

Cisco Network Convergence System 540 Passive Cooled Small Density Routers Hardware Installation Guide

First Published: 2022-04-29

Last Modified: 2026-02-26

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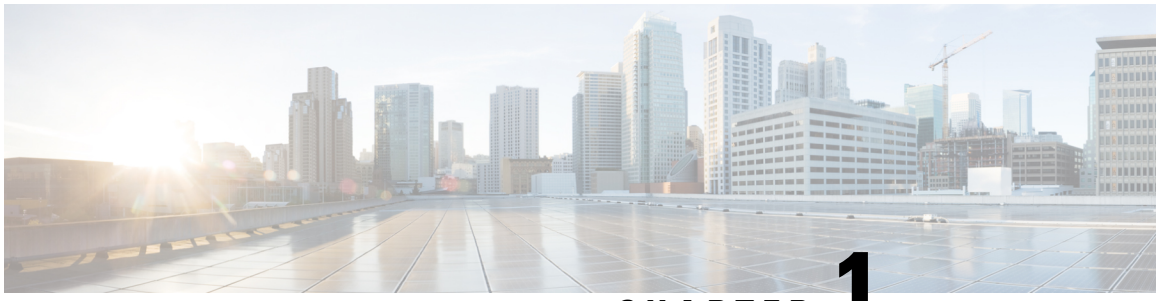
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CHAPTER 1

Safety Warnings

This handout lists the safety warnings necessary for handling this chassis. 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 3
- Safety Precautions for Module Installation and Removal, on page 3
- Safety with Electricity, on page 4
- Cautions and Regulatory Compliance Statements for NEBS, on page 7
- Power supply considerations, on page 8
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Standard Warning Statements

Warning IMPORTANT SAFETY INSTRUCTIONS

Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Read the installation instructions before using, installing, or connecting the system to the power source. Use the statement number at the beginning of each warning statement to locate its translation in the translated safety warnings for this device.

SAVE THESE INSTRUCTIONS



Warning This unit is intended for installation in restricted access areas. Only skilled, instructed, or qualified personnel can access a restricted access area.



Warning **Statement 1047—**Overheating Prevention

To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of: –40 to 149°F (–40 to 65°C).



Warning To reduce the risk of bodily injury, mount the chassis on a rack that is permanently affixed to the building.

Statement 1003—DC Power Disconnection



Warning To reduce risk of electric shock or personal injury, disconnect DC power before removing or replacing components or performing upgrades.

Statement 1006—Chassis Warning for Rack-Mounting and Servicing



Warning To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Statement 1022—Disconnect Device



Warning To reduce the risk of electric shock and fire, a readily accessible disconnect device must be incorporated in the fixed wiring.

Statement 1024—Ground Conductor



Warning This equipment must be grounded. To reduce the risk of electric shock, 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 1101—Connected To Grounded Outlet



Warning In the Scandinavian countries (Denmark, Finland, Iceland, Norway, and Sweden) the appliance must be connected to a grounded outlet.

Statement 9001—Product Disposal



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

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 can 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 To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Warning This product is a Class 1 laser product.

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

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

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

Safety with Electricity

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.
  - Seek medical attention, if necessary.

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.

Statement 1003—DC Power Disconnection



Warning To reduce risk of electric shock or personal injury, disconnect DC power before removing or replacing components or performing upgrades.

Statement 1005—Circuit Breaker



Warning This product relies on the building's installation for short-circuit (overcurrent) protection. To reduce risk of electric shock or fire, ensure that the protective device is rated not greater than:

Statement 1074—Comply with Local and National Electrical Codes



Warning To reduce risk of electric shock or fire, installation of the equipment must comply with local and national electrical codes.

Statement 1073—No User-Serviceable Parts

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

Statement 2004—Grounded Equipment

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.

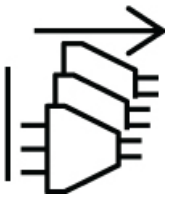
Statement 1046—Installing or Replacing the Unit

Warning To reduce risk of electric shock, when installing or replacing the unit, the ground connection must always be made first and disconnected last.

If your unit has modules, secure them with the provided screws.

Statement 1028—More Than One Power Supply

Warning This unit might have more than one power supply connection. To reduce risk of electric shock, remove all connections to de-energize the unit.



Statement 1024—Ground Conductor

Warning This equipment must be grounded. To reduce the risk of electric shock, 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 1022—Disconnect Device

Warning To reduce the risk of electric shock and fire, a readily accessible disconnect device must be incorporated in the fixed wiring.

Statement 1073—No User-Serviceable Parts

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

Cautions and Regulatory Compliance Statements for NEBS

The NEBS-GR-1089-CORE regulatory compliance statements and requirements are discussed in this section.

Warning **Statement 7003—**Shielded Cable Requirements for Intrabuilding Lightning Surge

The intrabuilding port(s) of the equipment or subassembly must use shielded intrabuilding cabling/wiring that is grounded at both ends.

- Copper Gigabit Ethernet ports

Note This equipment is suitable for installations using the CBN.

Warning **Statement 7016—**Battery Return Conductor

Treat the battery return conductor of this equipment as DC Isolated (DC-I).

Note This equipment is suitable for installation in network telecommunications facilities.

Note This equipment is suitable for installation in locations where the NEC applies.

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

Statement 7001—ESD Mitigation

Note This equipment may be ESD sensitive. Always use an ESD ankle or wrist strap before handling equipment. Connect the equipment end of the ESD strap to an unfinished surface of the equipment chassis or to the ESD jack on the equipment if provided.

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.

Statement 1024—Ground Conductor

Warning This equipment must be grounded. To reduce the risk of electric shock, 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.

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 60950-1, UL 62368-1, CSA 60950-1, CSA 62368-1, EN 60950-1, EN 62368-1, IEC 60950-1, and IEC 62368-1 standards.
- Protect the circuit by a dedicated two-pole DC 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.
- Ensure that each power feed of the equipment is connected to different power sources.

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.

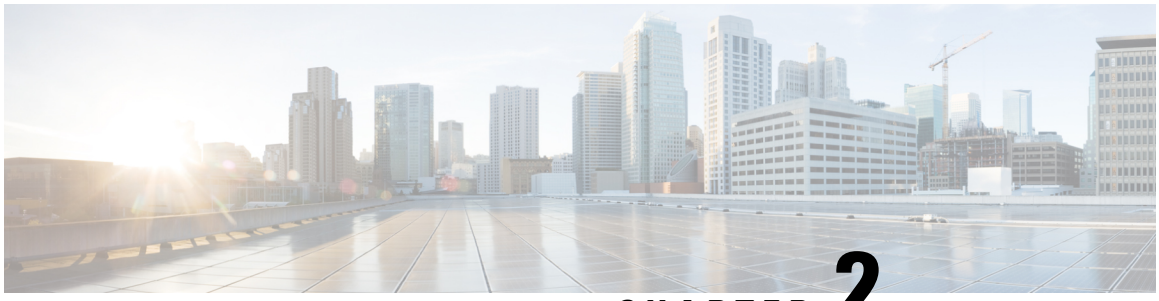
Determining power requirements is useful for planning the power distribution system to support the device.

Preventing ESD damage

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 Small Density Passive Cooled Routers Overview

The Cisco NCS 540 Small Density Passive Cooled Router is temperature-hardened, fixed port, 2.5 rack unit form-factor router. An IOS XR based cell site router, the router extends Cisco's 5G Converged SDN Transport to edge of the networks as a CSR/NID/CPE, with the smallest footprint, ever.

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

- Network Interfaces, on page 11
- Cisco NCS 540 Small Density Passive Cooled Router Features, on page 12
- Specification, on page 14
- Interface Naming, on page 14
- External Alarm Inputs, on page 15
- Console, on page 15
- Online Insertion and Removal, on page 16
- Supported Transceiver Modules, on page 16

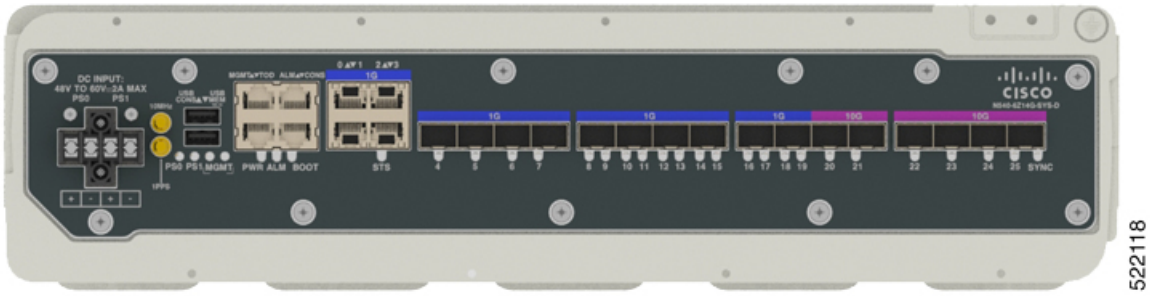
Network Interfaces

Cisco N540-6Z14S-SYS-D router

The Cisco N540-6Z14S-SYS-D router has the following hardware features:

- 6 X 1G/10G SFP+ ports
- 6 X CSFP ports
- 4 X 1G SFP ports
- 4 X 1G Copper GE ports

Figure 1: Cisco N540-6Z14S-SYS-D

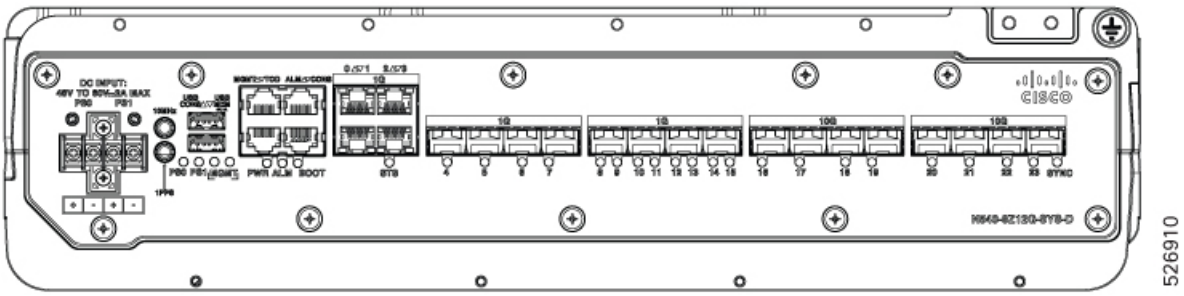


Cisco N540-8Z12G-SYS-D router

The Cisco N540-8Z12G-SYS-D router has the following hardware features:

- 8 X 1G/10G SFP+ ports
- 4 X CSFP ports
- 4 X 1G SFP ports
- 4 X 1G Copper GE ports

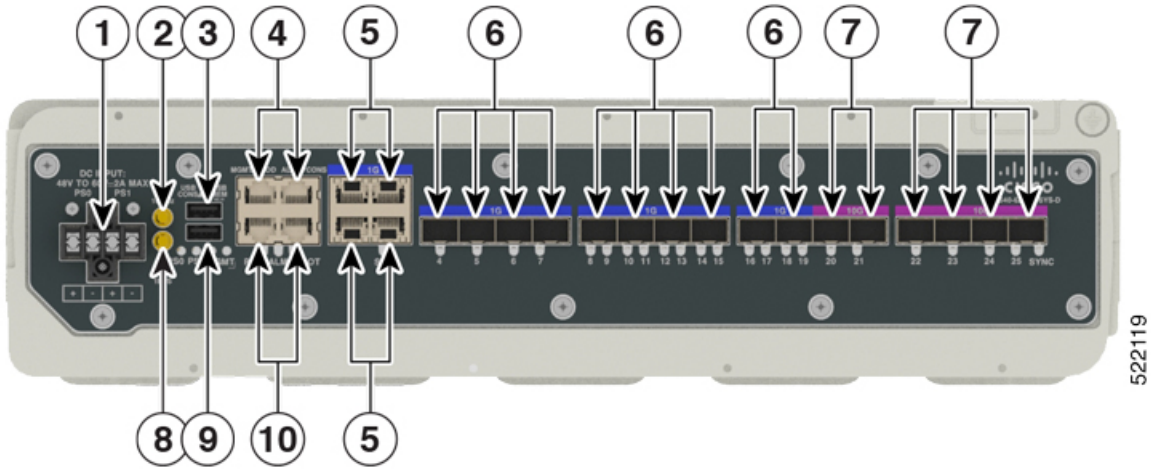
Figure 2: Cisco N540-8Z12G-SYS-D



Cisco NCS 540 Small Density Passive Cooled Router Features

Cisco N540-6Z14S-SYS-D ports

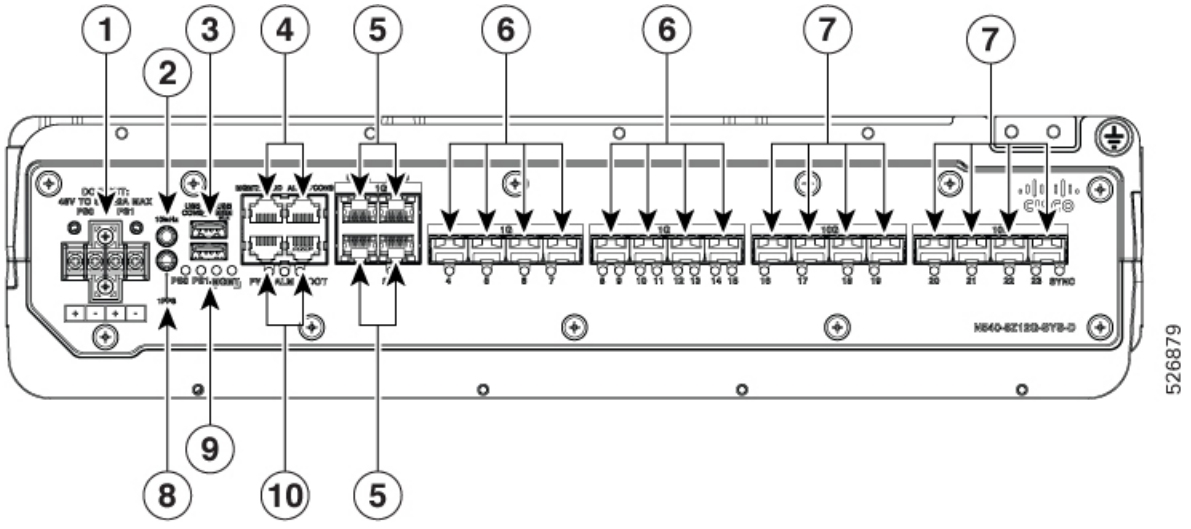
Figure 3: Cisco N540-6Z14S-SYS-D Ports



1	DC Power Input	2	10 MHz Input or Output
3	USB Console	4	Management and Alarm Ports
5	4 X 1G Copper Ports (Ports 0-3)	6	1G ports (Ports 4-19)
7	6 X 10G SFP ports (Ports 20-25)	8	1 PPS
9	USB Memory	10	ToD and Console Ports

Cisco N540-8Z12G-SYS-D ports

Figure 4: Cisco N540-8Z12G-SYS-D Ports



1	DC Power Input	2	10 MHz Input or Output
3	USB Console	4	Management and Alarm Ports
5	4 X 1G Copper Ports (Ports 0-3)	6	1G ports (Ports 4-15)
7	8 X 10G SFP ports (Ports 16-23)	8	1 PPS
9	USB Memory	10	ToD and Console Ports

Specification

For information on physical specification, temperature, and other details for the router, see *Cisco NCS 540 chassis specification* in the Cisco Network Convergence System 540 Small Density Router Data Sheet.

Interface Naming

Cisco N540-6Z14S-SYS-D router

The following table shows the interface naming of the Cisco N540-6Z14S-SYS-D router:

Table 1: Port Numbering

1G Copper ports	1G SFP ports	1G SFP ports (Including CSFP)	10G Dual rate SFP+ ports
0/0 to 0/3	0/4 to 0/7	0/8 to 0/19*	0/20 to 0/25

* ports 9, 11, 13, 15, 17, and 19 are enabled only with CSFP optical modules.

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

- **GigE** — 0/0/0/0 to 0/0/0/19 (ports 9, 11, 13, 15, 17, and 19 are enabled only with CSFP optics)
- **TenGigE** — 0/0/0/20- 0/0/0/25

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

Table 2: Maximum Number of Ports

Category	Maximum Number of Ports	Port Number
1GE	20	0/0 - 19

Category	Maximum Number of Ports	Port Number
10GE	6	0/20 - 25

Cisco N540-8Z12G-SYS-D router

The following table shows the interface naming of the N540-8Z12G-SYS-D router:

Table 3: Port Numbering

1G Copper ports	1G SFP ports	1G SFP ports (Including CSFP)	10G Dual rate SFP+ ports
0/0 to 0/3	0/4 to 0/7	0/8 to 0/15*	0/16 to 0/23

* ports 9, 11, 13, and 15 are enabled only with CSFP optical modules.

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

- **GigE** — 0/0/0/0 to 0/0/0/15 (ports 9, 11, 13, and 15 are enabled only with CSFP optics)
- **TenGigE** — 0/0/0/16- 0/0/0/23

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

Table 4: Maximum Number of Ports

Category	Maximum Number of Ports	Port Number
1GE	16	0/0 - 15
10GE	8	0/16 - 23

External Alarm Inputs

The router supports four dry contact alarm inputs through an RJ-45 jack at the front 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 uboot, 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. If you insert the USB cable and connect to the host computer, then you can only enter the commands using the USB.

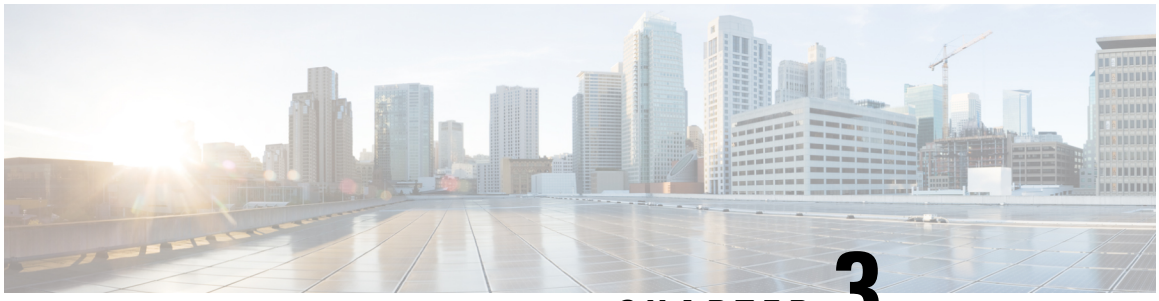
Online Insertion and Removal

The router supports the following Online Insertion and Removal (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 based on the current configuration. If the inserted SFP is incompatible with the current configuration of that port, the port does not become operational until the configuration is updated.
- When both power supplies are installed and active, the load may be shared between them or a single PSU supports 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.
- The power supply modules are fixed and cannot be removed.

Supported Transceiver Modules

For more information on the supported transceiver modules, see Transceiver Module Group (TMG) Compatibility Matrix. In the **Begin your Search** search box, enter the keyword and click **Enter**.



CHAPTER 3

Preparing for Installation

This chapter describe how to prepare for the installation of the Cisco N540-6Z14S-SYS-D router at your site, and contains the following sections:

- Safety Guidelines, on page 17
- Site Planning, on page 23

Safety Guidelines

Before you begin the installation of the Cisco N540-6Z14S-SYS-D routers, review the safety guidelines in this chapter to avoid injuring yourself or damaging the equipment.

In addition, before replacing, configuring, or maintaining the Cisco N540-6Z14S-SYS-D router, review the safety warnings listed in the *Regulatory Compliance and Safety Information for the Cisco NCS 540 Series Routers*document.

The following sections describe the safety guidelines of the router:

Standard Warning Statements

To see translations of the warnings that appear in this publication, see the *Regulatory Compliance and Safety Information for the Cisco NCS 540 Series Router* document.

Warning To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety: This unit should be mounted at the bottom of the rack if it is the only unit in the rack. When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack. If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack. Statement 1006.

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

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

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

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

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

Warning This is a Class A Device and is registered for EMC requirements for industrial use. The seller or buyer should be aware of this. If this type was sold or purchased by mistake, it should be replaced with a residential-use type. Statement 294.

Warning This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. Statement 340.

Warning This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. Statement 287.

Safety Guidelines for Personal Safety and Equipment Protection

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

- Before moving the system, always disconnect all the power cords and interface cables.
- Never assume that power is disconnected from a circuit; always check.
- Before and after installation, keep the chassis area clear and dust free.

- Keep tools and assembly components away from walk areas where you or others could trip over them.
- Do not work alone if potentially hazardous conditions exist.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Do not wear loose clothing that may get caught in the chassis.
- When working under conditions that may be hazardous to your eyes, wear safety glasses.

Safety Precautions for Module Installation and Removal

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

To see the translations of the warnings that appear in this publication, see the *Regulatory Compliance and Safety Information for the Cisco NCS 540 Series Router* document.



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 radiation present. Statement 1016



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

Safety with Electricity



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



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



Warning An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the connector(s) or terminal block(s). Statement 122



Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001



Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003



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



Warning This product relies on the building's installation for short-circuit (overcurrent) protection. For a DC installation, ensure that the branch circuit breaker is rated a maximum 15A for DC systems. For AC systems, 15A for voltages greater than 200Vac; 20A for voltages below 127Vac. Statement 1005



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



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



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



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



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



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



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



Warning Use copper conductors only. Statement 1025



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



Warning Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033



Warning Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool. Statement 1035



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



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

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

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

- Locate the room's emergency power-off switch. If an electrical accident occurs, you will be able to quickly turn off the power.
- Before starting work on the system, turn off the DC main circuit breaker and disconnect the power terminal block cable.
- Before doing the following, disconnect all power:
  - Working on or near power supplies
  - Installing or removing a router chassis or network processor module
  - Performing most hardware upgrades
- Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- Never assume that power is disconnected from a circuit; always check.
- Never perform any action that creates a potential hazard to people or makes the equipment unsafe.
- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Turn off power to the router.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim, and then call for help.
  - Determine whether the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Power Supply Considerations

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

Preventing ESD Damage

Warning This equipment needs to be grounded. Use a green and yellow 6 AWG ground wire to connect the host to earth ground during normal use. Statement 383

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

- Ensure that the router chassis is electrically connected to earth ground.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. To channel unwanted ESD voltages safely to ground, connect the clip to an unpainted surface of the chassis frame. To guard against ESD damage and shocks, the wrist strap and cord must operate effectively.
- If no wrist strap is available, ground yourself by touching a metal part of the chassis.
- Handle components by their handles or edges only.

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

Site Planning

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

General Precautions

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

- Keep your system components away from radiators and heat sources, and do not block cooling vents.
- Do not spill food or liquids on your system components, and never operate the product in a wet environment.
- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and power supply cable carefully. Route system cables, the power supply cable, and plug so that they are not stepped on or tripped over. Be sure that nothing else rests on your system component cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local and national wiring rules.
- If you turn off your system, wait at least 30 seconds before turning it on again to avoid damage to the system components.

Site Planning Checklist

Use the following checklist to perform and account for all the site planning tasks described in this chapter:

- The site meets the environmental requirements.
- The site's air conditioning system can compensate for the heat dissipation of the router.
- The floor space that the router occupies can support the weight of the system.

- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the router complies with the requirements.
- Consideration has been given to the console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The router Ethernet cabling distances are within the prescribed limitations.
- The equipment rack in which you plan to install the router complies with prescribed requirements.
- Factors that have been carefully considered when selecting the location of the rack:
  - safety,
  - ease of maintenance, and
  - proper airflow.

Site Selection Guidelines

The router requires specific environmental operating conditions. Temperature, humidity, altitude, and vibration can affect the performance and reliability of the router. The following sections provide specific information to help you plan for the proper operating environment.

The router is designed to meet the industry EMC, safety, and environmental standards described in the *Regulatory Compliance and Safety Information for the Cisco NCS 540 Series Router* document.

Environmental Requirements

Environmental monitoring of the router protects the system and components from damage that is caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration *before* installation. After installation, make sure that the site maintains the environmental characteristics that are described in the *Cisco Network Convergence System 540 Small Density Passive Cooled Routers Datasheet*.

For an outside plant installation (cell site cabinet, hut, and so on), install the router in a cabinet that protects the product against rain and direct sunlight. The airborne contaminants such as, dust, moisture, insects, pests, corrosive gases, polluted air, or other reactive elements present in the outside air should be within the GR3108 class 3 outdoor levels. Maintain a temperature within –40º C to 65º C (–40 to 149°F).

Note Not all metallic connections are applicable for outside plant connections.

The equipment is designed to meet the following requirements:

- GR-63-CORE, Issue 4
- GR-1089-CORE, Issue 6
- GR-3108-CORE, Class 3

Environmental Considerations for Cisco N540-8Z12G-SYS-D router

- For outside plant installation (cell site cabinet, hut, and so on), equipment must be protected 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.

  Examples of such cabinets include IP65/IP66 cabinets with heat exchanger complying with Telcordia GR487.
- Temperature must be maintained within: –40°C to +65°C. The maximum and minimum operating temperatures are supported at Mean Sea Level (MSL).
- The equipment shall be placed inside an enclosure (that is protected from direct outside weather and environmental stresses by the enclosure), and where the operating climate, as defined by GR3108 Class 2, is between:
  - Operating temperature range
    - -20°C to +65°C at 300 m
    - -20°C to +60°C up to 1800 m
    - -20°C to +50°C up to 4000 m
  - 5% and 95% RH
  - Airborne particulate concentration level < 20 micro grams per meter cube
  - Altitude: 0 to 4000 meters

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

Temperature

Temperature extremes may cause a system to operate at reduced efficiency and cause various problems, including premature aging and failure of chips, and failure of mechanical devices. Extreme temperature fluctuations may also cause chips to become loose in their sockets.

Observe these guidelines:

- Ensure that the chassis has adequate ventilation.
- Do not place the chassis within a closed-in wall unit or on top of cloth, which can act as thermal insulation.
- Do not place the chassis where it receives direct sunlight, particularly in the afternoon.
- Do not place the chassis next to a heat source of any kind, including heating vents.
- Adequate ventilation is important at high altitudes. Make sure that all the slots and openings on the system remain unobstructed, especially the fan vent on the chassis.
- Clean the installation site at regular intervals to avoid the buildup of dust and debris, which may cause a system to overheat.

Note Failure to observe these guidelines may damage the internal components of the chassis.

Dust and Particles

Fans cool power supplies and system components by drawing in room-temperature air and exhausting heated air out through various openings in the chassis. However, fans also ingest dust and other particles, causing contaminant buildup in the system and increased internal chassis temperature. A clean operating environment can greatly reduce the negative effects of dust and other particles, which act as insulators and interfere with the mechanical components in the system.

PM2.5 and PM10 are some of the commonly available air quality parameters to indicate dust concentration levels. Periodically check dust concentration levels and provide required protection to improve air quality around the equipment.

Air Quality

Dust is everywhere and often invisible to the naked eye. It consists of fine particles in the air that originate from various sources, such as soil dust lifted by weather, from volcanic eruptions, or pollution. Dust at an installation site may contain small amounts of textile, paper fibers, or minerals from outdoor soil. It may also contain natural contaminants, such as chlorine from the marine environment and industrial contaminants such as sulfur. Ionized dust and debris are dangerous and get attracted to electronic equipment.

The accumulation of dust and debris on electronic equipment has the following adverse effects:

- It increases the operating temperature of the equipment. According to the Arrhenius effect, an increase in the operating temperature leads to a decrease in reliability and life of the equipment.
- The moisture and corrosive elements that are present in the dust can corrode the electronic or mechanical components and cause premature board failure.

These adverse effects are further accelerated by the presence of fans in the data networking equipment that ingest dust and other particles into the equipment. Higher the volume of air that is generated by the fans for cooling, the higher the quantity of dust and particulates that get deposited and trapped inside the equipment.

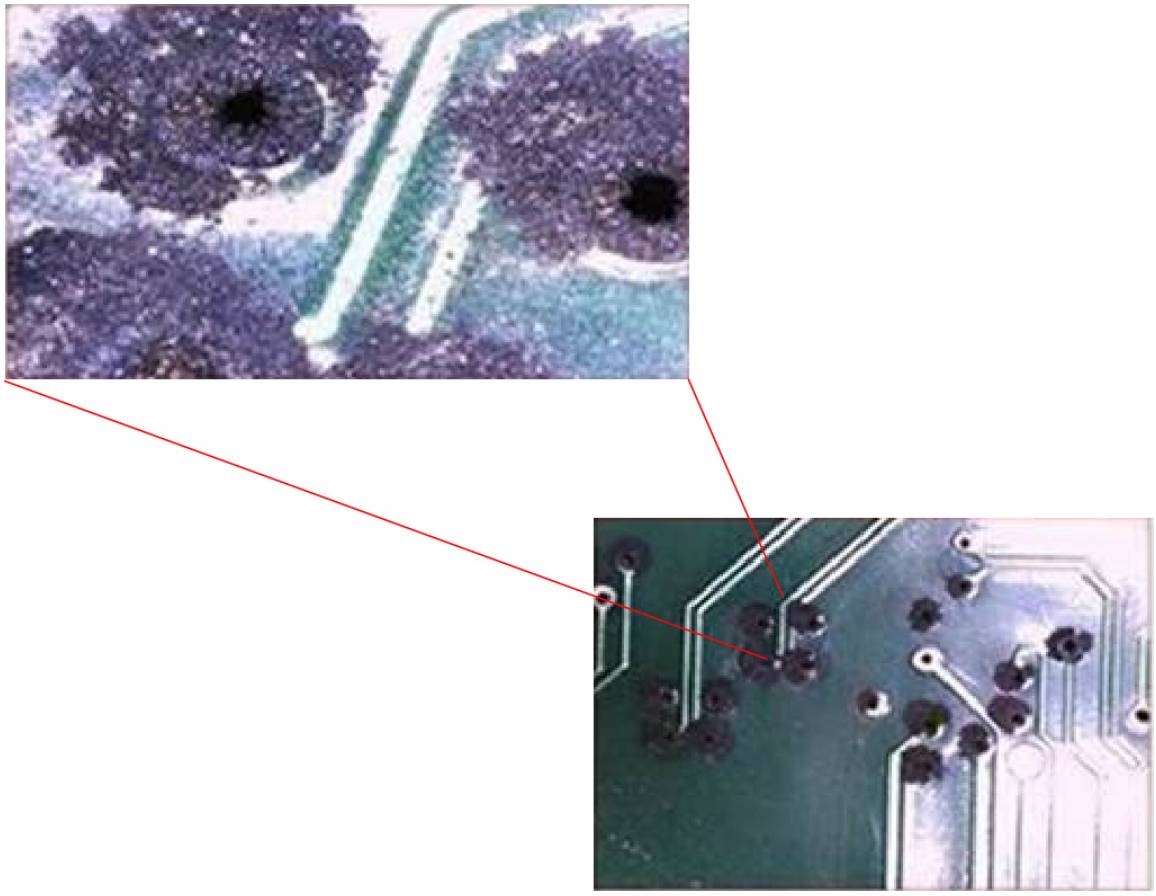
Corrosion

Corrosion is a chemical reaction that occurs between electronic components, gases, and humidity, which results in metal deterioration. Corrosion attacks edge connectors, pin connectors, IC plug-in sockets, wire wraps, and all other metal components. Depending on the type and concentration level of the corrosive gases, performance degradation of the components occurs either rapidly or over a period of time. It also leads to blocked currents, brittle connection points, and overheated electrical systems. Corrosion by-products from insulating layers on circuits and causes electronic failure, short circuits, pitting, and metal loss.

A type of corrosion known as creep corrosion, that primarily affects PCBA (Printed Circuit Board Assembly) occurs when the PCBA is subjected to a harsh, and sulfur-rich (hydrogen sulfide) end-use environment over a prolonged period of time. The corrosion begins on certain exposed metals, such as copper and silver, and then creeps along the remaining metal surface either causing electrical short circuits or creating holes. Creep corrosion also occurs on electronic components such as resistors and PCBs.

Note To prevent corrosion, remove or minimize the presence of dust and particulates at the installation site by following the guidelines mentioned in ANSI 71-04-2013 regulations.

Figure 5: PCB with Corrosion on its Metal Contacts



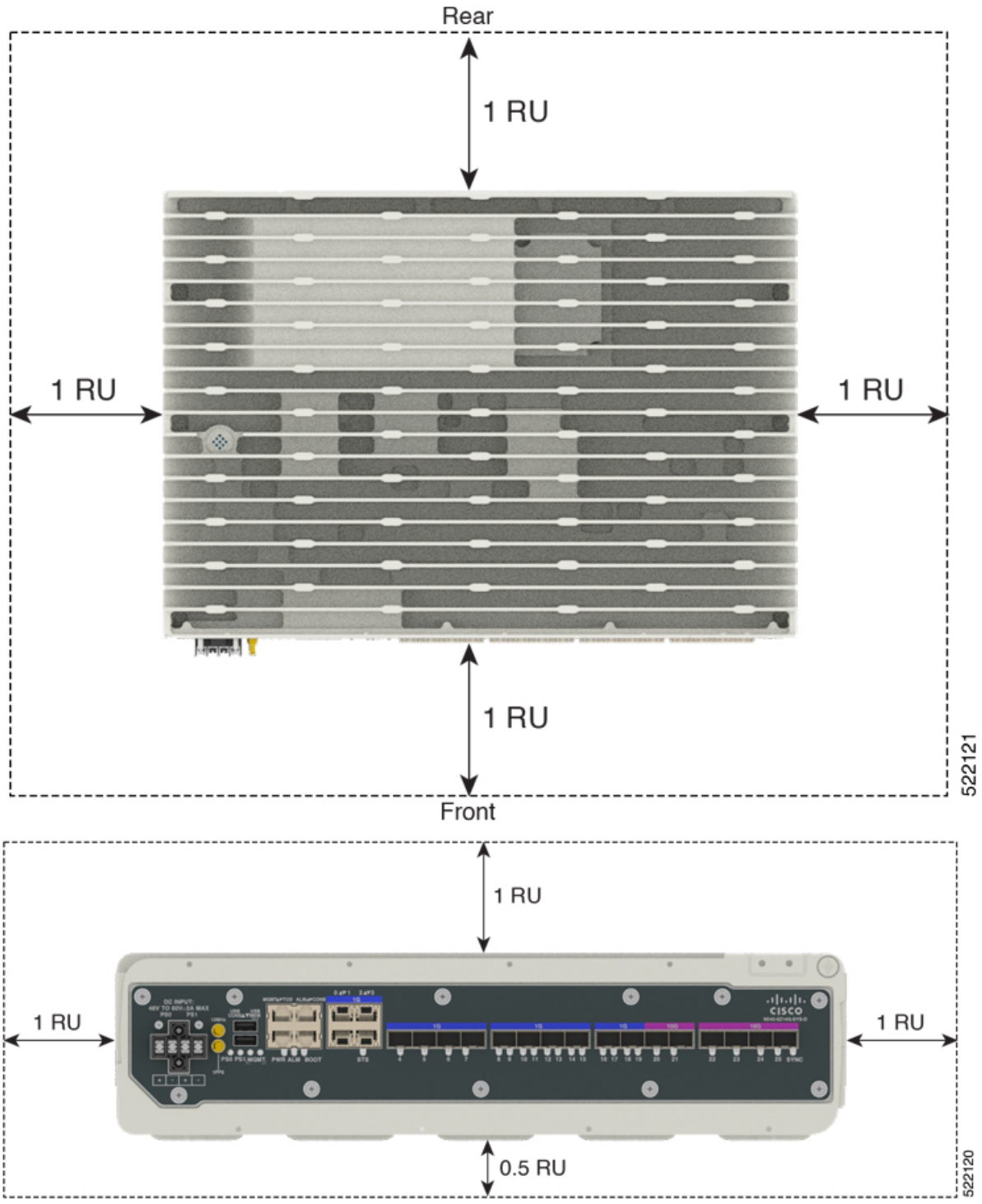
Physical Characteristics

Be familiar with the physical characteristics of the router to assist you in placing the system in the proper location. For more information, see the *Cisco Network Convergence System 540 Small Density Passive Cooled Routers Datasheet*.

Clearance Guidelines

The router is a passive-cooled equipment with no fans.

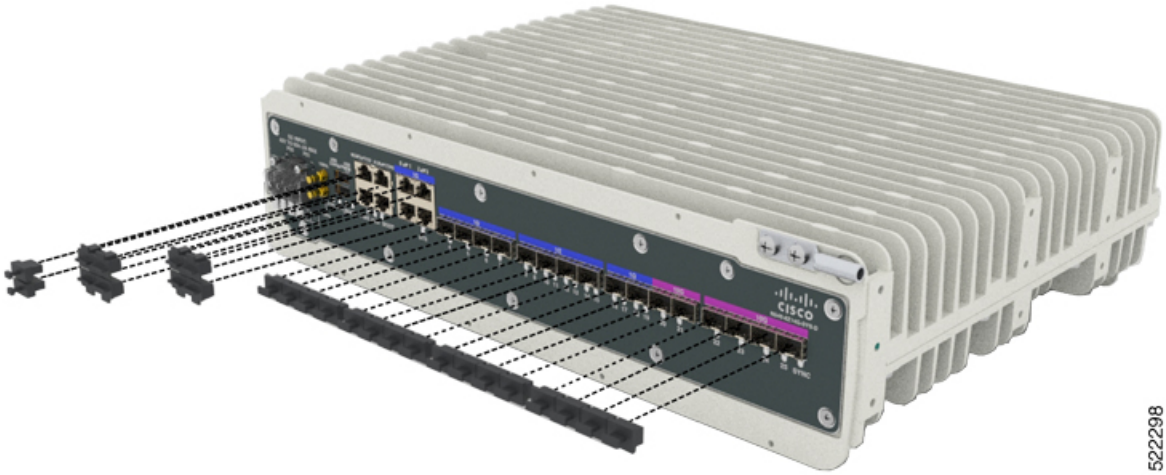
Figure 6: Clearance Guidelines



- To ensure thermal performance of the product in a horizontal mounting orientation, an airflow of 1 m/s must be maintained around the product as shown in above figure.

- In the vertical mounting orientation, 60% rack space must be open at top of the product, while sides must be free from any airflow obstructions.
- If any port (RJ-45, SFP, or USB) is not used, it is recommended that such ports be covered by using the dust caps that came with the product.

Figure 7: Dust Caps



Floor Loading Considerations

Ensure that the floor under the rack supporting the routers is capable of supporting the combined weight of the rack and all the other installed equipment.

To assess the weight of a fully configured routers, see the *Cisco Network Convergence System 540 Small Density Passive Cooled Routers Datasheet*.

For additional information about floor loading requirements, see the GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection document (www.telecom-info.telcordia.com).

Site Power Guidelines

The router has specific power and electrical wiring requirements. Adhering to these requirements ensures reliable operation of the system. Follow these precautions and recommendations when planning your site power for the router:

- The redundant power option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails.
- Connect each of the two power supplies to a separate input power source. If you fail to do this, your system might be susceptible to total power failure due to a fault in the external wiring or a tripped circuit breaker.
- To prevent a loss of input power, be sure that the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and the breakers.
- Check the power at your site before installation, and periodically after installation to ensure that you are receiving clean power. Install a power conditioner, if necessary.

- Provide proper grounding to avoid personal injury and damage to the equipment due to lightning striking power lines or due to power surges. The chassis ground must be attached to a central office or other interior ground system.

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

Caution The DC PSU requires external surge protection devices for installations where electrical surges higher than 4KV common mode and 2KV differential mode are expected. Failure to do so can result in permanent damage to the product.

Note The Cisco N540-6Z14S-SYS-D routers installation must comply with all the applicable codes, and is approved for use with copper conductors only. The ground bond-fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with a 6-AWG gauge wire copper ground conductor at a minimum.

For information on power specifications, see the *Cisco Network Convergence System 540 Small Density Passive Cooled Routers Datasheet*.

Electrical Circuit Requirements

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

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

Site Cabling Guidelines

These are the guidelines for wiring and cabling at your site:

- When preparing your site for network connections to the router, consider:
  - the type of cable required for each component, and the cable limitations.

    Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.
  - the distance limitations for signaling, ElectroMagnetic Interference (EMI), and connector compatibility.
  - any additional interface equipment you need, such as transceivers, hubs, switches, modems, Channel Service Units (CSU), or Data Service Units (DSU).

- Before you install the router, keep all the additional external equipments and cables handy. For information about ordering these equipments and cables, contact a Cisco customer service representative.
- The extent of your network and the distances between the network interface connections depend, in part, on the following factors:
  - Signal type
  - Signal speed
  - Transmission medium
- The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline when planning your network connections *prior to* installing the router.
- If wires exceed the recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

Asynchronous Terminal Connections

The router provides a console port to connect a terminal or computer for local console access. The router supports RS-232 asynchronous data with distance recommendations specified in the IEEE RS-232 standard.

Interference Considerations

When wires are run for any significant distance, there is a risk that stray signals will be induced on the wires as interference. If interference signals are strong, they may cause data errors or damage to the equipment.

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

Electromagnetic Interference

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

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

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

For information about the electrode magnetic compliance standards supported on the Cisco N540-6Z14S-SYS-D routers, see the *Regulatory Compliance and Safety Information for the Cisco NCS 540 Series Router* document.

Radio Frequency Interference

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

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

Lightning and AC Power Fault Interference

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

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

Rack-Mounting Guidelines

The following sections provide guidelines for rack-mounting the router:

Precautions for Rack-Mounting

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

- Ensure that the rack is level and stable before extending a component from the rack.
- Ensure that proper airflow is provided to the components in the rack.
- Do not step on or stand on any component or system when servicing other systems or components in a rack.
- When mounting the router in a partially filled rack, load the rack from the bottom to the top, with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Rack Selection Guidelines

The router can be mounted in most two-post or four-post, 19-inch equipment racks that comply with the Electronic Industries Association (EIA) standard for equipment racks (EIA-310-D19-inch). The rack must have at least two posts with mounting flanges to mount the chassis.



Caution When mounting a chassis in any type of rack equipment, ensure that the inlet air to the chassis does not exceed 65° C.

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 inch ± 0.06 inch (46.50 cm ± 0.15 cm). The rack-mounting hardware included with the chassis is suitable for most 19-inch equipment racks.

Consider installing the router in a rack with the following features:

- NEBS-compliant, 19-inch wide (48.3-cm) rack.
- EIA hole patterns in the mounting rails. The required mounting hardware is shipped with the router.
- Leveling feet for stability.

Caution If you use an enclosed rack, ensure that the air flow requirements are maintained as discussed in *Clearance Guidelines*.

Equipment Rack Guidelines

The placement of a rack can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics. Choose a proper location for the router by following the guidelines described here.

Locating for Safety

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

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

Locating for Easy Maintenance

Avoid installing the router in a congested rack and consider how routing of cables from other pieces of equipment in the same rack could affect access to the router.

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

To avoid problems during installation and ongoing operations, follow these general precautions when you plan equipment locations and connections:

- Use the **show environment all** command regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings about high temperature and creates reports on other potentially dangerous occurrences. If warning messages are displayed, take immediate action to identify the cause, and correct the problem.
- Keep the router off the floor and out of areas that collect dust.
- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

Installation Checklist

To assist you with your installation and to provide a record of what was done by whom and when, photocopy the Router Installation Checklist shown in below table. Use this to record the completion and verification of each procedure. After the checklist is completed, place it in your Site Log along with the other records pertaining to your new Cisco router.

Table 5: Cisco Router Installation Checklist

Task	Verified By	Date
Date on which chassis received		
Chassis and all accessories unpacked		

Task	Verified By	Date
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site Log established and background information entered		
Site power voltages verified		
Site environmental specifications verified		
Required passwords, IP addresses, device names, and so on, available		
Required tools available		
Network connection equipment available		
Cable guides installed (optional, but recommended)		
DC power cables connected to DC sources and router		
Network interface cables and devices connected		
System power turned on		
System boot complete (STATUS LED is on)		
Correct software configuration displayed after system banner appears		

Creating a Site Log

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

Create the Site Log prior to the installation. (See *Site Log* for more information about the Site Log as well as a sample Site Log that can be used to make copies.)

Chassis-Lifting Guidelines

The chassis is not intended to be moved frequently. Before you install the system, ensure that your site is properly prepared so that you can avoid having to move the chassis later to accommodate power sources and network connections.

Each time you lift the chassis or any heavy object, follow these guidelines:

- Ensure that your footing is solid, and balance the weight of the chassis between your feet.
- Lift the chassis slowly; never move suddenly or twist your body as you lift.
- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the chassis, bend at the knees, not at the waist, to reduce the strain on your back muscles.
- Do not remove installed components from the chassis.
- Always disconnect all external cables before lifting or moving the chassis.

Caution Lift the unit by holding from both the sides.

Tools and Equipment

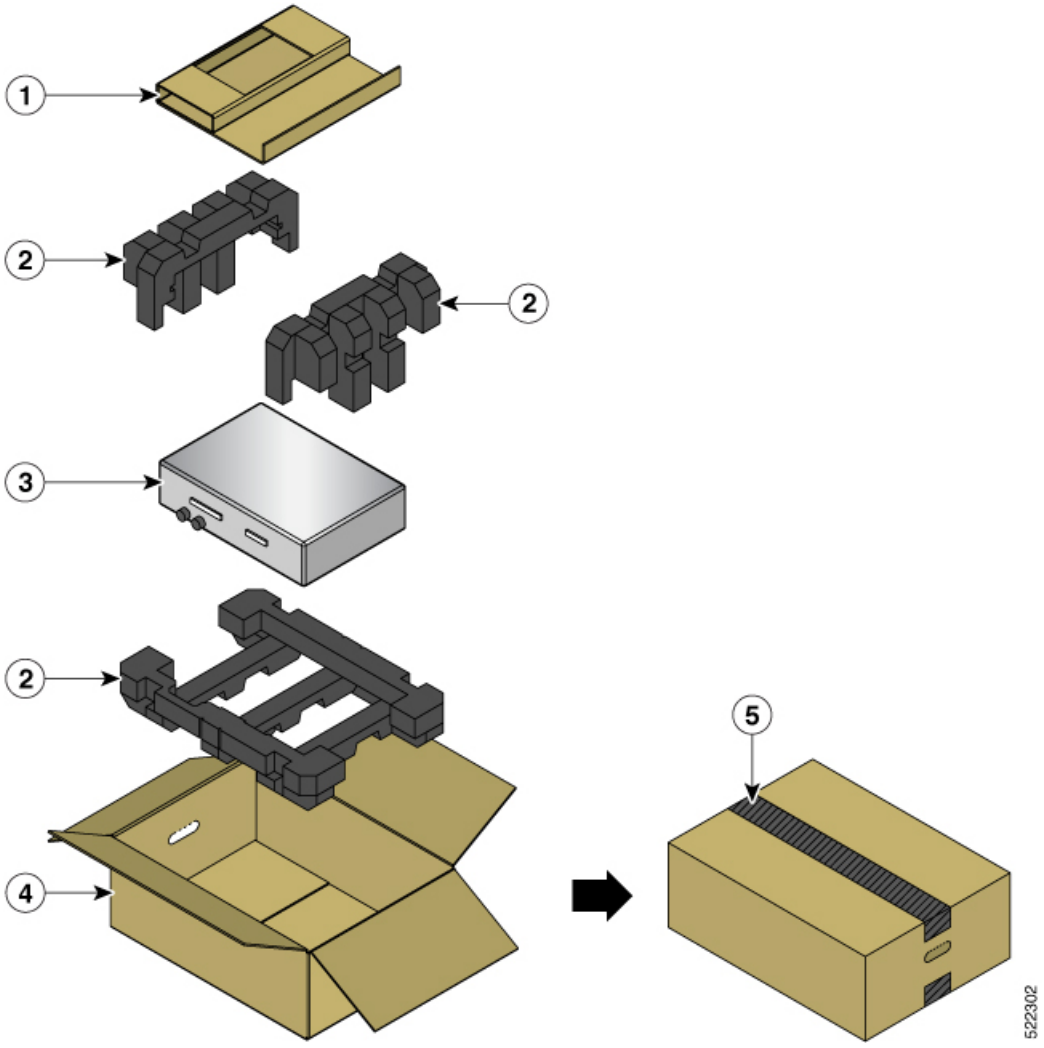
You need the following tools and equipment to install and upgrade the router and its components:

- ESD-preventive cord and wrist strap
- Antistatic mat or antistatic foam
- Number 1 and Number 2 Phillips-head screwdrivers
- #12-24 pan-head screws to secure the router to the equipment rack
- Cables for connecting to the network ports (depending on the configuration)
- Ethernet hub, switch, or PC with a network interface card for connecting to the Ethernet ports
- Console terminal (an ASCII terminal or a PC running terminal emulation software) that is configured for 115200 baud, 8 data bits, no parity, no flow control, and 1stop 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 (in-lb) or 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-AWG and 14-AWG wires
- Tape measure and level

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

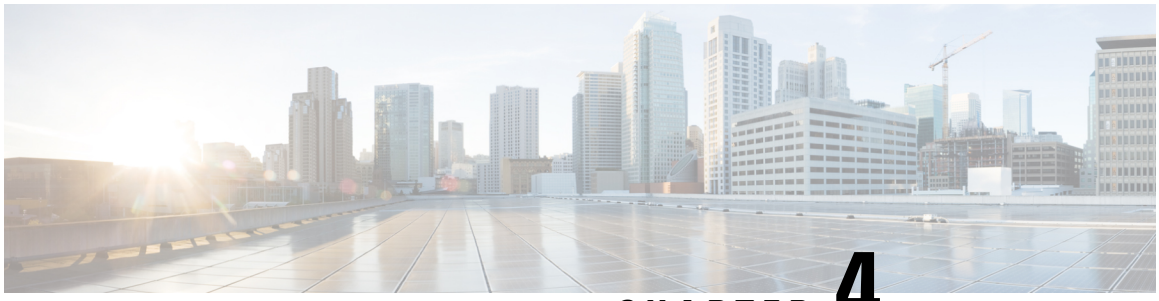
Unpacking and Verifying the Shipped Contents

Figure 8: Shipping Contents of the Router



When you receive your chassis, perform the following steps:

1. Inspect the box for any shipping damage. If there is obvious physical damage, contact your Cisco service representative.
2. Unpack the router.
3. Perform a visual inspection of the chassis.
4. Use below table to check the contents of the router shipping container. Do not discard the shipping container. You will need the container if you move or ship the router in the future.



CHAPTER 4

Install the Cisco N540-6Z14S-SYS-D Routers

This chapter describes how to install the routers and includes the following sections.

Note

- The DC power input cable to the router should not be routed outdoor before or after connecting to the router. For a similar installation, there must be a proper surge arrester where the cable enters or exits the cabinet hosting the router.
- The DC power should have a battery-based backup that is placed parallel to the rectifier output when installed with a single source for the DC feed.
- When battery backup is not provided, the redundant feeds A and B of the router should be provided with two independent power sources to avoid power failure when one feed fails.
- The router is rated for surge immunity of 2KV DM and 4KM CM. When surges beyond this level are expected, an appropriate surge arrestor must be installed to limit the surge to the above-mentioned levels.

- Prerequisites, on page 37
- Install the Router in a Rack, on page 37

Prerequisites

Before installing the router, it is important to prepare for the installation by:

- Preparing the site (site planning) and reviewing the installation plans or method of procedures (MOP). See *Site Planning* section.
- Unpacking and inspecting the router. See *Unpacking and Verifying the Shipped Contents* section.
- Gathering the tools and test equipment required to properly install the router. See *Tools and Equipment* section.

For more instructions on how to prepare for the installation of the router, see *Prepare for Installation*.

Install the Router in a Rack

The following sections describe how to install the router in a rack. The procedures in this section apply to both horizontal and vertical mounting of the router in a rack.

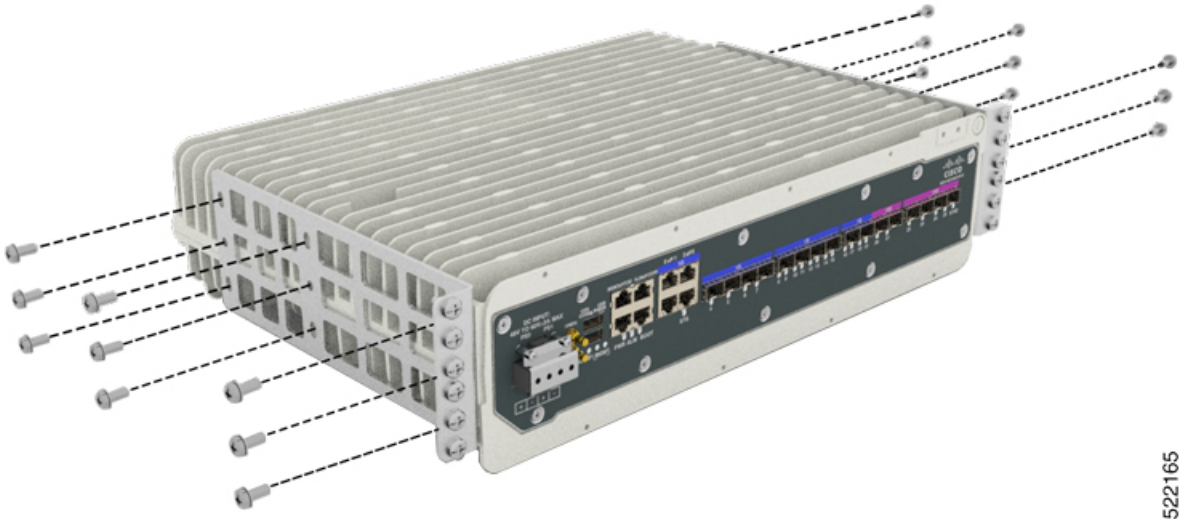
Install the Chassis Brackets

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

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

   Figure below shows how to attach the brackets at the front position on the router for a 19-inch EIA rack.

   Figure 9: Attach Mounting Brackets for a 19-inch EIA Rack



2. Position one of the brackets against the chassis side, and align the screw holes.
3. Secure the bracket to the chassis with the M5 screws removed when performing Step 1. The recommended maximum torque is 10 in.-lb.
4. Repeat Step 2 and Step 3 for the other bracket.

Install the Router Chassis in the Rack

Note Ensure adequate clearance and air flow when mounting the router in a rack. For more information, see the *Clearance Guidelines* section.

Note Install the cable guides along with rackmount brackets to install the router in a 19-inch EIA rack. See *Attaching the Cable Guides*.

To install the router chassis in the equipment rack, perform these steps:

1. Insert the rear of the chassis between the mounting posts.

2. Align the mounting holes in the bracket (and optional cable guide) with the mounting holes in the equipment rack.

   The following figure shows how to install the router in a 19-inch EIA rack.

Figure 10: Install the Chassis in a 19-inch EIA Rack



Figure 11: Install the Chassis in a 23-inch EIA Rack



3. Install the eight 12-24 x 3/4-inch or 10-32 x 3/4-inch zinc-plated steel screws through the holes in the bracket and into the threaded holes in the equipment rack posts.
4. Use a tape measure and level to verify that the chassis is installed straight and level.

Attach the Cable Guides

The router supports the A920-CBL-GUIDE-PC cable guide.

To install the cable guides, perform these steps:

1. Position the cable guide-left and cable guide-right against the front of the chassis and align the four screw holes, as shown in figure below.

Figure 12: Cable Guide Installation For 19-inch Rack Brackets

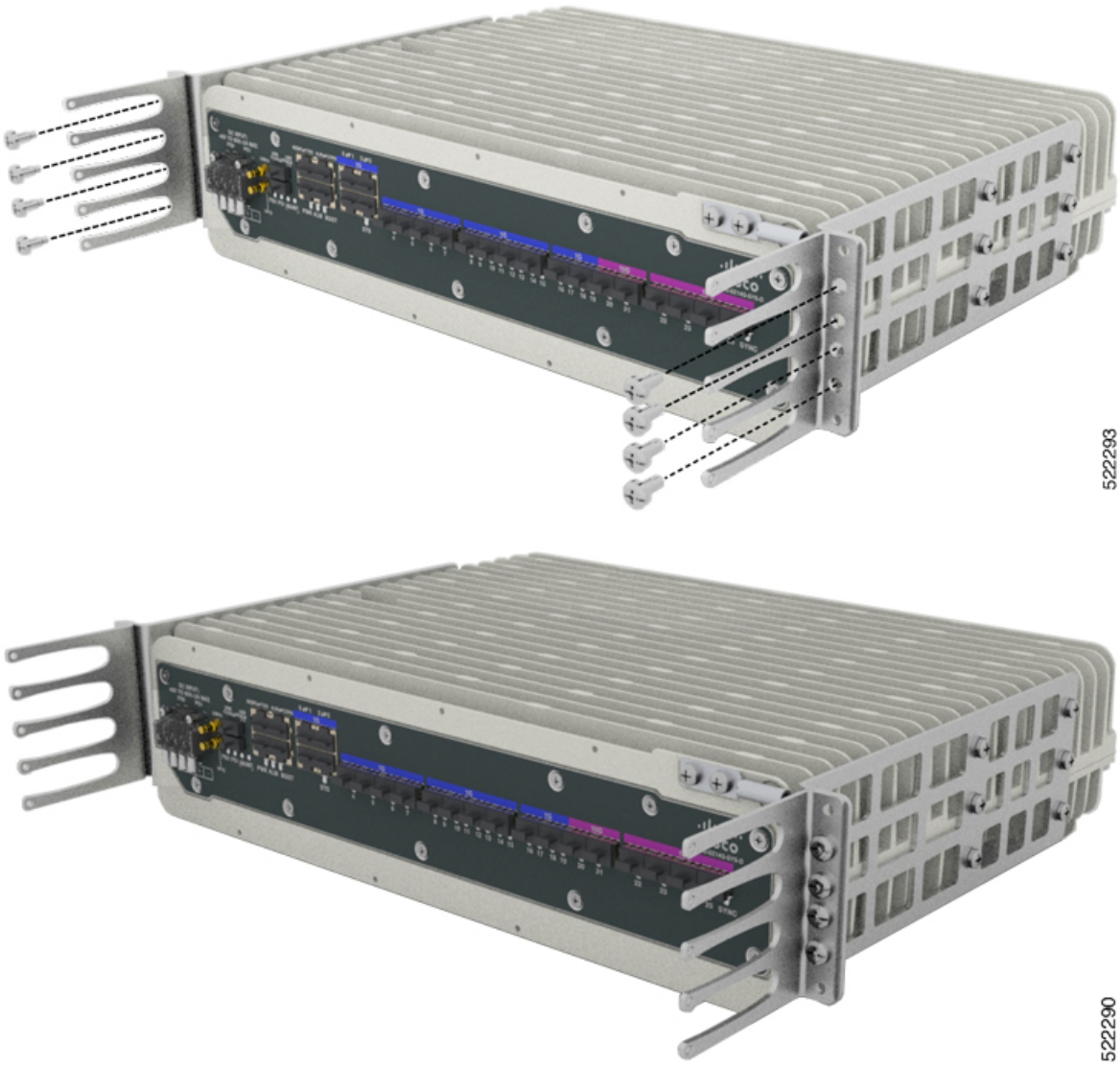
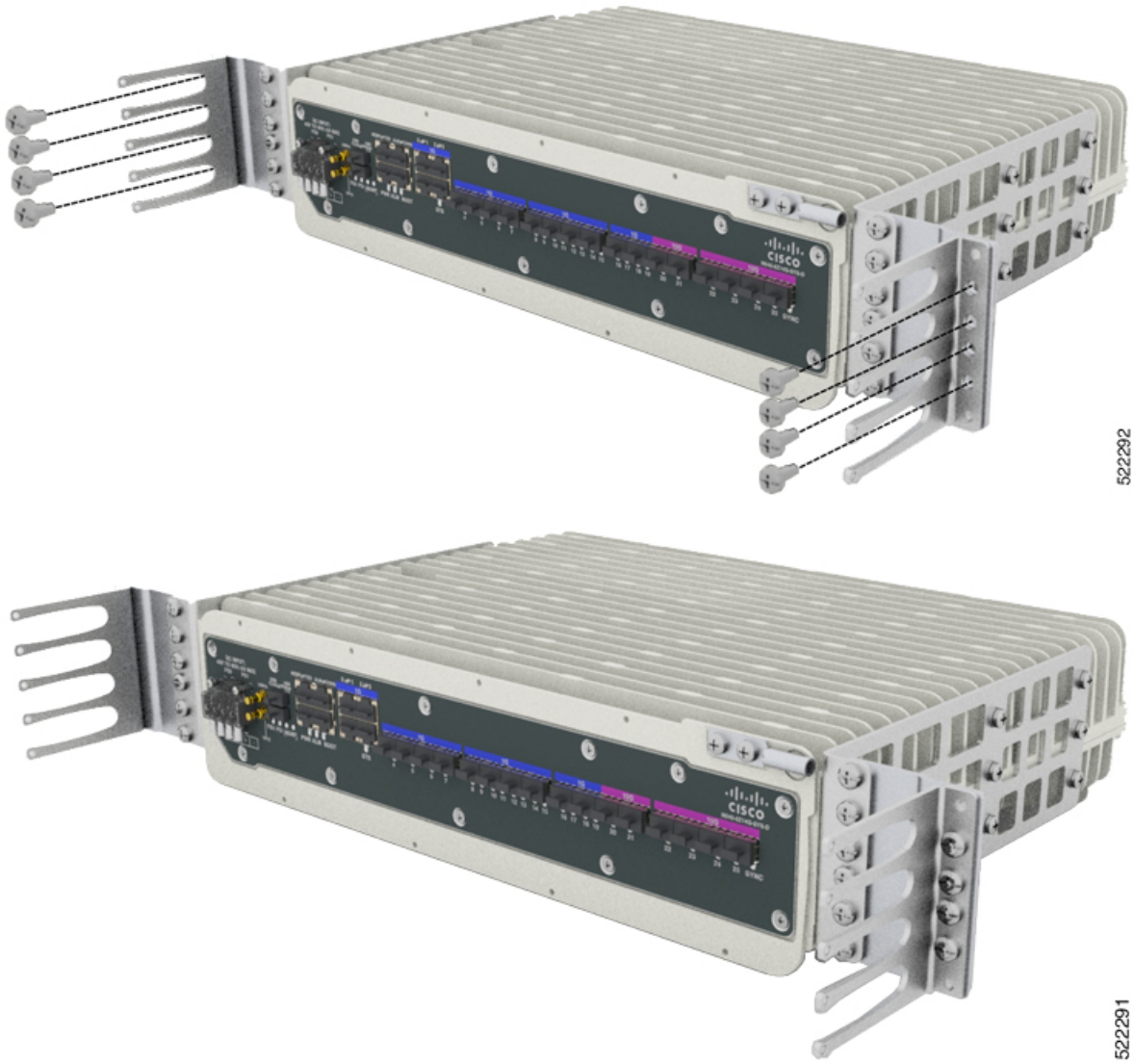


Figure 13: Cable Guide Installation For 23-inch Rack Brackets



2. Secure the cable guides along with rack mount brackets and fix it with the screws as shown above. M4 screws supplied with the cable guide are not indented to use for this unit.

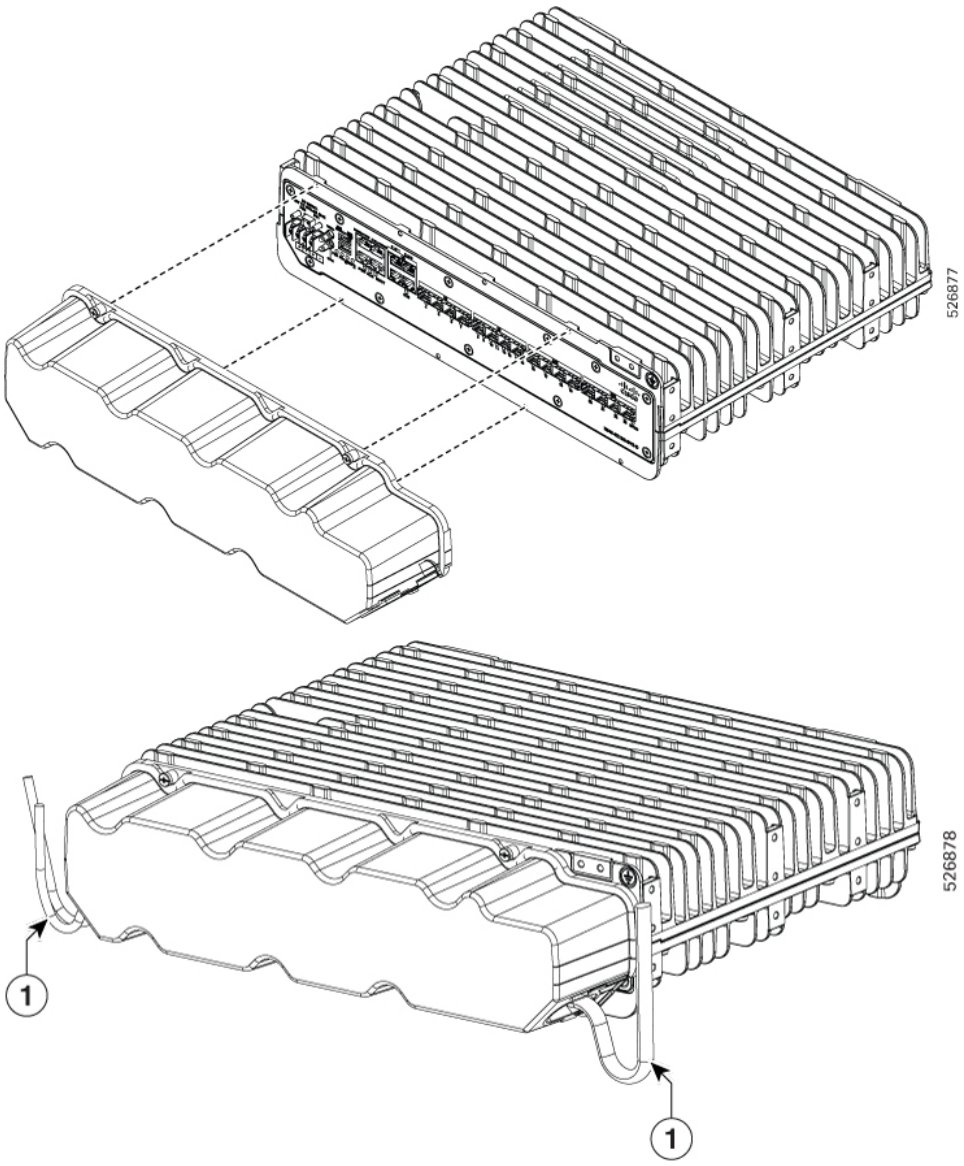
Protective cover for chassis

The protective cover for chassis helps to prevent water splashing into the chassis. With this cover, you can perform only horizontal mounting.

You can use this protective cover for the following routers:

- N540-6Z14S-SYS-D
- N540-8Z12G-SYS-D

Figure 14: Protective cover



The wire cabling should pass through the downward position (1) as displayed in the illustration.

Connect the Chassis Ground and Power

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

Ground the Router

The router provides a grounding point on either side of the unit for a two-hole lug.

Caution Before making connections to the router, ensure that you disconnect the power at the circuit breaker. Otherwise it may result in severe injury to yourself, or damage to the router.

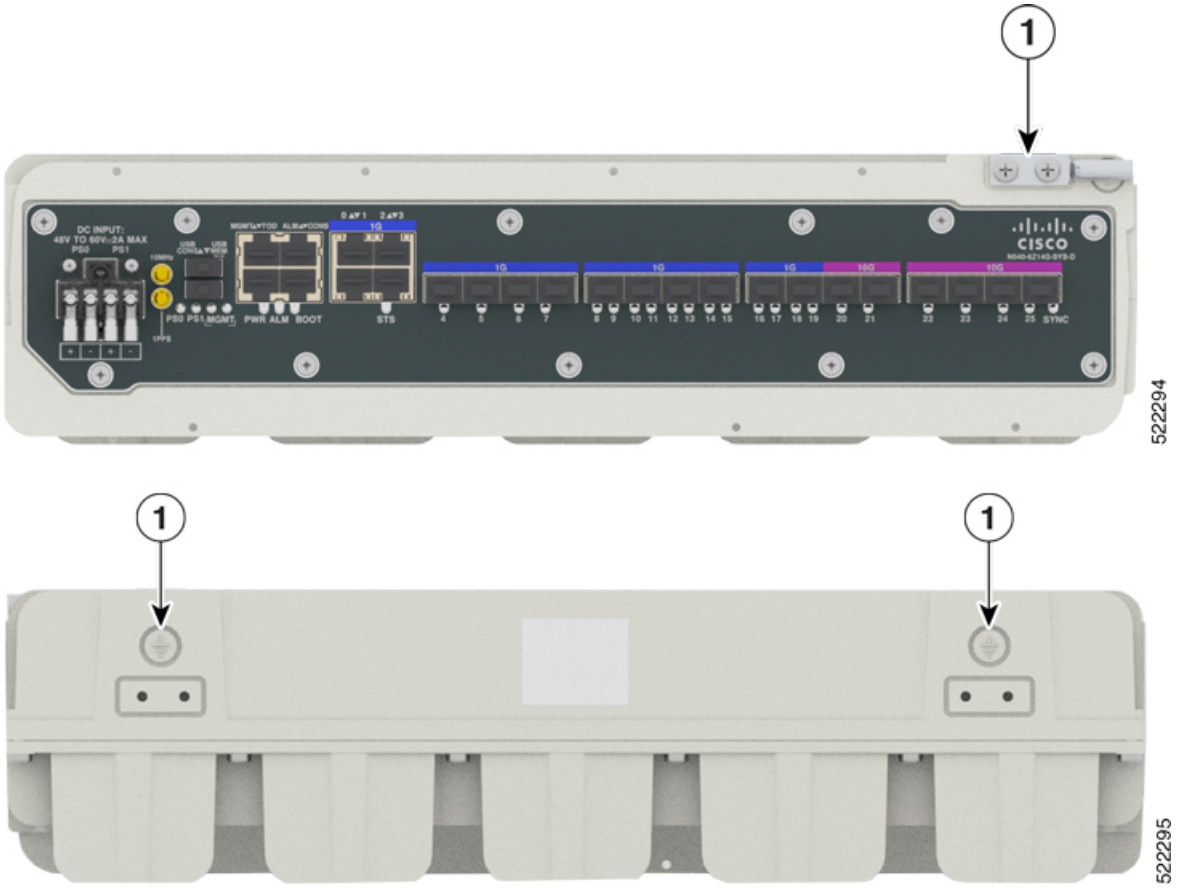
Warning This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning Use copper conductors only. Statement 1025

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

The following figure shows one of the grounding points of the router, for ease of installation. The other grounding point is on the front panel, which can also be used for grounding the router.

Figure 15: Grounding Point on the Router



1	Grounding Point

Perform the steps given below to ground the router using a two-hole lug and the corresponding mounting point. Most routers require a 6-AWG ground connection. Verify your router requirements for the ground connection.

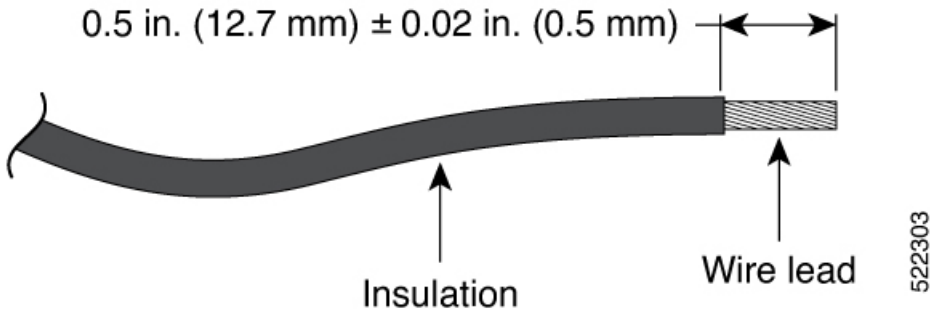
Materials Required

To ensure the chassis ground connection that you provide is adequate, you need the following parts and tools:

- Ratcheting torque screwdriver with Phillips head that exerts up to 15 pound-force inches (lbf-in) of pressure for attaching the ground wire to the router.
- Crimping tool as specified by the ground lug manufacturer.
- 6-AWG or larger copper wire for the grounding wire
- Appropriate wire-stripping tools

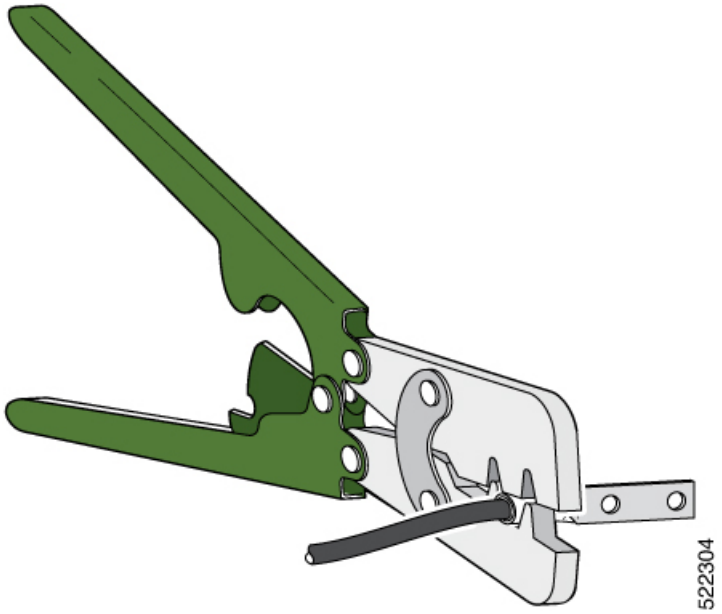
1. Remove the two-hole lug from the router.
2. Set the parts aside.
3. If your ground wire is insulated, use a wire-stripping tool to strip the ground wire to 0.5 inch ± 0.02 inch (12.7 mm ±0.5 mm) for the ring terminal (see the following figure).

Figure 16: Stripping a Ground Wire



4. Slide the open end of your 2-hole ground lug over the exposed area of the ground wire.
5. Using a crimping tool (as specified by the ground lug manufacturer), crimp the ground lug to the ground wire as shown in figure below.

Figure 17: Crimping a Ground Lug on to the Ground Wire



6. Use a Phillips head screwdriver to attach the 2-hole ground lug and wire assembly to the router with the 2 pan-head Phillips head screws.
7. Connect the other end of the ground wire to a suitable grounding point at your site.

Power Connection Guidelines

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

Warning Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 213.

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

Guidelines for DC-Powered Systems

Basic guidelines for DC-powered systems include the following:

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

Preventing Power Loss

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

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

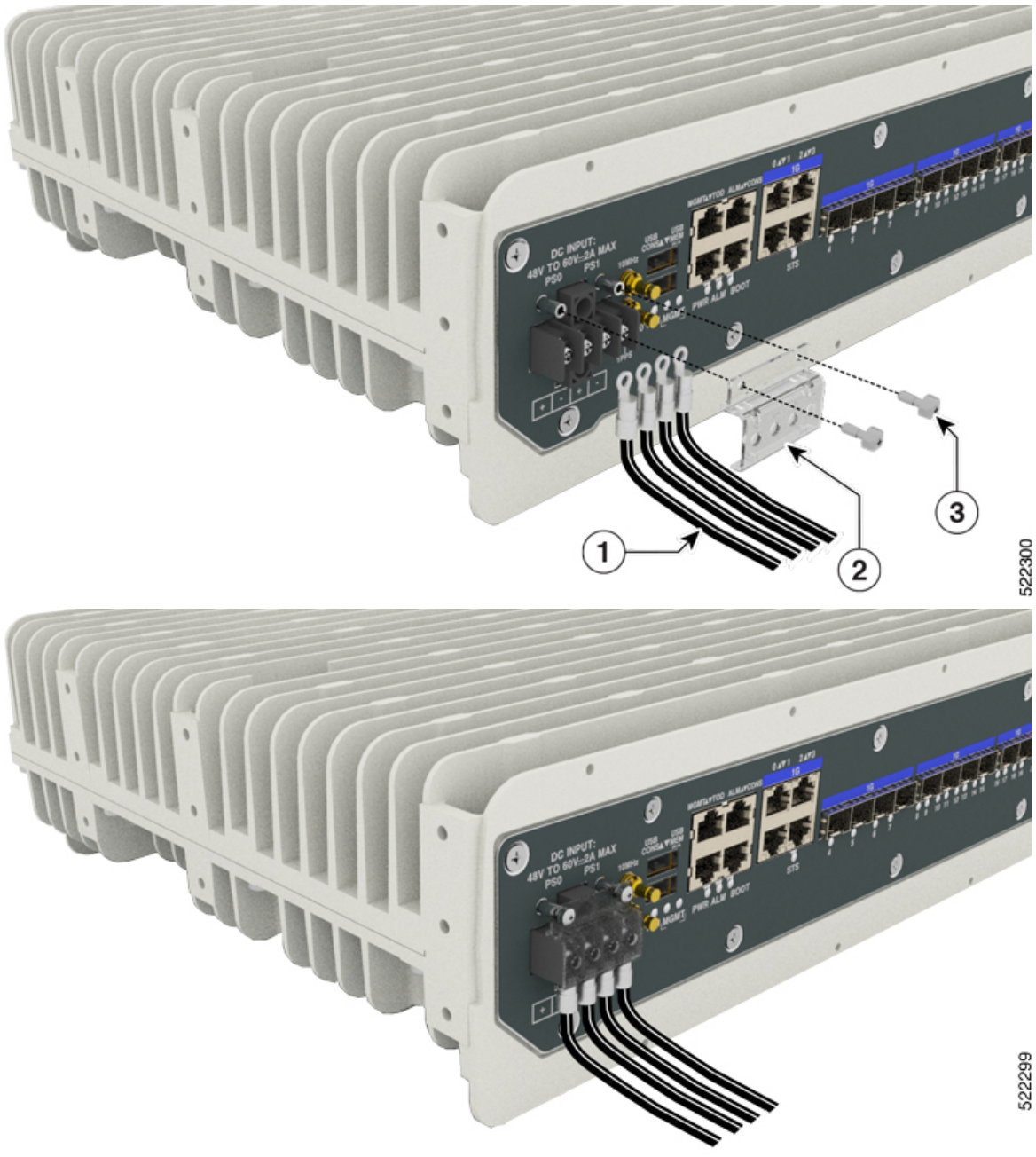
Use the information in the *Overview* section to estimate the power requirements and heat dissipation of a router based on a given configuration of the router. Determining power requirements is useful for planning the power distribution system needed to support the router.

Assemble and Connect the DC Power Cable to the Router

To connect the DC power cable to the router:

1. There is a DC cover over the DC power supply. Remove the screws to remove the DC terminal block protection cover.
2. The four lugs are provided in the accessories kit. The lugs are in turn connected with the wires.
3. Crimp the lugs to the wires. Fix the lugs to the terminal block and then fix the terminal block protection cover.

Figure 18: Connect the DC Power Cable to the Router



1	Four Lugs
2	DC Terminal Block Protection Cover
3	Screws

When installing DC power supply, use 20 AWG, 90°C wires. Always ensure that the building's installation for short-circuit (overcurrent) protection does not exceed 15A.

Note A circuit breaker of maximum 6A should be used.

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

Note This equipment is suitable for installation in Network Telecommunications Facilities and locations where the NEC applies. The equipment is suitable for installation as part of the Common Bonding Network (CBN).

Warning Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033

Caution 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.

Power On the Router

After the router is rack mounted, perform these tasks to complete the installation:

- Power on the router.
- Connect the front-panel ports. See the *Connect to SFP Modules* section, to complete the installation.

Activate the DC Power Supply

Perform the following procedure to activate a DC power supply:

1. Remove the tape from the circuit-breaker router handle, and restore power by moving the circuit-breaker router handle to the On (|) position.
2. Verify power supply operation by checking if the front panel LED (PWR) is ON.

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

Install and Remove SFP Modules

These sections describe how to install and remove SFP modules. The modules are inserted into the SFP module slots as depicted in *Install an SFP Module into an SFP Module Slot* figure. These field-replaceable modules provide interfaces.

See the Supported SFPs and PIDs for the list of SFP modules that the router supports. Each port must match the wavelength specifications on the other end of the cable. For reliable communications, the cable must not exceed the stipulated cable length.

Use only Cisco SFP modules on the Cisco router. Each SFP module has an internal serial EEPROM that is encoded with security information. This encoding provides a way for Cisco to identify and validate that the SFP module meets the requirements for the router.

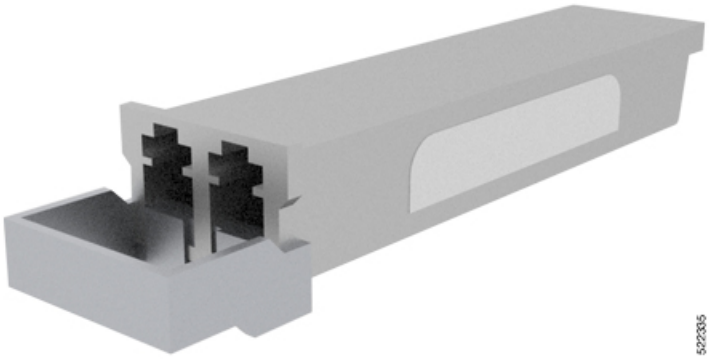
For detailed instructions on installing, removing, and cabling the SFP module, see the *SFP module* documentation.

Install SFP Modules

The figure below shows an SFP module that has a bale-clasp latch.

Caution We strongly recommend that you do not install or remove fiber-optic SFP modules with cables attached because of the potential damage to the cables, the cable connector, or the optical interfaces in the SFP module. Disconnect all cables before removing or installing an SFP module. Removing and installing an SFP module can shorten its useful life. Do not remove and insert SFP modules more often than is absolutely necessary.

Figure 19: SFP Module with a Bale-Clasp Latch



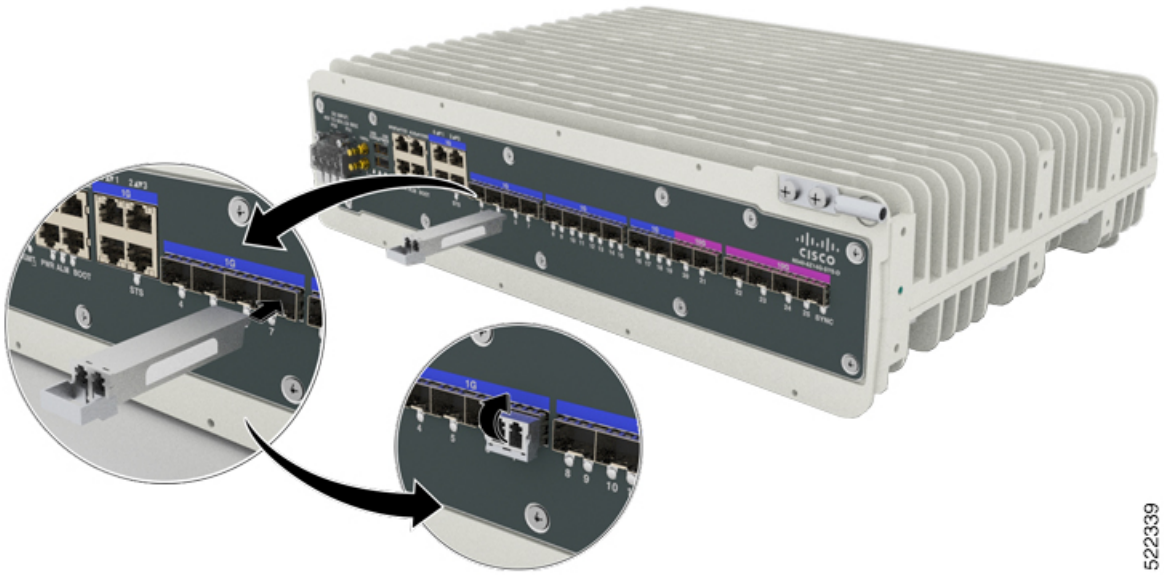
To insert an SFP module into the module slot, follow these steps:

1. Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface on the chassis.

   Some SFP modules identify the top side of the module with send (TX) and receive (RX) markings or arrows that show the direction of the connection.

2. If the SFP module that you are using has the markings, use them to identify the top side of the module.
3. Align the SFP module in front of the slot opening.
4. Insert the SFP module into the slot until you feel the connector on the module snap into place in the rear of the slot.

Figure 20: Install an SFP Module into an SFP Module Slot



Caution Do not remove the dust plugs from the fiber-optic SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light. Store the dust plugs for later use.

5. Insert the cable connector into the SFP module.

Remove SFP Modules

To remove an SFP module from a module receptacle, follow these steps:

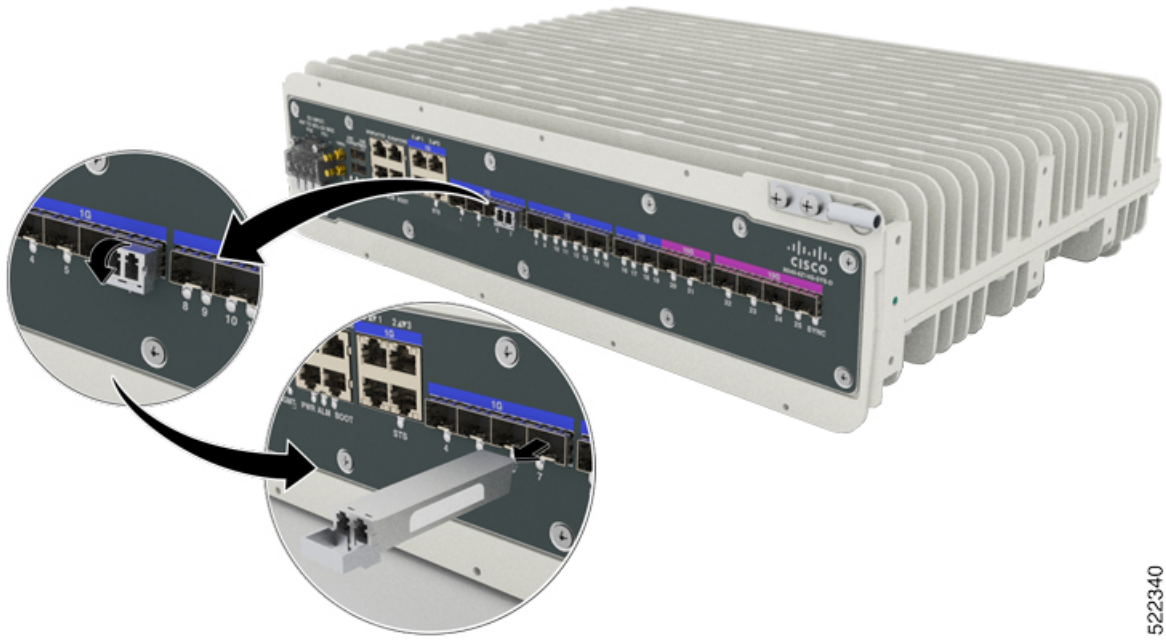
1. Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface on the chassis.
2. Disconnect the cable from the SFP module, and insert a dust plug into the cable end.

Tip For reattachment, note which cable connector plug is transmit (TX) and which is receive (RX).

3. Unlock and remove the SFP module, as shown in the following figure.

   If the module has a bale-clasp latch, pull the bale out and down to eject the module. If the bale-clasp latch 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 latch.

Figure 21: Remove a Bale-Clasp Latch SFP Module



4. Grasp the SFP module between your thumb and index finger, and carefully remove it from the module slot.
5. For fiber-optic SFP modules, insert a dust plug into the optical ports of the SFP module to keep the optical interfaces clean.
6. Place the removed SFP module in an antistatic bag or other protective environment.

Connect to the 10/100/1000 Ports

Note The router 10/100/1000 ports configure themselves to operate at the speed of attached devices. If the attached ports do not support autonegotiation, you can explicitly set the speed and duplex parameters. Connecting devices that do not autonegotiate or that have their speed and duplex parameters manually set can reduce performance or result in no linkage.

To maximize performance, choose one of these methods for configuring the Ethernet ports:

- Let the ports autonegotiate both speed and duplex.
- Set the port speed and duplex parameters on both ends of the connection.

1. When connecting to workstations, servers, and routers, connect a straight-through cable to an RJ-45 connector on the front panel.When connecting to routers or repeaters, use a crossover cable.
2. Connect the other end of the cable to an RJ-45 connector on the other device. The port LED turns on when both the router and the connected device have established link.

   If the port LED turns Yellow, the device at the other end might not be turned on, or there might be a cable problem or a problem with the adapter installed in the attached device.

Note On network interface ports, the port LED is green after the link is established.

3. Reconfigure and reboot the connected device, if necessary.
4. Repeat Steps 1 through 3 to connect each device.

Connect to SFP Modules

This section describes how to connect to SFP modules. For instructions on how to connect to fiber-optic SFP modules, see the *Connect to Fiber-Optic SFP Modules*.

For instructions about how to install or remove an SFP module, see the *Install and Remove SFP Modules*.

Connect to Fiber-Optic SFP Modules

Follow these steps to connect a fiber-optic cable to an SFP module:

Warning Class 1 laser product. Statement 1008

Caution Do not remove the rubber plugs from the SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.

1. Remove the rubber plugs from the module port and fiber-optic cable, and store them for future use.
2. Insert one end of the fiber-optic cable into the SFP module port.
3. Insert the other cable end into a fiber-optic connector on a target device.
4. Observe the port status LED.

   The LED turns green when the router and the target device have an established link. If the LED turns Yellow, the target device might not be turned on, there might be a cable problem, or there might be problem with the adapter installed in the target device.
5. If necessary, reconfigure and restart the router or target device.

Connect the Router to the Network

The following sections describe how to connect a router to the network:

Note Connect only SELV services to all the router ports.

Connect Console Cables

The following sections describe how to connect to the router using console cables:

Connect to the USB Serial Port Using Microsoft Windows

This procedure shows how to connect to the USB serial port using Microsoft Windows.

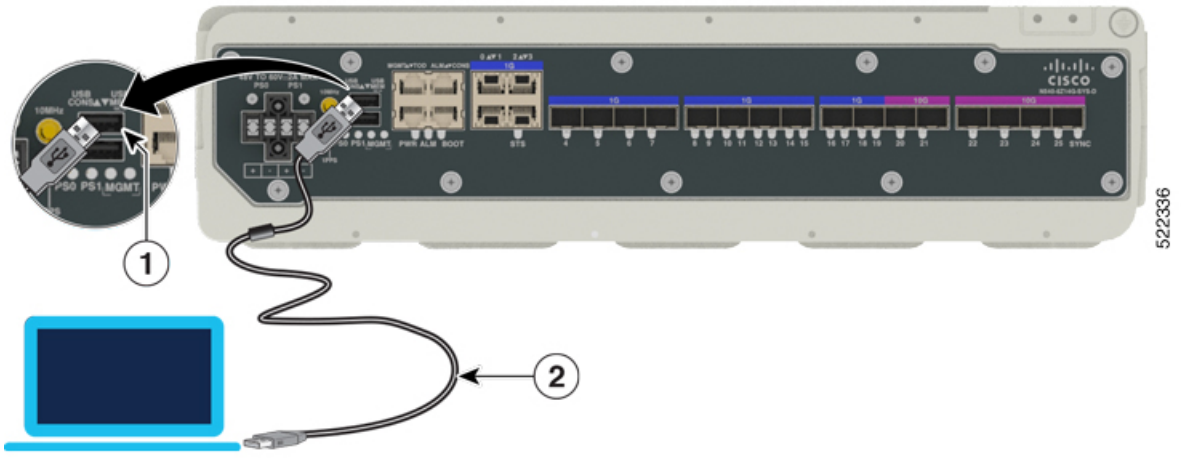
Note Install the USB device driver before establishing a physical connection between the router and the PC, by using the USB console cable plugged into the USB serial port. Otherwise, the connection will fail. For more information, see the *Installing the Cisco USB Device Driver* section.

1. Connect a USB Type A-to-Type A cable to the USB console port, as shown in figure below.

Note You cannot use the USB port and the EIA port concurrently. When the USB port is used, it takes priority over the EIA port.

2. Connect the USB Type A cable to the PC.
3. To communicate with the router, start a terminal emulator application, such as Microsoft Windows HyperTerminal. This software should be configured with the following parameters:
   - 115200 baud
   - 8 data bits
   - no parity
   - 1 stop-bit
   - no flow control

Figure 22: Connect the USB Console Cable to the Router



Connect to the Console Port Using Mac OS X

This procedure describes how to connect a Mac OS X system USB port to the console using the built-in OS X terminal utility.

1. Use the Finder to choose Applications > Utilities > Terminal.
2. Connect the OS X USB port to the router.
3. Enter the following commands to find the OS X USB port number:

```
macbook:user$ cd /dev
macbook:user$ ls -ltr /dev/*usb*
crw-rw-rw-  1 root    wheel       9,  66 Apr  1 16:46 tty.usbmodem1a21 DT-macbook:dev
user$
```

4. Connect to the USB port with the following command followed by the router USB port speed:

```
macbook:user$ screen /dev/tty.usbmodem1a21 9600
```

To disconnect the OS X USB console from the terminal window, enter **Ctrl-a** followed by **Ctrl-**

Connect to the Console Port Using Linux

This procedure shows how to connect a Linux system USB port to the console using the built-in Linux terminal utility.

1. Open the Linux terminal window.
2. Connect the Linux USB port to the router.
3. Enter the following commands to find the Linux USB port number:

```
root@usb-suse# cd /dev
root@usb-suse /dev# ls -ltr *ACM*
crw-r--r--    1 root     root     188,   0 Jan 14 18:02 ttyACM0
root@usb-suse /dev#
```

4. Connect to the USB port with the following command, followed by the router USB port speed:

```
root@usb-suse /dev# screen /dev/ttyACM0 9600
```

To disconnect the Linux USB console from the terminal window, enter **Ctrl-a** followed by : then **quit**

Install the Cisco USB Device Driver

A USB device driver must be installed the first time a Microsoft Windows-based PC is connected to the USB serial port on the router.

This procedure describes how to install the Microsoft Windows USB device driver in Microsoft Windows XP, Windows Vista, Windows 2000, Windows 7, and Windows 8. Download the driver for your router model from the Tools and Resources Download Software site, USB Console Software category, at:

https://software.cisco.com/download/home/286037604/type/282855122/release/3.13

Note To download the driver, you must have a valid service contract associated to your Cisco.com profile.

1. Unzip the file asr-9xx_usbconsole_drivers.zip.
2. Double-click xrusbser_ver2100_installer.exe in the XR21x141x-Win-DriversOnly-Vers2.1.0.0/EXE folder.

   Installation Wizard GUI is displayed.
3. Click Next. The InstallShield Wizard Completed window is displayed.
4. Click Finish.
5. Connect the USB cable to the PC and router USB console ports. Follow the on-screen instructions to complete the installation of the driver.
6. The message displays that XR21V1401 USB UART Device driver is successfully installed.

   The USB console is ready for use.

Uninstall the Cisco USB Driver

This procedure describes how to uninstall the Microsoft Windows USB device driver in Microsoft Windows XP, Windows Vista, Windows 2000, Windows 7, and Windows 8.

Note Disconnect the router console terminal before uninstalling the driver.

1. Choose Start > Control Panel > Add or Remove Programs.
2. Scroll to **Windows Driver Package - Exar corporation (xrusbser) Ports** and click **Remove**. The **Program Maintenance** window is displayed.
3. Click **Yes** to uninstall the driver.

Connect to the EIA Console Port

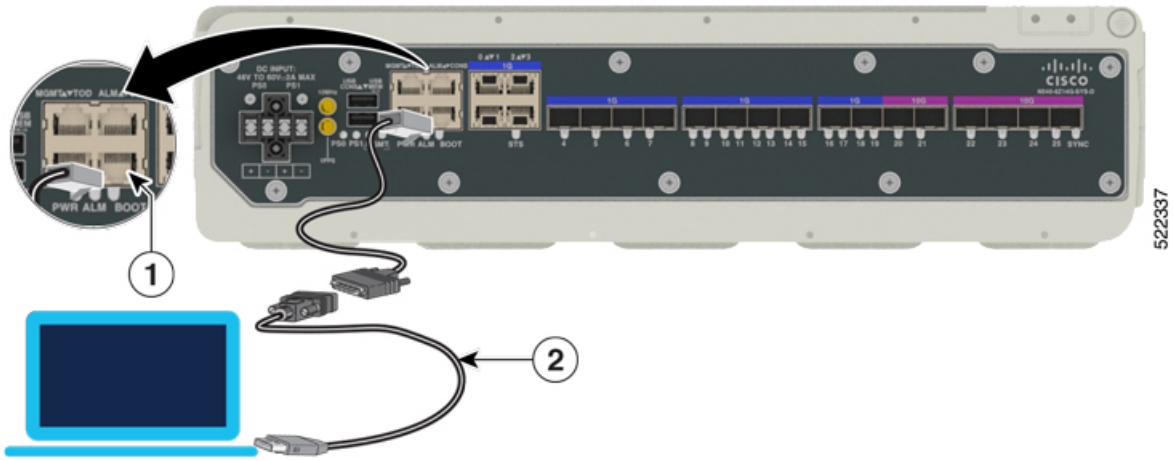
Note The USB-to-RJ45 adapter cable and the DB9 console cable are not included with the router; they can be ordered separately from Cisco.

Note The serial console cable kit is not included with the router; it has to be ordered separately.

To connect a terminal to the EIA Console port on the router, follow these steps:

1. Connect the USB end of the USB-to RJ-45 cable to the EIA Console port.
2. Connect the RJ-45 end of the DB-9 adapter cable to the USB-to RJ-45 cable, as shown in figure below.

Figure 23: Connect a Terminal to the Router



3. Connect the DB-9 end of the console cable to the DB-9 end of the terminal.
4. To communicate with the router, start a terminal emulator application, such as Microsoft Windows HyperTerminal. This software should be configured with the following parameters:
   - 115200 baud
   - 8 data bits
   - no parity
   - 1 stop-bit
   - no flow control

Connect a Management Ethernet Cable

Note It is recommended that you retain the RJ-45 dust caps for the ports (RJ-45, SFP, and USB ports) that are not used.

When using the Ethernet Management port in the default mode (speed-auto and duplex-auto) the port operates in the auto-MDI/MDI-X mode. The port automatically provides the correct signal connectivity through the Auto-MDI/MDI-X feature. The port automatically senses a crossover or straight-through cable and adapts to it.

However, when the Ethernet Management port is configured to a fixed speed (10, 100, or 1000 Mbps) through command-line interface (CLI) commands, the port is forced to the MDI mode.

When in a fixed-speed configuration and MDI mode:

- Use a crossover cable to connect to an MDI port
- Use a straight-through cable to connect to an MDI-X port

Note To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the Management Ethernet ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Install and Remove SFP and SFP+ Modules

The router supports a variety of SFP and SFP+ modules, including optical and Ethernet modules. For information on how to install and remove SFP and SFP+ modules, see the documentation for the SFP or SFP+ module at:

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

For information about inspecting and cleaning fiber-optic connections see, http://www.cisco.com/en/US/partner/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

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

Connect a USB Flash Device

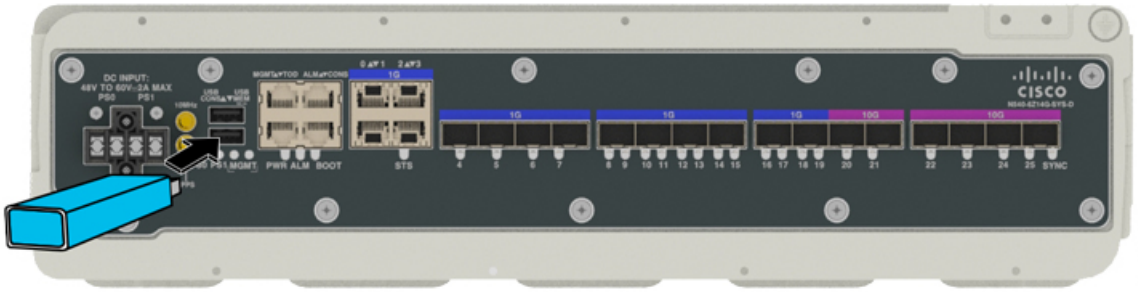
To connect a USB flash device to the router, remove the dust cap and insert the memory stick in the USB port labeled USB MEM.

Note Retain the dust caps for later use.

The Flash memory module can be inserted only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Figure below shows the USB port connector on the router.

Figure 24: Router Flash Token Memory Stick



Remove and Replace a USB Flash Device

To remove and replace a USB flash token memory stick from and into a router, follow these steps:

Note If the USB flash device is abruptly removed, the constant sync operations of the file system in progress fail due to the USB device removal. These errors occur with ext2 or ext3 or ext4 file systems and are not seen with fat32 file system. This is a default behavior on any Linux platform.

The following error messages are displayed when you remove the USB device:

```
*Jun 24 10:29:45.766: %IOSXE-3-PLATFORM: R0/0: kernel: EXT2-fs (sda1): previous I/O error
to superblock detected
*Jun 24 10:29:45.878: %IOSXE-3-PLATFORM: R0/0: kernel: EXT2-fs (sda1): previous I/O error
to superblock detected
*Jun 24 10:29:46.012: %IOSXE-3-PLATFORM: R0/0: kernel: EXT2-fs (sda1): previous I/O error
to superblock detected
*Jun 24 10:29:46.013: %IOSXE-3-PLATFORM: R0/0: kernel: EXT2-fs (sda1): previous I/O error
to superblock detected
```

1. Execute the **eject usb0:** command before removing the USB from the router.

   ```
   rommon 2 > eject usb0
   rommon 2 >
   ```

   If you do not run this command before removing the USB, the following error message is displayed:

   ```
   rommon 2 > dir usb0:
     usb_stor_BBB_comdat:usb_bulk_msg error
     failed to send CBW status 34
     RESET:stall
     usb_stor_BBB_comdat:usb_bulk_msg error
     failed to send CBW status 34
     RESET:stall
     usb_stor_BBB_comdat:usb_bulk_msg error
   ```

2. Pull the memory stick from the USB port.
3. To replace the Cisco USB Flash memory stick, simply insert the module into the USB port labeled USB MEM, as shown in router Flash Token Memory Stick figure. The Flash memory module can be inserted only one way, and can be inserted or removed regardless of whether the router is powered up or not.

Note If you are permanently removing the USB Flash device, reinstall the dust cap in the USB port.

Connect Ethernet Cables

Note To achieve good performance, it is recommended to use Shielded Twisted Pair (STP) Cat 5E/Cat 6 cables for all RJ-45 ports on the router.

The router interface modules support RJ-45 and Ethernet SFP ports. For instructions on how to connect cables to Ethernet SFP ports, see the *Connecting Cables to SFP Modules*.

The RJ-45 port supports standard straight-through and crossover Category 5E unshielded twisted-pair (UTP) cables. Cisco does not supply Category 5E UTP cables; these cables are available commercially.

Note To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the Gigabit Ethernet ports only to intra-building or unexposed wiring or cable. The intrabuilding cable must be shielded and the shield must be grounded at both ends. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

1. Connect one end of the cable to the Gigabit Ethernet port on the router.
2. Connect the other end to the BTS patch or demarcation panel at your site.

Connect Cables to SFP Modules

For information on connecting cables to Cisco optical and Ethernet SFP interfaces, see:

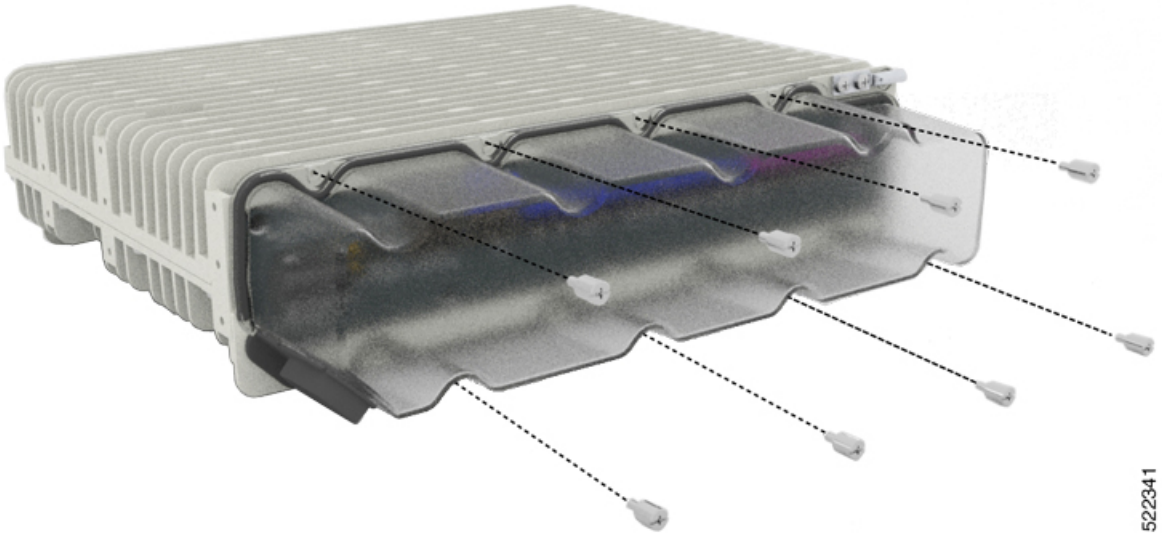
http://www.cisco.com/en/US/partner/products/hw/modules/ps5455/prod_installation_guides_list.html.

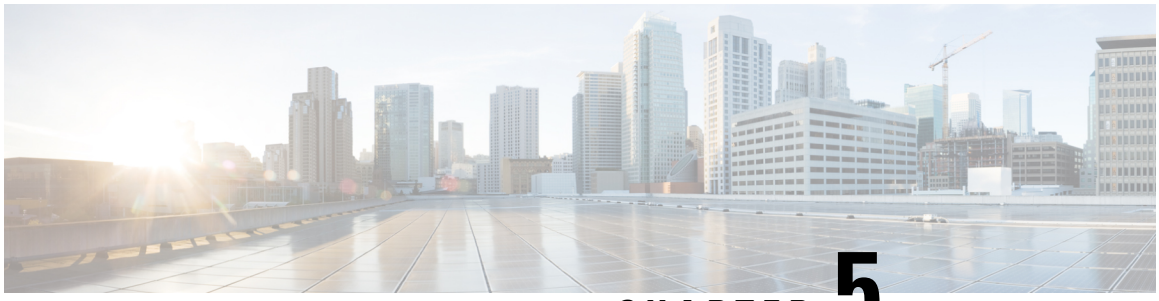
Install the Front Cover

The front cover protects the system from dust. Ensure the disturbance to cable routing is minimal to avoid loss of connection.

1. Place the cable sleeve close to the router.
2. Secure the fiber or cable bundle in the cable sleeve.
3. Slide the front cover with cable sleeve and secure it with the fasteners on the cable cover.

Figure 25: Install the Front Cover Assembly





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.

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

Note You can experience CPRI and MPLS traffic failure with load and unload configurations once in 40 power cycles.

Configuring the Cisco router involves these tasks:

- Create the Initial Router Configuration, on page 61
- Verify Device Installation, on page 63

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 help 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 other 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`:

Procedure

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 it 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 both numbers and 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 described by the guidelines 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 whether you want to edit the configuration. Enter **no** to not edit the configuration.

Step 8 The software asks whether you want to save the configuration. Enter **yes** to save the configuration.

Verify Device Installation

After installing the Cisco router, you use the **show** commands to verify the installation and configuration. If any issue is detected, take corrective action before continuing with further configurations.

1. **show inventory**

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

   Example:

   ```
   #show inventory
   ```

2. **admin show environment**

   Displays all environment-related router information.

   Example:

   ```
   #admin show environment
   ```

3. **show environment temperature**

   Displays temperature readings for on-board temperature sensors and for PSU. Each temperature sensor has three thresholds:

   - Minor temperature threshold: When a minor threshold is exceeded, a minor alarm occurs and the following actions occur for all sensors:
     - System messages are displayed
     - SNMP notifications (if configured) are sent
     - Log environmental alarm event is triggered (Run the **show alarm** command to review this.)
   - Major temperature threshold: When a major threshold is exceeded, a major alarm occurs and the following actions occur for all sensors:
     - System messages are displayed
     - SNMP notifications (if configured) are sent

- Log environmental alarm event is triggered (Run the **show alarm** command to review this.)

- Critical temperature threshold: When a critical threshold is exceeded, a critical alarm occurs and the following actions occurs:
  - For all the main board sensors the system is shut down.
  - For the PSU sensor, the particular PSU is turned off .

4. **show environment power**

   Displays the power usage information for the entire router.

   Example:

   ```
   #show environment power
   ```

5. **show environment voltage**

   Displays the voltage for the entire router.

   Example:

   ```
   #show environment voltage
   ```

6. **show environment current**

   Displays current for different voltage rails of the router.

   Example:

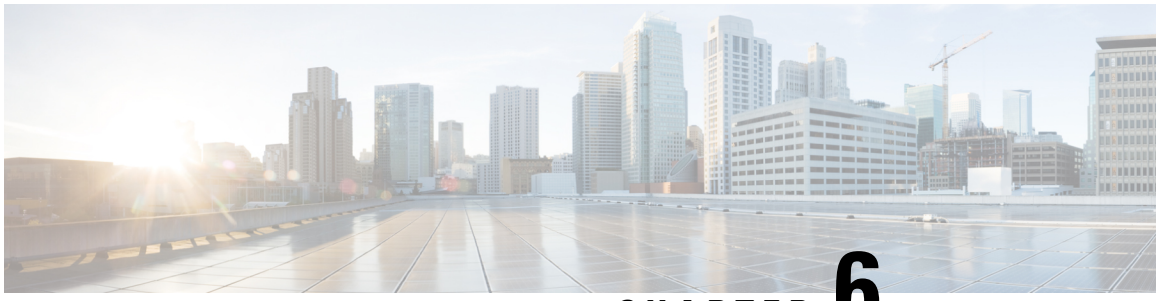
   ```
   #show environment current
   ```

7. **show environment fan**

   Displays the speed of all the fans including the fan in PSU.

   Example:

   ```
   #show environment fan
   ```



CHAPTER 6

Appendix

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

- LEDs, on page 65
- System Specifications, on page 68

LEDs

Note This section lists the LEDs of the router.

Router LEDs

All the data port LEDs in the Cisco N540-6Z14S-SYS-D router are at the front panel. There are five LEDs that reflect the different statuses of the system.

Table 6: Router LED Descriptions

LED Label	Color	Status
'PS0 and PS1'	Off	This indicates there is no DC input.
	Red	This indicates 12V output failure. If one of the input feeds is switched off when both the feeds are connected, then that particular feed shows as red.
	Green	This indicates 12V output is active.

LED Label	Color	Status
STS	Off	the system is placed in shutdown mode; only standby power mode is available.
	Flashing Amber (Slow)	The module is booting up.
	Flashing Amber (Fast)	The module is booting up, shutting down, or is being reloaded.
	Amber	Host kernel is booted and is ready to start SysAdmin VM.
	Green	The module is operational and has no active major or critical alarms.
	Flashing Red	The router has active major or critical alarms.
ALM	Off	No alarm
	Red	Critical alarm - system scope, critical temperature
	Flashing Red	Critical alarm - Relating to voltage rail failures
	Amber	Major alarm - system-scope
	Flashing Amber	Minor alarm - system-scope
SYNC	Off	Time core clock synchronization is disabled or in free-running state.
	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.

Power Status LEDs

Table 7: Power Status LEDs

LED Label	Color	Status
PWR	Off	Sytem is powered off
	Green	All the power supplies are on and operating normally.
	Amber	Standby FPGA upgrade is in progress (this is expected to take about three to five minutes).
	Red	Power redundancy is lost due to a power feed failure or an internal power supply failure.

Combination of LEDs

Table 8: Fan and Power Status LED Combination

FAN	PWR	Status
For all the conditions below, the system will not boot.		
Flashing Red	Flashing Red	Thermal shutdown at Power Up
Flashing Red	Flashing Amber	MSS Ready Failure
Flashing Amber	Flashing Green	TAM Init Failure
Flashing Amber	Flashing Red	TAM Ready Failure
Flashing Amber	Flashing Amber	Secure JTAG Failure

SFP and SFP+ Port LED

Table 9: SFP and SFP+ Port LEDs

LED Label	Color	Status
STATUS	Off	Admin is down
	Green	Link is up in 1G/10G ports.
	Yellow	Fault or Error or Link Down

Management Port LEDs

Table 10: Management Port LEDs

LED Label	Color	Status
Left LED	Green	Link is up in 1000 Mbps
	Blinking Green	Activity in 1000 Mbps
	Amber or Orange	Link is up in 100/10Mbps
	Blinking Amber or Orange	Activity in 100/10Mbps
	Off	Link is down
Right LED	Off	Unused

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

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

RJ45 Connectors

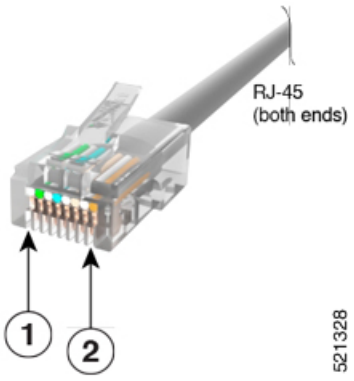
The RJ45 connector connects Category 3, Category 5, Category 5e, Category 6, or Category 6A foil twisted-pair or unshielded twisted-pair cable from the external network to the following module interface connectors:

- 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 RJ45 connector.

Figure 26: RJ45 Connector



1	Transmit data (bidirectional)
2	NC (Not Connected)

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 ToD or 1-PPS Port Pinouts

Note This section is not applicable to Cisco N540-6Z18G-SYS-A/D router.

This summarizes the RJ-45 ToD or 1-PPS port pinouts:

Table 11: RJ-45 ToD or 1-PPS Port Pinouts

Pin	Signal Name	Direction	Description
1	NA	NA	NA
2	NA	NA	NA
3	1PPS_N	Output or Input	1PPS RS422 signal
4	GND	NA	NA
5	GND	NA	NA
6	1PPS_P	Output or Input	1PPS RS422 signal

Pin	Signal Name	Direction	Description
7	TOD_N	Output or Input	Time-of-Day character
8	TOD_P	Output or Input	Time-of-Day character

Console Port Pinouts

This summarizes the Console port pinouts:

Table 12: Console Port Pinouts

Pin	Signal Name	Direction	Description
1	ACONS-TX	Output	Aux Consoles transmit output, RS232
2	NC	NA	NA
3	CONS-TX	Output	Console RS232 transmit
4	GND	NA	Ground
5	GND	NA	Ground
6	CONS-RX	Input	Console RS232 receive
7	ACONS-RX	Input	Aux Consoles receive input, RS232
8	NC	NA	NA

Alarm Port Pinouts

This summarizes the alarm port pinouts:

Table 13: Alarm Port Pinouts

Pin	Signal Name	Description
1	ALARM1_IN	Alarm input 1
2	ALARM2_IN	Alarm input 2
3	NC	NA
4	ALARM3_IN	Alarm input 3
5	ALARM4_IN	Alarm input 4
6	NC	NA
7	NC	NA

Pin	Signal Name	Description
8	ALARM_I_COMMON	Alarm input COM

To set the description of the alarm:

```
RP/0/RP0/CPU0:ios(config)# environment alarm-contact contact-number description
description
```

To set the severity of the alarm:

```
RP/0/RP0/CPU0:ios(config)# environment alarm-contact contact-number severity
[critical | major | minor] [
```

To set the trigger for the alarm:

```
RP/0/RP0/CPU0:ios(config)# environment alarm-contact contact-number trigger [open
 | closed]
```

Note You can configure up to four external alarms.

The *contact-number* is the pin number of the connected alarm port, that is Alarm input 1 to Alarm input 4.

The **description** string can be up to 80 alphanumeric characters in length and is included in any generated system messages.

For **severity**, enter any one of: **critical**, **major**, or **minor**.

Description and severity are both mandatory values.

Use the **show alarms** command in admin mode to view the alarm details. Use the **show logging** command to view the displays the state of syslog error and event logging.

An SNMP trap is sent for every external alarm that is raised or cleared on the system.

USB Port Console Pinouts

This table summarizes the USB port console pinouts:

Table 14: USB Port Console Pinouts

Pin	Signal Name	Description
A1	VCC	+5 VDC
A2	D–	Data–
A3	D+	Data+
A4	GND	Ground

USB Port Memory Pinouts

This table summarizes the USB port memory pinouts:

Table 15: USB Port Memory Pinouts

Pin	Signal Name	Description
A1	VCC	+5 VDC
A2	D–	Data–
A3	D+	Data+
A4	GND	Ground

Management Ethernet Port Pinouts

This table summarizes the management ethernet port pinouts:

Table 16: Management Ethernet Port Pinouts

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

GPS Port Pinouts

The table below summarizes the GPS port pinouts.

Note This section does not apply to Cisco N540-6Z18G-SYS-A/D router.

Table 17: GPS Port Pinouts

Category	10 MHz (Input and Output)	1PPS (Input and Output)
Waveform	Input—Sine wave Output—Sine wave	Input—Rectangular pulse Output—Rectangular pulse
Amplitude	Input— > 1.7 volts p-p Output— > 2.2 volts p-p	Input— > 1.2V Output— > 2.5V
Impedance	50 ohms	50 ohms
Pulse Width	50% duty cycle	50% duty cycle
Rise Time	Input—AC coupled	Output—5 nanoseconds