



## **Network Processing Engine and Network Services Engine Installation and Configuration**

Product Number: NPE-100=, NPE-150=, NPE-175=, NPE-200=, NPE-225=, NPE-300=, NPE-400=, NSE-1=, NPE-G1=, UBR7200-NPE-G1=, NPE-G2=, UBR7200-NPE-G2=

See the product chapters for the platforms supported.

### **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

Customer Order Number:  
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## Preface

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This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- [Document Revision History, page i](#)
- [Objectives, page ii](#)
- [Organization, page ii](#)
- [Related Documentation, page iii](#)
- [Obtaining Documentation and Submitting a Service Request, page iv](#)

## Document Revision History

The Document Revision History below records technical changes to this document.

Document Revision Version	Date	Change Summary
OL-4448-12	December, 2008	Added information about Cisco uBR7225VXR support on the NPE-G2.
OL-4448-11	June, 2008	Added information about the SFP-GE-F module.
OL-4448-10	February, 2008	Updated uBR7200-NPE-G2 support.
OL-4448-09	January, 2008	Added uBR7200-NPE-G2 support.
OL-4448-08	December, 2006	Added CWDM SFP module configuration information for the NPE-G2.
OL-4448-07	September, 2006	Added the Port Adapter Jacket Card support information for NPE-G1 and NPE-G2.
OL-4448-06	August, 2006	Added 2GB DIMM information for the NPE-G2.
OL-4448-05	May, 2006	Added NPE-G2 information.
OL-4448-04	October, 2005	Added warning statement numbers and additional optical cleaning document title and URL.
OL-4448-03	August 11, 2005	Added enabling the second CPU information as well as <b>show</b> commands and output.

# Objectives

This document includes an overview of each network processing engine (NPE) or network services engine (NSE), instructions for removing and installing an NPE or NSE, steps for verifying that the installed NPE or NSE initializes the system after you power up the router, configuration instructions, and troubleshooting information.

The NPEs are supported in the following Cisco 7200 series routers and Cisco 7200 VXR routers:

- Cisco 7200 series routers, consisting of the 2-slot Cisco 7202, 4-slot Cisco 7204 and Cisco 7204VXR, and the 6-slot Cisco 7206 and Cisco 7206VXR
- Cisco 7206VXR as a router shelf in the AS5800 Universal Access Server


**Note**

The NSE-1 is supported only in the Cisco 7204VXR and Cisco 7206VXR routers. The NPE-G1 is supported only in the Cisco 7204VXR, Cisco 7206VXR, and Cisco uBR7246VXR routers.

The NPEs are supported in the following Cisco uBR7200 series universal broadband routers:

- Cisco uBR7223 (1 port adapter slot and 2 cable interface and line card slots)
- Cisco uBR7246 (2 port adapter slots and 4 cable interface line card slots)
- Cisco uBR7246VXR (2 port adapter slots, 4 cable interface line card slots, and 1 Cisco Cable Clock Card slot)
- Cisco uBR7225VXR (2 cable interface line card slots)


**Note**

See the individual product chapters for the specific platforms supported by the NPEs or NSE-1.

# Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	<a href="#">NPE-100, NPE-150, and NPE-200 Overview</a>	Describes the NPE-100, NPE-150, and NPE-200—components, system management functions, and memory specifications and configuration.
Chapter 2	<a href="#">NPE-175 and NPE-225 Overview</a>	Describes the NPE-175 and NPE-225—components, system management functions, and memory specifications and configuration.
Chapter 3	<a href="#">NPE-300 and NPE-400 Overview</a>	Describes the NPE-300 and NPE-400—components, system management functions, and memory specifications and configuration.
Chapter 4	<a href="#">NSE-1 Overview</a>	Describes the NSE-1—components, system management functions, and memory specifications and configuration.

Section	Title	Description
Chapter 5	<a href="#">NPE-G1 Overview</a>	Describes the NPE-G1—components, system management functions, and memory specifications.
Chapter 6	<a href="#">NPE-G2 Overview</a>	Describes the NPE-G2—components, system management functions, and memory specifications.
Chapter 7	<a href="#">NPE-G1 and NPE-G2 Installation and Configuration Information</a>	Provides installation and configuration information for the NPE-G1 and NPE-G2.
Chapter 8	<a href="#">Preparation for Installation</a>	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 9	<a href="#">Removing and Installing the NPE or NSE</a>	Describes the procedures for installing and removing the network processing engine or network services engine in the supported platforms.
Chapter 10	<a href="#">Configuration Tasks and Troubleshooting Information</a>	Provides instructions for configuring the NSE-1 and troubleshooting information for both the NPEs and NSE-1. It also provides power supply removal information.

## Related Documentation

Your router and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- Cisco IOS software:

For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.



**Note** You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at <http://www.cisco.com>. Translated documentation is available at [http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml).

- For the NPE-G1, see the *NPE-G1 Read Me First* document, which is available at the following URL:

<http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/ubr7246vxt/upgrade/guide/15066R.html>

- For the Cisco uBR7200-NPE-G1, see the *Cisco uBR7200-NPE-G1 Read Me First* document, which is available at the following URL:

<http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/ubr7246vxt/upgrade/guide/15066R.html>

- For information on the Cisco 7200 series routers, refer to the following publications:

Your Cisco 7200 series routers contain extensive features and functionality, which are documented in the following resources:

- *Cisco 7200 Series Routers Documentation Roadmap* at [http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200\\_series\\_doc\\_roadmap/3512.html](http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200_series_doc_roadmap/3512.html) for a list of all Cisco 7200 series routers documentation and troubleshooting tools and information.
- *Cisco 7200 Series Routers Port Adapter Documentation Roadmap* at [http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200\\_series\\_port\\_adapter\\_doc\\_roadmap/3530.html](http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200_series_port_adapter_doc_roadmap/3530.html) for a list of all Cisco 7200 series routers-supported port adapter documentation.
- *Cisco 7200 Series Routers Troubleshooting Documentation Roadmap* at [http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200\\_series\\_trblshoot\\_doc\\_roadmap/3518.html](http://www.cisco.com/en/US/docs/routers/7200/roadmaps/7200_series_trblshoot_doc_roadmap/3518.html) for links to troubleshooting tools, utilities, and Tech Notes.
- For information about the Cisco uBR7200 series routers, refer to the following publications:
  - *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide* at: <http://www.cisco.com/en/US/docs/cable/cmts/ubr7200/installation/guide/ub72khig.html>
  - *Cisco uBR7200 Series Configuration Notes* at: [http://www.cisco.com/en/US/products/hw/cable/ps2217/products\\_installation\\_and\\_configuration\\_guides\\_list.html](http://www.cisco.com/en/US/products/hw/cable/ps2217/products_installation_and_configuration_guides_list.html)
- For information about the Cisco AS5800 Universal Access Server, refer to the following publications:
  - *Cisco AS5800 Universal Access Server Hardware Installation Guide* at: [http://www.cisco.com/en/US/docs/routers/access/as5800/hardware/installation/guide/5800\\_hig.html](http://www.cisco.com/en/US/docs/routers/access/as5800/hardware/installation/guide/5800_hig.html)
  - *Cisco AS5800 Universal Access Server Regulatory Compliance and Safety Information* at: [http://www.cisco.com/en/US/products/hw/univgate/ps509/products\\_regulatory\\_approvals\\_and\\_compliance09186a00800c9843.html](http://www.cisco.com/en/US/products/hw/univgate/ps509/products_regulatory_approvals_and_compliance09186a00800c9843.html)
- To view Cisco documentation or obtain general information about the documentation, refer to the following sources:
  - “Obtaining Documentation and Submitting a Service Request” section on page iv
  - *Cisco Information Packet* that shipped with your router or switch

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

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# CHAPTER 1

## NPE-100, NPE-150, and NPE-200 Overview

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This chapter describes the network processing engine (NPE) models NPE-100, NPE-150, and NPE-200 and contains the following sections:

- [Supported Platforms, page 1-1](#)
- [Software Requirements, page 1-1](#)
- [NPE-100, NPE-150, and NPE-200 Description and Overview, page 1-1](#)
- [NPE-100, NPE-150, and NPE-200 Memory Information, page 1-6](#)

### Supported Platforms

The following NPEs support the Cisco 7200 series routers and Cisco 7200 VXR routers:

- NPE-100
- NPE-150
- NPE-200

The following NPEs support the Cisco uBR7246 and Cisco uBR7223 universal broadband routers:

- NPE-150
- NPE-200

The NPE-200 supports the Cisco 7206 as a router shelf in a Cisco AS5800 Universal Access Server.

### Software Requirements

For minimum software release information, see the [“Software Requirements” section on page 8-4](#).

## NPE-100, NPE-150, and NPE-200 Description and Overview

This section contains information about the network processing engine components and the system management functions.

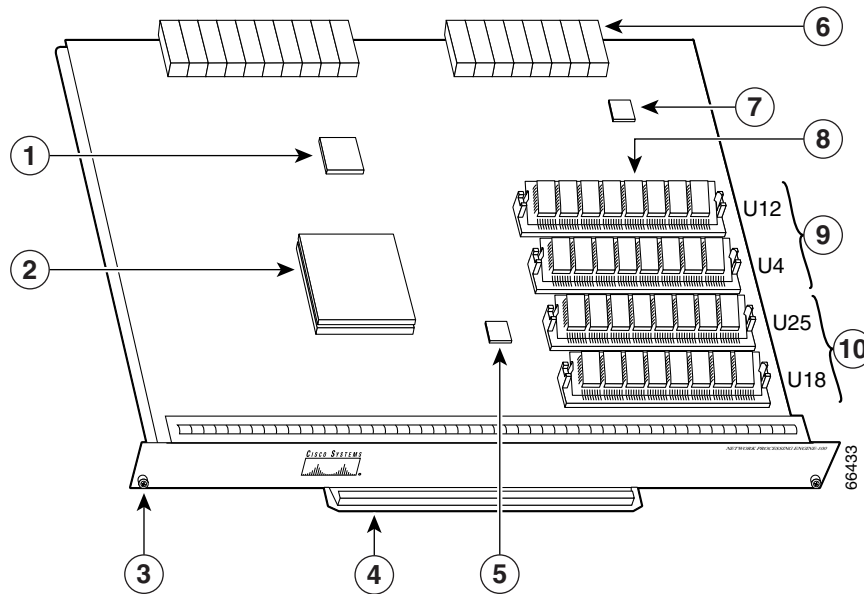
- The network processing engine maintains and executes the system management functions for the Cisco 7200 series routers.

- The network processing engine maintains and executes the system management functions for the Cisco uBR7200 series routers.

The NPE also shares the system memory and environmental monitoring functions with the I/O controller.

## Components

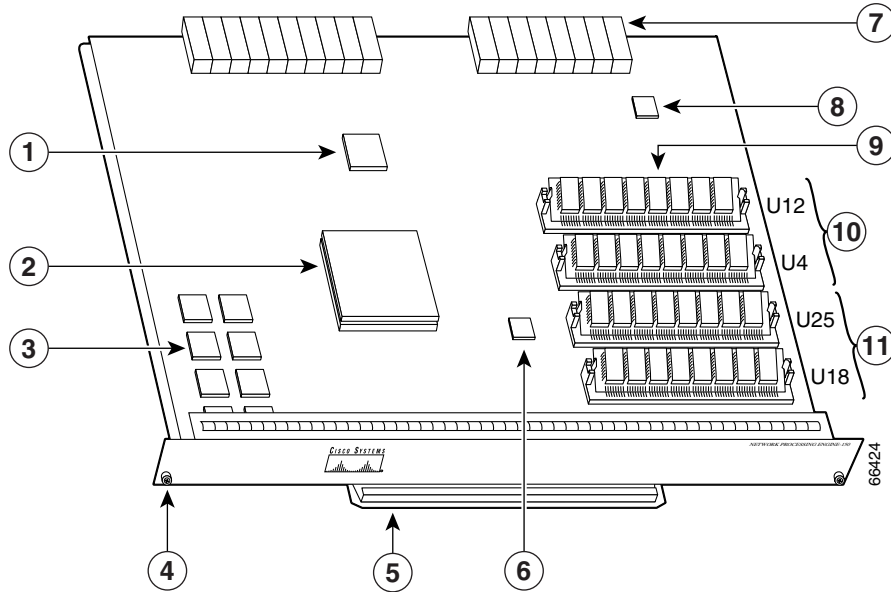
Figure 1-1 NPE-100



1	System controller	6	Midplane connectors
2	R4700 microprocessor	7	Temperature sensor
3	Captive installation screw	8	DRAM SIMMs
4	Handle	9	Bank 1
5	Temperature sensor	10	Bank 0

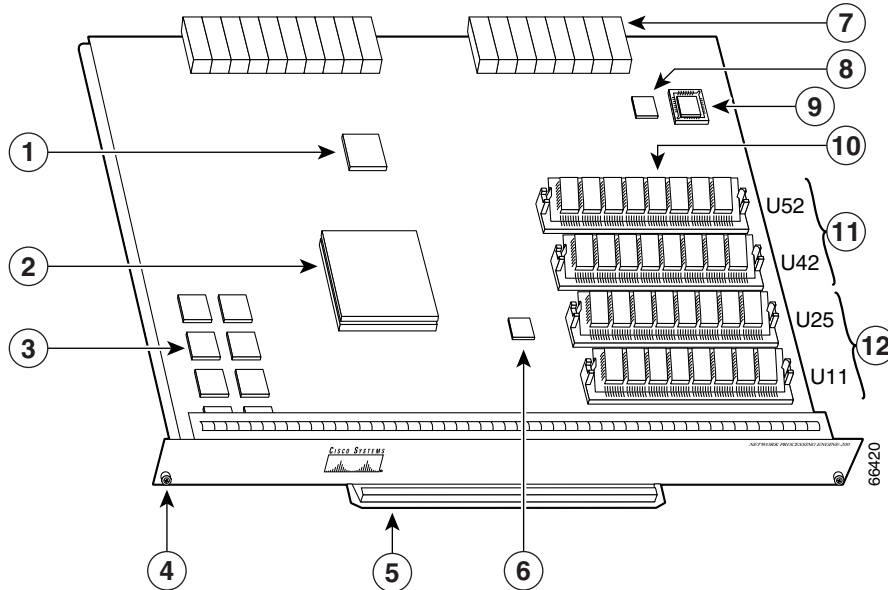


Figure 1-2 NPE-150



1	System controller	7	Midplane connectors
2	R4700 microprocessor	8	Temperature sensor
3	1-MB SRAM (U700 through U703 and U800 through U803)	9	DRAM SIMMs
4	Captive installation screw	10	Bank 1
5	Handle	11	Bank 0
6	Temperature sensor		

Figure 1-3 NPE-200



1	System controller	7	Midplane connectors
2	R5000 microprocessor	8	Temperature sensor
3	4-MB SRAM (U6, U10, U13, U14, U28, U29, U38, and U39)	9	Boot ROM U92
4	Captive installation screw	10	DRAM SIMMs
5	Handle	11	Bank 1
6	Temperature sensor	12	Bank 0

The NPE-100, NPE-150, and NPE-200 consist of the following components:

- Reduced instruction set computing (RISC) microprocessor
  - The NPE-100 and NPE-150 have an R4700 microprocessor that operates at an internal clock speed of 150 MHz.
  - The NPE-200 has an R5000 microprocessor that operates at an internal clock speed of 200 MHz.

- System controller

The system controller provides hardware logic to interconnect the processor, DRAM, and the PCI-based system backplane bus. The NPE-150 and NPE-200 have a system controller that uses direct memory access (DMA) to transfer data between DRAM and packet SRAM on the network processing engine.

- Upgradable memory modules

The NPE-100, NPE-150, and NPE-200 use DRAM for storing routing tables, network accounting applications, packets of information in preparation for process switching, and packet buffering for SRAM overflow (except in the NPE-100, which contains no packet SRAM). The standard configuration is 32 MB, with up to 128 MB available through single in-line memory module (SIMM) upgrades.
- Packet SRAM for storing data packets
  - The NPE-100 does not have packet SRAM.
  - The NPE-150 has 1 MB of SRAM.
  - The NPE-200 has 4 MB of SRAM.
- Cache memory

The NPE-100, NPE-150, and NPE-200 have unified cache SRAM that functions as the secondary cache for the microprocessor. (The primary cache is within the microprocessor.)
- Two environmental sensors for monitoring the cooling air as it leaves the chassis
- Boot ROM for storing sufficient code for booting the Cisco IOS software on the NPE-200



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**Note** The NPE-100 and NPE-150 use the boot ROM on the I/O controller.

---

## System Management Functions

The network processing engines perform the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- DIMM—dual in-line memory module
- DRAM—dynamic random-access memory
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.

- OTP—one time programmable
- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SIMM—single in-line memory module
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module
- SRAM—static random-access memory
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

## NPE-100, NPE-150, and NPE-200 Memory Information

To determine the memory configuration of your NPE, use the **show version** command.

The following example shows an NPE-150 installed in a Cisco 7206 router:

```
router(boot)# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Released Version 11.1(17)CA
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Sun 21-Apr-96 04:10
Image text-base:0x60010890, data-base:0x605F0000

(display text omitted)

cisco 7206 (NPE150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Rev 1.0, (Level 2 Cache)
Last reset from power-on

(display text omitted)
```

Use the following sections for information about memory specifications and configurations for the NPE-100, NPE-150, and NPE-200.



### Note

To prevent DRAM errors in the NPE-100, NPE-150, or NPE-200, and to ensure that your system initializes correctly at startup, DRAM bank 0 (socket U18 and U25, or U11 and U25) must contain no fewer than two SIMMs of the same type. You may also install two SIMMs of the same type in bank 1 (socket U4 and U12, or U42 and U52); however, bank 0 must always contain the two largest SIMMs.

## NPE-100 Memory Information

Table 1-1 provides information about memory specifications. Table 1-2 provides memory configurations for the NPE-100.

**Table 1-1** NPE-100 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-100 Board
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U18 and U25 Bank 1: U4 and U12
Primary cache	—	—	R4700 processor, internal cache	U201
Secondary cache	512 KB	4	R4700 processor, unified, external cache	U2, U10, U14, and U26

**Table 1-2** NPE-100 DRAM SIMM Configurations—Configurable Memory Only

Total DRAM <sup>1</sup>	Bank 0	Quantity - Bank 0	Bank 1	Quantity - Bank 1	Product Number
32 MB	U18 and U25	2 16-MB SIMMs <sup>2</sup>	U4 and U12	—	MEM-NPE-32MB <sup>2</sup>
64 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	—	MEM-NPE-64MB <sup>2</sup>
128 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	2 32-MB SIMMs	MEM-NPE-128MB <sup>2</sup>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed in the “[Related Documentation](#)” section on page iii for Cisco AS5800 Universal Access Server DRAM options.
2. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order Product Number MEM-NPE-64MB=.

## NPE-150 Memory Information

Table 1-3 provides information about memory specifications. Table 1-4 provides memory configurations for the NPE-150.

**Table 1-3** NPE-150 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-150 Board
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U18 and U2 Bank 1: U4 and U12
SRAM	1 MB	8	8 chips, each being 128K x 9 bits wide	U700 through U703 U800 through U803
Primary cache	—	—	R4700 processor, internal cache	U201
Secondary cache	512 MB	4	R4700 processor, unified, external cache	U2, U10, U14, and U26

**Table 1-4 NPE-150 DRAM SIMM Configurations—Configurable Memory Only**

Total DRAM <sup>1</sup>	Bank 0	Quantity - Bank 0	Bank 1	Quantity - Bank 1	Product Number
32 MB	U18 and U25	2 16-MB SIMMs	U4 and U12	—	MEM-NPE-32 MB <sup>2</sup>
64 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	—	MEM-NPE-64MB <sup>2</sup>
128 MB	U18 and U25	2 32-MB SIMMs	U4 and U12	2 32-MB SIMMs	MEM-NPE-128MB <sup>2</sup>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed in the “[Related Documentation](#)” section on page iii for Cisco AS5800 Universal Access Server DRAM options.
2. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order Product Number MEM-NPE-64MB=.

## NPE-200 Memory Information

[Table 1-5](#) provides information about memory specifications. [Table 1-6](#) provides memory configurations for the NPE-200.

**Table 1-5 NPE-200 Memory Specifications**

Memory Type	Size	Quantity	Description	Component Location on the NPE-200 Board
DRAM	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U11 and U25 Bank 1: U42 and U52
SRAM	4 MB	8	8 chips, each being 512K x 8 bits wide	U6, U10, U13, U14, U28, U29, U38, and U39
Boot ROM	256 KB	1	EPROM for the ROM monitor programs	U92
Primary cache	—	—	R5000 processor, internal cache	U44
Secondary cache	512 KB	4	R5000 processor, unified, external cache	U16, U9, U109, and U107

**Table 1-6 NPE-200 DRAM SIMM Configurations—Configurable Memory Only**

Total DRAM <sup>1</sup>	Bank 0	Quantity - Bank 0	Bank 1	Quantity - Bank 1	Product Number
32 MB	U11 and U25	2 16-MB SIMMs	U42 and U52	—	MEM-NPE-32MB <sup>2</sup>
64 MB	U11 and U25	2 32-MB SIMMs	U42 and U52	—	MEM-NPE-64MB <sup>2</sup>
128 MB	U11 and U25	2 32-MB SIMMs	U42 and U52	2 32-MB SIMMs	MEM-NPE-128MB <sup>2</sup>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed in the “[Related Documentation](#)” section on page iii for Cisco AS5800 Universal Access Server DRAM options.
2. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order Product Number MEM-NPE-64MB=.



## CHAPTER 2

# NPE-175 and NPE-225 Overview

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This chapter describes the network processing engine (NPE) models NPE-175 and NPE-225 and contains the following sections:

- [Supported Platforms, page 2-1](#)
- [Software Requirements, page 2-1](#)
- [NPE-175 and NPE-225 Description and Overview, page 2-1](#)
- [NPE-175 and NPE-225 Memory Information, page 2-5](#)

## Supported Platforms

The following NPEs support the Cisco 7200 series routers and Cisco 7200 VXR routers:

- NPE-175
- NPE-225

The following NPEs support the Cisco uBR7246VXR universal broadband router, Cisco uBR7246, and Cisco uBR7223 universal broadband routers:

- NPE-175
- NPE-225

## Software Requirements

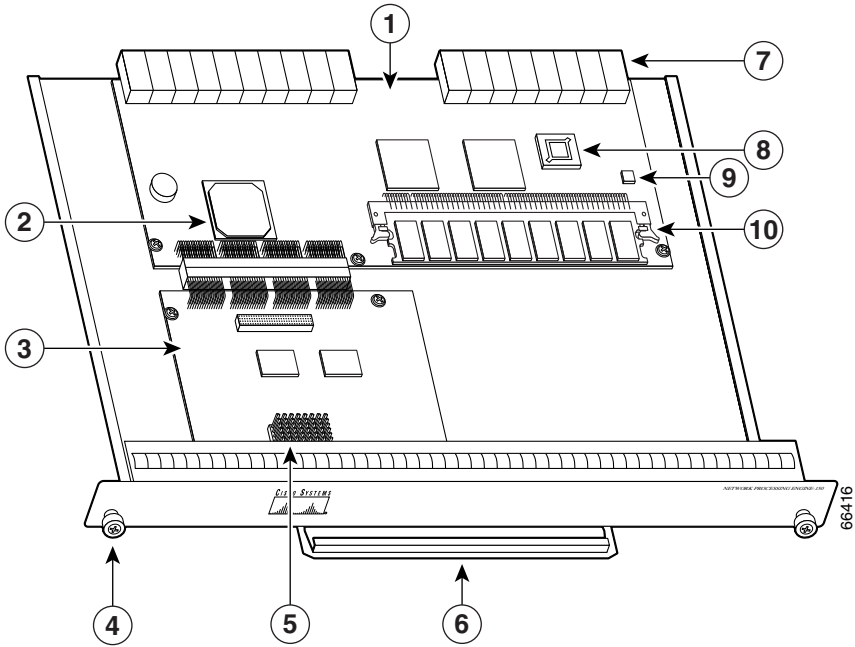
For minimum software release information, see the [“Software Requirements” section on page 8-4](#).

## NPE-175 and NPE-225 Description and Overview

This section contains information about the network processing engine components and the system management functions. The network processing engine maintains and executes the system management functions for the Cisco 7200 series and Cisco uBR7200 series routers. The NPE also shares the system memory and environmental monitoring functions with the I/O controller.

# Components

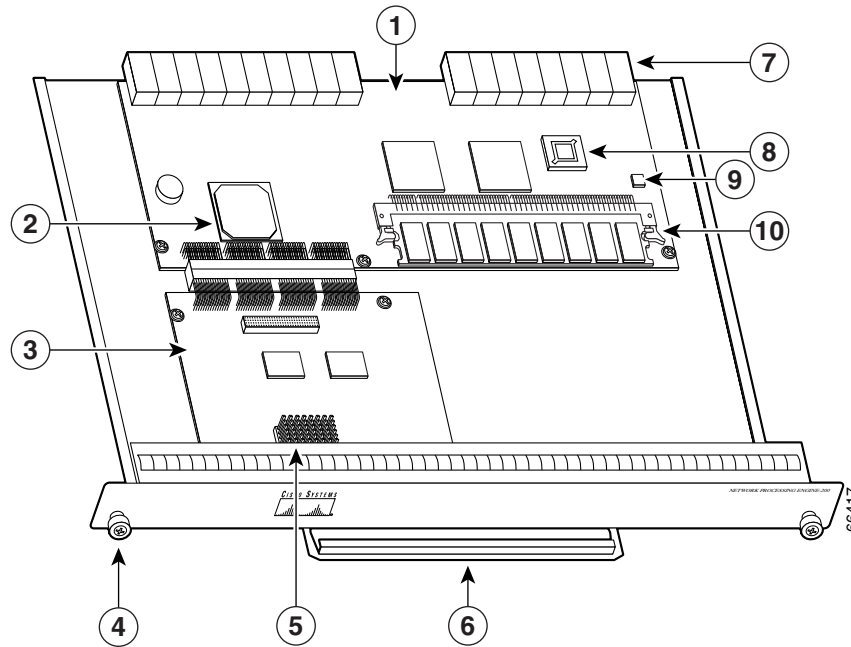
Figure 2-1 NPE-175



1	Network controller board	6	Handle
2	System controller	7	Midplane connectors
3	Processor engine board	8	Boot ROM (U1)
4	Captive installation screw	9	Temperature sensor
5	RM5270 microprocessor	10	SDRAM DIMM (U15)



Figure 2-2 NPE-225



1	Network controller board	6	Handle
2	System controller	7	Midplane connectors
3	Processor engine board	8	Boot ROM (U1)
4	Captive installation screw	9	Temperature sensor
5	RM5271 microprocessor	10	SDRAM DIMM (U15)

The NPE-175 and NPE-225 consist of the following components:

- Reduced instruction set computing (RISC) microprocessor
  - The NPE-175 has an RM5270 microprocessor that operates at an internal clock speed of 200 MHz.
  - The NPE-225 has an RM5271 microprocessor that operates at an internal clock speed of 262 MHz.
- System controller
 

The system controller provides hardware logic to interconnect the processor, DRAM, and the PCI-based system backplane bus. The NPE-175 and NPE-225 have one system controller that provides processor access to the two midplane and single I/O controller peripheral component interconnect (PCI) buses. The system controller also allows port adapters—on either of the two midplane PCI buses—access to SDRAM.
- Upgradable memory modules
 

The NPE-175 and NPE-225 use SDRAM for providing code, data, and packet storage.
- Cache memory
 

The NPE-175 and NPE-225 have unified cache SRAM that functions as the secondary cache for the microprocessor. (The primary cache is within the microprocessor.)
- Two environmental sensors for monitoring the cooling air as it leaves the chassis

- Boot ROM for storing sufficient code for booting the Cisco IOS software; the NPE-175 and NPE-225 have boot ROM




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**Note** Neither the NPE-175 nor the NPE-225 has packet SRAM.

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## System Management Functions

The network processing engines perform the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- DIMM—dual in-line memory module
- DRAM—dynamic random-access memory
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- OTP—one time programmable
- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SIMM—single in-line memory module
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module

- SRAM—static random-access memory
- Unified cache— Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

## NPE-175 and NPE-225 Memory Information

To determine the memory configuration of your NPE, use the **show version** command.

The following example shows an NPE-225 installed in a Cisco 7206VXR router:

```
router(boot)# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-BOOT-M), Released Version 12.0(19990124:222541)
[biff-nightly 115]
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 15-Feb-99 21:50 by biff
Image text-base:0x600088F8, data-base:0x6064C000

(display text omitted)

cisco 7206VXR (NPE225) processor with 57344K/8192K bytes of memory.
R527x CPU at 262Mhz, Implementation 40, Rev 10.0, 2048KB L2 Cache
6 slot VXR midplane, Version 2.0

(display text omitted)
```

[Table 2-1](#) provides memory specifications, [Table 2-2](#) provides memory configurations for the NPE-175, and [Table 2-3](#) provides memory configurations for the NPE-225.

**Table 2-1** NPE-175 and NPE-225 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-175 and NPE-225 Board
SDRAM	64 or 128 MB	1 configurable bank with 1 SDRAM slot	DIMM	U15
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM5270 processor, primary internal cache	U4
	32 KB (instruction), 32 KB (data)	—	RM5271 processor, primary internal cache	U4
Secondary cache	2 MB	4 x 256 x 18 bits = 64 bit plus 4 parity bits	RM527x processor, unified external cache	U5, U6, U7, U8 <sup>1</sup>

1. Located on the processor engine board.

**Table 2-2** NPE-175 SDRAM DIMM Configurations—Configurable Memory Only

Total SDRAM	Bank	Quantity	Product Number
64 MB	U15	1 64-MB DIMM	MEM-SD-NPE-64MB
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB

**Table 2-3** NPE-225 SDRAM DIMM Configurations—Configurable Memory Only

Total SDRAM	Bank	Quantity	Product Number
64 MB	U15	1 64-MB DIMM	MEM-SD-NPE-64MB
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB
256 MB	U15	1 256-MB DIMM	MEM-SD-NSE-256MB



## CHAPTER 3

# NPE-300 and NPE-400 Overview

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This chapter describes the network processing engine (NPE) models NPE-300 and NPE-400 and contains the following sections:

- [Supported Platforms, page 3-1](#)
- [Software Requirements, page 3-1](#)
- [NPE-300 and NPE-400 Description and Overview, page 3-2](#)
- [NPE-300 and NPE-400 Memory Information, page 3-5](#)

## Supported Platforms

The following NPEs support the Cisco 7200 VXR routers:

- NPE-300
- NPE-400

The following NPEs support the Cisco uBR7246VXR universal broadband router:

- NPE-300
- NPE-400

The following NPEs support the Cisco 7206VXR as a router shelf in the Cisco AS5800 Universal Access Router:

- NPE-300
- NPE-400

These NPEs are keyed to prevent insertion in the Cisco 7200 series routers (7202, 7204, 7206).

## Software Requirements

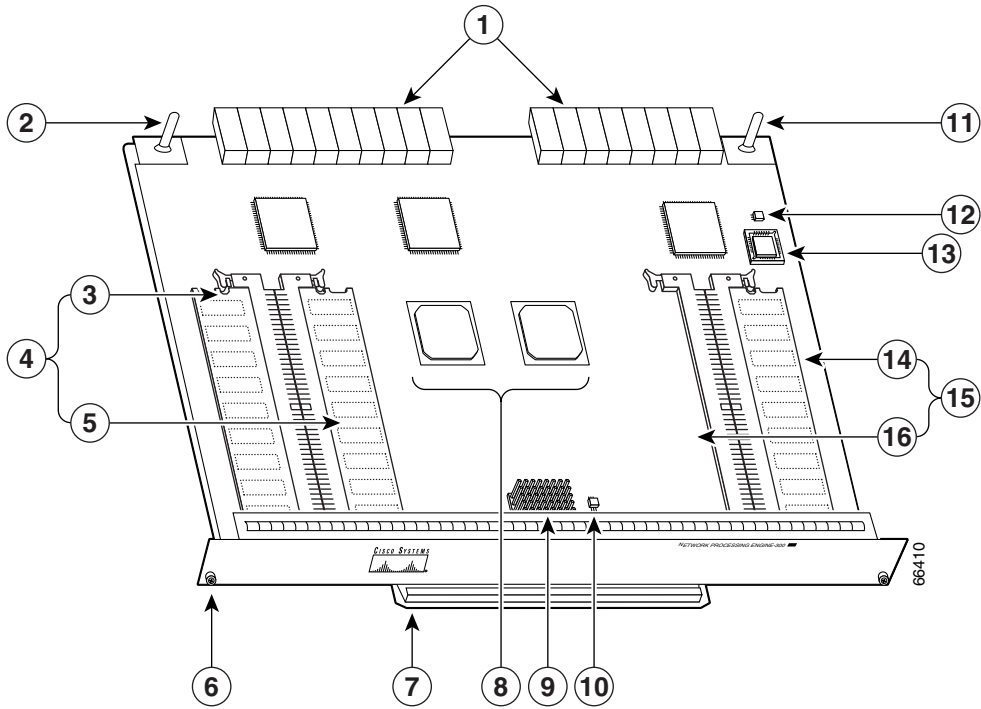
For minimum software release information, see the [“Software Requirements” section on page 8-4](#).

# NPE-300 and NPE-400 Description and Overview

This section contains information about the network processing engine components and the system management functions. The network processing engine maintains and executes the system management functions for the routers. It also shares the system memory and environmental monitoring functions with the I/O controller.

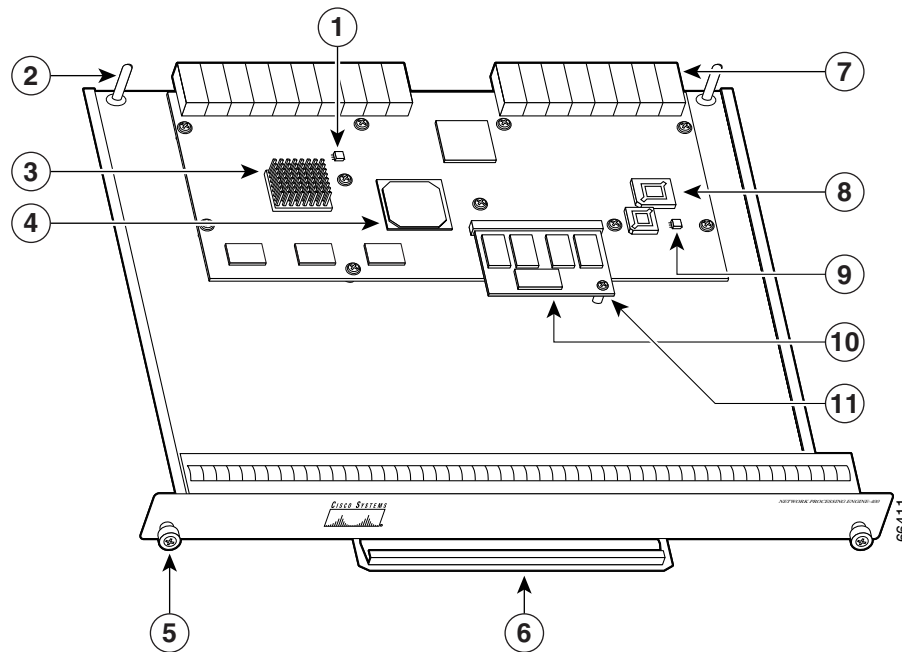
## Components

Figure 3-1 NPE-300



1	Midplane connectors	9	RM7000 microprocessor
2	Keying post	10	Temperature sensor (U42)
3	DIMM 3 (U44)	11	Keying post
4	Bank 1 (user configurable)	12	Temperature sensor (U41)
5	DIMM 2 (U45)	13	Boot ROM (U1)
6	Captive installation screw	14	DIMM 0 (U16)
7	Handle	15	Bank 0 (fixed)
8	System controllers	16	U15 (never populated)

Figure 3-2 NPE-400



1	Temperature sensor (U31)	7	Midplane connectors
2	Keying post	8	Boot ROM (U7)
3	RM7000 microprocessor	9	Temperature sensor (U6)
4	System controller	10	SODIMM (J1)
5	Captive installation screw	11	Standoff and screw
6	Handle		

The network processing engines consist of the following components:

- Reduced instruction set computing (RISC) microprocessor
  - The NPE-300 uses an RM7000 microprocessor that operates at an internal clock speed of 262 MHz.
  - The NPE-400 uses an RM7000 microprocessor that operates at an internal clock speed of 350 MHz.

- System controller

The system controller provides hardware logic to interconnect the processor, DRAM, and the PCI-based system backplane bus.

- The NPE-300 has two system controllers that provide processor access to the midplane and single I/O controller PCI buses. The system controllers also allow port adapters access to SDRAM using any of the three PCI buses.
- The NPE-400 has a single system controller that provides system access.

- Upgradable memory modules

The NPE-300 and NPE-400 use SDRAM for storing all packets received or sent from network interfaces. The SDRAM also stores routing tables and network accounting applications.

- On the NPE-300, two independent SDRAM memory arrays in the system allow concurrent access by port adapters and the processor; however, only one is upgradable.
- On the NPE-400, one memory array is shared by port adapters and the processor.

- Cache memory

The NPE-300 and NPE-400 have cache SRAM that functions as the tertiary cache for the microprocessor.

- Two environmental sensors for monitoring the cooling air as it leaves the chassis for both the NPE-300 and NPE-400
- Boot ROM for storing sufficient code for booting the Cisco IOS software




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**Note** The NPE-300 and the NPE-400 do not have packet SRAM.

---

## System Management Functions

The network processing engines perform the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- DIMM—dual in-line memory module
- DRAM—dynamic random-access memory
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- OTP—one time programmable



- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SIMM—single in-line memory module
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module
- SRAM—static random-access memory
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

## NPE-300 and NPE-400 Memory Information

To determine the memory configuration of your NPE-300, use the **show version** command.

The following example of the **show version** command shows an NPE-300 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Released Version 12.0(19980705:021501)
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Tue 25-Aug-98 04:01 by biff
Image text-base: 0x600088C4, data-base: 0x60FA6000
```

(display text omitted)

```
cisco 7206VXR (NPE300) processor with 44x1024K/20480K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 265KB L2, 2048KB L3 Cache
Six slot VXR midplane, Version 2.255
```

(display text omitted)

The following example of the **show version** command shows an NPE-400 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Released Version 12.1(20000622:181759)
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Thu 22-Jun-00 11:18 by BIFF
Image text-base: 0x60008950, data-base: 0x60BD8000
```

(display text omitted)

```
cisco 7206VXR (NPE400) processor (revision 0xFF) with 122880K/8192K bytes
of memory.
Processor board ID 8771013
R7000 CPU at 350Mhz, Implementation 39, Rev 2.1, 256KB L2, 4096KB L3 Cache
6 slot VXR midplane, Version 2.1
```

(display text omitted)

Table 3-1 provides memory specifications, and Table 3-2 provides user replaceable memory configurations for the NPE-300. Table 3-3 provides memory specifications, and Table 3-4 provides memory configurations for the NPE-400.

**Table 3-1 NPE-300 Memory Specifications**

Memory Type	Size	Quantity	Description	Component Location on the NPE-300 Board
SDRAM-configurable	32 to 256 MB	1 configurable bank with 2 SDRAM slots	32-, 64-, or 128-MB DIMMs (based on maximum SDRAM required)	Bank 1: U45 and U44
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U1 <sup>1</sup>
SDRAM-fixed	32 MB	1	32-MB DIMM	Bank 0 <sup>2</sup> : U16
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, integrated cache	U49
Secondary cache	256 KB (fixed)	—	RM7000 processor, unified, internal cache	U49
Tertiary cache	2 MB (fixed)	—	RM7000 processor, external cache	U7, U8, U9, U10, U17

1. Located on the processor engine board.
2. Socket U15 is never populated, although it is part of bank 0.

**Table 3-2 NPE-300 SDRAM DIMM Configurations—Configurable Memory Only**

Total SDRAM <sup>1</sup>	Bank 1 <sup>2</sup>	Quantity	Product Number <sup>3</sup>
32 MB <sup>4</sup> + 32 MB	U45 (DIMM slot 2 only)	1 32-MB DIMM	MEM-SD-NPE-32MB
32MB <sup>4</sup> + 64 MB	U45 and U44 or U45	2 32-MB DIMMs or 1 64-MB DIMM	MEM-SD-NPE-32MB MEM-SD-NPE-64MB

**Table 3-2 NPE-300 SDRAM DIMM Configurations—Configurable Memory Only (continued)**

Total SDRAM <sup>1</sup>	Bank 1 <sup>2</sup>	Quantity	Product Number <sup>3</sup>
32 MB <sup>4</sup> + 128 MB	U45 and U44 or U45	2 64-MB DIMMs or 1 128-MB DIMM	MEM-SD-NPE-64MB MEM-SD-NPE-128MB
32 MB <sup>4</sup> + 256 MB	U45 and U44	2 128-MB DIMMs	MEM-SD-NPE-256MB

1. Refer to the Cisco AS5800 Universal Access Server documentation listed in the “[Related Documentation](#)” section on page iii for Cisco AS5800 Universal Access Server SDRAM options.
2. There are two user-upgradable SDRAM slots in bank 1. (Bank 0 is used exclusively for packet memory and is set at a fixed configuration of 32 MB in the factory.)
3. These products are also available as SDRAM upgrades. To order an upgrade, add an equal sign (=) after the product number, for example, MEM-SD-NPE-128MB=.
4. This 32 MB is fixed memory in SDRAM bank 0, socket U16. Socket U15 is never populated.

**Table 3-3 NPE-400 Memory Specifications**

Memory Type	Size	Quantity	Description	Component Location on the NPE-400 Board
SDRAM-configurable	128, 256, or 512 MB	1	128-, 256- or 512-MB SODIMM	J1
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U7
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, integrated cache	U38
Secondary cache	256 KB (fixed)	—	RM7000 processor, unified, internal cache	U38
Tertiary cache	4 MB (fixed)	—	RM7000 processor, external cache	U2, U26, U27, U28, U37

**Table 3-4 NPE-400 Memory Configuration**

Total SDRAM	Bank 1	Quantity	Product Number
128 MB	J1	1 128-MB SODIMM	MEM-NPE-400-128MB
256 MB	J1	1 256-MB SODIMM	MEM-NPE-400-256MB
512 MB	J1	1 512-MB SODIMM	MEM-NPE-400-512MB





## CHAPTER 4

# NSE-1 Overview

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This chapter describes the network services engine (NSE-1) and contains the following sections:

- [Supported Platforms, page 4-1](#)
- [Software Requirements, page 4-1](#)
- [NSE-1 Description and Overview, page 4-1](#)
- [NSE-1 Memory Information, page 4-4](#)

For NSE-1 configuration and PXF troubleshooting information including NSE-1-specific **show** and **debug** commands, see [Chapter 10, “Configuration Tasks and Troubleshooting Information.”](#)

## Supported Platforms

The NSE-1 is supported only in the Cisco 7200 VXR routers. The NSE-1 is not supported in the Cisco uBR7200 VXR series routers.

## Software Requirements

For minimum software release information, see the [“Software Requirements” section on page 8-4.](#)

## NSE-1 Description and Overview

This section contains information about the network services engine components and the system management functions. The network services engine maintains and executes the system management functions for the Cisco 7200 VXR routers. The NSE-1 also shares the system memory and environmental monitoring functions with the I/O controller. Its performance is greater than that of the network processing engines because of the Parallel eXpress Forwarding (PXF) processor. The PXF processor works with the routing processor to provide accelerated packet switching, as well as accelerated IP Layer 3 feature processing.

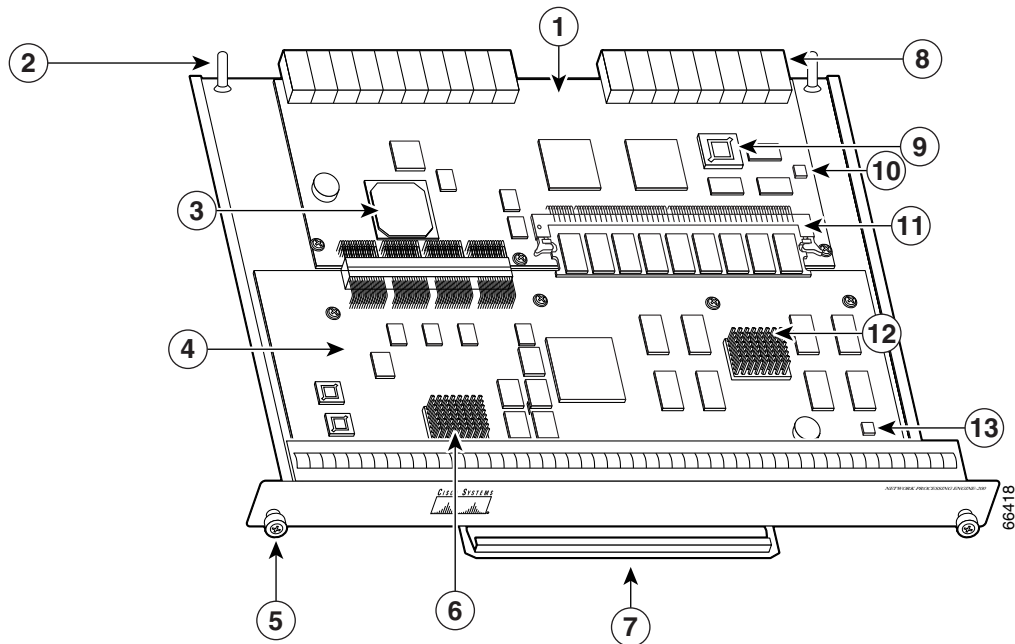
The NSE-1 consists of two modular boards: the processor engine board and the network controller board. It is keyed so that it can be used only in the Cisco 7200 VXR routers.

**Note**

The NSE-1 is not supported in the Cisco uBR7200 VXR series routers, even though it is physically capable of being inserted into the routers.

## Components

**Figure 4-1** NSE-1



1	Network controller board	8	Midplane connectors
2	Keying post	9	Boot ROM (U1)
3	System controller	10	Temperature sensor
4	Processor engine board	11	SDRAM DIMM (U15)
5	Captive installation screw	12	Parallel eXpress Forwarding (PXF) processor
6	RM7000 microprocessor	13	Temperature sensor
7	Handle		

The NSE-1 consists of the following components:

- Reduced instruction set computing (RISC) microprocessor

The NSE-1 uses an RM7000 microprocessor that operates at an internal clock speed of 262 MHz.

- Parallel eXpress Forwarding processor

The Parallel eXpress Forwarding (PXF) processor enables parallel IP multipacket processing functions, working with the routing processor to provide accelerated packet switching, as well as accelerated IP Layer 3 feature processing.

- System controller  
The system controller provides hardware logic to interconnect the processor, DRAM, and the PCI-based system backplane bus. The NSE-1 has one system controller that provides processor access to the two midplane and single I/O controller PCI buses. The system controller also allows port adapters—on either of the two midplane PCI buses—access to SDRAM.
- Upgradable memory modules  
The NSE-1 uses SDRAM for providing code, data, and packet storage.
- Cache memory  
The NSE-1 has three levels of cache: primary and secondary cache that are internal to the microprocessor with secondary unified cache for data and instruction, and tertiary, 2-MB external cache.
- Two environmental sensors for monitoring the cooling air as it leaves the chassis
- Boot ROM for storing sufficient code for booting the Cisco IOS software



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**Note** The NSE-1 does not have packet SRAM.

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## System Management Functions

The NSE-1 performs the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- DIMM—dual in-line memory module
- DRAM—dynamic random-access memory
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- OTP—one time programmable

- Primary, secondary, tertiary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache, but faster access than tertiary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SIMM—single in-line memory module
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module
- SRAM—static random-access memory
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

## NSE-1 Memory Information

To determine the memory configuration of your NSE-1, use the **show version** command.

The following example shows an NSE-1 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Released Version 12.0
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Wed 22-Dec-99 08:37 by
Image text-base:0x60008900, data-base:0x60B58000

(display text omitted)

cisco 7206VXR NSE-1 processor with 57344K/8192K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2 Cache
6 slot VXR midplane, Version 2.0

(display text omitted)
```

[Table 4-1](#) provides memory specifications and [Table 4-2](#) provides user replaceable memory configuration information for the NSE-1.

**Table 4-1 NSE-1 Memory Specifications**

Memory Type	Size	Quantity	Description	Component Location on the NSE-1 Board
SDRAM	128 MB or 256 MB	1	128-MB or 256-MB DIMMs	U15
Boot ROM	512 KB	1	OTP <sup>1</sup> ROM for the ROM monitor program	U1
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor, internal cache	U22



**Table 4-1** NSE-1 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Component Location on the NSE-1 Board
Secondary cache	256 KB	—	RM7000 processor, internal, unified cache	U22
Tertiary cache	2 MB (fixed)	—	RM7000 processor, external cache <sup>2</sup>	U7, U9, U12, U14, U17

1. OTP = one time programmable

2. Located on the processor engine board.

**Table 4-2** NSE-1 SDRAM DIMM Configurations—Configurable Memory Only

Total SDRAM	SDRAM Bank	Quantity	Product Number
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB
256 MB	U15	1 256-MB DIMM	MEM-SD-NSE-256MB





# CHAPTER 5

## NPE-G1 Overview

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This chapter describes the NPE-G1 and contains the following sections:

- [Supported Platforms, page 5-1](#)
- [Software Requirements, page 5-1](#)
- [NPE-G1 Description and Overview, page 5-2](#)
- [NPE-G1 Memory Information, page 5-9](#)
- [Connection Equipment and Specifications, page 5-10](#)
- [Fiber Optic Cleaning Information, page 5-20](#)



### Caution

You must copy and save your running configuration file to a CompactFlash Disk, PC Card, or TFTP server before you install the NPE-G1. For instructions on copying and saving your configuration file, see the “Copying the Configuration File” section on page 7-4 in Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”

For general preparation for installation instructions, see [Chapter 8, “Preparation for Installation.”](#) For installation and configuration instructions specific to the NPE-G1, see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

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## Supported Platforms

The NPE-G1 is supported only in the Cisco 7200 VXR routers, the Cisco uBR7246VXR universal broadband router, and the Cisco uBR7225VXR universal broadband router. For the Cisco 7200 VXR routers, order Part Number NPE-G1 or NPE-G1=. For the Cisco uBR7246VXR and Cisco uBR7225VXR routers, order Part Number UBR7200-NPE-G1 or UBR7200-NPE-G1=.



### Note

Unless otherwise indicated, all references to NPE-G1 in this document also refer to UBR7200-NPE-G1.

---

## Software Requirements

For minimum software release information, see the “Software Requirements” section on page 8-4.

# NPE-G1 Description and Overview

This section contains information about the NPE-G1 components and the system management functions. The NPE-G1 is the first net

processing engine for the Cisco 7200 VXR routers and Cisco uBR7200 series routers to provide the functionality of both a network processing engine and I/O controller. If used without an I/O controller, an I/O controller blank panel must be in place.

While its design provides I/O controller functionality, it can also work with any I/O controller supported in the Cisco 7200 VXR routers and Cisco uBR7200 series routers. The NPE-G1, when installed with an I/O controller, provides the bootflash and NVRAM that the Cisco IOS software uses to boot.

**Note**

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An I/O controller can be used with the NPE-G1, but an I/O controller is not necessary for system functionality. Installing an I/O controller in a chassis with the NPE-G1 activates the console and auxiliary ports on the I/O controller and automatically disables the console and auxiliary ports on the NPE-G1. However, you can still use the CompactFlash Disk slots and Ethernet ports on both the NPE-G1 and I/O controller when both cards are installed.

---

The NPE-G1 maintains and executes the system management functions for the Cisco 7200 VXR routers and Cisco uBR7200 series routers and also holds the system memory and environmental monitoring functions.

The NPE-G1 consists of one board with multiple interfaces. It can be used only in the Cisco 7200 VXR routers and Cisco uBR7200 series routers.

**Note**

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The Cisco 7200 VXR routers and Cisco uBR7200 series routers use different models of the NPE-G1 processor. For the Cisco 7200 VXR routers, order the NPE-G1 or NPE-G1= product. For the Cisco uBR7200 series router, order the UBR7200-NPE-G1 or UBR7200-NPE-G1= product. The two models of NPE-G1 have different labels and use different boot helper images, and they cannot be interchanged between the Cisco 7200 VXR routers and Cisco uBR7200 series routers.

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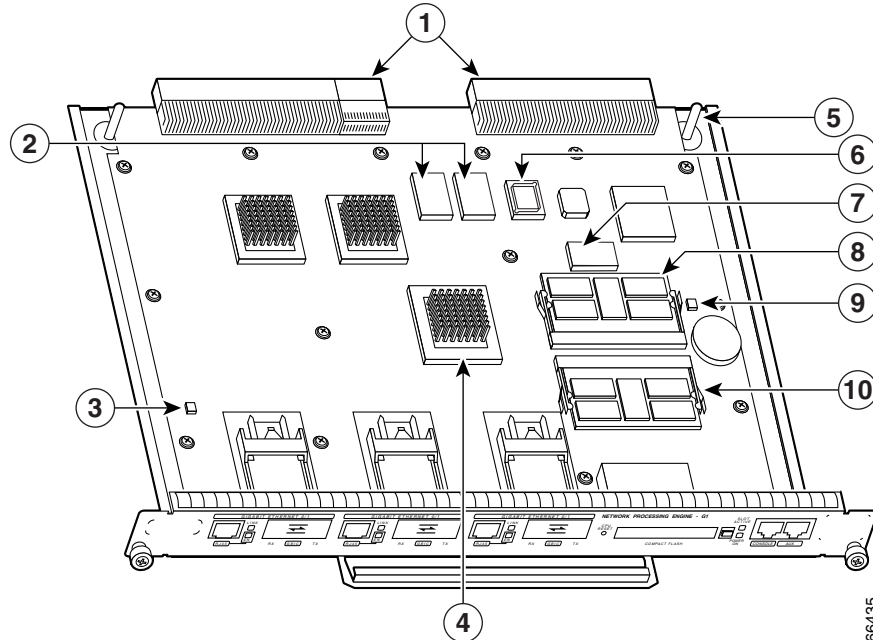
## Bandwidth

The NPE-G1 uses no bandwidth points, and when used with any I/O controller, the I/O controller also uses no bandwidth points. None of the Gigabit Ethernet interfaces on the NPE-G1 use bandwidth points.

## Components

Figure 5-1 illustrates the NPE-G1 and its major components.

Figure 5-1 NPE-G1



1	Midplane connectors	6	Boot ROM
2	Flash memory	7	NVRAM
3	Temperature sensor	8	SODIMM 2 (J4)
4	BCM1250 system	9	Temperature sensor
5	Keying post	10	SODIMM 1 (J3)

The NPE-G1 consists of the following components:

- BCM1250 system
  - Microprocessor operates at an internal clock speed of 700 MHz.
  - Hardware logic to interconnect the processor, double data rate synchronous dynamic random-access memory (DDR-SDRAM), lightning data transport (LDT) bus, the generic PCI bus, and three direct-interface Gigabit Ethernet interfaces.
- Cache memory
 

The NPE-G1 has two levels of cache: primary and secondary cache that are internal to the microprocessor with secondary unified cache for data and instruction.
- The NPE-G1 uses DDR-SDRAM for providing code, data, and packet storage.
- Two environmental sensors for monitoring the cooling air as it enters and leaves the chassis.
- Full-feature I/O controller functionality

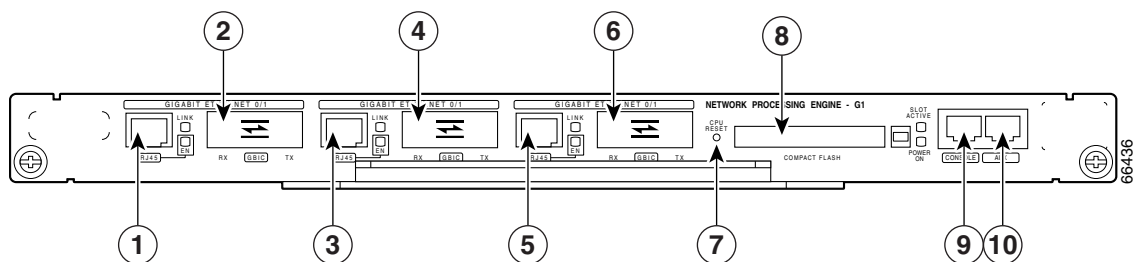
- Three Gigabit Ethernet interfaces (six ports: three GBIC [optical] and three RJ-45s [copper]). Any three ports are available at the same time and are linked directly to the BCM1250 system; therefore the interfaces are not charged bandwidth points.
- CompactFlash Disk for storing the default Cisco IOS software image. The CompactFlash Disk slot can be used whether or not an I/O controller is in the router.
- Auxiliary port with full data terminal equipment (DTE) functionality. (Functional when an I/O controller is not present. If an I/O controller is present, its auxiliary port is the default port.)
- Console port with full data communications equipment (DCE) functionality. (Functional when an I/O controller is not present. If an I/O controller is present, its console port is the default port.)
- Boot ROM for storing sufficient code for booting the Cisco IOS software.
- Flash memory for storing the boot helper (boot loader) image. (The boot helper image comes installed on the NPE-G1.) If an I/O controller is present, its flash memory is no longer available.
- NVRAM for storing the system configuration and environmental monitoring logs. NVRAM uses lithium batteries to maintain its contents when disconnected from power. If an I/O controller is present, its NVRAM memory is no longer available.
- Upgradable memory modules

**Note**

An I/O controller can be used with the NPE-G1, but an I/O controller is not necessary for system functionality. Installing an I/O controller in a chassis with the NPE-G1 activates the console and auxiliary ports on the I/O controller and automatically disables the console and auxiliary ports on the NPE-G1. However, you can still use the CompactFlash Disk slots and Ethernet ports on both the NPE-G1 and I/O controller when both cards are installed.

## Interfaces and LEDs

Figure 5-2 NPE-G1 Interfaces

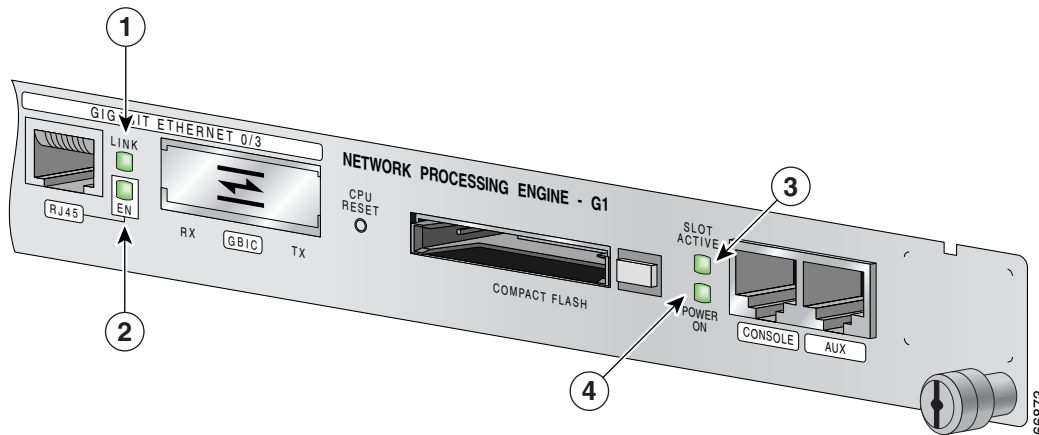


1	Fast Ethernet/Gigabit Ethernet RJ-45 port 0/1	6	Gigabit Ethernet port 0/3
2	Gigabit Ethernet port 0/1	7	CPU Reset
3	Fast Ethernet/Gigabit Ethernet RJ-45 port 0/2	8	CompactFlash Disk slot (disk2)
4	Gigabit Ethernet port 0/2	9	Console port
5	Fast Ethernet/Gigabit Ethernet RJ-45 port 0/3	10	Auxiliary port

The three interfaces on the NPE-G1 consist of three Gigabit Interface Converter (GBIC) ports and three 10/100/1000 Fast Ethernet/Gigabit Ethernet ports. The rules for using these ports are:

- Only one port per interface can be used at any one time. For example, for interface Gigabit Ethernet 0/1, either the RJ-45 port can be used or the GBIC port, but not both.
- A total of three ports on any of the three interfaces (0/1, 0/2, or 0/3) can be used at any one time; for example, 0/1 GBIC, 0/2 GBIC, and 0/3 RJ-45.
- The port numbering for the interfaces on the NPE-G1 start with 0/1 and not with 0/0, as is typical for other interface cards. This is to avoid conflicts with the Ethernet and FastEthernet ports on an I/O controller, if it is also installed.

Figure 5-3 NPE-G1 LEDs



No.	LED Label	LED	Color	In the Power Up state, the LED is	LED flashes when there is traffic
1	LINK (Interfaces 0/1, 0/2, 0/3)	RJ-45 and GBIC ports	Green	On, indicating that a link has been established	No
2	EN (Enable) (Interfaces 0/1, 0/2, 0/3)	RJ-45 ports only	Green	On if the RJ-45 port is selected Off if the GBIC port is selected	—
3	SLOT ACTIVE	CompactFlash Disk	Green	On when the slot is being used	—
4	POWER ON	Power	Green	On and stays on	No

The NPE-G1 faceplate contains LEDs that indicate system and port status. The RJ-45 and GBIC ports share the same LINK LED because only one of these ports per interface (0/1, 0/2, or 0/3) can be used at any one time. The EN (Enable) LED is on if the RJ-45 port is in use.

The POWER ON LED is on whether or not an I/O controller is present in the router. The CompactFlash Disk slot can be used whether or not an I/O controller is present in the router. The SLOT ACTIVE LED is on only when the CompactFlash Disk slot is in use.

LEDs are either on or off. The LED state (on or off), not the color, determines the status of the connection.

## CompactFlash Disk

The NPE-G1 has one CompactFlash Disk slot that uses CompactFlash Disks. The device in this slot is always addressed as **disk2:** when using Cisco IOS CLI commands.

CompactFlash Disks are smaller in size than Type 2 Flash Disks but provide the same Attachment (ATA) interface and equivalent functionality. This interface complies with the ANSI ATA Interface Document X3T13.1153 D Rev. 9 specification. CompactFlash Disks provide from 64 MB to 256 MB of storage space.

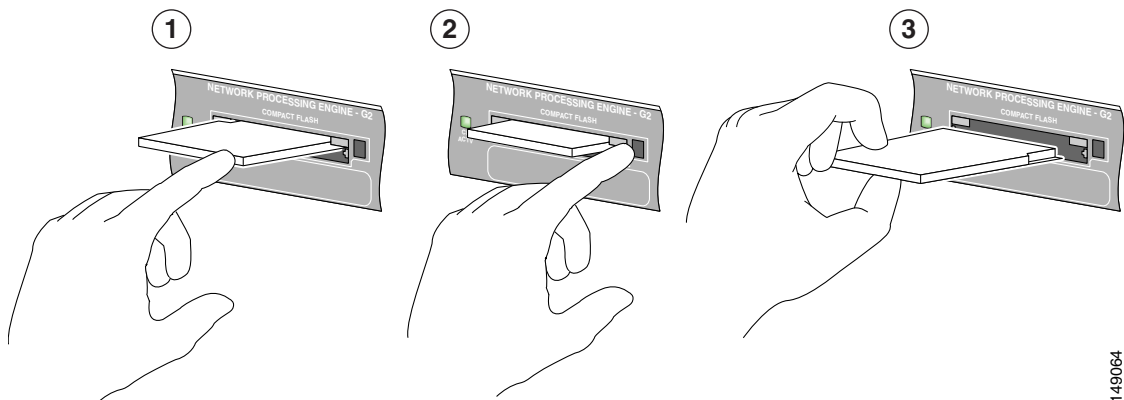
The CompactFlash Disk has controller circuitry that allows it to emulate a hard disk and automatically maps out bad blocks and performs automatic block erasure. The CompactFlash Disk also provides the capability to allocate noncontiguous sectors, which eliminates the need for the **squeeze** command (which was required with older-style linear flash memory cards to recover the space used by deleted files).

The CompactFlash Disk also supports the Cisco IOS File System feature, which provides a single interface to all of the router's file systems, including the Flash Disks and flash memory, as well as network file systems such as File Transfer Protocol (FTP) and Trivial FTP (TFTP) servers.

To install a CompactFlash Disk in the CompactFlash Disk slot, complete the following steps.

- 
- Step 1** Attach an ESD wrist or ankle strap, connecting the equipment end of the strap to an unfinished chassis surface.
- Step 2** Orient the CompactFlash Disk so that its connector end faces the appropriate slot. (See 1 in [Figure 5-4](#).)

**Figure 5-4** Installing and Removing a CompactFlash Disk



149064

<b>1</b>	Inserting the compact Flash Disk	<b>3</b>	Removing the CompactFlash Disk
<b>2</b>	Pressing the ejector button to release the CompactFlash Disk		

- Step 3** Carefully insert the CompactFlash Disk into the slot until it completely seats in the connector, and the ejector button for the slot pops out toward you. (See 2 in [Figure 5-4](#).)



**Note**

The CompactFlash Disk is keyed and cannot be seated the wrong way. The ejector button does not pop out if the CompactFlash Disk is not completely inserted.

]



To remove a CompactFlash Disk from the CompactFlash Disk slot, complete the following steps:

- 
- Step 1** Press the ejector button on the slot. (See 3 in [Figure 5-4](#).)
- Step 2** Grasp the CompactFlash Disk and pull it from the slot.
- Step 3** Place the CompactFlash Disk in an antistatic bag.
- 

**Note**

All CompactFlash Disks must be formatted before their initial use. CompactFlash Disks shipped with the NPE-G1 are formatted at the factory, but spare memory cards are not formatted.

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## Summary of Important NPE-G1 Information

**Caution**

The NPE-G1 requires that you copy and save your running configuration file to a CompactFlash Disk, PC Card, or TFTP server before you install the NPE-G1. For instructions on copying and saving your configuration file, see the [“Copying the Configuration File”](#) section on page 7-4 in [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

For general preparation for installation instructions, see [Chapter 8, “Preparation for Installation.”](#) For installation and configuration instructions specific to the NPE-G1, see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

---

- The RJ-45 ports and GBIC ports are both reported in software as GigabitEthernet 0/1, GigabitEthernet 0/2, and GigabitEthernet 0/3. Only one of the pair of interface ports can be used at a time; for example, GBIC GigabitEthernet 0/2 or RJ-45 GigabitEthernet 0/2.
- The I/O controller GE/E interface reports GigabitEthernet 0/0 and Ethernet 0/0, and the I/O controller 2FE/E interface reports FastEthernet 0/0 and FastEthernet 0/1.
- If the RJ-45 port is in use, the EN (Enable) LED is on. If the GBIC is in use, the EN (Enable) LED is off.
- With the NPE-G1 and an I/O controller both installed, the I/O controller functionality on the NPE-G1 is shared with that of the I/O controller.
- When both an NPE-G1 and an I/O controller are installed, the flash memory and NVRAM of the NPE-G1 are enabled and the flash memory and NVRAM on the I/O controller are no longer accessible.
- The console and auxiliary ports on the NPE-G1 are disabled by Cisco IOS when an I/O controller is present; the console and auxiliary ports on the I/O controller are active.
- Console port messages can be routed to the auxiliary port on either the NPE-G1 or on the I/O controller.
- The default media is the RJ-45 port. To change the media type, use the **media-type** command.
- Only the port selected by the **media-type** command is active. A cable attached to the other of the RJ-45 and GBIC pair will be ignored. For example, if GBIC GigabitEthernet 0/2 is selected using the **media-type** command, RJ-45 GigabitEthernet 0/2 is ignored, even if a cable is attached to RJ-45 0/2.

- The NPE-G1 uses no bandwidth points, and when used with any I/O controller, the I/O controller also uses no bandwidth points. None of the Gigabit Ethernet interfaces on the NPE-G1 use bandwidth points.
- The CompactFlash Disk on the NPE-G1 is available at all times, with or without an I/O controller installed. The CompactFlash Disk is always addressed as the **disk2** device, to avoid conflicts with the **disk0** and **disk1** devices on the I/O controller, if the I/O controller is also installed.

**Note**

The Gigabit Ethernet interfaces on the NPE-G1 do not support the Inter-Switch Link (ISL) VLAN encapsulation protocol. We recommend that customers use the IEEE 802.1Q VLAN encapsulation protocol as an alternative. Where an application requires the use of ISL, this can be provided by the Fast Ethernet or Gigabit Ethernet port adapters or I/O controllers.

## System Management Functions

The NPE-G1 performs the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Boot ROM—Read-only memory that stores the boot image for bringing up the Cisco IOS image
- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it
- DDR SDRAM—double data rate synchronous dynamic random-access memory
- CWDM GBIC—Coarse Wavelength-Division Multiplexing Gigabit Interface Converter
- Flash memory—Location where the basic boot image is stored
- Instruction and data cache—Instructions to the processor, and data on which the instructions work
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- LDT bus—lightning data transport bus
- NVRAM—nonvolatile random-access memory
- OTP—one time programmable

- Primary and secondary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache.
- RAM—random-access memory
- RISC—reduced instruction set computing
- ROM—read-only memory
- SDRAM—synchronous dynamic random-access memory
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded
- SODIMM—small outline dual in-line memory module
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.

## NPE-G1 Memory Information

To determine the memory configuration of your NPE-G1, use the **show version** command.

The following example shows an NPE-G1 installed in a Cisco 7206VXR router. The display for a Cisco uBR7246VXR router is similar.

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Experimental Version
12.2(20011112:161132)
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Tue 13-Nov-01 03:58 by
Image text-base:0x600089B8, data-base:0x6130A000

(display text omitted)

cisco 7206VXR (NPE-G1) processor (revision 0x00) with 245760K/16384K
bytes of memory.
Processor board ID 15191620
BCM12500 CPU at 700Mhz, Implementation 1, Rev 0.1, 512KB L2 Cache
6 slot VXR midplane, Version 2.0

(display text omitted)
```

[Table 5-1](#) provides memory specifications and [Table 5-2](#) provides user replaceable memory configuration information for the NPE-G1. [Table 5-3](#) provides CompactFlash Disk specifications.

**Table 5-1** NPE-G1 Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-G1 Board
SDRAM	128 MB, 256 MB, 512 MB	2	128-MB, 256-MB, or 512-MB SODIMMs <sup>1</sup>	J3 and J4
Boot ROM	512 KB	1	Reprogrammable Boot ROM for the ROM monitor program	U1
Flash memory	16 MB	1	Contains the default boot helper (boot loader) image	U25 and U26

**Table 5-1** NPE-G1 Memory Specifications (continued)

Memory Type	Size	Quantity	Description	Component Location on the NPE-G1 Board
NVRAM	512 KB	1	Nonvolatile EPROM for the system configuration file	U7
Primary cache	32 KB (16 KB instruction, 16 KB data)	—	BCM1250 system, internal cache	U22
Secondary cache	512 KB	—	BCM1250 system, internal, unified cache	U22

1. The NPE-G1 requires that locations J3 and J4 always contain two SODIMMs of the same size.

**Table 5-2** NPE-G1 SDRAM SODIMM Configurations—Configurable Memory Only

Total SDRAM	SDRAM Bank	Quantity	Product Number
256 MB	J3 and J4	2 128-MB SODIMMs	MEM-NPE-G1-256MB=
512 MB	J3 and J4	2 256-MB SODIMMs	MEM-NPE-G1-512MB=
1 GB	J3 and J4	2 512-MB SODIMMs	MEM-NPE-G1-1GB=

**Table 5-3** NPE-G1 CompactFlash Disk Specifications

Memory Size	Product Number
64 MB	MEM-NPE-G1-FLD64=
128 MB	MEM-NPE-G1-FLD128=
256 MB	MEM-NPE-G1-FLD256=

## Connection Equipment and Specifications

This section contains connection equipment and pinout information for the Gigabit Ethernet RJ-45 ports, Gigabit Interface Converter (GBIC) ports, console port, and auxiliary port that are located on the NPE-G1.

### Ethernet and Fast Ethernet RJ-45 Connection Equipment

The NPE-G1 has RJ-45 ports for Ethernet, Fast Ethernet, and Gigabit Ethernet or autosensing Ethernet, Fast Ethernet, and Gigabit Ethernet connections. The RJ-45 port supports IEEE 802.3 (Ethernet) and IEEE 802.3u (Fast Ethernet) interfaces compliant with 10BASET, 100BASETX, and 1000BASET and 1000BASEX specifications.

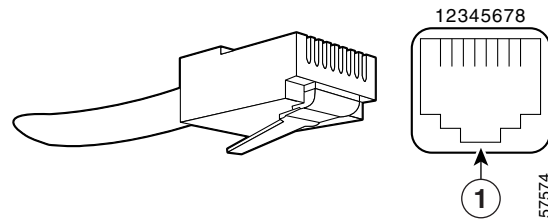
The RJ-45 ports support standard straight-through and crossover Category 5 UTP cables with RJ-45 connectors. (See [Figure 5-5](#)) Cisco does not supply Category 5 UTP cables; these cables are available commercially.

**Note**

To comply with EMI EN55022 Class B regulations, shielded Ethernet cables must be used with the UBR7200-NPE-G1 in the Cisco uBR7246VXR router. Three shielded cables are included with the UBR7200-NPE-G1.

Figure 5-5 shows an RJ-45 port and connector. Table 5-4 lists the pinouts and signals for the RJ-45 port.

**Figure 5-5 RJ-45 Port and Connector**



<b>1</b>	RJ-45 connector		
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**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 RJ-45 connectors. Use caution when connecting cables. Statement 1021

**Table 5-4 RJ-45 Port Pinouts**

Pin	10/100 Signal	Gigabit Ethernet Signal
1	Tx Data+ <sup>1</sup>	Tx A+
2	Tx Data–	Tx A–
3	Rx Data+ <sup>2</sup>	Rx B+
4	N/C	Tx C+
5	N/C	Tx C–
6	Rx Data–	Rx B–
7	N/C	Rx D+
8	NC	Rx D–

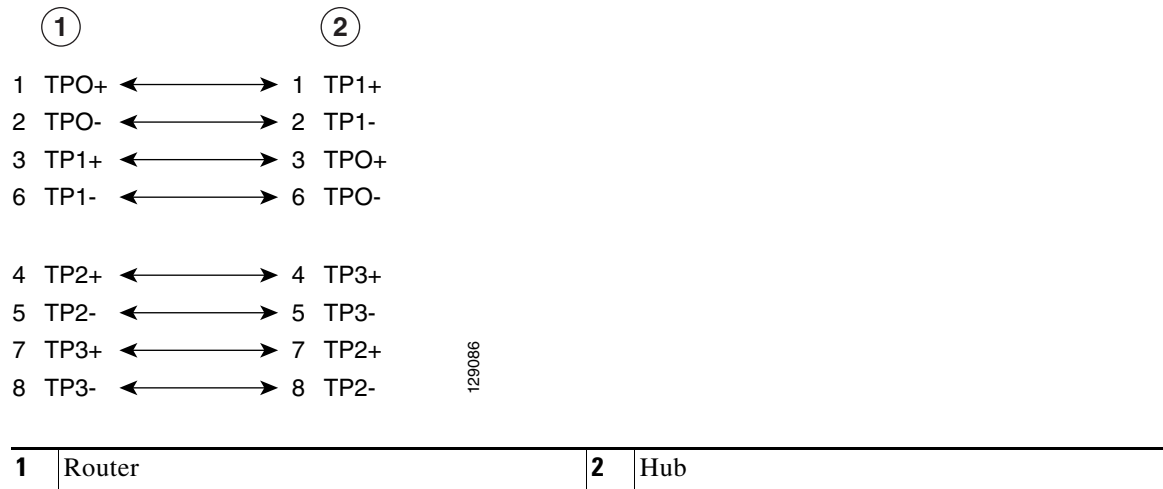
1. Tx Data = Transmit Data
2. Rx Data = Receive Data

**Note**

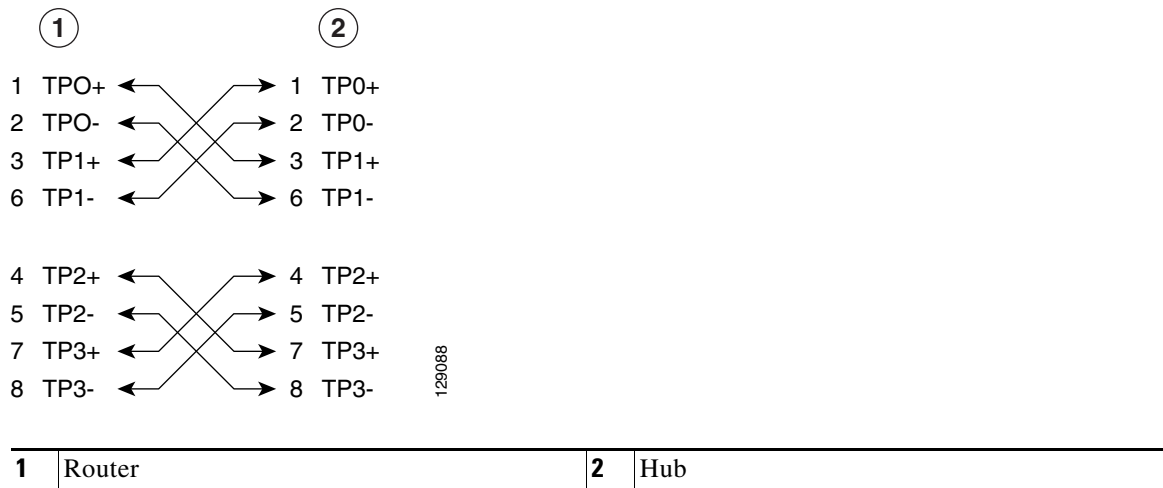
With reference to the RJ-45 pinout in Table 5-4, proper common-mode line terminations should be used for the unused Category 5 UTP cable pairs 4/5 and 7/8. Common-mode termination reduces electromagnetic interference (EMI).

Depending on your RJ-45 interface cabling requirements, use the pinouts shown in Figure 5-6 and Figure 5-7 for Gigabit Ethernet straight-through and crossover twisted-pair cable connections. Use Figure 5-8 for Ethernet/Fast Ethernet straight-through and crossover twisted-pair cable connections.

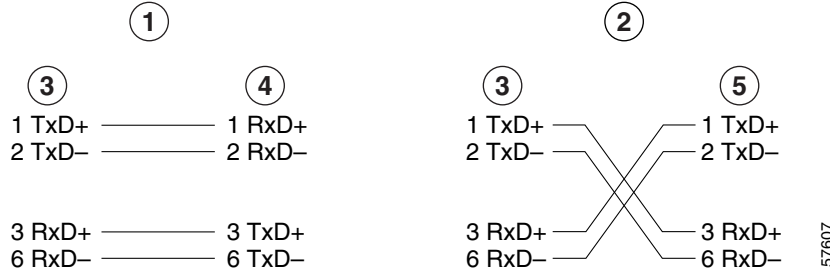
**Figure 5-6 Four Twisted-Pair Straight-Through Cable Schematics for 10/100/1000 and 1000BASE-T GBIC Module Ports**



**Figure 5-7 Four Twisted-Pair Crossover Cable Schematics for 10/100/1000 and 1000BASE-T GBIC Module Ports**



**Figure 5-8 Ethernet/Fast Ethernet Straight-Through and Crossover Cable Pinouts**



<b>1</b>	Straight-through cable pinout, Ethernet port to a hub or repeater	<b>4</b>	Hub
<b>2</b>	Crossover cable pinout, Ethernet port to a DTE	<b>5</b>	DTE
<b>3</b>	Ethernet port		

For straight-through and crossover cable information, see the “[Console and Auxiliary Port Connection Equipment](#)” section on page 5-17.

## Gigabit Ethernet GBIC Connection Equipment

The Gigabit Interface Converter (GBIC) port is a 1000-Mbps optical interface in the form of an SC-type duplex port that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard. (See [Figure 5-10](#).)



**Note**

The GBIC is a separately orderable part and does not ship installed in your NPE-G1. You must install the GBIC before you connect the cables to it. (For GBIC installation and cabling instructions, refer to the *Installing the Gigabit Interface Converter* document that shipped with your GBIC.)

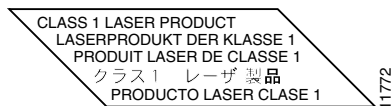


**Warning**

**Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures.** Statement 70

[Figure 5-9](#) shows the Class 1 warning label that appears on the Gigabit Ethernet optical ports.

**Figure 5-9 Laser Class 1 Warning Label**

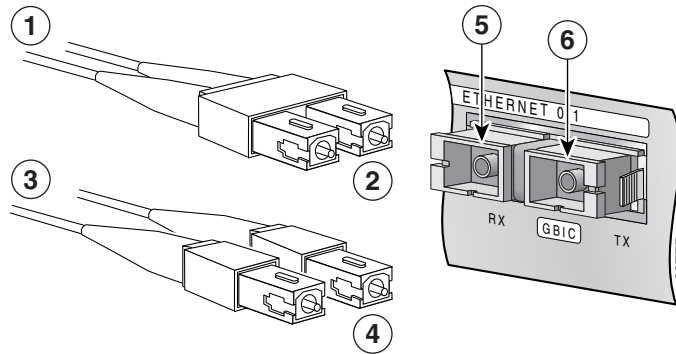


**Warning**

**Class 1 Laser Product.** Statement 1008

Figure 5-10 shows the simplex and duplex SC-type connectors on your multimode or single-mode optical fiber cables. For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX). For duplex connectors, only one cable that has both TX and RX connectors is required. You can use either simplex or duplex connectors for the NPE-G1.

**Figure 5-10 GBIC Port Connections**



1	To external 1000BASEX network	5	RX (GBIC port 0/1)
2	1 duplex connector (TX and RX)	6	TX (GBIC port 0/1)
3	To external 1000BASEX network		
4	2 simplex connectors		

Table 5-5 describes the available GBIC options.

**Table 5-5 GBIC Options**

Product Number	GBIC	Description
WS-G5484= or GBIC-SX=	Short wavelength (1000BASESX)	Operates on standard multimode fiber-optic link spans of up to 1804 ft (550 m).
WS-G5486= or GBIC-LX/LH=	Long wavelength/long haul (1000BASELX/LH)	Operates on single-mode and multimode fiber-optic link spans of up to 6.2 miles (10 km).
WS-G5487= or GBIC-ZX=	Extended distance (1000BASEZX)	Operates on ordinary single-mode fiber-optic link spans of up to 43.5 miles (70 km). Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber.



Table 5-6 lists the available CWDM GBIC options.

**Table 5-6 CWDM GBIC Options**

Product Number	CWDM GBIC	Color
CWDM-GBIC-1470=	Cisco 1000BASE-CWDM GBIC-1470 nm	Gray
CWDM-GBIC-1490=	Cisco 1000BASE-CWDM GBIC-1490 nm	Violet
CWDM-GBIC-1510=	Cisco 1000BASE-CWDM GBIC-1510 nm	Blue
CWDM-GBIC-1530=	Cisco 1000BASE-CWDM GBIC-1530 nm	Green
CWDM-GBIC-1550=	Cisco 1000BASE-CWDM GBIC-1550 nm	Yellow
CWDM-GBIC-1570=	Cisco 1000BASE-CWDM GBIC-1570 nm	Orange
CWDM-GBIC-1590=	Cisco 1000BASE-CWDM GBIC-1590 nm	Red
CWDM-GBIC-1610=	Cisco 1000BASE-CWDM GBIC-1610 nm	Brown

Table 5-7 provides cabling specifications for the GBICs that you install in Gigabit Ethernet devices. Note that all GBIC ports have SC-type connectors. Also, the minimum cable distance for the WS-G5484 or GBIC-SX and WS-G5486 or GBIC-LX/LH (multimode fiber [MMF] and single-mode fiber [SMF]) is 6.5 feet (2 m), and the minimum link distance for the WS-G5487 or GBIC-ZX is 6.2 miles (10 km) with an 8-dB attenuator installed at each end of the link. Without attenuators, the minimum link distance for the WS-G5487 or GBIC-ZX is 24.9 miles (40 km).



**Note**

Optical fiber cables are commercially available; they are not available from Cisco.

**Table 5-7 GBIC Port Cabling Specifications**

GBIC	Wavelength (nm)	Fiber Type	Core Size (micron)	Modal Bandwidth (MHz/km)	Maximum Cable Distance
WS-G5484 or GBIC-SX	850	MMF <sup>1</sup>	62.5	160	722 ft (220 m)
			62.5	200	902 ft (275 m)
			50.0	400	1640 ft (500 m)
			50.0	500	1804 ft (550 m)
WS-G5486 or GBIC-LX/LH	1300	MMF <sup>2</sup> and SMF	62.5	500	1804 ft (550 m)
			50.0	400	1804 ft (550 m)
			50.0	500	1804 ft (550 m)
			9/10	—	6.2 miles (10 km)
WS-G5487 or GBIC-ZX	1550	SMF	9/10	—	43.5 miles (70 km)
		SMF <sup>3</sup>	8	—	62.1 miles (100 km)

1. Multimode fiber (MMF) only.

2. A mode-conditioning patch cord is required.  
When using the WS-G5486 or GBIC-LX/LH with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the GBIC and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m). We do not recommend using the WS-G5486 or GBIC-LX/LH and MMF with no patch cord for very short link distances (tens of meters). The result could be an elevated bit error rate (BER).
3. Dispersion-shifted single-mode optical fiber cable.

Table 5-8 provides the GBIC transmit and receive power requirements and power budget.

**Table 5-8 GBIC Power Requirements and Power Budget**

GBIC	Transmit Power		Receive Power		Power Budget
	Minimum	Maximum	Minimum	Maximum	
WS-G5484 or GBIC-SX	-9.5 dBm <sup>1</sup>	-4 dBm <sup>1</sup>	-17 dBm	0 dBm	7.5 dBm <sup>2</sup>
WS-G5486 or GBIC-LX/LH	-9.5 dBm <sup>3</sup> -11.5dBm <sup>4</sup>	-3 dBm <sup>5</sup>	-20 dBm	-3 dBm	7.5 dBm <sup>6</sup> and 8.0 dBm <sup>7</sup>
WS-G5487 or GBIC-ZX	0 dBm	5.2 dBm	-24 dBm	-3 dBm	-24 dBm

1. For fiber types 50/125  $\mu\text{m}$ , NA = 0.20 fiber and 62.5/125  $\mu\text{m}$ , NA = 0.275 fiber.
2. For fiber types 50  $\mu\text{m}$  MMF and 62.5  $\mu\text{m}$  MMF.
3. For fiber types 9/125  $\mu\text{m}$  SMF.
4. For fiber types 62.5/125  $\mu\text{m}$  MMF and 50/125  $\mu\text{m}$  MMF.
5. For fiber types 9/125  $\mu\text{m}$  SMF, 62.5/125  $\mu\text{m}$  MMF, and 50/125  $\mu\text{m}$  MMF.
6. For fiber types 50  $\mu\text{m}$  MMF and 62.5  $\mu\text{m}$  MMF.
7. For fiber type 10  $\mu\text{m}$  SMF.

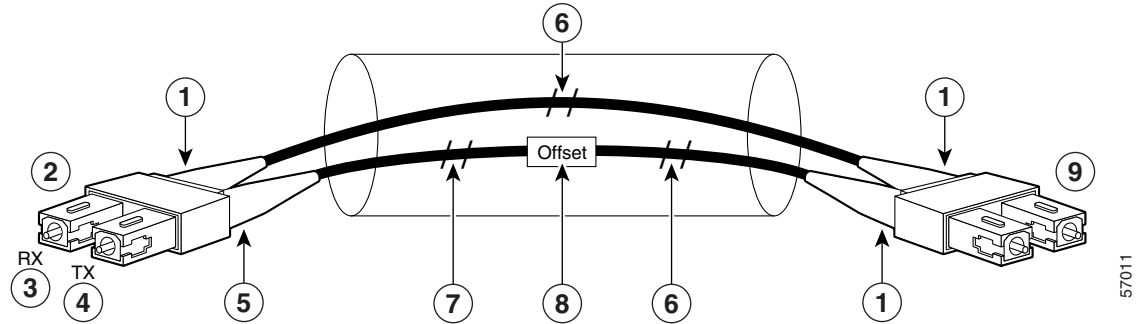
## Mode-Conditioning Patch Cord Description

A mode-conditioning patch cord can be used with the WS-G5486 or GBIC-LX/LH to allow reliable laser transmission between the single-mode laser source on the GBIC and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 5-11) to a graded-index multimode optical fiber. Figure 5-11 shows a diagram of the mode-conditioning patch cord assembly.

**Figure 5-11 Mode Conditioning Patch Cord**

1	Beige color identifier	6	Multimode fiber
2	To Gigabit Ethernet interface	7	Single-mode fiber
3	RX	8	Offset
4	TX	9	To cable plant
5	Blue color identifier		

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASELX and 1000BASELH links.

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the WS-G5486 or GBIC-LX/LH is compliant with the IEEE 802.3z standard for 1000BASELX.

## Console and Auxiliary Port Connection Equipment

The NPE-G1 has a DCE-mode console port for connecting a console terminal, and a DTE-mode auxiliary port for connecting a modem or other DCE device (such as a CSU/DSU or other router) to your router. However, with an I/O controller also installed in the router, the default console and auxiliary ports are on the I/O controller, and you cannot access the console and auxiliary ports on the NPE-G1.



### Note

Both the console and the auxiliary ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The NPE-G1 uses RJ-45 media for console port and auxiliary port connections.

Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 2 stop bits (9600 8N2). After you establish normal router operation, you can disconnect the terminal.



**Note** When connecting to an auxiliary port on a Cisco 7200 VXR router, the port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen.

Refer to [Table 5-9](#) for a list of the pins used on the RJ-45-to-DB-25 adapters, used with an RJ-45 cable, to connect terminals and modems to the Cisco 7200 series routers. The cable you use may be a roll-over cable or a straight cable.

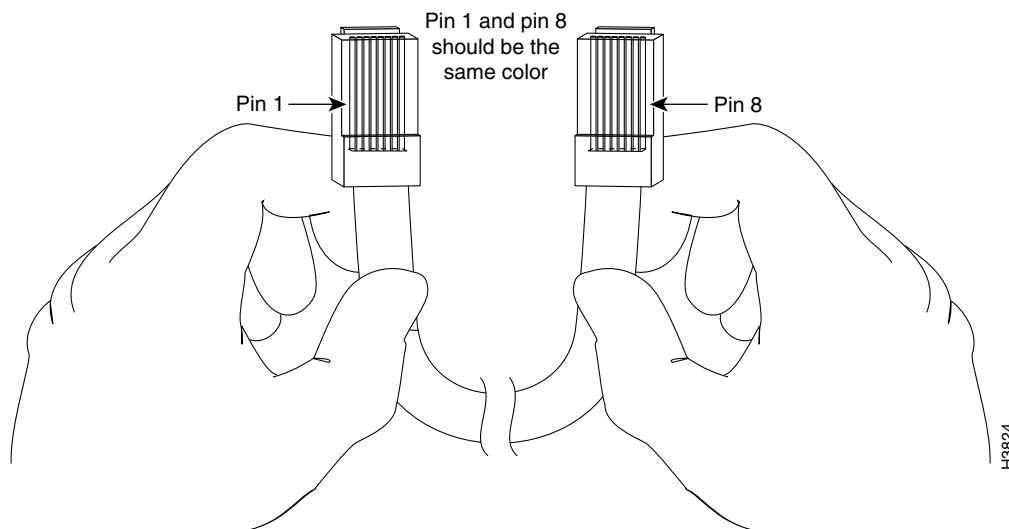
**Table 5-9 Pinouts for the RJ-45-to-DB-25 Adapters**

Adapter	DTE M/F Pins <sup>1</sup>	DCE M/F Pins	MMOD Pins <sup>2</sup>
1	4	5	5
2	20	6	8
3	2	3	3
4	7	7	7
5	7	7	7
6	3	2	2
7	6	20	20
8	5	4	4

1. The female data terminal equipment (FDTE) adapter that is available from Cisco is labeled “Terminal”.
2. The MMOD adapter that is available from Cisco is labeled “Modem”.

A roll-over cable can be detected by comparing the two modular ends of the cable. Holding the cables in your hand, side-by-side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the pin on the outside of the right plug. If your cable was purchased from Cisco, pin 1 will be white on one connector, and pin 8 will be white on the other (a roll-over cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5). (See [Figure 5-12](#).)

**Figure 5-12 Identifying a Roll-Over Cable**



The Cisco 7200 series routers ship with a roll-over cable. Connection to a terminal or a modem requires an RJ-45-to-DB-25 adapter, and possibly a DB-25-to-DB9 adapter. Refer to [Table 5-10](#) for the cable and adapter configurations that can be used to connect terminals and modems to the Cisco 7200 series routers.

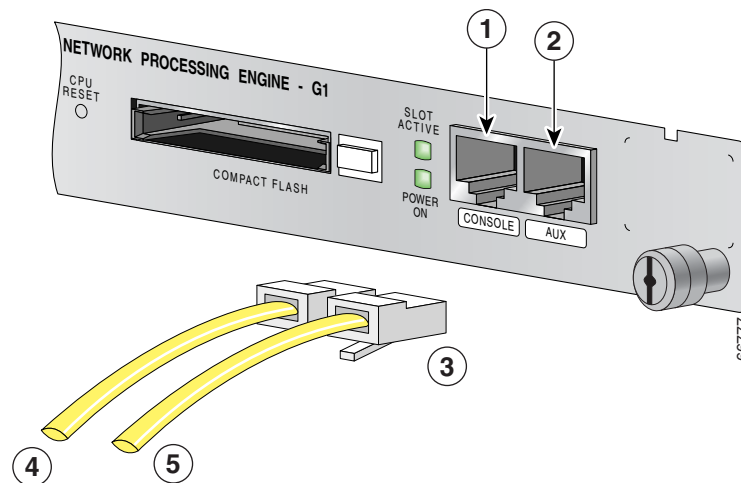
**Table 5-10 Asynchronous Device Cabling Options**

Access Server Port	RJ-45 Cable Type	DB-25 Adapter	End Device
Console or auxiliary	Roll-over	FDTE <sup>1</sup>	Terminal
Console or auxiliary	Straight	FDCE	Terminal
Auxiliary or console	Roll-over	MMOD <sup>2</sup>	Modem

1. The FDTE RJ-45-to-DB-25 adapter is labeled “Terminal”.
2. The MMOD RJ-45-to-DB-25 adapter is labeled “Modem”.

The cable and auxiliary ports are configured as asynchronous serial ports. [Figure 5-13](#) shows the RJ-45 console and auxiliary port connections.

**Figure 5-13 Console and Auxiliary Port RJ-45 Connections**



<b>1</b>	Console port	<b>4</b>	Cable to console terminal or DTE
<b>2</b>	Auxiliary port	<b>5</b>	Cable to modem or DCE
<b>3</b>	RJ-45 connectors		

A cable and adapter kit is available from Cisco (Product Number ACS-2500ASYN=). [Table 5-10](#) describes the cable and adapter configurations that can be used to connect terminals and modems to the console or the auxiliary port.

## RJ-45 Console Port Signals and Pinouts

The NPE-G1 console port supports Data Carrier Detect (DCD). [Table 5-11](#) lists the RJ-45 console port signals for the NPE-G1.

**Table 5-11 Console Port Signals for the NPE-G1**

Pin <sup>1</sup>	Signal	Direction	Description
1	CTS	Out	Clear To Send (tracks RTS)
2	DSR	Out	Data Set Ready (always on)
3	RXD	Out	Receive Data
4	GND	—	Signal Ground
6	TXD	In	Transmit Data
7	DTR	In	Data Terminal Ready
8	RTS	In	Ready To Send

1. Any pin not referenced is not connected.

## RJ-45 Auxiliary Port Signals and Pinouts

Table 5-12 lists the RJ-45 auxiliary port signals for the NPE-G1.

**Table 5-12 Auxiliary Port Signals for the NPE-G1**

Pin <sup>1</sup>	Signal	Direction	Description
1	RTS	Out	Ready To Send
2	DTR	Out	Data Terminal Ready
3	TXD	Out	Transmit Data
4	RING <sup>2</sup>	In	Ring Indication
5	GND	—	Signal Ground
6	RXD	In	Receive Data
7 <sup>3</sup>	DSR/DCD(RLSD)	In	Data Set Ready/Data Carrier Detect (Receive Line Signal Detect)
8	CTS	In	Clear To Send (tracks RTS)

1. Any pin not referenced is not connected.

2. RING is not supported on Cisco-supplied adapters. To use this pin, you must create a customized cable.

3. Pin 7 can be used as a DCD input for connection to a modem. The RJ-45-to-DB-25F adapter maps DCD to this pin when used with a straight-through cable.

## Fiber Optic Cleaning Information

We strongly recommend cleaning all optical fiber connections before reconnecting optical cables to equipment. For information about cleaning optical connectors, see the [Inspection and Cleaning Procedures for Fiber-Optic Connections](#) document and the [Compressed Air Cleaning Issues for Fiber-Optic Connections](#) document.



# CHAPTER 6

## NPE-G2 Overview

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This chapter describes the NPE-G2 and contains the following sections:

- [Supported Platforms, page 6-1](#)
- [Software Requirements, page 6-2](#)
- [NPE-G2 Description and Overview, page 6-2](#)
- [NPE-G2 Memory Information and Specifications, page 6-11](#)
- [Fiber Optic Cleaning Information, page 6-23](#)



### Caution

You must copy and save your running configuration file to a CompactFlash Disk, PC Card, or TFTP server before you install the NPE-G2. For instructions on copying and saving your configuration file, see the [“Copying the Configuration File”](#) section on page 7-4 in [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

For general preparation for installation instructions, see [Chapter 8, “Preparation for Installation.”](#) For installation and configuration instructions specific to the NPE-G2, see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

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## Supported Platforms

The NPE-G2 is supported on the Cisco 7200 VXR routers and Cisco uBR7200 series routers. For the Cisco 7200 VXR routers, order Part Number NPE-G2 or NPE-G2=. For the Cisco uBR7200 series routers, order Part Number UBR7200-NPE-G2 or UBR7200-NPE-G2=.



### Note

Unless otherwise indicated, all references to NPE-G2 in this document also refer to UBR7200-NPE-G2.

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# Software Requirements

For minimum software release information, see the [“Software Requirements” section on page 8-4](#).

**Note**

The NPE-G2 has its own Cisco IOS software image with the prefix “c7200p-” in the software images filenames, including the boot image. The NPE-G2 does not boot up with a software image with the prefix “c7200-”. Previous network processing engines, or the network services engine, do not boot up with the “c7200p-” boot image. They use the prefix “c7200-”.

## NPE-G2 Description and Overview

This section contains information about the NPE-G2 components and the system management functions. The following information is in this section:

- [Bandwidth Requirements, page 6-3](#)
- [Components, page 6-3](#)
- [Interfaces, page 6-4](#)
- [LEDs, page 6-5](#)
- [CompactFlash Disk, page 6-6](#)
- [USB Ports, page 6-8](#)
- [Summary of Important NPE-G2 Information, page 6-9](#)
- [System Management Functions, page 6-10](#)
- [Terms and Acronyms, page 6-10](#)

Like the NPE-G1, the NPE-G2 provides the functionality of both a network processing engine and I/O controller. If used without an I/O controller, an I/O controller blank panel must be in place.

While its design provides I/O controller functionality, it can also work with any I/O controller supported in the Cisco 7200 VXR routers or Cisco uBR7200 series routers. The NPE-G2, when installed with an I/O controller, provides the bootflash and NVRAM that the Cisco IOS software uses to boot.

**Note**

An I/O controller can be used with the NPE-G2, but an I/O controller is not necessary for system functionality. Installing an I/O controller in a chassis with the NPE-G2 activates the console and auxiliary ports on the I/O controller and automatically disables the console and auxiliary ports on the NPE-G2. However, you can still use the CompactFlash Disk slots and Ethernet ports on both the NPE-G2 and I/O controller when both cards are installed.

The NPE-G2 maintains and executes the system management functions for the Cisco 7200 VXR routers and Cisco uBR7200 series routers and also holds the system memory and environmental monitoring functions. The NPE-G2 consists of one board with multiple interfaces.

The NPE-G2 can be used with the Port Adapter Jacket Card installed in the I/O controller slot. If you are upgrading to an NPE-G2 and Port Adapter Jacket Card at the same time, see the *Port Adapter Jacket Card Installation Guide* for information about the order of installation of both the NPE-G2 and the Port Adapter Jacket Card.



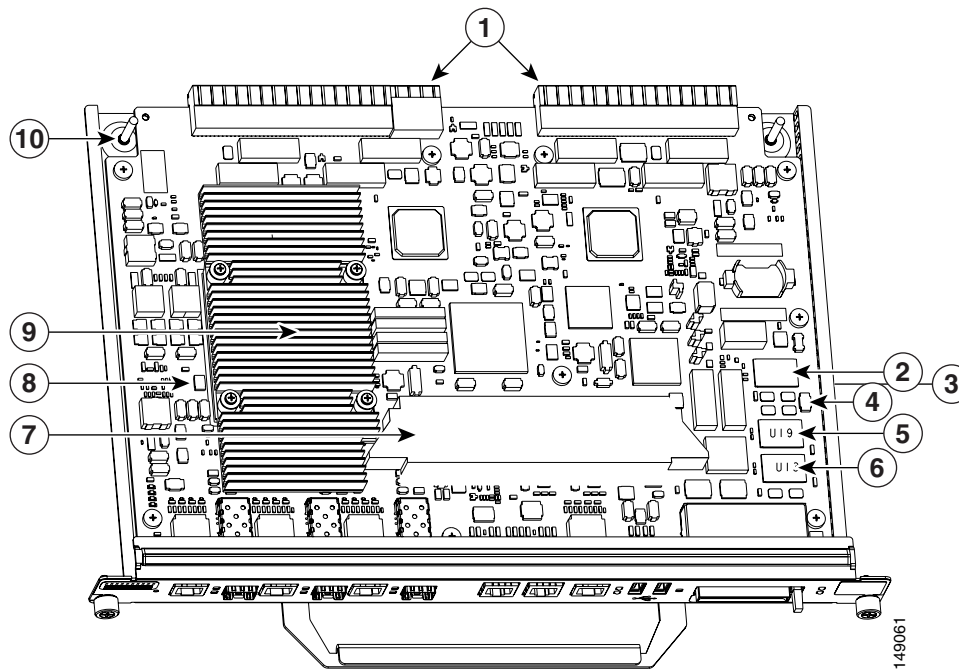
## Bandwidth Requirements

The Gigabit Ethernet ports on the NPE-G2 do not use bandwidth points, nor does the Fast Ethernet management port. When used with any I/O controller, the Ethernet ports, Fast Ethernet ports, or Gigabit Ethernet ports on the I/O controller also do not use bandwidth points.

## Components

Figure 6-1 illustrates the NPE-G2 and its major components.

**Figure 6-1** NPE-G2



1	Midplane connectors	6	Flash memory (U13)
2	Boot ROM (U24)	7	DIMM (socket—S1)
3	NVRAM (on bottom of board—U17)	8	Temperature sensor (inlet—U23)
4	Temperature sensor (outlet—U20)	9	Processor (U30)
5	Flash memory (U19)	10	Keying post

The NPE-G2 consists of the following components:

- Motorola Freescale 7448 processor
  - Microprocessor operates at an internal clock speed of 1.67 GHz.
  - Hardware logic to interconnect the processor, double data rate synchronous dynamic random-access memory (DDR-SDRAM), lightning data transport (LDT) bus, the generic PCI bus, and three direct-interface Gigabit Ethernet interfaces.

- Cache memory
 

The NPE-G2 has two levels of cache: primary and secondary cache that are internal to the microprocessor with secondary unified cache for data and instruction.
- The NPE-G2 uses DDR SDRAM for providing code, data, and packet storage.
- Two environmental sensors for monitoring the cooling air as it enters and leaves the chassis.
- Full-feature I/O controller functionality
  - Three Gigabit Ethernet interfaces (six ports: three SFP [optical] and three RJ-45s [copper]). Any three ports are available at the same time and are linked directly to the processor; therefore the interfaces are not charged bandwidth points.
  - CompactFlash Disk for storing the default Cisco IOS software image. The CompactFlash Disk slot can be used whether or not an I/O controller is in the router.
  - Auxiliary port with full data terminal equipment (DTE) functionality. (Functional when an I/O controller is not present. If an I/O controller is present, its auxiliary port is the default port.)
  - Console port with full data communications equipment (DCE) functionality. (Functional when an I/O controller is not present. If an I/O controller is present, its console port is the default port.)
  - Dedicated 10/100 Fast Ethernet Management port—Not to be used for any other purpose.
  - Two USB ports for data storage using Cisco USB flash memory modules or security eToken for VPN applications.
  - Boot ROM for storing the ROMmon images.
  - Internal flash memory for storing the boot helper (boot loader) image and the Cisco IOS image. (The boot helper image comes installed on the NPE-G2.) If an I/O controller is present, its internal flash memory is no longer available.
  - NVRAM for storing the system configuration and environmental monitoring logs. NVRAM uses lithium batteries to maintain its contents when disconnected from power. If an I/O controller is present, its NVRAM memory is no longer available.
  - Upgradable memory module




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**Note** An I/O controller can be used with the NPE-G2, but an I/O controller is not necessary for system functionality. Installing an I/O controller in a chassis with the NPE-G2 activates the console and auxiliary ports on the I/O controller and automatically disables the console and auxiliary ports on the NPE-G2. However, you can still use the Compact Flash Disk slots and Ethernet ports on both the NPE-G2 and I/O controller when both cards are installed.

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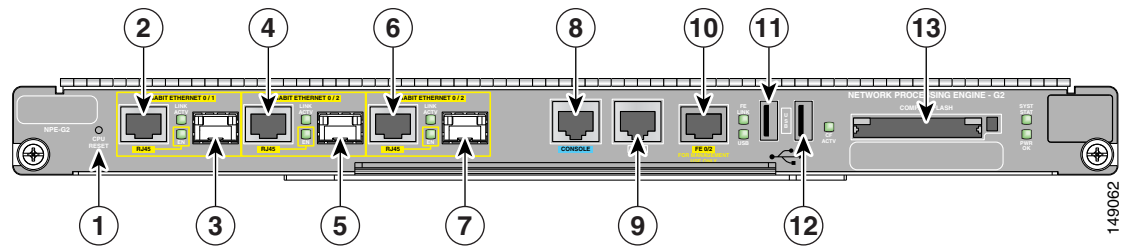
## Interfaces

The three interfaces on the NPE-G2 consist of three small form-factor (SFP) Gigabit Ethernet ports and three 10/100/1000 Fast Ethernet/Gigabit Ethernet ports. The rules for using these ports are:

- Only one port per interface can be used at any one time. For example, for interface Gigabit Ethernet 0/1, either the RJ-45 port can be used or the SFP port, but not both.
- A total of three ports on any of the three interfaces (0/1, 0/2, or 0/3) can be used at any one time; for example, 0/1 SFP, 0/2 SFP, and 0/3 RJ-45.

- The port numbering for the interfaces on the NPE-G2 starts with 0/1 and not with 0/0, as is typical for other interface cards. This is to avoid conflicts with the Ethernet and Fast Ethernet ports on an I/O controller, if it is also installed.

**Figure 6-2 NPE-G2 Interfaces**



<b>1</b>	CPU Reset	<b>8</b>	Console port
<b>2</b>	Fast Ethernet/Gigabit Ethernet RJ-45 port—GE 0/1	<b>9</b>	Auxiliary port
<b>3</b>	Gigabit Ethernet port—GE 0/1	<b>10</b>	Fast Ethernet Management port—FE 0/2
<b>4</b>	Fast Ethernet/Gigabit Ethernet RJ-45 port—GE 0/2	<b>11</b>	USB port 0
<b>5</b>	Gigabit Ethernet port—GE 0/2	<b>12</b>	USB port 1
<b>6</b>	Fast Ethernet/Gigabit Ethernet RJ-45 port—GE 0/3	<b>13</b>	CompactFlash Disk slot
<b>7</b>	Gigabit Ethernet port—GE 0/3		



**Note** The Fast Ethernet Management RJ-45 port is only used for management activities—not for any other purpose.



**Note** The USB function is not supported on Cisco uBR7200 series routers.

## LEDs

This section provides information about the location and behavior of the NPE-G2 LEDs.

The NPE-G2 faceplate contains LEDs that indicate system and port status. The RJ-45 and SFP ports share the same LINK ACTV LED because only one of these ports per interface (0/1, 0/2, or 0/3) can be used at any one time. The EN (Enable) LED is on if the RJ-45 port is in use.

The PWR OK LED is on whether or not an I/O controller is present in the router. The CompactFlash Disk slot can be used whether or not an I/O controller is present in the router. The SYST STAT LED provides information about the status of the system.

Figure 6-3 NPE-G2 LEDs

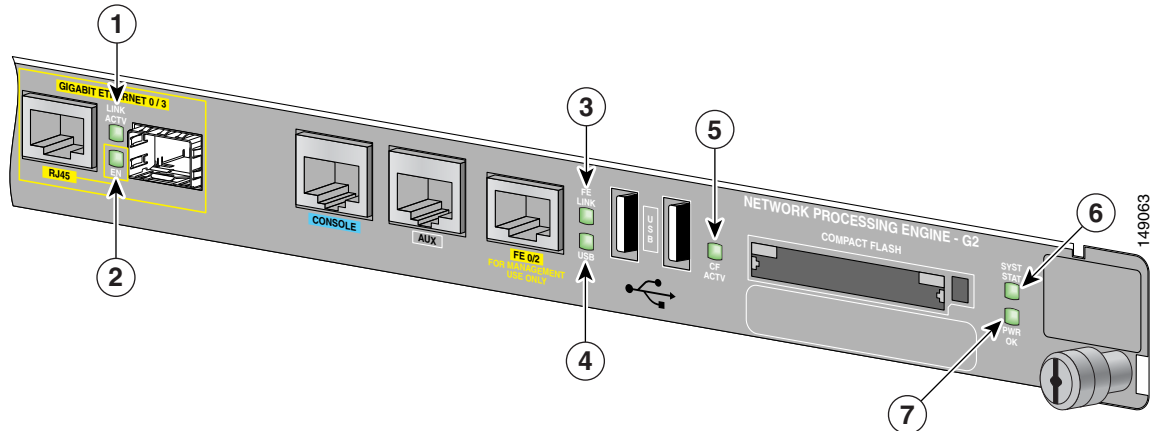


Table 6-1

No.	LED Label	LED	Color	Description
1	LINK ACTV (Interfaces 0/1, 0/2, 0/3)	RJ-45 and SFP ports	Solid green	Link with no activity
			Flashing green	Link with activity
			Off	No link
2	EN (Enable) (Interfaces 0/1, 0/2, 0/3)	RJ-45 ports only	Solid green	RJ-45 port is selected.
			Off	SFP port is selected.
3	FE LINK	Fast Ethernet Management port	Solid green	Link with no activity
			Flashing green	Link with activity
			Off	No link
4	USB	USB ports	Flashing green	Activity
			Off	No activity
5	CF ACTV	CompactFlash Disk	Flashing green	Activity
			Off	No activity
6	SYST STAT	System status	Blinking green	Cisco IOS is loading.
			Solid green	Cisco IOS has successfully booted.
			Blinking yellow	ROMmon is loading.
			Solid yellow	ROMmon has successfully booted.
7	PWR OK	Power	Green	The NPE-G2 has powered on.
			Off	No activity

## CompactFlash Disk

The NPE-G2 has one CompactFlash Disk slot that uses CompactFlash Disks. The device in this slot is always addressed as **disk2:** when using Cisco IOS CLI commands.

CompactFlash Disks are smaller in size than Type 2 Flash Disks but provide the same Attachment (ATA) interface and equivalent functionality. This interface complies with the ANSI ATA Interface Document X3T13.1153 D Rev. 9 specification. The CompactFlash Disk provides 256 MB of storage space.

The CompactFlash Disk has controller circuitry that allows it to emulate a hard disk and automatically maps out bad blocks and performs automatic block erasure. The CompactFlash Disk also provides the capability to allocate noncontiguous sectors, which eliminates the need for the **squeeze** command (which was required with older-style linear flash memory cards to recover the space used by deleted files).

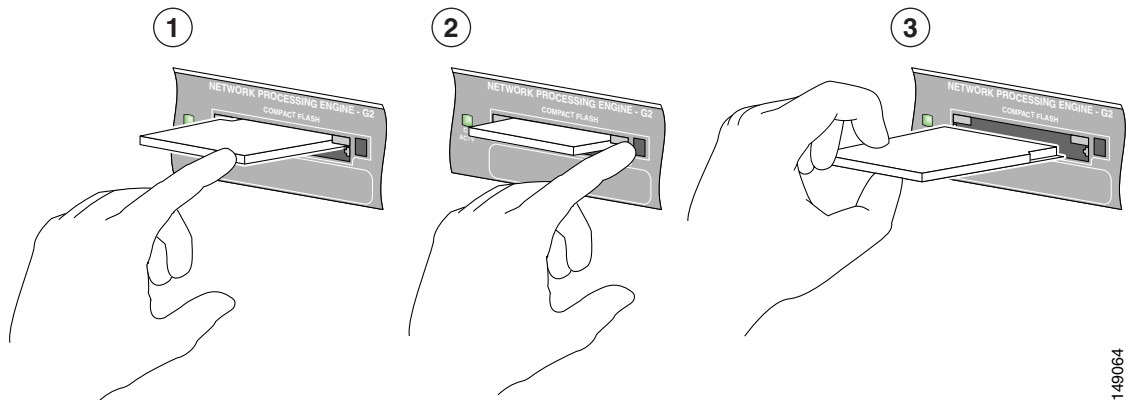
The CompactFlash Disk also supports the Cisco IOS File System feature, which provides a single interface to all of the router’s file systems, including the Flash Disks and flash memory, as well as network file systems such as File Transfer Protocol (FTP) and Trivial FTP (TFTP) servers.

Table 6-4 lists the CompactFlash Disk options.

To install a CompactFlash Disk in the CompactFlash Disk slot, complete the following steps

- Step 1** Attach an ESD wrist or ankle strap, connecting the equipment end of the strap to an unfinished chassis surface.
- Step 2** Orient the CompactFlash Disk so that its connector end faces the appropriate slot. (See 1 in Figure 6-4.)

**Figure 6-4** Installing and Removing a CompactFlash Disk



<b>1</b>	Inserting the compact Flash Disk	<b>3</b>	Removing the CompactFlash Disk
<b>2</b>	Pressing the ejector button to release the CompactFlash Disk		

- Step 3** Carefully insert the CompactFlash Disk into the slot until it completely seats in the connector, and the ejector button for the slot pops out toward you. (See 2 in Figure 6-4.)



**Note** The CompactFlash Disk is keyed and cannot be seated the wrong way. The ejector button does not pop out if the CompactFlash Disk is not completely inserted.

To remove a CompactFlash Disk from the CompactFlash Disk slot, complete the following steps:

- 
- Step 1** Press the ejector button on the slot. (See 3 in [Figure 6-4](#).)
- Step 2** Grasp the CompactFlash Disk and pull it from the slot.
- Step 3** Place the CompactFlash Disk in an antistatic bag.
- 

**Note**

All CompactFlash Disks must be formatted before their initial use. CompactFlash Disks shipped with the NPE-G2 are formatted at the factory, but spare memory cards are not formatted.

---

## USB Ports

The NPE-G2 provides two USB ports that can be used with USB Flash memory modules as secondary storage, similar to CompactFlash Disks. The USB Flash memory modules can be used to store Cisco IOS images, data, and configuration files. See [Table 6-5](#) for USB Flash memory module product options and numbers.

The NPE-G2 includes USB ports that can be used with Cisco USB Flash memory modules or with the Aladdin USB eToken Pro key. These USB devices can be used with the NPE-G2 for the following functions:

- The USB eToken Pro key by Aladdin Knowledge Systems provides a secure means to store and deploy information, such as a bootstrap configuration or VPN credentials, separate from the router chassis. The USB eToken uses smart card technology to protect a small area of memory and grants access using a personal identification number (PIN). When IP Security (IPSec) VPN credentials are stored on the USB eToken, they are safely external to the router. When the USB eToken is inserted in a USB port, the router can pass the PIN and unlock it, retrieving the credentials and copying them into running memory. When the USB eToken is removed, the router will erase the credentials from running memory, ensuring that they cannot be retrieved from the router itself.

**Note**

For more information about the USB eToken Pro key by Aladdin Knowledge Systems, see the Aladdin website at [www.aladdin.com/etoken/cisco](http://www.aladdin.com/etoken/cisco).

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- The Cisco USB Flash memory module can be used to store an image or configuration file like a CompactFlash Disk. Unlike the USB eToken, the Cisco USB Flash memory module is nonsecure. See [Table 6-5](#) for available USB Flash memory module configurations and product numbers.

**Note**

The Cisco USB Flash memory module cannot be used to boot the router. The USB drivers exist only in Cisco IOS software, not ROM Monitor mode (ROMmon). As a result, a Cisco IOS image must be booted to load the drivers; only then can files be copied to and from the USB Flash memory module.

---

**Note**

For detailed information about the Cisco IOS commands that support USB Flash memory modules, see the [Cisco IOS USB Flash Module and USB eToken Support](#) document.

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## Summary of Important NPE-G2 Information



### Caution

The NPE-G2 requires that you copy and save your running configuration file to a CompactFlash Disk, PC Card, or TFTP server before you install the NPE-G2. For instructions on copying and saving your configuration file, see the “[Copying the Configuration File](#)” section on page 7-4 in Chapter 7, “[NPE-G1 and NPE-G2 Installation and Configuration Information](#).”

For general preparation for installation instructions, see [Chapter 8, “Preparation for Installation.”](#) For installation and configuration instructions specific to the NPE-G2, see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

- The NPE-G2 software image and kboot image name begins with “c7200p-”, which is different from that of previous network processing engines.
- The RJ-45 ports and SFP ports are both reported in software as GigabitEthernet 0/1, GigabitEthernet 0/2, and GigabitEthernet 0/3. Only one of the pair of interface ports can be used at a time; for example, SFP GigabitEthernet 0/2 or RJ-45 GigabitEthernet 0/2.
- The I/O controller GE/E interface reports GigabitEthernet 0/0 and Ethernet 0/0, and the I/O controller 2FE/E interface reports FastEthernet 0/0 and FastEthernet 0/1.
- If the RJ-45 port is in use, the EN (Enable) LED is on. If the SFP port is in use, the EN (Enable) LED is off.
- With the NPE-G2 and an I/O controller both installed, the I/O controller functionality on the NPE-G2 is shared with that of the I/O controller.
- When both an NPE-G2 and an I/O controller are installed, the flash memory and NVRAM of the NPE-G2 are enabled and the flash memory and NVRAM on the I/O controller are no longer accessible.
- The console and auxiliary ports on the NPE-G2 are disabled by Cisco IOS when an I/O controller is present; the console and auxiliary ports on the I/O controller are active.
- Console port messages can be routed to the auxiliary port on either the NPE-G2 or on the I/O controller.
- The default media is the RJ-45 port. To change the media type, use the **media-type** command.
- Only the port selected by the **media-type** command is active. A cable attached to the other of the RJ-45 and SFP module pair will be ignored. For example, if SFP port GigabitEthernet 0/2 is selected using the **media-type** command, RJ-45 GigabitEthernet 0/2 is ignored, even if a cable is attached to RJ-45 0/2.
- The NPE-G2 uses no bandwidth points, and when used with any I/O controller, the I/O controller also uses no bandwidth points. None of the Gigabit Ethernet interfaces on the NPE-G2 use bandwidth points.
- The CompactFlash Disk on the NPE-G2 is available at all times, with or without an I/O controller installed. The CompactFlash Disk is always addressed as the **disk2** device, to avoid conflicts with the **disk0** and **disk1** devices on the I/O controller, if the I/O controller is also installed.
- USB Flash memory modules are available for data storage, with or without an I/O controller installed.

**Note**

The Gigabit Ethernet interfaces on the NPE-G2 do not support the Inter-Switch Link (ISL) VLAN encapsulation protocol. We recommend that customers use the IEEE 802.1Q VLAN encapsulation protocol as an alternative. Where an application requires the use of ISL, this can be provided by the Fast Ethernet or Gigabit Ethernet port adapters or I/O controllers.

## System Management Functions

The NPE-G2 performs the following system management functions:

- Sending and receiving routing protocol updates
- Managing tables, caches, and buffers
- Monitoring interface and environmental status
- Providing Simple Network Management Protocol (SNMP) management through the console and Telnet interface
- Accounting for and switching of data traffic
- Booting and reloading images
- Managing port adapters (including recognition and initialization during online insertion and removal)

## Terms and Acronyms

- Boot ROM—Read-only memory that stores the boot image for bringing up the Cisco IOS image.
- Cache—Memory with fast access and small capacity used to temporarily store recently accessed data; found either incorporated into the processor or near it.
- CWDM— Coarse Wavelength-Division Multiplexing.
- DIMM— Dual In-line Memory Module.
- DDR SDRAM—double data rate synchronous dynamic random-access memory.
- Flash memory—Location where the basic boot image is stored.
- Instruction and data cache—Instructions to the processor, and data on which the instructions work.
- Integrated cache—Cache that is built into the processor; sometimes referred to as internal cache. Cache memory physically located outside the processor is not integrated, and is sometimes referred to as external cache.
- LDT bus—lightning data transport bus.
- NVRAM—nonvolatile random-access memory.
- OTP—one time programmable.
- Primary and secondary cache—Hierarchical cache memory storage based on the proximity of the cache to the core of the processor. Primary cache is closest to the processor core and has the fastest access. Secondary cache has slower access than primary cache.
- RAM—random-access memory.
- RISC—reduced instruction set computing.
- ROM—read-only memory.



- SDRAM—synchronous dynamic random-access memory.
- SDRAM-fixed—SDRAM of a fixed size or quantity; can be replaced, but not upgraded.
- SFP module—small form-factor pluggable module.
- Unified cache—Instruction cache and data cache are combined. For example, a processor may have primary cache with separate instruction and data cache memory, but unified secondary cache.
- USB—universal serial bus.

## NPE-G2 Memory Information and Specifications

To determine the memory configuration of your NPE-G2, use the **show version** command.

The following example shows an NPE-G2 installed in a Cisco 7206VXR router.

```
Router# show version
Cisco IOS Software, 7200 Software (C7200-JS-M), Version 12.4(PC_D.051028)
CISCO DEVELOPMENT TEST VERSION
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Fri 28-Oct-05 00:30 by
ROM: System Bootstrap, Version 12.3(20050910:182137) [xxxx 103], DEVELOPMENT SOFTWARE

7448-1 uptime is 2 days, 17 hours, 52 minutes
System returned to ROM by power-on
System image file is "disk2:c7200p-js-mz"
Cisco 7206VXR (NPE-G2) processor (revision A) with 917504K/131072K bytes of memory.
Processor board ID 32428149
MPC7448 CPU at 1660Mhz, Implementation 0, Rev 2.0
6 slot VXR midplane, Version 2.8
Last reset from power-on

PCI bus mb1 (Slots 1, 3 and 5) has a capacity of 600 bandwidth points.
Current configuration on bus mb1 has a total of 780 bandwidth points.
The set of PA-2FE, PA-POS-2OC3, and I/O-2FE qualify for "half
bandwidth points" consideration, when full bandwidth point counting
results in oversubscription, under the condition that only one of the
two ports is used. With this adjustment, current configuration on bus
mb1 has a total of 480 bandwidth points.
This configuration is within the PCI bus capacity and is supported
under the above condition.

PCI bus mb2 (Slots 2, 4 and 6) has a capacity of 600 bandwidth points.
Current configuration on bus mb2 has a total of 1000 bandwidth points.
The set of PA-2FE, PA-POS-2OC3, and I/O-2FE qualify for "half
bandwidth points" consideration, when full bandwidth point counting
results in oversubscription, under the condition that only one of the
two ports is used. With this adjustment, current configuration on bus
mb2 has a total of 800 bandwidth points.
This configuration has oversubscribed the PCI bus and is not a
supported configuration.
Please refer to the following document "Cisco 7200 Series Port Adaptor
Hardware Configuration Guidelines" on Cisco.com <http://www.cisco.com>
for c7200 bandwidth points oversubscription and usage guidelines.
WARNING: PCI bus mb2 Exceeds 600 bandwidth points

3 FastEthernet interfaces
4 Gigabit Ethernet interfaces
2 Packet over SONET interfaces
2 Channelized T3 ports
```

2045K bytes of NVRAM.  
 250603K bytes of USB Flash usbflash0 (Read/Write)  
 125163K bytes of USB Flash usbflash1 (Read/Write)  
 250368K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).  
 65536K bytes of Flash internal SIMM (Sector size 512K).  
 Configuration register is 0x0

Table 6-2 provides memory specifications and Table 6-3 provides user replaceable memory configuration information for the NPE-G2. Table 6-4 provides CompactFlash Disk specifications. Table 6-5 provides USB Flash memory module information. Figure 6-5 provides I/O controller blank panel information.

**Table 6-2 NPE-G2 Memory Specifications**

Memory Type	Size	Quantity	Description	Component Location on the NPE-G2 Board
SDRAM	1 GB	1	1-GB DDR SDRAM	S1
Boot ROM	512 KB	1	Reprogrammable Boot ROM for the ROM monitor program	U24
Flash memory (also known as bootflash)	64 MB	1	Contains the default boot helper (boot loader) image	U19 and U13
NVRAM	2 MB	1	Nonvolatile EPROM for the system configuration file	U17
Primary cache	32 KB (16 KB instruction, 16 KB data)	—	Motorola Freescale 7448 processor, internal cache	U30
Secondary cache	1 MB	—	Motorola Freescale 7448 secondary cache	U30

**Table 6-3 NPE-G2 SDRAM Configuration—Configurable Memory Only**

Total SDRAM	SDRAM Bank	Quantity	Product Number
1 GB	S1	1 1-GB DIMM	MEM-NPE-G2-1GB=
2 GB	S1	1 2-GB DIMM	MEM-NPE-G2-2GB=

**Table 6-4 NPE-G2 CompactFlash Disk Specifications**

Memory Size	Product Number
256 MB	MEM-NPE-G2-FLD256=

**Table 6-5 NPE-G2 USB Flash Memory Module Specifications**

Token Size	Product Number
64-MB USB Flash Token <sup>1</sup> for Cisco 1800/2800/3800/7200	MEMUSB-64FT=
12-MB USB Flash Token for Cisco 1800/2800/3800/7200	MEMUSB-128FT=

1. Also known as flash memory modules.

**Table 6-6 I/O Controller Blank Panel**

Description	Product Number
I/O Controller slot blank panel	IO-CONTROLR-BLANK=

## Connection Equipment and Specifications

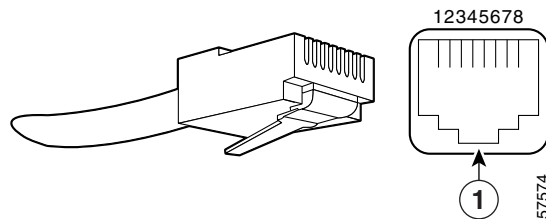
This section contains connection equipment and pinout information for the Gigabit Ethernet RJ-45 ports, Gigabit Ethernet SFP ports and SFP modules, Fast Ethernet Management port, console port, and auxiliary port that are located on the NPE-G2.

### Ethernet and Fast Ethernet RJ-45 Connection Equipment

The NPE-G2 has RJ-45 ports for Ethernet, Fast Ethernet, and Gigabit Ethernet or autosensing Ethernet, Fast Ethernet, and Gigabit Ethernet connections. The RJ-45 port supports IEEE 802.3 (Ethernet) and IEEE 802.3u (Fast Ethernet) interfaces compliant with 10BASET, 100BASETX, and 1000BASET and 1000BASEX specifications.

The RJ-45 ports, including the Fast Ethernet Management port, support standard straight-through and crossover Category 5 UTP cables with RJ-45 connectors. (See [Figure 6-5](#).) Cisco does not supply Category 5 UTP cables; these cables are available commercially.

[Figure 6-5](#) shows an RJ-45 port and connector. [Table 6-7](#) lists the pinouts and signals for the RJ-45 port.

**Figure 6-5 RJ-45 Port and Connector**

1	RJ-45 connector		
---	-----------------	--	--



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 RJ-45 connectors. Use caution when connecting cables. Statement 1021

**Table 6-7 RJ-45 Port Pinouts**

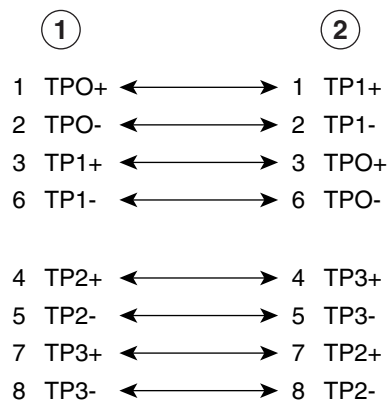
Pin	10/100 Signal	Gigabit Ethernet Signal
1	Tx Data+ <sup>1</sup>	Tx A+
2	Tx Data-	Tx A-
3	Rx Data+ <sup>2</sup>	Rx B+
4	N/C	Tx C+
5	N/C	Tx C-
6	Rx Data-	Rx B-
7	N/C	Rx D+
8	NC	Rx D-

1. Tx Data = Transmit Data
2. Rx Data = Receive Data

**Note**

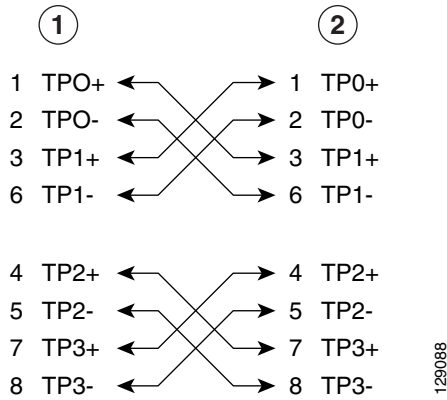
With reference to the RJ-45 pinout in [Table 6-7](#), proper common-mode line terminations should be used for the unused Category 5 UTP cable pairs 4/5 and 7/8. Common-mode termination reduces electromagnetic interference (EMI).

Depending on your RJ-45 interface cabling requirements, use the pinouts shown in [Figure 6-6](#) and [Figure 6-7](#) for Gigabit Ethernet straight-through and crossover twisted-pair cable connections. Use [Figure 6-8](#) for Ethernet/Fast Ethernet straight-through and crossover twisted-pair cable connections.

**Figure 6-6 Four Twisted-Pair Straight-Through Cable Schematics for 10/100/1000 and 1000BASE-T SFP Module Ports**

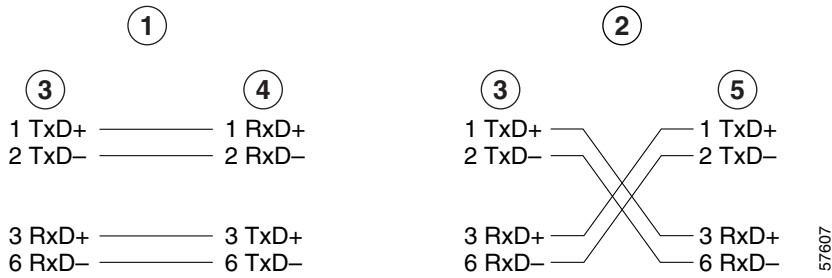
<b>1</b>	Router	<b>2</b>	Hub
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**Figure 6-7 Four Twisted-Pair Crossover Cable Schematics for 10/100/1000 and 1000BASE-T SFP Module Ports**



<b>1</b>	Router	<b>2</b>	Hub
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**Figure 6-8 Ethernet/Fast Ethernet Straight-Through and Crossover Cable Pinouts**



<b>1</b>	Straight-through cable pinout, Ethernet port to a hub or repeater	<b>4</b>	Hub
<b>2</b>	Crossover cable pinout, Ethernet port to a DTE	<b>5</b>	DTE
<b>3</b>	Ethernet port		

For information about straight-through and crossover cables, see the [“Console and Auxiliary Port Connection Equipment”](#) section on page 6-20.

## Gigabit Ethernet SFP Connection Equipment

The small form-factor pluggable (SFP) port is a 1000-Mbps optical interface in the form of an LC-type duplex port that supports IEEE 802.3z interfaces compliant with the 1000BASEX standard. (See [Figure 6-10](#).)



### Note

The SFP module you ordered is shipped installed in the NPE-G2. Cisco sells individual SFP modules separately and you can change the type of Gigabit Ethernet interface supported by this network processing engine by simply changing its SFP module.

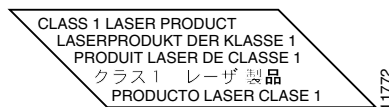


### Warning

**Because invisible laser radiation may be emitted from the aperture of the port when no cable is connected, avoid exposure to laser radiation and do not stare into open apertures.** Statement 70

[Figure 6-9](#) shows the Class 1 warning label that appears on the Gigabit Ethernet optical ports.

**Figure 6-9 Laser Class 1 Warning Label**

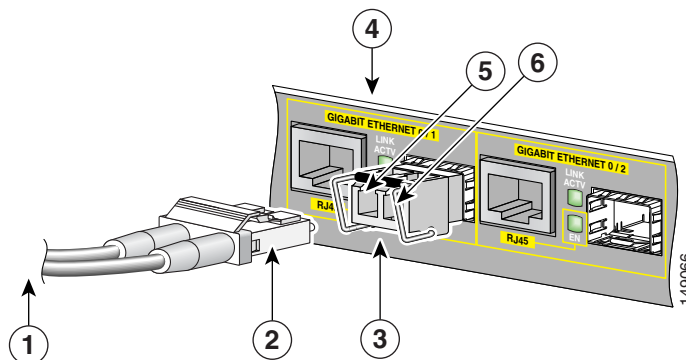


### Warning

**Class 1 Laser Product.** Statement 1008

[Figure 6-10](#) shows the duplex LC-type connectors on your multimode or single-mode optical fiber cables. For simplex connectors, two cables are required, one cable for transmit (TX) and a second cable for receive (RX). For duplex connectors, only one cable that has both TX and RX connectors is required. You can use either simplex or duplex connectors to the SFP ports on the NPE-G2.

**Figure 6-10 SFP Port Connections**



1	To external 1000BASEX network	4	Gigabit Ethernet port 0/1
2	1 duplex connector (TX and RX)	5	RX (SFP port 0/1)
3	SFP module	6	TX (SFP port 0/1)

Table 6-8 provides SFP module specifications.

**Table 6-8 SFP Module Specifications**

Specification	Description
Dimensions (H x W x D)	Height: 0.33 in. (8.5 mm) Depth: 0.53 in. (13.4 mm) Width: 2.22 in. (56.5 mm)
Connectors	Multimode fiber-optic: LC Single-mode fiber-optic: LC

The NPE-G2 supports single Gigabit Ethernet interfaces based on SFP technology. The following SFP modules are supported by the NPE-G2:

- 100BASE-FX SFP—The SFP-GE-F=, 100BASE-FX SFP module is a hot-swappable device that plugs into a Gigabit Ethernet SFP port. It provides full-duplex 100-Mbps connectivity between switches over multimode fiber (MMF) infrastructures. The 100BASE-FX SFP operates on ordinary MMF optical link spans of up to 6562 ft (2 km) in length. Customers implementing Cisco 100BASE-FX SFP can use 1000BASE-X SFP modules in the future (including SX, LH/LX, ZX, and coarse wavelength-division multiplexing SFP modules).
- 1000BASE-LX/LH SFP—The SFP-GE-L=, 1000BASE-LX/LH SFP module operates on ordinary single-mode fiber-optic link spans of up to 32,808 ft (10,000 m) in length.
- 1000BASE-SX SFP—The SFP-GE-S=, 1000BASE-SX SFP module operates on ordinary multimode fiber-optic link spans of up to 1804 ft (550 m) in length.
- 1000BASE-ZX SFP—The SFP-GE-Z=, 1000BASE-ZX SFP module operates on ordinary single mode fiber-optic link spans of up to 43.5 miles (70 km) in length. Link spans of up to 62.1 miles (100 km) are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. The SFP module provides an optical link budget of 23 dB—the precise link span length depends on multiple factors such as fiber quality, number of splices, and connectors.

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 5-decibel (dB) or 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the SFP-GE-Z= at each end of the link whenever the fiber-optic cable span is less than 15.5 miles (25 km).



**Note**

Optical fiber cables are commercially available; they are not available from Cisco.



**Note**

We strongly recommend cleaning optical fiber connections before attaching cables to equipment. See the “[Fiber Optic Cleaning Information](#)” section on page 6-23 for information.

Table 6-9 provides SFP port cabling specifications.

**Table 6-9 SFP Port Cabling Specifications**

SFP Module	Wavelength (nm)	Fiber Type	Core Size (microns)	Modal Bandwidth (MHz/km)	Cable Distance
100BASE-FX SFP-GE-F=	1270 1300 1380	MMF	62.5 2.5 50.0 50.0	500	6562 ft (2 km)
1000BASE-LX/LH SFP-GE-L=	1300	MMF <sup>1</sup>  SMF	62.5 50.0 50.0 9/10	500 400 500 —	1804 ft (550 m) 1804 ft (550 m) 1804 ft (550 m) 6.2 miles (10 km)
1000BASE-SX SFP-GE-S=	850	MMF	62.5 62.5 50.0 50.0	160 200 400 500	722 ft (220 m) 902 ft (275 m) 1640 ft (500 m) 1804 ft (550 m)
1000BASE-ZX SFP-GE-Z=	1550	SMF	9/10	—	43.5 miles (70 km)

1. A mode-conditioning patch cord is required. Using an ordinary patch cord with MMF, 1000BASE-LX/LH SFP modules, and a short link distance (tens of meters) can cause transceiver saturation resulting in an elevated bit error rate (BER). In addition, when using the LX/LH SFP module with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).

Table 6-10 provides SFP module power budget information.

**Table 6-10 SFP Module Transmit Power, Receive Power, and Power Budget**

SFP Module	Transmit Power		Receive Power		Power Budget
	Minimum	Maximum	Minimum	Maximum	
SFP-GE-F=	-23.5 dBm <sup>1</sup> -20 dBm <sup>2</sup>	-14 dBm <sup>1</sup> -14 dBm <sup>2</sup>	-33.5 dBm <sup>1</sup> -33.5 dBm <sup>2</sup>	-11.8 dBm <sup>1</sup> -11.8 dBm <sup>2</sup>	10 dBm <sup>1</sup> 13.5 dBm <sup>2</sup>
SFP-GE-L=	-9.5 dBm <sup>3</sup> -11.5 dBm <sup>4</sup>	-3 dBm <sup>5</sup>	-20 dBm	-3 dBm	7.5 dBm <sup>6</sup> and 8.0 dBm <sup>7</sup>
SFP-GE-S=	-9.5 dBm <sup>8</sup>	-4 dBm <sup>8</sup>	-17 dBm	0 dBm	7.5 dBm <sup>9</sup>
SFP-GE-Z=	0 dBm	5 dBm	-23 dBm	0 dBm	-24 dBm

1. For fiber type 50/125 mm SMF
2. For fiber type 62.5/125 mm SMF
3. For fiber types 9/125 μm SMF.
4. For fiber types 62.5/125 μm MMF and 50/125 μm MMF.
5. For fiber types 9/125 μm SMF, 62.5/125 μm MMF, and 50/125 μm MMF.
6. For fiber types 50/125 μm MMF and 62.5/125 μm MMF.
7. For fiber type 10 μm SMF.
8. For fiber types 50/125 μm, NA = 0.20 fiber and 62.5/125 μm, NA = 0.275 fiber.
9. For fiber types 50/125 μm MMF and 62.5/125 μm MMF.



Table 6-11 provides CWDM SFP module option information for the NPE-G2.

**Table 6-11 CWDM SFP Module Options**

Product Number	Color
CWDM-SFP-1470	Gray
CWDM-SFP-1490	Violet
CWDM-SFP-1510	Blue
CWDM-SFP-1530	Green
CWDM-SFP-1550	Yellow
CWDM-SFP-1570	Orange
CWDM-SFP-1590	Red
CWDM-SFP-1610	Brown

## Mode-Conditioning Patch Cord Description

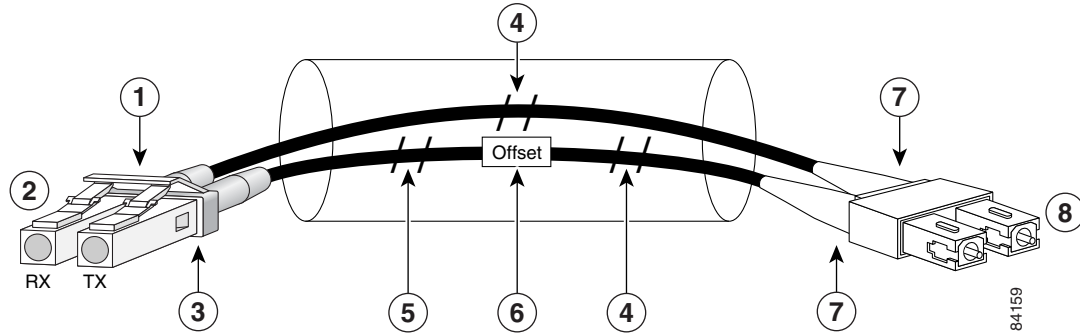
A mode-conditioning patch cord can be used with the SFP-GE-L= (SFP module) to allow reliable laser transmission between the single-mode laser source on the SFP module and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in Figure 6-11) to a graded-index multimode optical fiber. Figure 6-11 shows a diagram of the mode-conditioning patch cord assembly.

Figure 6-11 Mode-Conditioning Patch Cord for an SFP Module



1	Gray color identifier	5	Single-mode fiber
2	To Gigabit Ethernet interface	6	Offset
3	Blue color identifier	7	Beige color identifier
4	Multimode fiber	8	To cable plant

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASE LX and 1000BASE LH links.

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the SFP-GE-L= is compliant with the IEEE 802.3z standard for 1000BASE LX.

## Console and Auxiliary Port Connection Equipment

The NPE-G2 has a DCE-mode console port for connecting a console terminal, and a DTE-mode auxiliary port for connecting a modem or other DCE device (such as a CSU/DSU or other router) to your router. However, with an I/O controller also installed in the router, the default console and auxiliary ports are on the I/O controller, and you cannot access the console and auxiliary ports on the NPE-G2.



### Note

Both the console and the auxiliary ports are asynchronous serial ports; any devices connected to these ports must be capable of asynchronous transmission. (Asynchronous is the most common type of serial device; for example, most modems are asynchronous devices.)

The NPE-G2 uses RJ-45 media for console port and auxiliary port connections.

Before connecting a terminal to the console port, configure the terminal to match the router console port as follows: 9600 baud, 8 data bits, no parity, 2 stop bits (9600 8N2). After you establish normal router operation, you can disconnect the terminal.



**Note** When connecting to an auxiliary port on a Cisco 7200 VXR router, the port will not function at baud rates higher than 19.2k. If the baud rate on the connecting device is set higher than 19.2k, either garbled text or nothing will be displayed on the screen.

Refer to [Table 6-13](#) for a list of the pins used on the RJ-45-to-DB-25 adapters, used with an RJ-45 cable, to connect terminals and modems to the Cisco 7200 series routers. The cable you use may be a roll-over cable or a straight cable.

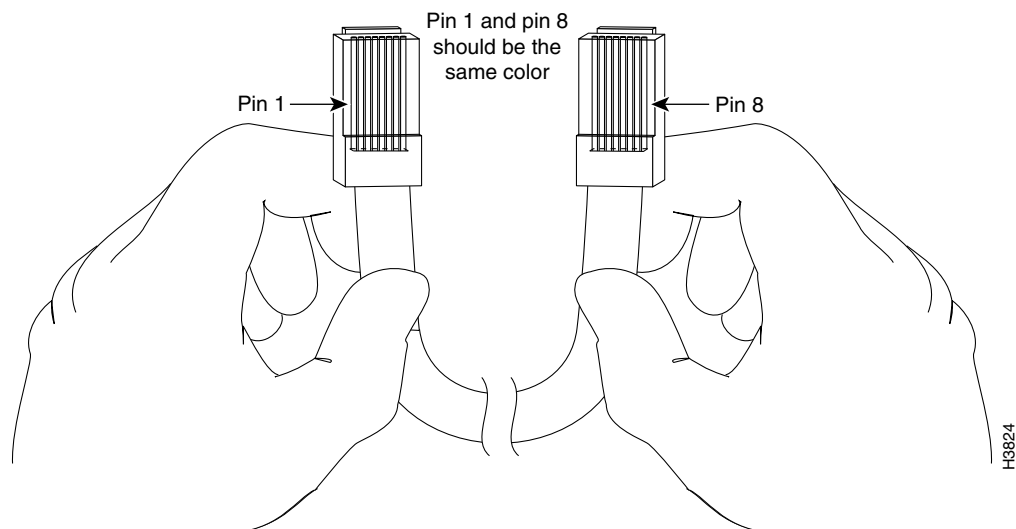
**Table 6-12 Pinouts for the RJ-45-to-DB-25 Adapters**

Adapter	DTE M/F Pins <sup>1</sup>	DCE M/F Pins	MMOD Pins <sup>2</sup>
1	4	5	5
2	20	6	8
3	2	3	3
4	7	7	7
5	7	7	7
6	3	2	2
7	6	20	20
8	5	4	4

1. The female data terminal equipment (FDTE) adapter that is available from Cisco is labeled “Terminal”.
2. The MMOD adapter that is available from Cisco is labeled “Modem”.

A roll-over cable can be detected by comparing the two modular ends of the cable. Holding the cables in your hand, side-by-side, with the tab at the back, the wire connected to the pin on the outside of the left plug should be the same color as the pin on the outside of the right plug. If your cable was purchased from Cisco, pin 1 will be white on one connector, and pin 8 will be white on the other (a roll-over cable reverses pins 1 and 8, 2 and 7, 3 and 6, and 4 and 5). (See [Figure 6-12](#).)

**Figure 6-12 Identifying a Roll-Over Cable**



The Cisco 7200 series routers ship with a roll-over cable. Connection to a terminal or a modem requires an RJ-45-to-DB-25 adapter, and possibly a DB-25-to-DB9 adapter. Refer to [Table 6-13](#) for the cable and adapter configurations that can be used to connect terminals and modems to the Cisco 7200 series routers.

**Table 6-13** Asynchronous Device Cabling Options

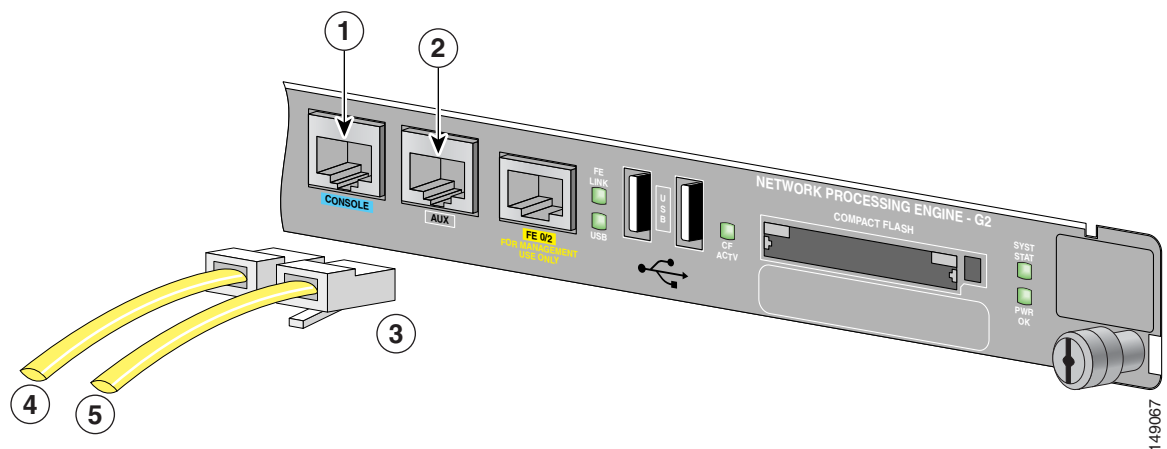
Access Server Port	RJ-45 Cable Type	DB-25 Adapter	End Device
Console or auxiliary	Roll-over	FDTE <sup>1</sup>	Terminal
Console or auxiliary	Straight	FDCE	Terminal
Auxiliary or console	Roll-over	MMOD <sup>2</sup>	Modem

1. The FDTE RJ-45-to-DB-25 adapter is labeled “Terminal.”

2. The MMOD RJ-45-to-DB-25 adapter is labeled “Modem.”

The console and auxiliary ports are configured as asynchronous serial ports. [Figure 6-13](#) shows the RJ-45 console and auxiliary port connections.

**Figure 6-13** Console and Auxiliary Port RJ-45 Connections



<b>1</b>	Console port	<b>4</b>	Cable to console terminal or DTE
<b>2</b>	Auxiliary port	<b>5</b>	Cable to modem or DCE
<b>3</b>	RJ-45 connectors		

A cable and adapter kit is available from Cisco (Cisco Product Number ACS-2500ASYN=). [Table 6-12](#) describes the cable and adapter configurations that can be used to connect terminals and modems to the console or the auxiliary port.

## RJ-45 Console Port Signals and Pinouts

The NPE-G2 console port supports Data Carrier Detect (DCD). [Table 6-14](#) lists the RJ-45 console port signals for the NPE-G2.

**Table 6-14 Console Port Signals for the NPE-G2**

Pin <sup>1</sup>	Signal	Direction	Description
1	CTS	Out	Clear To Send (tracks RTS)
2	DSR	Out	Data Set Ready (always on)
3	RXD	Out	Receive Data
4	GND	—	Signal Ground
6	TXD	In	Transmit Data
7	DTR	In	Data Terminal Ready
8	RTS	In	Ready To Send

1. Any pin not referenced is not connected.

## RJ-45 Auxiliary Port Signals and Pinouts

Table 6-15 lists the RJ-45 auxiliary port signals for the NPE-G2.

**Table 6-15 Auxiliary Port Signals for the NPE-G2**

Pin <sup>1</sup>	Signal	Direction	Description
1	RTS	Out	Ready To Send
2	DTR	Out	Data Terminal Ready
3	TXD	Out	Transmit Data
4	RING <sup>2</sup>	In	Ring Indication
5	GND	—	Signal Ground
6	RXD	In	Receive Data
7 <sup>3</sup>	DSR/DCD(RLSD)	In	Data Set Ready/Data Carrier Detect (Receive Line Signal Detect)
8	CTS	In	Clear To Send (tracks RTS)

1. Any pin not referenced is not connected.

2. RING is not supported on Cisco-supplied adapters. To use this pin, you must create a customized cable.

3. Pin 7 can be used as a DCD input for connection to a modem. The RJ-45-to-DB-25F adapter maps DCD to this pin when used with a straight-through cable.

## Fiber Optic Cleaning Information

We strongly recommend cleaning all optical fiber connections before reconnecting optical cables to equipment. For information about cleaning optical connectors, see the [Inspection and Cleaning Procedures for Fiber-Optic Connections](#) document and the [Compressed Air Cleaning Issues for Fiber-Optic Connections](#) document.





# CHAPTER 7

## NPE-G1 and NPE-G2 Installation and Configuration Information

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This chapter provides information on installing and configuring the NPE-G1 and NPE-G2 and contains the following sections:

- [Preparing for an Upgrade, page 7-2](#)
- [Copying the Configuration File, page 7-4](#)
- [Removing the Network Processing Engine, page 7-7](#)
- [Installing the NPE-G1 or NPE-G2, page 7-18](#)
- [Enabling the Second Processor on the NPE-G1, page 7-46](#)
- [Copying the Saved Configuration to NVRAM, page 7-52](#)
- [Auxiliary and Console Port Information, page 7-56](#)
- [Configuring the Native Gigabit Ethernet Interfaces, page 7-56](#)
- [Using show Commands to Check the Installation, page 7-59](#)
- [Upgrading the Cisco IOS Image and the Boot Helper \(Boot Loader\) Image, page 7-62](#)
- [Upgrading ROMmon on the NPE-G1 or NPE-G2, page 7-63](#)
- [Troubleshooting the Upgrade, page 7-65](#)
- [Upgrading FPGA on the NPE-G2, page 7-67](#)
- [Troubleshooting the NPE-G1 or NPE-G2, page 7-67](#)
- [Fiber Optic Cleaning Information, page 7-67](#)



### Note

The Cisco 7200 VXR routers and Cisco uBR7200 series routers use different models of the NPE-G1 and the NPE-G2 processors. For the Cisco 7200 VXR routers, order the NPE-G1 or NPE-G1= product. For the Cisco uBR7200 series routers, order the UBR7200-NPE-G1, UBR7200-NPE-G1=, UBR7200-NPE-G2, or UBR7200-NPE-G2= product.

---

**Tip**

Before you begin any removal or installation procedure, read [Chapter 8, “Preparation for Installation.”](#) Also, for the NPE-G1, see the *NPE-G1 Read Me First* document, at the following URL:

[http://www.cisco.com/en/US/products/hw/routers/ps341/prod\\_installation\\_guide09186a00805e396a.html](http://www.cisco.com/en/US/products/hw/routers/ps341/prod_installation_guide09186a00805e396a.html)

For the Cisco uBR7200-NPE-G1, see the *Cisco uBR7200-NPE-G1 Read Me First* document, at the following URL:

[http://www.cisco.com/en/US/products/hw/cable/ps2217/prod\\_pre\\_installation\\_guide09186a008017bde6.html](http://www.cisco.com/en/US/products/hw/cable/ps2217/prod_pre_installation_guide09186a008017bde6.html)

## Preparing for an Upgrade

**Note**

Cisco IOS Release 12.2 changed the behavior of the ROM monitor (ROMmon) during the bootup sequence. See the [“Boot Changes in Cisco IOS Release 12.2”](#) section on page 10-2 for more information.

Upgrading to the NPE-G1 or NPE-G2 is a different procedure than previous processor upgrades because of the following considerations:

- The NPE-G1 and NPE-G2 contain an I/O controller, which includes the bootflash and NVRAM memory. After you install the NPE-G1 or NPE-G2 in a chassis, you can no longer access the bootflash and NVRAM on the I/O controller. You therefore must make the existing Cisco IOS software image and configuration files available to the NPE-G1 or NPE-G2, either by putting these files on a CompactFlash Disk or on a TFTP server.
- The NPE-G1 and NPE-G2 include three Gigabit Ethernet interfaces. If you want to use these interfaces to replace the Ethernet or Fast Ethernet interfaces on the existing I/O controller, you must configure the new interfaces before they can be used to access the network. If you are also removing the existing I/O controller, you must remove the configuration for its Ethernet or Fast Ethernet interfaces.

**Note**

The NPE-G2 provides a Fast Ethernet Management port, as well as three RJ-45 Gigabit Ethernet ports.

- The NPE-G1 and NPE-G2 use Type 1 CompactFlash Disk memory instead of the Type 2 Flash Disk memory used in existing I/O controllers. You must transfer any information currently saved on Flash Disks to CompactFlash Disks so that it can be used after the upgrade to the NPE-G1 or NPE-G2.

**Note**

If you are upgrading to an NPE-G2 from an NPE-G1, you do not need to perform the following procedure.

To ensure a smooth upgrade, perform the following procedure *only* if you are upgrading to an NPE-G1 or NPE-G2 from an NPE-400 or earlier network processing engine.



Before you install an NPE-G1 or NPE-G2 in an existing router and remove the existing processor and I/O controller, do the following:

- 
- Step 1** Copy the configuration file from the existing router to a TFTP server, Flash Disk, or PC Card. See the “[Copying the Configuration File](#)” section on page 7-4 for details.
- Step 2** Modify the configuration file to accommodate the new Gigabit Ethernet interfaces on the NPE-G1 or NPE-G2. If you are also planning to remove the I/O controller, also remove the configuration lines for the Ethernet or Fast Ethernet interfaces on the I/O controller. See the “[Configuring the Native Gigabit Ethernet Interfaces](#)” section on page 7-56 for guidelines.
- Step 3** Copy the modified configuration file to a CompactFlash Disk that can be used on the NPE-G1 or NPE-G2. If you are not planning on removing the existing I/O controller, you can do this by copying the configuration to a Flash Disk, as described in Step 1, before you install the NPE-G1 or NPE-G2. Then you can keep the Flash Disk in the I/O controller and copy it to a CompactFlash Disk in the NPE-G1 or NPE-G2 after you have finished installing the NPE-G1 or NPE-G2.

If you are planning on removing the existing I/O controller, you can copy the configuration file to a CompactFlash Disk in the following ways:

- Copy the configuration file to a TFTP server and then copy it to a CompactFlash Disk on an existing NPE-G1 or NPE-G2.
- Copy the configuration file to a Type 2 Flash Disk using the existing I/O controller, as described in the “[Copying the Configuration File to a Flash Disk or PC Card](#)” section on page 7-4. Then use a multi-function reader that accommodates both Type 1 CompactFlash Disk and Type 2 Flash Disk memory cards to transfer the configuration file to the CompactFlash Disk.
- Use a Type 1-to-Type 2 adapter to convert the CompactFlash Disk to the Flash Disk form factor. Then insert the CompactFlash Disk and adapter into the existing I/O controller and copy the configuration file to it, as described in Step 1.



---

**Note** The CompactFlash Disk must be formatted before you can write any files to it. The CompactFlash Disk shipped with the NPE-G1 or NPE-G2 is already formatted, but a spare CompactFlash Disk must be formatted using the **format** command. Do not format the CompactFlash Disk in a PC or other workstation because the router cannot use CompactFlash Disks that are formatted by other computers. After the CompactFlash Disk is properly formatted, however, you can write to it using any PC or workstation that recognizes Type 2 CompactFlash Disk memory.

---

- Step 4** (Optional) Copy the proper Cisco IOS software image (see [Table 8-4 on page 8-4](#)) to the CompactFlash Disk, using the same technique you used to copy the configuration file in Step 3. You do not need to perform this step if you plan to boot the router from a TFTP server, but you must add the proper **boot** configuration command to the configuration file when you modify it in Step 2.
-

## Copying the Configuration File



### Caution

Before powering down the router to install the NPE-G1 or NPE-G2, you must save the current configuration to a Flash Disk, PC Card, Trivial File Transfer Protocol (TFTP) file server, or PC before you install the NPE-G1 or NPE-G2, or the configuration will be lost and you will have to manually re-enter your configuration.

Cisco IOS looks to the NPE-G1 or NPE-G2 NVRAM for the startup running configuration, because the NPE-G1 or NPE-G2, by default, stores the running configuration, whether or not an I/O controller is installed with the NPE-G1 or NPE-G2.

The following sections provide instructions for copying the file to a Flash Disk, PC Card, or TFTP server, and for copying it manually using a terminal program on a PC:

- [Copying the Configuration File to a Flash Disk or PC Card, page 7-4](#)
- [Copying the Configuration File to a TFTP Server, page 7-5](#)
- [Copying the Configuration File Using a PC, page 7-7](#)

## Copying the Configuration File to a Flash Disk or PC Card

Use the following instructions for copying the router configuration file to a Flash Disk or PC Card.



### Caution

If the NPE-G1 or NPE-G2 will be installed in a router with either a C7200-I/O-GE/E or C7200-I/O-2FE/E I/O controller, copy your running configuration to a Flash Disk, not a PC Card. PC Cards are not supported on these I/O controllers when an NPE-G1 or NPE-G2 is present. If you copy the running configuration to a PC Card with these I/O controllers present, you will not be able to retrieve the running configuration after the NPE-G1 or NPE-G2 is installed.

- Step 1** Insert the Flash Disk or PC Card into I/O controller PC Card slot 0. If slot 0 is full, use slot 1. If you need to format the Flash Disk, go to Step 2. If the Flash Disk is already formatted, go to Step 3.
- Step 2** Use the **format disk0:** command to format a Flash Disk in slot 0. Use the **format disk1:** command to format a Flash Disk in slot 1. If you are using a PC card, use **slot0** or **slot1** as part of the command.

```
System# format disk0:
Format operation may take a while. Continue: [confirm]
Format operation will destroy all data in 'disk0:'. Continue? [confirm]
Format :Drive communication and 1st Sector Write OK...
Writing Monlib sectors
.....
Monlib write complete
Format:All system sectors written. OK...
Format:Total sectors in formatted partition:81760
Format:Total bytes in formatted partition:49861120
Format:Operation completed successfully.

Format of disk0:complete
```

The Flash Disk is now formatted and ready to use in the system on which you formatted it.

- Step 3** Make sure you are at the privileged level of the EXEC command interpreter (check the system prompt for a pound sign [#]). If the system prompt does not have a pound sign (#), enter **enable**, and then your password.
- Step 4** Enter the **show running-config** command to display the router's running configuration. Ensure that the configuration information is complete and correct. If it is not, use the **configure** command to add or modify the existing configuration. Then enter the **copy running-config** command. If you have a Flash Disk 0 or 1, use **disk0** or **disk1** as part of the command. If you are using a PC Card, use **slot0** or **slot1** as part of the command.
- Step 5** To copy the running configuration file to the Flash Disk or PC Card, enter the **copy running-config disk0: filename** or **copy running-config slot0: filename** command:
- ```
System# copy running-config disk0: filename
```

---

You have finished copying the running configuration file to the Flash Disk or PC Card.

Go to the [“Removing the Network Processing Engine” section on page 7-7](#) for instructions on removing the current network processing engine or network services engine and replacing it with the NPE-G1 or NPE-G2.

## Copying the Configuration File to a TFTP Server

Before copying the router configuration file to a TFTP file server, check the following items:

- A console terminal is connected to the console port on the I/O controller or a Telnet session is established to the router.
- The router is connected to a network supporting a file server (remote host).
- The remote host supports the TFTP application.
- You have the name or address of the remote host.

Complete the following steps to copy the router's configuration file to a remote host:

- 
- Step 1** Make sure you are at the privileged level of the EXEC command interpreter (check the system prompt for a pound sign [#]). If the system prompt does not have a pound sign (#), enter **enable**, and then your password.
- Step 2** Use the **ping** command to check the connection between the router and the remote host.
- Step 3** Enter the **show running-config** command to display the router's running configuration. Ensure that the configuration information is complete and correct. If it is not, use the **configure** command to add or modify the existing configuration. Then enter the **copy running-config startup-config** command to save the retrieved configuration in NVRAM. NVRAM uses lithium batteries to maintain its contents when disconnected from power.



**Note** Refer to the appropriate software documentation listed in the [“Related Documentation” section on page iii](#) for descriptions of the configuration options available for the system and individual interfaces, and for specific configuration instructions.

---

- Step 4** Enter the **copy startup-config tftp** command. The EXEC command interpreter prompts you for the name or IP address of the remote host that is to receive the configuration file. (The prompt might include the name or address of a default file server.)

```
Router# copy startup-config tftp
Remote host []?
```

- Step 5** Enter the name or IP address of the remote host. In the following example, the name of the remote host is *servername*:

```
Router# copy startup-config tftp
Remote host []? servername
Translating "servername"...domain server (10.1.1.1) [OK]
```

- Step 6** The EXEC command interpreter prompts you for the name of the file that will contain the configuration. By default, the system appends *-config* to the router's name to create the new filename. Press **Return** to accept the default filename, or enter a different name for the file before pressing **Return**. In the following example, the default is accepted:

```
Name of configuration file to write [Router-config]?
Write file Router-config on host 10.1.1.1? [confirm]
Writing Router-config.....
```

- Step 7** Before the router executes the copy process, it displays the instructions you entered for confirmation. If the instructions are not correct, enter **n** (no), and then press **Return** to stop the process. To accept the instructions, press **Return**, or **y** and then press **Return**; the system begins the copy process. In the following example, the default is accepted:

```
Write file Router-config on host 10.1.1.1? [confirm]
Writing Router-config: !!!! [ok]
```

While the router copies the configuration to the remote host, it displays a series of exclamation points (! ! !) or periods ( . . ). The !!!! and [ok] indicate that the operation is successful. A display of . . . [timed out] or [failed] indicates a failure, which would probably be because of a network fault or the lack of a writable, readable file on the remote file server.

- Step 8** Check the result of the copy process.

- If the display indicates that the process was successful (with the series of exclamation points [! ! !] and [ok]), the copy process is complete. The configuration file is safely stored in the temporary file on the remote file server.
- If the display indicates that the process failed (with the series of periods [ . . . ] as shown in the following example), your configuration was not saved:

```
Writing Router-config .....
```

- Step 9** If your configuration was not saved, repeat the preceding steps, or select a different remote file server and repeat the preceding steps. If you are unable to copy the configuration to a remote host successfully, contact your network administrator or see the [“Obtaining Documentation and Submitting a Service Request”](#) section on page iv for instructions on contacting technical assistance.

---

This completes the procedure for copying the configuration file to a TFTP server. Proceed to [“Removing the Network Processing Engine”](#) section on page 7-7.

## Copying the Configuration File Using a PC

Complete the following steps to copy the router's configuration file to a text file on a PC connected to the router's console port.

- 
- Step 1** Connect a serial port on the PC to the router's console port. Start a terminal program on the PC and configure it for the same baud rate, parity, and stop-bits that the console port is using.
  - Step 2** Turn on the terminal program's capture buffer so that it will save all output to a text file.
  - Step 3** Enter the **show startup-config** command in privileged EXEC mode to display the router's startup configuration.



---

**Note** Refer to the appropriate software documentation listed in the [“Related Documentation”](#) section on page iii for descriptions of the configuration options available for the system and individual interfaces, and for specific configuration instructions.

---

- Step 4** When the router has completed displaying the configuration, turn off the terminal program's capture buffer and save the configuration file to the disk on the PC.
  - Step 5** (Optional) Use a text editor on the PC to modify the configuration, as needed.
- 

This completes the procedure for copying the configuration file to a PC. Proceed to [“Removing the Network Processing Engine”](#) section on page 7-7.

## Removing the Network Processing Engine

Before you begin any removal or installation procedure, read [Chapter 8, “Preparation for Installation.”](#) To install the NPE-G1 or NPE-G2, follow the instructions in this chapter for removal of an existing network processing engine or network services engine and installation of the NPE-G1 or NPE-G2.



---

**Note** If you are removing the I/O controller, and do not plan to replace it, you must install an I/O controller blank panel (Cisco Product Number IO-CONTROLR-BLANK=) in the I/O controller slot. See the [Input/Output Controller Replacement Instructions](#) for information on removing an I/O controller and installing an I/O controller blank panel.

If you are installing a Port Adapter Jacket Card, see the [Port Adapter Jacket Card Installation Guide](#) for installation information.

---

## Ensuring Easy Access to the Router

If your Cisco 7200 VXR router or Cisco uBR7200 series router is installed in a standard 19-inch, 4-post or telco-type rack, cables from other equipment in the rack might obstruct access to the rear of the router. Also, rack power strips or other permanent fixtures may obstruct access to the router. Review the following guidelines to ensure easy access to the rear of the router when it is installed in a rack. This is particularly important because the NPE-G1 and NPE-G2 have interfaces that require cabling on the rear of the router.

If the router is not installed in a rack, or if you already have clear access to the rear of the router, proceed to the [“Powering Down the Router and Disconnecting Input Power”](#) section on page 7-8.

Use the following guidelines to ensure easy access to the rear of the router when it is installed in a rack:

- Ensure that you have at least 3 to 4 feet (0.91 to 1.22 meters) of working space at the rear of the router.
- If cables from other equipment in the rack fall in front of the rear end of the router, carefully gather the cables (using care not to strain or stress them) and use cable ties to anchor them away from the rear of the router.
- If access to the rear of the router is partially blocked by a power strip or some other permanent rack fixture, detach the router from the rack and carefully slide it forward until there is enough clearance to remove the power supply, the network processing engine, and the subchassis from the router.



### Caution

Make sure that at least one other person is available to support the front of the router as you slide it out from the rack and, if necessary, to continue to support it while you remove and insert the power supply, network processing engine, or subchassis.

## Powering Down the Router and Disconnecting Input Power

Complete the steps in the following sections to power down the router and disconnect input power.



### Warning

**This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power cords before servicing. Statement 83**

## Powering Down the Router

To power down a Cisco 7200 VXR router or Cisco uBR7200 series router, complete the following steps:



### Note

Before powering down the router, use the **copy running-config startup-config** command to save the router's running configuration to a Flash Disk, PC Card, TFTP server, or PC. If you do not, you will have to manually re-enter the configuration after you install the NPE-G1 or NPE-G2 and power on the router. See the [“Copying the Configuration File”](#) section on page 7-4.

### Step 1

Facing the rear of the router, place the power switch on the power supply in the off (O) position. Repeat this action if a second power supply is installed in the router.



---

**Note** When powering off the router, wait a minimum of 30 seconds before powering it on again.

---

- Step 2** Observe the following items:
- The green OK LED on the power supply turns off.
  - The fans stop operating.
  - The LEDs on the I/O controller turn off.
  - The LEDs on the port adapters turn off.
- 



**Caution** When the power switch on a Cisco uBR7200 series power supply is turned to the off (O) position, the power supply enters a reset cycle for 90 seconds. Wait at least 90 seconds before turning the power switch back to the on (I) position. If you do not wait the full 90 seconds, the power supply does not restart.

---

This completes the procedure for powering down the router. The following sections provide instructions on disconnecting power from the Cisco 7200 VXR routers and Cisco uBR7200 series routers:

- [Disconnecting AC-Input Power from a Cisco 7200 VXR Router, page 7-9](#)
- [Disconnecting AC-Input Power from a Cisco uBR7246VXR Router, page 7-10](#)
- [Disconnecting AC-Input Power from a Cisco uBR7225VXR Router, page 7-11](#)
- [Disconnecting DC-Input Power from a Cisco 7200 VXR Router, page 7-11](#)
- [Disconnecting DC-Input Power from a Cisco uBR7246VXR Router, page 7-13](#)

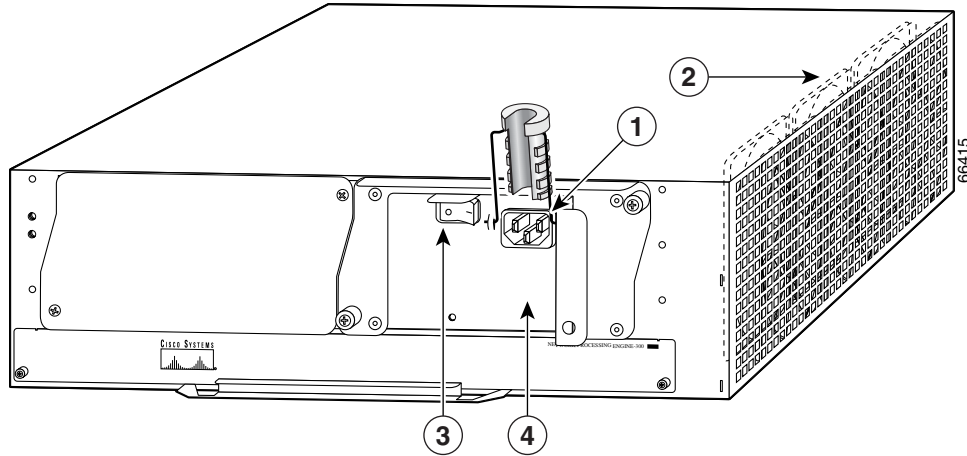
## Disconnecting AC-Input Power from a Cisco 7200 VXR Router

To disconnect AC-input power from a Cisco 7200 VXR router, complete the following steps:

---

- Step 1** Unplug the input power cable from the power source.
- Step 2** Push up on the cable-retention clip that secures the input power cable to the router power supply.
- Step 3** Unplug the other end of the input power cable from the power supply. See [Figure 7-1](#).

Figure 7-1 Disconnecting Power from a Cisco 7200 VXR Router AC-Input Power Supply



|   |                     |   |                       |
|---|---------------------|---|-----------------------|
| 1 | AC-input receptacle | 3 | Power switch          |
| 2 | Internal fans       | 4 | AC-input power supply |

**Step 4** Repeat Step 1 through Step 3 if a second power supply is installed.

This completes the procedure for disconnecting AC-input power from a Cisco 7200 VXR router. Go to the [“Removing the NPE or NSE-1”](#) section on page 7-16.

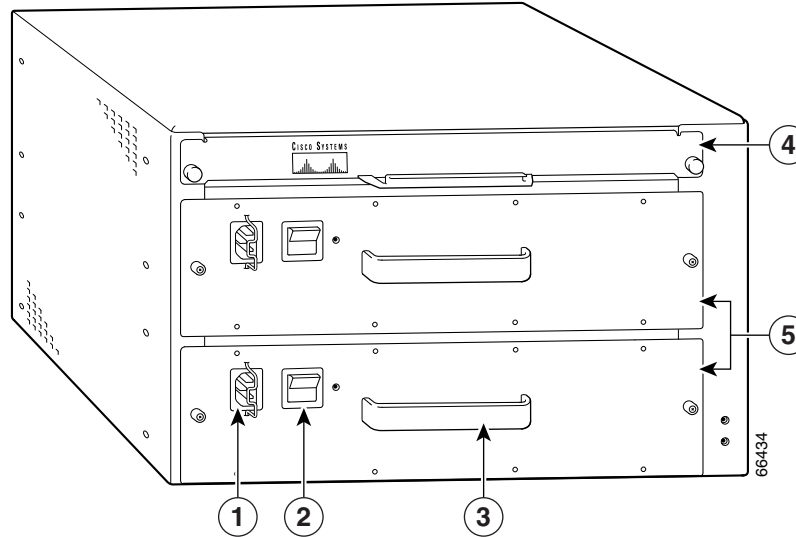
## Disconnecting AC-Input Power from a Cisco uBR7246VXR Router

To disconnect AC-input power from a Cisco uBR7246VXR router, complete the following steps:

- Step 1** Unplug the input power cable from the power source.
- Step 2** Push the cable-retention clip that secures the input power cable to the router power supply to the left.
- Step 3** Unplug the other end of the input power cable from the power supply. See [Figure 7-2](#).



**Figure 7-2** Disconnecting Power from a Cisco uBR7246VXR AC-Input Power Supply



|          |                     |          |                           |
|----------|---------------------|----------|---------------------------|
| <b>1</b> | AC-input receptacle | <b>4</b> | Network processing engine |
| <b>2</b> | Power switch        | <b>5</b> | AC-input power supply     |
| <b>3</b> | Handle              |          |                           |

**Step 4** Repeat Step 1 through Step 3 if a second power supply is installed.

This completes the procedure for disconnecting AC-input power from a Cisco uBR7246VXR router. Go to the [“Removing the NPE or NSE-1”](#) section on page 7-16.

## Disconnecting AC-Input Power from a Cisco uBR7225VXR Router

To disconnect AC-input power from a Cisco uBR7225VXR router, complete the following steps:

- Step 1** Unplug the input power cable from the power source.
- Step 2** Unplug the other end of the input power cable from the power supply.



**Note** The Cisco uBR7225VXR router power supply does not have a cable retention-clip.

## Disconnecting DC-Input Power from a Cisco 7200 VXR Router

To disconnect DC-input power from a Cisco 7200 VXR router, complete the following steps.

**Warning**

Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. Statement 332

**Warning**

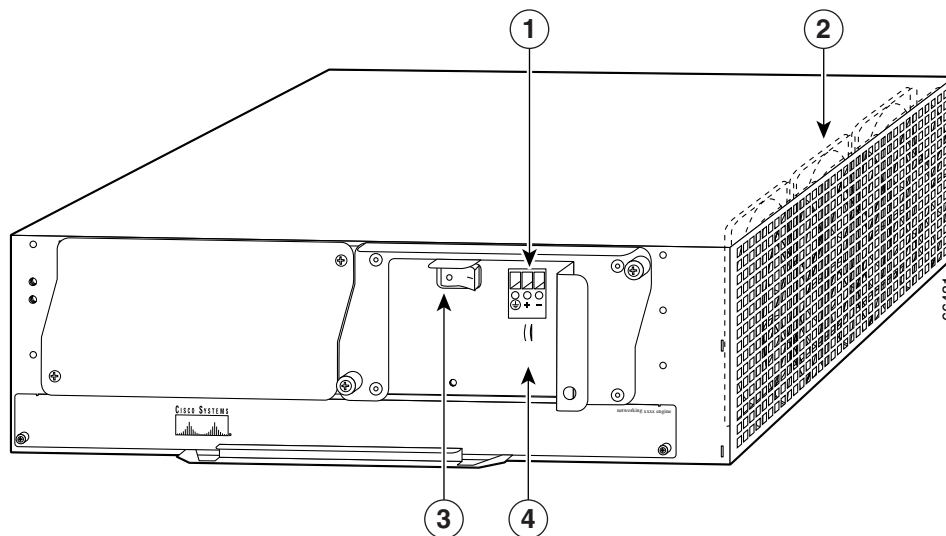
When you install the unit, the ground connection must always be made first and disconnected last. Statement 42

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position. (For the Cisco 7200 VXR routers, see [Figure 7-3](#).)
- Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.
- Step 3** Disconnect the -V and +V leads. You can leave the ground cable connected. For a Cisco 7200 VXR router, remove the cable tie that secures the -V, +V, and ground leads to the power supply faceplate. Save the cable tie.

**Note**

The cable tie that accompanied your Cisco 7200 VXR router DC-input power supply can be removed and replaced on the power supply without the use of a tool. If you secured the DC-input power supply leads to the power supply faceplate using a different type of cable tie, use a wire stripper to cut that cable tie from the power supply.

**Figure 7-3** Disconnecting Power from a Cisco 7200 VXR Router DC-Input Power Supply



|   |                     |   |                       |
|---|---------------------|---|-----------------------|
| 1 | DC-input receptacle | 3 | Power switch          |
| 2 | Internal fans       | 4 | DC-input power supply |

- Step 4** Using a 3/16-inch flat-blade screwdriver, loosen the screw below the +V lead receptacle and pull the lead from the connector. See [Figure 7-3](#).

**Step 5** Repeat this step for the –V lead and the ground lead.



**Note** The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

**Step 6** Repeat Step 1 through Step 6 if a second power supply is installed.

This completes the procedure for disconnecting DC-input power from a Cisco 7200 VXR router. Go to the [“Removing the NPE or NSE-1” section on page 7-16](#).

## Disconnecting DC-Input Power from a Cisco uBR7246VXR Router

To disconnect DC-input power from a Cisco uBR7246VXR router, complete the following steps.



### Warning

**Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322

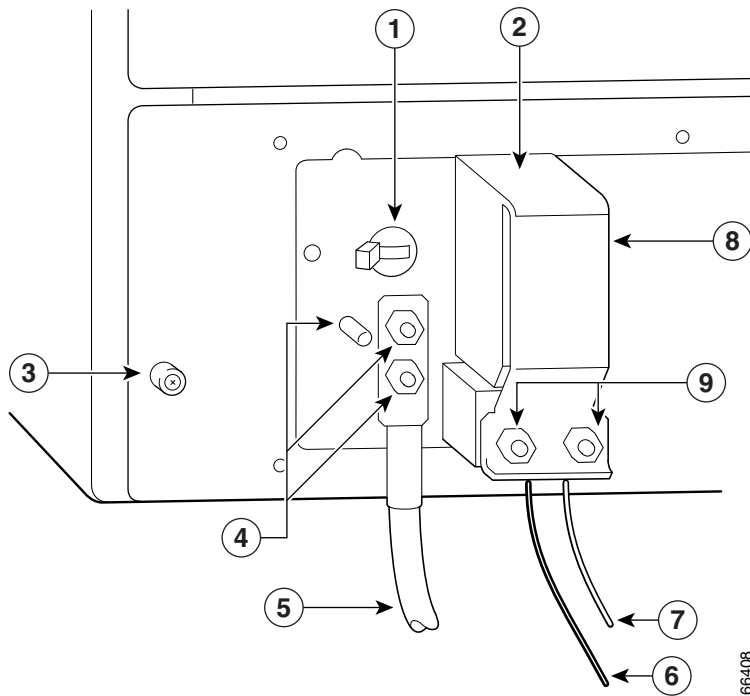


### Warning

**When you install the unit, the ground connection must always be made first and disconnected last.** Statement 42

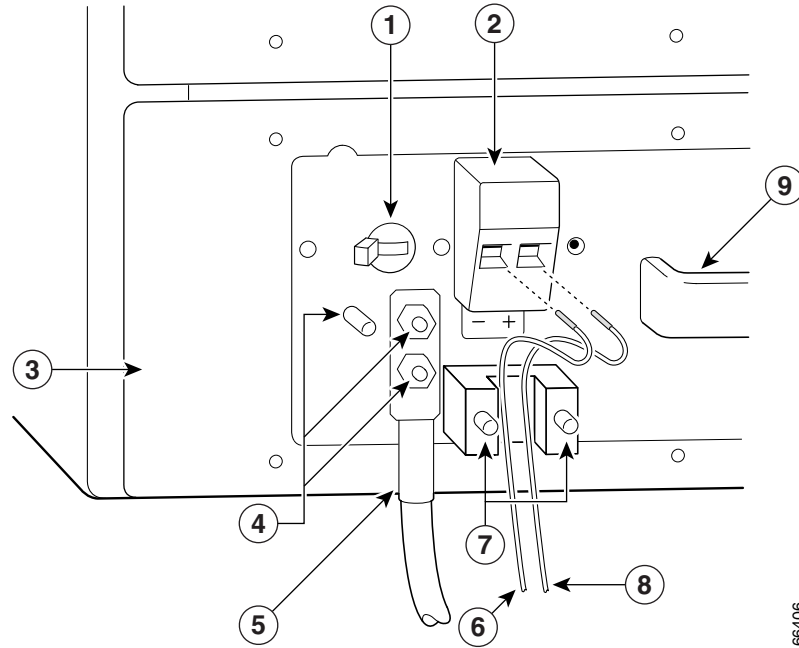
- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Ensure that no current is running through the –V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.
- Step 3** Use a 7-mm wrench or nut driver (or adjustable wrench) to loosen and remove the two M4 nuts from the strain-relief cover that secures the –V and the +V leads to the power supply faceplate. See [Figure 7-4](#).

**Figure 7-4** Removing the Strain-Relief Cover from a Cisco uBR7246VXR Router DC-Input Power Supply



|   |                          |   |                     |
|---|--------------------------|---|---------------------|
| 1 | Power switch             | 6 | -V lead             |
| 2 | Power receptacle         | 7 | +V lead             |
| 3 | Captive screw            | 8 | Strain-relief cover |
| 4 | M5 grounding receptacles | 9 | M4 nuts and studs   |
| 5 | M5 grounding lug         |   |                     |

- Step 4** Using a 3/16-inch flat-blade screwdriver, loosen the screw below the +V lead receptacle and pull the lead from the connector. Repeat this step for the -V lead only. See [Figure 7-5](#).

**Figure 7-5** Disconnecting Power from a Cisco uBR7246VXR DC-Input Power Supply

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|   |                          |   |          |
|---|--------------------------|---|----------|
| 1 | Power switch             | 6 | -V lead  |
| 2 | Power receptacle         | 7 | M4 studs |
| 3 | DC Power supply          | 8 | +V lead  |
| 4 | M5 grounding receptacles | 9 | Handle   |
| 5 | M5 grounding lug         |   |          |

- Step 5** Using an 8-mm wrench or nut driver (or adjustable wrench), loosen and remove the two M5 nuts that secure the two-hole grounding lug to the grounding receptacle, and pull the grounding lug and lead from the receptacle.



**Note** The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

- Step 6** Repeat the steps above to disconnect a secure power supply.

This completes the procedure for disconnecting DC-input power from a Cisco uBR7246VXR router. Go to the following section, "[Removing the NPE or NSE-1.](#)"

## Removing the NPE or NSE-1

To remove the NPE or NSE-1 from a Cisco 7200 VXR router, a Cisco uBR7246VXR or a Cisco UBR7225VXR router complete the following steps.

**Note**

The weight of installed power supplies in your Cisco 7200 VXR or Cisco uBR7246VXR router might make it difficult to remove the network processing engine. If you have difficulty, first remove the power supplies from the chassis, and then remove the network processing engine. See the [“Removing and Replacing an AC-Input or DC-Input Power Supply”](#) section on page 10-14 for information on removing and replacing an installed power supply.

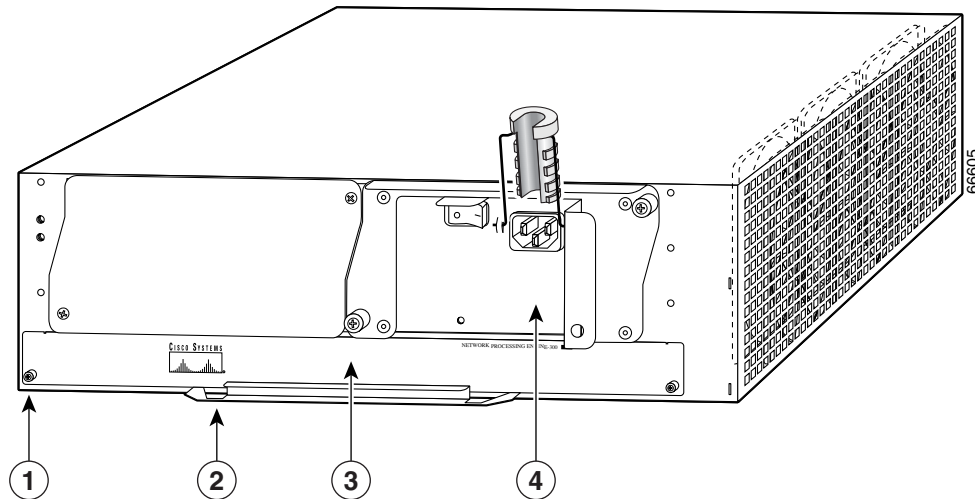
**Note**

If you have difficulty installing a network processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, network processing engine and I/O controller from the chassis and reinstall them. Install the network processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

- 
- Step 1** Power down the router and disconnect the input power cable. (See the [“Powering Down the Router and Disconnecting Input Power”](#) section on page 7-8.)
- Step 2** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.
- Step 3** Using a number 2 Phillips or a 3/16-inch flat-blade screwdriver, loosen the two captive installation screws on the faceplate of the network processing engine. (See [Figure 7-6](#).)

If the router is not installed in a standard 19-inch, 4-post or telco-type rack, skip to [Step 7](#). If the router is installed in a rack, determine if any permanent rack fixtures, such as a power strip, are obstructing access to the rear of the router. If a rack fixture is obstructing access to the router, proceed with [Step 4](#).

Figure 7-6 Cisco 7200 VXR Router NPE Captive Installation Screws and Handle



|   |                            |   |                                                      |
|---|----------------------------|---|------------------------------------------------------|
| 1 | Captive installation screw | 3 | Network processing engine or network services engine |
| 2 | Handle                     | 4 | AC-input power supply                                |

- Step 4** Using a 3/16-inch flat-blade screwdriver, loosen the screws that secure the router to the front mounting strips of the rack.
- Step 5** Position at least one person in front of the rack to support the front underside of the router.
- Step 6** From the rear of the rack, carefully push the front of the router out of the rack until there is enough clearance to remove the network processing engine.
- Step 7** Grasp the network processing engine handle and carefully pull the network processing engine from its chassis slot.

**Caution**

Handle the network processing engine by the carrier edges and handle only; never touch the printed circuit board components or connector pins.

- Step 8** Place the NPE on an antistatic surface with its printed circuit board components facing upward, or in a static shielding bag. If you are returning the network processing engine to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing an installed NPE. For instructions on installing the NPE-G1 or NPE-G2, go to the [“Installing the NPE-G1 or NPE-G2”](#) section on page 7-18.

# Installing the NPE-G1 or NPE-G2

To install the NPE-G1 or NPE-G2 in the router, use the following procedures:

- [Basic Guidelines](#), page 7-18
- [Installing a CompactFlash Disk](#), page 7-19
- [Installing a USB Flash Memory Module or eToken—NPE-G2](#), page 7-19
- [Installing an SFP Module—NPE-G2](#), page 7-20
- [Installing a GBIC—NPE-G1](#), page 7-23
- [Replacing the DIMM on the NPE-G2](#), page 7-24
- [Upgrading the SDRAM SODIMMs on the NPE-G1 \(Optional\)](#), page 7-26
- [Inserting the NPE-G1 or NPE-G2 into the Router](#), page 7-28
- [Attaching the Rear Cable-Management Brackets and Cables \(Optional\)](#), page 7-29
- [Reconnecting Input Power and Powering Up the Router](#), page 7-35

## Basic Guidelines



### Note

If you have difficulty installing a network processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, network processing engine and I/O controller from the chassis and reinstall them. Install the network processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

Use the following guidelines when installing the NPE-G1 or NPE-G2:

- Step 1** Ensure that the router is powered down and the input power cable is disconnected from the router and the power source. See the [“Powering Down the Router and Disconnecting Input Power”](#) section on page 7-8.
- Step 2** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.
- Step 3** Remove the NPE-G1 or NPE-G2 from its static shielding bag.
- Step 4** When touching the NPE-G1 or NPE-G2, use both hands, grasp the NPE-G1 or NPE-G2 by its metal carrier edges, and orient it so that its printed circuit board components face upward.



### Caution

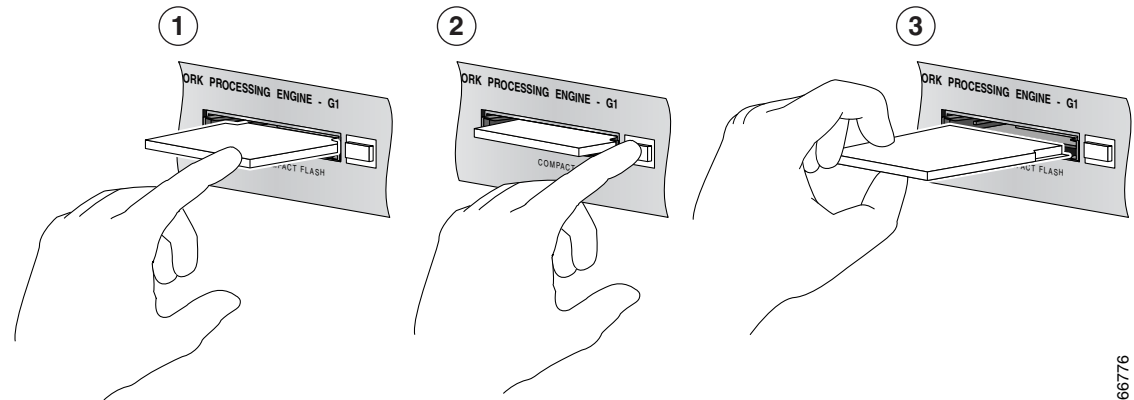
Handle the NPE-G1 or NPE-G2 by the carrier edges and handle only; never touch the printed circuit board components or connector pins.



## Installing a CompactFlash Disk

Use the following instructions to install the CompactFlash Disk.

**Figure 7-7** Installing a CompactFlash Disk



|          |                                                              |          |                                |
|----------|--------------------------------------------------------------|----------|--------------------------------|
| <b>1</b> | Inserting the CompactFlash Disk                              | <b>3</b> | Removing the CompactFlash Disk |
| <b>2</b> | Pressing the ejector button to release the CompactFlash Disk |          |                                |

- 
- Step 1** Turn the CompactFlash Disk so that the label is facing down.
- Step 2** Slide the CompactFlash Disk into the CompactFlash Disk slot.
- Step 3** To remove the CompactFlash Disk, push the ejector button, and gently pull the CompactFlash Disk from its slot.
- 

You are finished installing the CompactFlash Disk. For more information on using the CompactFlash Disk, see *Using the Flash Disk* at the following URL:  
[http://www.cisco.com/en/US/products/hw/routers/ps341/prod\\_installation\\_guide09186a00802a6394.html](http://www.cisco.com/en/US/products/hw/routers/ps341/prod_installation_guide09186a00802a6394.html)

For instructions on installing an SFP module in the NPE-G2, go to the “[Installing an SFP Module—NPE-G2](#)” section on page 7-20.

For instructions on installing a Gigabit Interface Converter (GBIC) in the NPE-G1, go to the “[Installing a GBIC—NPE-G1](#)” section on page 7-23.

## Installing a USB Flash Memory Module or eToken—NPE-G2

To connect a Cisco USB Flash memory module or the Aladdin USB eToken Pro key to the NPE-G2 USB port, simply insert the module into the port as shown in [Figure 7-8](#). The USB Flash memory module can be inserted in only one way, and can be inserted or removed regardless of whether the router is powered up or not.

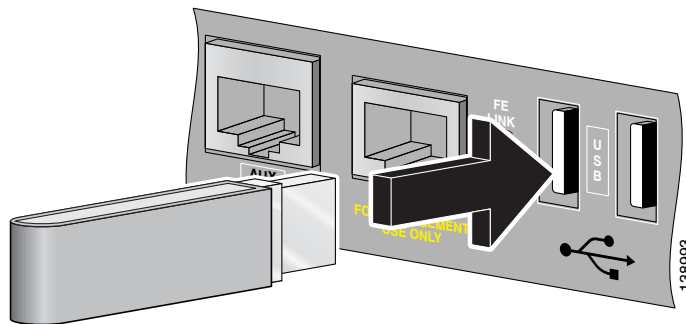
**Caution**

Do not remove a USB Flash memory module when a read or write operation to the USB Flash memory module is in progress. The router might reload, or the USB Flash memory module can be damaged.

**Note**

Only Cisco USB Flash memory modules and the Aladdin USB eToken Pro key are supported by Cisco routers.

**Figure 7-8** Connecting a USB Flash Memory Module to a Router USB Port

**Note**

For detailed information about the Cisco IOS commands that support USB Flash memory modules, see the [Cisco USB eToken and USB Flash Features Support](#) document.

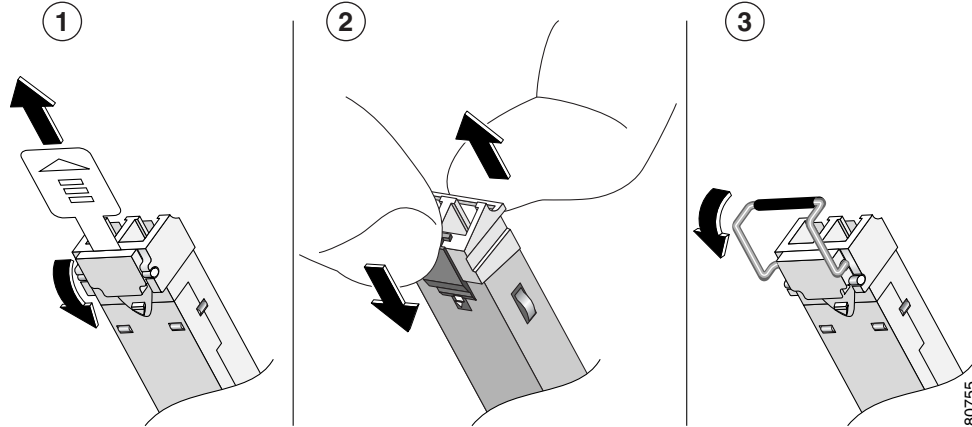
Go to the “[Inserting the NPE-G1 or NPE-G2 into the Router](#)” section on [page 7-28](#) for instructions on installing the NPE-G1 or NPE-G2 in the chassis.

## Installing an SFP Module—NPE-G2

**Note**

The SFP module is a separately orderable part and ships installed in your NPE-G2. However, if you are adding a SFP module, you must install the SFP module before you connect the cables to it. We strongly recommend cleaning optical cable connectors before connecting them to the SFP modules. See the “[Fiber Optic Cleaning Information](#)” section on [page 7-67](#).

Figure 7-9 Types of SFP Module Latches



|   |                       |   |             |
|---|-----------------------|---|-------------|
| 1 | Sliding latch         | 3 | Swing latch |
| 2 | Swing and slide latch |   |             |



**Note**

The SFP module must be installed before you connect the cables to it.

The SFP module has three types of latches, which are also the removal mechanism. See Figure 7-9. There is no correlation of the type of latch to the model (such as SX or LH) or technology type (such as Gigabit Ethernet) of SFP modules. Always read the label on the SFP module to determine the technology type, and model. You can install and remove Gigabit Ethernet SFP modules with power on to the system. Disconnect all cables before removing or installing a Gigabit Ethernet SFP module. We strongly recommend that you do *not* install or remove the SFP module with optical fiber cables attached to it. SFP modules are keyed to prevent incorrect insertion.



**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



**Warning**

**Class 1 laser product.** Statement 1008



**Warning**

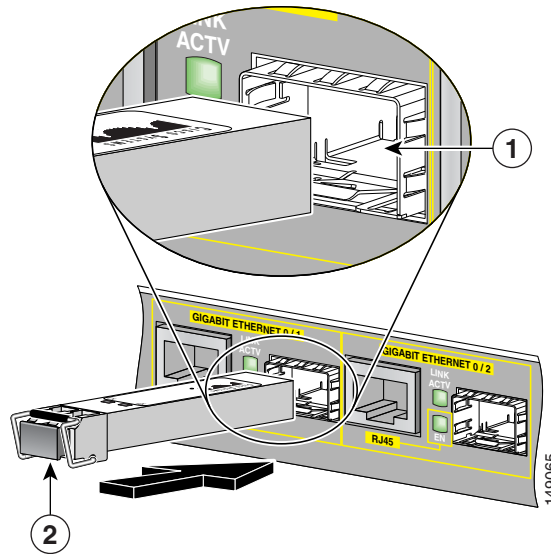
**Class 1 LED product.** Statement 1027



**Warning**

**During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.** Statement 94

Figure 7-10 Inserting an SFP Module into the NPE-G2 Gigabit Ethernet Port 0/1



|          |              |          |            |
|----------|--------------|----------|------------|
| <b>1</b> | SFP port 0/1 | <b>2</b> | SFP module |
|----------|--------------|----------|------------|

Use the following procedure to install an SFP module in the NPE-G2:

- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
- Step 2** Locate the label on the SFP module and turn the SFP module so the label is on top and the alignment groove is down.



**Note** The SFP module is keyed so that it cannot be inserted incorrectly.

- Step 3** Insert the SFP module into SFP port 0/1, 0/2, or 0/3. The SFP module snaps into place when you have completely and properly inserted it.
- Step 4** Repeat Step 2 if you are inserting a second or third SFP module.



**Note** Do not remove the plug from the SFP module optical bores until you are ready to install the network interface optical fiber cable. Save the plug for future use.



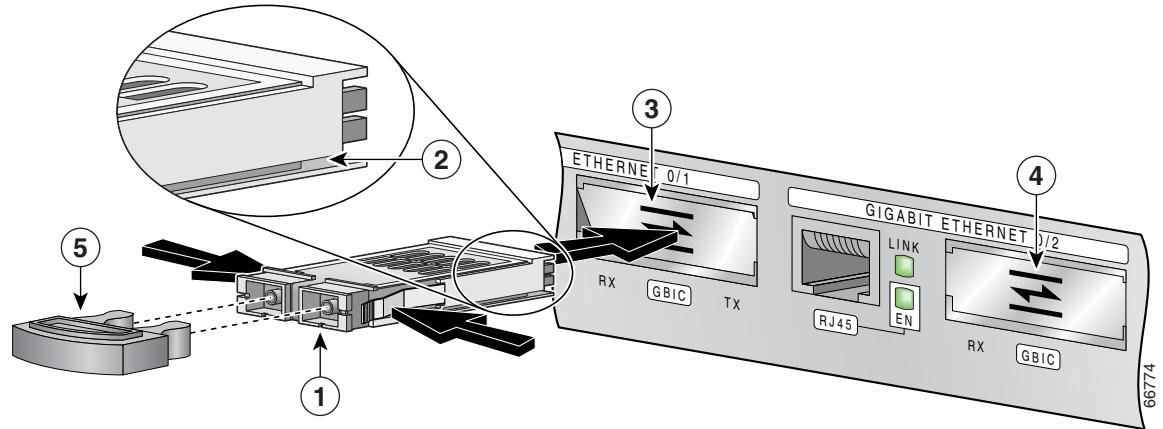
**Note** We strongly recommend cleaning all optical fiber connections before connecting optical cables to equipment. For information about cleaning optical connectors, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* document.

This completes the SFP module installation procedure. For information on inserting the NPE-G2 into the chassis, see the “[Inserting the NPE-G1 or NPE-G2 into the Router](#)” section on page 7-28.

## Installing a GBIC—NPE-G1

Use the instructions in this section to install a GBIC in the NPE-G1.

**Figure 7-11** Installing a GBIC in the NPE-G1



|   |                  |   |               |
|---|------------------|---|---------------|
| 1 | GBIC             | 4 | GBIC port 0/2 |
| 2 | Alignment groove | 5 | Plug          |
| 3 | GBIC port 0/1    |   |               |

**Step 1** Turn the GBIC so the label side is up and the alignment groove is down.



**Note** The GBIC is keyed so that it cannot be inserted incorrectly.

**Step 2** Insert the GBIC into GBIC port 0/1, 0/2, or 0/3. Repeat this step if you are installing more than one GBIC.



**Note** Do not remove the GBIC plugs until you are ready to install the cables.

You are finished installing the GBICs. For more information on cabling or specifications, see the “[Gigabit Ethernet GBIC Connection Equipment](#)” section on page 5-13.



**Note** We strongly recommend cleaning all optical fiber connections before connecting optical cables to equipment. For information about cleaning optical connectors, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* document.

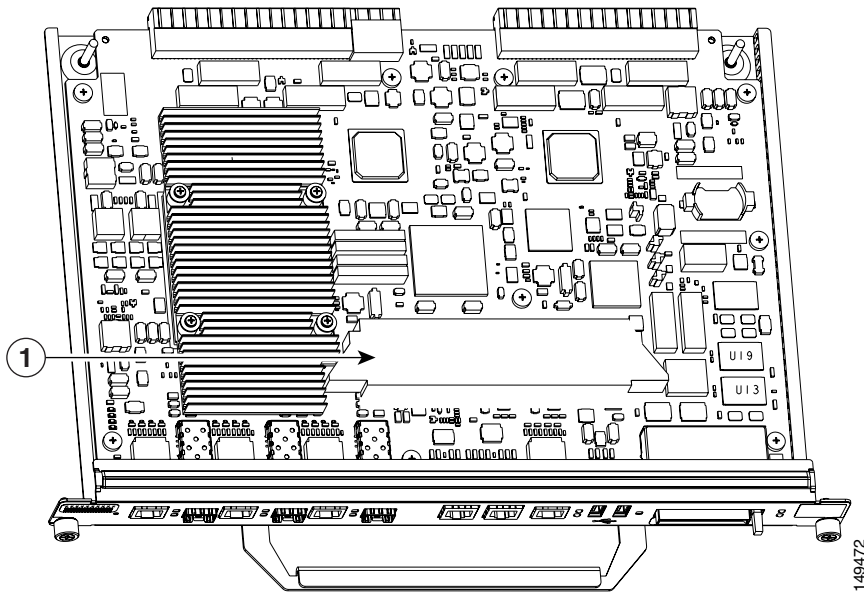
Go to the “[Inserting the NPE-G1 or NPE-G2 into the Router](#)” section on page 7-28 for instructions on installing the NPE-G1 or NPE-G2 in the chassis.

## Replacing the DIMM on the NPE-G2

To replace the DIMM on the NPE-G2, use the following instructions:

- Step 1** Locate the DIMM on the NPE-G2. See [Figure 7-12](#).

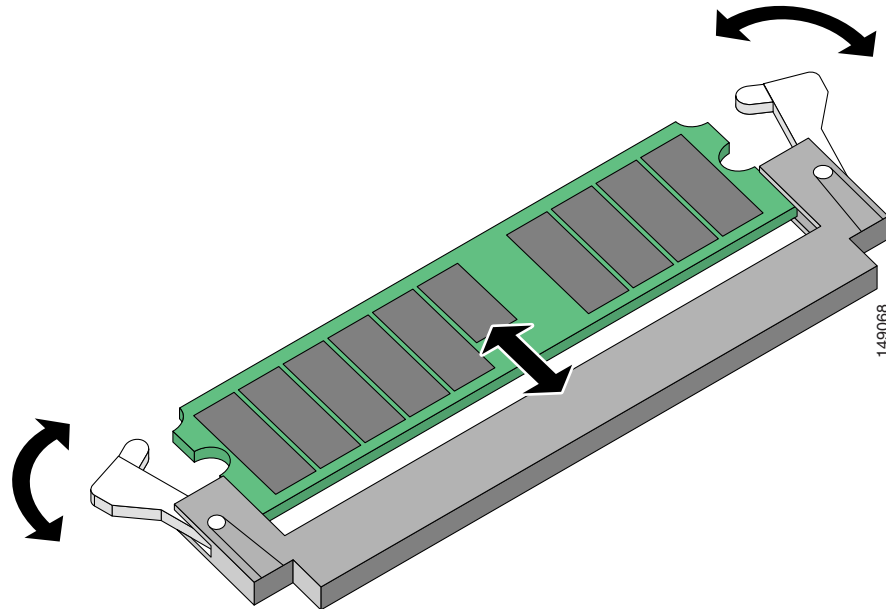
**Figure 7-12** Locating the DIMM on the NPE-G2



|   |      |  |  |
|---|------|--|--|
| 1 | DIMM |  |  |
|---|------|--|--|

- Step 2** Remove the DIMM by pressing against the DIMM latches until the DIMM releases.
- Step 3** Gently remove it from the DIMM socket.

**Figure 7-13** Installing or Removing the DIMM on the NPE-G2



**Step 4** Gently insert a DIMM into the DIMM socket.

**Step 5** Push the release latches until they slip into the notch on the edge of the DIMM, holding it securely in place.

You have finished replacing the DIMM. To install the NPE-G2 in the chassis, go to the [“Inserting the NPE-G1 or NPE-G2 into the Router”](#) section on page 7-28.

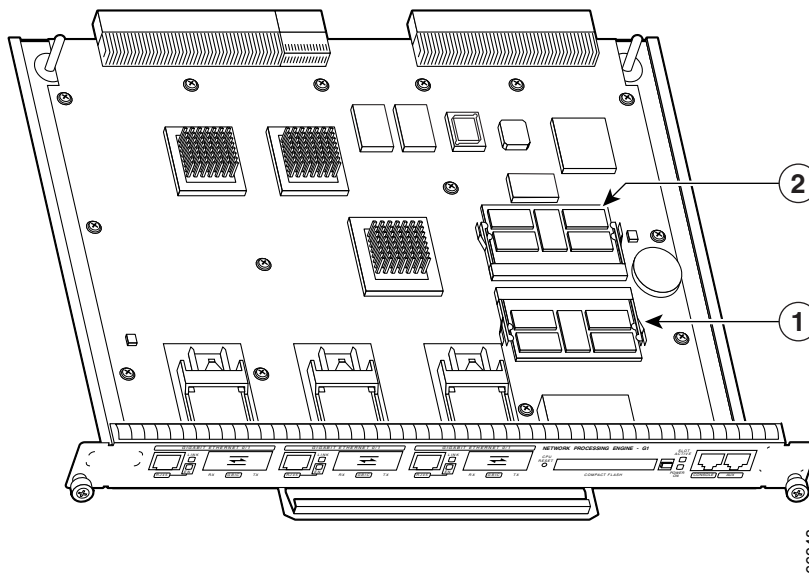
## Upgrading the SDRAM SODIMMs on the NPE-G1 (Optional)

If you have purchased an SDRAM memory upgrade for the NPE-G1, replace the SDRAM SODIMMs on the NPE-G1 using the following instructions.

### Removing a SODIMM

**Step 1** Locate the SODIMMs on the NPE-G1.

**Figure 7-14** Locating the SODIMMs on the NPE-G1



|          |          |          |          |
|----------|----------|----------|----------|
| <b>1</b> | SODIMM 2 | <b>2</b> | SODIMM 1 |
|----------|----------|----------|----------|



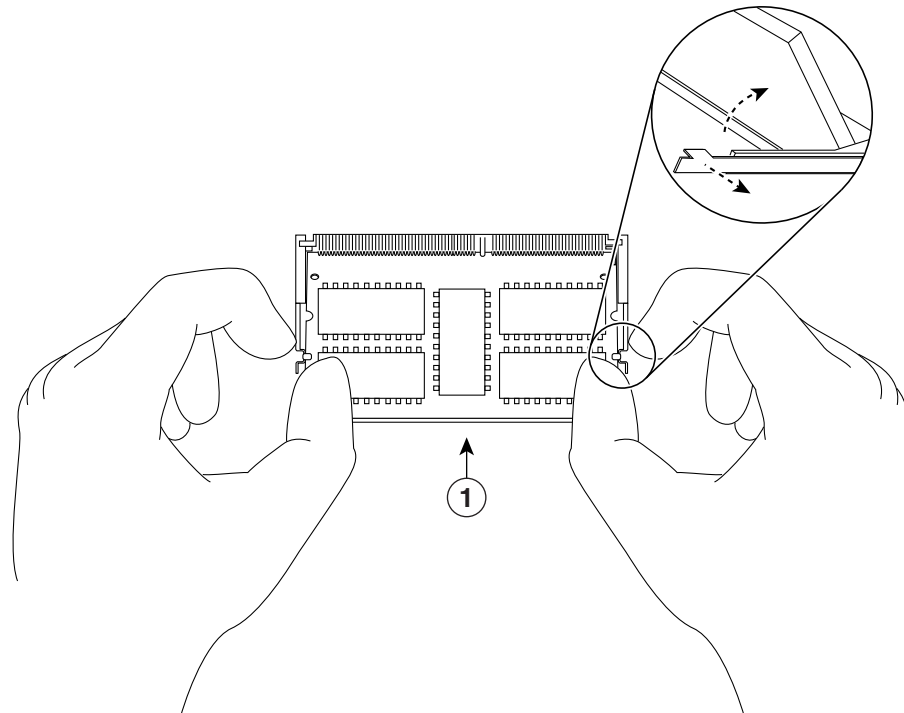
**Note**

Both SODIMMs must be of the same size and type, and both SODIMM sockets must be populated.

**Step 2** Remove the SODIMM you want to replace by pulling outward on the SODIMM spring latches with your thumbs.

The SODIMM springs up to allow you to easily pull it from the socket.



**Figure 7-15 Removing or Installing an SDRAM SODIMM**

66437

|          |        |
|----------|--------|
| <b>1</b> | SODIMM |
|----------|--------|

- Step 3** Remove the SODIMM from the socket. Avoid touching the SODIMM as much as possible, particularly the traces, the metal *fingers* on the connector side of the SODIMM.
- Step 4** Place the SODIMM in an antistatic shielding bag.

## Installing a SDRAM SODIMM

**Caution**

SODIMMs are sensitive components that are susceptible to ESD damage. Handle SODIMMs by the edges only; avoid touching the memory modules, pins, or traces (the metal *fingers* along the connector edge of the SODIMM).

- Step 1** Remove a new SODIMM from the antistatic container.
- Step 2** Hold the SODIMM component-side-up, with the connector edge (the metal *fingers*) away from you.
- Step 3** Align the new SODIMM notch with the connector and insert the SODIMM into the socket.

**Caution**

When inserting the SODIMM, use firm but not excessive pressure. If you damage a socket, you will have to return the NPE-G1 to the factory for repair.

- Step 4** Gently press on the SODIMM until the SODIMM spring latches snap into place.

- Step 5** If the SODIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SODIMM gently back into the socket until the spring latches snap into place.

You have finished replacing the SDRAM SODIMM. To install the NPE-G1 in the chassis, go to the [“Inserting the NPE-G1 or NPE-G2 into the Router”](#) section on page 7-28.

## Inserting the NPE-G1 or NPE-G2 into the Router



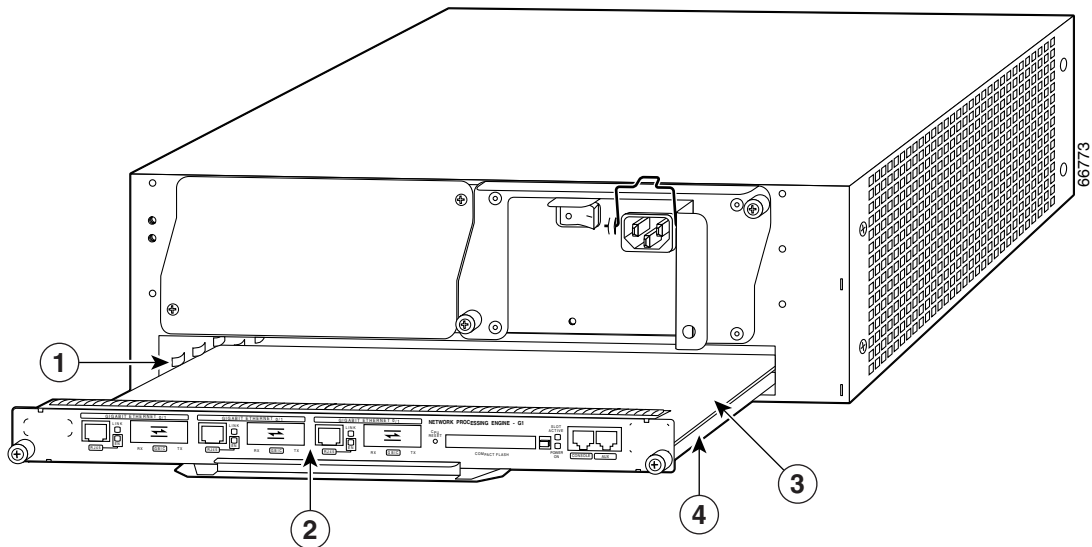
### Note

If you have difficulty installing a network processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, network processing engine and I/O controller from the chassis and reinstall them. Install the network processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

To insert the NPE-G1 or NPE-G2 into the router, follow the instructions in this section:

- Step 1** Align the left and right edges of the NPE-G1 or NPE-G2 with the chassis slot guides. [Figure 7-16](#) shows an NPE-G1 being installed into a Cisco 7200 VXR router; inserting an NPE-G2 is similar. Inserting a Cisco uBR7200-NPE-G1 or Cisco uBR7200-NPE-G2 in a Cisco uBR7200 series router is similar.

**Figure 7-16** *Aligning the NPE-G1 Between the Slot Guides on a Cisco 7200 VXR Router*



|          |             |          |                       |
|----------|-------------|----------|-----------------------|
| <b>1</b> | Slot guides | <b>3</b> | Printed circuit board |
| <b>2</b> | NPE-G1      | <b>4</b> | Metal carrier         |

- Step 2** Gently slide the NPE-G1 or NPE-G2 all the way into its chassis slot until you feel the connectors seat with the router midplane.
- Step 3** Seat the NPE-G1 or NPE-G2 in the router midplane by tightening its captive installation screws with a number 2 Phillips or a 3/16-inch flat-blade screwdriver.



---

**Note** The NPE-G1 or NPE-G2 is not fully seated in the router midplane until you tighten its captive installation screws.

---

- Step 4** If you removed power supplies from the router, replace the power supplies. (See the “[Removing and Replacing an AC-Input or DC-Input Power Supply](#)” section on page 10-14 when replacing a power supply in a Cisco 7200 VXR router.)
- Step 5** If you slid the front of the router out of the rack, slowly guide the router back into the rack.
- Step 6** Use a 3/16-inch flat-blade screwdriver to tighten the screws that secure the router to the front mounting strips of the rack.
- 

This completes the procedure for installing the NPE-G1 or NPE-G2 in a Cisco 7200 VXR router.

## Attaching the Rear Cable-Management Brackets and Cables (Optional)

You may choose to use one of two types of cable-management brackets. One type is the same as is used on the front of the router for managing port adapter and I/O controller cables. The NPE-G1- or NPE-G2-specific bracket is used only on the NPE-G1 or NPE-G2, and provides more support for optical fiber cables.

Depending on whether the router is front-mounted or rear-mounted in the rack, install the cable-management brackets to the router. Go to one of these sections for instructions on rear-mounting the cable-management brackets and attaching the cables:

- [Installing the NPE-G1 or NPE-G2 Cable-Management Brackets, page 7-29](#)—This procedure applies to both the Cisco 7200 VXR routers and Cisco uBR7200 series routers.
- [Installing the Rear Cable-Management Brackets on a Front-Mounted Router \(Optional\), page 7-31](#)—This procedure applies to only the Cisco 7200 VXR routers.
- [Installing the Rear Cable-Management Brackets on a Rear-Mounted Router \(Optional\), page 7-32](#)—This procedure applies to only the Cisco 7200 VXR routers.
- [Installing the Default Cable-Management Bracket on a Cisco uBR7246VXR Router \(Optional\), page 7-34](#)—This procedure applies to only the Cisco UBR 7246VXR universal broadband router.

## Installing the NPE-G1 or NPE-G2 Cable-Management Brackets

If you are using the NPE-G1 or NPE-G2 and installing the cable-management bracket (Cisco Product Number MAS-7200-CBLMGMT), use the following instructions. [Figure 7-17](#) illustrates installing the bracket on the NPE-G1 or NPE-G2 on the Cisco 7200 VXR routers. [Figure 7-18](#) illustrates installing the bracket on the Cisco uBR7200-NPE-G1 or Cisco uBR7200-NPE-G2 on the Cisco uBR7200 series routers.



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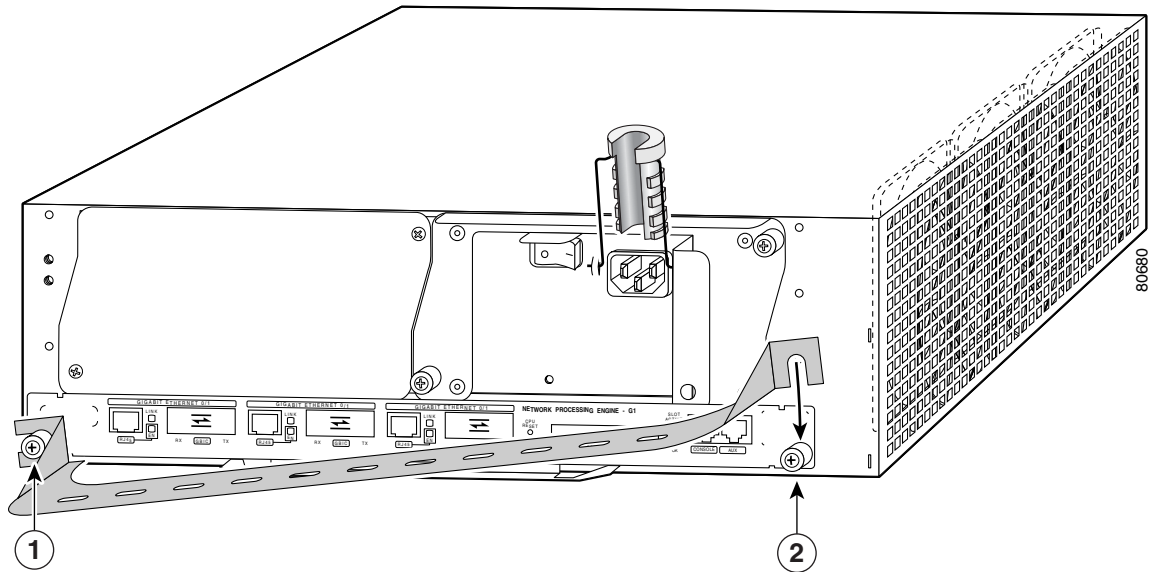
**Note** The captive installation screws on the NPE-G1 or NPE-G2 must be fastened to allow the cable-management bracket to provide proper cable support and strain relief. Always ensure that the captive installation screws are properly tightened.

---

**Note**

Do not use the cable-management bracket as a handle for inserting and removing the NPE-G1 or NPE-G2 in the chassis. You must always first unfasten the NPE-G1 or NPE-G2 captive installation screws and remove the cable-management bracket before removing or inserting the NPE-G1 or NPE-G2 in the chassis.

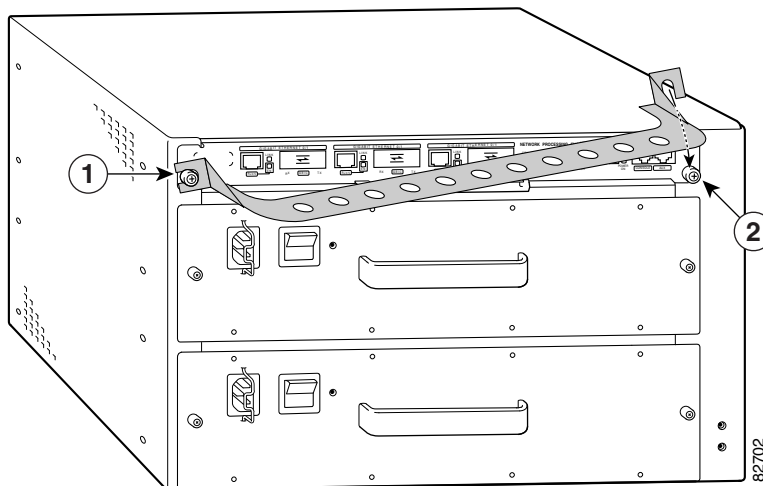
**Figure 7-17** Installing the NPE-G1 or NPE-G2 Cable-Management Bracket



**1** Captive installation screw

**2** Captive installation screw

**Figure 7-18** Installing the Cisco uBR7200-NPE-G1 or Cisco uBR7200-NPE-G2 Cable-Management Bracket



**1** Captive installation screw

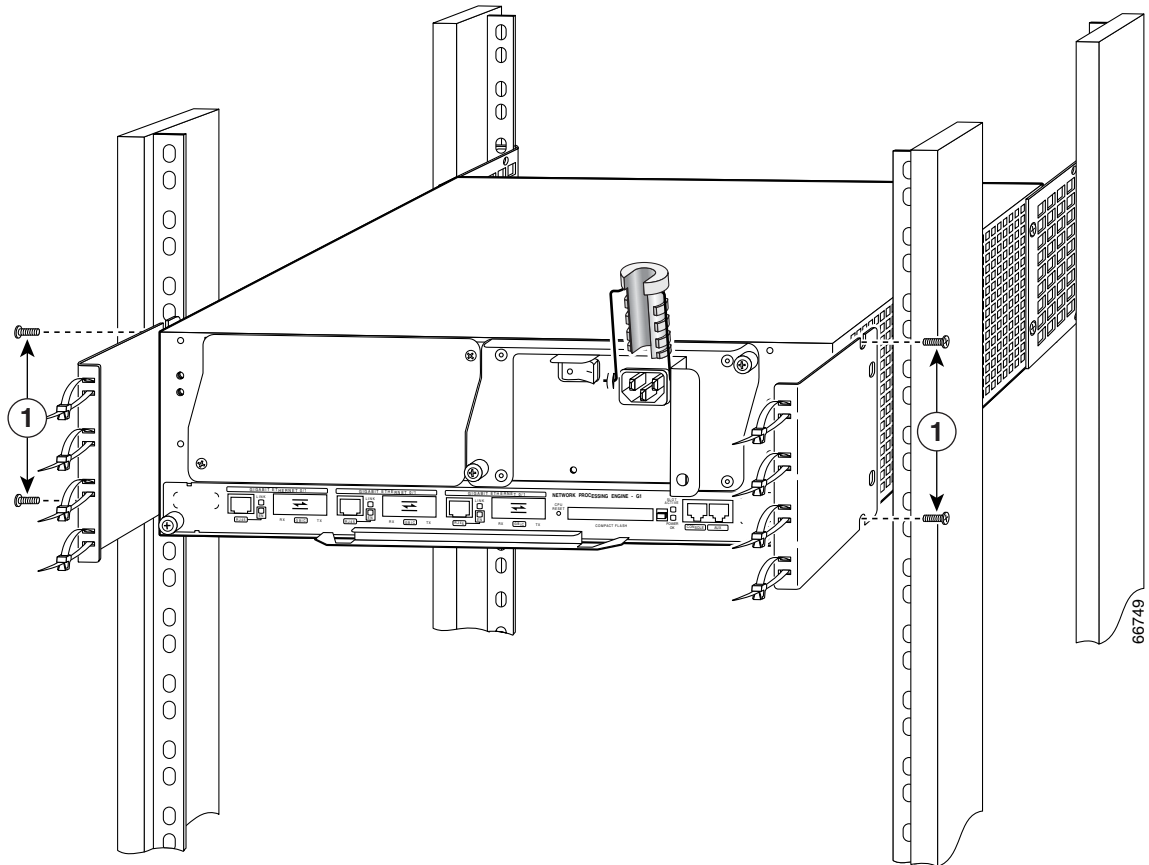
**2** Captive installation screw

- 
- Step 1** Loosen the left and right captive installation screws on the NPE-G1 or NPE-G2.
- Step 2** Hold the cable-management bracket so that it is positioned above the NPE-G1 or NPE-G2 captive installation screws as shown in [Figure 7-17](#) and [Figure 7-18](#). The bracket is properly positioned when the horizontally-faced notch is at the left, the vertically-faced notch is at the right, and the bracket's outer edge is flush with the edge on the NPE-G1 or NPE-G2. If you reverse the bracket so that it is not flush with the NPE-G1 or NPE-G2, you will not be able to access the GBIC or SFP module connectors on the NPE-G1 or NPE-G2 front panel.
- Step 3** Slide the left end of the bracket between the captive installation screw and the front panel of the NPE-G1 or NPE-G2.
- Step 4** Rotate the cable-management bracket down, until its other notch slides behind the right captive installation screw. Make sure the bracket's outer edge is flush with the edge of the NPE-G1 or NPE-G2 and does not obstruct the GBIC or SFP ports.
- Step 5** Tighten both captive installation screws.
- Step 6** Install the cables, and fasten them to the bracket with the velcro straps provided.
- 

## Installing the Rear Cable-Management Brackets on a Front-Mounted Router (Optional)

Use the instructions in this section to attach the cable-management brackets to a front-mounted Cisco 7200 VXR router.

**Figure 7-19** Installing the Rear Cable-Management Brackets with an NPE-G1 or NPE-G2—Router Front-Mounted



|          |        |
|----------|--------|
| <b>1</b> | Screws |
|----------|--------|

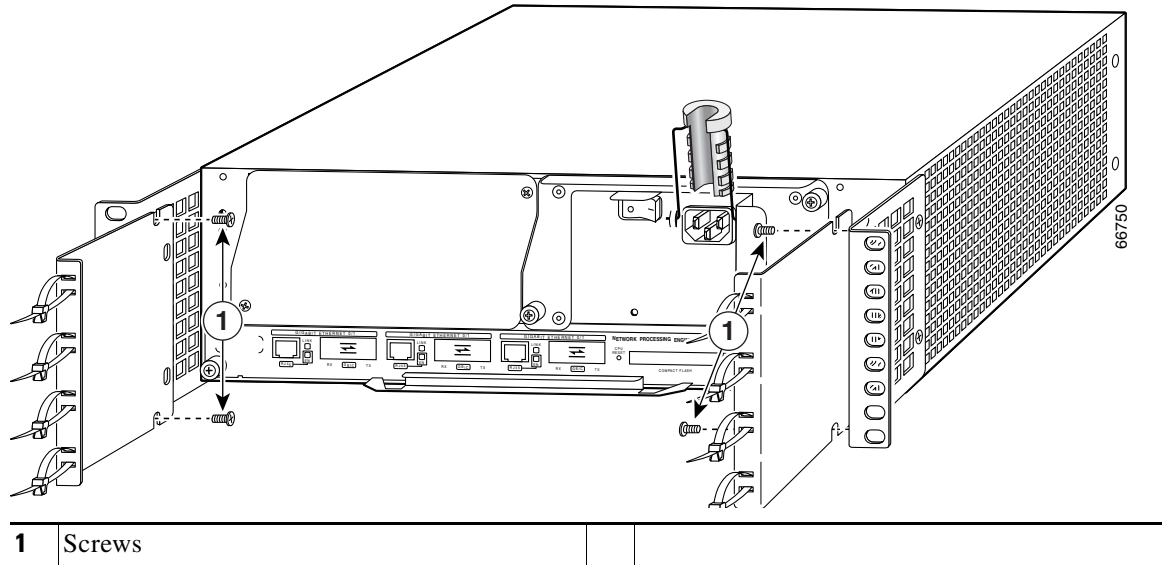
- 
- Step 1** If the back of the router protrudes from the rack, place the cable-management brackets against the router as shown in [Figure 7-19](#).
- Step 2** Insert two screws into each bracket, and tighten them to the router.
- Step 3** Insert the GBIC, SFP module, or RJ-45 cables into the interface ports on the NPE-G1 or NPE-G2.
- Step 4** Place the cables through the cable-management brackets.
- 

You have finished installing the cable-management brackets. Go to the [“Reconnecting Input Power and Powering Up the Router”](#) section on page 7-35.

## Installing the Rear Cable-Management Brackets on a Rear-Mounted Router (Optional)

Use the instructions in this section to attach the cable-management brackets if you have a rear-mounted Cisco 7200 VXR router.

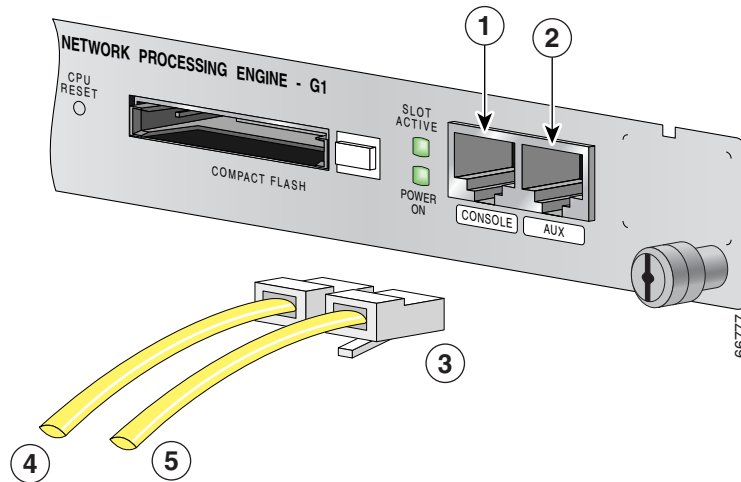
**Figure 7-20** Installing the Rear Cable-Management Brackets with the NPE-G1 or NPE-G2—Router Rear-Mounted



**1** Screws

- Step 1** Align the cable-management brackets with the rack-mount brackets as shown in [Figure 7-20](#).
- Step 2** Insert and tighten two screws for each bracket. The screws come with the cable-management brackets.

**Figure 7-21** Attaching Console and Auxiliary Port Cables



|          |                  |          |                                  |
|----------|------------------|----------|----------------------------------|
| <b>1</b> | Console port     | <b>4</b> | Cable to console terminal or DTE |
| <b>2</b> | Auxiliary port   | <b>5</b> | Cable to modem or DCE            |
| <b>3</b> | RJ-45 connectors |          |                                  |

- Step 3** Insert the console and auxiliary RJ-45 cables into the interface ports on the NPE-G1 or NPE-G2.
- Step 4** Place the cables through the cable-management brackets.

You have finished installing the cable-management brackets. Go to the “[Reconnecting Input Power and Powering Up the Router](#)” section on page 7-35.

## Installing the Default Cable-Management Bracket on a Cisco uBR7246VXR Router (Optional)

If you are not using the NPE-G1 cable-management bracket, you can alternatively use two cable-management bracket configurations for the Cisco uBR7246VXR router. In the first configuration, for a 4-post rack, the rack-mount brackets are installed at the rear of the chassis and the cable-management bracket is installed at the right front of the chassis. (See [Figure 7-22](#).) You must install both sets of brackets before you install the chassis in the rack.

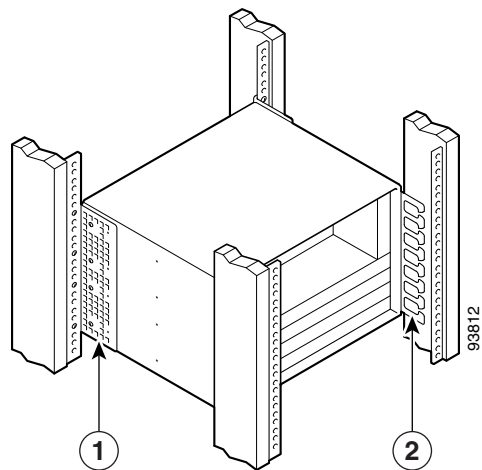
In the second configuration, for a telco-type rack, the rack-mount brackets are installed at the middle of the chassis and the cable-management bracket is installed at the right front of the chassis. (See [Figure 7-23](#).) You must install both sets of brackets before you install the chassis in the rack.



### Note

The cable-management bracket must be installed on the right side of the chassis when viewed from the front.

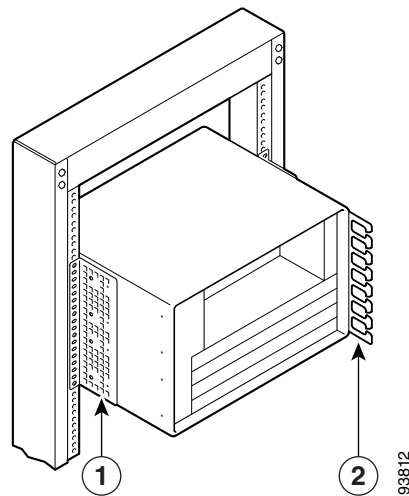
**Figure 7-22** Installing the Chassis in a 4-Post Rack with an Installed Cable-Management Bracket



|          |                    |          |                          |
|----------|--------------------|----------|--------------------------|
| <b>1</b> | Rack-mount bracket | <b>2</b> | Cable-management bracket |
|----------|--------------------|----------|--------------------------|



**Figure 7-23** Installing the Chassis in a Telco-Type Rack with an Installed Cable-Management Bracket



|                      |                            |
|----------------------|----------------------------|
| 1 Rack-mount bracket | 2 Cable-management bracket |
|----------------------|----------------------------|

## Reconnecting Input Power and Powering Up the Router

The following procedures explain how to reconnect input power to a Cisco 7200 VXR router, Cisco UBR7225VXR, or Cisco uBR7246VXR router, power up the router, and verify a successful system boot.



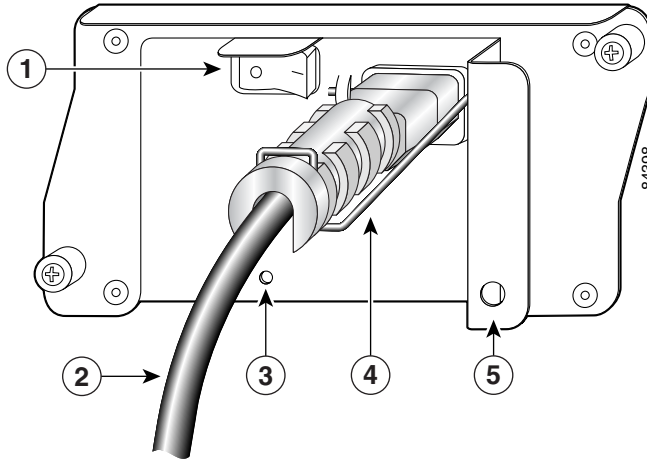
**Warning**

**Read the installation instructions before you connect the system to its power source.** Statement 10

### Reconnecting AC-Input Power to the Cisco 7200 VXR Router

To reconnect AC-input power to a Cisco 7200 VXR router, complete the following steps:

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Slide the cable-retention clip up away from the AC receptacle, and plug in the power cable.
- Step 3** Secure the cable in the power supply AC receptacle by sliding the cable-retention clip down until it snaps around the connector. The cable-retention clip provides strain relief for the AC power cable.

**Figure 7-24** Connecting AC-Input Power to a Cisco 7200 VXR Router

|   |                |   |                          |
|---|----------------|---|--------------------------|
| 1 | Power switch   | 4 | Cable-retention clip     |
| 2 | AC power cable | 5 | Hole for nylon cable tie |
| 3 | POWER OK LED   |   |                          |

**Step 4** Plug the AC power supply cable into the AC power source.



**Note** For Cisco 7200 VXR routers, each AC-input power supply operating at 120 VAC requires a minimum of 5A service.

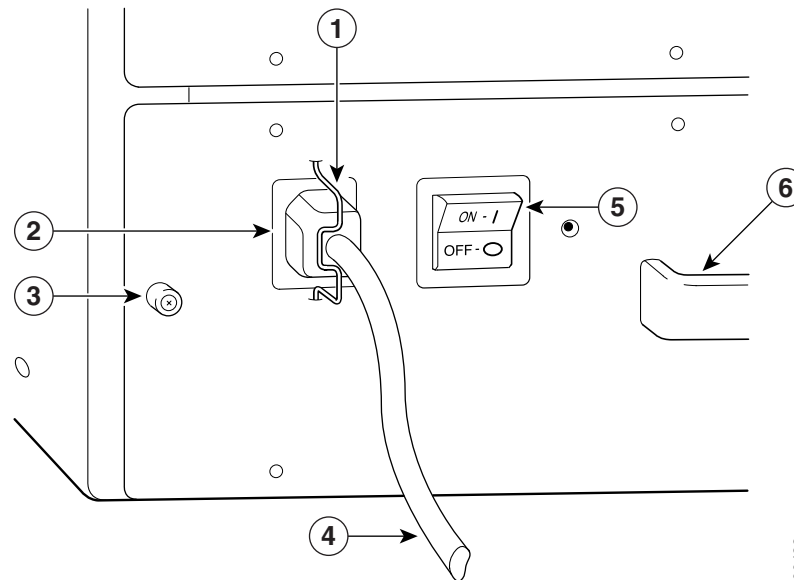
We recommend powering the Cisco 7200 VXR routers from a 120 VAC, 15A receptacle U.S. (240 VAC, 10A international) at the power source.

**Step 5** Repeat Step 1 through Step 4 if a second power supply is installed.

This completes the steps for reconnecting AC-input power to a Cisco 7200 VXR router. Proceed to the [“Powering Up the Router”](#) section on page 7-45.

## Reconnecting AC-Input Power to the Cisco uBR7246VXR Router

Figure 7-25 Connecting AC-Input Power to a Cisco uBR7246VXR Router



|   |                            |   |                |
|---|----------------------------|---|----------------|
| 1 | Cable-retention clip       | 4 | AC power cable |
| 2 | Power receptacle           | 5 | Power switch   |
| 3 | Captive installation screw | 6 | Handle         |

To reconnect AC-input power to a Cisco uBR7246VXR router, complete the following steps:

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Slide the cable-retention clip to the left away from the AC receptacle, and plug in the power cable.
- Step 3** Secure the cable in the power supply AC receptacle by sliding the cable-retention clip to the right until it snaps around the connector. The cable-retention clip provides strain relief for the AC power cable.
- Step 4** Plug the AC power supply cable into the AC power source.



**Note** For the Cisco uBR7200 series routers, each AC-input power supply operating at 120 VAC requires a minimum of 7A service.

We recommend powering the Cisco uBR7200 series routers from a 120 VAC, 15A receptacle U.S. (240 VAC, 10A international) at the power source.

- Step 5** Repeat Step 1 through Step 4 if a second power supply is installed.

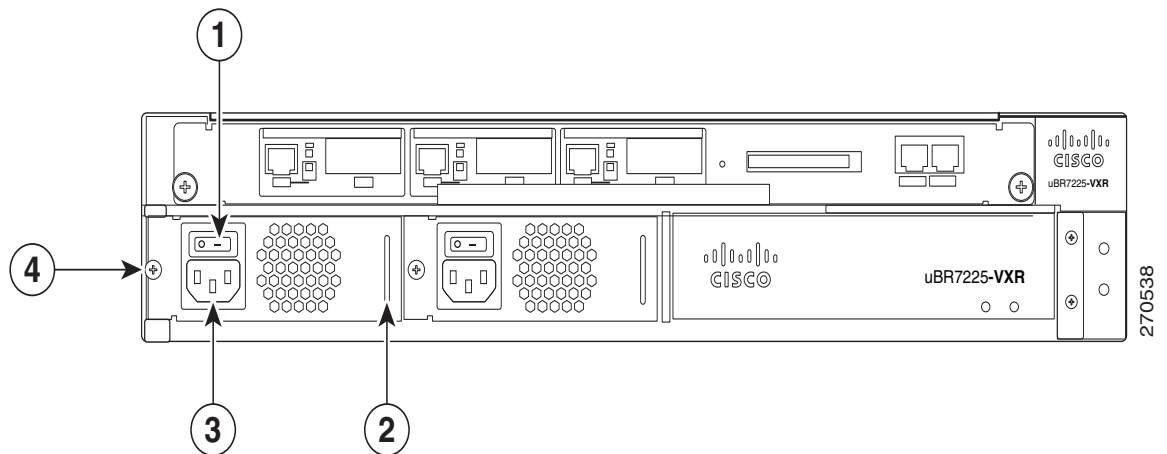
This completes the steps for reconnecting AC-input power to a Cisco uBR7246VXR router. Proceed to the [“Powering Up the Router”](#) section on page 7-45.

## Reconnecting AC-Input Power to the Cisco uBR7225VXR Router

To connect AC-input power to the Cisco uBR7225VXR router, complete the following steps:

- Step 1** At the rear of the router, ensure that the power switch on the power supply is in the off position.

**Figure 7-26** Connecting AC-Input Power to a Cisco UBR7225VXR Router



|   |              |   |                            |
|---|--------------|---|----------------------------|
| 1 | Power switch | 4 | AC-input receptacle        |
| 2 | Handle       | 5 | Captive installation screw |

- Step 2** Plug the power cable into the AC connector of the power supply.



**Note**

For additional AC power cable strain relief, secure the cable to the power supply handle by inserting a nylon cable tie through the hole in the handle and around the cable.

- Step 3** Plug the AC power supply cable into the AC power source.
- Step 4** Repeat [Step 1](#) through Step 3 for the second power supply, if required.
- Step 5** Turn on the power switch on the router.

This completes the steps for reconnecting AC-Input power to a Cisco UBR7225VXR router. Proceed to the [“Powering Up the Router”](#) section on page 7-45

## Reconnecting DC-Input Power to the Cisco 7200 VXR Router

To reconnect DC-input power to a Cisco 7200 VXR router, complete the following steps.



**Note**

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

 **Warning**

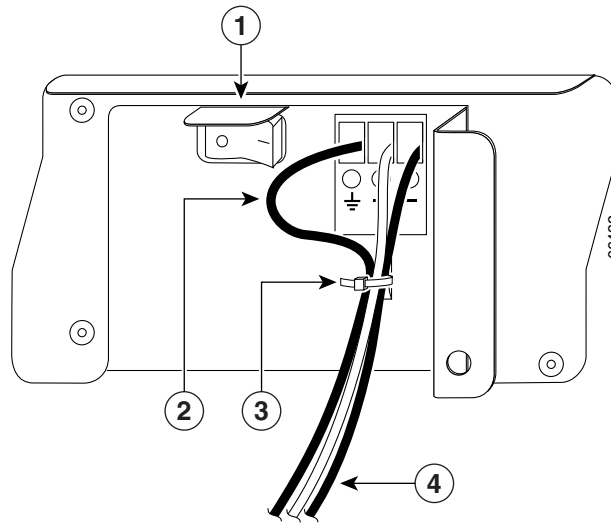
Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. Statement 322

 **Warning**

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

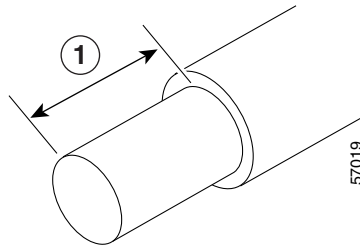
- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

**Figure 7-27 Connecting DC-Input Power to a Cisco 7200 VXR Router**



|          |                          |          |                |
|----------|--------------------------|----------|----------------|
| <b>1</b> | Power switch             | <b>3</b> | Cable tie      |
| <b>2</b> | Ground lead service loop | <b>4</b> | DC power leads |

- Step 3** If necessary, use a wire stripper to strip approximately 0.55 inch (14 mm) from the -V, +V, and ground leads. (See [Figure 7-28](#).)

**Figure 7-28 Stripping the DC-Input Lines**

|          |                  |  |  |
|----------|------------------|--|--|
| <b>1</b> | 0.55 in. (14 mm) |  |  |
|----------|------------------|--|--|

**Step 4** For the Cisco 7200 VXR routers, insert the stripped end of the ground lead all the way into the ground lead receptacle on the DC-input power supply and tighten the receptacle screw using a 3/16-inch flat-blade screwdriver.

**Step 5** Insert the stripped end of the +V lead all the way into the +V lead receptacle and tighten the receptacle screw using the same 3/16-inch flat-blade screwdriver. Repeat this step for the –V lead.

**Note**

Make sure that the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle, use the wire stripper to cut the stripped end of the lead, and repeat through [Step 5](#).

**Step 6** After tightening the receptacle screws for the ground, +V, and –V DC-input leads, secure the leads to the power supply faceplate.

Use the cable tie you saved earlier in this procedure to secure the three leads.

**Note**

When securing the ground, +V, and –V DC-input leads to the power supply faceplate, leave a small service loop in the ground lead to ensure that it is the last lead to disconnect from the power supply if a great deal of strain is placed on all three leads. (See [Figure 7-27](#).)

**Step 7** Restore current to the –V and +V leads.

**Note**

For the Cisco 7200 VXR routers:

- Each DC-input power supply operating at 24 VDC requires a minimum of 19A service.
- Each DC-input power supply operating at 48 VDC requires a minimum of 13A service.
- Each DC-input power supply operating at 60 VDC requires a minimum of 8A service.

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a listed and certified fuse or circuit breaker, 35A minimum 60 VDC, is used on all current-carrying conductors. Site wiring and circuit breakers need to be sized to accommodate the maximum values for safety reasons.

**Step 8** Repeat Step 1 through Step 7 if a second power supply is installed.

This completes the steps for reconnecting DC-input power to a Cisco 7200 VXR router. Proceed to the “Powering Up the Router” section on page 7-45.

## Reconnecting DC-Input Power to a Cisco uBR7246VXR Router

To reconnect DC-input power to a Cisco uBR7246VXR router, complete the following steps.

**Note**

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

**Warning**

**Before completing any of the following procedures, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322

**Warning**

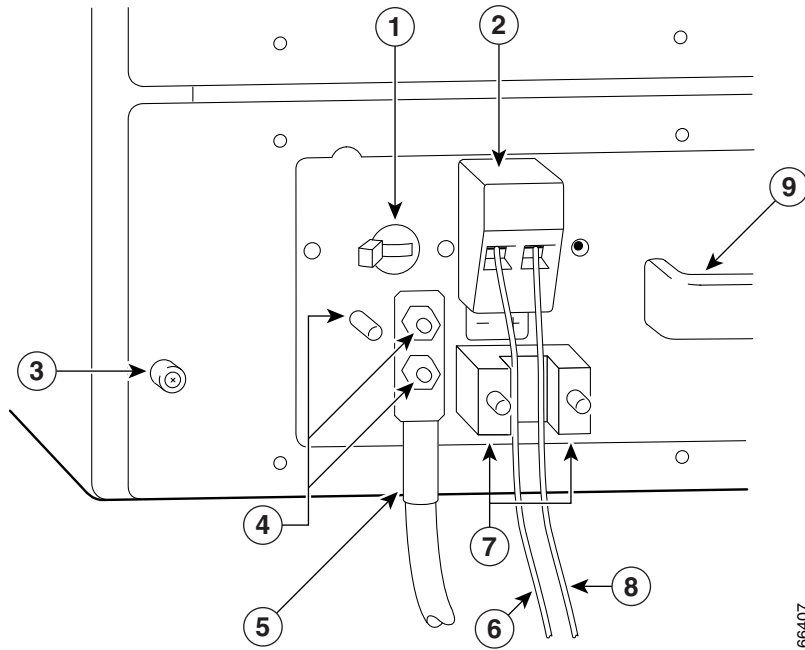
**When installing the unit, the ground connection must always be made first and disconnected last.** Statement 42

**Step 1**

At the rear of the router, check that the power switch on the power supply is in the off (O) position.

**Step 2**

Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

**Figure 7-29** Connecting DC-Input Power to a Cisco uBR7246VXR Router

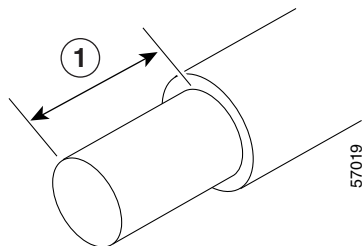
66407

|   |                            |   |          |
|---|----------------------------|---|----------|
| 1 | Power switch               | 6 | -V lead  |
| 2 | Power receptacle           | 7 | M4 studs |
| 3 | Captive installation screw | 8 | +V lead  |
| 4 | M5 grounding receptacles   | 9 | Handle   |
| 5 | M5 grounding lug           |   |          |

**Step 3** If necessary, use a wire stripper to strip approximately 0.55 inch (14 mm) from the -V, +V, and ground leads.

**Note**

The ground lead for the Cisco uBR7200 series DC-input power supply consists of a two-hole grounding lug that connects to an M5 grounding receptacle; you do not need to strip this ground lead.

**Figure 7-30** Stripping the DC-Input Lines

57019

|   |                  |  |  |
|---|------------------|--|--|
| 1 | 0.55 in. (14 mm) |  |  |
|---|------------------|--|--|



**Step 4** Connect the two-hole grounding lug on the grounding lead to the M5 grounding receptacles with the M5 nuts. Tighten the nuts using an 8-mm wrench or nut driver (or adjustable wrench). (See [Figure 7-31](#).)

**Step 5** Insert the stripped end of the +V lead all the way into the +V lead receptacle and tighten the receptacle screw using the 3/16-inch flat-blade screwdriver. Repeat this step for the –V lead.

**Note**

Make sure that the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle, use the wire stripper to cut the stripped end of the lead, and repeat through [Step 5](#).

**Step 6** After tightening the receptacle screw or nuts for the ground, +V, and –V DC-input leads, secure the leads to the power supply faceplate.

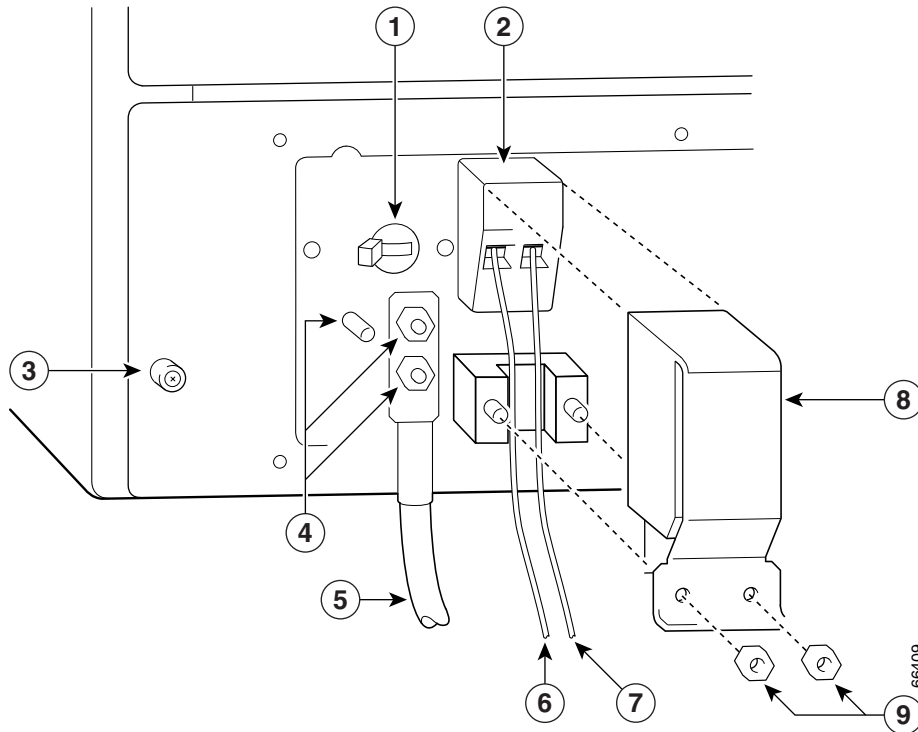
**Step 7** Run the +V and –V leads between the two strain-relief studs on the power supply faceplate.

**Note**

A service loop is not required in the lead attached to the grounding lug because this lead is separate from the +V and –V leads and is secured by two M5 nuts to the M5 receptacles.

**Step 8** Replace the strain-relief cover over the +V and –V leads and secure the cover to the strain-relief studs with the two M4 nuts using the 7-mm wrench or nut driver (or adjustable wrench).

**Figure 7-31** Replacing the Strain-Relief Cover on a Cisco uBR7246VXR Series DC-Input Power Supply



|   |                            |   |                     |
|---|----------------------------|---|---------------------|
| 1 | Power switch               | 6 | -V lead             |
| 2 | Power receptacle           | 7 | +V lead             |
| 3 | Captive installation screw | 8 | Strain-relief cover |
| 4 | M5 grounding receptacles   | 9 | M4 nuts             |
| 5 | M5 grounding lug           |   |                     |

**Step 9** Restore current to the -V and +V leads.



**Note** For the Cisco uBR7200 series routers, each DC-input power supply rating is 14A, 700 volt ampere (VA).

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a listed and certified fuse or circuit breaker, 35A minimum 60 VDC, is used on all current-carrying conductors. Site wiring and circuit breakers need to be sized to accommodate the maximum values for safety reasons.

**Step 10** Repeat Step 1 through Step 9 if a second power supply is installed.

This completes the steps for reconnecting DC-input power to a Cisco uBR7246VXR router. Proceed to the following section, "[Powering Up the Router.](#)"

## Powering Up the Router

To power up a Cisco 7200 VXR router, Cisco uBR7246VXR router, or Cisco uBR7225VXR router that has an installed power supply, complete the following steps:

### Step 1 Check for the following:

- Each port adapter is inserted in its slot, and its respective port adapter lever is in the locked position.
- The network processing engine and the I/O controller or I/O controller blank panel are inserted in their respective slots, and the captive installation screws are tightened.
- All network interface cables are connected to the port adapters or I/O controller or NPE-G1 or NPE-G2 interfaces.
- Each cable interface line card is inserted in its slot, and its respective captive installation screws are tightened (Cisco uBR7246VXR router only).
- (Optional) A CompactFlash Disk is installed in the CompactFlash Disk slot in the NPE-G1 or NPE-G2. If you also have an I/O controller installed, you can optionally install a PC Card or Flash Disk in one of the I/O controller's PC Card slots.

**Note**

A Flash Disk can be installed in either slot 0 or slot 1 of the I/O controller. A CompactFlash Disk can be installed only in the CompactFlash Disk slot in the NPE-G1 or NPE-G2.

- (Optional) A USB Flash memory module or USB eToken Pro key is inserted into a USB port on the NPE-G2.
- Each AC-input power cable is connected and secured with the cable-retention clip, except for uBR7224VXR routers(AC-input power supplies only).
- For a Cisco 7200 VXR router, each DC lead is connected and secured to the power supply faceplate with a cable tie.
- For a Cisco uBR7246VXR router, each DC lead is connected with M4 nuts for the grounding receptacle and the strain-relief cover over the +V and –V leads (DC-input power supplies only).
- Each DC lead is connected and secured to the power source (DC-input power supplies only).
- Ensure that the tape (that you applied earlier) is removed from the circuit breaker switch handle, and power is restored by moving the circuit breaker handle to the on (I) position (DC-input power supplies only).
- The console terminal is turned on.

**Caution**

When the power switch on a Cisco uBR7200 series power supply is turned to the off (O) position, the power supply enters a reset cycle for 90 seconds. Wait at least 90 seconds before turning the power switch back to the on (I) position. If you do not wait the full 90 seconds, the power supply does not restart.

- ### Step 2
- At the rear of the router, place the power switch on the power supply in the on (I) position. Repeat this step if a second power supply is installed in the router. The green OK LED on the power supply turns on.




---

**Note** When powering on the router, wait a minimum of 30 seconds before powering it off again.

---

- Step 3** Listen for the fans; you should immediately hear them operating.
- Step 4** During the boot process, observe the system LEDs. The LEDs on most of the port adapters go on and off in an irregular sequence. Some may go on, go off, and go on again for a short time. On the NPE-G1 or NPE-G2 and the I/O controller, the POWER OK LED goes on immediately.
- Step 5** Observe the initialization process. When the system boot is complete (a few seconds), the NPE-G1 or NPE-G2 begins to initialize the port adapters and the I/O controller. During this initialization, the LEDs on each port adapter behave differently (most flash on and off). The enabled LED on each port adapter and Cisco uBR7200 series cable interface line card goes on when initialization is completed, and the console screen displays a script and system banner similar to the following:

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), 11.3(2)T
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Sun 22-Feb-98 06:00 by Biff
```

---

This completes the procedures for connecting input power and powering up the router. This also completes the procedure for installing the NPE-G1 or NPE-G2 in a Cisco 7200 VXR router, Cisco uBR7246VXR router, or Cisco uBR7225VXR.

## Enabling the Second Processor on the NPE-G1

The Cisco 7200VXR NPE-G1 includes a dual-CPU-core BCM1250 processor. All Cisco IOS images for the Cisco 7200VXR NPE-G1 use CPU-core 0. CPU-core 1 allows acceleration of specific feature sets via separately purchased special software. As of Cisco IOS Release 12.3(14)YM, multi-processor forwarding (MPF) accelerates the following broadband features: L2TP Access Concentrator (LAC), L2TP Network Server (LNS), and PPP Terminated Aggregation (PTA). Port adapters are not supported in the multi-processor forwarding (MPF) path on processor 1.

Only the following port adapters are supported in the punt path (Processor 0 processing Cisco IOS) on Cisco IOS Release 12.3(14)YM and later releases of Cisco IOS Release 12.3YM:

- PA-A3-OC3 (SMI/SML/MM)
- PA-A3-T3
- PA-A3-E3
- PA-A6-OC3 (SMI/SML/MM)
- PA-A6-T3
- PA-A6-E3
- PA-FE-TX
- PA-2FE-TX
- PA-2FE-FX

You may have purchased the enabling software when you purchased a new chassis or you may have purchased the software as an upgrade.

If you are purchasing the software as an upgrade, you must:

- Upgrade the ROMmon. (The minimum ROMmon version is 12.3-4r.T3.)
- Install the enabling software.

Instructions for upgrading ROMmon are in the [“Using the upgrade rom-monitor file Command”](#) section on page 7-64.

The minimum software release for the Broadband L2TP Access Concentrator (LAC), L2TP Network Server (LNS), and PPP Terminated Aggregation (PTA) is Cisco IOS Release 12.3(14)YM.

Also see the [MPF for Broadband LAC, LNS, and PTA](#) document for minimum memory requirements and configuration information.

**Note**

---

Before enabling the second processor, you must have IP routing turned on.

---

Processor 1 is enabled by default after you install the enabling software. To have all packets forwarded by processor 0, use the **no ip mpf** command. To enable processor 1, use the **ip mpf** command.

Save the running configuration to NVRAM. See the [“Copying the Saved Configuration to NVRAM”](#) section on page 7-52. If you do not save the configuration settings that you created in the router using configuration mode and the setup facility, your configuration will be lost the next time you reload the router.

## Error Messages

The following error messages are displayed if a feature is configured that is not supported in the MPF path:

```
Router# %MPF-4-IGNOREDFEATURES: Interface Gi0/3: Input "PBR" configurations are not MPF supported and are IGNORED. %SYS-5-CONFIG_I: Configured from console by console
```

```
Router# (config-if)# %MPF-4-IGNOREDFEATURES: Interface Gi0/3: Input "PBR" configurations are not MPF supported and are IGNORED.
%MPF-4-IGNOREDFEATURES: Interface Gi0/3: Output "NetFlow" configurations are not MPF supported and are IGNORED.
```

## Using show Commands Associated with the mpf Command

There are a variety of **show** commands associated with the **mpf** command. They are listed below along with sample output. Use these commands to verify the **mpf** installation.

- [Using the show interface stats Command, page 7-48](#)
- [Using the show ip interface Command, page 7-48](#)
- [Using the show mpf cpu Command, page 7-49](#)
- [Using the show mpf cpu history Command, page 7-49](#)
- [Using the show mpf interface Command, page 7-50](#)
- [Using the show mpf ip exact-route Command, page 7-51](#)
- [Using the show mpf punt Command, page 7-51](#)
- [Using the show version Command, page 7-51](#)

## Using the show interface stats Command

Use the **show interface stats** command for information about the interface.

```
Router# show interface stats
GigabitEthernet0/1
      Switching path   Pkts In   Chars In   Pkts Out   Chars Out
      Processor        33090    6424353    86353      8645650
      Route cache       2         116        0           0
      Multi-Processor Fwding 1004     158632    5004       790632
      Total             34096    6583101    91357      9436282
```

## Using the show ip interface Command

Use the **show ip interface** command to get information about the specific interface port.

```
Router# show ip interface g0/3
GigabitEthernet0/3 is up, line protocol is up
Internet address is 155.1.1.1/16
Broadcast address is 255.255.255.255
Address determined by setup command
MTU is 1500 bytes
Helper address is not set
Directed broadcast forwarding is disabled
Outgoing access list is not set
Inbound access list is not set
Proxy ARP is enabled
Local Proxy ARP is disabled
Security level is default
Split horizon is enabled
ICMP redirects are always sent
ICMP unreachable are always sent
ICMP mask replies are never sent
IP fast switching is enabled
IP fast switching on the same interface is disabled
IP Flow switching is disabled
IP CEF switching is enabled
IP Feature Fast switching turbo vector
IP VPN Flow CEF switching turbo vector
IP multicast fast switching is enabled
IP multicast distributed fast switching is disabled
IP route-cache flags are Fast, CEF
Router Discovery is disabled
IP output packet accounting is disabled
IP access violation accounting is disabled
TCP/IP header compression is disabled
RTP/IP header compression is disabled
Policy routing is enabled, using route map PBR
Network address translation is disabled
BGP Policy Mapping is disabled
IP Multi-Processor Forwarding is enabled
IP Input features, "PBR",
are not supported by MPF and are IGNORED
IP Output features, "NetFlow",
are not supported by MPF and are IGNORED
```



CPU% per hour (last 72 hours)  
 \* = maximum CPU% # = average CPU%

## Using the show mpf interface Command

Using the **show mpf interface** command without arguments shows the interface information for all Gigabit Ethernet interfaces and subinterfaces. This command is supported only for physical interfaces. There is no support for the virtual access interface.

```
Router# show mpf interface
Name      Index  State  Counter      Count
Gi0/1     0      up     RX packets   1004
          RX bytes   158632
          TX packets   5004
          TX bytes   790632
          RX punts   32961
          TX punts   85972

Gi0/1     1      up
Gi0/1.100 100    up     RX packets   1004
          RX bytes   158632
          TX packets   5004
          TX bytes   790632
          RX punts     25

Gi0/1.101 101    up
Gi0/1.102 102    up
Gi0/1.105 105    up
Gi0/1.106 106    up
Gi0/1.107 107    up
Gi0/1.200 200    up
Gi0/1.201 201    up     RX punts     29
Gi0/1.202 202    up
Gi0/1.206 206    up
Gi0/1.2002 602   up     RX punts    26114
Gi0/1.2004 604    up
```

## Using the show mpf interface GigabitEthernet 0/1 Command

The following example displays the interface information for GigabitEthernet 1/0, subinterface number 100. However, all Gigabit Ethernet interface and subinterface information is displayed because MPF does not recognize the subinterface number, unless it is a VLAN number.

```
Router# show mpf interface GigabitEthernet 0/1.100
Name      Index  State  Counter      Count
Gi0/1     0      up     RX packets   1004
          RX bytes   158632
          TX packets   5004
          TX bytes   790632
          RX punts   32996
          TX punts   86062

Gi0/1     1      up
Gi0/1.100 100    up     RX packets   1004
          RX bytes   158632
          TX packets   5004
          TX bytes   790632
          RX punts     25

Gi0/1.101 101    up
Gi0/1.102 102    up
Gi0/1.105 105    up
Gi0/1.106 106    up
Gi0/1.107 107    up
Gi0/1.200 200    up
```



```

Gi0/1.201    201    up      RX punts          29
Gi0/1.202    202    up
Gi0/1.206    206    up
Gi0/1.2002   602    up      RX punts          26142
Gi0/1.2004   604    up

```

### Using the show mpf interface GigabitEthernet 0/1 100 Command

The following example displays the interface information for VLAN number 100 on the GigabitEthernet 0/1 interface, including up state, receiving packet count, receiving bytes count, transmitting packet count, transmitting bytes count, and receiving punts count.

```

Router# show mpf interface GigabitEthernet 0/1 100

Name      Index      State      Counter      Packets      Bytes
Gi0/1.100 100        up         RX total     963          151050
                RX punt     5           475
                TX total     956         150449

IP Multi-Processor Forwarding is enabled

```

### Using the show mpf ip exact-route Command

Use the **show mpf ip exact-route** command to show which routing decision is made for a given IP address pair.

```

hostname: show mpf ip exact-route [vrf vrf_name] src-ip-addr dst-ip-addr

1.1.1.1 -> 192.168.255.255 :Gi2/0/0 (next hop 10.1.255.10)

```

### Using the show mpf punt Command

Use the **show mpf punt** command to display the per-box punt reason and punt packet counts.

```

Router# show mpf punt

Type      Message                                     Count
l2tp      unknown session errors                    7
l2tp      L2TP control                             6
ipv4/verify adjacency punt                       1
ethernet  unknown ethernet type                    542
ppp       punts due to unknown protocol            333
arp       ARP request                               6

```

### Using the show version Command

Following is output from the **show version** command with the second processor enabled. Note that the **show version** output provides “SB-1 CPU” when processor 1 is enabled.

```

Router# show version

Cisco IOS Software, 7200 Software (C7200-I12S-M), Version 12.3(BSNOP4_NIGHTLY.050202)
UBUILDIT Image, CISCO DEVELOPMENT TEST VERSION
Copyright (c) 1986-2005 by Cisco Systems, Inc.

```

```

Compiled Wed 02-Feb-05 04:57 by
ROM: System Bootstrap, Version 12.3(4r)T3, RELEASE SOFTWARE (fc1)
BOOTLDR: Cisco IOS Software, 7200 Software (C7200-KBOOT-M),
12.3(20040712:050512) [REL-v123_7_xi_throttle.ios-weekly 115]
Lacl uptime is 16 hours, 22 minutes
System returned to ROM by reload at 18:12:49 UTC Mon Feb 7 2005
System image file is
"tftp://223.255.254.254/auto/tftpboot-users/biff/c7200-i12s-mz.2005-02-02.BSNOP4_NIGH"
Last reload reason: Reload command

```

```

Cisco 7206VXR (NPE-G1) processor (revision 0xFF) with 983040K/65536K bytes of memory.
Processor board ID 31650243
SB-1 CPU at 700MHz, Implementation 1025, Rev 0.2, 512KB L2 Cache
6 slot VXR midplane, Version 2.7
Last reset from power-on
CPU 1 Multi-Processor Forwarding, Tue Feb 1 00:48:42 PST 2005 [rtang 100]
PCI bus mb1 (Slots 1, 3 and 5) has a capacity of 600 bandwidth points.
Current configuration on bus mb1 has a total of 400 bandwidth points.
This configuration is within the PCI bus capacity and is supported.
PCI bus mb2 (Slots 2, 4 and 6) has a capacity of 600 bandwidth points.
Current configuration on bus mb2 has a total of 700 bandwidth points.
The set of PA-2FE, PA-POS-2OC3, and I/O-2FE qualify for "half
bandwidth points" consideration, when full bandwidth point counting
results in oversubscription, under the condition that only one of the
two ports is used. With this adjustment, current configuration on bus
mb2 has a total of 700 bandwidth points.
This configuration has oversubscribed the PCI bus and is not a
supported configuration.
Please refer to the following document "Cisco 7200 Series Port
Adaptor Hardware Configuration Guidelines" on CCO <www.cisco.com>,
for c7200 bandwidth points oversubscription/usage guidelines.
WARNING: PCI bus mb2 Exceeds 600 bandwidth points
1 Ethernet interface
2 FastEthernet interfaces
5 Gigabit Ethernet interfaces
1 ATM interface
509K bytes of NVRAM.
62976K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).
16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2

```

## Copying the Saved Configuration to NVRAM

After installing and cabling the NPE-G1 or NPE-G2 and powering on the router, copy the configuration file to the NVRAM on the NPE-G1 or NPE-G2, using one of the following procedures:

- If you have kept the previous I/O controller installed in the router, use the procedure given in the [“Copying the Saved Configuration File from a Flash Disk or PC Card”](#) section on page 7-53 to copy the saved configuration to the NVRAM on the NPE-G1 or NPE-G2.
- If you have removed the previously installed I/O controller from the router, and you were able to copy the file to a CompactFlash Disk, use the procedure given in the [“Copying the Saved Configuration File from the CompactFlash Disk”](#) section on page 7-53 to copy the saved configuration file to the NVRAM on the NPE-G1 or NPE-G2.
- If you have removed the previously installed I/O controller from the router, and you have not been able to copy the file to a CompactFlash Disk, use the procedure given in the [“Downloading the Saved Configuration from the TFTP Server”](#) section on page 7-54 to copy the saved configuration file to the NVRAM on the NPE-G1 or NPE-G2.

## Copying the Saved Configuration File from a Flash Disk or PC Card

To copy the saved configuration file from the Flash Disk or PC Card, follow these steps:

- 
- Step 1** Make sure you are at the privileged level of the EXEC command interpreter (check the system prompt for a pound sign [#]). If the system prompt does not have a pound sign (#), enter **enable**, and then your password.
- Step 2** Insert the Flash Disk or PC Card containing the saved configuration file into the first PC Card slot in the I/O controller.
- Step 3** Enter the **copy disk0: filename running** or **copy slot0: filename running** command.
- ```
Router# copy disk0: filename running
or
Router# copy slot0: filename running
```
- Step 4** Enter the **write** command:
- ```
Router# write
```
- 

You have finished copying and writing the saved configuration file to NVRAM.

## Copying the Saved Configuration File from the CompactFlash Disk

If you have been able to copy the configuration file to the CompactFlash Disk, use the following steps to copy the configuration to the NVRAM on the NPE-G1 or NPE-G2:

- 
- Step 1** Make sure you are at the privileged level of the EXEC command interpreter (check the system prompt for a pound sign [#]). If the system prompt does not have a pound sign (#), enter **enable**, and then your password.
- Step 2** Insert the CompactFlash Disk containing the saved configuration file into the CompactFlash Disk slot on the NPE-G1 or NPE-G2.
- Step 3** Enter the **copy disk2: filename** command.
- ```
Router# copy disk2: filename running
```
- Step 4** Enter the **write** command:
- ```
Router#: write
```
- 

You have finished copying and writing the saved configuration file to NVRAM.

## Downloading the Saved Configuration from the TFTP Server

After you install the NPE-G1 or NPE-G2 in the router and verify a successful router boot, you must retrieve the router configuration from the TFTP server and copy it to NVRAM. Use the **copy tftp running-config** command to copy the saved configuration from the TFTP file server. The system prompts you for a hostname and address, the name of the configuration file stored on the host, and confirmation to reboot using the remote file.

After the NPE-G1 or NPE-G2 is installed, save the router configuration file to NVRAM (the default is the NPE-G1 or NPE-G2 NVRAM) using the **copy system:running-config nvram:startup-config** command as follows:

```
Router# copy system:running-config nvram:startup-config
```

You will want to configure the NPE-G1 or NPE-G2 interfaces after retrieving the router configuration and copying it to NVRAM.

Before retrieving the router configuration file from the TFTP server, check the following:

- A console terminal is connected to the console port on the NPE-G1 or NPE-G2, or a Telnet session is established to the router.
- The router is connected to a network supporting a file server (remote host).
- The remote host supports the TFTP application.
- You have the name or address of the remote host.

Before configuring the new interfaces on the NPE-G1 or NPE-G2, be prepared with the following information:

- Protocols and encapsulations you plan to use on the new interface
- Protocol-specific information, such as IP addresses if you will configure the interface for IP routing

For complete descriptions of interface commands and the configuration options available for Cisco 7200 VXR-related interfaces, refer to the documentation resources listed in the [“Related Documentation” section on page iii](#).

To retrieve the saved router configuration from the remote host, complete the following steps:

- 
- Step 1** Make sure you are at the privileged level of the EXEC command interpreter (check the system prompt for a pound sign [#]). If the system prompt does not have a pound sign (#), enter **enable**, and then your password.




---

**Note** Until you retrieve the saved configuration, the router runs from the default configuration in NVRAM. Therefore, any passwords that were previously configured on the system are not valid until you retrieve the configuration.

---

- Step 2** Use the **ping** command to check the connection between the router and the remote host (the remote file server to which you copied the configuration file).

- Step 3** At the system prompt, enter the **copy tftp running-config** command and press **Return** to enter configuration mode. Specify that you will configure the system from a network device (instead of from the console terminal, which is the default).

```
Router# copy tftp running-config
```

**Step 4** The system prompts you to select a host or network configuration file. The default is host; press **Return** to accept the default.

```
Host or network configuration file [host]?
```

**Step 5** The system prompts you for the IP address of the host. Enter the IP address or name of the remote host.

```
IP address of remote host [255.255.255.255]? 10.1.1.1
```

**Step 6** The system prompts you for the name of the configuration file. When the system copies the file to the server, the default is to use the name of the router with the suffix *-config* (*router-config* in the following example). If you specified a different filename when you copied the configuration, enter that filename; otherwise, press **Return** to accept the default.

```
Name of configuration file [router-config]?
```

**Step 7** Before the system reboots with the new configuration, it displays the instructions you entered for confirmation. If the instructions are not correct, enter **n** (no), and then press **Return** to cancel the process. To accept the instructions, press **Return**, or **y** and then **Return**.

```
Configure using router-config from 10.1.1.1? [confirm]
Booting router-config from 10.1.1.1: !! [OK - 874/16000 bytes]
```

While the router retrieves and boots from the configuration on the remote host, the console display indicates whether or not the operation was successful. A series of exclamation points (!!!) and [OK] (as shown in the preceding example) indicates that the operation was successful. A series of periods (. . .) and [timed out] or [failed] indicates a failure (which would probably be due to a network fault or an incorrect server name, address, or filename). The following is an example of a failed attempt to boot from a remote server:

```
Booting Router-config . . . . . [timed out]
```

- If the display indicates that the process was successful, proceed to the next step.
- If the display indicates that the process failed, verify the name or address of the remote server and the filename, and repeat the preceding steps. If you are unable to retrieve the configuration, contact your network administrator or see the [“Obtaining Documentation and Submitting a Service Request”](#) section on page iv for instructions on contacting Cisco technical assistance.

**Step 8** Enter the **show running-config** command to display the currently running configuration on the terminal. Review the display and ensure that the configuration information is complete and correct. If it is not, verify the filename and repeat the preceding steps to retrieve the correct file, or use the **configure** command to add or modify the existing configuration. (Refer to the appropriate software documentation for descriptions of the configuration options available for the system and individual interfaces and specific configuration instructions.)

**Step 9** When you have verified that the currently running configuration is correct, enter the **copy running-config startup-config** command to save the retrieved configuration in NVRAM. Otherwise, the new configuration will be lost when you restart the system.

---

This completes the procedure for downloading the saved router configuration from the remote host. Proceed to the [“Configuring the Native Gigabit Ethernet Interfaces”](#) section on page 7-56.

## Auxiliary and Console Port Information

If the NPE-G1 or NPE-G2 and an I/O controller are both installed in the same system, the console and auxiliary ports on the I/O controller are used and the console and auxiliary ports on the NPE-G1 or NPE-G2 are disabled by Cisco IOS.

Both the NPE-G1 or NPE-G2 and the I/O controller console ports are available from the ROM monitor (ROMmon); however, once the system has completed loading the Cisco IOS image, the console port on the NPE-G1 or NPE-G2 is disabled if an I/O controller is also installed in the router.

If the NPE-G1 or NPE-G2 is used without an I/O controller, the console and auxiliary ports on the NPE-G1 or NPE-G2 are available both during and after loading the Cisco IOS image.

## Configuring an Auxiliary Port to Receive Console Port Messages

If you choose to have console port messages routed to the auxiliary port, use the Cisco IOS command **terminal monitor** on the auxiliary port on which you desire to receive console messages.

```
Router# terminal monitor
```

## Configuring the Native Gigabit Ethernet Interfaces

The NPE-G1 and NPE-G2 report both the RJ-45 and GBIC or SFP GE interface ports as GigabitEthernet 0/1, GigabitEthernet 0/2, and GigabitEthernet 0/3. Each interface has two ports with two different media types, GBIC or SFP, or RJ-45 (default). You can use only one port for each interface, and before configuring either port type, you must first use the **media-type** interface command to select the media type, GBIC (**gbic**) for NPE-G1 or SFP (**sfp**) for NPE-G2, or RJ-45 (**rj45**) port.



### Note

The Gigabit Ethernet interfaces on the NPE-G1 and NPE-G2 do not support the Inter-Switch Link (ISL) VLAN encapsulation protocol. We recommend that customers use the IEEE 802.1Q VLAN encapsulation protocol as an alternative. Where an application requires the use of ISL, this can be provided by the Fast Ethernet or Gigabit Ethernet port adapters or I/O controllers.



### Note

The RJ-45 port is the default media.

## Changing the Media Type of the Native Gigabit Ethernet GBIC, SFP, or RJ-45 Ports

To be able to use a particular media port, use Cisco IOS to select the media type. This is done by using the **media-type** interface command:

```
media-type { gbic | sfp | rj45 }
```

Example:

```
interface GigabitEthernet 0/1
  media-type rj45
end
```

## Configuring the Interface Transmission and Speed Modes

- Step 1** After changing the media type, configure the speed and transmission modes to appropriately match the new interface characteristics. Changing the speed and duplex of an NPE-G1 or NPE-G2 Gigabit Ethernet interface is done using the **speed** and **duplex** interface commands.



**Note** These commands are only applicable when using the RJ-45 media.

```
speed { 10 | 100 | 1000 | auto }
duplex { full | half | auto }
```

The following speed/duplex settings are supported:

| Media Type | Speed               | Duplex           |
|------------|---------------------|------------------|
| RJ45       | 10, 100, 1000, auto | full, half, auto |
| GBIC(1)    | 1000, auto(2)       | full, half, auto |

- If you are using the **no negotiation auto** command, the speed and duplex should be set to a value other than **auto** for correct operation.
- The only available speed in the no autonegotiation mode is 1000 Mbps; there is no difference whether **1000** or **auto** is selected.

When using the GBIC media, there is also the additional **negotiation auto** command that is used to enable the IEEE 802.1z Gigabit Ethernet (1000 Mbps) autonegotiation protocol.

- Step 2** To turn the autonegotiation feature off (it is on by default), issue the interface command **no negotiation auto**. This is useful for connecting to other Gigabit Ethernet equipment that does not support 802.1z autonegotiation.



**Note** The autonegotiation feature is not supported when using the **rj-45** media type and will be ignored if implementation is attempted.

If you change from the **GBIC** or **SFP** to the **rj-45** media type, you must set **speed** and **duplex** after you have executed the **media-type** command to ensure the interface will operate in the correct mode.

The **media-type GBIC** or **media-type SFP** mode will always default to 1000 Mbps. Both full-duplex and half-duplex operations are supported in this mode.

## Sample Configuration for the Gigabit Ethernet Interfaces

The following shows a typical configuration for the three Gigabit Ethernet interfaces on the NPE-G1. The same configuration would be typical for the NPE-G2 also, although the second interface would be configured for the SFP media type. In this example, the first interface is configured for the GBIC media type, the second interface is configured for the RJ-45 media type, and the third interface is not used.

```
interface GigabitEthernet0/1
```

```

ip address 10.198.75.35 255.255.255.240
load-interval 30
no keepalive
duplex full
speed 1000
media-type gbic
no negotiation auto
no cdp enable
no shutdown
!
interface GigabitEthernet0/2
ip address 10.179.16.2 255.255.255.240
duplex auto
speed auto
media-type rj45
no cdp enable
no shutdown
!
interface GigabitEthernet0/3
no ip address
shutdown
duplex auto
speed auto
media-type rj45
no negotiation auto
no cdp enable

```

**Note**

At the very minimum, an interface must be configured with the **ip address**, **media-type**, and **speed** commands before it can be enabled using the **no shutdown** command. Other interface commands might be needed, depending on the nature of the connected network.

## Debugging

Cisco IOS provides two commands to provide information on your interfaces: **show interface GigabitEthernet 0/X** (where X is 1, 2, or 3) and **show controllers GigabitEthernet 0/0**.

The output of the **show interface** command is useful for determining the current operating mode of the interface (speed/duplex/media-type) and the current interface statistics.

The output of the **show controllers** command displays more information specific to the I/O controller interface. For example, it shows the detected link status, speed, and duplex, and also determines the current status of autonegotiation and the link partners' abilities (if it is an autonegotiation-capable interface).

The **show controllers** command also displays the current operating state of the driver and the Ethernet controller hardware. The **show controllers** command is a very powerful debugging aid, especially for Cisco engineers should you need help in debugging a problem. If you have any problems with your Gigabit Ethernet interfaces, you will need to provide the **show controllers** command output to Cisco for analysis.

## Resetting the Interface

Should you have a problem with your interface and wish to try and reset it, use the command:

**clear interface GigabitEthernet 0/X** (where X is 1, 2, or 3)



## Clearing Counters

Interface counters may be cleared (reset) by using the command:

**clear counters GigabitEthernet 0/X** (where X is 1, 2, or 3)

This will not reset the interface.

## Using show Commands to Check the Installation

Use **show** commands to identify the hardware installed in your router, to verify the operation status, to view interface configuration settings, and to troubleshoot your router configuration. The interfaces on the NPE-G1 and NPE-G2 are identified by their chassis slot number and interface port number (*slot/port*). The interfaces on your I/O controller are also identified by chassis slot number and interface port number (*slot/port*). The chassis slot number for the I/O controller is always slot 0. [Table 7-1](#) lists the NPE-G1, NPE-G2, the I/O controller models, their corresponding interfaces, and the interface addressing syntax for each interface.

**Table 7-1 Identifying Interface Addresses on the NPE-G1, NPE-G2, and Various I/O Controllers**

| Model                         | Interface                                | Numbers                                   | Syntax              |
|-------------------------------|------------------------------------------|-------------------------------------------|---------------------|
| NPE-G1 and NPE-G2             | Gigabit Ethernet (port 0/1) <sup>1</sup> | Chassis slot—always 0                     | GigabitEthernet 0/1 |
|                               | Gigabit Ethernet (port 0/2)              | Interface port—1, 2, or 3                 | GigabitEthernet 0/2 |
|                               | Gigabit Ethernet (port 0/3)              |                                           | GigabitEthernet 0/3 |
| C7200-I/O-GE+E                | Gigabit Ethernet (port GE 0)             | Chassis slot—always 0<br>Interface port—0 | gigabitethernet 0/0 |
|                               | Ethernet (port E 0)                      | Chassis slot—always 0<br>Interface port—0 | fastethernet 0/0    |
| C7200-I/O-2FE/E               | Fast Ethernet/Ethernet (port 0)          | Chassis slot—always 0<br>Interface port—0 | fastethernet 0/0    |
|                               | Fast Ethernet/Ethernet (port 1)          | Chassis slot—always 0<br>Interface port—1 | fastethernet 0/1    |
| C7200-I/O-FE <sup>2</sup>     | Fast Ethernet (MII or RJ-45)             | Chassis slot—always 0<br>Interface port—0 | fastethernet 0/0    |
| C7200-I/O                     | No interface ports                       | —                                         | —                   |
| C7200-I/O-FE-MII <sup>3</sup> | Fast Ethernet (MII)                      | Chassis slot—always 0<br>Interface port—0 | fastethernet0/0     |

- Both optical and copper ports report the same syntax. For example, Gigabit Ethernet RJ-45 port 0/2 reports GigabitEthernet 0/2, as does Gigabit Ethernet GBIC port 0/2. You can use only one port per interface, depending on the port selected using the **media-type** command.
- The Product Number C7200-I/O-FE does not specify MII because both an MII and an RJ-45 receptacle are included.
- The I/O controller with the Product Number C7200-I/O-FE-MII has a single MII Fast Ethernet receptacle only. Although still supported by Cisco, this I/O controller with a single MII receptacle is no longer an orderable product as of May 1998.

The remainder of this section provides examples of **show** commands that pertain to the NPE-G1 and NPE-G2. The output from the **show** commands is from the NPE-G1 or the NPE-G2.

To determine the hardware configuration of your NPE-G1 or NPE-G2, use the **show version** command.

The following example shows an NPE-G2 installed in a Cisco 7206VXR router:

```
Router# show version  
Cisco IOS Software, 7200 Software (C7200-JS-M), Version 12.4(PC_D.051028) UBUILDT Image,  
Copyright (c) 1986-2005 by Cisco Systems, Inc.  
Compiled Fri 28-Oct-05 00:30 by biff
```

(display text omitted)

```
Cisco 7206VXR (NPE-G2) processor (revision A) with 917504K/131072K bytes of memory.  
Processor board ID 32428149  
MPC7448 CPU at 1660Mhz, Implementation 0, Rev 2.0  
6 slot VXR midplane, Version 2.8
```

(display text omitted)

Use the **show controllers** command to display initialization block information, transmit ring, receive ring, and errors for the interface controllers. The following example provides information about the interfaces on the I/O controller C7200-I/O-2FE/E and the NPE-G1 installed in a Cisco 7206VXR router:

```
Router# show controllers
Interface FastEthernet0/0 (idb 0x62EC78B8)
Hardware is i82543 (Livengood) A1
  network link is up
  Config is Auto Speed, Full Duplex
  loopback type is none
  10/100 PHY is enabled (MII mode)

(display text omitted)

Interface FastEthernet0/1 (idb 0x62EBA1A4)
Hardware is i82543 (Livengood) A1
  network link is up
  Config is Auto Speed, Auto Duplex
  loopback type is none
  10/100 PHY is enabled (MII mode)

(display text omitted)

Interface GigabitEthernet0/1 (idb 0x62E3A4AC)
Hardware is BCM-12500 Internal MAC
  Network connection mode is AUTO
  MAC Registers:

(display text omitted)

Interface GigabitEthernet0/2 (idb 0x62E4F968)
Hardware is BCM-12500 Internal MAC
  Network connection mode is AUTO
  Physical Interface - RJ45

(display text omitted)

Interface GigabitEthernet0/3 (idb 0x62E6581C)
Hardware is BCM-12500 Internal MAC
  Network connection mode is AUTO
```

Use the **show interface** or **show interface slot/port** command to display status information:

```
Router# show interface g0/1
GigabitEthernet0/1 is administratively down, line protocol is down
  Hardware is BCM-12500 Internal MAC, address is (display text omitted)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, reliability 255/255, txload 1/255,
  rxload 1/255
  Encapsulation ARPA, loopback not set
  Unknown duplex, Unknown Speed, link type is autonegotiation, media type is unknown 0
  output flow-control is unsupported, input flow-control is unsupported
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters 21:18:23
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
```

```

5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 0 multicast, 0 pause input
  0 input packets with dribble condition detected
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 4294967295 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 pause output
  0 output buffer failures, 0 output buffers swapped out

```

## Upgrading the Cisco IOS Image and the Boot Helper (Boot Loader) Image

Should you ever upgrade the Cisco IOS image on your Cisco 7200 VXR router with an NPE-G1 or NPE-G2, you need to ensure that you also upgrade your boot helper (boot loader) image.

The boot helper (boot loader) image resides in flash memory on the NPE-G1 and NPE-G2 and contains a subset of the Cisco IOS software. This image is used to boot your router from the network or to load Cisco IOS images onto the router. This image is also used if the system cannot find a valid system image.

Your boot helper (boot loader) image should correspond to the Cisco IOS release that is running on your router.

- The NPE-G1 requires the c7200-kboot boot helper image.
- The NPE-G2 requires the c7200p-kboot-mz helper image.
- The Cisco uBR7200-NPE-G1 requires the ubr7200-kboot-mz boot helper image.
- The Cisco uBR7200-NPE-G2 requires the ubr7200p-kboot-mz boot helper image.

To upgrade your boot helper (boot loader) image, obtain the most current boot helper image through Cisco.com and copy the new boot helper image to flash memory on your router. For information on how to access Cisco.com, see the [“Obtaining Documentation and Submitting a Service Request”](#) section on [page -iv](#). Follow the **Software Center** link under **Service and Support**. You need to get a login code from a Cisco representative to retrieve files from the **Software Center**.

To obtain a boot helper (boot loader) image from Cisco.com and upgrade your boot flash memory, do the following:

---

**Step 1** Download the boot helper (boot loader) image from Cisco.com to a Trivial File Transfer Protocol (TFTP) server.

**Step 2** Reformat the flash memory on your router as follows:

```

router# format bootflash:
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in "bootflash:". Continue? [confirm]
Formatting sector ...
Format of bootflash:complete

```




---

**Note** Reformatting flash memory erases the current flash memory contents.

---

**Step 3** Copy the boot helper image from the TFTP server to flash memory as follows:

```
router# copy tftp bootflash:
Address or name of remote host []? biff
Source filename []? c7200-boot-mz.120-5.S
Destination filename [c7200-boot-mz.120-5.S]?
Accessing tftp://biff/c7200-boot-mz.120-5.S...
Loading c7200-boot-mz.120-5.S from 192.168.254.254 (via
Ethernet4/0):!!
!!
!!
!!
!!

[OK - 3132516/6264832 bytes]

3132516 bytes copied in 28.488 secs (111875 bytes/sec)
```

This completes the procedure for upgrading your boot helper (boot loader) image. For more detailed instructions on loading and maintaining system images and microcode, including boot helper images, refer to the *Configuration Fundamentals Configuration Guide*, which is available on Cisco.com.

## Upgrading ROMmon on the NPE-G1 or NPE-G2

Upgrading the rewriteable ROM monitor (ROMmon) allows you to download a new ROMmon image instead of having to replace hardware (NPE-G1 or NPE-G2) to get a new image.



### Note

ROMmon can be upgraded on the NPE-G1 or NPE-G2, but cannot be upgraded on any other network processor engine for the Cisco 7200 series routers.

There are two ROMmon images: one ReadOnly image (the original image that shipped with your system) that is always available if you have the following:

- NPE-G1 hardware EPROM version 4.0 with NPE-G1 ROMmon version 12.3(4r)T1 or later
- NPE-G2 hardware

You can choose to configure the system to point to the second ROMmon image, the upgradeable ROMmon image. At bootup, the system starts with the ReadOnly image and then, if configured, jumps to the upgradeable image. If the upgradeable ROMmon image fails to boot, the router will mark this ROMmon image as invalid and revert to the ReadOnly image.

The first time a new ROMmon image is executed, you must allow the system to boot ROMmon before doing any additional resets or power cycling. If the ROMmon-executing process is interrupted, the stem interprets this as a bootup failure of the new ROMmon image. The router reverts to the ReadOnly image.



### Note

The ROMmon upgrade image is marked as invalid if it fails to boot. Do not reset the router when it is performing an initial bootup.

## Using the show rom-monitor Command and ROMmon CLI showmon Commands

Use the **show rom-monitor** command if you are in Cisco IOS, or the ROMmon CLI **showmon** command if you are in ROMmon, to determine which ROMmon images are available. See the following examples for information shown in the output of the **show rom-monitor** or ROMmon CLI **showmon** commands:

- If you are in Cisco IOS, use the **show rom-monitor** command:

```
Router> show rom-monitor
ReadOnly ROMMON version:

System Bootstrap, Version 12.2(20031011:151758)
Copyright (c) 1994-2003 by cisco Systems, Inc.

Upgrade ROMMON version:

System Bootstrap, Version 12.2(20031011:151758)
Copyright (c) 1994-2003 by cisco Systems, Inc.

Currently running ROMMON from Upgrade region
ROMMON from Upgrade region is selected for next boot
```

- If you are in ROMmon, use the ROMmon CLI **showmon** command:

```
rommon 1 > showmon

ReadOnly ROMMON version is:
System Bootstrap, Version 12.2(20031011:151758) [biff]
Copyright (c) 1994-2003 by cisco Systems, Inc.

Upgrade ROMMON version is:
System Bootstrap, Version 12.2(20031011:151758) [biff]
Copyright (c) 1994-2003 by cisco Systems, Inc.

Upgrade ROMMON currently running
Upgrade ROMMON is selected for next boot
rommon 2 >
```

## Using the upgrade rom-monitor file Command

Use the **upgrade rom-monitor file file\_id** command to program the ROMmon.

See the following example of the **upgrade rom-monitor file** command:

```
Router# upgrade rom-monitor file tftp://00.0.00.0/biff/C7200_NPEG2_RMFUR.srec
Loading pgettnr/C7200_NPEG2_RMFUR.srec from 00.0.00.0 (via GigabitEthernet0/1):
!!
[OK - 392348 bytes]

This command will reload the router. Continue? [yes/no]:yes
ROMMON image upgrade in progress.
Erasing boot flash eeeeeeeeeeeeeeeeeee
Programming boot flash ppppp
Now Reloading via hard watchdog timeout

Unexpected exception, CP
System Bootstrap, Version 12.2(20031011:151758) [biff]
Copyright (c) 1994-2003 by cisco Systems, Inc.
```

```
Running new upgrade for first time

System Bootstrap, Version 12.2(20031011:151758) [biff]
Copyright (c) 1994-2003 by cisco Systems, Inc.

ROM:Rebooted by watchdog hard reset
C7200 platform with 1048576 Kbytes of main memory

Upgrade ROMMON initialized
rommon 1 >
```

**Note**

---

It is advisable to load a known good Cisco IOS image after a ROMmon upgrade.

---

## Changing Preferences to Choose the Other ROMmon Image

To use the other ROMmon image, use one of the following commands to make the change depending on whether you are in Cisco IOS or in ROMmon:

- In Cisco IOS, use the **upgrade rom-monitor preference** command to change to the other ROMmon image:

```
upgrade rom-monitor preference [readonly | upgrade]
```

Example:

```
Router: upgrade rom-monitor preference readonly
You are about to mark ReadOnly region of ROMMON for the highest boot preference.
Proceed? [confirm]
Done! Router must be reloaded for this to take effect.
```

- In ROMmon, use the ROMmon CLI **rommon-pref** command to change to the other ROMmon image:

```
rommon-pref [readonly | upgrade]
```

Example:

```
rommon 2 > rommon-pref readonly
```

## Troubleshooting the Upgrade

This section contains sample error messages that appear if an upgrade fails, or if an upgrade is successful, but the upgrade image is corrupted.

## ROMmon Upgrade Error Messages

One if these error message appears when the upgrade has failed or if the upgrade image is corrupted:

- ROMmon image is not compatible with the ReadOnly image:

```
Router: upgrade rom-monitor file tftp://00.0.00.0/biff/C7200_NPEG2_RMFUR.srec
Loading biff/C7200_NPEG2_RMFUR.srec from 00.0.00.0 (via GigabitEthernet0/1):
!!
[OK - 392348 bytes]
```

ROMMON upgrade aborted; new ROMMON image version is not compatible with ReadOnly

- ROMmon upgrade image is too big:

```
Router: upgrade rom-monitor file tftp://00.0.00.0/biff/C7200_NPEG2_RMFUR.srec
Loading biff/C7200_NPEG2_RMFUR.srec from 00.0.00.0 (via GigabitEthernet0/1):
!!
[OK - 392348 bytes]
```

ROMMON upgrade aborted; new ROMMON is too big

- Hardware does not support ROMmon upgrade:

```
Router: upgrade rom-monitor file tftp://00.0.00.0/biff/C7200_NPEG2_RMFUR.srec
Loading biff/C7200_NPEG2_RMFUR.srec from 00.0.00.0 (via GigabitEthernet0/1):
!!
[OK - 392348 bytes]
```

ROMMON upgrade aborted; Current ROMMON does not support upgrade capability

- Upgrade command with incorrect file type:

```
NPEG1-10# upgrade rom-monitor file tftp://00.0.00.0/biff/C7200_NPEG2_BOOT_ROM.bin
from 00.0.00.0 (via GigabitEthernet0/1):!!!!!!!!!!!!!!!!!!!!
!!
[OK - 524288 bytes]
```

%Error:not srec file

- A boot of a corrupted upgrade image:

```
System Bootstrap, Version 12.2(20031011:151758) [biff-npeg2-fur 135], DEVELOPMENT
SOFTWARE
Copyright (c) 1994-2003 by cisco Systems, Inc.
```

```
Upgrade ROMMON corrupted.
Falling to ReadOnly ROMMON
```

```
ROM:Rebooted by watchdog hard reset
C7200 platform with 1048576 Kbytes of main memory
```

```
ReadOnly ROMMON initialized
```



## Upgrading FPGA on the NPE-G2

A field-programmable gate array (FPGA) device exists on the NPE-G2. FPGA devices do not exist on other Cisco 7200 series routers network processing engines. FPGA devices are a type of field-programmable device (FPD) that support separate software upgrades. Whenever a Cisco image is released that supports the FPD feature, a companion FPD image package is also released for that Cisco IOS software release. The FPD image package is available from Cisco.com and is accessible from the Cisco Software Center page where you go to download your Cisco IOS software image.

**Note**

---

For Cisco IOS Release 12.4(4)XD, only a manual FPD upgrade of the NPE-G2 is supported.

---

For FPGA upgrade information and procedures, see the *Field-Programmable Device Upgrades* document at:

[http://www.cisco.com/en/US/docs/routers/7200/configuration/feature\\_guides/fpd.html](http://www.cisco.com/en/US/docs/routers/7200/configuration/feature_guides/fpd.html)

## Troubleshooting the NPE-G1 or NPE-G2

For troubleshooting information, see the “[Troubleshooting the NPE-G1 or NPE-G2](#)” section on [page 10-2](#).

## Fiber Optic Cleaning Information

We strongly recommend cleaning all optical fiber connections before reconnecting optical cables to equipment. For information about cleaning optical connectors, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* document.





## CHAPTER 8

# Preparation for Installation

---

This chapter provides a list of parts and tools you need to remove and replace the network processing engine (NPE) or network services engine (NSE) in:

- Cisco 7200 series routers, including the Cisco 7200 VXR routers
- Cisco uBR7200 series routers

This chapter also includes safety and ESD-prevention guidelines to help you avoid injury to yourself and damage to the equipment. See the [“Obtaining Documentation and Submitting a Service Request”](#) section on [page iv](#) for ordering and contact information. The following sections are found in this chapter:

- [Required Tools and Equipment, page 8-1](#)
- [Software and Hardware Requirements, page 8-2](#)
- [Table 8-4 lists the minimum software requirements for the NPE-400, NPE-G1, and NPE-G2. Table 8-5 and Table 8-6 list the recommended minimum Cisco IOS software release to ensure proper operation of the network processing engine or network services engine in supported router platforms., page 8-4](#)

## Required Tools and Equipment

You need the following parts and tools to remove and replace an NPE or NSE in Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers:

- A network processing engine or network services engine (NPE-100, NPE-150, NPE-175, NPE-200, NPE-225, NPE-300, NPE-400, NSE-1, NPE-G1, or NPE-G2)
- Number 2 Phillips screwdriver and a 3/16-inch flat-blade screwdriver
- An 8-mm wrench or nut driver, or adjustable wrench (for connecting a grounding lug to a Cisco uBR7200 series DC-input power supply)
- A 7-mm wrench or nut driver, or adjustable wrench (for connecting the DC-input power lead strain-relief cover to a DC-input power supply)
- Standard wire stripper (for connecting power to an installed DC-input power supply)
- Tape (for securing the switch handle of a DC circuit breaker in the off position)
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all field-replaceable units (FRUs)
- An antistatic mat or surface, or static-shielding bag
- Cable-management brackets and screws that ship with the NPE-G1 or NPE-G2

If your router is mounted in a 4-post or telco-type rack, make sure you have at least one other person available to assist you with removing the chassis from the rack.

## Software and Hardware Requirements

The network processing engine and network services engine have different requirements for both hardware and software. See the “NPE or NSE Requirements” section on page 8-2.



### Note

Cisco IOS Release 12.2 changed the behavior of the ROM monitor (ROMmon) during the bootup sequence. See “Boot Changes in Cisco IOS Release 12.2” section on page 10-2 for more information.

## NPE or NSE Requirements

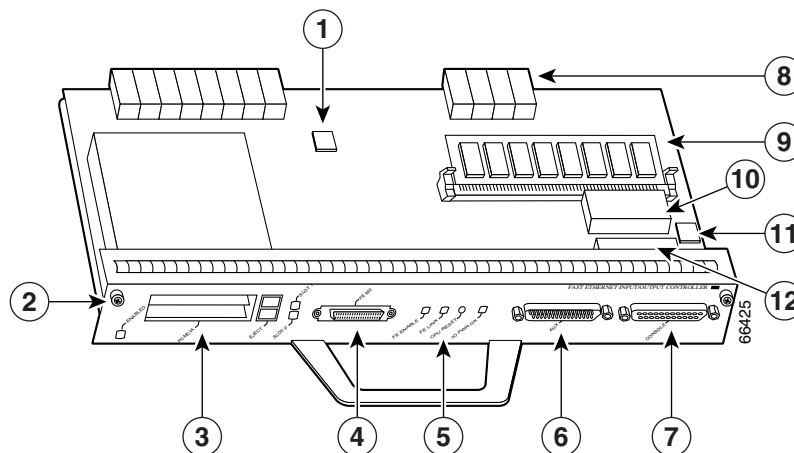
When installing an NPE-175, NPE-225, NPE-300, NPE-400, NPE-G2, or NSE-1 in a Cisco 7200 VXR router or Cisco uBR7246VXR router that is using a previously purchased I/O controller, you must upgrade the I/O controller boot helper image. The Cisco uBR7225VXR router does not support port adapters or I/O controllers.



### Note

Instructions for upgrading the boot helper image on the I/O controller are contained in the online *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* publication.

**Figure 8-1** Input/Output Controller—Showing Boot ROM and Flash SIMM



|   |                                              |    |                     |
|---|----------------------------------------------|----|---------------------|
| 1 | Temperature sensor                           | 7  | Console port        |
| 2 | Captive installation screw                   | 8  | Midplane connectors |
| 3 | PC Card slots                                | 9  | Flash SIMM (U99)    |
| 4 | Optional Fast Ethernet port (MII receptacle) | 10 | NVRAM (U41)         |
| 5 | LEDs and CPU reset button                    | 11 | Temperature sensor  |
| 6 | Auxiliary port                               | 12 | Boot ROM (U20)      |

Use the following table to determine supported NPEs or the NSE-1 for specific routers.

**Table 8-1 Routers and Supported NPEs or NSE-1**

| Router                                                                    | Supported NPEs or NSE                                         |
|---------------------------------------------------------------------------|---------------------------------------------------------------|
| Cisco 7200 VXR routers                                                    | All NPEs and the NSE-1                                        |
| Cisco 7200 series routers                                                 | NPE-100, NPE-150, NPE-175, NPE-200, and NPE-225               |
| Cisco 7206 as a router shelf in a Cisco AS5800 Universal Access Server    | NPE-200                                                       |
| Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server | NPE-300 and NPE-400                                           |
| Cisco uBR7223 universal broadband router                                  | NPE-150, NPE-200, and NPE-225                                 |
| Cisco uBR7246 universal broadband router                                  | NPE-150, NPE-200, and NPE-225                                 |
| Cisco uBR7246VXR universal broadband router                               | NPE-225, NPE-300, NPE-400, and UBR7200-NPE-G1, UBR7200-NPE-G2 |
| Cisco uBR7225VXR universal broadband router                               | UBR7200-NPE-G1, UBR7200-NPE-G2                                |

**Table 8-2 NPE or NSE Router and Port Adapter Compatibility Requirements**

| NPE or NSE          | Compatible Only With Routers                                                 | Not Compatible or Supported With Routers                                                                                                                                                                                                          | Port Adapter                              |
|---------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| NPE-G2              | Cisco 7200 VXR routers<br>Cisco uBR7246VXR router<br>Cisco uBR7225VXR router | Keyed to prevent inserting in Cisco 7200 series routers (7202, 7204, and 7206)                                                                                                                                                                    | —                                         |
| NPE-G1              | Cisco 7200 VXR routers<br>Cisco uBR7246VXR router<br>Cisco uBR7225VXR router | Keyed to prevent inserting in Cisco 7200 series routers (7202, 7204, and 7206)                                                                                                                                                                    | —                                         |
| NSE-1               | Cisco 7200 VXR routers                                                       | Keyed to prevent inserting in Cisco 7200 series routers (7202, 7204, and 7206)<br><br><b>Note</b> The NSE-1 is not supported in the Cisco uBR7200 series routers, even though it is physically capable of being inserted into the router chassis. | —                                         |
| NPE-300 and NPE-400 | Cisco 7200 VXR routers<br>Cisco uBR7246VXR router                            | Keyed to prevent insertion in Cisco 7200 series routers (7202, 7204, and 7206) and the Cisco uBR7246 and Cisco uBR7223 universal broadband routers                                                                                                | Not supported with the PA-A1 port adapter |

## Port Adapter Jacket Card Support

The Port Adapter Jacket Card inserts into the I/O controller slot of a Cisco 7200 VXR router when an NPE-G2 or NPE-G1 is installed. The Port Adapter Jacket Card network processing engine support is shown in [Table 8-3](#).

**Table 8-3 Network Processing Engines Supporting the Port Adapter Jacket Card**

| Network Processing Engine | Software                     |
|---------------------------|------------------------------|
| NPE-G2                    | Cisco IOS Release 12.4(4)XD2 |
| NPE-G1                    | Cisco IOS Release 12.4(4)XD  |

## Software Requirements

[Table 8-4](#) lists the minimum software requirements for the NPE-400, NPE-G1, and NPE-G2. [Table 8-5](#) and [Table 8-6](#) list the recommended minimum Cisco IOS software release to ensure proper operation of the network processing engine or network services engine in supported router platforms.

**Table 8-4 Software Requirements for the NPE-400, NPE-G1, and NPE-G2**

| Router Platform                                                                       | Network Processing Engine                                                                                                                                                 |                                                                                       |                                                                                                                                                            |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                       | NPE-400                                                                                                                                                                   | NPE-G1                                                                                | NPE-G2                                                                                                                                                     |
| <b>Cisco 7200 Series</b>                                                              |                                                                                                                                                                           |                                                                                       |                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>Cisco 7204VXR and Cisco 7206VXR</li> </ul>     | Cisco IOS Release 12.1(3a)E or later releases of 12.1E<br>Cisco IOS Release 12.1(5)T or later releases of 12.1T<br>Cisco IOS Release 12.0(14)S or later releases of 12.0S | Cisco IOS Release 12.2(4)BW<br>Cisco IOS Release 12.2(8)B or later releases of 12.2 B | Cisco IOS Release 12.4(4)XD or later releases of 12.4XD.<br><b>Note</b> The NPE-G2 <sup>1</sup> uses software images that begin with the prefix “c7200p-”. |
| <ul style="list-style-type: none"> <li>Cisco 7204 and Cisco 7206</li> </ul>           | —                                                                                                                                                                         | —                                                                                     | —                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>Cisco 7202</li> </ul>                          | —                                                                                                                                                                         | —                                                                                     | —                                                                                                                                                          |
| <b>Cisco AS5800 Universal Access Server</b>                                           |                                                                                                                                                                           |                                                                                       |                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>Cisco 7206 router shelf<sup>2</sup></li> </ul> | —                                                                                                                                                                         | —                                                                                     | —                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>Cisco 7206VXR router shelf</li> </ul>          | Cisco IOS Release 12.2(5)M or later releases of 12.2M                                                                                                                     | —                                                                                     | —                                                                                                                                                          |
| <b>Cisco uBR7200 series</b>                                                           |                                                                                                                                                                           |                                                                                       |                                                                                                                                                            |

**Table 8-4 Software Requirements for the NPE-400, NPE-G1, and NPE-G2**

| Router Platform                                                    | Network Processing Engine                                                                                                                                                                                                                                          |                                                                                                                                                                                                                    |                                                                                                                                       |
|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|                                                                    | NPE-400                                                                                                                                                                                                                                                            | NPE-G1                                                                                                                                                                                                             | NPE-G2                                                                                                                                |
| <ul style="list-style-type: none"> <li>Cisco uBR7246VXR</li> </ul> | Cisco IOS Release 12.1(6)EC or later releases of 12.1EC with a special boot helper image of 12.0(15)SC [ubr7200-boot-mz.120-15.SC]<br><br>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC<br><br>Cisco IOS Release 12.3(9a)BC or later releases of 12.3BC | Cisco IOS Release 12.2(11)CX <sup>3</sup> with a special boot helper image of 12.2(11)CX [ubr7200-boot-mz.122-11.CX or ubr7200-kboot-mz.122-11.CX]<br><br>Cisco IOS Release 12.2(33)SCA or later releases of 12.2S | Cisco IOS Release 12.2(33)SCA <sup>4</sup><br><br><b>Note</b> The NPE-G2 uses software images that begin with the prefix “ubr7200p-”. |
| <ul style="list-style-type: none"> <li>Cisco uBR7225VXR</li> </ul> | —                                                                                                                                                                                                                                                                  | Cisco IOS Release 12.2(33)<br><br>Cisco IOS Release 12.2(33)SCA with a boot helper image [ubr7200-boot-mz.122-33.SCA] or [ubr7200-kboot-mz.122-33.SCA]                                                             | Cisco IOS Release 12.2S                                                                                                               |

- The NPE-G2 has its own Cisco IOS software image with the prefix “c7200p-” in the software images filenames, including the boot image. The NPE-G2 does not boot up with a software image with the prefix “c7200-”. Previous network processing engines, or the network services engine, do not boot up with the “c7200p-” boot image. They use the prefix “c7200-”.
- For information about the Cisco 7206 or Cisco 7206VXR as router shelves in the Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation listed in the [“Related Documentation” section on page iii](#).
- The Cisco uBR7246VXR universal broadband router requires the Cisco uBR7200-NPE-G1 version of the NPE-G1.
- The Cisco uBR7246VXR universal broadband router requires the Cisco uBR7200-NPE-G2 version of the NPE-G2.

**Table 8-5 Software Requirements for the NPE-100, NPE-150, NPE-200, and NPE-300**

| Router Platform <sup>1</sup>                                                      | Network Processing Engine                                                                                         |                      |                      |                      |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|----------------------|
|                                                                                   | NPE-100 <sup>2</sup>                                                                                              | NPE-150 <sup>2</sup> | NPE-200 <sup>2</sup> | NPE-300 <sup>2</sup> |
| <b>Cisco 7200 series</b>                                                          |                                                                                                                   |                      |                      |                      |
| <ul style="list-style-type: none"> <li>Cisco 7204VXR and Cisco 7206VXR</li> </ul> | Cisco IOS Release 12.0(2)XE2 or later releases of 12.0XE<br>Cisco IOS Release 12.0(3)T or later releases of 12.0T |                      |                      |                      |

Table 8-5 Software Requirements for the NPE-100, NPE-150, NPE-200, and NPE-300 (continued)

| Router Platform <sup>1</sup>                                                          | Network Processing Engine |                                                                                             |                                                                                                                                                                                                                                                              |                                                         |
|---------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
|                                                                                       | NPE-100 <sup>2</sup>      | NPE-150 <sup>2</sup>                                                                        | NPE-200 <sup>2</sup>                                                                                                                                                                                                                                         | NPE-300 <sup>2</sup>                                    |
| <ul style="list-style-type: none"> <li>Cisco 7204 and Cisco 7206</li> </ul>           | Cisco IOS Release 11.1(8) | Cisco IOS Release 11.1(5)                                                                   | Cisco IOS Release 12.0 or 12.0S or later releases of 12.0 or 12.0S<br><br>Cisco IOS Release 11.2(12)P or later releases of 11.2P<br><br>Cisco IOS Release 11.3(2)T or later releases of 11.3T<br><br>Cisco IOS Release 11.3(2)AA or later releases of 11.3AA | —                                                       |
| <ul style="list-style-type: none"> <li>Cisco 7202</li> </ul>                          | —                         | Cisco IOS Release 11.3(4)AA or later releases of 11.3AA:<br>Cisco IOS Release 12.0 or 12.0S | —                                                                                                                                                                                                                                                            | —                                                       |
| <b>Cisco AS5800 Universal Access Server</b>                                           |                           |                                                                                             |                                                                                                                                                                                                                                                              |                                                         |
| <ul style="list-style-type: none"> <li>Cisco 7206 router shelf<sup>3</sup></li> </ul> | —                         | —                                                                                           | Cisco IOS Release 11.3(2)AA or later releases of 11.3AA                                                                                                                                                                                                      | —                                                       |
| <ul style="list-style-type: none"> <li>Cisco 7206VXR router shelf</li> </ul>          | —                         | —                                                                                           | —                                                                                                                                                                                                                                                            | Cisco IOS Release 12.0(4)XJ or later releases of 12.0XJ |



Table 8-5 Software Requirements for the NPE-100, NPE-150, NPE-200, and NPE-300 (continued)

| Router Platform <sup>1</sup>                                                      | Network Processing Engine |                                                                                                                                                                                                                                                        |                      |                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | NPE-100 <sup>2</sup>      | NPE-150 <sup>2</sup>                                                                                                                                                                                                                                   | NPE-200 <sup>2</sup> | NPE-300 <sup>2</sup>                                                                                                                                                                     |
| <b>Cisco uBR7200 series</b>                                                       |                           |                                                                                                                                                                                                                                                        |                      |                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>Cisco uBR7246VXR</li> </ul>                | —                         | —                                                                                                                                                                                                                                                      | —                    | Cisco IOS Release 12.0(6)SC or later releases of 12.0SC<br><br>Cisco IOS Release 12.1(3)EC1 or later releases of 12.1 EC<br><br>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC |
| <ul style="list-style-type: none"> <li>Cisco uBR7246 and Cisco uBR7223</li> </ul> | —                         | Cisco IOS Release 11.3(6)NA or later releases of 11.3NA<br><br>Cisco IOS Release 12.0(6)SC or later releases of 12.0SC<br><br>Cisco IOS Release 12.1(3)EC1 or later releases of 12.1EC<br><br>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC |                      | —                                                                                                                                                                                        |

- The NPE-300 is not supported in the Cisco 7202, Cisco 7204, or Cisco 7206 routers.
- Cisco IOS Release 12.1(5)T and later releases of 12.1T require a minimum of 128 MB of SRAM or SDRAM.
- For information about the Cisco 7206 or Cisco 7206VXR as router shelves in the Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation listed in the “[Related Documentation](#)” section on page iii.

Table 8-6 Software Requirements for the NPE-175, NPE-225, and NSE-1

| Router Platform                                                                   | NPE or NSE                                                                                                           |                      |                                                                                        |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------|
|                                                                                   | NPE-175 <sup>1</sup>                                                                                                 | NPE-225 <sup>1</sup> | NSE-1                                                                                  |
| <b>Cisco 7200 Series</b>                                                          |                                                                                                                      |                      |                                                                                        |
| <ul style="list-style-type: none"> <li>Cisco 7204VXR and Cisco 7206VXR</li> </ul> | Cisco IOS Release 12.0(4)XE or later releases of 12.0XE<br><br>Cisco IOS Release 12.0(5)T or later releases of 12.0T |                      | Cisco IOS Release 12.1E or<br>Cisco IOS Release 12.1(5)T or<br>later releases of 12.1T |

Table 8-6 Software Requirements for the NPE-175, NPE-225, and NSE-1 (continued)

| Router Platform                                                                                      | NPE or NSE                                                                                                       |                                                                                                                                                                                          |       |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|                                                                                                      | NPE-175 <sup>1</sup>                                                                                             | NPE-225 <sup>1</sup>                                                                                                                                                                     | NSE-1 |
| <ul style="list-style-type: none"> <li>Cisco 7204 and Cisco 7206</li> </ul>                          | Cisco IOS Release 12.0(4)XE or later releases of 12.0XE<br>Cisco IOS Release 12.0(5)T or later releases of 12.0T |                                                                                                                                                                                          | —     |
| <b>Cisco uBR7200 series<sup>2</sup></b>                                                              |                                                                                                                  |                                                                                                                                                                                          |       |
| <ul style="list-style-type: none"> <li>Cisco uBR7246VXR, Cisco uBR7246, and Cisco uBR7223</li> </ul> | —                                                                                                                | Cisco IOS Release 12.0(6)SC or later releases of 12.0SC<br><br>Cisco IOS Release 12.1(3)EC1 or later releases of 12.1 EC<br><br>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC | —     |

- Cisco IOS Release 12.1(5)T and later releases of 12.1T require a minimum of 128 MB of SRAM or SDRAM.
- Previous documents stated that the Cisco uBR7200 series routers supported the NPE-175. Because the NPE-175 has reached its end of life and was never made orderable for the Cisco uBR7200 series routers, the NPE-175 is no longer shown as supported for the Cisco uBR7200 series routers.

## Safety Guidelines

Following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.



### Warning

**Only trained and qualified personnel should be allowed to install or replace this equipment.**

Statement 1030

## Safety Warnings



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

### SAVE THESE INSTRUCTIONS

Waarschuwing

### BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

### BEWAAR DEZE INSTRUCTIES

Varoitus

### TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelyyn liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

### SÄILYTÄ NÄMÄ OHJEET

Attention

### IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

### CONSERVEZ CES INFORMATIONS

**Warnung WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

**BEWAHREN SIE DIESE HINWEISE GUT AUF.**

**Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

**CONSERVARE QUESTE ISTRUZIONI**

**Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

**TA VARE PÅ DISSE INSTRUKSJONENE**

**Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

**GUARDE ESTAS INSTRUÇÕES**

**¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

**GUARDE ESTAS INSTRUCCIONES**

**Varning! VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

**SPARA DESSA ANVISNINGAR****Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK**

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

**ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!****Предупреждение ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

**СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ****警告 重要的安全性说明**

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

**警告 安全上の重要な注意事項**

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

**주의**    **중요 안전 지침**

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**Aviso**    **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

**Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.**

**GUARDE ESTAS INSTRUÇÕES****Advarsel**    **VIGTIGE SIKKERHEDSANVISNINGER**

**Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemeskade. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.**

**GEM DISSE ANVISNINGER****تحذير****إرشادات الأمان الهامة**

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمة الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

**Upozorenje**    **VAŽNE SIGURNOSNE NAPOMENE**

**Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.**

**SAČUVAJTE OVE UPUTE**

**Upozornění DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

**USCHOVEJTE TYTO POKYNY****Προειδοποίηση ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ**

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

**ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ****אזהרה****הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

**שמור הוראות אלה****Opomena VAŽNI BEZBEDNOSNI NAPATSTVIJA**

Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.

**ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА**

**Ostrzeżenie WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

**NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ****Upozornenie DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

**USCHOVAJTE SI TENTO NÁVOD**

## Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

## Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.



- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

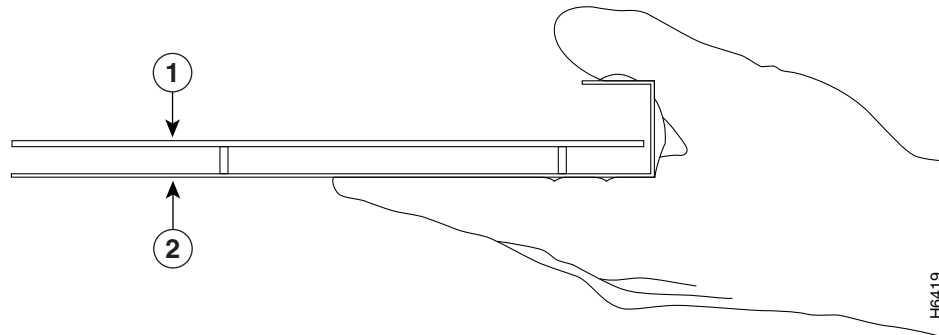
## Electrostatic Discharge Prevention

Electrostatic discharge (ESD) damages equipment and impairs electrical circuitry. ESD occurs when printed circuit boards are improperly handled and results in complete or intermittent failures.

The network processing engine or network services engine, I/O controller, port adapters, and Cisco uBR7200 series cable interface line cards consist of printed circuit boards that are fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Handle the network processing engine or network services engine, I/O controller, port adapters, and Cisco uBR7200 series cable interface line cards by their carrier edges and handles; never touch the printed circuit board or connector pins.

Figure 8-2 shows the location of a printed circuit board in a network processing engine or network services engine, I/O controller, or Cisco uBR7200 series cable interface line card metal carrier. Do not touch the printed circuit board when handling any of the components.

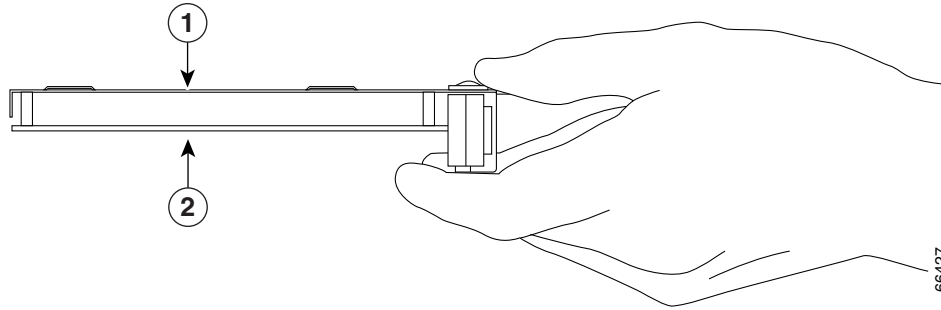
**Figure 8-2** Handling the Network Processing Engine or Network Services Engine, the I/O Controller, and the Cisco uBR7200 Series Cable Interface Line Cards—Side View



|          |                       |          |               |
|----------|-----------------------|----------|---------------|
| <b>1</b> | Printed circuit board | <b>2</b> | Metal carrier |
|----------|-----------------------|----------|---------------|

Figure 8-3 shows the location of a printed circuit board in a port adapter metal carrier. Do not touch the printed circuit board when handling a port adapter.

**Figure 8-3 Handling a Port Adapter—Side View**



|          |               |          |                       |
|----------|---------------|----------|-----------------------|
| <b>1</b> | Metal carrier | <b>2</b> | Printed circuit board |
|----------|---------------|----------|-----------------------|

Although the metal carrier helps to protect the printed circuit boards from ESD, wear a preventive antistatic strap whenever handling the network processing engine or network services engine, I/O controller, port adapters, or Cisco uBR7200 series cable interface line cards. Ensure that the strap makes good skin contact and connect the strap’s clip to an unpainted chassis surface to channel unwanted ESD voltages safely to ground.

If no wrist strap is available, ground yourself by touching the metal part of the chassis.

**Caution**

Make sure to tighten the captive installation screws on the network processing engine or network services engine, Cisco uBR7200 series cable interface line cards, and the I/O controller (use a number 2 Phillips or a 3/16-inch flat-blade screwdriver). These screws prevent accidental removal, provide proper grounding for the router, and help to ensure that the network processing engine or network services engine, Cisco uBR7200 series cable interface line cards, and the I/O controller are properly seated in the router midplane.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap when installing or replacing the network processing engine or network services engine, I/O controller, port adapters, or Cisco uBR7200 series cable interface line cards. Ensure that the ESD strap makes contact with your skin.
- Handle the network processing engine or network services engine, I/O controller, port adapters, or Cisco uBR7200 series cable interface line cards by their metal carrier edges and handles only; avoid touching the printed circuit board components or any connector pins.
- When removing the network processing engine or network services engine, I/O controller, port adapters, or Cisco uBR7200 series cable interface line cards, place them on an antistatic surface with the printed circuit board components facing upward, or in a static shielding bag. If you are returning an I/O controller, network processing engine or network services engine, port adapter, or Cisco uBR7200 series cable interface line card to the factory, immediately place it in a static shielding bag.

**Caution**

Periodically check the resistance value of the antistatic strap. The measurement should be within the range of 1 to 10 megohms (Mohms).



## CHAPTER 9

# Removing and Installing the NPE or NSE

This chapter describes how to remove a network processing engine (NPE) or network services engine (NSE) from supported platforms and also how to install a replacement network processing engine or network services engine. This chapter provides instructions for the NPE-100 through NPE-400 and the NSE-1. The NPE-G1 and NPE-G2 installation instructions are in [Chapter 7, “Installing the NPE-G1 or NPE-G2.”](#) This chapter contains the following sections:

- [Ensuring Easy Access to the Router, page 9-1](#)
- [Removing and Replacing the NPE or NSE, page 9-2](#)



**Note**

This chapter describes the installation of all processors except the NPE-G1, the NPE-G2, and the Cisco uBR7200-NPE-G1. For those processors, please see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

## Ensuring Easy Access to the Router

If your Cisco 7200 VXR router or Cisco uBR7246VXR router is installed in a standard 19-inch, 4-post or telco-type rack, cables from other equipment in the rack might obstruct access to the rear of the router. Also, rack power strips or other permanent fixtures may obstruct access to the router. Review the following guidelines to ensure easy access to the rear of the router when it is installed in a rack. If the router is not installed in a rack, or if you already have clear access to the rear of the router, proceed to the [“Removing and Replacing the NPE or NSE” section on page 9-2.](#)

Use the following guidelines to ensure easy access to the rear of the router when it is installed in a rack:

- Ensure that you have at least 3 to 4 feet (0.91 to 1.22 meters) of working space at the rear of the router.
- If cables from other equipment in the rack fall in front of the rear end of the router, carefully gather the cables (using care not to strain or stress them) and use cable ties to anchor them away from the rear of the router.
- If access to the rear of the router is partially blocked by a power strip or some other permanent rack fixture, detach the router from the rack and carefully slide it forward until there is enough clearance to remove the power supply, the network processing engine, and the subchassis from the router. Detailed steps for detaching the router from the rack are contained in the [“Removing and Replacing the NPE or NSE” section on page 9-2.](#)

**Caution**

Make sure that at least one other person is available to support the front of the router as you slide it out from the rack and, if necessary, to continue to support it while you remove and insert the power supply, network processing engine or network services engine, or subchassis.

## Removing and Replacing the NPE or NSE

The procedures for removing and replacing an NPE or NSE are the same for all Cisco 7200 series routers, including the Cisco 7206 and Cisco 7206VXR when used as router shelves in the Cisco AS5800 Universal Access Server. The procedures are also the same for the Cisco uBR7246VXR router.

The illustrations and procedures in the following sections apply to the Cisco 7200 series routers or Cisco uBR7246VXR router and the Cisco AS5800 Universal Access Server router shelves unless indicated otherwise.

**Note**

The NSE-1 is keyed for insertion in only Cisco 7200 VXR routers. The NSE-1 is not supported on the Cisco uBR7246VXR universal broadband router, although it can be inserted into the router chassis.

The following sections explain how to remove and install an NPE or NSE-1 in the Cisco 7200 VXR routers or Cisco uBR7246VXR router:

- [Powering Down the Router and Disconnecting Input Power, page 9-2](#)
- [Removing the NPE or NSE, page 9-9](#)
- [Removing and Installing Memory, page 9-11](#)
- [Installing the NPE or NSE, page 9-21](#)
- [Reconnecting Input Power and Powering Up the Router, page 9-23](#)

**Note**

When installing an NPE-175, NPE-225, NPE-300, NPE-400, or NSE-1 in a Cisco 7200 VXR router that is using a previously purchased I/O controller, you must upgrade the I/O controller boot helper image.

Instructions for upgrading the boot helper image on the I/O controller are contained in the online [Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller](#) publication.

## Powering Down the Router and Disconnecting Input Power

Complete the steps in the following sections to power down the router and disconnect input power.

**Warning**

**This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power cords before servicing. Statement 83**

## Powering Down the Router

To power down a Cisco 7200 series router, Cisco 7204VXR or Cisco 7206VXR router, or Cisco uBR7200 series router, complete the following steps:

**Note**

Before powering down the router, use the **copy running-config startup-config** command to save the router's running configuration to nonvolatile memory.

**Step 1**

Facing the rear of the router, place the power switch on the power supply in the off (O) position. Repeat this action if a second power supply is installed in the router.

**Note**

When powering off the router, wait a minimum of 30 seconds before powering it on again.

**Step 2**

Observe the following items:

- The green OK LED on the power supply turns off.
- The fans stop operating.
- The LEDs on the I/O controller turn off.
- The LEDs on the port adapters turn off.
- On a Cisco uBR7200 series router, the LEDs on the cable interface line cards turn off.

**Caution**

When the power switch on a Cisco uBR7200 series power supply is turned to the off (O) position, the power supply enters a reset cycle for 90 seconds. Wait at least 90 seconds before turning the power switch back to the on (I) position. If you do not wait the full 90 seconds, the power supply does not restart.

This completes the procedure for powering down the router. For instructions on disconnecting power from the Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 routers, see the following sections:

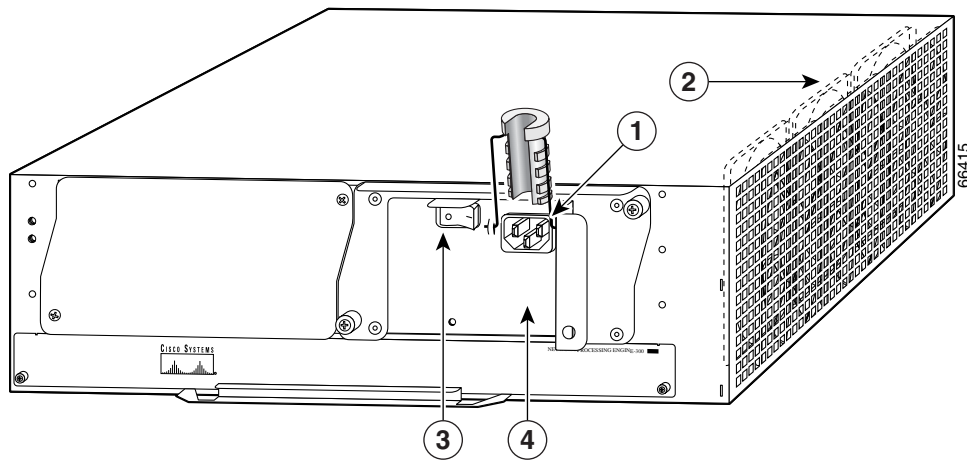
- [Disconnecting AC-Input Power from a Cisco 7200 Series Router or Cisco 7200 VXR Router, page 9-4](#)
- [Disconnecting AC-Input Power from a Cisco uBR7200 Series Router, page 9-4](#)
- [Disconnecting DC-Input Power from a Cisco 7200 Series Router or Cisco 7200 VXR Router, page 9-5](#)
- [Disconnecting DC-Input Power from a Cisco uBR7246 Router, page 9-7](#)

## Disconnecting AC-Input Power from a Cisco 7200 Series Router or Cisco 7200 VXR Router

To disconnect AC-input power from a Cisco 7200 series router or Cisco 7200 VXR router, complete the following steps:

- 
- Step 1** Unplug the input power cable from the power source.
  - Step 2** Push up on the cable-retention clip that secures the input power cable to the router power supply.
  - Step 3** Unplug the other end of the input power cable from the power supply. See [Figure 9-1](#).

**Figure 9-1** Disconnecting Power from a Cisco 7200 Series AC-Input Power Supply



|          |                     |          |                       |
|----------|---------------------|----------|-----------------------|
| <b>1</b> | AC-input receptacle | <b>3</b> | Power switch          |
| <b>2</b> | Internal fans       | <b>4</b> | AC-input power supply |

- 
- Step 4** Repeat Step 1 through Step 3 if a second power supply is installed.
- 

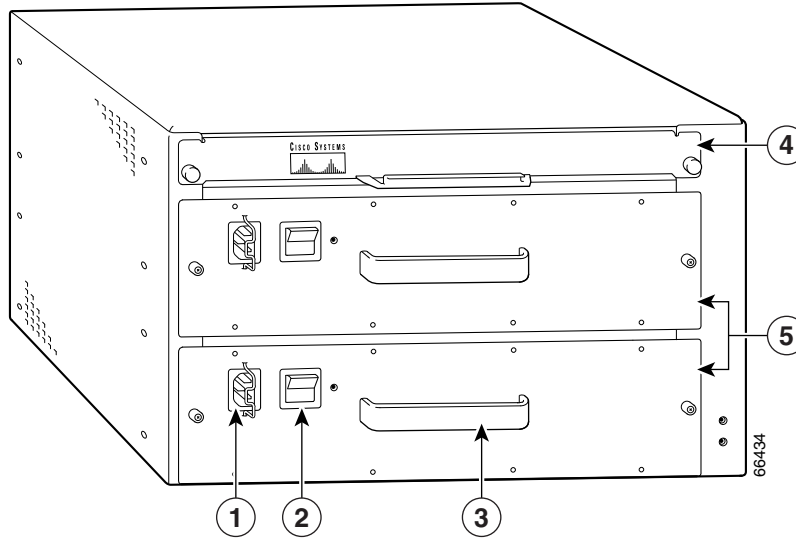
This completes the procedure for disconnecting AC-input power from a Cisco 7200 series router or Cisco 7200 VXR router. Go to the [“Removing the NPE or NSE”](#) section on page 9-9.

## Disconnecting AC-Input Power from a Cisco uBR7200 Series Router

To disconnect AC-input power from a Cisco uBR7200 series router, complete the following steps:

- 
- Step 1** Unplug the input power cable from the power source.
  - Step 2** Push the cable-retention clip that secures the input power cable to the router power supply to the left.
  - Step 3** Unplug the other end of the input power cable from the power supply. See [Figure 9-2](#).

**Figure 9-2** Disconnecting Power from a Cisco uBR7200 Series AC-Input Power Supply—Cisco uBR7246 Shown



|   |                     |   |                           |
|---|---------------------|---|---------------------------|
| 1 | AC-input receptacle | 4 | Network processing engine |
| 2 | Power switch        | 5 | AC-input power supply     |
| 3 | Handle              |   |                           |

**Step 4** Repeat Step 1 through Step 3 if a second power supply is installed.

This completes the procedure for disconnecting AC-input power from a Cisco uBR7200 series router. Go to the [“Removing the NPE or NSE”](#) section on page 9-9.

### Disconnecting DC-Input Power from a Cisco 7200 Series Router or Cisco 7200 VXR Router

To disconnect DC-input power from a Cisco 7200 series router or Cisco 7200 VXR router, complete the following steps.

  
**Warning**

**Before completing any of the following procedures, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322

  
**Warning**

**When you install the unit, the ground connection must always be made first and disconnected last.** Statement 42

**Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.

**Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

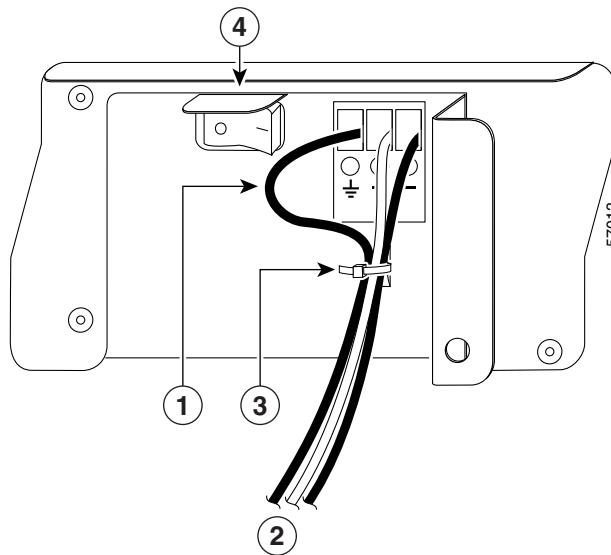
- Step 3** Remove the cable tie that secures the –V, +V, and ground leads to the power supply faceplate. Save the cable tie.



**Note** The cable tie that accompanied your Cisco 7200 series DC-input power supply can be removed and replaced on the power supply without the use of a tool. If you secured the DC-input power supply leads to the power supply faceplate using a different type of cable tie, use a wire stripper to cut that cable tie from the power supply.

- Step 4** Disconnect the –V and +V leads. You can leave the ground cable connected.

**Figure 9-3** *Disconnecting DC-Input Power from a Cisco 7200 Series Router or Cisco 7200 VXR Router*



|   |                          |   |              |
|---|--------------------------|---|--------------|
| 1 | Ground lead service loop | 3 | Cable tie    |
| 2 | DC power leads           | 4 | Power switch |

- Step 5** Using a 3/16-inch flat-blade screwdriver, loosen the screw below the +V lead receptacle and pull the lead from the connector. Repeat this step for the –V lead and the ground lead.



**Note** The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

- Step 6** Repeat Step 1 through Step 5 if a second power supply is installed.

This completes the procedure for disconnecting DC-input power from a Cisco 7200 series router or Cisco 7200 VXR router. Go to the [“Removing the NPE or NSE” section on page 9-9](#).



## Disconnecting DC-Input Power from a Cisco uBR7246 Router

To disconnect DC-input power from a Cisco uBR7346 router, complete the following steps.



**Warning**

**Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322

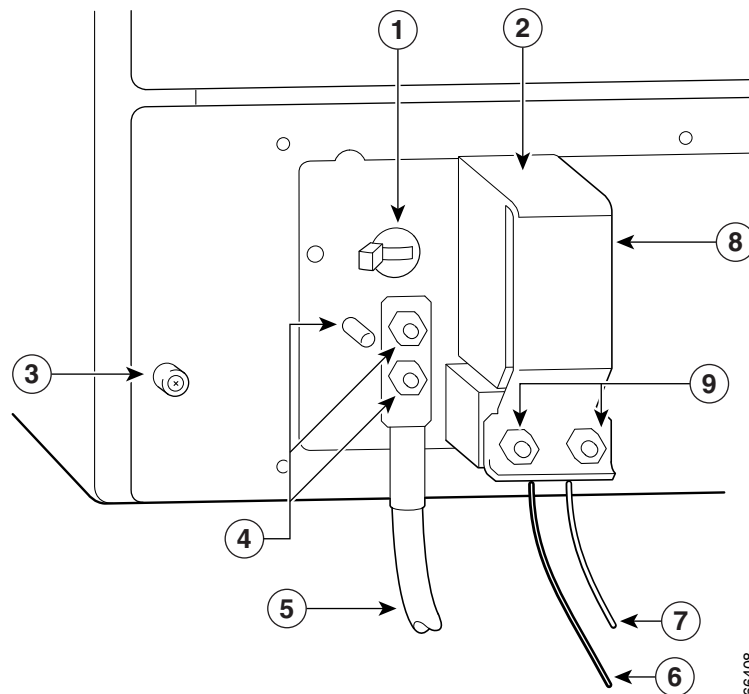


**Warning**

**When you install the unit, the ground connection must always be made first and disconnected last.** Statement 42

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.
- Step 3** Use a 7-mm wrench or nut driver (or adjustable wrench) to loosen and remove the two M4 nuts from the strain-relief cover that secures the -V and the +V leads to the power supply faceplate. See [Figure 9-4](#).

**Figure 9-4** Removing the Strain-Relief Cover from a Cisco uBR7246VXR Router DC-Input Power Supply

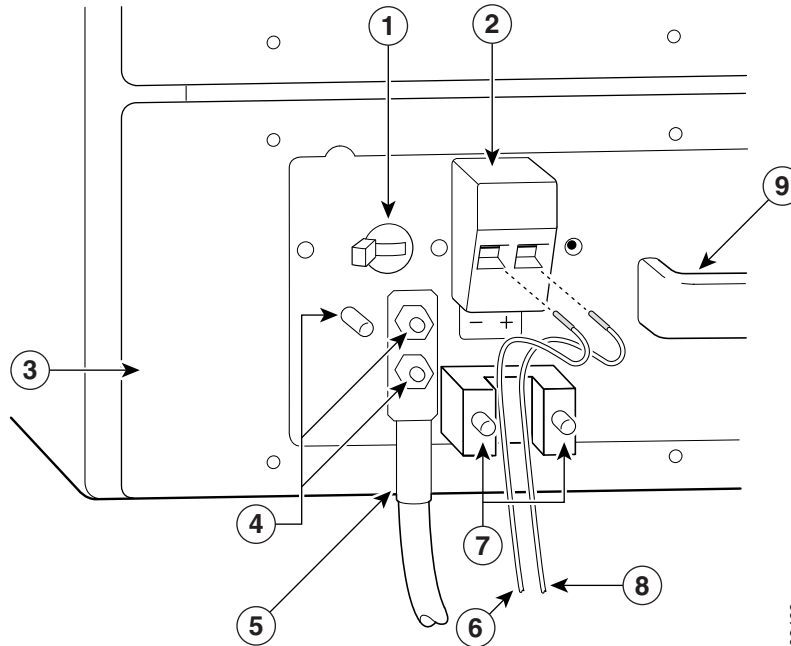


|   |                  |   |         |
|---|------------------|---|---------|
| 1 | Power switch     | 6 | -V lead |
| 2 | Power receptacle | 7 | +V lead |

|   |                            |   |                     |
|---|----------------------------|---|---------------------|
| 3 | Captive installation screw | 8 | Strain-relief cover |
| 4 | M5 grounding receptacles   | 9 | M4 nuts             |
| 5 | M5 grounding lug           |   |                     |

**Step 4** Using a 3/16-inch flat-blade screwdriver, loosen the screw below the +V lead receptacle and pull the lead from the connector. Repeat this step for the –V lead only. See [Figure 9-5](#).

**Figure 9-5** *Disconnecting Power from a Cisco uBR7246VXR Router DC-Input Power Supply*



|   |                          |   |          |
|---|--------------------------|---|----------|
| 1 | Power switch             | 6 | –V lead  |
| 2 | Power receptacle         | 7 | M4 studs |
| 3 | DC power supply          | 8 | +V lead  |
| 4 | M5 grounding receptacles | 9 | Handle   |
| 5 | M5 grounding lug         |   |          |

**Step 5** Using an 8-mm wrench or nut driver (or adjustable wrench), loosen and remove the two M5 nuts that secure the two-hole grounding lug to the grounding receptacle, and pull the grounding lug and lead from the receptacle.



**Note** The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

**Note**

---

Repeat the Steps 1 to 5 to disconnect secondary power supply, if connected.

---

This completes the procedure for disconnecting DC-input power from a Cisco uBR7246VXR router. Go to the following section, [“Removing the NPE or NSE”](#).

## Removing the NPE or NSE

To remove the NPE or NSE from a Cisco 7200 series router, Cisco 7204VXR or Cisco 7206VXR router, or Cisco uBR7200 series router, complete the following steps.

**Note**

---

The weight of installed power supplies in your Cisco 7200 series router might make it difficult to remove the network processing engine. If you have difficulty, first remove the power supplies from the chassis, and then remove the network processing engine. See the [“Removing and Replacing an AC-Input or DC-Input Power Supply”](#) section on page 10-14 for information on removing and replacing an installed power supply.

This note does not apply to the Cisco uBR7200 series routers; the network processing engine is installed above the power supplies in the Cisco uBR7200 series routers.

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**Note**

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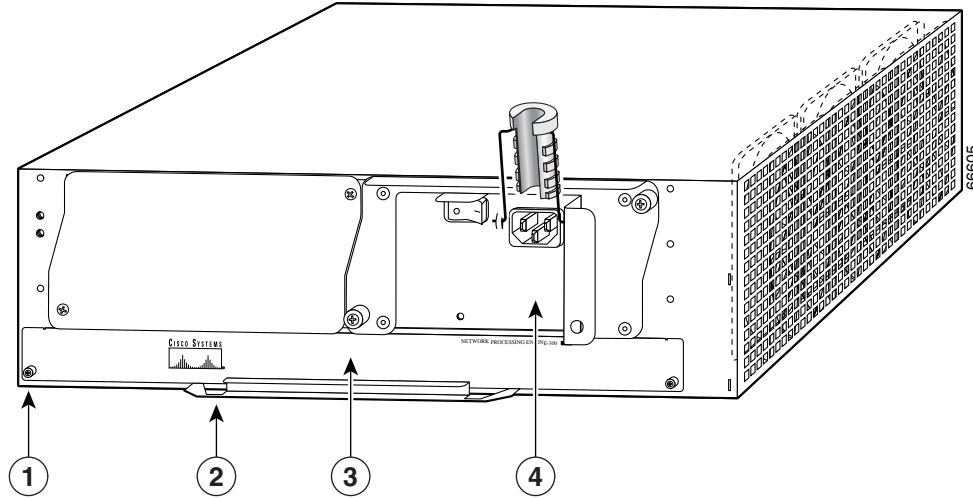
If you have difficulty installing a network processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, network processing engine and I/O controller from the chassis and reinstall them. Install the network processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

---

- Step 1** Power down the router and disconnect the input power cable. (Refer to the [“Powering Down the Router and Disconnecting Input Power”](#) section on page 9-2.)
- Step 2** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.
- Step 3** Using a number 2 Phillips or a 3/16-inch flat-blade screwdriver, loosen the two captive installation screws on the faceplate of the network processing engine. (See [Figure 9-6](#).)

If the router is not installed in a standard 19-inch, 4-post or telco-type rack, skip to [Step 7](#). If the router is installed in a rack, determine if any permanent rack fixtures, such as a power strip, are obstructing access to the rear of the router. If a rack fixture is obstructing access to the router, proceed with [Step 4](#).

Figure 9-6 Cisco 7200 Series NPE or NSE Captive Installation Screws and Handle



|   |                            |   |                                                      |
|---|----------------------------|---|------------------------------------------------------|
| 1 | Captive installation screw | 3 | Network processing engine or network services engine |
| 2 | Handle                     | 4 | AC-input power supply                                |

- Step 4** Using a 3/16-inch flat-blade screwdriver, loosen the screws that secure the router to the front mounting strips of the rack.
- Step 5** Position at least one person in front of the rack to support the front underside of the router.
- Step 6** From the rear of the rack, carefully push the front of the router out of the rack until there is enough clearance to remove the network processing engine.
- Step 7** Grasp the network processing engine handle and carefully pull the network processing engine from its chassis slot.



**Caution** Handle the network processing engine by the carrier edges and handle only; never touch the printed circuit board components or connector pins.

- Step 8** Place the NPE or NSE on an antistatic surface with its printed circuit board components facing upward, or in a static shielding bag. If you are returning the network processing engine to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing an installed NPE or NSE. For instructions on installing the NPE or NSE, go to the [“Installing the NPE or NSE”](#) section on page 9-21.

## Removing and Installing Memory

This section provides instructions for removing and installing DRAM or SDRAM on a network processing engine or network services engine.

### Removing DRAM SIMMs

This section explains how to remove DRAM SIMMs that are installed on your network processing engine. To remove the installed DRAM SIMMs, complete the following steps:

**Note**

The NPE-175, NPE-225, and NPE-300, and NSE-1 use SDRAM DIMMS. See the “[Removing SDRAM DIMMs](#)” section on page 9-14 for DIMM replacement instructions.

- 
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted router surface.
- Step 2** Place the network processing engine on an antistatic mat or surface (ensure that you are wearing an antistatic device, such as a wrist strap).
- Step 3** Position the network processing engine or network services engine so that the handle is away from you and the edge connector is toward you.
- Step 4** Locate the SIMMs.

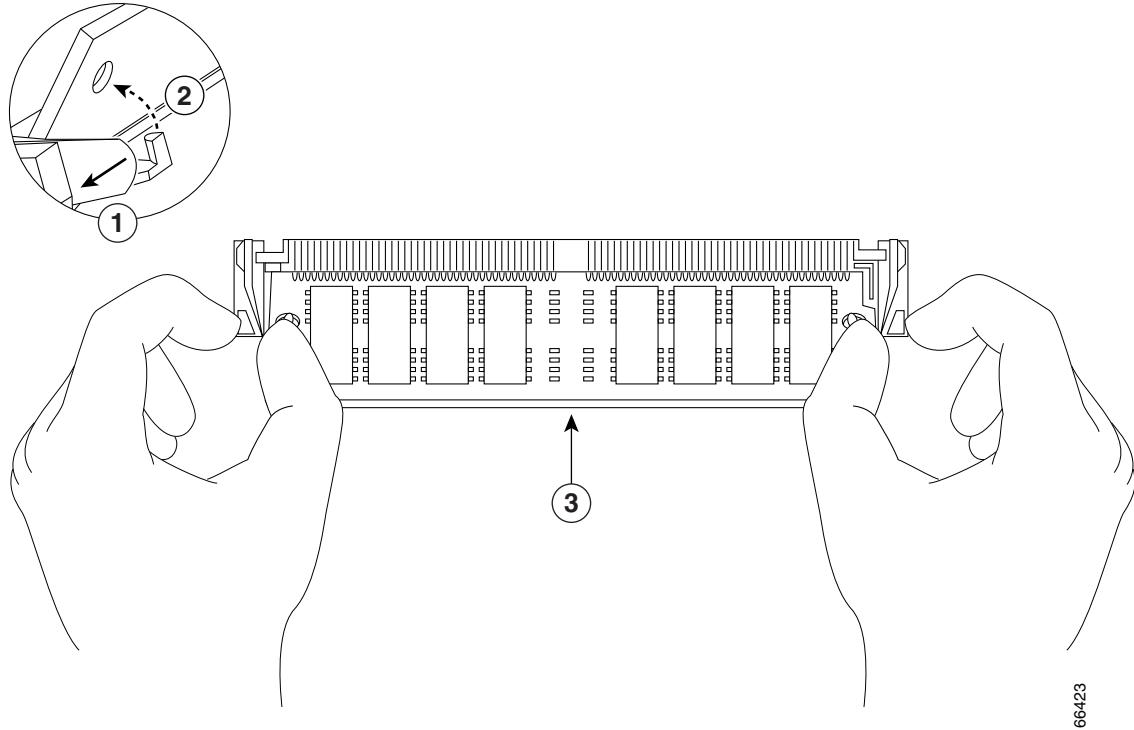
For the location of the memory module you are replacing, find the illustration that corresponds to your network processing engine in [Chapter 1, “NPE-100, NPE-150, and NPE-200 Overview.”](#)

**Note**

SIMMs installed in your system might look different from the SIMMS shown in the following illustrations.

- Step 5** Release the spring latches from the SIMM that you want to remove, and release the SIMM from the socket. (See [Figure 9-7.](#))
- Pull the latches away with your thumbs, bracing your forefingers against the posts.
  - Raise the SIMM to a vertical position.

Figure 9-7 Releasing the SIMM Spring Latches



66423

|   |             |   |                                   |
|---|-------------|---|-----------------------------------|
| 1 | Latch       | 3 | Faceplate edge of the system card |
| 2 | Latch holes |   |                                   |

- Step 6** When both ends of the SIMM are released from the socket, grasp the ends of the SIMM with your thumb and forefinger and pull the SIMM completely out of the socket. Handle the edges of the SIMM only; avoid touching the memory modules, pins, or traces (the metal *fingers* on the connector side of the SIMM).
- Step 7** Place the SIMM in an antistatic bag to protect it from ESD damage. You can use the SIMMs that you remove in compatible equipment.
- Step 8** Repeat Step 4 through Step 7 for the remaining SIMMs.

This completes the SIMM removal procedure.

## Installing DRAM SIMMs

The DRAM SIMMs on the network processing engine are located in the following sockets:

- U18, U25, U4, and U12 on the NPE-100 and the NPE-150 (See Chapter 1, “NPE-100, NPE-150, and NPE-200 Overview,” Figure 1-1 and Figure 1-2.)
- U11, U25, U42, and U52 on the NPE-200 (See Chapter 1, “NPE-100, NPE-150, and NPE-200 Overview,” Figure 1-3.)

  
**Caution**

Handle SIMMs by the edges only; avoid touching the memory modules, pins, or traces (the metal *fingers* along the connector edge of the SIMM). (See Figure 9-8.)

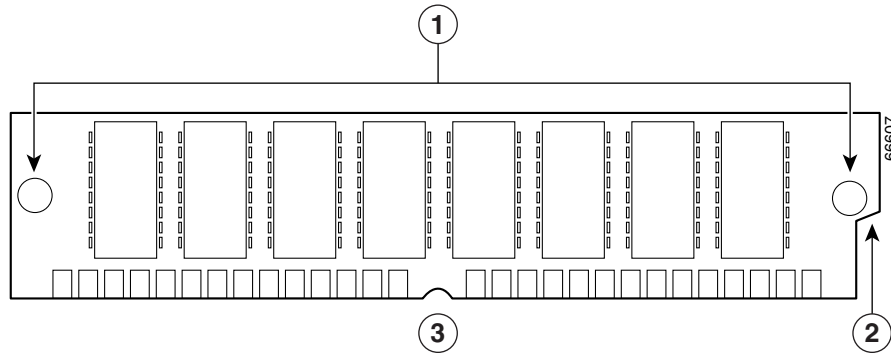
To install memory SIMMs in the network processing engine, complete the following steps:

- Step 1** With the network processing engine in the same orientation as the previous procedure (with the handle away from you and the edge connector toward you), install the first SIMM in the socket farthest from you. Then install the last SIMM in the socket closest to you.
- Step 2** Remove a new SIMM from the antistatic bag.



**Note** To prevent DRAM errors in the NPE-100, NPE-150, or NPE-200, and to ensure that your system initializes correctly at startup, DRAM bank 0 (sockets U18 and U25, or U11 and U25) *must* contain no fewer than two SIMMs of the same type. You can also install two SIMMs of the same type in bank 1 (sockets U4 and U12, or U42 and U52); however, bank 0 must always contain the two largest SIMMs.

**Figure 9-8 Cisco 7200 Series Main Memory SIMM**



|          |                    |          |                           |
|----------|--------------------|----------|---------------------------|
| <b>1</b> | Alignment holes    | <b>3</b> | Connector edge with notch |
| <b>2</b> | Polarization notch |          |                           |

- Step 3** Orient the SIMM so its connector edge (the metal *fingers*) is down and the component side is facing you. (See Figure 9-8.)
- Step 4** Hold the sides of the SIMM between your thumb and middle finger, with your forefinger against the far edge, opposite the connector edge.
- Step 5** Tilt the SIMM to approximately the same angle as the socket and insert the entire connector edge into the socket.

**Caution**

When inserting SIMMs, use firm but not excessive pressure. If you damage a socket, you must return the network processing engine or network services engine to the factory for repair.

- Step 6** Gently push the SIMM into the socket until the spring latches snap over the ends of the SIMM. If necessary, rock the SIMM gently back and forth to seat it properly.
- Step 7** Repeat Step 2 through Step 6 for the remaining SIMMs.
- Step 8** When all SIMMs are installed, check all alignment holes (two on each SIMM) and ensure that the spring latch is visible. If it is not, the SIMM is not seated properly. If any SIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SIMM firmly back into the socket until the spring latches snap into place.

This completes the SIMM replacement procedure. Proceed to the [“Installing the NPE or NSE” section on page 9-21](#).

## Removing SDRAM DIMMs

The procedures in this section are required only if you have an NPE-175, NPE-225, NPE-300, or NSE-1 and need to upgrade or replace the SDRAM DIMMs. On the NPE-175, NPE-225, and NSE-1, the SDRAM DIMMs are located in socket U15. The two user-configurable SDRAM DIMMs on the NPE-300 are located in sockets U45 and U44.

**Note**

The NPE-300 contains two banks of SDRAM. Both SDRAM banks are used for all packet memory requirements; however, bank 0 is used exclusively for packet memory and is set at a fixed configuration in the factory.

Bank 1 contains two user-configurable SDRAM slots, DIMM slot 2 and DIMM slot 3 (see [Chapter 3, “NPE-300 and NPE-400 Overview,”](#) the [“Components” section on page 3-2](#)). Both slots in bank 1 can be populated by DIMMs of different sizes; however, the size of the DIMM in slot 2 must be greater than or equal to the size of the DIMM in slot 3, and the size of the DIMM in slot 3 can be zero.

**Note**

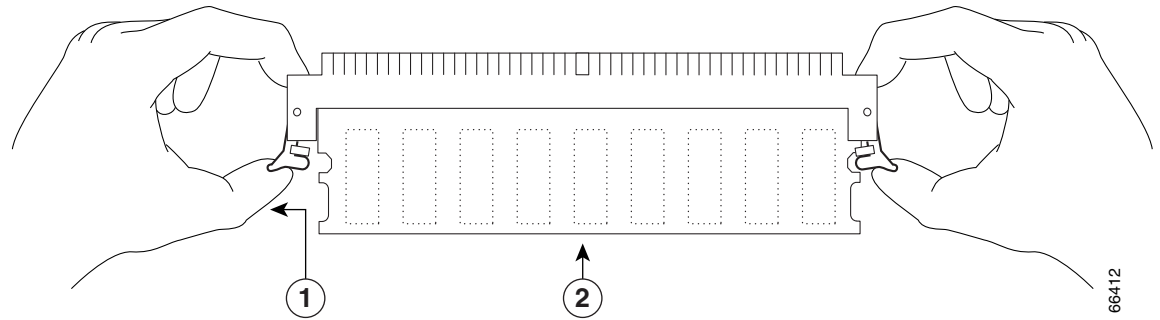
Use only SDRAM DIMMs supplied by Cisco.

Use the following procedure to remove the existing DIMMs:

- Step 1** Turn off the system power and remove the network processing engine or network services engine from the system. (Follow the steps in the [“Removing the NPE or NSE” section on page 9-9](#).)
- Step 2** Place the network processing engine or network services engine on an antistatic mat or pad and ensure that you are wearing an antistatic device, such as a wrist strap.
- Step 3** Locate the DIMM and position the network processing engine or network services engine so that you are facing the DIMM you want to remove.
- Step 4** Open the DIMM socket latches on the DIMM to release the DIMM from the socket. (See [Figure 9-9](#).) The DIMM is under tension in the socket; therefore, the DIMM might be released from the socket with some force.



**Figure 9-9** Opening DIMM Socket Latches



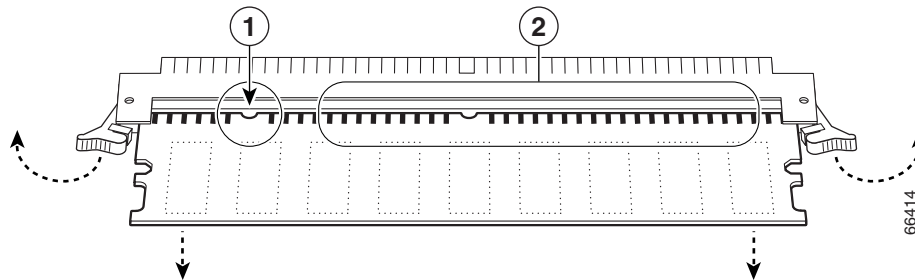
|          |                 |          |            |
|----------|-----------------|----------|------------|
| <b>1</b> | Release latches | <b>2</b> | SDRAM DIMM |
|----------|-----------------|----------|------------|



**Note** The SDRAM DIMM sockets on the NPE-175, NPE-225, and NPE-300 are parallel to the circuit board. They are not tilted at an angle.

**Step 5** With the DIMM socket latches open, grasp the ends of the DIMM between your thumbs and forefingers and pull the DIMM completely out of the socket. (See [Figure 9-10](#).)

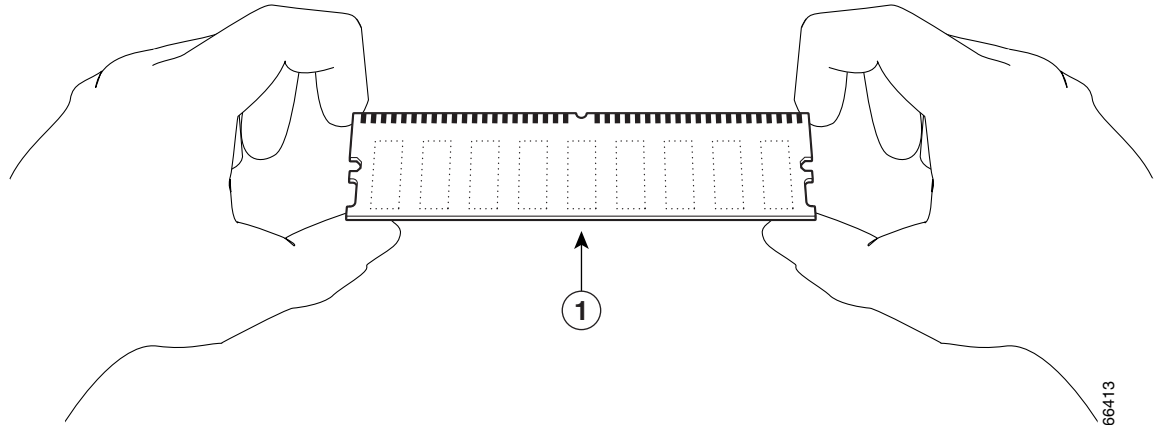
**Figure 9-10** Removing the DIMM



|          |       |          |               |
|----------|-------|----------|---------------|
| <b>1</b> | Notch | <b>2</b> | Metal fingers |
|----------|-------|----------|---------------|

Handle the edges of the DIMM only; avoid touching the memory modules, pin or traces (the metal *fingers* on the connector side of the DIMM). (See [Figure 9-11](#).)

Figure 9-11 Handling the DIMM



|   |            |
|---|------------|
| 1 | SDRAM DIMM |
|---|------------|

**Caution**

To prevent ESD damage, handle the DIMM by the card edges only. Place a removed DIMM on an antistatic mat and store it in an antistatic container.

**Step 6**

Place the DIMM in an antistatic container to protect it from ESD damage.

This completes the DIMM removal procedure. Go to the [“Installing SDRAM DIMMs”](#) section on page 9-16.

## Installing SDRAM DIMMs

**Caution**

The DIMM is a sensitive component that is susceptible to ESD damage. Handle the DIMM by the edges only; avoid touching the memory modules, pins, or traces (the metal *fingers* along the connector edge of the DIMM). To prevent ESD damage, handle the DIMM as shown in [Figure 9-11](#).

**Note**

The NPE-300 contains two banks of SDRAM. Both SDRAM banks are used for all packet memory requirements; however, bank 0 is used exclusively for packet memory and is set at a fixed configuration in the factory.

Bank 1 contains two user-configurable SDRAM slots, DIMM slot 2 and DIMM slot 3. (See [Chapter 3, “NPE-300 and NPE-400 Overview,”](#) the [“Components”](#) section on page 3-2.) Both slots in bank 1 can be populated by DIMMs of different sizes; however, the size of the DIMM in slot 2 must be greater than or equal to the size of the DIMM in slot 3, and the size of the DIMM in slot 3 can be zero.

With the network processing engine or network services engine in the same orientation as the previous procedure, install the DIMM in the DIMM socket as follows:

- Step 1** Remove the new DIMM from its antistatic container.  
**Step 2** Hold the DIMM between your thumbs and forefingers. (See [Figure 9-11](#).)



**Note** The 64-MB DIMM should be facing component-side-down.

- Step 3** Align the notch on the DIMM with the connector. The DIMM only inserts one way.  
**Step 4** Insert the edge of the DIMM into the socket.



**Note** The SDRAM DIMM sockets on the NPE-175, NPE-225, and NPE-300 are parallel to the circuit board. They are not tilted at an angle.

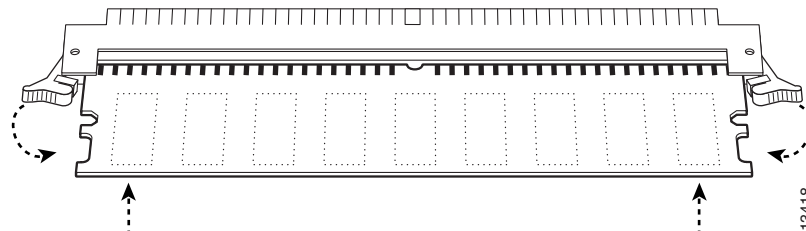


**Caution**

When inserting the DIMM, use firm but not excessive pressure. If you damage a socket, you will have to return the NPE or NSE to the factory for repair.

- Step 5** Gently push the DIMM into the socket until the socket latches close over the ends of the DIMM. (See [Figure 9-12](#).) If necessary, rock the DIMM gently back and forth to seat it properly.

**Figure 9-12** Inserting the DIMM



- Step 6** When the DIMM is installed, check to see it is seated properly. If the DIMM appears misaligned, carefully remove it and reseat it in the socket. Push the DIMM firmly back into the socket until first one and then the other socket latch moves into place.  
**Step 7** Repeat Step 4 and Step 5 if you are replacing more than one DIMM.

This completes the DIMM replacement procedure. Go to the [“Installing the NPE or NSE”](#) section on [page 9-21](#).

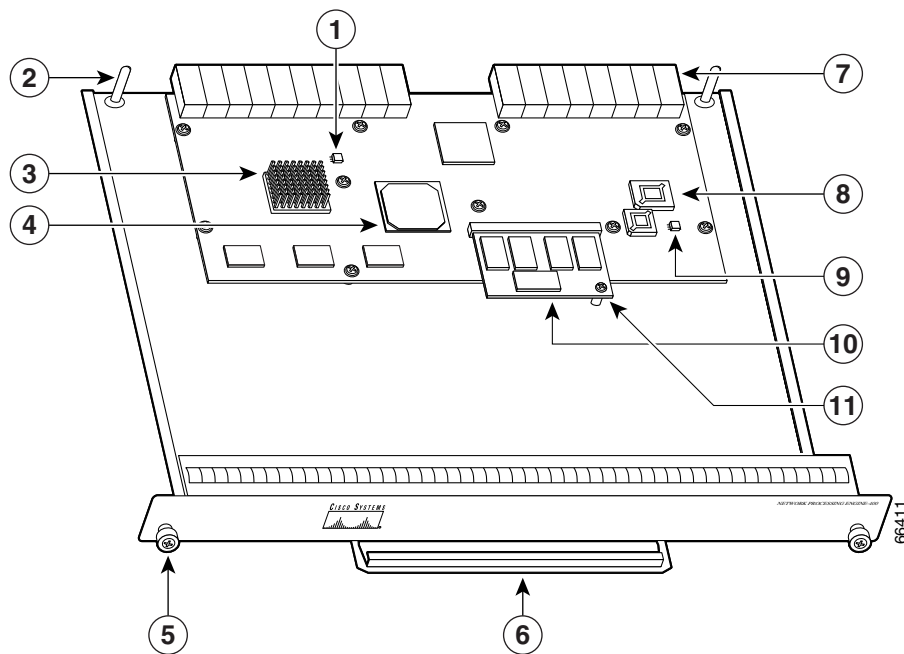
## Removing a SDRAM SODIMM

This section provides a procedure for removing the small outline dual in-line memory module (SODIMM) on the NPE-400.

Follow these steps to remove the existing SODIMM:

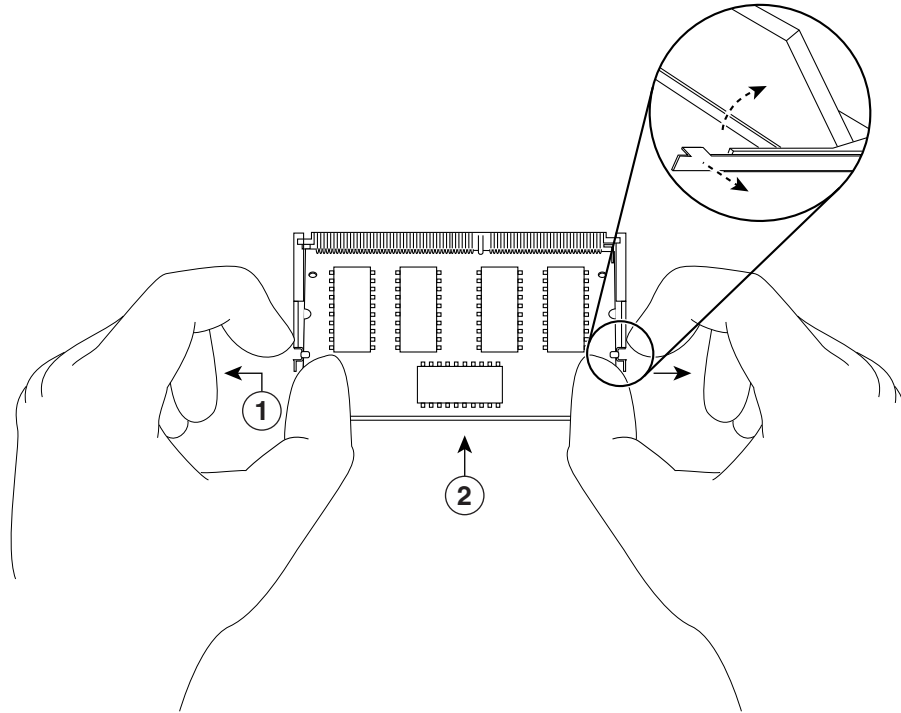
- 
- Step 1** Remove the NPE-400 from the system.
- Step 2** Place the NPE-400 on an antistatic mat or pad and ensure that you are wearing an antistatic device, such as a wrist strap.
- Step 3** Locate the SODIMM (see [Figure 9-13](#)).

**Figure 9-13** Location of SDRAM SODIMM on the NPE-400



|   |                            |    |                         |
|---|----------------------------|----|-------------------------|
| 1 | Temperature sensor (U31)   | 7  | Midplane connectors     |
| 2 | Keying post                | 8  | Boot ROM (U7)           |
| 3 | RM7000 microprocessor      | 9  | Temperature sensor (U6) |
| 4 | System controller          | 10 | SODIMM (J1)             |
| 5 | Captive installation screw | 11 | Standoff and screw      |
| 6 | Handle                     |    |                         |

- Step 4** Locate the SODIMM standoff screw and use a Phillips screwdriver to remove it.

**Figure 9-14** Releasing the SODIMM Spring Latch

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|          |                                   |          |              |
|----------|-----------------------------------|----------|--------------|
| <b>1</b> | Spring latch on the release latch | <b>2</b> | SDRAM SODIMM |
|----------|-----------------------------------|----------|--------------|

**Step 5** Remove the SODIMM you want to replace by pulling outward on the SODIMM spring latches with your thumbs.

The SODIMM springs up to allow you to easily pull it from the socket.



**Caution** To prevent ESD damage, handle the SODIMM by the card edges only (as shown in [Figure 9-14 on page 9-19](#)). Place the removed SODIMM on an antistatic mat and store it in an antistatic container.

**Step 6** Remove the SODIMM from the socket. Avoid touching the SODIMM as much as possible, particularly the traces, the metal *fingers* on the connector side of the SODIMM.

**Step 7** Place the SODIMM in an antistatic container to protect it from ESD damage.

This completes the SODIMM removal procedure. Proceed to the next section to install the new SODIMM.

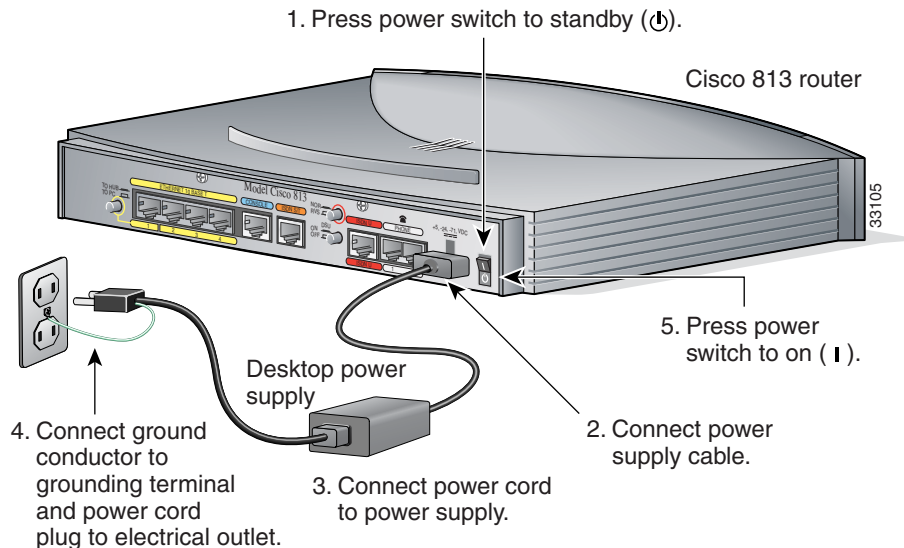
## Installing a SDRAM SODIMM

This section provides a procedure for replacing the SODIMM on the NPE-400.

The synchronous dynamic random-access memory (SDRAM) on the NPE-400 is contained in one small outline dual in-line memory module (SODIMM) (see [Figure 9-13 on page 9-18](#)).

**Caution**

SODIMMs are sensitive components that are susceptible to ESD damage. Handle SODIMMs by the edges only; avoid touching the memory modules, pins, or traces (the metal *fingers* along the connector edge of the SODIMM). (See [Figure 9-15](#).)

**Figure 9-15 Handling a SODIMM**

Follow these steps to install the new SODIMM:

- Step 1** Remove a new SODIMM from the antistatic container.
- Step 2** Hold the SODIMM component-side-up, with the connector edge (the metal *fingers*) away from you.
- Step 3** Tilt the SODIMM to approximately the same angle as the socket, and insert the connector edge into the socket.

**Caution**

When inserting the SODIMM, use firm but not excessive pressure. If you damage a socket, you will have to return the NPE-400 to the factory for repair.

- Step 4** Gently press on the SODIMM until the SODIMM spring latches snap into place.
- Step 5** If the SODIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SODIMM gently back into the socket until the spring latches snap into place.

This completes the SDRAM SODIMM replacement procedure. To reinstall the NPE-400 in the chassis, see the [“Installing the NPE or NSE”](#) section on page 9-21.

## Checking a SDRAM Upgrade or Replacement

If, after a SDRAM upgrade or replacement, the system fails to boot properly, or if the console terminal displays a checksum or memory error, ensure that the SIMM, DIMM, or SODIMM is installed correctly. If necessary, shut down the system and remove the network processing engine or network services engine. Check the SIMM, DIMM, or SODIMM by looking straight down it and then at eye level. The

SIMMs or DIMMs should be aligned at the same angle and the same height as others on the board when properly installed. If the SIMM, DIMM, or SODIMM appears to stick out or rest in the socket at an odd angle, remove it and reinsert it. Then replace the network processing engine or network services engine and reboot the system for another installation check.

If after several attempts the system fails to restart properly, contact a service representative for assistance. Before you call, note any error messages, unusual LED states, or other indications that might help solve the problem.

## Installing the NPE or NSE

**Note**

If you have difficulty installing a network processing engine or I/O controller in the lowest slot of a Cisco 7200 VXR router that is rack-mounted, remove the port adapters, network processing engine and I/O controller from the chassis and reinstall them. Install the network processing engine and I/O controller in the lowest slots first, then populate the slots above them, in a bottom-to-top order.

To install an NPE or NSE in the router, complete the following steps:

**Note**

When installing an NPE-175, NPE-225, NPE-300, NPE-400, or NSE-1 in a Cisco 7200 VXR router that is using a previously purchased I/O controller, you must upgrade the I/O controller boot helper image.

Instructions for upgrading the boot helper image on the I/O controller are contained in the online [Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller](#) publication.

- Step 1** Ensure that the router is powered down and the input power cable is disconnected from the router and the power source. See the “[Powering Down the Router and Disconnecting Input Power](#)” section on [page 9-2](#).
- Step 2** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.
- Step 3** Remove the new network processing engine or network services engine from its static shielding bag.
- Step 4** Using both hands, grasp the NPE or NSE by its metal carrier edges and orient it so that its printed circuit board components are upward. (See [Figure 9-16](#).)

**Caution**

Handle the network processing engine or network services engine by the carrier edges and handle only; never touch the printed circuit board components or connector pins.

- Step 5** Align the left and right edges of the network processing engine or network services engine printed circuit board between the network processing engine slot guides.

**Note**

For the NPE-175 and NPE-225, align the left and right edges of the network processing engine metal carrier into the guides.

**Caution**

Do not align the network processing engine or network services engine metal carrier between the slot guides (for all except the NPE-175 and NPE-225). Doing so damages components on the network processing engine's printed circuit board as you slide the network processing engine into its chassis slot.

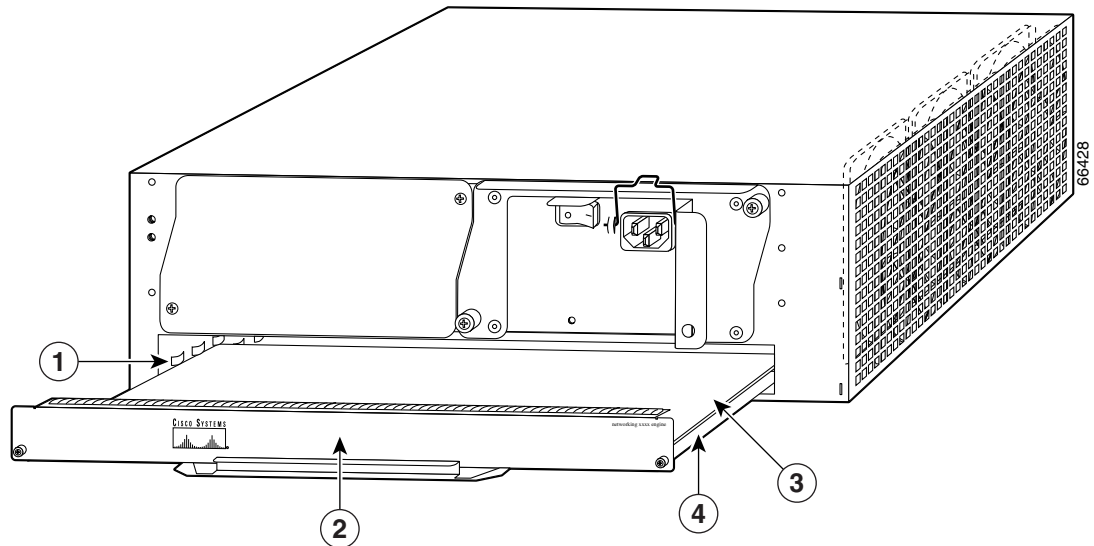
**Note**

The NPE-300 and NPE-400 are compatible only with the Cisco 7200 VXR router and Cisco uBR7246VXR router; the NPE-300 and NPE-400 are keyed to prevent insertion in the Cisco 7200 series routers (7202, 7204, and 7206) and Cisco uBR7200 series routers (Cisco uBR7223 and Cisco uBR7246).

**Note**

The NSE-1 is compatible with the Cisco 7200 VXR routers only. It is keyed to prevent insertion in the Cisco 7200 series routers and the Cisco uBR7200 series routers.

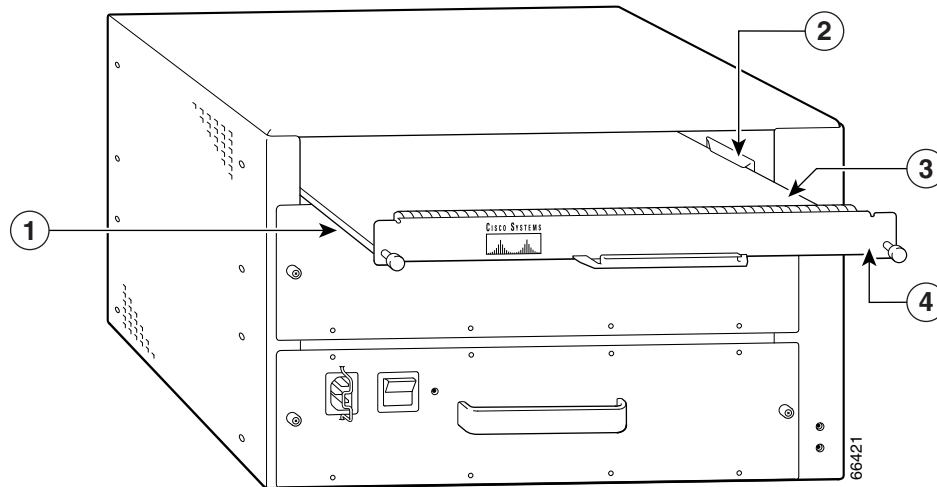
**Figure 9-16** *Aligning the NPE Between the Slot Guides on a Cisco 7200 VXR Router*



|          |                                                      |          |                       |
|----------|------------------------------------------------------|----------|-----------------------|
| <b>1</b> | Slot guides                                          | <b>3</b> | Printed circuit board |
| <b>2</b> | Network processing engine or network services engine | <b>4</b> | Metal carrier         |



**Figure 9-17** *Aligning the NPE Between the Slot Guides on a Cisco uBR7200 Series—Cisco uBR7246 Shown*



|          |               |          |                           |
|----------|---------------|----------|---------------------------|
| <b>1</b> | Metal carrier | <b>3</b> | Printed circuit board     |
| <b>2</b> | Slot guides   | <b>4</b> | Network processing engine |

**Step 6** Gently slide the network processing engine all the way into its chassis slot until you feel the connectors seat with the router midplane.

**Step 7** Seat the network processing engine in the router midplane by tightening its captive installation screws with a number 2 Phillips or a 3/16-inch flat-blade screwdriver.



**Note** The network processing engine is not fully seated in the router midplane until you tighten its captive installation screws.

**Step 8** If you removed power supplies from the router, replace the power supplies. (See the “[Removing and Replacing an AC-Input or DC-Input Power Supply](#)” section on page 10-14 when replacing a power supply in a Cisco 7200 series router.)

**Step 9** If you slid the front of the router out of the rack, slowly guide the router back into the rack.

**Step 10** Use a 3/16-inch flat-blade screwdriver to tighten the screws that secure the router to the front mounting strips of the rack.

This completes the procedure for replacing the network processing engine in a Cisco 7200 series router or Cisco uBR7200 series router.

## Reconnecting Input Power and Powering Up the Router

The following procedures explain how to reconnect input power to a Cisco 7200 series router, Cisco 7200 VXR router, and Cisco uBR7200 series router, power up the router, and verify a successful system boot.

**Warning**

**Read the installation instructions before you connect the system to its power source.** Statement 10

**Note**

When installing an NPE-175, NPE-225, NPE-300, NPE-400, or NSE-1 in a Cisco 7200 VXR router that is using a previously purchased I/O controller, you must upgrade the I/O controller boot helper image.

Instructions for upgrading the boot helper image on the I/O controller are contained in the online *Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller* publication.

To reconnect AC-input power or DC-input power to a Cisco 7200 series router, Cisco 7200 VXR router, or Cisco uBR7200 series router, see these sections:

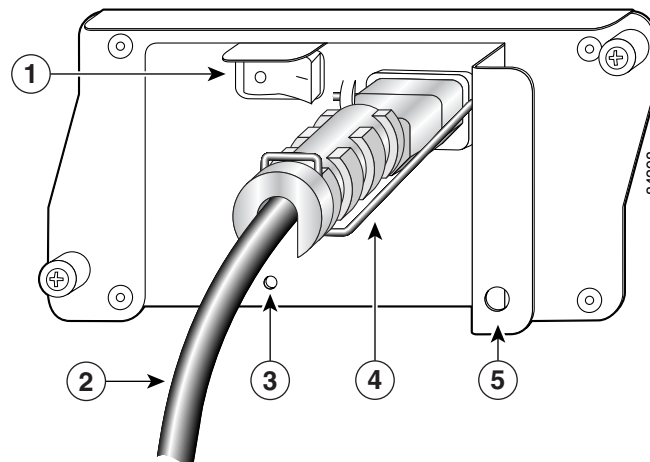
- [Reconnecting AC-Input Power to the Cisco 7200 Series Router or Cisco 7200 VXR Router, page 9-25](#)
- [Reconnecting AC-Input Power to the Cisco uBR7200 Series Router, page 9-26](#)
- [Reconnecting DC-Input Power to a Cisco 7200 Series Router or Cisco 7200 VXR Router, page 9-27](#)
- [Reconnecting DC-Input Power to a Cisco uBR7246VXR Router, page 9-29](#)
- [Powering Up the Router, page 9-33](#)

## Reconnecting AC-Input Power to the Cisco 7200 Series Router or Cisco 7200 VXR Router

To reconnect AC-input power to a Cisco 7200 series router or Cisco 7200 VXR router, complete the following steps:

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.

**Figure 9-18** Connecting AC-Input Power to a Cisco 7200 Series Router



|   |                |   |                                      |
|---|----------------|---|--------------------------------------|
| 1 | Power switch   | 4 | Cable-retention clip                 |
| 2 | AC power cable | 5 | Handle with hole for nylon cable tie |
| 3 | POWER OK LED   |   |                                      |

- Step 2** Slide the cable-retention clip up away from the AC receptacle, and plug in the power cable.
- Step 3** Secure the cable in the power supply AC receptacle by sliding the cable-retention clip down until it snaps around the connector. The cable-retention clip provides strain relief for the AC power cable.
- Step 4** Plug the AC power supply cable into the AC power source.



**Note** For the Cisco 7200 series routers, each AC-input power supply operating at 120 VAC requires a minimum of 5A service.

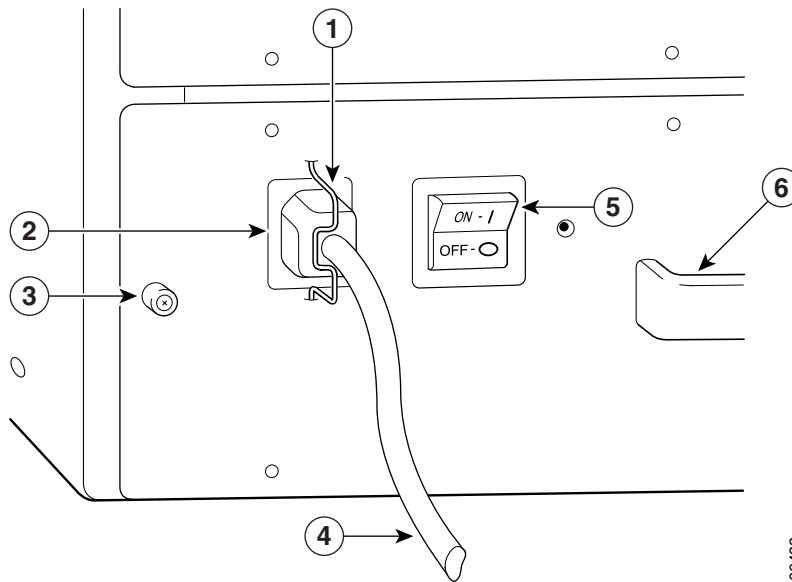
We recommend powering the Cisco 7200 series routers from a 120 VAC, 15A receptacle U.S. (240 VAC, 10A international) at the power source.

- Step 5** Repeat Step 1 through Step 4 if a second power supply is installed.

This completes the steps for reconnecting AC-input power to a Cisco 7200 series router or Cisco 7200 VXR router. Proceed to the [“Powering Up the Router”](#) section on page 9-33.

## Reconnecting AC-Input Power to the Cisco uBR7200 Series Router

**Figure 9-19** Connecting AC-Input Power to a Cisco uBR7200 Series Router



|          |                            |          |                |
|----------|----------------------------|----------|----------------|
| <b>1</b> | Cable-retention clip       | <b>4</b> | AC power cable |
| <b>2</b> | Power receptacle           | <b>5</b> | Power switch   |
| <b>3</b> | Captive installation screw | <b>6</b> | Handle         |

To reconnect AC-input power to the Cisco uBR7200 series router complete, the following steps:

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Slide the cable-retention clip to the left away from the AC receptacle, and plug in the power cable.
- Step 3** Secure the cable in the power supply AC receptacle by sliding the cable-retention clip to the right until it snaps around the connector. The cable-retention clip provides strain relief for the AC power cable.
- Step 4** Plug the AC power supply cable into the AC power source.



**Note** For the Cisco uBR7200 series routers, each AC-input power supply operating at 120 VAC requires a minimum of 7A service.

We recommend powering the Cisco uBR7200 series routers from a 120 VAC, 15A receptacle U.S. (240 VAC, 10A international) at the power source.

- Step 5** Repeat Step 1 through Step 4 if a second power supply is installed.

This completes the steps for reconnecting AC-input power to a Cisco uBR7200 series router. Proceed to the [“Powering Up the Router”](#) section on page 9-33.

## Reconnecting DC-Input Power to a Cisco 7200 Series Router or Cisco 7200 VXR Router

To reconnect DC-input power to a Cisco 7200 series router or Cisco 7200 VXR router, complete the following steps:



### Note

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.



### Warning

**Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322



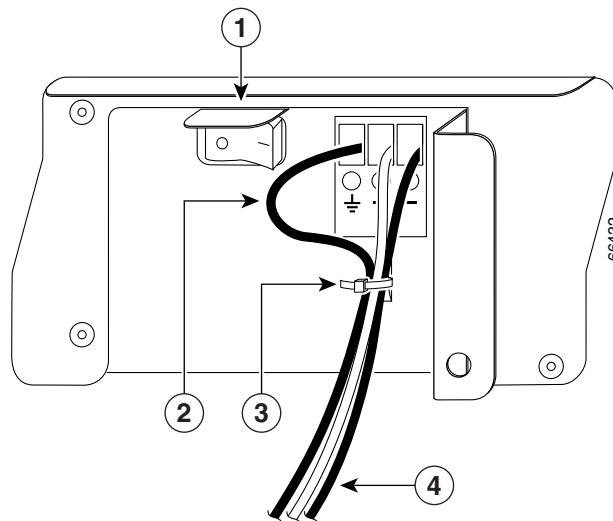
### Warning

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

**Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.

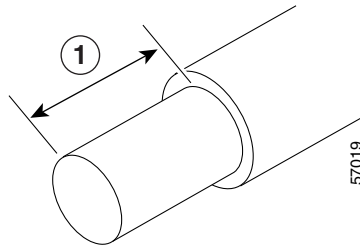
**Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

**Figure 9-20** Connecting DC-Input Power to a Cisco 7200 Series Router



|   |                          |   |                |
|---|--------------------------|---|----------------|
| 1 | Power switch             | 3 | Cable tie      |
| 2 | Ground lead service loop | 4 | DC power leads |

**Step 3** If necessary, use a wire stripper to strip approximately 0.55 inch (14 mm) from the -V, +V, and ground leads. (See [Step 3](#).)

**Figure 9-21 Stripping the DC-Input Lines**

|          |                  |  |  |
|----------|------------------|--|--|
| <b>1</b> | 0.55 in. (14 mm) |  |  |
|----------|------------------|--|--|

- Step 4** Insert the stripped end of the ground lead all the way into the ground lead receptacle on the DC-input power supply and tighten the receptacle screw using a 3/16-inch flat-blade screwdriver.
- Step 5** Insert the stripped end of the +V lead all the way into the +V lead receptacle and tighten the receptacle screw using the same 3/16-inch flat-blade screwdriver. Repeat this step for the -V lead.



**Note** Make sure that the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle, use the wire stripper to cut the stripped end of the lead, and repeat through [Step 5](#).

- Step 6** After tightening the receptacle screws for the ground, +V, and -V DC-input leads, secure the leads to the power supply faceplate.

Use the cable tie you saved earlier in this procedure to secure the three leads.



**Note** When securing the ground, +V, and -V DC-input leads to the power supply faceplate, leave a small service loop in the ground lead to ensure that it is the last lead to disconnect from the power supply if a great deal of strain is placed on all three leads. (See [Figure 9-20](#).)

- Step 7** Restore current to the -V and +V leads.



**Note** For the Cisco 7200 series routers:

- Each DC-input power supply operating at 24 VDC requires a minimum of 19A service.
- Each DC-input power supply operating at 48 VDC requires a minimum of 13A service.
- Each DC-input power supply operating at 60 VDC requires a minimum of 8A service.

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a listed and certified fuse or circuit breaker, 35A minimum 60 VDC, is used on all current-carrying conductors. Site wiring and circuit breakers need to be sized to accommodate the maximum values for safety reasons.

- Step 8** Repeat Step 1 through Step 7 if a second power supply is installed.

This completes the steps for reconnecting DC-input power to a Cisco 7200 series router or a Cisco 7200 VXR router. Proceed to the [“Powering Up the Router”](#) section on page 9-33.

## Reconnecting DC-Input Power to a Cisco uBR7246VXR Router

To reconnect DC-input power to a Cisco uBR7246VXR router, complete the following steps:

**Note**

The color coding of the DC-input power supply leads depends on the color coding of the DC power source at your site. Typically, green or green and yellow are used for ground. Make certain that the lead color coding you choose for the DC-input power supply matches the lead color coding used at the DC power source.

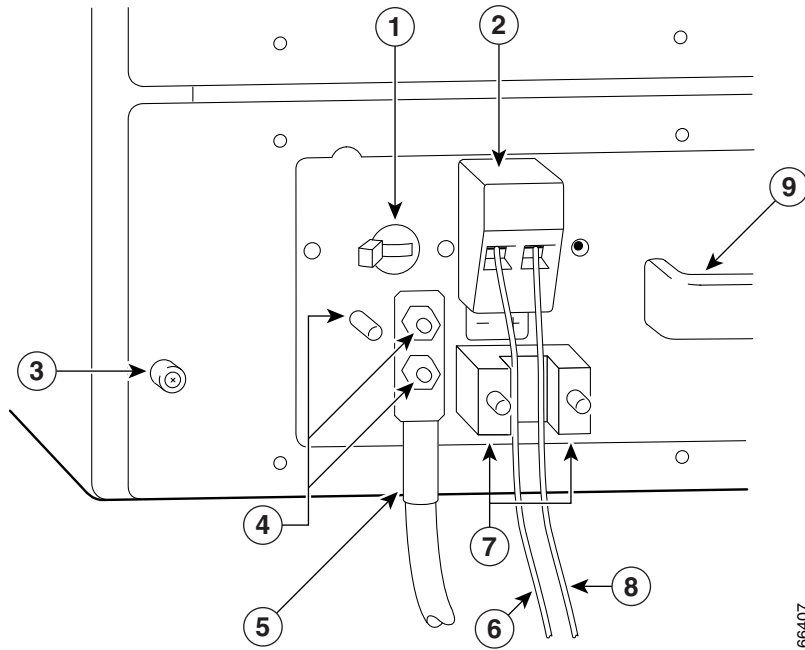
**Warning**

**Before completing any of the following steps, and to prevent short-circuit or shock hazards, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.** Statement 322

**Warning**

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

- Step 1** At the rear of the router, check that the power switch on the power supply is in the off (O) position.
- Step 2** Ensure that no current is running through the -V and +V leads. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the off position, and tape the switch handle of the circuit breaker in the off position.

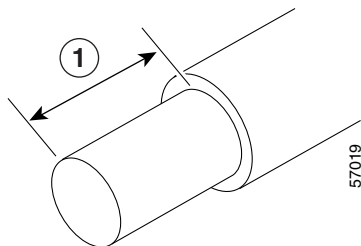
**Figure 9-22** Connecting DC-Input Power to a Cisco uBR7246VXR Router

|   |                            |   |          |
|---|----------------------------|---|----------|
| 1 | Power switch               | 6 | -V lead  |
| 2 | Power receptacle           | 7 | M4 studs |
| 3 | Captive installation screw | 8 | +V lead  |
| 4 | M5 grounding receptacles   | 9 | Handle   |
| 5 | M5 grounding lug           |   |          |

**Step 3** If necessary, use a wire stripper to strip approximately 0.55 inch (14 mm) from the -V, +V, and ground leads.

**Note**

The ground lead for the Cisco uBR7246VXR router DC-input power supply consists of a two-hole grounding lug that connects to an M5 grounding receptacle; you do not need to strip this ground lead.

**Figure 9-23** Stripping the DC-Input Lines

|   |                  |  |  |
|---|------------------|--|--|
| 1 | 0.55 in. (14 mm) |  |  |
|---|------------------|--|--|



**Step 4** Connect the two-hole grounding lug on the grounding lead to the M5 grounding receptacles with the M5 nuts. Tighten the nuts using an 8-mm wrench or nut driver (or adjustable wrench). (See [Figure 9-24](#).)

**Step 5** Insert the stripped end of the +V lead all the way into the +V lead receptacle and tighten the receptacle screw using the 3/16-inch flat-blade screwdriver. Repeat this step for the -V lead.

**Note**

Make sure that the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle, use the wire stripper to cut the stripped end of the lead, and repeat through [Step 5](#).

**Step 6** After tightening the receptacle screw or nuts for the ground, +V, and -V DC-input leads, secure the leads to the power supply faceplate.

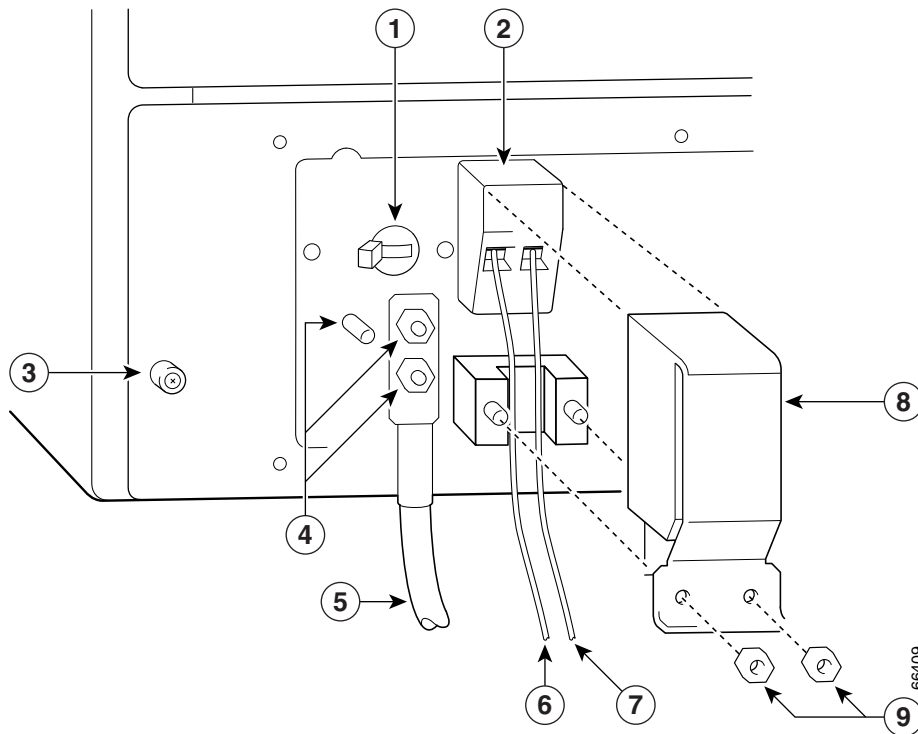
**Step 7** Run the +V and -V leads between the two strain-relief studs on the power supply faceplate.

**Note**

A service loop is not required in the lead attached to the grounding lug because this lead is separate from the +V and -V leads and is secured by two M5 nuts to the M5 receptacles.

**Step 8** Replace the strain-relief cover over the +V and -V leads and secure the cover to the strain-relief studs with the two M4 nuts using the 7-mm wrench or nut driver (or adjustable wrench).

**Figure 9-24** Replacing the Strain-Relief Cover on a Cisco uBR7246VXR Router DC-Input Power Supply



|   |                            |   |                     |
|---|----------------------------|---|---------------------|
| 1 | Power switch               | 6 | -V lead             |
| 2 | Power receptacle           | 7 | +V lead             |
| 3 | Captive installation screw | 8 | Strain-relief cover |
| 4 | M5 grounding receptacles   | 9 | M4 nuts             |
| 5 | M5 grounding lug           |   |                     |

**Step 9** Restore current to the -V and +V leads.



**Note** For the Cisco uBR7246VXR router, each DC-input power supply rating is 14A, 700 volt ampere (VA).

This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a listed and certified fuse or circuit breaker, 35A minimum 60 VDC, is used on all current-carrying conductors. Site wiring and circuit breakers need to be sized to accommodate the maximum values for safety reasons.

**Step 10** Repeat Step 1 through Step 9 if a second power supply is installed.

This completes the steps for reconnecting DC-input power to a Cisco uBR7246VXR router. Proceed to the following section, "[Powering Up the Router.](#)"

## Powering Up the Router

To power up a Cisco 7200 series router, Cisco 7200 VXR router, or Cisco uBR7200 series router that has an installed power supply, complete the following steps:

---

**Step 1** Check for the following:

- Each port adapter is inserted in its slot, and its respective port adapter lever is in the locked position.
- The network processing engine and the I/O controller are inserted in their respective slots, and the captive installation screws are tightened.
- All network interface cables are connected to the port adapters.
- Each cable interface line card is inserted in its slot, and its respective captive installation screws are tightened (Cisco uBR7200 series router only).
- A PC Card or Flash Disk is installed in one of the PC Card slots.



---

**Note** The Flash Disk can be installed in either slot 0 or slot 1 of the Cisco 7200 series router.

- 
- Each AC-input power cable is connected and secured with the cable-retention clip (AC-input power supplies only).
  - For a Cisco 7200 series router, each DC lead is connected and secured to the power supply faceplate with a cable tie.
  - For a Cisco uBR7200 series router, each DC lead is connected with M5 nuts for the grounding receptacle and the strain-relief cover over the +V and –V leads (DC-input power supplies only).
  - Each DC lead is connected and secured to the power source (DC-input power supplies only).
  - Ensure that the tape (that you applied earlier) is removed from the circuit breaker switch handle, and power is restored by moving the circuit breaker handle to the on (I) position (DC-input power supplies only).
  - The console terminal is turned on.



---

**Caution** When the power switch on a Cisco uBR7200 series power supply is turned to the off (O) position, the power supply enters a reset cycle for 90 seconds. Wait at least 90 seconds before turning the power switch back to the on (I) position. If you do not wait the full 90 seconds, the power supply does not restart.

---

**Step 2** At the rear of the router, place the power switch on the power supply in the on (I) position. Repeat this step if a second power supply is installed in the router. The green OK LED on the power supply turns on.

---

**Note** When powering on the router, wait a minimum of 30 seconds before powering it off again.

---

**Step 3** Listen for the fans; you should immediately hear them operating.

---

**Step 4** During the boot process, observe the system LEDs. The LEDs on most of the port adapters go on and off in an irregular sequence. Some may go on, go out, and go on again for a short time. On the I/O controller, the I/O power OK LED goes on immediately.

- Step 5** Observe the initialization process. When the system boot is complete (a few seconds), the network processing engine or network services engine begins to initialize the port adapters and the I/O controller. During this initialization, the LEDs on each port adapter behave differently (most flash on and off). The enabled LED on each port adapter and Cisco uBR7200 series cable interface line card goes on when initialization is completed, and the console screen displays a script and system banner similar to the following:

```
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), 11.3(2)T
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Sun 22-Feb-98 06:00 by Biff
```

---

This completes the procedures for connecting input power and powering up the router. This also completes the procedure for installing the network processing engine or network services engine in a Cisco 7200 series router, Cisco 7200 VXR router, or Cisco uBR7200 series router.



# CHAPTER 10

## Configuration Tasks and Troubleshooting Information

---

This chapter provides configuration and troubleshooting information. Troubleshooting information includes general **show** commands, **show** commands specific to the NSE-1, and error messages and the like. Instructions for removing a power supply for easier removal or installation of the network services engine are also provided. The following topics are covered in this chapter:

- [NPE Configuration Tasks, page 10-1](#)
- [NSE Configuration Tasks, page 10-1](#)
- [Boot Changes in Cisco IOS Release 12.2, page 10-2](#)
- [Troubleshooting the NPE-G1 or NPE-G2, page 10-2](#)
- [.Troubleshooting the NPE-100 Through NPE-400, page 10-4](#)
- [NPE or NSE show Commands, page 10-4](#)
- [NSE-1 show Commands, page 10-6](#)
- [NSE-1 Error Messages, page 10-10](#)
- [Using Debugging Commands and PXF, page 10-11](#)
- [PXF Troubleshooting Information, page 10-11](#)
- [Removing and Replacing an AC-Input or DC-Input Power Supply, page 10-14](#)
- [Fiber Optic Cleaning Information, page 10-17](#)

### NPE Configuration Tasks

Network processing engines (NPEs) NPE-100 through NPE-400 are not configurable. There are no tasks to perform.

For NPE-G1 and NPE-G2 configuration tasks, see [Chapter 7, “NPE-G1 and NPE-G2 Installation and Configuration Information.”](#)

### NSE Configuration Tasks

The PXF processor is turned on by default. If it is ever disabled, you must enable it to take advantage of IP packet switching and feature acceleration.

**Note**


---

Before enabling the PXF processor, you must have IP routing and IP CEF switching turned on.

---

To manually disable or enable the PXF processor, use the **ip pxf** global command. To see a current list of Cisco IOS features supported by the PXF processor, go to Cisco.com and search for Cisco 7200 product literature for the NSE-1.

## Boot Changes in Cisco IOS Release 12.2

Cisco IOS Release 12.2 changed the behavior of the ROM monitor (ROMmon) during the bootup sequence. Previously, users could issue the break signal during the bootup sequence to break into ROMmon, and then immediately boot a new Cisco IOS image using the **boot** command.

This behavior is no longer allowed when the router is using a boot image that is based on Cisco IOS Release 12.2, because interrupting the boot process could leave the hardware and software registers in an unknown state. Instead, use the following procedure when using a router with a Cisco IOS Release 12.2 boot image:

- 
- Step 1** At the router console prompt, send a BREAK signal to interrupt the boot process and enter ROMmon.
  - Step 2** Set the configure register to boot into ROMmon by using the **confreg 0x0** command.
  - Step 3** Use the **reset** command to reset the NPE and boot into ROMmon. This ensures a clean boot into ROMmon, with all registers set to a known state.
  - Step 4** Set the configuration register to boot a Cisco IOS image by using the **confreg 0x2102** command.
  - Step 5** Use the **boot** command to boot the desired Cisco IOS image.
- 

## Troubleshooting the NPE-G1 or NPE-G2

The procedures in this section assume that the NPE-G1, NPE-G2, Cisco uBR7200-NPE-G1, or Cisco uBR7200-NPE-G2 is installed without an I/O controller. Unless otherwise indicated, all references to NPE-G1 refer to both the NPE-G1 and Cisco uBR7200-NPE-G1. Also, unless otherwise indicated, all references to NPE-G2 refer to both the NPE-G2 and Cisco uBR7200-NPE-G2.

**Note**


---

The NPE-G2 has its own Cisco IOS software image with the prefix “c7200p-” in the software images filenames, including the boot image. The NPE-G2 does not boot up with a software image with the prefix “c7200-”. Previous network processing engines, or the network services engine, do not boot up with the “c7200p-” boot image. They use the prefix “c7200-”.

---

**Note**


---

The Cisco uBR7200-NPE-G2 has its own Cisco IOS software image with the prefix “ubr7200p”.

---

For NPE-G1 or NPE-G2 ROMmon upgrade error messages, see the [“ROMmon Upgrade Error Messages”](#) section on page 7-66.

**Caution**

If an NPE-G1 or NPE-G2 is installed in a router with either an C7200-I/O-GE+E or C7200-I/O-2FE/E I/O controller, or if a Cisco uBR7200-NPE-G1 will be installed in a router with a C7200-I/O-2FE/E I/O controller, copy your running configuration to a TFTP server or Flash Disk, not a PC Card. PC Cards are not supported on these I/O controllers when an NPE-G1 or NPE-G2 are present. If you copy the running configuration to a PC Card with these I/O controllers present, you will not be able to retrieve the running configuration after the NPE-G1 or NPE-G2 is installed.

**Note**

If an I/O controller is installed with the NPE-G1 or NPE-G2, only the EN (Enable) LED and LINK LED information in this section is applicable.

The procedures in this section assume that the NPE-G1 or NPE-G2 and the router itself are in the original factory configuration, and that you have not made changes to your configuration file.

- If the NPE-G1 POWER ON LED or the NPE-G2 PWR OK LED does not go on as expected, make sure the power to the router is turned off, reseal the NPE-G1 or NPE-G2 in its slot, and restart the router.

If the POWER ON LED or the PWR OK LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

- If the EN (Enable) LED does not come on when a Gigabit Ethernet RJ-45 port is selected, try using a different cable. If the EN (Enable) LED does not come on, check to be sure that in software the RJ-45 media is selected. See the [“Changing the Media Type of the Native Gigabit Ethernet GBIC, SFP, or RJ-45 Ports”](#) section on page 7-56.
- If the EN LED remains off when the GBIC media or SFP media are selected, the LED is functioning properly. If the GBIC port or SFP port does not seem to be operating, try installing a different GBIC or a different SFP module, or a different cable. Also check in software to be sure the optical fiber media is selected. See the [“Changing the Media Type of the Native Gigabit Ethernet GBIC, SFP, or RJ-45 Ports”](#) section on page 7-56.

If any of these actions do not produce a functioning LED, contact an authorized service representative.

- If the LINK LED does not come on only when any of the Gigabit Ethernet media are in use:
  - Check that the router is receiving power.
  - Check that the correct media type is selected in software. See the [“Configuring the Native Gigabit Ethernet Interfaces”](#) section on page 7-56.
  - Check that the media cables are functioning and are completely connected to the NPE-G1 or NPE-G2.
  - If the GBIC modules are being used, check to be sure they are connected to the NPE-G1. If SFP modules are being used, check to be sure they are connected to the NPE-G2.

If any of these actions do not produce a functioning LED, contact an authorized service representative.

- If the SLOT ACTIVE LED on the NPE-G1, or the CF ACTV LED on the NPE-G2 does not come on when the CompactFlash Disk slot is being used, try inserting a different CompactFlash Disk. If the SLOT ACTIVE LED on the NPE-G1 or the CF ACTV LED on the NPE-G2 still does not come on, contact an authorized service representative.

- Check the Cisco IOS release running on the router. For minimum software release information, see the “[Software Requirements](#)” section on page 8-4

## .Troubleshooting the NPE-100 Through NPE-400

The procedures in this section assume that the I/O controller, network processing engine or network services engine, and the router itself are in the original factory configuration, and that you have not made any changes to your configuration file.

If the I/O controller ENABLED LED does not go on as expected, make sure the power to the router is turned off, reseal the network processing engine or network services engine in its slot, and restart the router.

If the ENABLED LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

Check the Cisco IOS release running on the router. For minimum software release information, see the “[Software Requirements](#)” section on page 8-4.

## NPE or NSE show Commands

Use the global **show version** or **show c7200** commands to obtain information about the NPE or NSE, hardware, and software installed on your router. Examples of each follow.

### Using the show version Command

Use the **show version** command to display the configuration of the system hardware including the NPE or NSE and the software version.

The following example of the **show version** command identifies an NPE-400 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-P-M), Released Version 12.1(20000622:181759)
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Thu 22-Jun-00 11:18 by BIFF
Image text-base:0x60008950, data-base:0x60BD8000

(display text omitted)

cisco 7206VXR (NPE400) processor (revision 0xFF) with 114688K/16384K bytes
of memory.
Processor board ID 8771013
R7000 CPU at 350Mhz, Implementation 39, Rev 2.1, 256KB L2, 4096KB L3 Cache
6 slot VXR midplane, Version 2.1

(display text omitted)
```

The following example shows an NSE-1 installed in a Cisco 7206VXR router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Version 12.1(1)E
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 22-Mar-00 08:37 by Biff
```



```

Image text-base:0x60008900, data-base:0x6141C000

(display text omitted)

cisco 7206VXR (NSE-1) processor (revision B) with 57344K/8192K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2 Cache6 slot VXR midplane,
Version 2.0

(display text omitted)

PXF processor tmc is running.
6 FastEthernet/IEEE 802.3 interface(s)
10 Serial network interface(s)
2 HSSI network interface(s)
2 Channelized T3 port(s)
125K bytes of non-volatile configuration memory.

(display text omitted)

```

## Using the show c7200 Command

Use the **show c7200** command to obtain information about the router.

```

Router# show c7200
Network IO Interrupt Throttling:
throttle count=0, timer count=0
active=0, configured=0
netint usec=4000, netint mask usec=200

C7200 Midplane EEPROM:
Hardware revision 2.0          Board revision A0
Serial number 16061833        Part number 73-3223-05
Test history 0x0              RMA number 00-00-00
MAC=00b0.4aae.4000, MAC Size=1024
EEPROM format version 1, Model=0x6
EEPROM contents (hex):
0x20:01 06 02 00 00 F5 15 89 49 0C 97 05 00 B0 4A AE
0x30:40 00 04 00 00 00 00 00 01 13 50 00 00 FF 00

C7206VXR CPU EEPROM:
Hardware revision 1.2          Board revision A0
Serial number 15053437        Part number 73-3453-04
Test history 0x0              RMA number 00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20:01 C2 01 02 00 E5 B2 7D 49 0D 7D 04 00 00 00 00
0x30:50 00 00 00 00 01 14 00 00 00 FF FF FF FF FF FF

C7200 PE EEPROM:
Hardware Revision :1.0
Top Assy. Part Number :800-05272-04
Part Number :73-4068-02
Board Revision :A0
PCB Serial Number :12342775
RMA History :00
Fab Version :02
Fab Part Number :28-3146-02
Product Number :NSE1
EEPROM format version 4
EEPROM contents (hex):
0x00:04 FF 40 00 DE 41 01 00 C0 46 03 20 00 14 98 04
0x10:82 49 0F E4 02 42 41 30 C1 8B 31 32 33 34 32 37

```

```

0x20:37 35 20 20 20 04 00 02 02 85 1C 0C 4A 02 CB 84
0x30:4E 53 45 31 FF FF FF FF FF FF FF FF FF FF FF FF
0x40:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## Using the show environment Command with the NPE-G2—NPE-G2 -Specific Output

The output for the **show environment** command has changed slightly for the NPE-G2. See the [NPE-G2 Support for the show environment Command](#) document for information about changes to the output of the **show environment** command with the NPE-G2 at:

[http://www.cisco.com/en/US/docs/ios/12\\_4/12\\_4x/12\\_4\\_4xd/showenv2.html](http://www.cisco.com/en/US/docs/ios/12_4/12_4x/12_4_4xd/showenv2.html).

## NSE-1 show Commands

Following are five NSE-1-specific **show pxf** commands and several subcommands. Included in this section are examples for each command.

- **show pxf accounting ?**
  - **show pxf accounting summary**
  - **show pxf accounting interface**
- **show pxf crash**
- **show pxf info**
- **show pxf interface**
- **show pxf feature ?**

Sample output for these commands and subcommands follows.

## Using the show pxf accounting ? Command and Subcommands

The following is an example of the **show pxf accounting ?** command with sample output:

```

Router# show pxf accounting ?
  ATM          ATM interface
  Ethernet     IEEE 802.3
  FastEthernet FastEthernet IEEE 802.3
  Hssi         High Speed Serial Interface
  Null         Null interface
  POS          Packet over Sonet
  Serial       Serial
  summary     PXF summary statistics

```

The following is an example of the **show pxf accounting summary** command with sample output:

```

Router# show pxf accounting summary
  Pkts      Dropped  RP Processed      Ignored
  Total                0                90                0

  PXF complex busy      : 8%
  PXF input pipeline full: 0%

```

```

PXF Statistic:
Packets RP -> PXF:
switch ip:          0
switch raw:        90
qos fastsend:      0
qos enqueue:       0
Total:              90

Packets PXF -> RP:
qos pkts:          0
fast pkts:         0
drops:total        0
punts:total        90
"  not IP :        89
"  CEF receive :   1
Total:              90

Packets ignored:   0      |   ring space:
shadow ring full:  0      |   shadow ring: 16382
in ring full:     0      |   inring:      995
PXF inactive:     0

tx credits:        0      |   delayed credits:  0
holdq enqueues:   0      |   requeue drops:    0
interrupts:       90     |   pending read bytes: 0
L2TP tunnel read: 0      |   session stats:    0

Interface  Pkts In  Chars In  Pkts Out  Chars Out  Punted  Dropped
Et0/0      0         0         0         0         93         0
Gi0/0      0         0         0         0         0         0
Fa1/0      0         0         0         0         0         0
Fa4/0      0         0         0         0         0         0
Vt1        0         0         0         0         0         0
Lo0        0         0         0         0         0         0

```

The following is an example of the **show pxf accounting interface** command with sample output:

```

Router# show pxf accounting POS4/0

Interface  Pkts In  Chars In  Pkts Out  Chars Out  Punted
POS4/0     19      1064     0         0         44

```

## Using the show pxf crash Command

The following is an example of the **show pxf crash** command with sample output:

```

Router# show pxf crash

toaster-ut#sh pxf crash
EX_Type = 0x80000000
EX_ID(b0~3,16~17) = 0x00400
CPU_EX_ID(b0~15) = 0x0004
IHB_EX_Type(b0~5) = 0x00
XRAM0(b0~13) = 0x00000
XRAM1(b0~13) = 0x00000
XRAM2(b0~13) = 0x00000
XRAM3(b0~13) = 0x00000
Pipeline:7FDEFD pdone[3210]:1F 17 17 1D

```

```

ICM0 (b4~13) = 0x00000 ICM1 (b4~13) = 0x00000
ICM2 (b4~13) = 0x00010 ICM3 (b4~13) = 0x00000
LOCK0 (b0~4) = 0x00000 LOCK1 (b0~4) = 0x00000
LOCK2 (b0~4) = 0x00000 LOCK3 (b0~4) = 0x00000
CPU0/2: SW EX Type=0x00000000 LBUS EX Type=0x00000081 HW EX
Type=0x00000400
CPU:row=0x0 column=0x2 cpu=0x2
PC:0000098E LR:0000087F CR:002C4C00
r0:00000000 r1:8001CEA0 r2:80784390 r3:00000000
r4:00005400 r5:80D3BA04 r6:80A7CA00 r7:00000004
r8:00000000 r9:00000008 r10:80092324 r11:800A6200
r12:00000033 r13:00000008 r14:00000000 r15:00000000
misr1a:00000000 misr1bhi:00000000 misr1blo:00000000 misr2hi:00000000
misr2lo:00000000 reserve:00000000 reserve:00000000 reserve:00000000
sisr1a:01000040 sisr1b:00000000 irhi:4402200F irlo:00000000
cAll:C20DE822 DCD1:00020400 DCD2:00000002 CNTL:00000000
TBuf intr 0:1111111F
TBuf intr 1:020FFFF0
TBuf intr 2:00003C80
TBuf intr 3:80000000
TBuf intr 4:00000400
Xram return:00000000
Icram return hi:80024E00
Icram return lo:800A4E00
TBuf addr 0:005E6800 TBuf sblock1 0:8078A374 TBuf sblock0 0:804FD600
TBuf addr 1:005E6800 TBuf sblock1 1:8078A374 TBuf sblock0 1:804FD600
TBuf addr 2:005E6800 TBuf sblock1 2:8078A374 TBuf sblock0 2:804FD600
TBuf addr 3:005E6800 TBuf sblock1 3:8078A374 TBuf sblock0 3:804FD600
TBuf addr 4:005E6800 TBuf sblock1 4:8078A374 TBuf sblock0 4:804FD600
TBuf addr 5:005E6800 TBuf sblock1 5:8078A374 TBuf sblock0 5:804FD600
TBuf addr 6:005E6800 TBuf sblock1 6:8078A374 TBuf sblock0 6:804FD600
TBuf addr 7:005E6800 TBuf sblock1 7:8078A374 TBuf sblock0 7:804FD600

```

## Using the show pxf info Command

The following is an example of the **show pxf info** command with sample output:

```

Router# show pxf info

pxf:tmc type TMC ASIC Pass1 (no ECC) revision 3
ucode:filename 'system:pxf/ucode0' revision 1.1
state: is running, number of starts 1
uptime:15:24:18
Memory Configuration:

```

| Bank Name                    | Total | Reserved   | In-use  | Free       |
|------------------------------|-------|------------|---------|------------|
| tmc internal memory column 0 | 16 Kb | 10 Kb      | 0 bytes | 6144 bytes |
| tmc column 0 memory bank 0   | 32 Mb | 26 Mb      | 16 Kb   | 5554 Kb    |
| tmc internal memory column 1 | 16 Kb | 512 bytes  | 0 bytes | 15 Kb      |
| tmc column 1 memory bank 0   | 32 Mb | 669 Kb     | 2015 Kb | 29 Mb      |
| tmc internal memory column 2 | 16 Kb | 6656 bytes | 0 bytes | 9728 bytes |
| tmc column 2 memory bank 0   | 32 Mb | 441 Kb     | 800 Kb  | 30 Mb      |
| tmc internal memory column 3 | 16 Kb | 15 Kb      | 0 bytes | 512 bytes  |
| tmc column 3 memory bank 0   | 32 Mb | 2092 Kb    | 128 Kb  | 29 Mb      |

## Using the show pxf interface Command

The **show pxf interface** command provides a summary of the interfaces in the router and which PXF features or capabilities are enabled on these interfaces. The following is an example of the **show pxf interface** command:

```
Router# show pxf interface
  Intf  I/f #  Attributes
Fa0/0   3     Raw, Encap, QoS(Cr 0, Thrsh 2, Max 101)
Et1/0   4     Raw, Encap
Et1/1   5     Raw, Encap, QoS(Cr 0, Thrsh 2, Max 13)
Et1/2   6     Raw, Encap
Et1/3   7     Raw, Encap
Se2/0   8     Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/1   9     Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/2  10    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Se2/3  11    Raw, Encap, QoS(Cr 0, Thrsh 2, Max 5)
Fa3/0  12    Raw, Encap
PO4/0  13    Raw, Encap
AT5/0  14    Raw, Encap
```

## Using the show pxf feature ? Command and Subcommands

The following is an example of the feature-specific **show pxf feature ?** command with sample output:

```
Router# show pxf feature ?
  cef  PXF CEF info
  nat  PXF NAT info
```

- **show pxf feature cef ?**

```
display pxf entry
```

```
Router# show pxf feature cef entry
Shadow 16-4-4-8 PXF Mtrie:
  41 leaves, 1968 leaf bytes, 15 nodes, 267000 node bytes
  5 invalidations
  46 prefix updates
  refcounts: 66746 leaf, 66720 node
```

| Prefix/Length    | Refcount | Parent           |
|------------------|----------|------------------|
| 0.0.0.0/0        | 62282    |                  |
| 0.0.0.0/32       | 3        | 0.0.0.0/0        |
| 171.69.12.128/27 | 34       | 0.0.0.0/0        |
| 171.69.12.128/32 | 3        | 171.69.12.128/27 |
| 171.69.12.129/32 | 3        | 171.69.12.128/27 |
| 171.69.12.130/32 | 3        | 171.69.12.128/27 |
| 171.69.12.131/32 | 3        | 171.69.12.128/27 |
| 171.69.12.132/32 | 3        | 171.69.12.128/27 |
| 171.69.12.138/32 | 3        | 171.69.12.128/27 |
| 171.69.12.139/32 | 3        | 171.69.12.128/27 |
| 171.69.12.140/32 | 3        | 171.69.12.128/27 |
| 171.69.12.141/32 | 3        | 171.69.12.128/27 |
| 171.69.12.142/32 | 3        | 171.69.12.128/27 |
| 171.69.12.143/32 | 3        | 171.69.12.128/27 |
| 171.69.12.145/32 | 3        | 171.69.12.128/27 |
| 171.69.12.146/32 | 3        | 171.69.12.128/27 |
| 171.69.12.147/32 | 3        | 171.69.12.128/27 |

(display text omitted)

- **show pxf feature nat ?**

```
Router# show pxf feature nat ?
entry  toaster nat entry
stat   toaster nat processing info
tcp    toaster nat tcp logging info
```

```
Router# show pxf feature nat entry
--- 171.69.12.175      192.168.0.129      ---
--- 171.69.12.161      192.168.0.7        ---
--- 171.69.12.162      192.168.0.2        ---
--- 171.69.12.163      192.168.0.3        ---
--- 171.69.12.164      192.168.0.4        ---
--- 171.69.12.165      192.168.0.13       ---
--- 171.69.12.166      192.168.0.5        ---
```

```
Router# show pxf feature nat stat
NAT translation processing information
total nat entries = 0x1000, entries (used, free) = (0x7, 0xFF9)
untranslated flows:0x7022D
translated flows:0x1030
icmp extendable flows:0x0
noop alloc miss:0x0
entry alloc miss:0x0
entry delete miss:0x0
```

## NSE-1 Error Messages

If the PXF processor crashes or hangs, check the syslog for any error messages.

You may see error messages similar to the following messages.

- PXF processor crash and error message:

```
WARNING:PXF Exception:mac_xid=0x10000
*** IHB watchdog timer expired
6d16h:%PXF-2-EXCEPTION:pxf exception on pxf tmc.
```

Workaround: Run the **show pxf crash** command to obtain more information.

- PXF processor hang and error message:

```
WARNING:PXF Exception:mac_xid=0x8
*** External Memory Column 3 exception, type = 20
```

If you see this error message, the PXF processor has been left in HALT state. During bootup, the PXF processor is in error state and cannot be brought up.

Workaround: Reboot the router.

- PXF processor crash and error message:

```
00:49:37:Fatal pxf interrupt, int_reg=0x80, int_mask=0xFFFF, config=0x1FF40
00
00:49:37:-Traceback= 6055B9CC 60530D10
```

This message indicates the PXF processor encountered a serious error and crashed.

Workaround: Reboot the router.



**Note**

The most current product documentation is online. For information on accessing documentation, see [“Obtaining Documentation and Submitting a Service Request”](#) section on page iv.

## Using Debugging Commands and PXF

To enable all normal Cisco IOS packet debugging facilities, disable PXF. In configuration mode, use the **no ip pxf** command:

```
hostname (config)# no ip pxf
```

Then use the Cisco IOS debugging commands to troubleshoot the problem.



**Note**

The most current product documentation is online. For information on accessing documentation, see [“Obtaining Documentation and Submitting a Service Request”](#) section on page iv.

## PXF Troubleshooting Information

Use the information in this section to troubleshoot PXF problems.

### Cisco IOS Statistics Not Supported by PXF

Some standard Cisco IOS statistics are not supported in the PXF path, including:

- Subinterface counters
- ATM VC counters
- Class-match statistics on classes with neither policing nor class-based weighted fair queueing (CBWFQ)

### Features Not Supported by PXF

Features that are not supported by PXF are punted to the Route Processor (RP), which can cause high RP CPU usage.

### High PXF CPU Usage

Enter the **show pxf accounting summary** command to display information about PXF CPU usage:

```
Router# show pxf accounting summary
.
.
.
10 second averages: PXF complex busy: 1% PXF read pipeline full: 0%
```

The PXF has 16 processors, only one of which is in use at a time when there is a low traffic rate. Even though only one of the processors is working, all of the PXF processors are slightly slowed. At higher traffic rates many of the PXF processors are working at the same time, but there is no additional slow down.

### High Route Processor CPU Usage

High RP CPU usage may result from punting of packets from the PXF processors to the RP. Enter the **show pxf accounting summary** command to view the number and cause of punts.

Router# **show pxf accounting summary**

```

Pkts          Dropped  RP Processed  Ignored
              Total            0            48360            0

PXF Statistic:
Packets RP -> PXF:
  switch ip:                0
  switch raw:              30048360
  qos fastsend:            0
  qos enqueue:             1938
Total:                    30050298

Packets PXF -> RP:
  qos pkts:                1938
  fast pkts:              30000000
  drops:total             0
  punts:total             48360
  " not IP :                40572
  " CEF no adjacency :     7788
Total:                    30050298

Packets ignored:           0 | ring space:
  shadow ring full:       0 | shadow ring:          16384
  in ring full:          0 | inring:              968
  PXF inactive:          0

tx credits:              16230330 | delayed credits:      0
holdq enqueues:          0 | requeue drops:        0
interrupts:              40538 | interrupt misses:     1947
interrupt packets:       53326
pending read bytes:      0

Interface  Pkts In  Chars In  Pkts Out  Chars Out  Punted  Dropped
-----
Fa0/0      0        0        30000000 1740000000 970      0
Et1/0      0        0          0          0        21309   0
Et1/1      0        0          0          0          0      0
Et1/2      0        0          0          0          0      0
Et1/3      0        0          0          0          0      0
Se2/0      0        0          0          0          963    0
Se2/1      0        0          0          0          0      0
Se2/2      0        0          0          0          0      0
Se2/3      0        0          0          0          0      0
Fa3/0      0        0          0          0          963    0
PO4/0     30000000 1440000000 0          0          963    0
AT5/0      0        0          0          0        23192   0
Vi1        0        0          0          0          0      0
Vt1        0        0          0          0          0      0
Vi2        0        0          0          0          0      0
Vt2        0        0          0          0          0      0

```



**Note**

CPU usage becomes more efficient as packet load increases. For example, if you are running at 60 percent CPU with only 33 percent of customer load on the system, this does not mean that you need 180 percent CPU for 100 percent of customers. Part of the original 60 percent CPU usage is overhead usage, which does not increase as packet load increases.

**Ignored Packets**

Packet ignores on an interface may result from high CPU usage. Enter the **show interfaces** command to display any input ignores:

```
Router# show interfaces ethernet 0/0
Ethernet0/0 is up, line protocol is up
...
21 input errors, 0 CRC, 0 frame, 0 overrun, 21 ignored
```

Packets are ignored if there is no available CPU to accept the new packets. This can happen if the router is overloaded with traffic, but can also happen if the interface is faulty. If ignores are present on all interfaces, then the router is probably overloaded with traffic, or does not have sufficient free buffers in the pool that match the maximum transmission unit (MTU) on interfaces. In the latter case, an increment of the ignored counter is followed by an increment of the no buffer counter:

```
Router# show interfaces serial 0/0
...
1567 packets input, 0 bytes, 22 no buffer
22 input errors, 0 CRC, 0 frame, 0 overrun, 22 ignored, 0 abort
```

**No Buffers**

If there are too many buffers configured for the output hold queue on an interface, this can use memory and result in dropped input packets. Enter the **show running-config** command and the **show interfaces** command to display the status of the incoming packet interfaces.

**Priority and Policing Configured in the Class Policy**

PXF does not support a configured priority and policing in the same class of a policy.

**PXF Punts**

If a feature that is supported in the PXF path appears not to be working, it could be the result of PXF failing to punt packets when it should. If you have only particular interfaces running the feature, you can configure a feature that PXF does not support on that interface to force PXF to punt packets.

**QoS Fast-send and QoS Enqueue**

PXF is responsible for managing the outbound traffic queues on an interface on which output QoS queueing is configured. All traffic destined for this interface must be processed by PXF, including both keepalive packets that originate in the router, known as QoS Fast-send packets, and packets that are switched in Cisco IOS, known as QoS Enqueue packets. If there is excessive traffic on the QoS Enqueue or on the QoS Fast-send path, QoS functionality can be disrupted. Use the **show pxf accounting summary** feature to display the QoS Fast-send and QoS Enqueue packets:

```
Router# show pxf accounting summary
.
.
.
qos fastsend:           8
qos enqueue:           5
```

**WFQ Queues**

When there is an increase in ignored packets and in the no buffer count, it is possible that the output weighted fair queuing (WFQ) queues are too long. To specify the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy, use the **fair-queue** policy-map class configuration command; for example:

```
policy-map policy9
  class class-default
    fair-queue 16
    queue-limit 20
```

## Removing and Replacing an AC-Input or DC-Input Power Supply

The weight of power supplies installed in a Cisco 7200 series router or Cisco 7200 VXR router might make it difficult for you to pull the network processing engine from its chassis slot. If this is the case, first remove the installed power supplies from the chassis, and then remove the network processing engine. The following sections explain how to remove and replace an AC-input or a DC-input power supply in a Cisco 7200 series router.

**Note**

The network processing engine is installed above the power supplies in a Cisco uBR7200 series router. You do not need to remove the power supplies from a Cisco uBR7200 series router to pull the network processing engine from its chassis slot.

**Caution**

Do not mix AC-input and DC-input power supplies in the same router.

## Removing a Power Supply from a Cisco 7200 Series Router

The steps for removing an AC-input and DC-input power supply from a Cisco 7200 series router are the same. The two power supplies share the same dimensions and faceplates, except for the AC-input receptacle on the AC-input power supply and the DC-input lead receptacles on the DC-input power supply.

To remove an AC-input or DC-input power supply from a Cisco 7200 series router, complete the following steps:

- Step 1** Ensure that the power switch on the power supply is in the off (O) position and input power is disconnected from the power supply and its power source. (See the [“Removing and Replacing the NPE or NSE” section on page 9-2.](#))

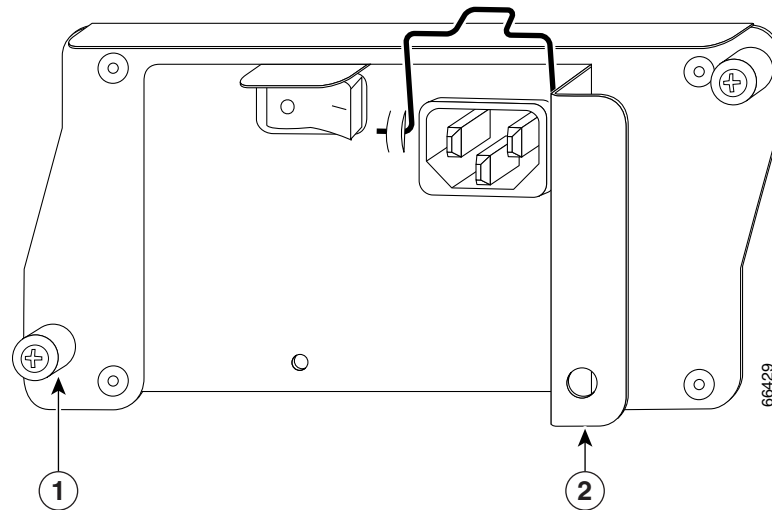
**Note**

When powering off the router, wait a minimum of 30 seconds before powering it on again.

- Step 2** Using a number 2 Phillips or a 3/16-inch flat-blade screwdriver, loosen the two captive installation screws on the faceplate of the power supply. (See [Figure 10-1.](#))

If the router is not installed in a standard 19-inch, 4-post rack or in a telco-type rack, skip to Step 6. If the router is installed in a rack, determine if any permanent rack fixtures, such as a power strip, are obstructing access to the power supply. If a rack fixture is obstructing access to the power supply, proceed to [Step 3.](#)

**Figure 10-1** Power Supply Captive Installation Screws and Handle—Cisco 7200 Series AC-Input Power Supply Shown



|          |                            |          |        |
|----------|----------------------------|----------|--------|
| <b>1</b> | Captive installation screw | <b>2</b> | Handle |
|----------|----------------------------|----------|--------|

- Step 3** Using a 3/16-inch flat-blade screwdriver, loosen the screws that secure the router to the front mounting strips of the rack.
- Step 4** Position at least one person in front of the rack to support the front underside of the router.
- Step 5** From the rear of the rack, carefully push the front of the router out of the rack until there is enough clearance to remove the power supply.
- Step 6** Grasp the power supply handle and pull the power supply from the router.



**Caution**

To maintain agency compliance requirements and meet EMI emissions standards for the Cisco 7200 series chassis with a single power supply, the power supply filler plate must remain in the power supply adjacent to the installed power supply. Do not remove this filler plate from the router unless you intend to install a redundant power supply.

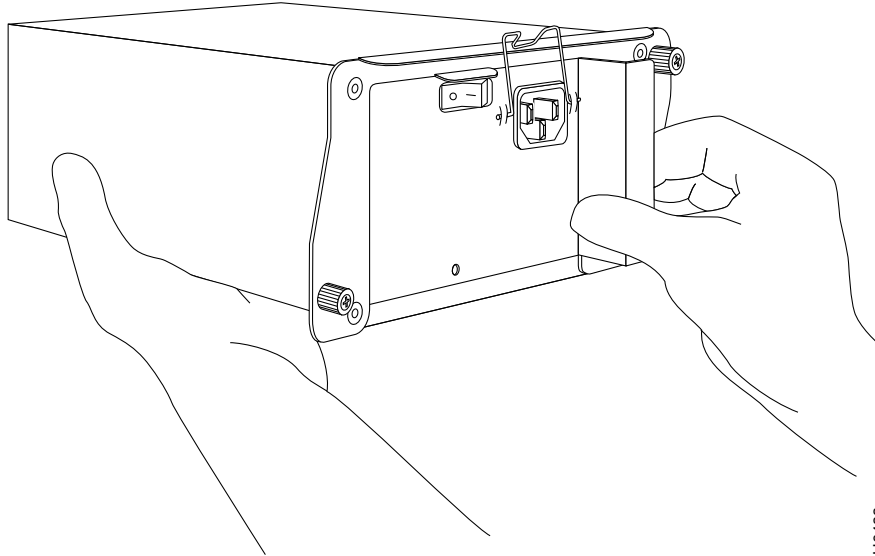
- Step 7** Repeat Step 1 through Step 6 for the other installed power supply (if present).

This completes the procedure for removing an AC-input or DC-input power supply from a Cisco 7200 series router.

## Replacing a Power Supply in a Cisco 7200 Series Router

To install a new AC-input or DC-input power supply in a Cisco 7200 series router, complete the following steps:

- Step 1** Make sure that the power switch on the power supply is in the off (O) position.
- Step 2** Grasp the power supply handle with one hand and place your other hand underneath the power supply for support. (See [Figure 10-2](#).)

**Figure 10-2** Holding the Power Supply—Cisco 7200 Series AC-Input Power Supply Shown

**Step 3** Align the power supply to the power supply bay.

**Step 4** Slide the power supply completely into the power supply bay until its faceplate is flush with the router's rear panel.

**Caution**

When inserting a power supply into the router, do not use unnecessary force; slamming the power supply into the bay can damage the connectors on the rear of the supply and on the midplane.

**Step 5** Seat the power supply in the router by tightening its captive installation screws with a number 2 Phillips or a 3/16-inch flat-blade screwdriver.

**Note**

The power supply is not fully seated in the router midplane until you tighten its captive installation screws (use a number 2 Phillips or a 3/16-inch flat-blade screwdriver).

**Step 6** Repeat [Step 1](#) through [Step 5](#) for a second power supply (if present).

**Step 7** If there is no second power supply, replace the filler plate on the empty power supply bay. Using a number 2 Phillips or a 3/16-inch flat-blade screwdriver, tighten the filler plate's captive installation screws.

**Step 8** If you pushed the router from the rack, slowly guide the router back into the rack.

**Step 9** Use a 3/16-inch flat-blade screwdriver to tighten the screws that secure the router to the front mounting strips of the rack.

**Note**

When powering on the router, wait a minimum of 30 seconds before powering it off again.

This completes the procedures for replacing an AC-input or DC-input power supply in a Cisco 7200 series router.

**Caution**

---

To maintain agency compliance requirements and meet EMI emissions standards for the Cisco 7200 series routers with a single power supply, the power supply filler plate must remain in the power supply adjacent to the installed power supply. Do not remove this filler plate from the router unless you intend to install a redundant power supply.

---

## Fiber Optic Cleaning Information

We strongly recommend cleaning all optical connections before reconnecting any optical cables to equipment. For information about cleaning optical connectors, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* document.





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