



## **Hardware Installation Guide for Cisco NCS 5000 Series Routers**

**First Published:** December 23, 2015

**Last Modified:**

### **Americas Headquarters**

Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA  
<http://www.cisco.com>  
Tel: 408 526-4000  
800 553-NETS (6387)  
Fax: 408 527-0883





## CONTENTS

---

### Preface

#### Preface vii

Changes to This Document vii

Obtaining Documentation and Submitting a Service Request vii

---

### CHAPTER 1

#### Overview 1

Overview 1

Cisco NCS 5001 1

Cisco NCS 5002 4

---

### CHAPTER 2

#### Safety Guidelines 7

Cisco NCS 5000 Safety Guidelines 7

---

### CHAPTER 3

#### Prepare to Install Cisco NCS 5000 9

Installation Options with Racks and Cabinets 9

Airflow Direction 9

Chassis Weight 9

Required Equipment 10

Unpack and Inspect the New Router 10

---

### CHAPTER 4

#### Installing the NCS 5000 Router 13

Installation Guidelines 13

Installing Cisco NCS 5000 14

Installing Cisco NCS 5001 14

Installing Cisco NCS 5002 17

Grounding the Cisco NCS 5001 and NCS 5002 Routers 21

Starting Cisco NCS 5001 and NCS 5002 Routers 23

---

**APPENDIX A**

**Accessory Kits 25**

- Accessory Kit Contents 25
- Cisco NCS 5001 Router Accessory Kit 25
- Cisco NCS 5002 Router Accessory Kit 25

---

**APPENDIX B**

**Cabinet and Rack Installation 27**

- Cabinet and Rack Requirements 27
- General Requirements for Cabins and Racks 27
- Requirements Specific to Perforated Cabinets 28
- Cable Management Guidelines 28

---

**APPENDIX C**

**Technical Specifications 29**

- Router Specifications 29
- Environment Specification 30
- Power Specifications 30
- Specifications for the Cisco NCS 5001 Power Supply 30
- Specifications for the Cisco NCS 5002 Power Supply 31

---

**APPENDIX D**

**Cable and Port Specification 33**

- Console Port 33
- Supported Power Cords and Plugs 33
- Jumper Power Cord 37

---

**APPENDIX E**

**LEDs 39**

- Chassis and Module LEDs for the Cisco NCS 5000 Series Routers 39
- Chassis and Module LED Descriptions 39
- Conditions Indicated by the Power Supply LEDs 40

---

**APPENDIX F**

**Troubleshooting Hardware Components 41**

- Overview 41
- Router Hardware Best Practices 41
- Installation Best Practices 42
- Initialization Best Practice 42
- Router Operation Best Practices 42

Power Supply Conditions 42

---

**APPENDIX G**

**Site Planning and Maintenance Records 45**

Site Preparation Checklist 45

Contact and Site Information 47

Chassis and Module Information 48





## Preface

---

- [Changes to This Document](#), page vii
- [Obtaining Documentation and Submitting a Service Request](#), page vii

## Changes to This Document

This table lists the technical changes made to this document since it was first released.

**Table 1: Changes to This Document**

Date	Summary
December 2015	Initial release of this document for the 6.0 release.

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*, at: <http://www.cisco.com/c/en/us/td/docs/general/whatsnew/whatsnew.html>.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation as an RSS feed and delivers content directly to your desktop using a reader application. The RSS feeds are a free service.







## Overview

---

This chapter provides an overview of the Cisco 5000 Series routers.

The Network Convergence System 5000 Series offers a high-density, small-form-factor MPLS aggregation router for metro aggregation. It is designed to economically scale large enterprise, over-the-top (OTT), and service provider Data Center networking architectures.

- [Overview, page 1](#)
- [Cisco NCS 5001, page 1](#)
- [Cisco NCS 5002, page 4](#)

## Overview

This chapter provides an overview of the Cisco 5000 Series routers.

The Network Convergence System 5000 Series offers a high-density, small-form-factor MPLS aggregation router for metro aggregation. It is designed to economically scale large enterprise, over-the-top (OTT), and service provider Data Center networking architectures.

## Cisco NCS 5001

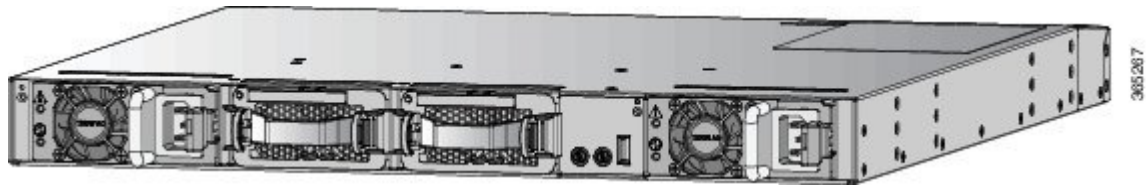
### Cisco NCS 5001 Overview

The Cisco NCS 5001 router is an extension to Cisco's routing platform portfolio enabling Service Providers and MPLS enabled data center architectures to offer elastic networks with improved business agility and simplified operations to deliver high-bandwidth mobile, video, and cloud services.

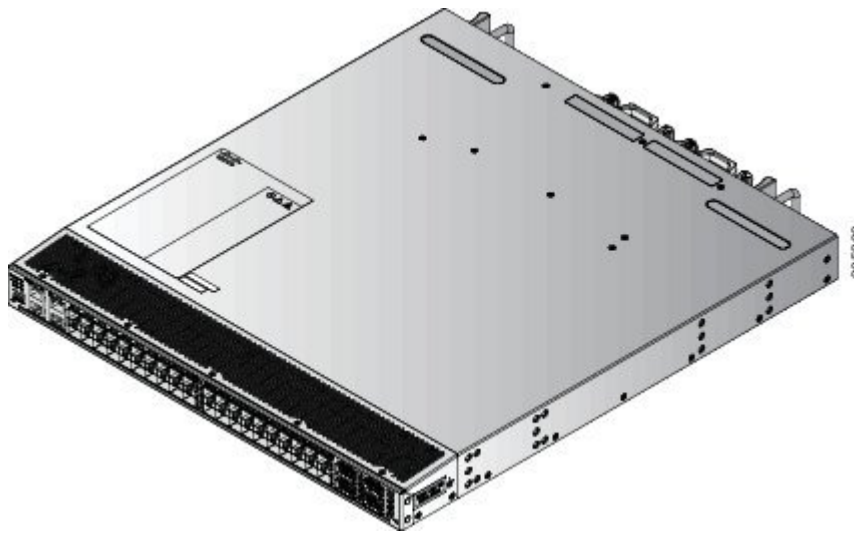
It can also operate as an extension shelf of Cisco ASR 9000 Series Aggregation Services Routers using Network Virtualization (nV) technology, consolidating multiple layers in the network and dramatically reducing operational costs.

The Cisco NCS 5001 router is a small form factor dense GE/10GE aggregation systems. Powered by industry leading routing operation system, IOS-XR, the system also offers rich functions such as third party application hosting, machine-to-machine interface, telemetry and flexible package delivery.

**Figure 1: Cisco NCS 5001 Router - Back (Fan Side) View**



**Figure 2: Cisco NCS 5001 Router - Front (Port Side) View**



## Ports

Cisco NCS 5001 router consists of the following ports:

- 40 x One GE/10GE SFP+ ports
  - 16 x Regular 10G SFP+ Ports
  - 24 x DWDM and ZR Capable 10G SFP+ Ports (Purple in color)
- 4 x 100G QSFP28 ports (Light Green in color)

## Features

The Cisco NCS 5001 router has the following features:

- Two 1+1 redundant, hot-swappable power supplies, which provide port side intake or exhaust for cooling
- Two 1+1 redundant, hot-swappable fan modules, which provide port side intake or exhaust for cooling

- A management and console interface are on the port (front) side of the router whereas the USB interface on the fan (back) side of the router.

### Power Supply

The Cisco NCS 5001 chassis has slots for two 1+1 redundant power supplies. Power supply options need to be configured with the base chassis. A minimum of one power supply is required for normal operation. The following table lists the power supplies that are configurable with the Cisco NCS 5001 router.

**Table 2: Power Supplies for the Cisco NCS 5001 router**

Part Number	Power Supply
NC5K-PDC-930W-FR	Cisco NCS 5000 Power DC 930W Front to Back Airflow
NC5K-PDC-930W-FR=	Cisco NCS 5000 Power DC 930W Front to Back Airflow, spare
NC5K-PDC-930W-BK	Cisco NCS 5000 Power DC 930W Back to Front Airflow
NC5K-PDC-930W-BK=	Cisco NCS 5000 Power DC 930W Back to Front Airflow, spare
NC5K-PAC-650W-FR	Cisco NCS 5000 Series Router Power AC 650W Front to Back Airflow
NC5K-PAC-650W-FR=	Cisco NCS 5000 Series Router Power AC 650W Front to Back Airflow, spare
NC5K-PAC-650W-BK	Cisco NCS 5000 Series Router Power AC 650W Back to Front Airflow
NC5K-PAC-650W-BK=	Cisco NCS 5000 Series Router Power AC 650W Back to Front Airflow, spare

### Fan Modules

The Cisco NCS 5001 chassis has slots for two 1+1 redundant fan modules. The fan modules are hot-swappable. Fan modules operate in an 1+1 redundancy mode. Fan options need to be configured with the base chassis. The Cisco NCS 5001 system supports both forward and reverse airflow. The system can work with a single fan failure. More than one fan failure leads to system shutdown. The following table lists the fan modules that are configurable with the Cisco NCS 5001 router.

**Table 3: Fan Modules for the Cisco NCS 5001 router**

Part Number	Fan Module
NCS-5001-FN-FR	Cisco NCS 5001 Router Fan Front to Back Airflow
NCS-5001-FN-FR=	Cisco NCS 5001 Router Fan Front to Back Airflow, spare
NCS-5001-FN-BK	Cisco NCS 5001 Router Fan Back to Front Airflow
NCS-5001-FN-BK =	Cisco NCS 5001 Router Fan Back to Front Airflow, spare

# Cisco NCS 5002

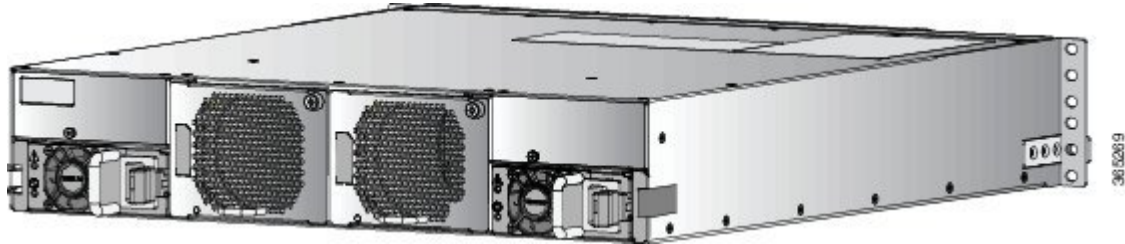
## Cisco NCS 5002

The Cisco NCS 5002 router is also an extension to Cisco's routing platform portfolio enabling Service Providers and MPLS enabled data center architectures to offer elastic networks with improved business agility and simplified operations to deliver high-bandwidth mobile, video, and cloud services.

It can also operate as an extension shelf of Cisco ASR 9000 Series Aggregation Services Routers using Network Virtualization (nV) technology, consolidating multiple layers in the network and dramatically reducing operational costs.

The Cisco NCS 5002 router is a small form factor dense GE/10GE aggregation systems in 2RU form factor. Powered by industry leading routing operation system, IOS-XR, the system also offers rich functions such as third party application hosting, machine-to-machine interface, telemetry and flexible package delivery.

*Figure 3: Cisco NCS 5002 - Back (Fan Side) View*



*Figure 4: Cisco NCS 5002 - Front (Port Side) View*



## Ports

Cisco NCS 5002 router consists of the following ports:

- 80 x One GE/10GE SFP+ ports
  - 40 x Regular 10G SFP+ Ports, on baseboard
  - 40 x DWDM and ZR Capable 10G SFP+ Ports, on mezzanine (Cisco Metallic Grey in color)
- 4 x 100G QSFP28 ports (Light Green in color)

## Features

The Cisco NCS 5002 router has the following features:

- Two 1+1 redundant, hot-swappable power supplies, which provide port side intake or exhaust for cooling
- Two 1+1 redundant, hot-swappable fan modules, which provide port side intake or exhaust for cooling
- A management, console, and the USB interface on the port (front) side of the router

## Power Supply

The Cisco NCS 5002 chassis has slots for two 1+1 redundant power supplies. Power supply options need to be configured with the base chassis. A minimum of one power supply is required for normal operation. The following table lists the power supplies that are configurable with the Cisco NCS 5002 router.

**Table 4: Power Supplies for the Cisco NCS 5002 router**

Part Number	Power Supply
NC5K-PDC-930W-FR	Cisco NCS 5000 Power DC 930W Front to Back Airflow
NC5K-PDC-930W-FR=	Cisco NCS 5000 Power DC 930W Front to Back Airflow, spare
NC5K-PDC-930W-BK	Cisco NCS 5000 Power DC 930W Back to Front Airflow
NC5K-PDC-930W-BK=	Cisco NCS 5000 Power DC 930W Back to Front Airflow, spare
NC5K-PAC-650W-FR	Cisco NCS 5000 Series Router Power AC 650W Front to Back Airflow
NC5K-PAC-650W-FR=	Cisco NCS 5000 Series Router Power AC 650W Front to Back Airflow, spare
NC5K-PAC-650W-BK	Cisco NCS 5000 Series Router Power AC 650W Back to Front Airflow
NC5K-PAC-650W-BK=	Cisco NCS 5000 Series Router Power AC 650W Back to Front Airflow, spare

## Fan Modules

The Cisco NCS 5002 chassis has slots for two 1+1 redundant fan modules. The fan modules are hot-swappable. Fan modules operate in an 1+1 redundancy mode. Fan options need to be configured with the base chassis. The Cisco NCS 5002 system supports both forward and reverse airflow. The system can work with a single fan failure. More than one fan failure leads to system shutdown. The following table lists the fan modules that are configurable with the Cisco NCS 5002 router.

**Table 5: Fan Modules for the Cisco NCS 5002 router**

<b>Part Number</b>	<b>Fan Module</b>
NCS-5002-FN-FR	Cisco NCS 5002 Router Fan Front to Back Airflow
NCS-5002-FN-FR=	Cisco NCS 5002 Router Fan Front to Back Airflow, spare
NCS-5002-FN-BK	Cisco NCS 5002 Router Fan Back to Front Airflow
NCS-5002-FN-BK=	Cisco NCS 5002 Router Fan Back to Front Airflow, spare



## Safety Guidelines

---

This chapter lists and describes all the safety guidelines for Cisco NCS 5000 Series routers. Read these safety guidelines before installing Cisco NCS 5000 routers.

- [Cisco NCS 5000 Safety Guidelines, page 7](#)

### Cisco NCS 5000 Safety Guidelines



**Note**

#### Caution

When handling router components, wear an ESD strap and handle modules by their handles and carrier edges only. An ESD socket is provided on the chassis. For the ESD socket to be effective, the chassis must be grounded through the power cable, the chassis ground, or the metal-to-metal contact with a grounded rack.

---



**Note**

#### Caution

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

---



**Note**

#### Caution

To prevent loss of input power, ensure the total maximum loads on the circuits supplying power to the router are within the current ratings for the wiring and breakers.

---



**Note**

#### Caution

To prevent loss of input power, ensure the total maximum loads on the circuits supplying power to the router are within the current ratings for the wiring and breakers.

---

**Note****Warning**

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





## Prepare to Install Cisco NCS 5000

This chapter describes how to prepare the Cisco NCS 5000 series router for installation. This chapter includes the following topics:

- [Installation Options with Racks and Cabinets, page 9](#)
- [Airflow Direction, page 9](#)
- [Chassis Weight, page 9](#)
- [Required Equipment, page 10](#)
- [Unpack and Inspect the New Router, page 10](#)

### Installation Options with Racks and Cabinets

The Cisco NCS 5001 and Cisco NCS 5002 routers can be installed in the following types of racks using a rack-mount kit shipped with the router:

- Open EIA rack
- Perforated EIA cabinet

To enable you to easily mount your router in any qualifying rack, you can attach the rack-mount brackets accommodate racks of different depths.

### Airflow Direction

The airflow direction of the Cisco NCS 5001 and Cisco NCS 5002 routers can be configured as front-to-back (port side intake), or back-to-front (port side exhaust). This is dependent on the type of fan modules and power supplies configured with the chassis. It is not possible to mix airflow directions. In other words, all fan modules and power supplies must either be configured to the same front-to-back, or back-to-front airflow directions.

### Chassis Weight

When lifting the router chassis, follow these guidelines.:

- Disconnect all power and external cables before lifting the router.
- Ensure that two people lift the router. The Cisco NCS 5001 router with two power supplies, weighs 22 lb, and the Cisco NCS 5002 with two power supplies, weighs 46 lbs. Ensure that your footing is solid and the weight of the router is evenly distributed between your feet.
- Lift the router slowly, keeping your back straight. Lift with your legs, not with your back. Bend at the knees, not at the waist.

## Required Equipment

Before beginning the installation, ensure that you have the following items available:

- Four 12-24 or 10-32 screws for attaching slider rails to the rack
- Number 1 and number 2 Phillips screwdrivers with torque capability
- 3/16-inch flat-blade screwdriver
- Tape measure and level
- ESD wrist strap or other grounding device
- Antistatic mat or antistatic foam

Also, the following additional items (not found in the accessory kit) are required to ground the chassis:

- Grounding cable (6 AWG recommended), sized according to local and national installation requirements; the required length depends on the proximity of the router to proper grounding facilities
- Crimping tool, large enough to accommodate the girth of the lug
- Wire-stripping tool

## Unpack and Inspect the New Router

Before you install a new chassis, you need to unpack and inspect it to be sure that you have all the items that you ordered and verify that the router was not damaged during shipment.



### Caution

When handling router components, wear an ESD strap and handle modules by their handles and carrier edges only. An ESD socket is provided on the chassis. For the ESD socket to be effective, the chassis must be grounded through the power cable, the chassis ground, or the metal-to-metal contact with a grounded rack.



### Tip

Do not discard the shipping container when you unpack the router. Flatten the shipping cartons and store them with the pallet used for the system. If you need to move or ship the system in the future, you will need these containers.



---

**Note** The router is thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, contact your customer service representative immediately.

---

To inspect the shipment, follow these steps:

---

**Step 1** Compare the shipment to the equipment list provided by your customer service representative and verify that you have received all items ordered (optional items as well), including the following:

- Grounding lug kit
- Rack mount kit
- ESD wrist strap
- Cables with connectors
- Filters (According to air flow direction)
- Any optional items ordered

**Step 2** Check the contents of each box for damage.

**Step 3** If you notice any discrepancies or damage, send the following information to your customer service representative by email:

- Invoice number of the shipper (see the packing slip)
  - Model and serial number of the missing or damaged unit
  - Description of the problem and how it affects the installation
  - Photos of the damage to external packaging, internal packaging, and product
  - Effect of damage on the installation
-





## Installing the NCS 5000 Router

---

This chapter describes how to install the Cisco NCS 5000 Series routers. This chapter includes the following sections:

- [Installation Guidelines, page 13](#)
- [Installing Cisco NCS 5000, page 14](#)
- [Grounding the Cisco NCS 5001 and NCS 5002 Routers, page 21](#)
- [Starting Cisco NCS 5001 and NCS 5002 Routers, page 23](#)

### Installation Guidelines

When installing the Cisco NCS 5000 routers, follow these guidelines:

- Record the information listed in [Site Planning and Maintenance Records](#), on page 45 as you install and configure the router.
- Ensure that there is adequate space around the router to allow for servicing the router and for adequate airflow. [Technical Specifications](#), on page 29, lists the service and airflow requirements.
- Ensure that the air-conditioning meets the heat dissipation requirements listed in [Technical Specifications](#), on page 29.
- Ensure that the cabinet or rack meets the requirements listed in [Cabinet and Rack Installation](#), on page 27.



---

**Note** Jumper power cords are available for use in a cabinet. See the [Jumper Power Cord](#), on page 37 section.

---

- Ensure that the chassis can be adequately grounded. If the router is not mounted in a grounded rack, we recommend connecting both the system ground on the chassis and the power supply ground directly to an earth ground.
- Ensure that the site power meets the power requirements listed in [Technical Specifications](#), on page 29. If available, you can use an uninterruptible power supply (UPS) to protect against power failures.

- Ensure that circuits are sized according to local and national codes. For North America, the power supply requires a 15-A or 20-A circuit.

**Note****Caution**

To prevent loss of input power, ensure the total maximum loads on the circuits supplying power to the router are within the current ratings for the wiring and breakers.

## Installing Cisco NCS 5000

The following sections describe how to install the Cisco NCS 5000 Series routers.

### Installing Cisco NCS 5001

This section describes how to use the rack-mount kit provided with the router to install the Cisco NCS 5001 router into a cabinet or rack that meets the requirements described in [Cabinet and Rack Installation](#), on page 27.

**Note****Warning**

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

The following table lists the items contained in the rack-mount kit provided with the Cisco NCS 5001 router.

**Table 6: Cisco NCS 5001 Router Rack-Mount Kit**

Quantity	Part Description
4	Rack-mount brackets
16	M4 x 0.7 x 7-mm Phillips flat-head screws
4	Rack-mount guides
2	Slider rails

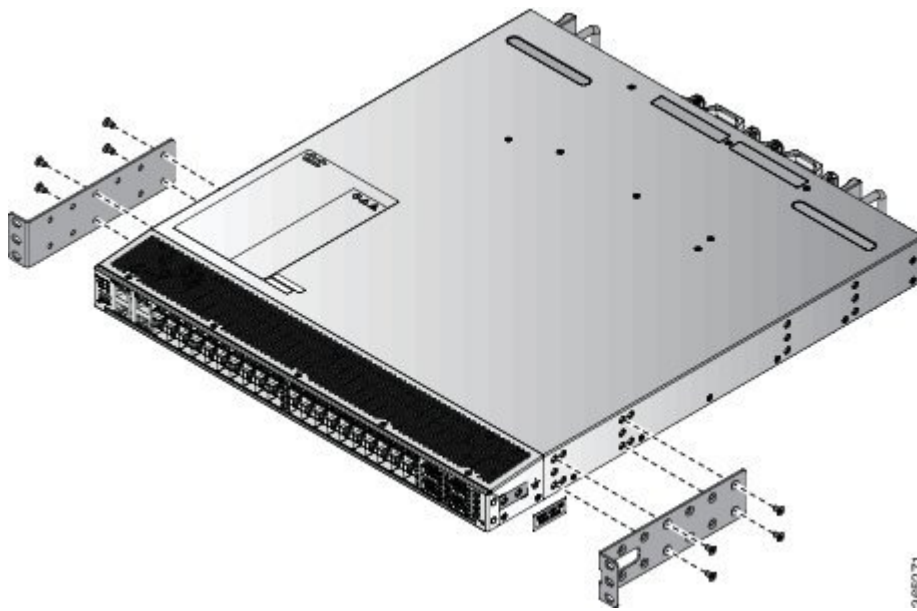
**Step 1** Install the front rack-mount brackets on the chassis as follows:

- Position a front rack-mount bracket on the side of the chassis with its four holes aligned to four of the six screw holes on the front side of the chassis, and then use four M4 screws to attach the bracket to the chassis.

**Note** You can align any four of the holes in the front rack-mount bracket to four of the six screw holes in the chassis. The holes that you use depend on the requirements of your rack.

- b) Repeat Step 1a with the other front rack-mount bracket on the other side of the router.

**Figure 5: Rack-mount brackets at the front on Cisco NCS 5001**

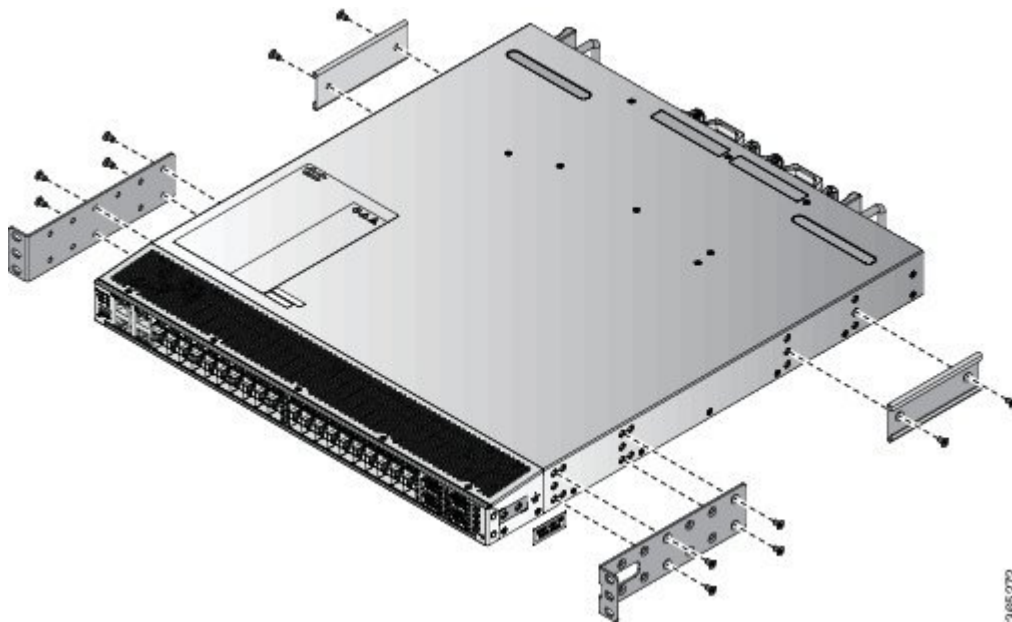


**Step 2** Install the rear rack-mount guides on the chassis as follows:

- a) Position a rear rack-mount bracket on the side of the chassis with its four holes aligned to four of the six screw holes on the side of the chassis, and then use four M4 screws to attach the bracket to the chassis.

- b) Repeat Step 2a with the other rear rack-mount bracket on the other side of the router.

**Figure 6: Rack-mount brackets at the rear side on Cisco NCS 5001**



**Step 3** Install the slider rails to the rack as follows:

- a) Position the slider rails at the desired levels on the back side of the rack and use two 12-24 screws or two 10-32 screws, depending on the rack thread type, to attach the rails to the rack.
 

**Note** For racks with square holes, you might need to position a 12-24 cage nut behind each mounting hole in a slider rail before using a 12-24 screw.
- b) Repeat with the other slider rail on the other side of the rack.
- c) Use the tape measure and level to verify that the rails are at the same height and horizontal.

**Step 4** Insert the router into the rack and attach it as follows:

- a) Holding the router with both hands, position the back of the router between the front posts of the rack.
- b) Align the two rear rack-mount guides on either side of the router with the slider rails installed in the rack. Slide the rack-mount guides onto the slider rails, and then gently slide the router all the way into the rack.
 

**Note** If the router does not slide easily, try realigning the rack-mount guides on the slider rails.
- c) Holding the chassis level, insert two screws (12-24 or 10-32, depending on the rack type) through the cage nuts and the holes in one of the front rack-mount brackets and into the threaded holes in the rack-mounting rail.
- d) Repeat for the other front rack-mount bracket on the other side of the router.



## Installing Cisco NCS 5002

This section describes how to use the rack-mount kit provided with the router to install the Cisco NCS 5002 router into a cabinet or rack that meets the requirements described in [Cabinet and Rack Installation](#), on page 27.



---

**Note**    **Caution**

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

The following table lists the items contained in the rack-mount kit provided with the Cisco NCS 5002 router.

**Table 7: Cisco NCS 5002 Router Rack-Mount Kit**

Quantity	Part Description
4	Rack-mount brackets
16	M4 x 0.7 x 7-mm Phillips flat-head screws
4	Rack-mount guides
2	Slider rails

---

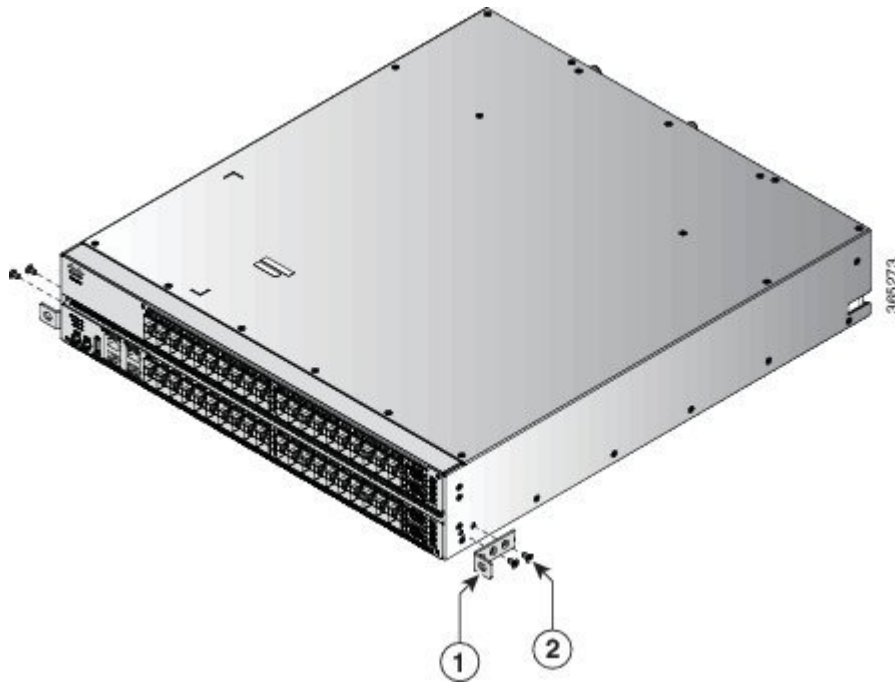
**Step 1**

Install the front rack-mount brackets on the router as follows:

- a) Position a front rack-mount bracket on the side of the router with its two holes aligned to two holes on the front side of the router, and then use two M4 screws to attach the bracket to the router.

- b) Repeat Step 1a with the other front rack-mount bracket on the other side of the router.

**Figure 7: Rack-Mount Brackets on the Front Side on Cisco NCS 5002**



1 - Rack mount bracket

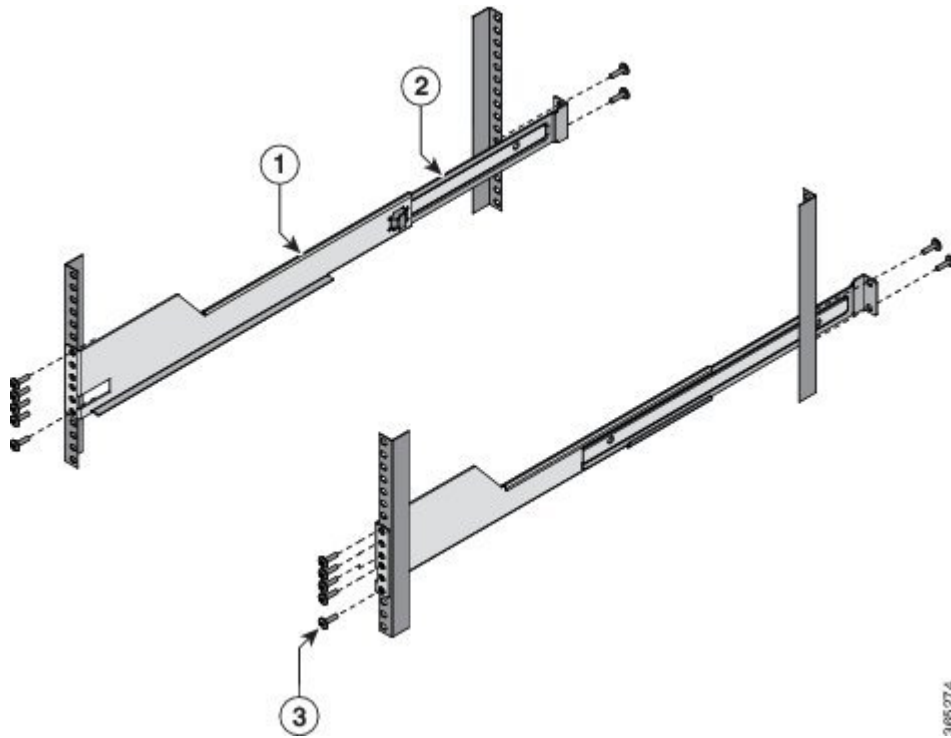
2 - Screws

**Step 2** Install the rear rack-mount guides on the rack as follows:

- a) Assemble the rack mount and slider using 5 screws (12-24 screws or 10-32 screws depending on the rack type) in front and 2 screws (12-24 screws or 10-32 screws depending on the rack type) on the back.

b) Repeat Step 2a for the other side of the router.

**Figure 8: Assembling Rack Mount and Slider**

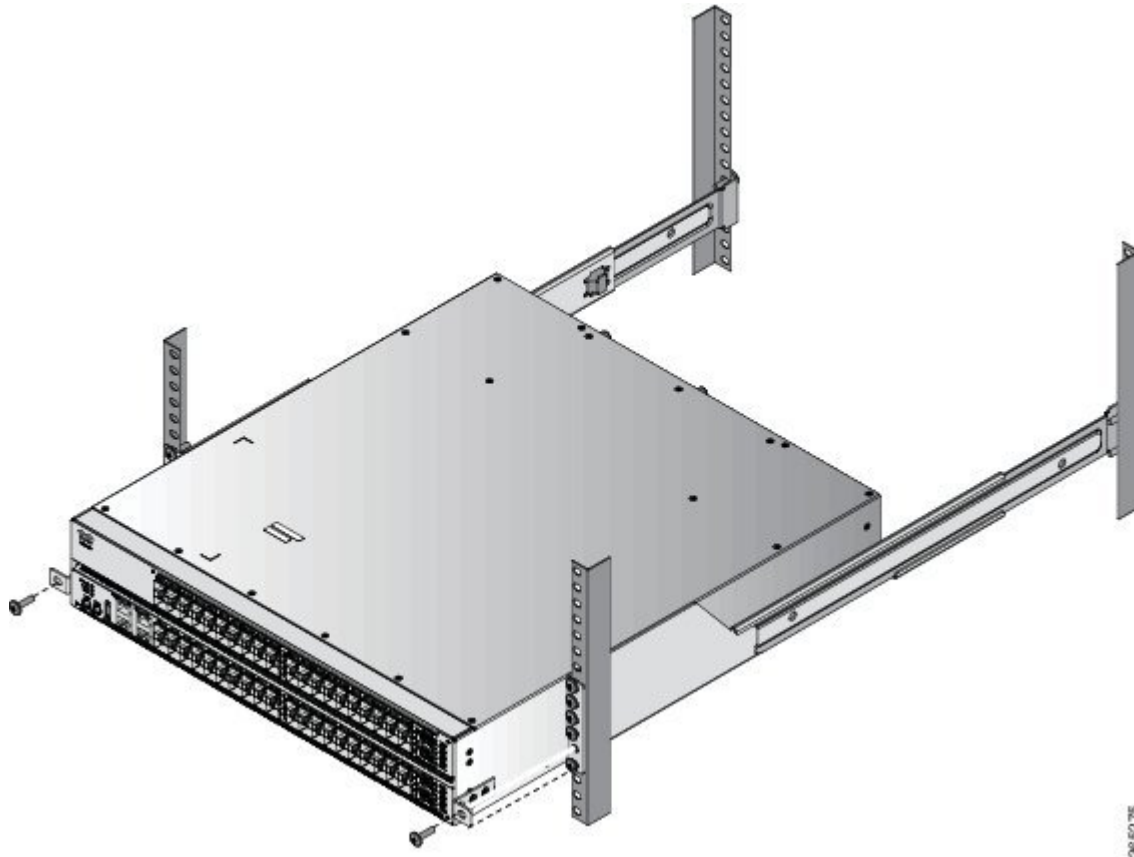


1 - Slider	2 - Rack mount
3 - Screws	

**Step 3** Install the slider rails to the rack as follows:

- a) Position the router with the front rack mounts aligned at the location shown in the following image and assemble on rack using one screw on either side (12-24 screws or 10-32 screws depending on the rack type).

**Figure 9: Slide the Cisco NCS 5002 Router**



**Note** For racks with square holes, you might need to position a 12-24 cage nut behind each mounting hole in a slider rail before using a 12-24 screw.

- b) Repeat with the other slider rail on the other side of the rack.  
 c) Use the tape measure and level to verify that the rails are at the same height and horizontal.

#### Step 4

Insert the router into the rack and attach it as follows:

- a) Holding the router with both hands, position the back of the router between the front posts of the rack.  
 b) Align the two rear rack-mount guides on either side of the router with the slider rails installed in the rack. Slide the rack-mount guides onto the slider rails, and then gently slide the router all the way into the rack.

**Note** If the router does not slide easily, try realigning the rack-mount guides on the slider rails.

- c) Holding the router level, insert two screws (12-24 or 10-32, depending on the rack type) through the cage nuts and the holes in one of the front rack-mount brackets and into the threaded holes in the rack-mounting rail.  
 d) Repeat for the other front rack-mount bracket on the other side of the router.

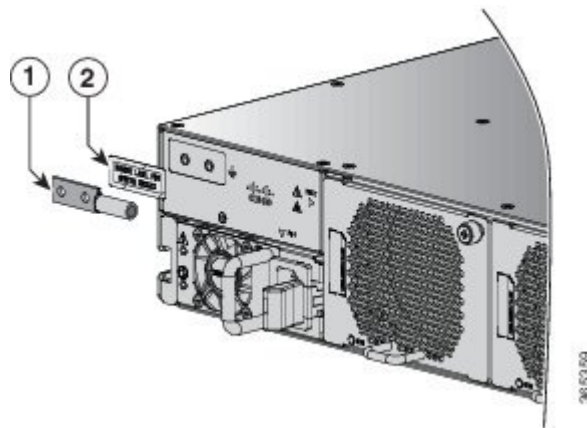
# Grounding the Cisco NCS 5001 and NCS 5002 Routers

This section describes how to ground the Cisco NCS 5001 and Cisco NCS 5002 routers.

## Step 1

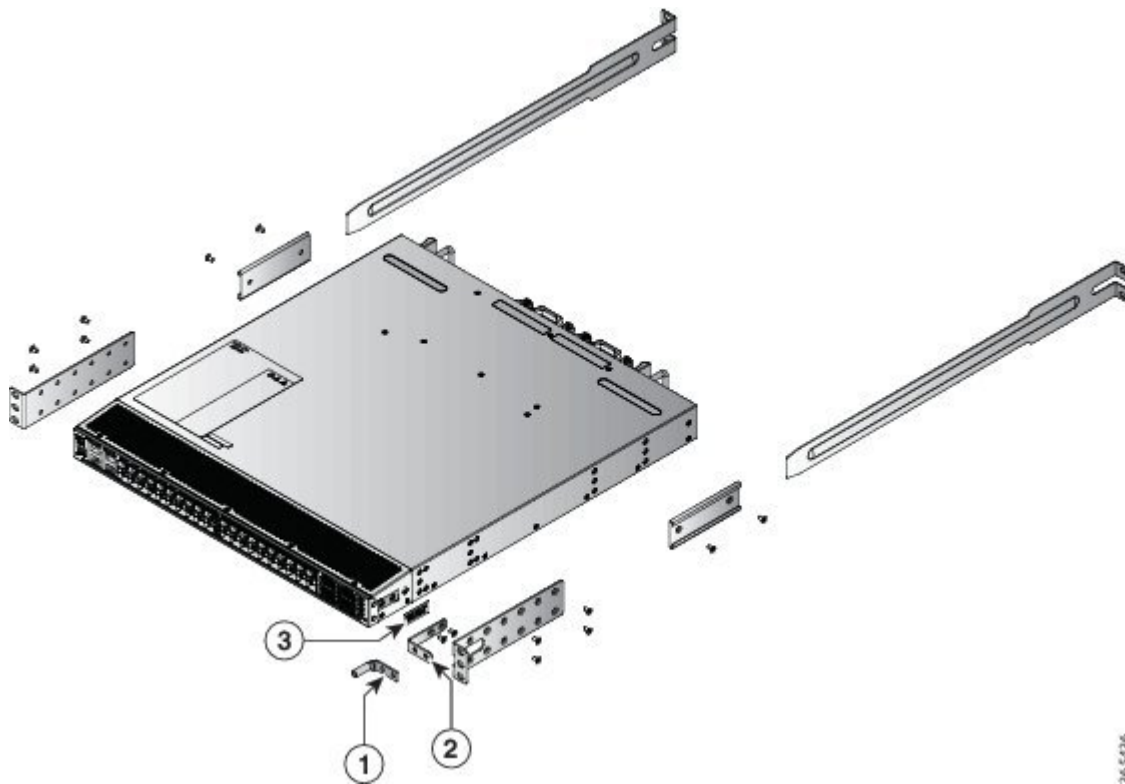
On Cisco NCS 5001 remove the label on the rear side (fan side) of the router to expose the ground mounting holes (as shown in the figure). On Cisco NCS 5002, remove the label on the right side of the front side (port side) of the router to expose the ground mounting holes (as shown in the figure).

**Figure 10: Grounding the Cisco NCS 5001 Router**



1 - Ground Lug	2 - Label
----------------	-----------

Figure 11: Grounding the Cisco NCS 5002 Router



1 - Ground Lug	2 - Ground Lug bracket
3 - Label	

- Step 2** Install the ground lug bracket to the mounting holes with two flat head M4 X 7mm screws.
- Step 3** Install ground lug to the ground lug bracket with two pan head M4 screws.
- Step 4** Using a wire-stripping tool, remove the covering from one end of the grounding cable and insert the stripped end of the grounding cable to the open end of the grounding lug.
- Step 5** Prepare the other end of the ground cable and connect it to an appropriate grounding point in your site to ensure adequate earth ground.

## Starting Cisco NCS 5001 and NCS 5002 Routers

This section provides instructions for powering up the Cisco NCS 5001 and 5002 routers and verifying their component installation.



---

**Note** Do not connect the Ethernet port to the LAN until the initial router configuration has been performed.

---



---

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

---

To power up the router and verify hardware operation, follow these steps:

---

**Step 1** Verify that the power supply and the fan modules are installed.

**Note** Depending on the outlet receptacle on your power distribution unit, you may need the optional jumper power cord to connect the router to your outlet receptacle. See the [Jumper Power Cord](#), on page 37 section.

**Step 2** Ensure that the router is adequately grounded as described in the [Grounding the Cisco NCS 5001 and NCS 5002 Routers](#), on page 21, and that the power cables are connected to outlets that have the required AC power voltages (see [Power Specifications](#), on page 30)

**Step 3** For the router, insert each end of the power clip (from the accessory kit) into holes on tabs located on either side of the power connectors.

**Step 4** Connect each power cable to the power connectors on the router and an AC power source. Press the power cable into the power clip to ensure that the power cable stays connected to the router when bumped. The router should power on as soon as you connect the power cable.

**Step 5** Check if the fans are operational; they should begin operating when the power cable is plugged in.

**Step 6** After the router boots up, verify that the LED operation as follows:

- Fan module—Status LED is green.
- Power supply—Status LED is green.
- After initialization, the system status LED is green, indicating that all router environmental monitors are reporting that the system is operational. If this LED is orange or red, then one or more environmental monitor is reporting a problem.
- The Link LEDs for the Ethernet connector should not be ON unless the cable is connected.

**Step 7** Try removing and reinstalling a component that is not operating correctly. If it still does not operate correctly, contact your customer service representative for a replacement.

**Note** If you purchased this product through a Cisco reseller, contact the reseller directly for technical support. If you purchased this product directly from Cisco, contact Cisco Technical Support at this URL: [http://www.cisco.com/en/US/support/tsd\\_cisco\\_worldwide\\_contacts.html](http://www.cisco.com/en/US/support/tsd_cisco_worldwide_contacts.html).

**Step 8** Verify that the system software has booted and the router has initialized without error messages. If you cannot resolve an issue, contact your customer service representative.

**Step 9** Complete the worksheets provided in [Site Planning and Maintenance Records](#) , on page 45 for future reference.

---





## Accessory Kits

---

- [Accessory Kit Contents, page 25](#)

### Accessory Kit Contents

This appendix describes the contents of the accessory kits for the Cisco NCS 5000 Series routers.

#### Cisco NCS 5001 Router Accessory Kit

This section describes the accessory kit contents for the Cisco NCS 5001 router accessory kit (NCS-5001-ACSR). The Cisco NCS 5001 router accessory kit includes the following items:

- 2 rack-mount guides
- 2 rack-mount brackets
- 2 rack-mount sliders
- 16 M4 x 0.7 x 6-mm Phillips flat-head screws
- 1 console cable with an RJ-45-RS-232 adapter and a DB9 adapter
- 1 ground lug kit
- 1 ESD wrist strap



**Note**

---

Additional parts can be ordered from your customer service representative.

---

#### Cisco NCS 5002 Router Accessory Kit

This section describes the accessory kit contents for the Cisco NCS 5002 router accessory kit (NCS-5002-ACSR). The Cisco NCS 5002 router accessory kit includes the following items:

- 2 rack-mount guides

- 2 rack-mount brackets
- 2 rack-mount sliders
- 16 M4 x 0.7 x 6-mm Phillips flat-head screws
- 1 console cable with an RJ-45-RS-232 adapter and a DB9 adapter
- 1 ground lug kit
- 1 ESD wrist strap

**Note**

---

Additional parts can be ordered from your customer service representative.

---



## Cabinet and Rack Installation

---

This appendix provides the requirements for cabinet and rack installation for the Cisco NCS 5000 router and includes the following sections:

- [Cabinet and Rack Requirements, page 27](#)
- [Cable Management Guidelines, page 28](#)

### Cabinet and Rack Requirements

This section provides the requirements for the following types of cabinets and racks, assuming an external ambient air temperature range of 0° F to 104° F (0° C to 40° C):

- Standard perforated cabinets
- Standard open racks



---

**Note**

If you are selecting an enclosed cabinet, we recommend one of the thermally validated types: standard perforated or solid-walled with a fan tray.

---



---

**Note**

Do not use racks that have obstructions (such as power strips), because the obstructions could impair access to field-replaceable units (FRUs).

---

This section includes the following topics:

[General Requirements for Cabins and Racks, on page 27](#)

[Requirements Specific to Perforated Cabinets, on page 28](#)

### General Requirements for Cabins and Racks

The cabinet or rack must be one of the following types:

- Standard 19-in. (48.3 cm) (four-post EIA cabinet or rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the “[Requirements Specific to Perforated Cabinets, on page 28](#)”.

The cabinet or rack must also meet the following requirements:

- The minimum vertical rack space for the Cisco NCS 5000 router chassis must be one RU (rack units).
- The width between the rack-mounting rails must be at least 19 inches if the rear of the router is not attached to the rack. For four-post EIA racks, this is the distance between the two front rails.
- For four-post EIA cabinets (perforated or solid-walled), the requirements are as follows:
  - The minimum spacing for the bend radius for fiber-optic cables should have the front-mounting rails of the cabinet offset from the front door by a minimum of 3 inches (7.6 cm), and a minimum of 5 inches (12.7 cm) if cable management brackets are installed on the front of the chassis.
  - The distance between the outside face of the front mounting rail and the outside face of the back mounting rail should be 23.5 to 34.0 inches (59.7 to 86.4 cm) to allow for rear-bracket installation.
  - A minimum of 2.5 inches (6.4 cm) of clear space should exist between the side edge of the chassis and the side wall of the cabinet. No sizeable flow obstructions should be immediately in the way of chassis air intake or exhaust vents.



---

**Note** Optional jumper power cords are available for use in a cabinet. See the Jumper Power Cord section on page C-8

---

## Requirements Specific to Perforated Cabinets

A perforated cabinet is as a cabinet with perforated front and rear doors and solid side walls. In addition to the requirements listed in the “[General Requirements for Cabins and Racks, on page 27](#)”, perforated cabinets must meet the following requirements:

- The front and rear doors must have at least a 60 percent open area perforation pattern, with at least 15 square inches (96.8 square cm) of open area per rack unit of door height.
- The roof should be perforated with at least a 20 percent open area.
- The cabinet floor should be open or perforated to enhance cooling.

Cisco provides an R-Series rack that conforms to these requirements.

## Cable Management Guidelines

To help with cable management, you might want to allow additional space in the rack above and below the chassis to make it easier to route as many as 56 fiber or copper cables through the rack.



## Technical Specifications

This appendix describes the technical specifications for the Cisco NCS 5001 and 5002 routers. This appendix includes the following sections:

- [Router Specifications, page 29](#)
- [Environment Specification, page 30](#)
- [Power Specifications, page 30](#)

## Router Specifications

The following table lists the physical specifications for the Cisco NCS 5001 router.

**Table 8: Physical Specifications for the Cisco NCS 5001 Router**

Description	Specification
Dimensions (H x W x D)	1.72 x 17.42 x 19.28 in. (4.4 cm x 44.3 cm x 48.97 cm)
Cisco NCS 5001 with two 650W power supplies, and two fan modules	22 lb (10 kg)

The following table lists the physical specifications for the Cisco NCS 5002 router.

**Table 9: Physical Specifications for the Cisco NCS 5002 Router**

Description	Specification
Dimensions (H x W x D)	3.5 x 17.42 x 19.28 in. (8.9 cm x 44.3 cm x 48.97 cm)
Cisco NCS 5002 with two 650W power supplies, and two fan modules	46 lb (20.9 kg)

## Environment Specification

The following table lists the environmental specifications for the Cisco NCS 5001 Router.

**Table 10: Environmental Specifications for the Cisco NCS 5001 Router**

Property	Cisco NCS 5001 Router
Operating temperature	32 to 104°F (0 to 40°C)
Nonoperating (storage) temperature	-40 to 158°F (-40 to 70°C)
Humidity	5 to 95% (non condensing)
Altitude	0 to 10,000 ft (0 to 3000 m)

**Table 11: Environmental Specifications for the Cisco NCS 5002 Router**

Property	Cisco NCS 5002 Router
Operating temperature	32 to 104°F (0 to 40°C)
Nonoperating (storage) temperature	-40 to 158°F (-40 to 70°C)
Humidity	5 to 95% (non condensing)
Altitude	0 to 10,000 ft (0 to 3000 m)

## Power Specifications

This section describes the power specifications for the Cisco NCS 5000 Series routers.

### Specifications for the Cisco NCS 5001 Power Supply

The following table lists the Power supply specifications for the Cisco NCS 5001 Series routers.

**Table 12: Specifications for the Cisco NCS 5001 AC Power Supply**

AC Power Supply Properties	Specifications
Typical operating power	357 W
Maximum Power	650 W
Input Voltage	110/220

AC Power Supply Properties	Specifications
Frequency	47 Hz to 53 Hz
Efficiency	94% (At 50% Load)
RoHS Compliance	Yes
Hot Swappable	Yes
Port side exhaust air flow power supply	Yes
Port side intake air flow power supply	Yes

**Table 13: Specifications for the Cisco NCS 5001 DC Power Supply**

DC Power Supply Properties	Specifications
Typical operating power	511 W
Maximum Power	930 W
Input Voltage	-48/-60
Efficiency	94% (At 50% Load)
RoHS Compliance	Yes



**Note**

The minimum cable sizing required for DC power supply is 10 AWG.

## Specifications for the Cisco NCS 5002 Power Supply

The following table lists the Power supply specifications for the Cisco NCS 5002 Series router.

**Table 14: Specifications for the Cisco NCS 5002 AC Power Supply**

AC Power Supply Properties	Specifications
Typical operating power	357 W
Maximum Power	650 W
Input Voltage	110/220

AC Power Supply Properties	Specifications
Frequency	47 Hz to 53 Hz
Efficiency	94% (At 50% Load)
RoHS Compliance	Yes
Hot Swappable	Yes
Port side exhaust air flow power supply	Yes
Port side intake air flow power supply	Yes

**Table 15: Specifications for the Cisco NCS 5002 DC Power Supply**

DC Power Supply Properties	Specifications
Typical operating power	511 W
Maximum Power	930 W
Input Voltage	-48/-60
Efficiency	94% (At 50% Load)
RoHS Compliance	Yes



**Note**

The minimum cable sizing required for DC power supply is 10 AWG.





## Cable and Port Specification

---

This appendix provides cable and port specifications for the Cisco NCS 5001 and 5002 Series routers.

- [Console Port, page 33](#)
- [Supported Power Cords and Plugs, page 33](#)
- [Jumper Power Cord, page 37](#)

### Console Port

The console port is an asynchronous RS-232 serial port with an RJ-45 connector.

### Supported Power Cords and Plugs

Each power supply has a separate power cord. Standard power cords or jumper power cords are available for connection to a power distribution unit that has IEC 60320 C19 outlet receptacles. The standard power cords have an IEC C13 connector on the end that plugs into the router. The optional jumper power cords, for use in cabinets, have an IEC C13 connector on the end that plugs into the router and an IEC C14 connector on the end that plugs into an IEC C13 outlet receptacle.



**Note**

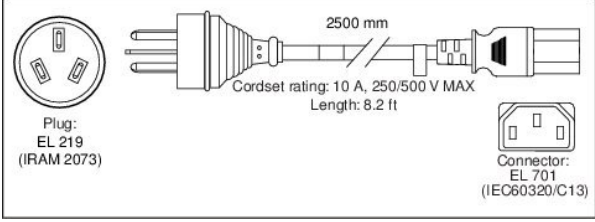
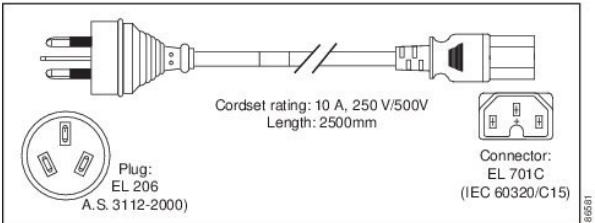
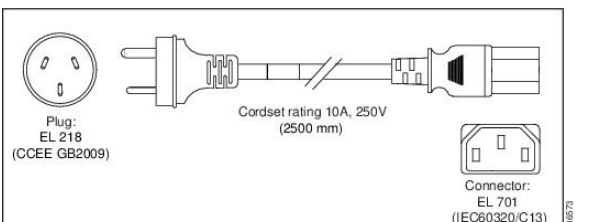
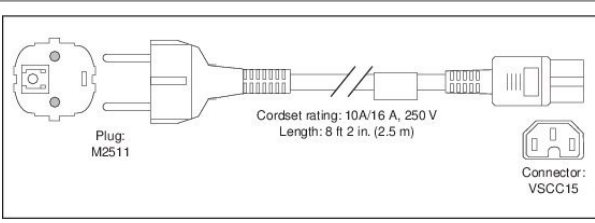
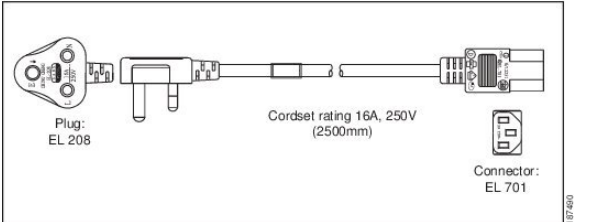
---

Only the regular power cords or jumper power cords provided with the router are supported.

---

The following table lists the power cords for the Cisco NCS 5000 Series router and provides their lengths in feet and meters.

Table 16: Power Cords for the Cisco NCS 5000 Series Router

Description	Length		Power Cord Reference Illustration
	Feet	Meters	
CAB-250V-10A-AR Power cord 250 VAC 10 A, IRAM 2073 plug Argentina	8.2	2.5	 <p>2500 mm Cordset rating: 10 A, 250/500 V MAX Length: 8.2 ft</p> <p>Plug: EL 219 (IRAM 2073)</p> <p>Connector: EL 701 (IEC60320/C13)</p>
CAB-9K10A-AU Power cord 250 VAC 10 A, 3112 plug, Australia	8.2	2.5	 <p>2500 mm Cordset rating: 10 A, 250 V/500V Length: 2500mm</p> <p>Plug: EL 206 A.S. 3112-2000</p> <p>Connector: EL 701C (IEC 60320/C15)</p>
CAB-250V-10A-CN Power cord 250 VAC 10 A, GB 2009 plug China	8.2	2.5	 <p>2500 mm Cordset rating 10A, 250V (2500 mm)</p> <p>Plug: EL 218 (CCEE GB2009)</p> <p>Connector: EL 701 (IEC60320/C13)</p>
CAB-9K10A-EU Power cord, 250 VAC 10 A, M 2511 plug Europe	8.2	2.5	 <p>2500 mm Cordset rating: 10A/16 A, 250 V Length: 8 ft 2 in. (2.5 m)</p> <p>Plug: M2511</p> <p>Connector: VSCC15</p>
CAB250V-10A-ID Power cord 250 VAC 16A, EL-208 plug South Africa, United Arab Emirates, India	8.2	2.5	 <p>2500 mm Cordset rating 16A, 250V (2500mm)</p> <p>Plug: EL 208</p> <p>Connector: EL 701</p>

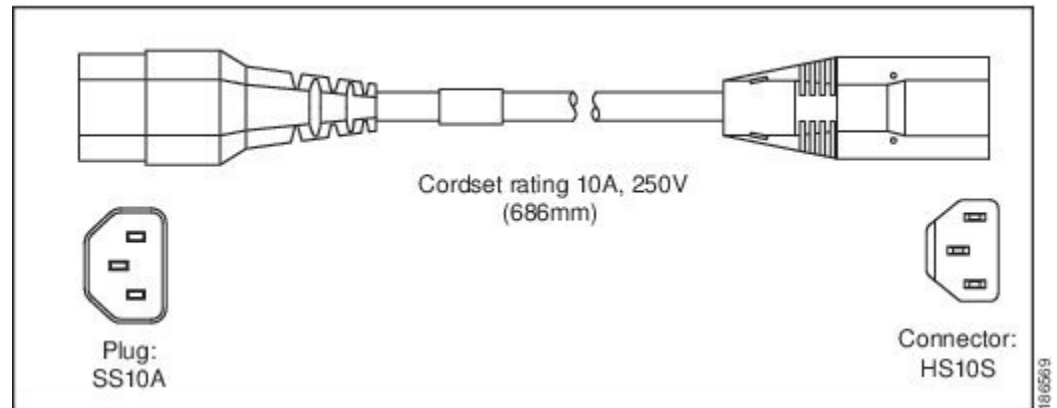
Description	Length		Power Cord Reference Illustration
	Feet	Meters	
CAB-250V-10A-IS Power cord 250 VAC 10 A, SI-32 plug Israel	8.2	2.5	
CAB-9K10A-IT Power cord 250 VAC 10 A, CEI 23-16 plug Italy	8.2	2.5	
CAB-9K10A-SW Power cord 250 VAC 10 A, MP232 plug Switzerland	8.2	2.5	
CAB-9K10A-UK Power cord 250 VAC 10 A, BS1363 plug (13 A fuse) United Kingdom	8.2	2.5	
CAB-AC-250V/13A Power cord 250 VAC 13 A, NEMA L6-20 plug North America	6.6	2.0	

Description	Length		Power Cord Reference Illustration
	Feet	Meters	
CAB-N5K6A-NA Power cord 250 VAC 10 A, NEMA 6-15 plug North America	8.2	2.5	<p>Plug: NEMA 6-15P</p> <p>Cordset rating: 10 A, 250 V Length: 8.2 ft</p> <p>Connector: IEC60320/C13</p>
CAB-9K12A-NA Power cord 125 VAC 13 A, NEMA 5-15 plug North America	8.2	2.5	<p>Plug: NEMA 5-15P</p> <p>Cordset rating 13A, 125V (8.2 feet) (2.5m)</p> <p>Connector: IEC60320/C15</p>
CAB-C13-CBN Power cord 250 VAC 10 A, SS 10A plug	8.2	2.5	<p>Plug: SS10A</p> <p>Cordset rating 10A, 250V (686mm)</p> <p>Connector: HS10S</p>
CAB-IND-10A Power cord 250 VAC 10 A, EL 208B plug	8.2	2.5	<p>Plug: EL 208B (IS 6538-1971)</p> <p>Cordset rating 10A, 250V (8.2 feet) (2.5m)</p> <p>Connector EL701B (IEC60320/C13)</p>
CAB-C13-C14-JMPR Cabinet Jumper Power Cord 250 VAC 13 A, C13-C14 Connectors	2.2	0.7	<p>Plug: SS10A</p> <p>Cordset rating 10A, 250V (686mm)</p> <p>Connector: HS10S</p>

## Jumper Power Cord

The following figure shows the plug connector on the optional jumper power cord for the Cisco NCS 5001 and 5002 Series routers. This cable plugs into the power supply, and the receptacle of a power distribution unit for a cabinet. This cable comes in 6- and 9-foot (2- and 3-meter) lengths.

**Figure 12: CAB-C13-C14-JMPR, Jumper Power Cord**







## LEDs

This appendix describes the conditions indicated by the chassis and module LEDs on the Cisco NCS 5000 Series routers.

- [Chassis and Module LEDs for the Cisco NCS 5000 Series Routers, page 39](#)

## Chassis and Module LEDs for the Cisco NCS 5000 Series Routers

This section includes the following topics:

[Chassis and Module LED Descriptions, on page 39](#)

[Conditions Indicated by the Power Supply LEDs, on page 40](#)

### Chassis and Module LED Descriptions

This table describes the chassis LEDs for the Cisco NCS 5000 Series routers.

Indicator	Location	Function	Color	Status	State
Power LED	Front of Chassis	Chassis Power/Health	Green	Solid On	System is On and operating normally.
				Off	Router is powered off.
			Amber	On	Fault Condition.
Fan Tray Status	Fan Trays	Fan tray health indicator (multi-color)	Green	Solid On	Fan tray operating normally.
			Amber	Solid On	Fan failure within the fan tray.

Indicator	Location	Function	Color	Status	State
PSU Status Indicators	Power Supply(front)	PSU Health(Multi-Color)	Green	Off	No AC power to power supply.
				Solid On	power supply on and OK.
			Amber	Solid On	Power supply failures, over voltage, over current, over temperature
				1 Hz blinking	AC present, 3.3VSB on, PSU is off
Off	Operating normally .				

## Conditions Indicated by the Power Supply LEDs

You can determine the power supply conditions by combining the LED states of the OK and FAIL LEDs .

**Table 17: Power Supply LED Descriptions**

AC Power Supply Condition	OK LED(Green)	FAILED LED(Amber)
No AC or DC power to all power supplies.	Off	Off
Power supply failure, including over voltage, over current, over temperature, and fan failure.	off	On
Power supply warning events where the power supply continues to operate. These events include high temperature, high power, and slow fan.	Off	Blinking
AC present, 3.3 voltage standby (VSB) on, and the power supply unit is off. For a DC power supply, it indicates that DC power is present.	Blinking	Off
Power supply on and OK.	On	Off





## Troubleshooting Hardware Components

---

This appendix describes how to identify and resolve problems that might occur with the hardware components of a Cisco NCS 5000 Series routers.

- [Overview, page 41](#)
- [Router Hardware Best Practices, page 41](#)
- [Power Supply Conditions, page 42](#)

### Overview

The key to success when troubleshooting the system hardware is to isolate the problem to a specific system component. The first step is to compare what the system is doing to what it should be doing. Because a startup problem can usually be attributed to a single component, it is more efficient to isolate the problem to a subsystem rather than troubleshoot each separate component in the system.

Problems with the initial power up are often caused by a module that is not firmly connected to the backplane or a power supply that has been disconnected from the power cord connector.

Overheating can also cause problems with the system, though typically only after the system has been operating for an extended period of time. The most common cause of overheating is the failure of a fan module.

### Router Hardware Best Practices

Use the recommendations in this section to ensure the proper installation, initialization, and operation of the router.

This section includes the following topics:

- [Installation Best Practices, on page 42](#)
- [Initialization Best Practice, on page 42](#)
- [Power Supply Conditions, on page 42](#)

## Installation Best Practices

When installing the router, follow these best practices:

- Plan your site configuration and prepare the site before installing the chassis.
- Verify that you have the appropriate power supplies for your chassis configuration.
- Install the chassis following the rack and airflow guidelines presented in this guide.
- Verify that the chassis is adequately grounded.

## Initialization Best Practice

When the initial system boot is complete, verify the following:

- Power supplies are supplying power to the system.
- Fan modules are operating normally.
- The system software boots successfully.

## Router Operation Best Practices

To ensure proper operation of your router, take the following actions:

- Make a copy of the running configuration to CompactFlash for a safe backup.
- Always enter the **copy running-config startup-config CLI** command after you modify the running configuration and ensure that the system is operating properly.
- Never use the **init system** CLI command unless you understand that you will lose the running and startup configuration as well as the files stored on bootflash.
- Keep backup copies of the running kickstart and the system images on CompactFlash.

## Power Supply Conditions

The two LEDs on each power supply indicate the power status for each power supply. To determine the current status for a power supply unit, note which LED is on, blinking, or off and refer the following table.

**Table 18: Power Supply Condition**

Power Supply Condition	Power LED Status	Fail LED Status
No power to all power status.	Off	Off
Power supply failure, including overvoltage, overcurrent, overtemperature, and fan failure.	Off	On

Power Supply Condition	Power LED Status	Fail LED Status
Power supply warning events where the power supply continues to operate. These events include high temperature, high power, and slow fan.	Off	Blinking
AC present, 3.3 voltage standby (VSB) on, and the power supply unit is off.	Blinking	Off
Power supply on and OK.	On	Off





## Site Planning and Maintenance Records

This appendix provides log sheets that you can use to record information when installing a Cisco NCS 5000 Series router.

This appendix includes the following sections:

- [Site Preparation Checklist](#), page 45
- [Contact and Site Information](#), page 47
- [Chassis and Module Information](#), page 48

### Site Preparation Checklist

Planning the location and layout of your equipment rack or wiring closet is essential for successful router operation, ventilation, and accessibility. The following table lists the site planning tasks that we recommend completing before installing a Cisco NCS 5000 Series router.

Consider heat dissipation when sizing the air-conditioning requirements for an installation. See the [Technical Specifications](#), on page 29, for power and heat ratings.

**Table 19: Site Planning Checklist**

Task No.	Planning Activity	Verified By	Time	Date
1	Space Evaluation: <ul style="list-style-type: none"> <li>• Space and layout</li> <li>• Floor covering</li> <li>• Impact and vibration</li> <li>• Lighting</li> <li>• Maintenance access</li> </ul>			

Task No.	Planning Activity	Verified By	Time	Date
2	Environmental Evaluation: <ul style="list-style-type: none"> <li>• Ambient temperature</li> <li>• Humidity</li> <li>• Altitude</li> <li>• Atmospheric contamination</li> <li>• Air flow</li> </ul>			
3	Power evaluation: <ul style="list-style-type: none"> <li>• Input power type</li> <li>• Power receptacles<sup>1</sup></li> <li>• Receptacle proximity to the equipment</li> <li>• Dedicated circuit for power supply</li> <li>• Dedicated (separate) circuits for redundant power supplies</li> <li>• UPS<sup>2</sup> for power failures</li> </ul>			
4	Grounding evaluation: <ul style="list-style-type: none"> <li>• Circuit breaker size</li> <li>• CO ground (AC-powered systems)</li> </ul>			
5	Cable and interface equipment evaluation: <ul style="list-style-type: none"> <li>• Cable type</li> <li>• Connector type</li> <li>• Cable distance limitations</li> <li>• Interface equipment (transceivers)</li> </ul>			

Task No.	Planning Activity	Verified By	Time	Date
6	EMI <sup>3</sup> evaluation: <ul style="list-style-type: none"> <li>• Distance limitations for signaling</li> <li>• Site wiring</li> <li>• RFI<sup>4</sup> levels</li> </ul>			

<sup>1</sup> Verify that the power supply installed in the chassis has a dedicated AC source circuit.

<sup>2</sup> UPS = uninterruptible power supply.

<sup>3</sup> EMI = electromagnetic interference.

<sup>4</sup> RFI = radio frequency interference.

## Contact and Site Information

Use the following worksheet table to record contact and site information.

**Table 20: Contact and Site Information**

Contact person	
Contact phone	
Contact e-mail	
Building/site name	
Data center location	
Floor location	
Address (line 1)	
Address (line 2)	
City	
State	
Zip code	
Country	

## Chassis and Module Information

Use the following worksheets tables to record information about the chassis and modules.

Contact Number		
Chassis Number		
Serial Product Number		

**Table 21: Network-Related Information**

Router IP Address	
Router IP netmask	
Host name	
Domain name	
IP broadcast address	
Gateway/router address	
DNS Address	
Modem telephone number	

**Table 22: Module Information**

Slot	Module Type	Module Serial Number	Notes
1	Supervisor		
2			