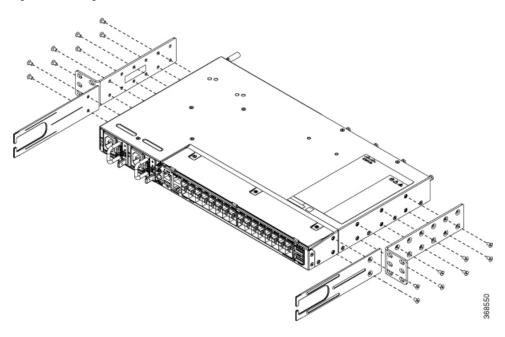


Figure 12: Installing ETSI Rack-mount Brackets in the Middle

- **Step 3** Install the router onto the 2-post rack as follows:
 - a) Lift and position the router into position between the two rack posts.
 - b) Move the router until the rack-mount brackets come in contact with the two rack posts.
 - c) Hold the chassis at level and have another while the second person insert two screws (12-24 or 10-32, depending on the rack type) in each of the two rack-mount brackets (using a total of four screws) and into the cage nuts or threaded holes in the vertical rack-mounting rails.
 - d) Tighten the 10-32 screws to 20 in-lb (2.26 N.m) or tighten the 12-24 screws to 30 in-lb (3.39 N.m).

Ground the Device

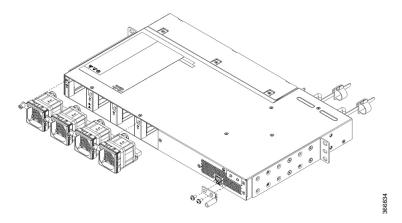
Before you begin this task, ensure that you have read and understood the safety warnings in the Preventing ESD Damage section of the Safety Warnings handout topic.

Before you connect the power or turn on the power to the device, you must provide an adequate device ground (earth) connection to your device.

This section describes how to ground the device. The grounding lug location is on the back panel of the device.

Step 1 Verify that the ground cable is connected to the top of the rack and according to local site practice.

Figure 13: Cisco NCS 540 Ground Lug



- Step 2 Attach one end of the shelf ground cable (#6 AWG cable) to the ground point on the rear of the chassis using the specified dual-hole lug connector.
 - a) Use a wire-stripping tool to remove approximately 0.75 inches (19 mm) of the covering from the end of the grounding cable.
 - b) Insert the stripped end of the grounding cable into the open end of the grounding lug.
 - c) Use the crimping tool to secure the grounding cable in the grounding lug.
 - d) Remove the adhesive label from the grounding pad on the chassis.
 - e) Place the grounding lug against the grounding pad so that there is solid metal-to-metal contact, and insert the two M4 screws with washers through the holes in the grounding lug and into the grounding pad.
 - f) Ensure that the lug and cable do not interfere with other equipment.
 - g) Prepare the other end of the grounding cable and connect it to an appropriate grounding point in your site to ensure adequate earth ground.

Install the AC Power Cables

To install the AC power cables in the power supply slots:

- **Step 1** Plug the power supply cord in the power supply module.
- Step 2 Insert the power supply cord into the tie [1] and tighten the tie around the power supply cord as shown in [2] in the figure below.

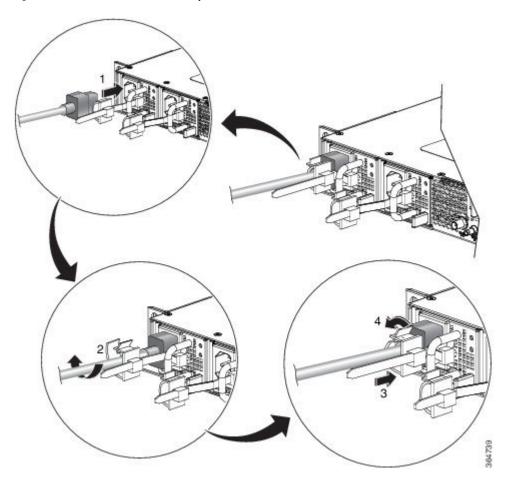


Figure 14: Attach the AC Power Tie-and-Clip Cord

Activate an AC Power Supply Module

Perform the following procedure to activate an AC power supply:

- **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 if the respective power supply front panel LED (PS0 or PS1) is green.
- **Step 4** If the LEDs indicate a power problem, see *Troubleshooting* for troubleshooting information.
- **Step 5** If you are connecting a redundant AC power supply, repeat these steps for the second power source.

Note If you are connecting 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.

Install the DC Power Cables



Note

When installing DC power supply, use 12AWG, 90°C temperature rated cable. The recommanded cable length is 3 meters maximum from source. Up to 5 meters use 10AWG, and up to 3 meters use 12AWG, 90°C temperature rated cable and for other length contact Cisco.



Note

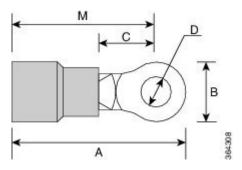
- Always ensure that the building's installation for short-circuit (overcurrent) protection does not exceed
- We recommended using a Circuit breaker or a fast acting fuse with a maximum DC rating of 10A for over current protection.



Note

The DC connector or terminal block has an inbuilt screw and cage nut to which a torque of 1.3 to 1.8 N-m can be applied.

Figure 15: DC Connector with Inbuilt Screw

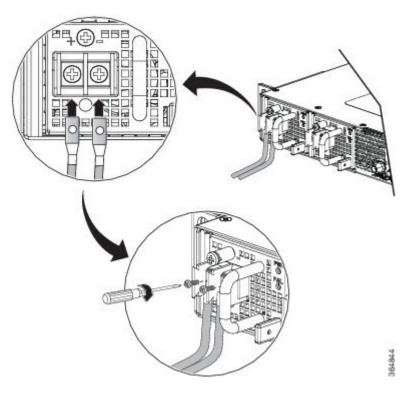


| A | 0.97 in. (2.4 cm) | С | 0.27 in. (0.68 cm) |
|---|--------------------|---|--------------------|
| В | 0.31 in. (0.78 cm) | D | 0.17 in. (0.43 cm) |
| M | 0.81 in. (2 cm) | | |

To attach the DC power supplies:

- **Step 1** Locate the terminal block plug.
- **Step 2** Insert the DC-input power source wires into the terminal block plug.
- **Step 3** Attach the DC supply wires using the designated screws.
- **Step 4** Use a ratcheting torque screwdriver to torque the terminal block plug captive screw. See the following figure.





Activate a DC Power Supply Module

Perform the following procedure to activate a DC power supply:

- **Step 1** Remove the tape from the circuit-breaker router handle, and restore power by moving the circuit-breaker router handle to the On (|) position.
- **Step 2** Verify power supply operation by checking if the respective power supply front panel LED (PS0 or PS1) is green.
- **Step 3** If the LEDs indicate a power problem, see *Troubleshooting*.
- **Step 4** If you are connecting a redundant DC power supply, repeat these steps for the second power source.

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

Port Connection Guidelines

Depending on the chassis and installed line cards, you can use Quad Small Form-Factor Pluggable Plus (QSFP+), QSFP28, SFP, SFP+, and RJ-45 connectors to connect the ports on the line cards to other network devices.

To prevent damage to the fiber-optic cables, Cisco recommends that you keep the transceivers disconnected from their fiber-optic cables when installing the transceiver in the line card. Before removing a transceiver from the router, remove the cable from the transceiver.

To maximize the effectiveness and life of your transceivers and optical cables, do the following:

- Wear an ESD-preventative wrist strap that is connected to an earth ground whenever handling transceivers. The router is typically grounded during installation and provides an ESD port to which you can connect your wrist strap.
- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep the transceivers and fiber-optic cables clean and dust free to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be kept below 0.35 dB.
 - Clean these parts before installation to prevent dust from scratching the fiber-optic cable ends.
 - Clean the connectors regularly; the required frequency of cleaning depends upon the environment.
 In addition, clean connectors when they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.
 - Do not touch the ends of connectors. Touching the ends can leave fingerprints and cause other contamination.
- Inspect routinely for dust and damage. If you suspect damage, clean and then inspect fiber ends under a microscope to determine if damage has occurred.



Warning

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

Connect to the Console Port

Before you create a network management connection for the router or connect the router to the network, you must create a local management connection through a console terminal and configure an IP address for the router. You also can use the console to perform the following functions (each of which can be performed through the management interface after you make that connection):

- Configure the router using the command-line interface (CLI).
- Monitor network statistics and errors.
- Configure Simple Network Management Protocol (SNMP) agent parameters.
- · Download software updates.

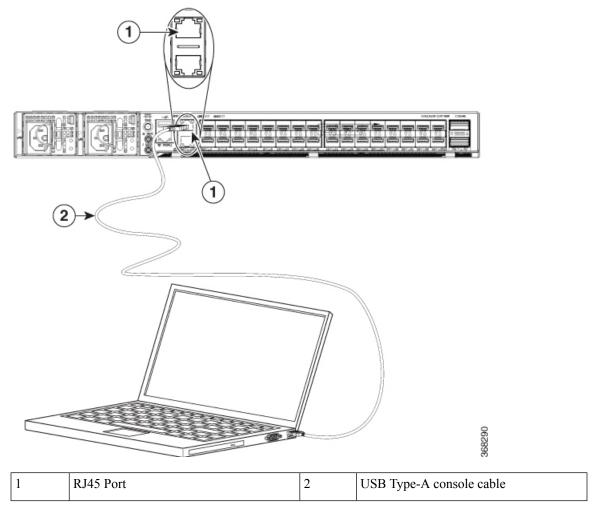
The system console port is an RJ-45 receptacle for connecting a data terminal to perform the initial configuration of Cisco NCS 540 fixed-port chassis. The console cable is shipped with the hardware.



Note

Only RJ45 to DB-9 adapter cable is provided in the package.

Figure 17: Connecting the USB Console Cable to the Chassis



Follow this procedure to connect a data terminal to the console port.

Before you begin

- The router must be fully installed in its rack, connected to a power source, and grounded.
- The necessary cabling for the console, management, and network connections must be available.
 - An RJ-45 rollover cable and DB9F/RJ-45 adapter are provided in the router accessory kit.
 - Network cabling should already be routed to the location of the installed router.

Step 1 Set your terminal to these operational values: 115200 bps, 8 data bits, no parity, and 2 stop bits.

- **Step 2** Attach the terminal end of the cable to the interface port on the data terminal.
- **Step 3** Attach the other end of the cable to the console port.

Following table represents the RJ-45 cable pin-out information.

Table 5: RJ-45 Straight-through Cable Pin-outs

| RJ-45 Pin | Signal |
|-----------|--------------|
| 1 | _ |
| 2 | _ |
| 3 | Tx |
| 4 | Ground (GND) |
| 5 | GND |
| 6 | Rx |
| 7 | _ |
| 8 | _ |

Connect to the Management Ethernet Port

The management Ethernet port provides out-of-band management, which enables you to use the command-line interface (CLI) to manage the router by its IP address. This port uses a 10/100/1000 Ethernet connection with an RJ-45 interface.

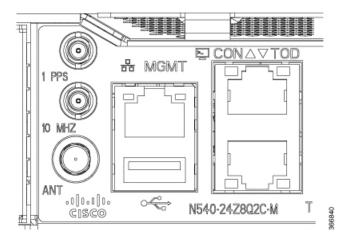


Note

To prevent an IP address conflict, do not connect the management Ethernet port until the initial configuration is complete.

To connect cables to the system management port, attach Category 5 cables directly to the RJ-45 receptacle on the management Ethernet port.

Figure 18: Console Port





Note

To comply with GR-1089-CORE, the intra-building port(s) of the equipment must use shielded intra-building cabling or wiring that is grounded at both ends.

Before you begin

You must complete initial router configuration.

- **Step 1** Plug the cable directly into the RJ-45 receptacle.
- **Step 2** Connect the network end of your RJ-45 cable to a switch, hub, repeater, or other external equipment.

Install and Remove Transceiver Modules

Install and Remove SFP Modules

Before you remove or install an SFP or SFP+ module, read the installation information in this section.



Warning

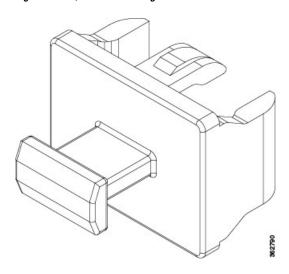
Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051



Caution

Protect the line card by inserting a clean SFP/SFP+ module cage cover, shown in the figure below, into the optical module cage when there is no SFP or SFP+ module installed.

Figure 19: SFP/SFP+ Module Cage Cover





Caution

Protect the SFP or SFP+ modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another module. Avoid getting dust and other contaminants into the optical ports of your SFP or SFP+ modules, because the optics do not work correctly when obstructed by dust.



Caution

We strongly recommended that you do not install or remove the SFP or SFP+ module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the module. Disconnect all cables before removing or installing an SFP or SFP+ module. Removing and inserting a module can shorten its useful life, so you should not remove and insert modules any more than is absolutely necessary.



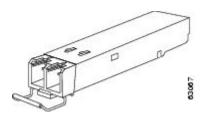
Note

When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the module snaps into the hole in the receptacle. The click indicates that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP or SFP+ module.

Bale Clasp SFP or SFP+ Module

The bale clasp SFP or SFP+ module has a clasp that you use to remove or install the module (see the figure below).

Figure 20: Bale Clasp SFP or SFP+ Module

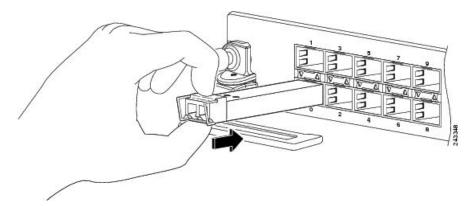


Install a Bale Clasp SFP or SFP+ Module

To install this type of SFP or SFP+ module, follow these steps:

- **Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- **Step 2** Close the bale clasp before inserting the SFP module.
- **Step 3** Line up the SFP module with the port and slide it into the port (see the figure below).

Figure 21: Installing a Bale Clasp SFP Module into a Port



Note

When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle. This click indicates that the module is correctly seated and secured in the receptacle. Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module.

Remove a Bale Clasp SFP or SFP+ Module

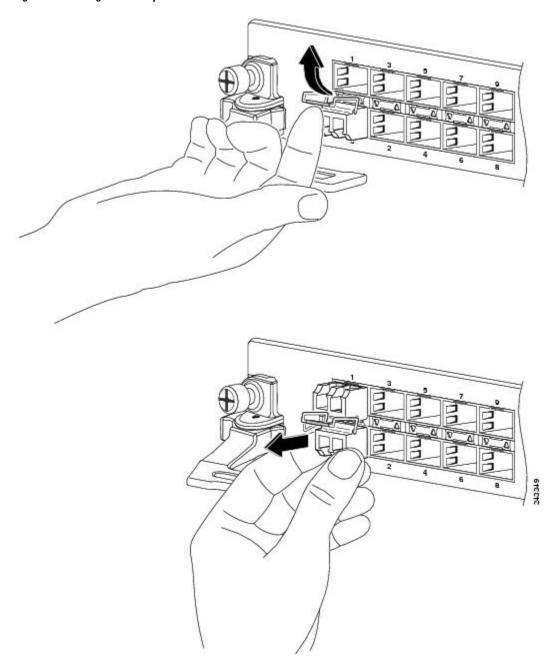
To remove this type of SFP or SFP+ module, follow these steps:

- **Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
- **Step 2** Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.
- Step 3 Open the bale clasp on the SFP module with your index finger, as shown in the figure below. If the bale clasp is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver or other long, narrow instrument to open the bale clasp.

Step 4 Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in the figure below.

Note This action must be performed during your first instance. After all the ports are populated, this may not be possible.

Figure 22: Removing a Bale Clasp SFP or SFP+ Module



Step 5 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

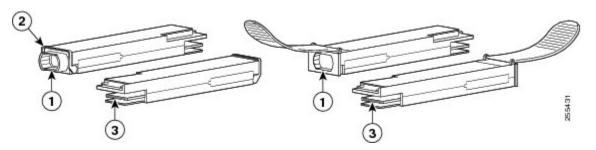
Step 6 Protect your line card by inserting a clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Install and Remove QSFP+/QSFP28 Transceiver Modules

This section provides the installation, cabling, and removal instructions for the 40-Gigabit Quad Small Form-Factor Pluggable Plus (QSFP+) and 100 Gigabit (QSFP28) transceiver modules. The modules are hot-swappable input/output (I/O) devices that connect the system's module port electrical circuitry with either a copper or a fiber-optic network.

The following figure shows the 40-Gigabit optical QSFP+ transceiver. The transceiver is used primarily in short reach applications in switches, routers, and data center equipment where it provides higher density than SFP+ modules. The 100-Gigabit optical QSFP28 transceiver is similar to the 40-Gigabit optical QSFP transceiver.

Figure 23: 40-Gigabit QSFP+ Transceiver Module (Optical)



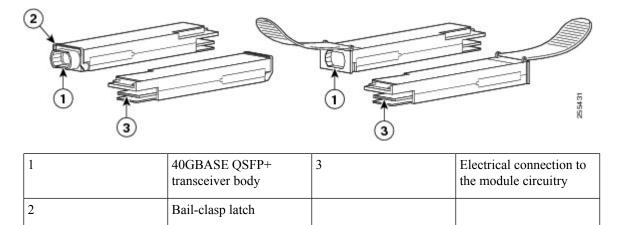
| 1 | 40GBASE QSFP+ transceiver body | 3 | Electrical connection to the module circuitry |
|---|-----------------------------------|---|---|
| 2 | Bail-clasp latch | | |

Overview

The 40-Gigabit (GE) QSFP+ and 100 Gigabit (QSFP28) transceiver module is a hot-swappable, parallel fiber-optical module with 4 independent optical transmit and receive channels. These channels can terminate in another 40-Gigabit QSFP+ transceiver, or the channels can be broken out to 4 separate 10-Gigabit SFP+ transceivers. The QSFP+ transceiver module connects the electrical circuitry of the system with an optical external network.

The following figure shows the 40-Gigabit optical QSFP+ transceiver. The transceiver is used primarily in short reach applications in switches, routers, and data center equipment where it provides higher density than SFP+ modules. The 100-Gigabit optical QSFP28 transceiver is similar to the 40-Gigabit optical QSFP transceiver.

Figure 24: 40-Gigabit QSFP+ Transceiver Module (Optical)



Required Tools and Equipment

You need these tools to install the 40-Gigabit QSFP+ / 100-Gigabit QSFP28 transceiver modules:

- Wrist strap or other personal grounding device to prevent ESD occurrences.
- Antistatic mat or antistatic foam to set the transceiver on.
- Fiber-optic end-face cleaning tools and inspection equipment.

For information on inspecting and cleaning fiber-optic connections, see Maintain Transceivers and Optical Cables.

Install the 100-Gigabit Transceiver Module

The QSFP+ or QSFP28 transceiver module can have either a bail-clasp latch or a pull-tab latch. Installation procedures for both types of latches are provided.



Caution

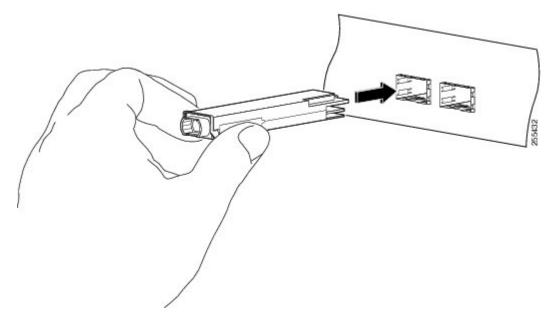
The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with system modules.

To install an OSFP+ or OSFP28 transceiver module, follow these steps:

- **Step 1** Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.
- **Step 2** Remove the QSFP+ or QSFP28 transceiver module from its protective packaging.
- Step 3 Check the label on the QSFP+ or QSFP28 transceiver module body to verify that you have the correct model for your network.
- **Step 4** For optical QSFP+ or QSFP28 transceiver modules, remove the optical bore dust plug and set it aside.
- **Step 5** For QSFP+ or QSFP28 transceiver modules equipped with a pull-tab, hold the transceiver so that the identifier label is on the top.
- **Step 6** For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch, keep the bail-clasp aligned in a vertical position.

Align the QSFP+ or QSFP28 transceiver module in front of the module's transceiver socket opening and carefully slide the QSFP+ or QSFP28 transceiver into the socket until the transceiver makes contact with the socket electrical connector (see the figure below).

Figure 25: Installing the 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)



Step 8 Press firmly on the front of the QSFP+ or QSFP28 transceiver module with your thumb to fully seat the transceiver in the module's transceiver socket (see the below figure).

Caution If the latch is not fully engaged, you might accidentally disconnect the QSFP+ or QSFP28 transceiver module.

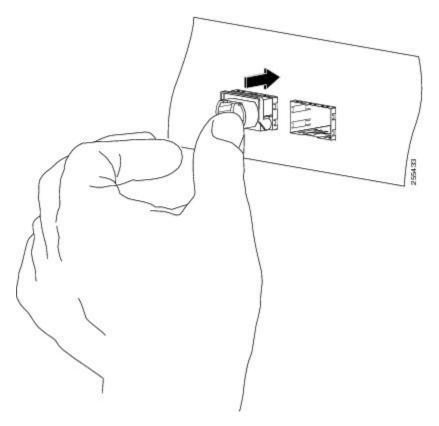


Figure 26: Seating the 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)

Step 9 For optical QSFP+ or QSFP28 transceiver modules, reinstall the dust plug into the QSFP+ or QSFP28 transceivers optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

Attach the Optical Network Cable

Before you begin

Before you remove the dust plugs and make any optical connections, follow these guidelines:

- Keep the protective dust plugs installed in the unplugged fiber-optic cable connectors and in the transceiver optical bores until you are ready to make a connection.
- Inspect and clean the MPO connector end faces just before you make any connections.
- Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.



Note

40-Gigabit QSFP+ or QSFP28 transceiver modules are keyed to prevent incorrect insertion.

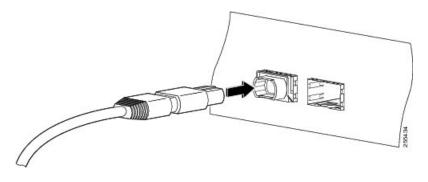


Note

The multiple-fiber push-on (MPO) connectors on the optical QSFP+ or QSFP28 transceivers support network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types. The MPO connectors on the optical QSFP+ or QSFP28 transceivers do not support network interface cables with an angle-polished contact (APC) face type.

- **Step 1** Remove the dust plugs from the optical network interface cable MPO connectors. Save the dust plugs for future use.
- **Step 2** Inspect and clean the MPO connector's fiber-optic end faces.
- **Step 3** Remove the dust plugs from the QSFP+ or QSFP28 transceiver module optical bores.
- **Step 4** Immediately attach the network interface cable MPO connectors to the QSFP+ or QSFP28 transceiver module (see the figure below).

Figure 27: Cabling a 40-Gigabit QSFP+ or QSFP28 Transceiver Module



Remove the 100-Gigabit QSFP28 Transceiver Module



Caution

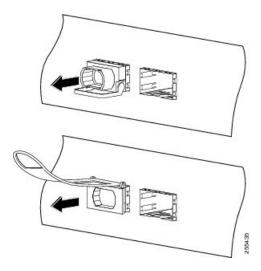
The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or when coming into contact with modules.

To remove a QSFP+ or QSFP28 transceiver module, follow these steps:

- **Step 1** For optical QSFP+ or QSFP28 transceiver modules, disconnect the network interface cable from the QSFP+ or QSFP28 transceiver connector.
- **Step 2** For QSFP+ or QSFP28 transceiver modules equipped with a bail-clasp latch (see the below figure, top view):
 - a) Pivot the bail-clasp down to the horizontal position.
 - b) Immediately install the dust plug into the transceivers optical bore.
 - c) Grasp the sides of the QSFP+ or QSFP28 transceiver and slide it out of the module socket.
- **Step 3** For QSFP+ or QSFP28 transceivers equipped with a pull tab latch (see the below figure, bottom view):
 - a) Immediately install the dust plug into the transceiver's optical bore.
 - b) Grasp the tab and gently pull to release the transceiver from the socket.

c) Slide the transceiver out of the socket.

Figure 28: Removing the 100-Gigabit QSFP28 Transceiver Module



Step 4 Place the QSFP+ or QSFP28 transceiver module into an antistatic bag.

Connect Interface Ports

You can connect optical interface ports on line cards with other devices for network connectivity.

Connect a Fiber-Optic Port to the Network

Depending on the line card model that you are using, you can use either QSFP+ or QSFP28 transceivers. Some transceivers work with fiber-optic cables that you attach to the transceivers and other transceivers work with pre-attached copper cables. When installing fiber-optic cables for a port, you must install SFP transceivers for 1-Gigabit optical ports or install SFP+ transceivers for 10-Gigabit optical ports or QSFP+ transceivers for 100-Gigabit ports before installing the fiber-optic cable in the transceivers.



Caution

Removing and installing a transceiver can shorten its useful life. Do not remove and insert transceivers any more than is absolutely necessary. We recommended that you disconnect cables before installing or removing transceivers to prevent damage to the cable or transceiver.

Disconnect Optical Ports from the Network

When you need to remove fiber-optic transceivers, you must first remove the fiber-optic cables from the transceiver before you remove the transceiver from the port.

Maintain Transceivers and Optical Cables

Transceivers and fiber-optic cables must be kept clean and free of dust to maintain high signal accuracy and to prevent damage to the connectors. Attenuation (loss of light) is increased by contamination and should be below 0.35 dB.

Consider the following maintenance guidelines:

- Transceivers are static sensitive. To prevent ESD damage, wear an ESD-preventative wrist strap that is connected to the grounded chassis.
- Do not remove and insert a transceiver any more than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep all optical connections covered when not in use. Clean them before use to prevent dust from scratching the fiber-optic cable ends.
- Do not touch the ends of connectors. Touching the ends would leave fingerprints and cause other contamination.
- Clean the connectors regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors if they are exposed to dust or have been accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedures.
- Inspect routinely for dust and damage. Clean and then inspect fiber ends under a microscope to determine whether any damage has occurred.

Maintain Transceivers and Optical Cables



Configure the Device

Before you begin this task, ensure that you have read and understood the safety warnings in the Safety with Electricity section of the Safety Warnings handout topic.

Configuring the Cisco NCS 540 involves these tasks:

- Create the Initial Router Configuration, on page 51
- Verify Device Installation, on page 53

Create the Initial Router Configuration

You must assign an IP address to the router management interface so that you can then connect the router to the network.

When you initially power up the router, it boots up and asks a series of questions to configure the router. To enable you to connect the router to the network, you can use the default choices for each configuration except for the IP address, which you must provide.



Note

Be aware of the router's unique name to identify it among the devices in the network.

Before you begin

- A console device must be connected with the router.
- The router must be connected to a power source.
- Determine the IP address and netmask needed for the Management interfaces: MgmtEth0/RP0/CPU0/0 and MgmtEth0/RP1/CPU0/0:

Step 1 Power up the router.

The LEDs on each power supply light up (green) when the power supply units are sending power to the router, and the software asks you to specify a password to use with the router.

Step 2 When the system is booted up for the first time, a new username and a password is to be created. The following prompt appears:

Step 3 Enter a new password to use for this router.

The software checks the security strength of your password and rejects your password if it is not considered to be a strong password. To increase the security strength of your password, make sure that it adheres to the following guidelines:

- At least eight characters
- Minimizes or avoids the use of consecutive characters (such as "abcd")
- Minimizes or avoids repeating characters (such as "aaa")
- Does not contain recognizable words from the dictionary
- Does not contain proper names
- Contains both uppercase and lowercase characters
- Contains numbers as well as letters

Note Clear text passwords cannot include the dollar sign (\$) special character.

Tip If a password is trivial (such as a short, easy-to-decipher password), the software rejects the password configuration. Be sure to configure a strong password as explained in this step. Passwords are case sensitive.

If you enter a strong password, the software asks you to confirm the password.

Step 4 Reenter the password.

When you enter the same password, the software accepts the password.

- **Step 5** Enter the IP address for the management interface.
- **Step 6** Enter a network mask for the management interface.
- **Step 7** The software asks if you need to edit the configuration. Enter **no** to not edit the configuration.
- **Step 8** The software asks if you need to save the configuration. Enter **yes** to save the configuration.

Verify Device Installation

After installing the Cisco NCS 540 Router, you can use the **show** commands to verify the installation and configuration. If any issue is detected, take corrective action before making further configurations.

Step 1 show inventory

Example:

#show inventory

Displays information about the field replaceable units (FRUs), including product IDs, serial numbers, and version IDs.

Step 2 show environment

Example:

#show environment

Displays all environment-related router information.

Step 3 show environment temperature

Example:

#show environment temperature

Displays temperature readings for card temperature sensors. Each system controller, route processor, line card, and fabric card has temperature sensors with two thresholds:

- Minor temperature threshold: when a minor threshold is exceeded, a minor alarm occurs and the following actions
 occur for all four sensors:
 - System messages displayed
 - SNMP notifications (if configured) sent
 - Log environmental alarm event triggered (can be reviewed by running the show alarm command).
- Major temperature threshold: when a major threshold is exceeded, a major alarm occurs and the following actions occur:
 - For sensors 1, 3, and 4 (outlet and onboard sensors), the following actions occur:
 - System messages displayed
 - SNMP notifications (if configured) sent
 - Log environmental alarm event triggered (can be reviewed by running the show alarm command).
 - For sensor 2 (intake sensor), the following actions occur:
 - If the threshold is exceeded in a switching card, only that card is shut down.
 - If the threshold is exceeded in an active route processor card with HA-standby or standby present, only that route processor card is shut down and the standby route processor card takes over.
 - If you do not have a standby route processor card in your router, you have up to 2 minutes to decrease the temperature. During this interval, the software monitors the temperature every 5 seconds and continuously sends system messages as configured.

Note We recommend that you install dual route processor cards. If you are using a router without dual route processor cards, we recommend that you immediately replace the fan card even if just one fan is not working.

Step 4 hw-module location <loc> shutdown or [no] hw-module shutdown location <loc>

Example:

#hw-module location <loc> shutdown

Powers up or shuts down a card gracefully.

Step 5 show environment power

Example:

#show environment power

Displays the power usage information for the entire router.

Step 6 show environment voltage

Example:

#show environment voltage

Displays the voltage for the entire router.

Step 7 show environment current

Example:

#show environment current

Displays the current environment status.

Step 8 show environment fan

Example:

#show environment fan

Displays the status of the fan trays.



Replace Fan Module and Power Supply

Before you begin this task, ensure that you have read and understood the safety warnings in the Safety with Electricity section of the Safety Warnings handout topic.

Replacing the Cisco NCS 540 involves these tasks:

- Replace Fan Module, on page 55
- Replace Power Supply, on page 56

Replace Fan Module



Caution

If you cannot replace a fan tray within three minutes, we recommend that you leave it in the chassis until you are prepared to replace it within that specified time limit.

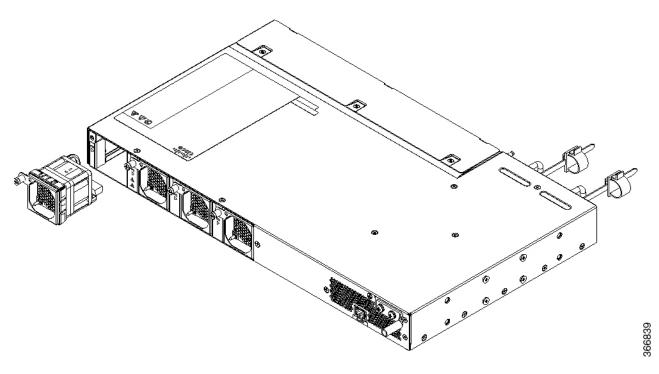


Note

If you remove more than one fan tray at a time during operations, the router allows up to 2 minutes of operations before shutting down, unless you replace extra missing fan trays within that time. If the router senses an over temperature condition when multiple fan trays are removed, the shutdown can occur in less than 2 minutes.

Step 1 Unscrew the captive thumbscrew at the front of the fan tray.

Figure 29: Remove Fan Tray from the Chassis



- **Step 2** Pull the fan tray to remove the fan tray to be replaced.
- **Step 3** Hold the fan module with the LED and PID label at the top.
- Step 4 Align the fan module to the open fan tray slot in the chassis and press the module all the way into the slot until the left and right latches click and lock on the chassis.
- **Step 5** If the chassis is powered on, listen for the fans. You should immediately hear them in operation. If you do not hear them, ensure that the fan module is inserted completely in the chassis.
- **Step 6** Verify that the fan module LED is green. If the LED is not green, one or more fans are faulty.

Replace Power Supply

The router provides the choice of two different power supplies:

- DC power—The DC power supply uses 2-position terminal block-style connector with positive latching/securing and labeled connections for +24/48V, GRD, -24/48V. The terminal block connector is of suitable size to carry the appropriate AWG wire size to handle the input current of the power supply. No ON/OFF switch is provided.
- AC power—The AC power supply has an IEC 320-type power receptacle and a 15 Amp service connector.
 You can use standard right angle power cords with the AC power supply. The power supply includes a power cord retainer. No ON/OFF switch is provided.

You can install dual power supplies for redundancy.



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.

Remove the DC Power Supply Module

This section provides information about removing and replacing the DC power supply.



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

Follow these steps to remove and replace the DC power supply:

- **Step 1** Before servicing the power supply, switch off the circuit breaker in your equipment area. As an additional precaution, tape the circuit-breaker switch in the Off position.
- **Step 2** Slip on the ESD-preventive wrist strap that was included in the accessory kit.
- **Step 3** Switch the power supply circuit-breaker switch to the Off (O) position.
- **Step 4** Pull the terminal block plug connector out of the terminal block head in the power supply. See the following figure.
- **Step 5** Loosen the captive screws on the DC power supply.
- **Step 6** Grasp the power supply handle. Simultaneously press the power supply lock towards the left and pull the power supply out from the chassis while supporting it with the other hand.

Install the DC Power Supply Module

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

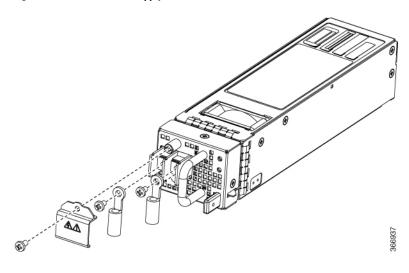
This equipment is suitable for installations utilizing the Common Bonding Network (CBN).

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:

- **Step 1** Ensure that the system (earth) ground connection has been made. See the following figure.
- **Step 2** If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.
- Step 3 Verify that power to the DC circuit connected to the power supply you are installing is off. To ensure that power has been removed from the DC circuits, locate the circuit breakers for the DC circuits, switch the circuit breakers to the OFF position, and tape the circuit-breaker switches in the OFF position.
- Grasp the power supply handle with one hand. Place your other hand underneath the power supply. Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay.
- **Step 5** Tighten the captive installation screws of the power supply. The recommended maximum torque is 5.5 in.-lb (0.62 N-m).

Figure 30: Install DC Power Supply Module



Remove the AC Power Supply Module

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



Warning

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



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:

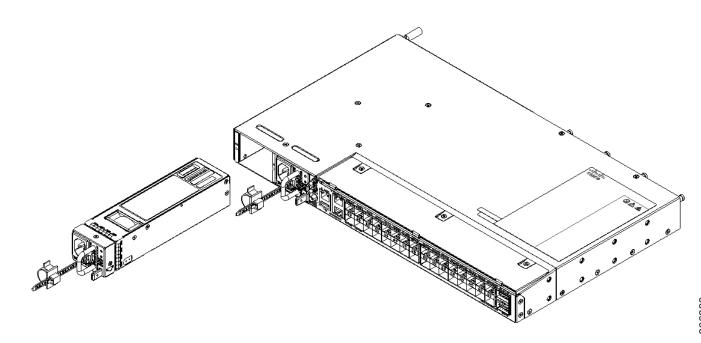
- **Step 1** Disconnect the power cord from the power source. Do not touch any metal on the power cord when it is still connected to the power supply.
- **Step 2** Loosen the tie and remove the power cord from the tie-and holder.
- **Step 3** Remove the power cord from the power connection on the power supply. Do not touch the metal prongs embedded in the power supply.
- **Step 4** Grasp the power supply handle. Simultaneously press the power supply lock towards the left and pull the power supply out from the chassis while supporting it with the other hand.

Install the AC Power Supply Module

Follow these steps to install the AC power supply module:

- **Step 1** Ensure that the system (earth) ground connection has been made.
- **Step 2** If necessary, remove the blank power supply filler plate from the chassis power supply bay opening by loosening the captive installation screws.
- Grasp the power supply handle with one hand. Place your other hand underneath the power supply. Slide the power supply into the power supply bay. Make sure that the power supply is fully seated in the bay. See the following figure.

Figure 31: Install AC Power Supply Module



- **Step 4** Slide the AC power supply cord inside the tie of the tie-and-holder and tighten the tie around the power supply cord.
- **Step 5** Plug the power supply cord into the AC power supply.

Install the AC Power Supply Module



LEDs

Certain troubleshooting aids of the Cisco NCS 540 enable you to perform these tasks that assist the troubleshooting process:

- Router LEDs, on page 61
- Fan Assembly LEDs, on page 62
- Power Supply LEDs, on page 63

Router LEDs

All the data port LEDs in the Cisco NCS 540 Router is at the front panel. There are 5 LEDs that reflect the different statuses of the system.

Table 6: Router LED Descriptions

| LED | Color | Status |
|---|-------|--|
| STATUS | Green | The module is operational and has no active major or critical alarms. |
| | Amber | Host kernel is booted and is ready to start SysAdmin VM. |
| | Red | Power-up failure is preventing the CPU from booting (set by hardware). |
| (Slow) Flashing Amber (Fast) The module is booting VM is being reloaded | | The module is booting up (set by IOFPGA). |
| | | The module is booting up (set by BIOS), shutting down, or the SysAdmin VM is being reloaded. |
| | | RP0 has active major or critical alarms. |
| | Off | The module is powered-off (set by hardware). |

| LED | Color | Status | |
|----------------------------------|----------------|--|--|
| ALARM | Red | Critical alarm - system-scope (including RP0). | |
| | Flashing Red | Critical alarm - Relating to voltage rail failures. | |
| | Amber | Major alarm - system-scope (including RP0). | |
| | Flashing Amber | Minor alarm - system-scope (including RP0). | |
| | Off | No alarm. | |
| SYNC | Green | Time core is synchronized to an external source including IEEE1588. | |
| | Flashing Green | System is in Synchronous Ethernet mode. | |
| | Amber | Acquiring state or Holdover: Time core is in acquiring state or holdover mode. | |
| | Off | Time core clock synchronization is disabled or in free-running state. | |
| STATUS + ALARM (Both LEDs) | Flashing Red | Secure Boot boot flash contents validation failed. (set by IOFPGA). This case is only applicable immediately after power-on. | |
| TIMING | Off | GPS config and GPS port is down. Time-of-day (ToD), 1PPS, and 10 MHz ports are not provisioned or disabled. | |
| | Amber | ToD, 1PPS, and 10 MHz signals are not valid. | |
| | Green | GPS port is up. ToD, 1PPS, and 10 MHz signals are valid. | |
| GNSS | Off | GNSS is not configured. | |
| | Green | GNSS Normal State. Self-survey is complete. | |
| | Red | Power up. GNSS is not tracking any satellite. | |
| | Amber | Auto holdover. | |
| | Blinking Green | Learning state–normal. Self-survey is not completed. | |

Fan Assembly LEDs

Cisco NCS 540 has 4 fans at the back panel. There is an LED on each fan assembly and they reflect the different status of the fans.

Table 7: Fan Assembly LED Descriptions

| LED | Color | Status | |
|--------|--|--|--|
| STATUS | Green | Fans are operating normally. | |
| | Flashing Amber One or more fans have failed. | | |
| | Amber | Fan tray is inserted and waiting to come online. | |
| | Off | Fan tray is not receiving power. | |

Power Supply LEDs

Table 8: Power Supply LED Descriptions

| POWER LED | FAIL LED | Power Supply Condition | |
|--|----------|--|--|
| Green | Off | Power Supply ON; valid input/output. | |
| Amber 1Hz Red 1Hz blinking PSU Warning due to: | | PSU Warning due to: | |
| blinking | | Over current | |
| | | Over temperature | |
| | | • Under voltage | |
| | | Over voltage | |
| | | Over power | |
| | | • Fan failure | |
| Off | On | PSU failure due to: | |
| | | Over current | |
| | | Over temperature | |
| | | • Under voltage | |
| | | Over voltage | |
| | | Over power | |
| | | • Fan failure | |
| Green 1Hz blinking | Off | Power supply is not plugged in to the chassis or shutdown by the system. | |
| Off | Off | No valid power input. | |
| Amber | Off | Low input voltage. | |

Power Supply LEDs



System Specifications

Certain troubleshooting aids of the Cisco NCS 540 enable you to perform these tasks that assist the troubleshooting process:

- Weight and Power Consumption, on page 65
- Environmental Specifications, on page 65
- Transceiver and Cable Specifications, on page 65
- RJ-45 Connectors, on page 66
- Time-of-Day Port Pinouts, on page 66
- Management and PTP Ethernet Port Pinouts, on page 67
- USB Flash or MEM Port Pinouts, on page 67
- Alarm Port Pinouts, on page 67
- Console Port Pinouts, on page 68
- Power Supply Power Cord Specifications, on page 68

Weight and Power Consumption

For information on physical specifications and power consumption, see table *Cisco NCS 540 chassis* specification on the Cisco Network Convergence System 540 Router Data Sheet.

Environmental Specifications

For information on environmental specifications, see table *Environmental properties for NCS 540 fixed systems* on the Cisco Network Convergence System 540 Router Data Sheet.

Transceiver and Cable Specifications

To determine which transceivers and cables are supported by this router, see Cisco Transceiver Modules Compatibility Information.

To see the transceiver specifications and installation information, see Cisco Transceiver Modules Install and Upgrade Guides.

RJ-45 Connectors

The RJ-45 connector connects Category 3, Category 5, Category 5e, Category 6, or Category 6A foil twisted-pair or unshielded twisted-pair cable from the external network to the following module interface connectors:

- · Router chassis
 - CONSOLE port
 - MGMT ETH port

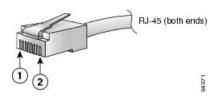


Caution

To comply with GR-1089 intrabuilding, lightning immunity requirements, you must use a foil twisted-pair (FTP) cable that is properly grounded at both ends.

The following figure shows the RJ-45 connector.

Figure 32: RJ-45 Connector



| 1 | Pin 1 | 2 | Pin 2 |
|---|-------|---|-------|
| | | | |

Time-of-Day Port Pinouts

The following table summarizes the ToD/1-PPS port pinouts.

Table 9: RJ-45 ToD/1-PPS Port Pinouts

| Pin | Signal Name | Direction | Description |
|-----|-------------|-----------------|-----------------------|
| 1 | _ | - | _ |
| 2 | _ | _ | _ |
| 3 | 1PPS_N | Output or Input | 1PPS RS422 signal |
| 4 | GND | - | - |
| 5 | GND | - | _ |
| 6 | 1PPS_P | Output or Input | 1PPS RS422 signal |
| 7 | TOD_N | Output or Input | Time-of-Day character |
| 8 | TOD_P | Output or Input | Time-of-Day character |

Management and PTP Ethernet Port Pinouts

The following table summarizes the Management and Precision Time Protocol (PTP) Ethernet port pinouts.

Table 10: Management and PTP Ethernet Port Pinouts

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

USB Flash or MEM Port Pinouts

The following table summarizes the USB flash or MEM port pinouts.

Table 11: USB Flash or MEM Port Pinouts

| Pin | Signal Name | Description |
|-----|-------------|-------------|
| A1 | Vcc | +5 VDC |
| A2 | D- | Data - |
| A3 | D+ | Data + |
| A4 | Gnd | Ground |

Alarm Port Pinouts

The following table summarizes the external alarm input pinouts.

Table 12: External Alarm Input Pinouts

| Pin | Signal Name | Description |
|-----|-------------|---------------|
| 1 | ALARM0_IN | Alarm input 0 |

| Pin | Signal Name | Description |
|-----|-------------|---------------|
| 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 Port Pinouts

The following table summarizes the Console port pinouts.

Table 13: Console Port Pinouts

| Pin | Signal Name | Direction | Description |
|-----|-------------|-----------|------------------------|
| 1 | Loop1 | NA | Loopback 1 |
| 2 | Loop2 | NA | Loopback 2 |
| 3 | TxD | Output | Console RS232 Transmit |
| 4 | Gnd | NA | Ground |
| 5 | Gnd | NA | Ground |
| 6 | RxD | Input | Console RS232 receive |
| 7 | Loop2 | NA | Loopback 2 |
| 8 | Loop1 | NA | Loopback 1 |

Power Supply Power Cord Specifications

For more information on the supported power cables, see *Ordering information for power cables supported* on NCS 540 on the Cisco Network Convergence System 540 Router Data Sheet.