



## **Cisco NCS 540 Router Hardware Installation Guide**

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# CHAPTER 1

## 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



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**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

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

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**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

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

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**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



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**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

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**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

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**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

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

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**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

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

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**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

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

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**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

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**Warning** When installing or replacing the unit, ensure the ground connection first and disconnected last. Statement 1046

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**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

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**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

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

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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.



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**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

---



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**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

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## 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.





## CHAPTER 2

# 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.

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

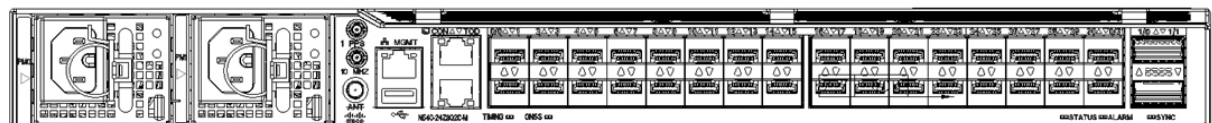
- [Features, on page 9](#)
- [Interface Naming, on page 10](#)
- [Network Timing Interfaces, on page 11](#)
- [GNSS, on page 11](#)
- [External Alarm Inputs, on page 12](#)
- [Console, on page 12](#)
- [Online Insertion and Removal, on page 12](#)
- [Power Supply \(N540-PWR400-A and N540-PWR400-D\), on page 12](#)
- [Fan Assembly \(N540-FAN\), on page 13](#)

## 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 N540-24Z8Q2C-M ports:

**Table 1: Port Numbering**

1G/10G Dual rate ports (SFP+)												1G/10G/25G Dual rate ports (SFP28)				40G/100G ports (QSFP28)	
0	2	4	6	8	0	2	4	6	8	0	2	24	26	28	30	1/0	
1	3	5	7	9	1	3	5	7	9	1	3	25	27	29	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 2: Maximum Number of Interfaces**

Category	Maximum Interface	Port Number
100ME copper	24	0/0 - 23



Category	Maximum Interface	Port Number
1GE	32	0/0 - 31
10GE	32 / 40* <sup>1</sup>	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

<sup>1</sup> \*4x10GE or 4x25GE option

## Network Timing Interfaces

- BITS input or output—The BITS interfaces support clock recovery from either a T1 at 1.544 MHz or an E1 at 2.048 MHz, 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 10 Mhz input and output—10 MHz 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.




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**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 4 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.



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

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## CHAPTER 3

# Prepare for Installation

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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](#)
- [Site Power Guidelines, on page 16](#)
- [Site Cabling Guidelines, on page 17](#)
- [Tools and Equipment, on page 18](#)
- [Prepare Your Location , on page 19](#)
- [Prepare Yourself , on page 20](#)
- [Prepare Rack for Router Installation, on page 20](#)
- [Unpack the Cisco NCS 540 Router, on page 21](#)

## 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 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.

## 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.



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**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.

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**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.

## 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 9600 baud, 8 data bits, no parity, no flow control, and 1 stop bit.
- Console cable for connecting to the console port

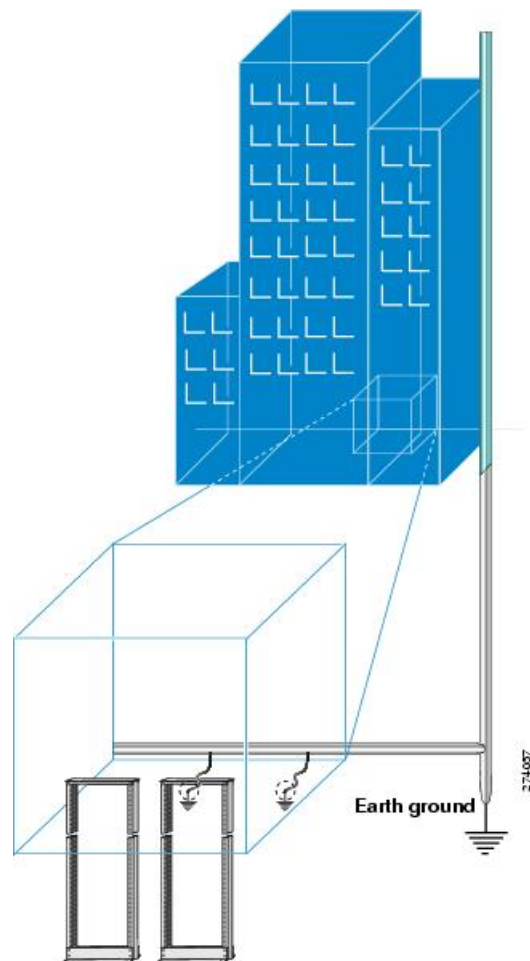


- Ratcheting torque screwdriver with a Phillips head that exerts up to 30-pound force per square inch (0.02-kilograms force per square millimeter (kgf/mm<sup>2</sup>)) of pressure.
- Crimping tool as specified by the ground lug manufacturer
- Wire-stripping tools for stripping both 6 and 14-AWG wires
- 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 2: Building with Rack Room Connected to Earth Ground**

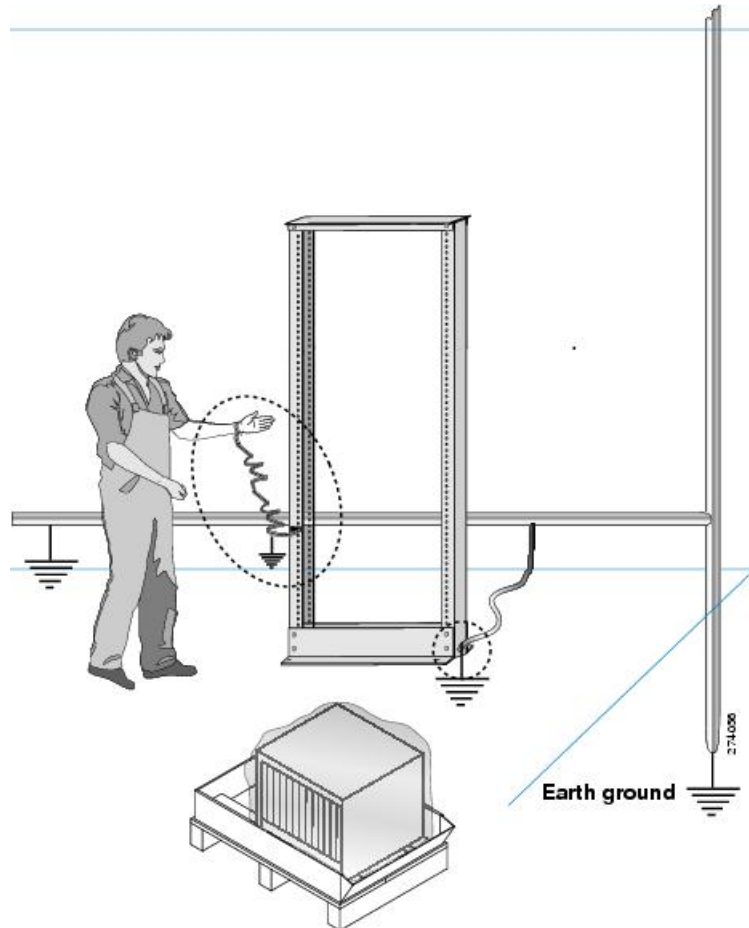


## Prepare Yourself

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 3: 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](https://www.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.

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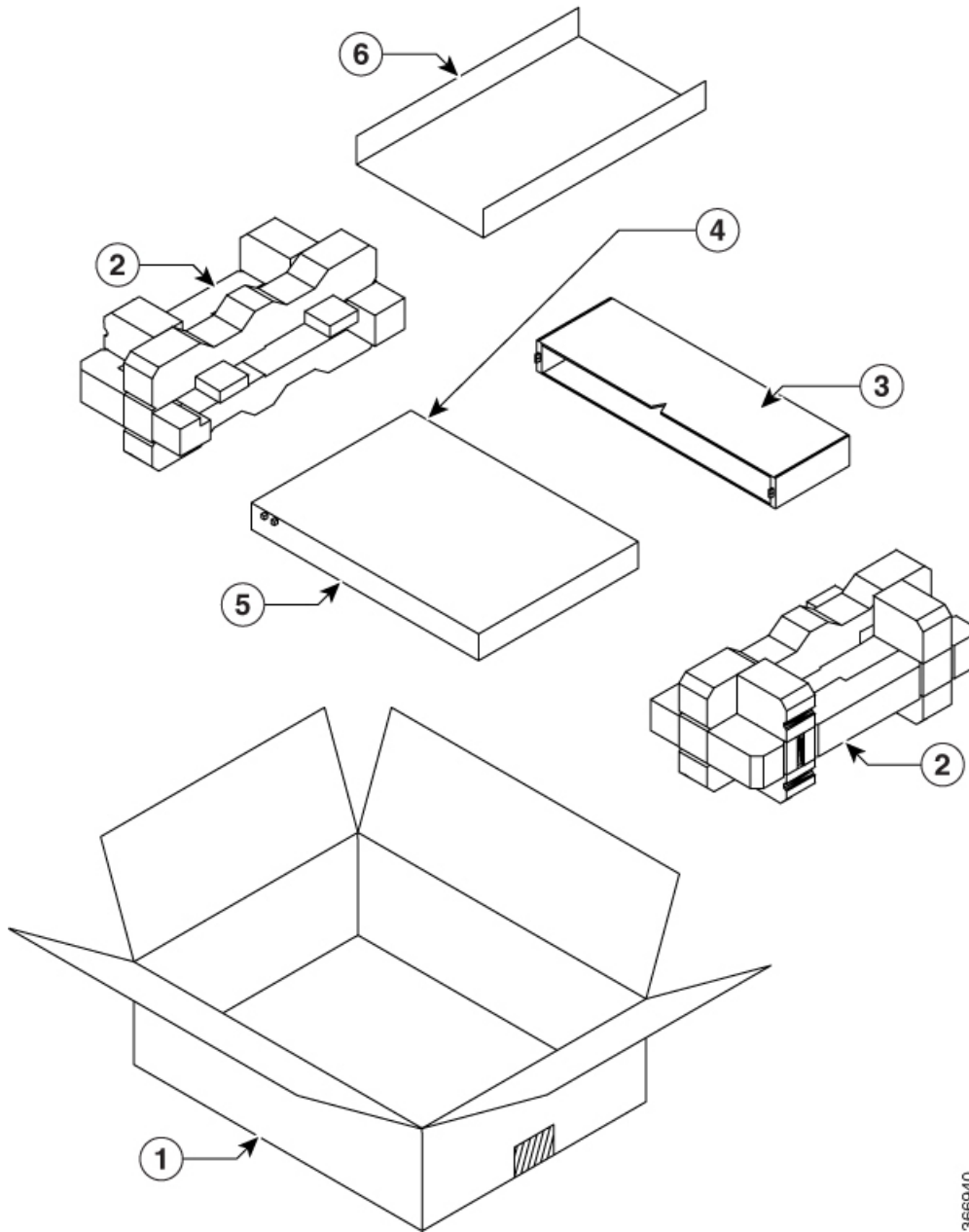
**Step 1** Remove the accessory tray and the packing material.

**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 4: Unpacking the Device



366940

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



## CHAPTER 4

# 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 23
- [Ground the Device](#), on page 25
- [Install the AC Power Cables](#), on page 26
- [Install the DC Power Cables](#), on page 27
- [Port Connection Guidelines](#), on page 28
- [Connect to the Console Port](#), on page 29
- [Connect to the Management Ethernet Port](#), on page 31
- [Install and Remove Transceiver Modules](#), on page 32
- [Connect Interface Ports](#), on page 41
- [Maintain Transceivers and Optical Cables](#), on page 42

## 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 3: 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 <sup>2</sup>	M3 x 0.5 x 4-mm Phillips countersink screws

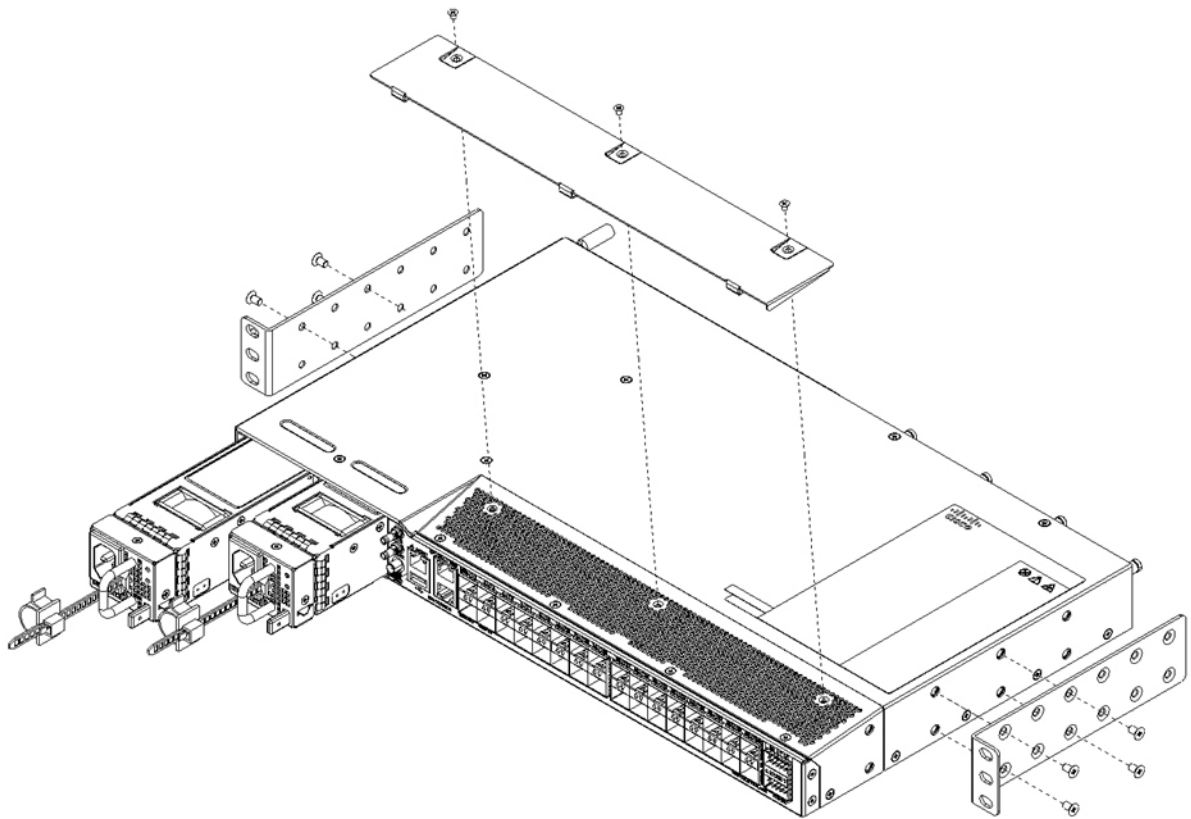
<sup>2</sup> Top cover or the NEBs kit is an optional accessory to improve the air flow, hence it may not be a part of your standard package.

**Step 1** (Optional) Attach the top cover or the NEBs kit by using the M3 screws to the chassis.

**Step 2** Attach the two rack-mount brackets to the router as follows:

- The router has port-side intake modules, position the router so that its ports are facing the cold aisle.
- With the bracket ears facing the center of the chassis, position a front rack-mount bracket on the side of the chassis so that its four holes are aligned to four screw holes on the side of the chassis.
- Use four M4 screws to attach the bracket to the chassis.
- Repeat Steps 1b and 1c with the other rack-mount bracket on the other side of the router.

**Figure 5: Rack-mount brackets on Cisco NCS 540**



966833

**Step 3** Install the router onto the 2-post rack as follows:

- Lift and position the router into position between the two rack posts.
- Move the router until the rack-mount brackets come in contact with the two rack posts.
- 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.
- 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.

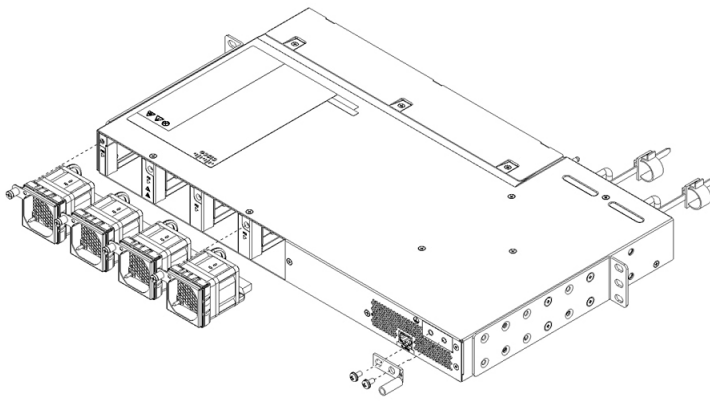
Before you connect the power or turn on the power to the device, you must provide an adequate device ground (earth) connection to your device.

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 6: Cisco NCS 540 Ground Lug**



1	Grounding lug	2	M4 x 12 mm pan-head screws
---	---------------	---	----------------------------

## 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.

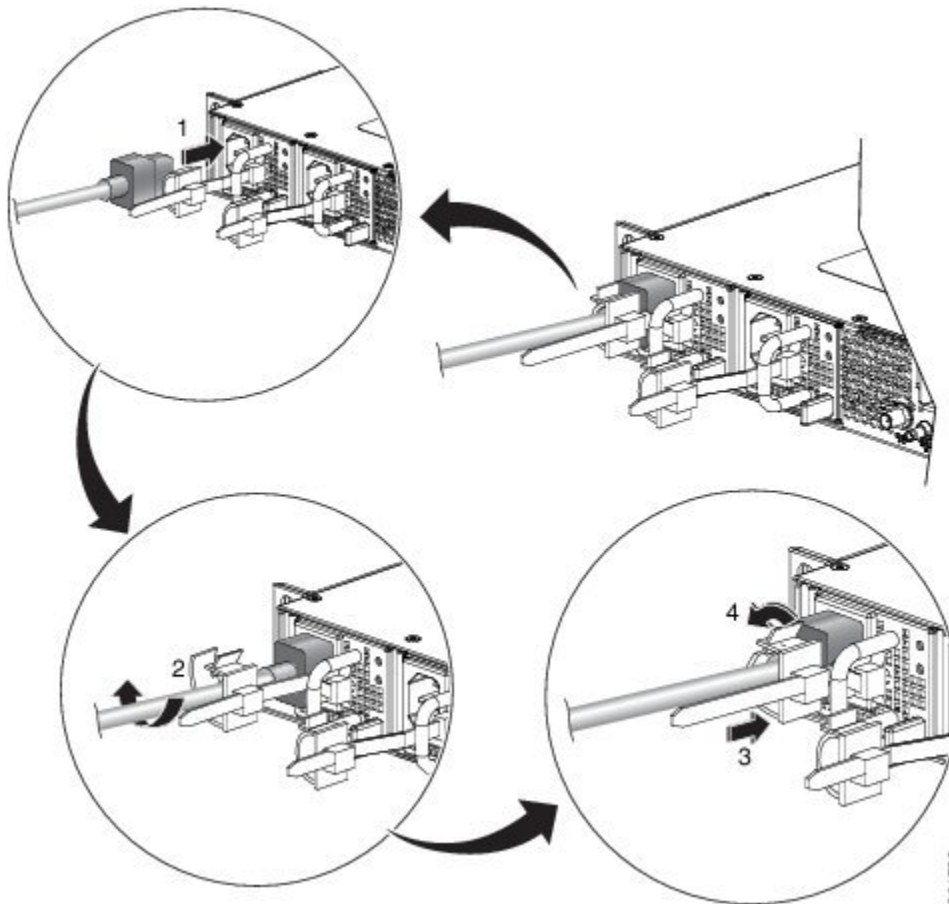
- a) Use a wire-stripping tool to remove approximately 0.75 inches (19 mm) of the covering from the end of the grounding cable.
- b) Insert the stripped end of the grounding cable into the open end of the grounding lug.
- c) Use the crimping tool to secure the grounding cable in the grounding lug.
- 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 7: 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

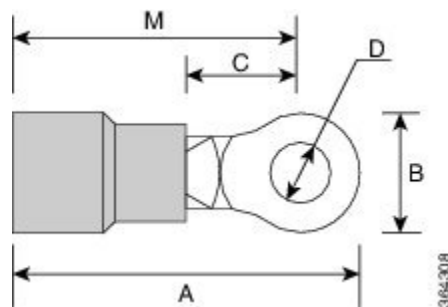


**Note** When installing DC power supply, use 14 AWG, 90°C wires. Always ensure that the building's installation for short-circuit (overcurrent) protection does not exceed 15A.



**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 8: DC Connector With Inbuilt Screw**

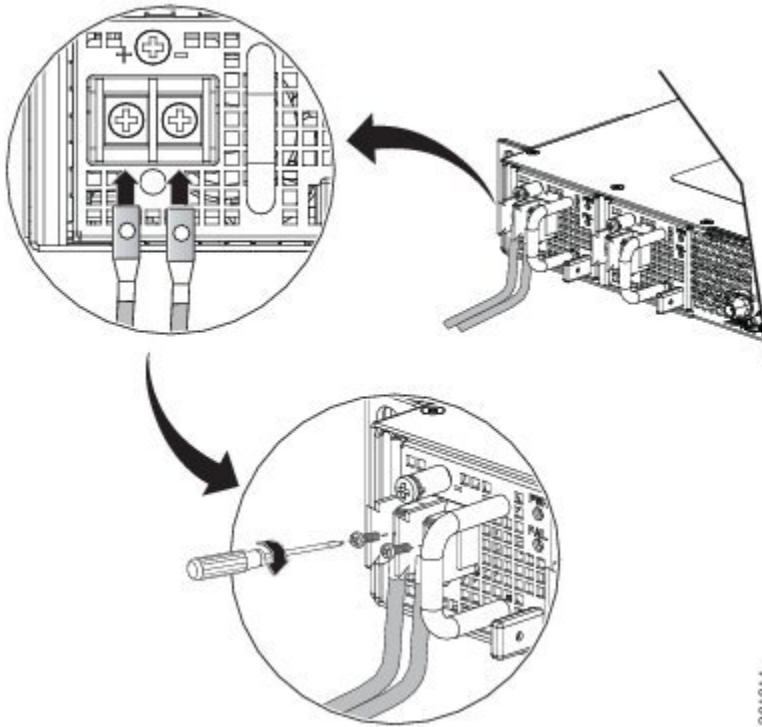


A	0.97 inches (2.4 centimeters)	C	0.27 inches (0.68 centimeters)
B	0.31 inches (0.78 centimeters)	D	0.17 inches (0.43 centimeters)
M	0.81 inches (2 centimeters)		

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.

Figure 9: Attach the DC Power Supply Wires



## 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 (I) 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.

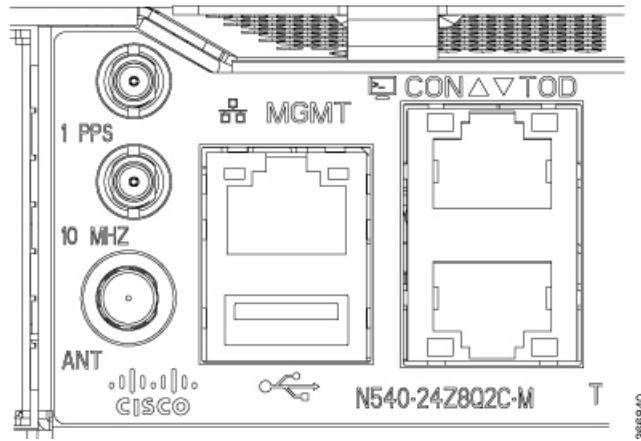
## Connect to the Console Port

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.

Figure 10: Console Port



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 4: RJ-45 Straight-through Cable Pin-outs**

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

RJ-45 Pin	Signal
8	—

## Connect to the Management Ethernet Port

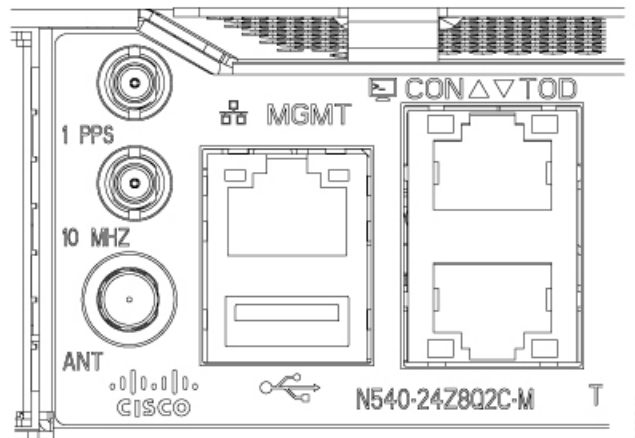
The management Ethernet port provides out-of-band management, which enables you to use the command-line interface (CLI) to manage the router by its IP address. This port uses a 10/100/1000 Ethernet connection with an RJ-45 interface.



**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 11: 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.

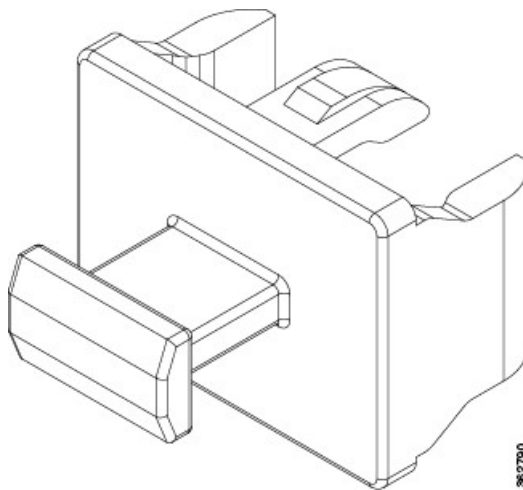


**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051



**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 12: 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 recommend 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.

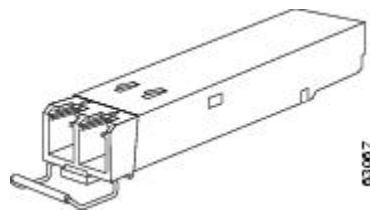


**Note** When installing an SFP or SFP+ module, you should hear a click as the triangular pin on the bottom of the module snaps into the hole in the receptacle. The click indicates that the module is correctly seated and secured in the receptacle. Verify that the modules are completely seated and secured 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 13: Bale Clasp SFP or SFP+ Module*

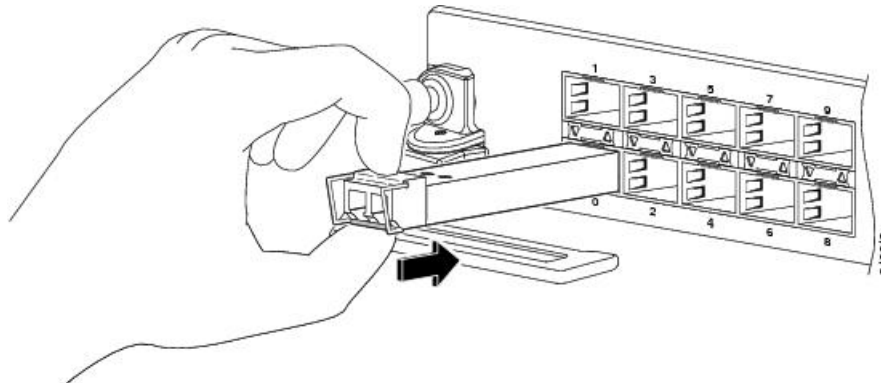


## Install a Bale Clasp SFP or SFP+ Module

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 14: 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.

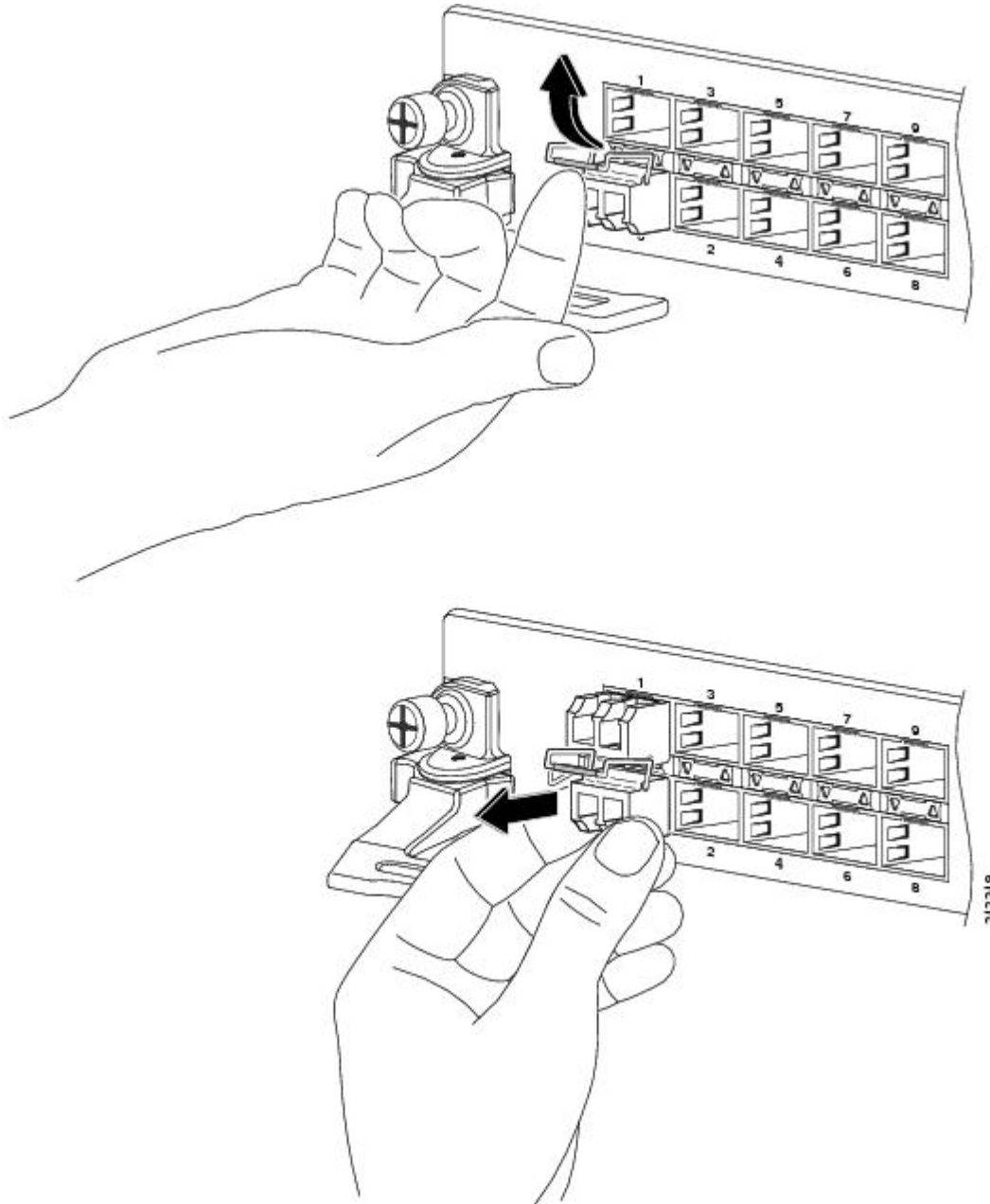
## Remove a Bale Clasp SFP or SFP+ Module

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 15: Removing a Bale Clasp SFP or SFP+ Module



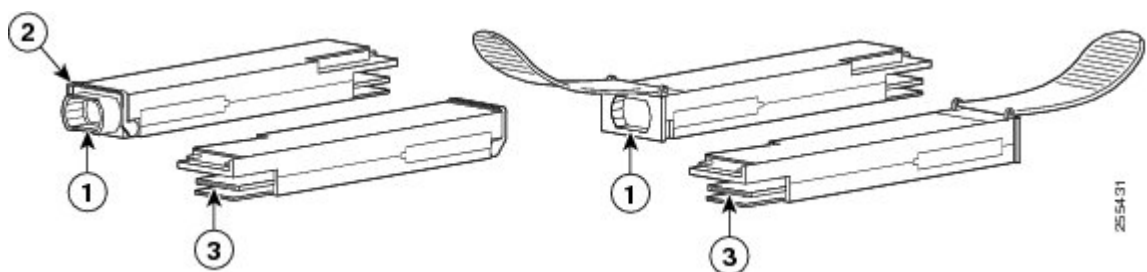
- Step 5** Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.
- Step 6** Protect your line card by inserting a clean SFP module cage covers into the optical module cage when there is no SFP module installed.

## 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 16: 40-Gigabit QSFP+ Transceiver Module (Optical)**



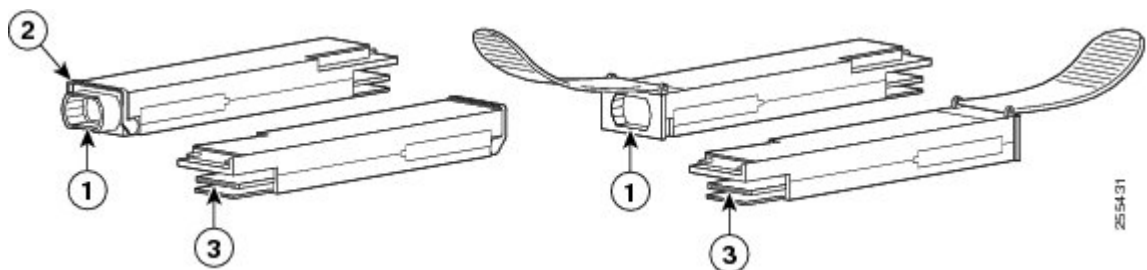
1	40GBASE QSFP+ transceiver body	3	Electrical connection to the module circuitry
2	Bail-clasp latch		

### 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 17: 40-Gigabit QSFP+ Transceiver Module (Optical)**



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

## 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.




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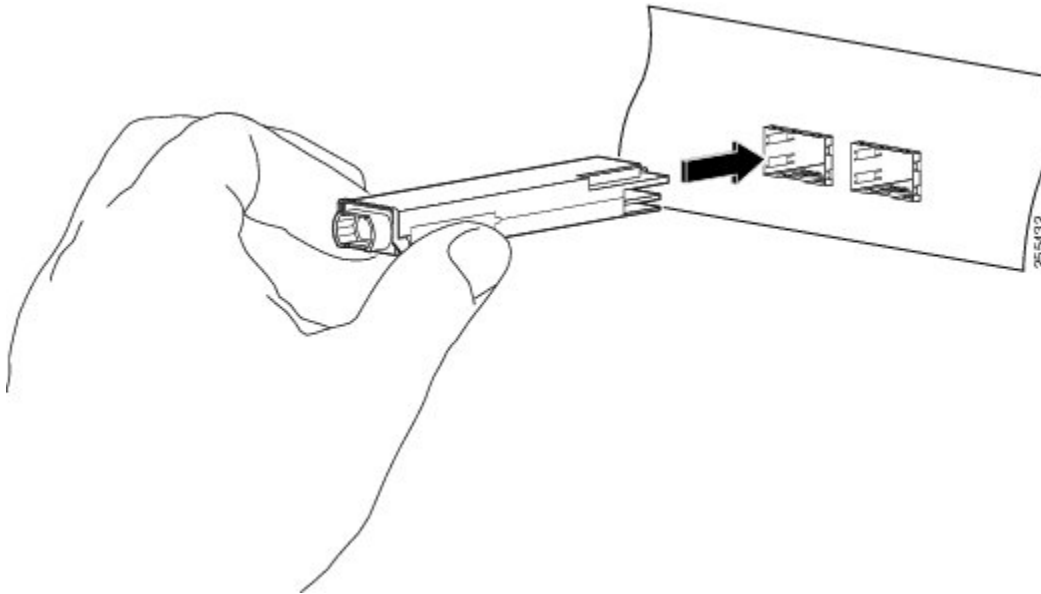
**Caution** The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or coming into contact with system modules.

---

To install an QSFP+ or QSFP28 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.
  - Step 7** 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).

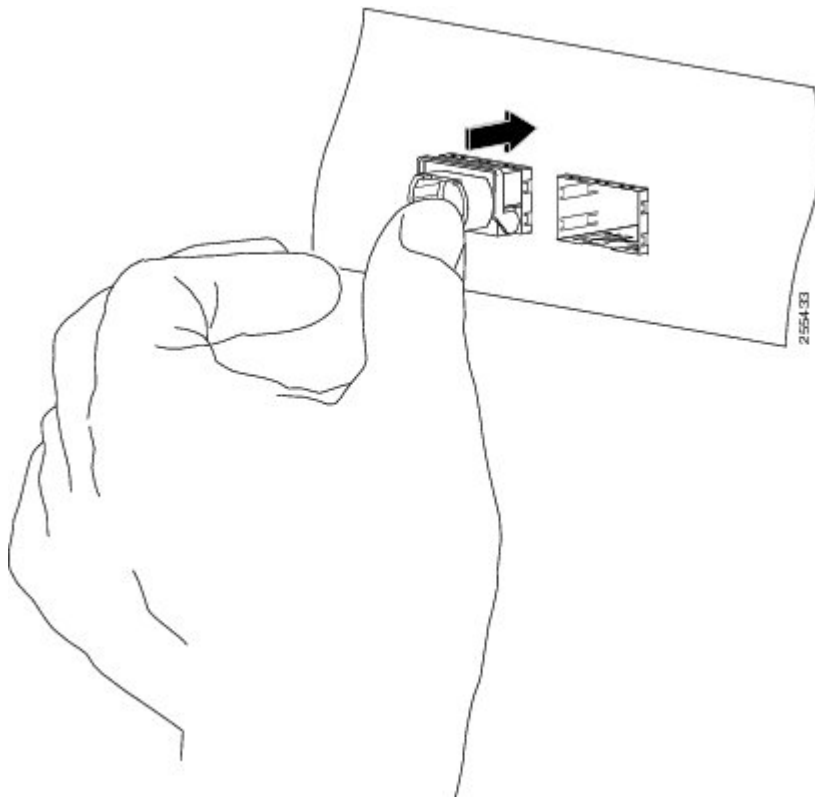
*Figure 18: Installing the 100-Gigabit QSFP28 Transceiver Module (Optical Transceiver Equipped with a Bail-Clasp Latch Shown)*



**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 19: 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.



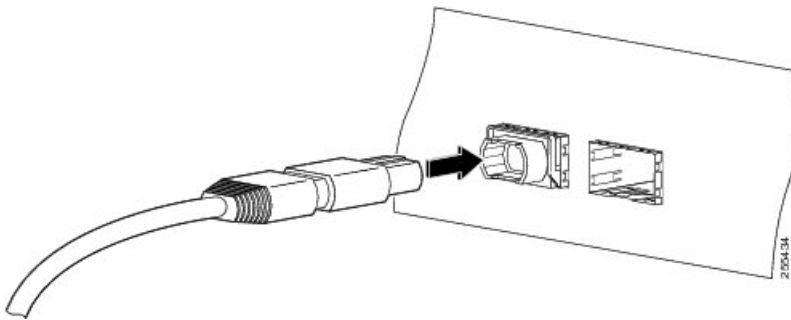
**Note** 40-Gigabit QSFP+ or QSFP28 transceiver modules are keyed to prevent incorrect insertion.



**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 20: Cabling a 40-Gigabit QSFP+ or QSFP28 Transceiver Module*



## Remove the 100-Gigabit QSFP28 Transceiver Module



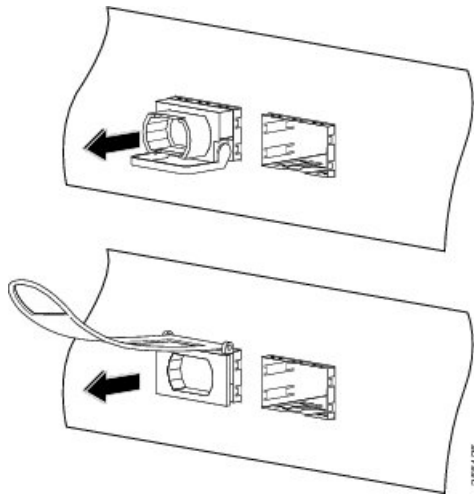
**Caution** The QSFP+ or QSFP28 transceiver module is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling QSFP+ or QSFP28 transceiver modules or when coming into contact with modules.

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):
- Pivot the bail-clasp down to the horizontal position.
  - Immediately install the dust plug into the transceivers optical bore.
  - 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):
- Immediately install the dust plug into the transceiver's optical bore.
  - Grasp the tab and gently pull to release the transceiver from the socket.

- c) Slide the transceiver out of the socket.

**Figure 21: 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 recommend 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.





## CHAPTER 5

# 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 43](#)
- [Verify Device Installation, on page 45](#)

## 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:

```

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

--- Administrative User Dialog ---

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

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

Username: root
Password:

RP/0/RP0/CPU0:ios#

```

**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.

---



## CHAPTER 6

# 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 47](#)
- [Replace Power Supply, on page 48](#)

## Replace Fan Module



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**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.

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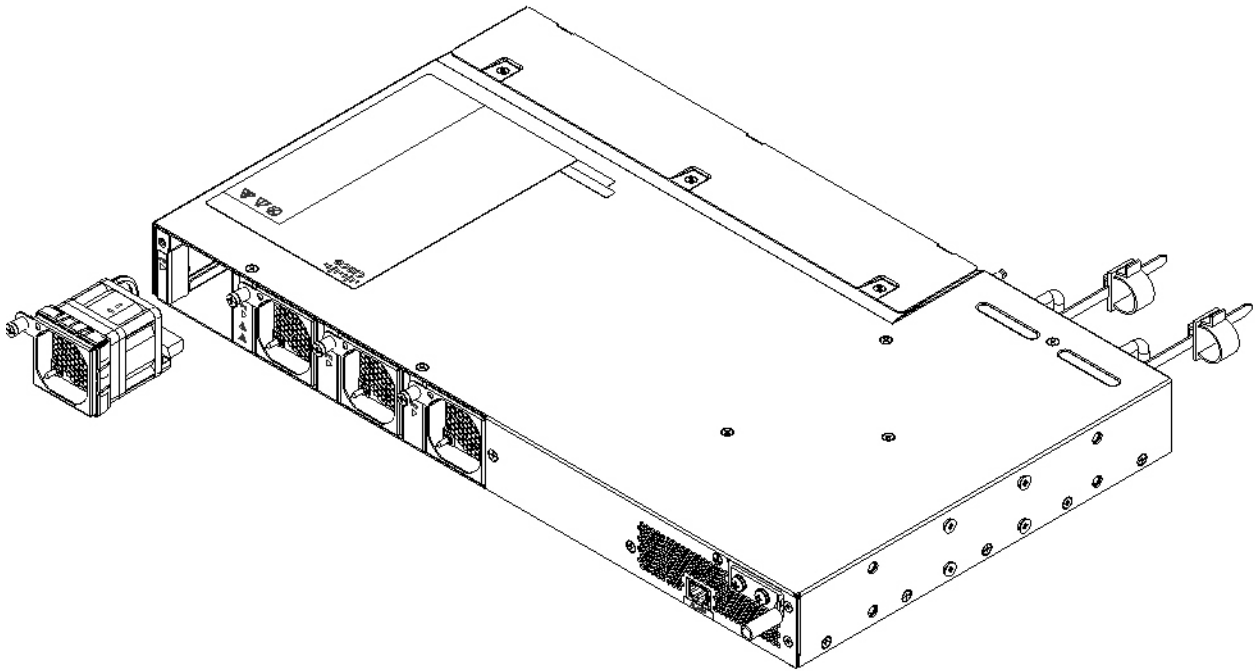
**Note** If you remove more than one fan tray at a time during operations, the router allows up to 2 minutes of operations before shutting down, unless you replace extra missing fan trays within that time. If the router senses an over temperature condition when multiple fan trays are removed, the shutdown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

---

---

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

Figure 22: Remove Fan Tray from the Chassis



366839

- 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.

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**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.

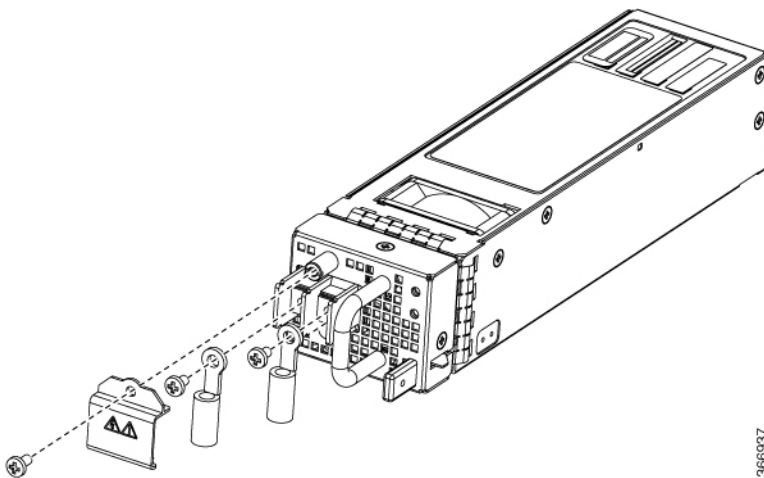
This equipment is suitable for installations utilizing the Common Bonding Network (CBN).

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.
- Step 4** 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 23: 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:



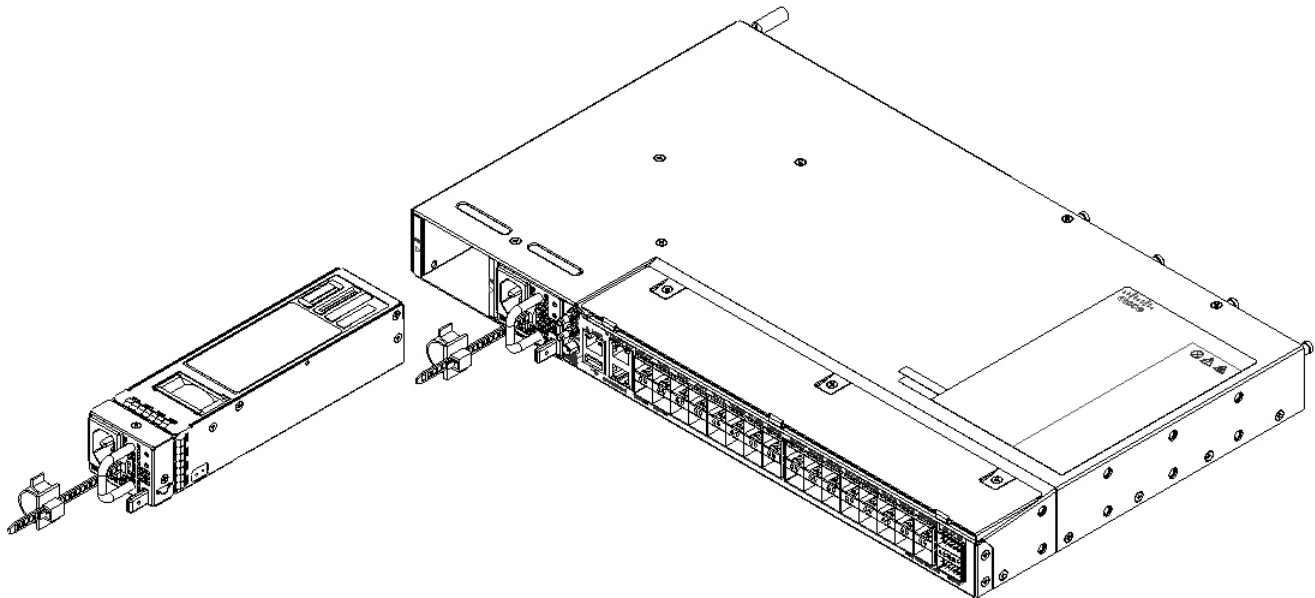
- 
- Step 1** Disconnect the power cord from the power source. Do not touch any metal on the power cord when it is still connected to the power supply.
- Step 2** Loosen the tie and remove the power cord from the tie-and holder.
- Step 3** Remove the power cord from the power connection on the power 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.
- Step 3** 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 24: 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.
-





# APPENDIX A

## LEDs

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

- [Router LEDs, on page 53](#)
- [Fan Assembly LEDs, on page 54](#)
- [Power Supply LEDs, on page 55](#)

## 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 5: 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).
	Flashing Amber (Slow)	The module is booting up (set by IOFPGA).
	Flashing Amber (Fast)	The module is booting up (set by BIOS), shutting down, or the SysAdmin VM is being reloaded.
	Flashing Red	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 6: 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 7: Power Supply LED Descriptions**

OK LED	FAIL LED	Status
Green	Off	Power supply is on and outputs power to the router.
Flashing Green	Off	Power supply is connected to AC power source but does not output power to the router. The power supply may not be properly installed in the chassis.
Off	Off	Either one uninstalled power supply or all installed power supplies are not receiving power.
Off	Flashing Amber	Power supply is operating but a warning condition has occurred; possibly one of the following conditions: <ul style="list-style-type: none"> <li>• High temperature</li> <li>• High power</li> <li>• Slow power supply fan</li> <li>• Low voltage</li> <li>• Power supply is installed in the chassis but has been disconnected from the power source</li> </ul>
Off	Amber	Power supply failure—possibly one of the following conditions: <ul style="list-style-type: none"> <li>• Over voltage</li> <li>• Over current</li> <li>• Over temperature</li> <li>• Power supply fan failure</li> </ul>

