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

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.
- The following factors 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

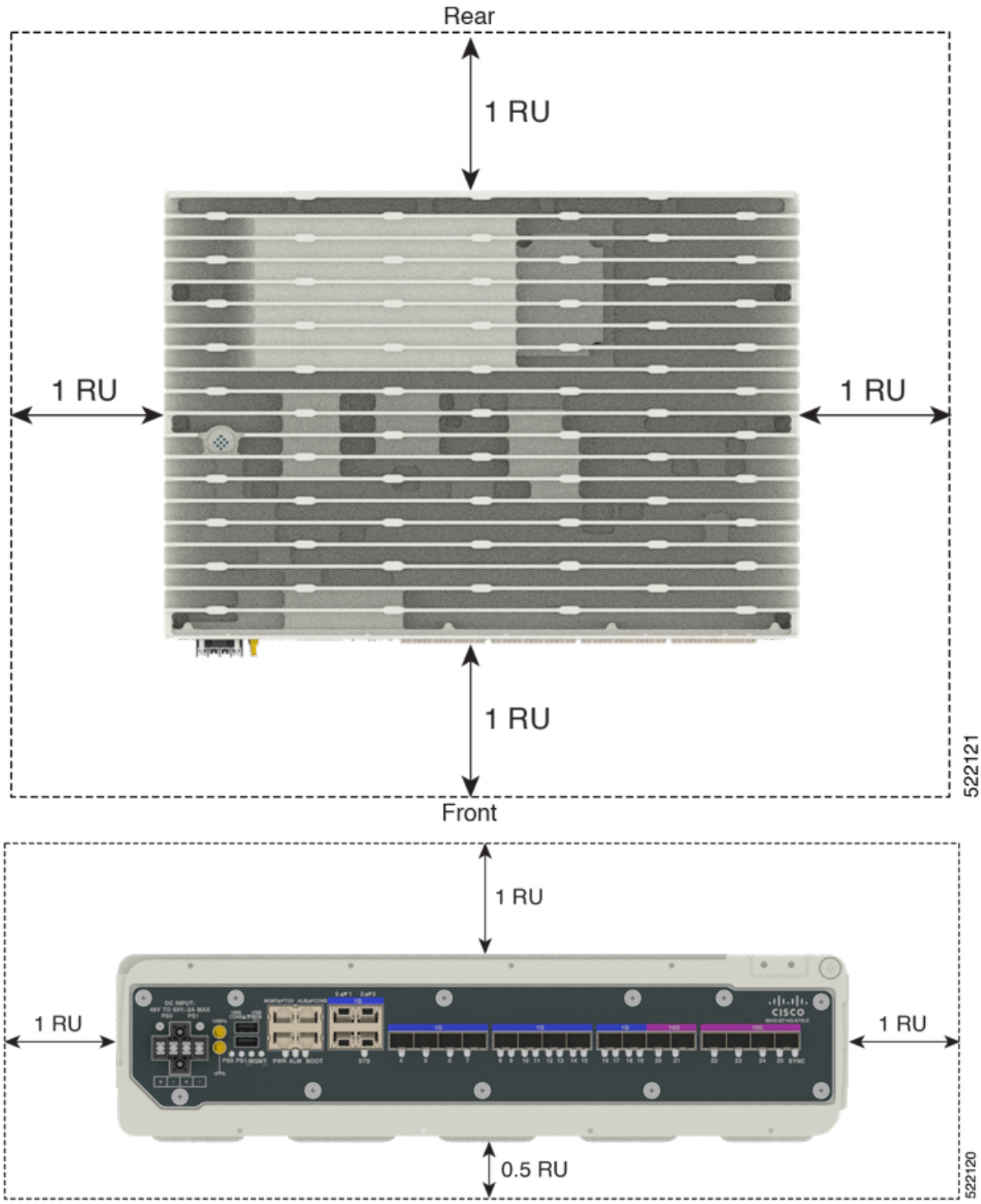
Physical Characteristics

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.

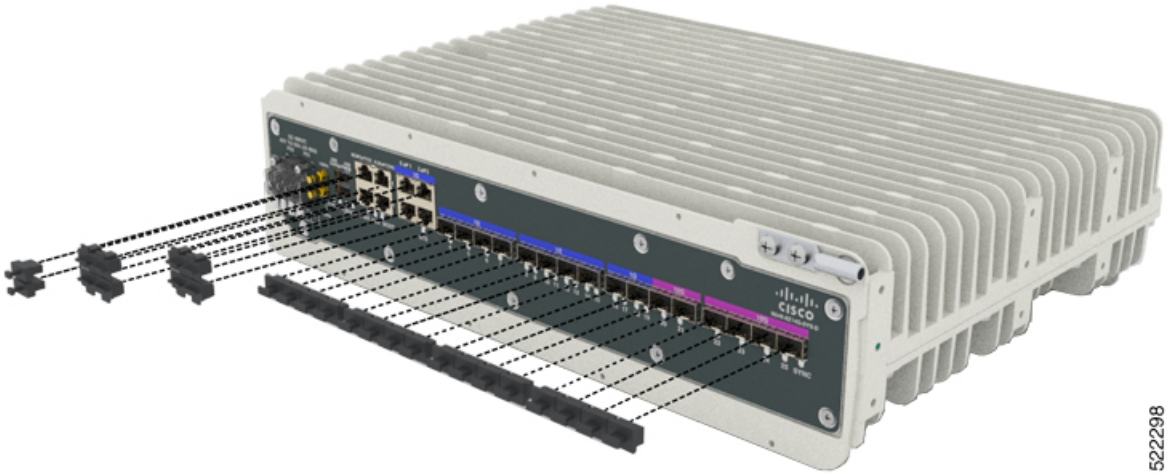
Figure 1: Clearance Guidelines



- 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 2: 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.

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.

Statement 1252—Equipment Grounding

Warning **Statement 1252—**Equipment Grounding

This equipment must be grounded. To reduce the risk of electric shock, the power cord, plug, or combination must be connected to a properly grounded electrode, outlet, or terminal.

Site Cabling Guidelines

This section contains 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. Consider the distance limitations for signaling, ElectroMagnetic Interference (EMI), and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair, or unshielded twisted-pair cabling.

Also consider any additional interface equipment you need, such as transceivers, hubs, switches, modems, Channel Service Units (CSU), or Data Service Units (DSU).

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

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

- Signal type
- Signal speed
- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as a guideline 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 1: Cisco Router Installation Checklist

Task	Verified By	Date
Date on which chassis received		
Chassis and all accessories unpacked		
Types and numbers of interfaces verified		
Safety recommendations and guidelines reviewed		
Installation Checklist copied		
Site Log established and background information entered		

Task	Verified By	Date
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

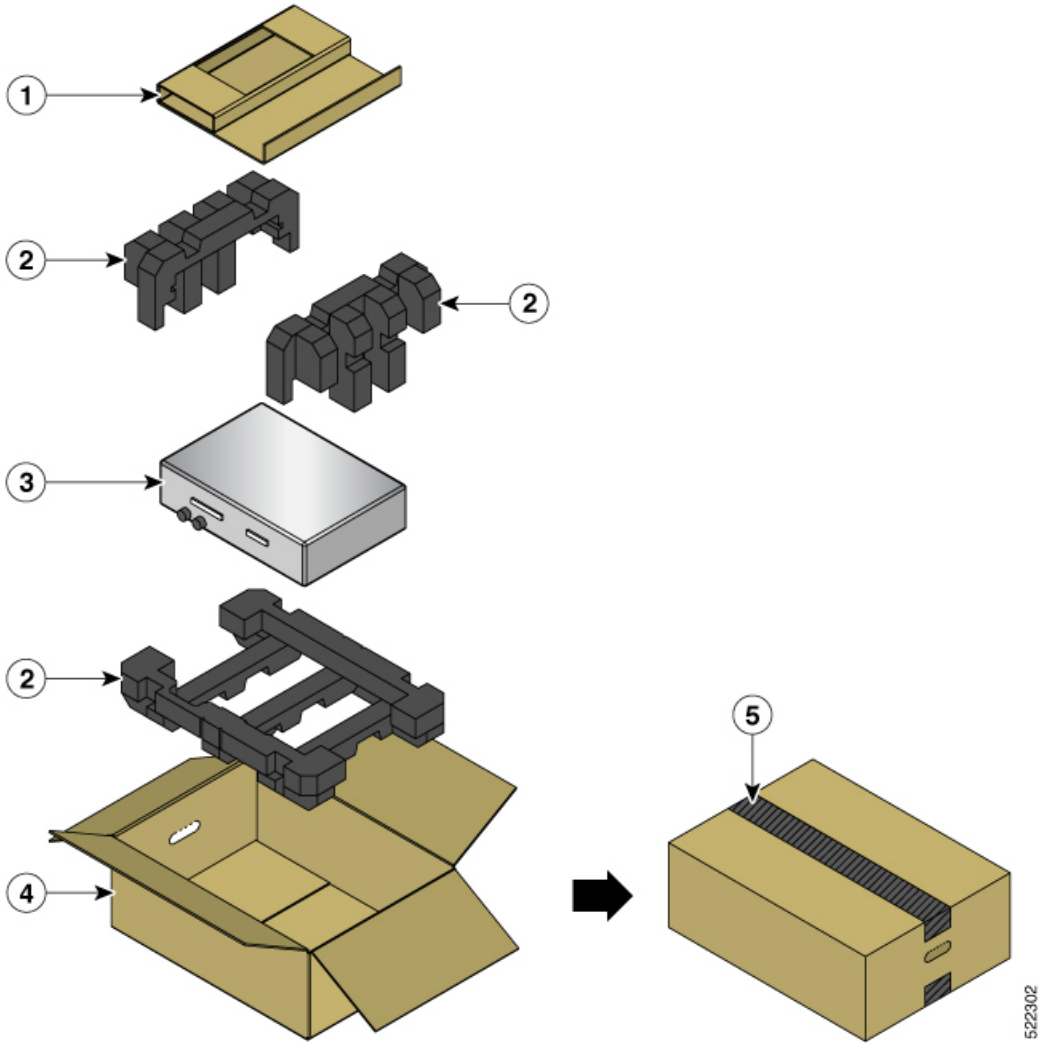
You need the following tools and equipment to install and upgrade the router and its components:

- 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 3: 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.