Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller

Supported Platforms: Cisco 7200 series, Cisco uBR7200 series, and Cisco AS5800 Universal Access Server

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Document Revision History

The Document Revision History below, beginning with online part number OL-8358-01, records technical changes to this document.

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Change Summary</th>
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<tr>
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<td>February, 2008</td>
<td>Added UBR7200-NPE-G2 support.</td>
</tr>
<tr>
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<td>August, 2006</td>
<td>Adding NPE-G2 additional memory information.</td>
</tr>
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<td>OL-8358-02</td>
<td>May, 2006</td>
<td>This version adds NPE-G2 memory information.</td>
</tr>
<tr>
<td>OL-8358-01</td>
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<td>This version removes end-of-sale MEM-I/O-D-FLD48M product identification from the document, and adds statement numbers to warnings.</td>
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Introduction

This document explains how to replace the main memory DRAM or SDRAM modules on the network processing engine (NPE) or network services engine (NSE). It also explains how to install, reformat, and copy images onto and between the CompactFlash Disks and between Flash Disks or PC cards that reside in the I/O controller PC card slots. Read this entire document before upgrading the memory in your router. For CompactFlash Disk or Flash Disk memory information, see Using the Flash Disk online at http://www.cisco.com/en/US/products/hw/routers/ps341/prod_installation_guide09186a00802a6394.html. PC card information is in Chapter 1 of this document.

Contents

This document contains the following chapters:

- Chapter 1, “CompactFlash Disk, Flash Disk, and Flash Memory Card Information,” provides information and installation instructions, as well as how to copy boot images for PC cards that insert into I/O controllers.
- Chapter 2, “SDRAM and DRAM Memory Systems Overview,” provides information, specifications, and configurations of SDRAM options for the network processing engine or network services engine.
• Chapter 3, “Preparing for Installation,” contains preparatory information for installing SDRAM memory, as well as safety warnings.

• Chapter 4, “Installing and Removing SDRAM and DRAM,” provides SDRAM installation and removal instructions.

Supported Platforms

The network processing engine or network services engine and the I/O controller are used in the following platforms:

• Cisco 7200 series routers, which consist of the two-slot Cisco 7202, the four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR

  Note The network services engine is supported only on the Cisco 7204VXR and Cisco 7206VXR routers.

• Cisco uBR7200 series universal broadband routers, which consist of the six-slot Cisco uBR7246VXR or Cisco uBR7246 (two port adapter slots and four cable modem card slots)

  Note The Cisco 7206VXR and Cisco 7206 can be used as router shelves in a Cisco AS5800 Universal Access Server. References to the Cisco 7200 VXR routers and the Cisco 7200 series routers in this document include the Cisco 7206VXR and Cisco 7206 as router shelves in a Cisco AS5800 Universal Access Server, unless indicated otherwise.

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 7200 Series Routers Documentation Roadmap—For hardware installation, maintenance, and international agency regulatory compliance and safety information for wide-area network (WAN) interfaces for the Cisco 7200 series routers.

• Cisco 7200 Series Routers Port Adapter Documentation Roadmap—For a complete listing of all port adapter documentation for the Cisco 7200 series routers.

• Cisco 7200 Series Routers Troubleshooting Documentation Roadmap—For troubleshooting information with links to troubleshooting documents and tools.


• For hardware installation and maintenance information on the Cisco uBR7200 series routers, refer to the Cisco uBR7200 Series Universal Broadband Router Hardware Installation and Guide at: http://www.cisco.com/univercd/cc/td/doc/product/cable/cab_rout/cr72hig/index.htm

• For international agency compliance, safety, and statutory information for wide-area network (WAN) interfaces for the Cisco uBR7200 series routers, refer to the following publications:
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:


Subscribe to the What’s New in Cisco Product Documentation as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.

This chapter describes the CompactFlash Disk, Flash Disk, and Flash Memory card options and specifications, as well as information regarding installation, reformatting, and copying bootable images. The following topics are covered in this chapter:

- **Product Description**, page 1-1
- **Boot Environment Variables**, page 1-3
- **Installing and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card**, page 1-4
- **Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card**, page 1-7
- **Copying a Bootable Image onto a CompactFlash Disk, Flash Disk, or Flash Memory Card**, page 1-9
- **Copying Bootable Images Between Flash Disks or Flash Memory Cards**, page 1-10
- **Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card**, page 1-11

**Product Description**

The CompactFlash Disk slots on the NPE-G1 and NPE-G2 network processing engines for the Cisco 7200 VXR routers, and the PC card slots on the I/O controllers and used with Cisco 7200 series routers, use three types of Flash memory options. The PC card slots on the I/O controllers and CompactFlash Disk slots on the NPE-G1 and Cisco uBR7200 series universal broadband routers also use three types of Flash Memory options. These options as follows:

- **CompactFlash Disks.** CompactFlash Disks are smaller in size than Flash Disks but provide the same ATA interface and equivalent functionality.

**Note**

Use the CompactFlash Disk only with the NPE-G1, NPE-G2, UBR7200-NPE-G1, or UBR7200-NPE-G2. Do not attempt to use a CompactFlash Disk in the Type 2 Flash Disk slots in an I/O controller.
• Flash Disks, also known as Flash Memory Disks. Flash Disks are Flash memory-based devices that conform to the PC card standard (formerly called Personal Computer Memory Card International Association or PCMCIA) and present an ATA (AT Attachment) interface to the system. This interface complies with the ANSI ATA Interface Document X3T13.1153 D Rev. 9 specification. These cards provide from 48 MB to 256 MB of storage space.

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

The Flash 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 onboard Flash memory, as well as network file systems such as File Transfer Protocol (FTP) and Trivial FTP (TFTP) servers.

---

**Note**
The Flash Disk is only supported on systems with the Cisco IOS File System feature, and the Cisco IOS File System feature is supported in Cisco IOS Release 12.0(1) or later releases of 12.0. In general, Flash Disk functionality requires Cisco IOS Release 12.0(2) or a later release of 12.0.

• Linear Flash Disks, also known as PC cards, were the initial PC card used for the routers and are available in 16 MB and 20 MB sizes.

Table 1-1 lists the CompactFlash Disk options and supported processors. Table 1-2 lists the Flash Disk options and supported I/O controllers. Table 1-3 lists the PC card options and supported I/O controllers.

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### Table 1-1 CompactFlash Disk Options

<table>
<thead>
<tr>
<th>Memory Size</th>
<th>Product Number</th>
<th>Supported Processors</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 MB</td>
<td>MEM-NPE-G1-FLD64</td>
<td>NPE-G1, UBR7200-NPE-G1</td>
</tr>
<tr>
<td>128 MB</td>
<td>MEM-NPE-G1-FLD128</td>
<td>NPE-G1, UBR7200-NPE-G1</td>
</tr>
<tr>
<td>256 MB</td>
<td>MEM-NPE-G1-FLD256</td>
<td>NPE-G1, UBR7200-NPE-G1</td>
</tr>
<tr>
<td>256 MB</td>
<td>MEM-NPE-G2-FLD256</td>
<td>NPE-G2, UBR-7200-NPE-G2</td>
</tr>
</tbody>
</table>

1. These products are also available as CompactFlash Disk upgrades. To order an upgrade, add an equal sign (=) after the Product Number, for example, MEM-NPE-G1-FLD64=.

### Table 1-2 Flash Disk Options

<table>
<thead>
<tr>
<th>Memory Size</th>
<th>Product Number</th>
<th>Supported I/O Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 MB</td>
<td>MEM-I/O-FLD64M</td>
<td>C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII, C7200-I/O-2FE/E, C7200-I/O-GE-E+, UBR7200-I/O, UBR7200-I/O/FE, UBR7200-I/O-2FE/E</td>
</tr>
</tbody>
</table>

1. These products are also available as Flash Disk upgrades. To order an upgrade, add an equal sign (=) after the Product Number, for example, MEM-I/O-FLD64M=.
Table 1-3  PC Card Options

<table>
<thead>
<tr>
<th>Memory Size</th>
<th>Product Number</th>
<th>Supported I/O Controllers</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 MB</td>
<td>MEM-I/O-FLC16M</td>
<td>C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UBR7200-I/O, UBR7200-I/O/FE</td>
</tr>
<tr>
<td>20 MB</td>
<td>MEM-I/O-FLC20M</td>
<td>C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UBR7200-I/O, UBR7200-I/O/FE</td>
</tr>
</tbody>
</table>

1. All linear PC card memory options have reached End-of-Life and are no longer orderable, but they can continue to be used in existing legacy installations.

A complete discussion of the Cisco IOS File System feature is beyond the scope of this publication. For information about this feature, refer to the Configuration Fundamentals Configuration Guide and Configuration Fundamentals Command Reference publications for Cisco IOS Release 12.x. These publications are available on the Documentation DVD and on Cisco.com.

Boot Environment Variables

By default, and as a result of a reset or power on, the ROM monitor loads the boot image from boot flash memory. If the ROM monitor cannot find a bootable image in boot flash memory, it searches the CompactFlash Disk or PC card-based devices (such as linear Flash memory cards or Flash Disks) for the first bootable image.

The boot image, when loaded, looks in the boot environment variables—stored in nonvolatile random-access memory (NVRAM)—to determine the location of the Cisco IOS software image and the configuration to use. If boot environment variables are not defined, the system will boot the first image found on a Flash Disk, or if no such image is found, the system will boot the first image found on a linear Flash memory card.

The contents of the boot environment variables, which are stored in the configuration file in NVRAM, determine the actions your system takes on bootup. To see the current settings of these variables, use the `show bootvar` command as follows:

```
Router> show bootvar
BOOT variable =
CONFIG_FILE variable =
Current CONFIG_FILE variable =
BOOTLDR variable does not exist
Configuration register is 0x100
```

Following are explanations for each of these boot environment variables:

- **BOOT variable**—Points to the Cisco IOS software image that you want to boot; you set it in configuration mode. The default software image is the `CISCOxxx` image (where `xxx` is a filename assigned by the system, if you do not enter a specific filename). The system then looks for the first image on the Flash Disk in slot 0.
Enter configuration mode and specify a filename and PC card slot from which to boot using the `configure terminal` and `boot system` commands as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot system flash disk0:c7200-p-mz.12-0
```

The result of this configuration file entry is that the BOOT variable is disk0:c7200-p-mz.12-0.

- **CONFIG_FILE** (configuration file) variable—Determines where the configuration is read from on bootup; you set it in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot config disk0:configfile
```

The result of this configuration file entry is that the CONFIG_FILE variable is disk0:configfile.

- **BOOTLDR** (boot loader) variable—Determines which image is used as the boot helper (boot image); you set it in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot bootldr bootflash:c7200-boot-mz
```

The result of this configuration file entry is that the BOOTLDR variable is bootflash:c7200-boot-mz.

- **Configuration register variable**—Instructs the system where to look for a bootable Cisco IOS software image; you set it as a hexadecimal value in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# config-register 0x102
```

The result of this configuration file entry is that the configuration register is set to hexadecimal 0x102. For more information about the configuration register, see Chapter 4, “Observing System Startup and Performing a Basic Configuration,” in the Cisco 7200 VXR Installation and Configuration Guide at the following URL:


### Install and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card

This section describes the proper method for installing and removing a CompactFlash Disk, Flash Disk, or Flash memory card into the CompactFlash Disk slots on an NPE-G1 or NPE-G2, or the Flash Disk or PC card slots on an I/O controller.

**Tip**

All CompactFlash Disks, Flash Disks, and Flash memory cards must be formatted before their initial use. CompactFlash Disks, Flash Disks, or Flash memory cards shipped with an I/O controller, NPE-G1, or NPE-G2, are formatted at the factory, but spare memory cards are not formatted. To avoid potential problems when using spare memory cards, we recommend that you reformat all of your memory cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the “Software and Hardware Requirements” section on page 3-2.)
See the “Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card” section on page 1-7 for instructions on how to reformat a memory card.

For safety warnings for the memory cards, see the “Safety Guidelines” section on page 3-8.

An I/O controller has two physical PC card slots: slot 0 (lower) and slot 1 (upper). (See Figure 1-1.) The NPE-G1 and NPE-G2 have one CompactFlash Disk slot. (See Figure 1-2.)

Do not confuse the physical card slot name with the proper device name to use when addressing the card. Linear memory cards are addressed as the slot0: and slot1: devices. Flash Disk cards are inserted into the slot0 and slot1 physical slots but are addressed as the disk0: and disk1: devices. The CompactFlash Disk is inserted into the one slot on the NPE-G1 or NPE-G2 and is addressed as the disk2: device.

To install a Flash Disk or PC card in a PC card 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 Flash Disk or PC card so that its connector end faces the appropriate slot. (See a in Figure 1-1 or 1 in Figure 1-2.)

Step 3  Carefully insert the card into the slot until it completely seats in the connector, and the ejector button for the slot pops out toward you. (See b in Figure 1-1 or 2 in Figure 1-2.)

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

Note  PC cards do not insert all the way into the PC card slots on the I/O controller; the end of the card protrudes from the I/O controller faceplate. Do not attempt to force the card past this point.

Some older PC cards might have foil tape attached to the outside edge of the card. If you insert one of these PC cards into the upper PC card slot (slot 1) of an I/O controller installed in a Cisco uBR7200 series router, it might be difficult to remove the card. You should use a new PC card that does not have the foil tape, remove the foil tape from the older PC card, or if necessary, use small pliers to remove the PC card.

This completes the procedure for installing a PC card in a PC card slot.

Figure 1-2 Installing and Removing a CompactFlash Disk

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

Step 1  Press the ejector button on the slot.

Step 2  Grasp the card and pull it from the slot.

Step 3  Place the card in an antistatic bag.

Step 4  Insert the CompactFlash Disk into the CompactFlash Disk slot until it engages. It protrudes slightly.
Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card

Depending on the circumstances, you might need to use a Compact Flash Disk, Flash Disk, or PC card from another system to copy images or to back up configuration files; however, you cannot boot from a CompactFlash Disk, Flash Disk, or PC card that was formatted on another type of system. You must reformat the card before you can use it as a boot source.

The procedure for reformatting a CompactFlash Disk, Flash Disk, or PC card is similar. The major difference between them is selecting the correct device name for formatting.

To avoid potential problems when you insert CompactFlash Disks, Flash Disks, or PC cards in your router, we recommend that you reformat all of your CompactFlash Disks, Flash Disks, or PC cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the “Software and Hardware Requirements” section on page 3-2.)

Caution

The following formatting procedure erases all information on the CompactFlash Disk, Flash Disk, or PC card. To prevent the loss of important data that might be stored on a CompactFlash Disk, Flash Disk, or PC card, proceed carefully. If you want to save the data on a CompactFlash Disk, Flash Disk, or PC card, copy the data to a server before you format the card.

The formatting procedure assumes the following:

- You have already booted your Cisco 7200 series router or Cisco uBR7200 series router.
- To be able to save the existing information on the CompactFlash Disk, Flash Disk, or PC card, you should have access to a TFTP server (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server or a secondary CompactFlash Disk, Flash Disk, or PC card.

To ensure access to a TFTP server, you need to configure at least one network interface using the setup facility. Refer to the Configuration Fundamentals Configuration Guide publication for instructions on how to configure a network interface using the setup facility.

- If you do not have access to a TFTP server and want to save the existing information on the CompactFlash Disk, Flash Disk, or PC card, you have a second CompactFlash Disk, Flash Disk, or PC card that is already formatted with sufficient space on which to copy the files.
- You know the filename of the files you want to copy to the TFTP server or onto the secondary CompactFlash Disk, Flash Disk, or PC card.

Use the following procedure to reformat a CompactFlash Disk, Flash Disk, or PC (Flash memory) card:

**Step 1** Insert the disk or card into slot 0. (If slot 0 is not available, use slot 1.) See the “Installing and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card” section on page 1-4.

**Step 2** (Optional) Copy all the files on the CompactFlash Disk, Flash Disk, or PC card to a TFTP server or a secondary Flash Disk or PC card using the `copy` command. The appropriate device name depends on the type of memory card and the slot you are using. The CompactFlash Disk is inserted into the one slot on
the NPE-G1 or NPE-G2 and is addressed as the disk2: device. Flash Disks or PC cards are inserted into
the slot0 and slot1 physical slots but are addressed as the disk0: and disk1: devices. PC cards are
addressed as the slot0: and slot1: devices.

The following example is for copying files from a Flash Disk in physical slot0 (device name disk0:) to
a TFTP server:

Router> enable
Password: <password>
Router# copy disk0:image.name tftp
Enter destination file name [image.name]: image.name
cCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCWWWWWWWWWWWWWWWWWWWWWWW
cccCCCCCCCCCCCCCCC
Address or name of remote host [tftp.server.name]? tftp.server.name
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Step 3 To reformat the CompactFlash Disk, Flash Disk, or PC card, use the format command along with the
appropriate device name. The following example shows a Flash Disk in slot0 being formatted:

Router# format disk0:
All sectors will be erased, proceed? [confirm]
Enter volume id (up to 30 characters): MyNewCard
Formatting sector 1
Format device slot1 completed
Router#

Step 4 (Optional) Copy the files you saved to the TFTP server or second card or Flash disk back to the
CompactFlash Disk, Flash Disk, or PC card as follows:

Router# copy tftp disk0:
Enter source filename: image.name
20575008 bytes available on device disk0, proceed? [confirm]
address or name of remote host [tftp.server.name]? tftp.server.name
loading new.image from tftp.server.name (via Ethernet1/0):!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

The CompactFlash Disk, Flash Disk, or PC card is now reformatted and ready to use.
Copying a Bootable Image onto a CompactFlash Disk, Flash Disk, or Flash Memory Card

After you have reformatted your CompactFlash Disk, Flash Disk, or PC (Flash memory) card, you can copy a bootable image onto it. The procedure for copying an image onto a CompactFlash Disk, Flash Disk, or PC card is based on the following assumptions:

- You have an I/O controller or NPE-G1 or NPE-G2 with a good image in the onboard Flash memory so you can start the router.
- The bootable image you want to copy to the Compact Flash Disk, Flash Disk, or PC card exists on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server.

**Note** To ensure access to a TFTP server, you will need to configure at least one network interface using the setup facility. Refer to the Configuration Fundamentals Configuration Guide publication for instructions on how to configure a network interface using the setup facility.

- You know the filename of the image you want to copy onto the CompactFlash Disk, Flash Disk, or PC card.

Use the following procedure to copy a bootable file (called new.image in the examples) to the memory card:

**Step 1** Boot the router and allow it to initialize.

**Step 2** Insert a CompactFlash Disk, Flash Disk, or PC card into an available slot and reformat the disk or card using the procedure in the “Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card” section on page 1-7. Then proceed to Step 3.

**Note** You cannot boot from a CompactFlash Disk, Flash Disk, or PC card that was formatted on another type of system. You must reformat the disk or card to use it as a boot source. To avoid potential problems when you insert a CompactFlash Disk, Flash Disk, or PC card in your router, we recommend that you reformat all of your CompactFlash Disks, Flash Disks, or PC cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the “Software and Hardware Requirements” section on page 3-2, and Table 1-1, Table 1-2, and Table 1-3 in this chapter.)

**Step 3** Use the following series of commands to copy the new image (new.image in the following example) to a PC card in slot0:

```
Router> enable
Password: 
Router> copy tftp:new.image slot0:new.image
```

20575008 bytes available on device slot0, proceed? [confirm]

address or name of remote host [1.1.1.1]?

loading new.image from 1.1.1.1 (via Ethernet1/0):!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Copying Bootable Images Between Flash Disks or Flash Memory Cards

As future releases of Cisco IOS images become available, you will receive these images either as a file booted from a network server, a file on floppy disk, or a file on a Flash Disk or PC Card. Use the following procedure for copying bootable images between disks or cards so that you can use the new software image in your router.

The following scenario describes how to use a newly released image on a Flash Disk or PC card in a system that has an older image on a Flash Disk, or PC card in the slot 0, and a default boot helper image in the onboard Flash memory.

For this scenario, the filenames are as follows:

- The new image on the new Flash Disk or PC card is new.image.
- The old image on the Flash Disk or PC card in slot 0 is old.image.
- The bootable image in onboard Flash memory is boot.image.

You will copy the new image from the new Flash Disk or PC card onto the Flash Disk or PC card that contains the old image.

The scenario assumes that the new image will fit on the Flash Disk or PC card in slot 0, alongside the old image. If there is not enough available space, use the delete command to delete files from the card to make sufficient room for the new image; however, do not delete the old.image file. If you are using a Flash Disk or PC card, you must then use the squeeze command to make the deleted space available for new files. If, after you have deleted files and used the squeeze command, the two files cannot coexist.
on the PC card in slot 0, remove this card (place it in an antistatic bag and store it in a safe place), and insert the new PC card (with the new.image file) in slot 0. Proceed to Step 5 and use the `boot system flash slot0:new.image` command to designate the new.image file as the default boot helper image.

Step 1
Boot the router. By default, the boot.image file is used.

Step 2
Enable the router as follows:
```
Router> enable
Password:  
Router#  
```

Step 3
Insert the new Flash Disk or PC card in slot 1.

Step 4
Use the following command to copy the new.image file in slot 1 to the Flash Disk or PC card in slot 0, only if there is enough memory space for the two images to coexist. If there is not enough memory space, proceed to Step 5.
```
Router# copy slot1:new.image slot0:new.image
```

**Note** Use the disk0: and disk1: device names when using Flash Disks.

Step 5
Use the following series of commands to designate the new.image file (which is on the card in slot 0) as the default boot helper image and reboot the router:
```
Router# configure terminal
Router(config)# no boot system
Router(config)# boot system flash slot0:new.image
Router(config)# Ctrl-Z
Router# copy running-config startup-config
Router# reload
```

When the system reloads, it will boot the new.image file from the card in slot 0.

**Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card**

This section provides basic instructions for working with a CompactFlash Disk, Flash Disk, or Flash memory card in your system. Detailed descriptions of more complex CompactFlash Disk, Flash Disk, or Flash memory card options and the Cisco IOS File System feature are beyond the scope of this publication and can be found in the following Cisco IOS Release 12.x publications:

- *Configuration Fundamentals Command Reference*, in the chapter “File Management Commands”

**Software Command Overview**

This section lists some of the basic software commands you can use with a CompactFlash Disk, Flash Disk, or PC card. Examples of these commands are included in the sections that follow.
Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card

The CompactFlash Disk, Flash Disk, or Flash memory cards, along with other locations in your system, are defined as file systems, which are locations where you can store, use, or retrieve files and software images. You can use a Flash Disk or Flash memory card in either one or both of the PC card slots in your I/O controller, and you can use a CompactFlash Disk in the one CompactFlash Disk slot on the NPE-G1 or NPE-G2.

The CompactFlash Disk inserted into the CompactFlash Disk slot in the NPE-G1 or NPE-G2 is referred to as the disk2: device. Flash Disks or PC cards inserted into slot0 and slot1 are referred to as the slot0: and slot1: devices, respectively.

The following partial output of the show file systems command shows a sample system with a Flash Disk—called disk0:—installed in PC card slot 0 and a linear Flash memory card—called slot1:—installed in PC card slot 1:

Router# show file systems

File Systems:

<table>
<thead>
<tr>
<th>Size(b)</th>
<th>Free(b)</th>
<th>Type</th>
<th>Flags</th>
<th>Prefixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>3276800</td>
<td>29093816</td>
<td>flash</td>
<td>rw</td>
<td>bootflash:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>flash</td>
<td>rw</td>
<td>slot0: flash:</td>
</tr>
<tr>
<td>7995392</td>
<td>4717276</td>
<td>flash</td>
<td>rw</td>
<td>slot1:</td>
</tr>
<tr>
<td>48755200</td>
<td>48747008</td>
<td>flash</td>
<td>rw</td>
<td>disk0:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>disk</td>
<td>rw</td>
<td>disk1:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>opaque</td>
<td>rw</td>
<td>system:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>opaque</td>
<td>rw</td>
<td>null:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>network</td>
<td>rw</td>
<td>tftp:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>network</td>
<td>rw</td>
<td>rcp:</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>network</td>
<td>rw</td>
<td>ftp:</td>
</tr>
</tbody>
</table>

The show file systems command displays all recognized file systems, even if they are not currently in use. This is why the above display shows entries for both slot0: and disk1:, even though those devices are not currently inserted into the PC card slots.

Table 1-4 lists the software commands, along with their most common command options, that you can use with the Flash memory cards.

The following device names can be used with most of these commands:

- **disk2**: (CompactFlash Disk)
- **disk0**: and **disk1**: (Flash Disks)
- **slot0**: and **slot1**: (linear PC cards)
- **bootflash**: (onboard Flash memory)
- **nvram**: (onboard nonvolatile random-access memory)
- **running-config** (the running system configuration file)
- **startup-config** (the startup system configuration file)
- **tftp**: (a TFTP server to which you have access)
### Table 1-4 Flash Disk-Related Software Commands

<table>
<thead>
<tr>
<th>Command and Arguments</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cd</strong> [dev:]directory-name&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Changes current directory. Allows you to move between directories on a file system, where <em>directory-name</em> is the directory to which you want to move.</td>
</tr>
<tr>
<td><strong>copy</strong> [dev:]source-filename [dev:]destination-filename</td>
<td>Copies from one file to another. Allows you to make a copy of a file (<em>source-filename</em>) located on a source file system (<em>dev:</em>), and place it with either the same filename or a different filename (<em>destination-filename</em>) on a destination file system.</td>
</tr>
<tr>
<td><strong>delete</strong> [dev:]filename</td>
<td>Deletes a file. Allows you to delete any file you designate, where <em>filename</em> designates the name of the file.</td>
</tr>
<tr>
<td><strong>dir</strong> [/all</td>
<td>dev:]</td>
</tr>
<tr>
<td><strong>format</strong> [flash:</td>
<td>bootflash:</td>
</tr>
<tr>
<td><strong>mkdir</strong> [dev:]directory-name&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Creates a new directory. Allows you to create directories on a Flash Disk, where <em>directory-name</em> is the name you assign to this directory.</td>
</tr>
<tr>
<td><strong>pwd</strong></td>
<td>Displays current working directory. Allows you to display the name of the Flash Disk directory in which you are currently working.</td>
</tr>
<tr>
<td><strong>rename</strong> [dev:]filename [dev:]filename</td>
<td>Renames a file. Allows you to rename a file that is located on one Flash Disk and assign to that file another (or the same) file system path and filename. The first group of arguments defines the source (current) file system path and filename, and the second set of arguments defines the destination file system path and filename.</td>
</tr>
<tr>
<td><strong>rmdir</strong> [dev:]directory-name&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Removes an existing directory. Allows you to remove a directory that currently exists on a Flash Disk, where <em>directory-name</em> is the name of the directory you want to remove.</td>
</tr>
<tr>
<td><strong>show</strong> [dev:]</td>
<td>Lists information about Flash Disk format and geometry.</td>
</tr>
<tr>
<td><strong>show file systems</strong></td>
<td>Displays a list of all defined file systems.</td>
</tr>
</tbody>
</table>

<sup>1</sup> This command does not work with a PC Card.
Using Software Commands

This section provides examples of some of the basic software commands you can use with the CompactFlash Disk, Flash Disk, or Flash memory cards.

- Using the show Command, page 1-14
- Using the pwd Command, page 1-15
- Using the cd Command, page 1-15
- Using the dir Command, page 1-15
- Using the format Command, page 1-16
- Using the copy Command, page 1-17
- Using the mkdir Command, page 1-18
- Using the rmdir Command, page 1-18
- Using the delete Command, page 1-18

Using the show Command

To display information about the CompactFlash Disk, Flash Disk, or Flash memory card format and geometry, use the show [dev:] command:

```
System# show disk0:
******** ATA Flash Card Geometry/Format Info ********

ATA CARD GEOMETRY
 Number of Heads:  16
 Number of Cylinders  840
 Sectors per Cylinder:  32
 Sector Size:  512
 Total Sectors:  430080

ATA CARD FORMAT
 Number of FAT Sectors:  105
 Sectors Per Cluster:  16
 Number of Clusters:  26822
 Number of Data Sectors:  429536
 Base Root Sector:  338
 Base FAT Sector:  128
 Base Data Sector:  370

Router#
```

In this example:
- Number of Heads is the number of heads on the Flash Disk.
- Number of Cylinders is the number of cylinders on the Flash Disk.
- Sectors per Cylinder is the number of sectors in each cylinder.
- Sector Size is the number of bytes in each sector.
Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card

- Total Sectors is the total number of sectors on the Flash Disk.
- Number of FAT Sectors is the number of sectors used to track allocation of clusters to files.
- Sectors Per Cluster is the number of sectors contained in each cluster. (Files grow by a minimum of one cluster.)
- Number of Clusters is the total number of clusters available for use by files.
- Number of Data Sectors is the number of sectors available for files.
- Base Root Sector is the logical address of the first sector of the root directory.
- Base FAT Sector is the first sector in the File Allocation Table (FAT).
- Base Data Sector is the first sector available for use by files.

Using the pwd Command

To determine which CompactFlash Disk or Flash Disk slot you are accessing, use the `pwd` command:

```
System# pwd
disk0:/
System#
```

The preceding example indicates that you are currently in the working directory called `disk0:`; which is the Flash Disk in PC Card slot 0.

Using the cd Command

To move back and forth between installed Flash Disks, use the `cd` command by defining a specific path name. Then to verify your working directory, use the `pwd` command:

```
System# cd disk1:
System# pwd
disk1:/
System# cd disk0:
System# pwd
disk0:/
```

You can also move up (or back) one level in the directory hierarchy using the `cd ..` command, and then verify your working directory with the `pwd` command:

```
System# pwd
disk1:daily_dir/
System# cd ..
System# pwd
disk1:/
```

Using the dir Command

To list the directory structure and contents of the CompactFlash Disk, Flash Disk, or PC card from which you are currently working, use the `dir` command with no arguments:

```
System# dir
Directory of disk1: /

  1 drwx-   0 Jul 25 1998 10:23:11 daily_dir
  2 drwx-   0 Jul 25 1998 10:28:37 access_lists

48755200 bytes total (48742912 bytes free)
```
Note that the size of the CompactFlash Disk, Flash Disk, or PC card is shown in the output of the `dir` command. (A 48-MB Flash Disk is shown in this example.) You can also view the contents of other directories and file systems using specific optional arguments with the `dir` command. (See Table 1-4.)

### Using the `format` Command

To format a new CompactFlash Disk, Flash Disk, or PC card, use the `format [dev:]` command.

**Note**

You must format a new CompactFlash Disk, Flash Disk, or PC card before you can use it. Flash memory cards or Flash Disks shipped with I/O controllers or CompactFlash Disks shipped with the the NPE-G1 or NPE-G2 are formatted at the factory. Spare Flash memory cards are blank and must be formatted before you can use them.

**Caution**

The formatting procedure erases all information on the Flash Disk. To prevent the loss of important data that might be stored on a Flash Disk, proceed carefully. If you want to save data that is currently on your Flash Disk, copy the data to a TFTP server or to another Flash Disk before you format the new Flash Disk. A Flash Disk that was shipped as part of a configured system contains a Flash Disk-compatible Cisco IOS software image; therefore, you do not need to format it to use it in the system in which it was shipped.

Use the following procedure to format a new CompactFlash Disk, Flash Disk, or PC card using the `format` command. (The procedure assumes you have already booted your system.)

**Step 1** Insert the Flash memory card into the appropriate PC card slot.

**Step 2** Use the `format dev:` command to format the CompactFlash Disk, Flash Disk, or PC card. Use the `disk2:` device name for a CompactFlash Disk, `disk0:` and `disk1:` device names for Flash Disks, and `slot0:` and `slot1:` device names for linear PC cards. The following example shows a 48-MB Flash Disk in slot0 being formatted:

```
System# format disk0:
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in 'disk0:'. Continue? [confirm]
Format:Drive communication & 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 new CompactFlash Disk, Flash Disk, or PC card is now formatted and ready to use in the system on which you formatted it.
Chapter 1
CompactFlash Disk, Flash Disk, and Flash Memory Card Information

Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card

Using the copy Command

To copy an image from a CompactFlash Disk, Flash Disk, or PC card to another file system or from another file system to the Flash Disk, use the `copy` command:

```
copy [dev:]source-filename [dev:]destination-filename
```

In this example:

- The file you want to copy is located in a file system (tftp:, bootflash:, slot0:, disk1:, and so forth).
- The variable `source-filename` is the name of the file you want to copy to another file system (tftp:, bootflash:, slot0:, disk1:, and so forth).
- The variable `destination-filename` is the name you want to apply to this file after it is copied. This can be the same name as the original filename or a different filename.

The following assumptions are made for this command:

- You have a system processor with a Flash Disk-compatible Cisco IOS software image in the onboard Flash memory—called boot flash memory—so you can start the system.
- Your system is running Cisco IOS Release 12.0(2) or later.
- The bootable image you want to copy to the CompactFlash Disk, Flash Disk, or PC card exists in another file system or on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server through Telnet. To ensure access to a TFTP server, you need to configure at least one interface. To configure an interface, you can use the `setup` command or use the configuration editor.
- An Ethernet interface is used in the examples that follow.
- You know the filename of the image you want to copy to the CompactFlash Disk, Flash Disk, or PC card.

**Note**

You might need to copy a new image to a CompactFlash Disk, Flash Disk, or PC Card whenever a new Cisco IOS software release or a new Cisco IOS software maintenance release becomes available. You can use the `copy` command for this purpose.

Use the following procedure to copy a file (called `new.image` in this example) located on a Flash Disk—called `disk1:`—in PC card slot 1 to the Flash Disk—called `disk0:`—in PC card slot 0:

**Step 1**

If the CompactFlash Disk, Flash Disk, or PC card is unformatted or has been formatted on another, possibly incompatible system, format it now using the procedure in the “Using the format Command” section on page 1-16, as appropriate.

**Step 2**

To copy the image `new.image` to Flash Disk `disk0:`, use the following series of commands:

```
System> enable
Password:
System# copy disk1: new.image disk0: new.image
3393 bytes copied in 0.548 secs#
System#
```

In the preceding example, the 3393-byte file `new.image` was copied to the Flash Disk in PC card slot 0 in approximately one-half second.
Verify that the file *new.image* is now on the Flash Disk in PC card slot 0:

```
System# pwd
disk0:/
System# dir
Directory of disk0:/

  1   -rw-    3393   Jul 26 1998 17:44:47 new.image

48755200 bytes total (48747008 bytes free)
```

### Using the mkdir Command

To create a directory on a CompactFlash Disk or Flash Disk, use the `mkdir` command. The following example shows how to create a directory called `daily_dir` on the Flash Disk in PC card slot 1, and then verify that it was created:

```
System# mkdir disk1:daily_dir
Created dir disk1:daily_dir
System# dir
Directory of disk1:/

  1  drw-      0   Jul 25 1998 10:15:43  daily_dir

48755200 bytes total (48751104 bytes free)
```

**Note**

If you create a directory and place a file in it that you plan to access or use later on, be sure to define the entire directory path to the file as you enter the appropriate software commands.

For example, if you placed the file `itsa.file` into the directory `daily_dir` on a Flash Disk in slot 1, you must designate the entire directory path as follows: `disk1:daily_dir/itsa.file`. Otherwise, the system might not be able to locate this file.

### Using the rmdir Command

To remove a directory from a CompactFlash Disk or Flash Disk, use the `rmdir` command. The following example shows how to remove the directory `daily_dir` from the Flash Disk in PC Card slot 1, and then verify that it was removed:

```
System# rmdir disk1:daily_dir
Delete disk1:daily_dir? [confirm] y
Removed dir disk1:daily_dir
System# dir
Directory of disk1:/

No files in directory.

48755200 bytes total (48751104 bytes free)
```

### Using the delete Command

To delete a file from a CompactFlash Disk, Flash Disk, or PC card, use the `delete` command. Use the `dir` command to find the file you want to delete, and then use the `delete` command to delete it.
The following example shows how to find a file (called *fun1*) on the Flash Disk in PC card slot 0, delete the file, and then verify that it is deleted:

**Step 1** Find the file you want to delete:

```
System# dir
Directory of disk0:/
  1 drw-          0 May 10 1998 09:54:53 fun1
48755200 bytes total (48742912 bytes free)
```

**Step 2** Delete the file *fun1*:

```
System# delete disk0:fun1
```

**Step 3** Verify that the file *fun1* is deleted:

```
System# dir
Directory of disk0:/
   No files in directory.
48755200 bytes total (48742912 bytes free)
System#
```

---

### Enabling Booting from a CompactFlash Disk, Flash Disk, or PC Card

To enable booting from a Flash memory card, set configuration register bits 3, 2, 1, and 0 to a value between 2 and 15 in conjunction with the `boot system [dev:]filename` configuration command. The following are definitions of the various Flash Disk-related `boot` commands:

- **boot system flash disk0:** or **boot system slot0:**—Boots the first file on the card in slot 0.
- **boot system flash disk1:** or **boot system slot1:**—Boots the first file on the card in slot 1.
- **boot system flash disk0:**`herfile` or **boot system slot0:**`herfile`—Boots the file named *herfile* on the card in slot 0.
- **boot system flash disk1:**`hisfile` or **boot system slot1:**`hisfile`—Boots the file named *hisfile* on the card in slot 1.

**Note**

As you enter `boot` commands, pay attention to how you use the Spacebar, which influences the way your system interprets the commands. Also, ensure that you define the entire path to a file as you enter the `boot` commands; otherwise, the system might not be able to find the file.

For example, notice the difference in the following correct and incorrect commands:

```
System(config)# boot flash system disk0:myfile
```

Based on the preceding correct command, the system boots the file specified (*myfile*).

```
System(config)# boot flash system disk0: myfile
```

Based on the preceding incorrect command, the system finds the `filename` field blank because there is a space after the `disk0:` name. In this case, the system ignores the filename argument and boots the first file on the Flash Disk, which might not be the file called *myfile*. 
Use the following procedure to enable booting the file *myfile* from a Flash memory card:

**Step 1** Enter configuration mode and specify an image filename in the PC card slot from which to boot using the `configure terminal` command, as follows:

System# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot system flash disk0:myfile

*Note* Specify `disk2:` for a CompactFlash Disk on the NPE-G1 or NPE-G2.

**Step 2** Enable the `boot system flash disk0:myfile` command using the `config-register` command with the hexadecimal value shown in the following example:

System(config)# config-reg 0x2102

This command, with the hexadecimal value 0x2102, results in the following:

- Enables the system to boot the default boot ROM software if the Flash Disk-based image fails to boot—hexadecimal value 0x2000
- Disables Break—hexadecimal value 0x0100
- Enables the image *myfile* as the default boot image—hexadecimal value 0x0002

**Step 3** Press Ctrl-Z to exit configuration mode:

System(config)#
Ctrl-Z
System#

**Step 4** Save the new configuration to NVRAM by using the `copy system:running-config nvram:startup-config` command as follows:

System# copy system:running-config nvram:startup-config

System# reload

When the system reloads, it boots the image *new.image* from the Flash Disk in slot 0.

### Making a CompactFlash Disk or Flash Disk-Based Software Image the Bootable Software Image

After you copy a software image to the Flash Disk, use the following series of commands to make the image bootable (the file named *new.image* in this example). The software image in this example is located on the Flash Disk in PC card slot 0. Note that the `config-register` command is also a part of this command sequence because you must set the configuration register to 0x2102 to enable loading an image from the Flash Disk.

System# config terminal
System(config)# no boot system
System(config)# boot system flash disk0:new.image
System(config)# config-register 0x2102
Ctrl-Z
System# copy system:running-config nvram:startup-config
System# reload

When the system reloads, it boots the image *new.image* from the Flash Disk in slot 0.
SDRAM and DRAM Memory Systems Overview


The Cisco 7200 series and Cisco uBR7200 series memory systems are part of the network processing engine or network services engine. The network processing engine is available in nine versions: the NPE-100, NPE-150, NPE-175, NPE-200, NPE-225, NPE-300, NPE-400, NPE-G1 and NPE-G2. The network services engine is available in one version, the NSE-1.

The NPE-100, NPE-150, NPE-175, NPE-200, and NPE-300 have reached their end-of-life and are no longer sold, although they are still supported in existing installations. For information about each processor’s end-of-life cycle, see the Cisco 7200 Series Routers Bulletins at the following URL: http://www.cisco.com/en/US/products/hw/routers/ps341/prod_bulletins_list.html.

Note: The Cisco uBR7246VXR universal broadband router does not support the NPE-G1 or NPE-G2 processor but must use the UBR7200-NPE-G1 or UBR7200-NPE-G2 processor, which contains the bootflash code required to boot the router. Unless otherwise indicated, all references to NPE-G1 or NPE-G2 in this document also refer to the UBR7200-NPE-G1 or UBR7200-NPE-G2 processor.

Table 2-1 shows the current network processing engine or network services engine options and restrictions for Cisco 7200 series and Cisco uBR7200 series routers. Table 2-2 shows the network processing engine options for Cisco 7200 series and Cisco uBR7200 series routers that have reached their end-of-life and are no longer sold, but are still supported in existing installations.

### Table 2-1 NPE-G2, NPE-G1, NSE-1, NPE-400, or NPE-225 Options for Cisco 7200 Series and Cisco uBR7200 Series Routers

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-G2</th>
<th>NPE-G1</th>
<th>NSE-1</th>
<th>NPE-400</th>
<th>NPE-225</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7200 series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR, Cisco 7206VXR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>• Cisco 7202, 7204, and 7206</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cisco AS5800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7206VXR router shelf</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco 7206 router shelf</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>—</td>
</tr>
</tbody>
</table>
Table 2-1 NPE-G2, NPE-G1, NSE-1, NPE-400, or NPE-225 Options for Cisco 7200 Series and Cisco uBR7200 Series Routers (continued)

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-G2</th>
<th>NPE-G1</th>
<th>NSE-1</th>
<th>NPE-400</th>
<th>NPE-225</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco uBR7200 series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246VXR</td>
<td>Yes¹</td>
<td>Yes²</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>• Cisco uBR7246</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

¹. The Cisco uBR7246VXR router cannot use the NPE-G2 processor but must use the UBR7200-NPE-G2 processor.
². The Cisco uBR7246VXR router cannot use the NPE-G1 processor but must use the UBR7200-NPE-G1 processor.

Table 2-2 NPE-300, NPE-200, NPE-175, NPE-150, or NPE-100 Options for Cisco 7200 Series and Cisco uBR7200 Series Routers

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-300</th>
<th>NPE-200</th>
<th>NPE-175¹</th>
<th>NPE-150</th>
<th>NPE-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7200 series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR, Cisco 7206VXR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>• Cisco 7202, 7204, and 7206</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cisco AS5800</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7206VXR router shelf</td>
<td>Yes</td>
<td>Yes</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco 7206 router shelf</td>
<td>No</td>
<td>Yes</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cisco uBR7200 series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246VXR</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco uBR7246</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>—</td>
</tr>
</tbody>
</table>

¹. Previous documents stated that the NPE-175 was also supported on the Cisco uBR7200 series routers. Because the NPE-175 has reached its end of life and was never made orderable on the Cisco uBR7200 series routers, it is no longer shown as supported on the Cisco uBR7200 series routers.

The memory systems provide the following functions:

- Main memory (DRAM in the NPE-100, NPE-150, and NPE-200; SDRAM in the NPE-175, NPE-225, NPE-300, NPE-400, NSE-1, NPE-G1, and NPE-G2)—Stores the running configuration and routing tables. The Cisco IOS software executes from main memory.
- Shared memory—Used for packet buffering by the router’s network interfaces.
- Flash memory—Stores the boot helper image software. The boot helper image allows you to boot the router when PC cards do not contain a valid system image. It also allows you to boot the router from a network server.
- CompactFlash Disks, Flash Disks, or PC cards—Stores the default Cisco IOS software image.
- Boot erasable programmable read-only memory (EPROM)—Does power-on diagnostics and initialization; initiates system boot-up based on virtual configuration register. Contains the ROM monitor, which permits you to boot the Cisco IOS image from a CompactFlash Disk, Flash Disk, or PC card if a boot helper image is not present in the Flash memory.
- Nonvolatile random-access memory (NVRAM)—Stores the system configuration, environmental monitoring logs, and the virtual configuration register.

### Terms and Acronyms

- **Cache memory**—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 memory**—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.
- **Primary, secondary, tertiary cache memory**—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.
- **OTP**—one time programmable
- **RAM**—random-access memory
- **RISC**—reduced instruction set computing
- **ROM**—read-only memory
- **SIMM**—single in-line memory module
- **SODIMM**—small outline dual in-line memory module
- **SDRAM**—synchronous dynamic random-access memory
- **SDRAM-fixed**—SDRAM that is a fixed size or quantity; can be replaced, but not upgraded.
- **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.
Network Processing Engine or Network Services Engine Memory Information

Refer to figures and tables for memory location specifications, and configurations for the network processing engine or the network services engine on these pages:

- NPE-G2 and UBR7200-NPE-G2 Memory Information, page 2-5
- NPE-G1 and UBR7200-NPE-G1 Memory Information, page 2-6
- NSE-1 Memory Information, page 2-8
- NPE-400 Memory Information, page 2-10
- NPE-300 Memory Information, page 2-11
- NPE-225 and NPE-175 Memory Information, page 2-14
- NPE-200 Memory Information, page 2-16
- NPE-150 Memory Information, page 2-18
- NPE-100 Memory Information, page 2-20

For removal and installation information, follow the instructions in Chapter 3, “Preparing for Installation” and Chapter 4, “Installing and Removing SDRAM and DRAM.”
NPE-G2 and UBR7200-NPE-G2 Memory Information

Use the following figure and tables for information about the NPE-G2 memory location, specifications, and configurations.

**Figure 2-1  NPE-G2 and UBR7200-NPE-G2**

---

**Table 2-3  NPE-G2 and UBR7200-NPE-G2 Processor and Memory Specifications**

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-G2 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRAM</td>
<td>1 GB</td>
<td>1</td>
<td>1-GB DDR SDRAM (DIMM)</td>
<td>S1</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
<td>1</td>
<td>Reprogrammable Boot ROM for the ROM monitor program</td>
<td>U24</td>
</tr>
<tr>
<td>Flash memory (also known as bootflash)</td>
<td>64 MB</td>
<td>1</td>
<td>Contains the default boot helper (boot loader) image</td>
<td>U19 and U13</td>
</tr>
<tr>
<td>NVRAM</td>
<td>2 MB</td>
<td>1</td>
<td>Nonvolatile EPROM for the system configuration file</td>
<td>U17</td>
</tr>
<tr>
<td>Primary cache</td>
<td>32 KB (16 KB instruction, 16 KB data)</td>
<td>—</td>
<td>Motorola Freescale 7448 processor, internal cache</td>
<td>U30</td>
</tr>
<tr>
<td>Secondary cache</td>
<td>1 MB</td>
<td>—</td>
<td>MPC7448 secondary cache</td>
<td>U30</td>
</tr>
</tbody>
</table>
### Table 2-4  NPE-G2 SDRAM DIMM Configuration—Configurable Memory Only

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>SDRAM Bank</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 GB</td>
<td>S1</td>
<td>1-GB DIMM</td>
<td>MEM-NPE-G2-1GB=</td>
</tr>
<tr>
<td>2 GB</td>
<td>S1</td>
<td>2-GB DIMM</td>
<td>MEM-NPE-G2-2GB=</td>
</tr>
</tbody>
</table>

### NPE-G1 and UBR7200-NPE-G1 Memory Information

Use the following figure and tables for information about the NPE-G1 and UBR7200-NPE-G1 memory location, specifications, and configurations.

### Figure 2-2  NPE-G1 and UBR7200-NPE-G1

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Midplane connectors</td>
<td>2</td>
<td>Flash memory</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>BCM 1250 processor (U22)</td>
<td>5</td>
<td>Keying post</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>NVRAM (U7)</td>
<td>8</td>
<td>SODIMM 2 (J4)</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>SODIMM 1 (J3)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2-5  NPE-G1 and UBR7200-NPE-G1 Processor and Memory Specifications

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-G1 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRAM</td>
<td>128MB, 256MB, 512 MB</td>
<td>2</td>
<td>128-MB, 256-MB, or 512-MB SODIMMs—Requires two SODIMMs of the same size to create the total memory size of 256 MB, 512 MB, or 1024 MB (see Table 2-6 on page 2-7)</td>
<td>J3 and J4</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
<td>1</td>
<td>Reprogrammable Boot ROM for the ROM monitor program</td>
<td>U1</td>
</tr>
<tr>
<td>Flash memory</td>
<td>16 MB</td>
<td>1</td>
<td>Contains the default boot helper (boot loader) image¹</td>
<td>U25 and U26</td>
</tr>
<tr>
<td>NVRAM</td>
<td>512 KB</td>
<td>1</td>
<td>Nonvolatile EPROM for the system configuration file</td>
<td>U7</td>
</tr>
<tr>
<td>Primary cache</td>
<td>32 KB (16 KB instruction, 16 KB data)</td>
<td>—</td>
<td>BCM 1250 processor internal cache</td>
<td>U22</td>
</tr>
<tr>
<td>Secondary cache</td>
<td>512 KB</td>
<td>—</td>
<td>BCM 1250 system unified, internal cache</td>
<td>U22</td>
</tr>
</tbody>
</table>

¹. The NPE-G1 and UBR7200-NPE-G1 processors contain different boot helper images to support the Cisco 7200 series and Cisco uBR7200 series routers, respectively.

Table 2-6  NPE-G1 and UBR7200-NPE-G1 SDRAM SODIMM—Configurable Memory Only

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>Bank²</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>256 MB (default)</td>
<td>J3 and J4</td>
<td>2 128-MB SODIMMs</td>
<td>MEM-NPE-G1-256MB</td>
</tr>
<tr>
<td>512 MB</td>
<td>J3 and J4</td>
<td>2 256-MB SODIMMs</td>
<td>MEM-NPE-G1-512MB</td>
</tr>
<tr>
<td>1 GB</td>
<td>J3 and J4</td>
<td>2 512-MB SODIMMs</td>
<td>MEM-NPE-G1-1GB</td>
</tr>
</tbody>
</table>

². The same-sized SODIMM must be installed in each bank.
NSE-1 Memory Information

Use the following figure and tables for information about the NSE-1 memory location, specifications, and configurations.

**Figure 2-3  NSE-1**

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

**Table 2-7  NSE-1 Processor and Memory Specifications**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NSE-1 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM7000 processor</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>262-MHz RM7000 RISC</td>
<td>U22</td>
</tr>
<tr>
<td>PXF processor</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td></td>
<td>U34</td>
</tr>
<tr>
<td>SDRAM</td>
<td>128, 256 MB</td>
<td>1</td>
<td>1</td>
<td>128- or 256-MB DIMM</td>
<td>U15</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
<td>1</td>
<td>1</td>
<td>OTP&lt;sup&gt;1&lt;/sup&gt; ROM for the ROM monitor program</td>
<td>U1</td>
</tr>
</tbody>
</table>
Table 2-7  NSE-1 Processor and Memory Specifications (continued)

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NSE-1 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Primary cache</td>
<td>16 KB (instruction), 16 KB (data)</td>
<td>—</td>
<td>RM7000 processor internal cache</td>
<td>U22</td>
</tr>
<tr>
<td></td>
<td>Secondary cache</td>
<td>256 KB</td>
<td>—</td>
<td>RM7000 processor internal, unified instruction and data cache</td>
<td>U22</td>
</tr>
<tr>
<td></td>
<td>Tertiary cache</td>
<td>2 MB (fixed)</td>
<td>—</td>
<td>RM7000 processor external cache</td>
<td>U7, U9, U12, U14, U17</td>
</tr>
</tbody>
</table>

1. OTP = one time programmable

Table 2-8  NSE-1 SDRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>SDRAM Bank</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 MB</td>
<td>U15</td>
<td>1 128-MB DIMM</td>
<td>MEM-SD-NPE-128MB</td>
</tr>
<tr>
<td>256 MB</td>
<td>U15</td>
<td>1 256-MB DIMM</td>
<td>MEM-SD-NSE-256MB</td>
</tr>
</tbody>
</table>
NPE-400 Memory Information

Use the following figure and tables for information about the NPE-400 memory location, specifications, and configurations.

The NPE-400 uses a single small outline dual in-line memory module (SODIMM).

**Figure 2-4  NPE-400**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temperature sensor (U31)</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Keying post</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>RM7000 microprocessor</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>System controller</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Captive installation screw</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>Handle</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2-9  NPE-400 Processor and Memory Specifications**

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-400 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRAM-configurable</td>
<td>128, 256, or 512 MB</td>
<td>1</td>
<td>128-, 256-, or 512-MB SODIMM</td>
<td>J1</td>
</tr>
<tr>
<td>Boot ROM</td>
<td>512 KB</td>
<td>1</td>
<td>OTP ROM for the ROM monitor program</td>
<td>U7</td>
</tr>
<tr>
<td>Primary cache</td>
<td>16 KB (instruction), 16 KB (data)</td>
<td>---</td>
<td>RM7000 processor integrated cache</td>
<td>U38</td>
</tr>
</tbody>
</table>
Table 2-9    **NPE-400 Processor and Memory Specifications (continued)**

<table>
<thead>
<tr>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-400 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary cache</td>
<td>256 KB (fixed)</td>
<td>—</td>
<td>RM7000 processor unified, internal cache</td>
<td>U38</td>
</tr>
<tr>
<td>Tertiary cache</td>
<td>4 MB (fixed)</td>
<td>—</td>
<td>RM7000 processor external cache</td>
<td>U2, U26, U27, U28, U37</td>
</tr>
</tbody>
</table>

Table 2-10    **NPE-400 SDRAM Configurable Memory**

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>Bank 1</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>128 MB</td>
<td>J1</td>
<td>1</td>
<td>MEM-NPE-400-128MB</td>
</tr>
<tr>
<td>256 MB</td>
<td>J1</td>
<td>1</td>
<td>MEM-NPE-400-256MB</td>
</tr>
<tr>
<td>512 MB</td>
<td>J1</td>
<td>1</td>
<td>MEM-NPE-400-512MB</td>
</tr>
</tbody>
</table>

**NPE-300 Memory Information**

Use the following figure and tables for information about the NPE-300 memory location, specifications, and configurations.

**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 Figure 2-5.) 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.
Chapter 2  SDRAM and DRAM Memory Systems Overview

Network Processing Engine or Network Services Engine Memory Information

Figure 2-5  NPE-300

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

Table 2-11  NPE-300 Processor and Memory Specifications

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-300 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM7000</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>262-MHz RM7000 RISC</td>
<td>U49</td>
</tr>
<tr>
<td>Fixed SDRAM</td>
<td>—</td>
<td>32-MB</td>
<td>1</td>
<td>32-MB DIMM</td>
<td>Bank 0¹: U16</td>
</tr>
<tr>
<td>Configurable SDRAM</td>
<td>32 to 256 MB</td>
<td>1 configurable bank with 2 SDRAM slots (based on maximum SDRAM required)</td>
<td>Bank 1: U45 and U44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boot ROM</td>
<td>—</td>
<td>512 KB</td>
<td>1</td>
<td>OTP² ROM for the ROM monitor program</td>
<td>Socket U1³</td>
</tr>
</tbody>
</table>

²OTP: One-Time Programmable
³U1³: USB connector
Table 2-11  NPE-300 Processor and Memory Specifications (continued)

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-300 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cache</td>
<td>RM7000 processor internal cache</td>
<td>—</td>
<td></td>
<td>RM7000 processor internal cache</td>
<td>U49</td>
</tr>
<tr>
<td>Secondary cache</td>
<td>RM7000 processor unified, internal cache</td>
<td>—</td>
<td></td>
<td>RM7000 processor unified, internal cache</td>
<td>U49</td>
</tr>
<tr>
<td>Tertiary cache</td>
<td>RM7000 processor external cache</td>
<td>—</td>
<td></td>
<td>RM7000 processor external cache</td>
<td>U7, U8, U9, U10, U17</td>
</tr>
</tbody>
</table>

1. Socket U15 is never populated, although it is part of bank 0.
2. OTP = one time programmable
3. Located on the processor engine board

Table 2-12  NPE-300 SDRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>SDRAM Bank</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 MB + 32 MB</td>
<td>U45 (DIMM slot 2 only)</td>
<td>1 32-MB DIMM</td>
<td>MEM-SD-NPE-32MB</td>
</tr>
<tr>
<td>32 MB + 64 MB</td>
<td>U45 and U44 or U45</td>
<td>2 32-MB DIMMs or 1 64-MB DIMM</td>
<td>MEM-SD-NPE-32MB</td>
</tr>
<tr>
<td>32 MB + 128 MB</td>
<td>U45 and U44 or U45</td>
<td>2 64-MB DIMMs or 1 128-MB DIMM</td>
<td>MEM-SD-NPE-64MB</td>
</tr>
<tr>
<td>32 MB + 256 MB</td>
<td>U45 and U44 or U45</td>
<td>2 128-MB DIMMs or 1 256-MB DIMM</td>
<td>MEM-SD-NPE-256MB</td>
</tr>
</tbody>
</table>

1. Refer to the Cisco AS5800 Universal Access Server documentation on Cisco.com 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 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.
NPE-225 and NPE-175 Memory Information

Use the following figure and tables for information about the NPE-225 and NPE-175 memory location, specifications, and configurations.

**Figure 2-6  NPE-225**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Network controller board</td>
</tr>
<tr>
<td>2</td>
<td>System controller</td>
</tr>
<tr>
<td>3</td>
<td>Processor engine board</td>
</tr>
<tr>
<td>4</td>
<td>Captive installation screw</td>
</tr>
<tr>
<td>5</td>
<td>RM5271 microprocessor</td>
</tr>
<tr>
<td>6</td>
<td>Handle</td>
</tr>
<tr>
<td>7</td>
<td>Midplane connectors</td>
</tr>
<tr>
<td>8</td>
<td>Boot ROM (U1)</td>
</tr>
<tr>
<td>9</td>
<td>Temperature sensor</td>
</tr>
<tr>
<td>10</td>
<td>SDRAM DIMM (U15)</td>
</tr>
</tbody>
</table>
**Chapter 2: SDRAM and DRAM Memory Systems Overview**

**Network Processing Engine or Network Services Engine Memory Information**

**Figure 2-7 NPE-175**

<p>| | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Network controller board</td>
<td>6</td>
<td>Handle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>System controller</td>
<td>7</td>
<td>Midplane connectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Processor engine board</td>
<td>8</td>
<td>Boot ROM (U1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Captive installation screw</td>
<td>9</td>
<td>Temperature sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>RM5270 microprocessor</td>
<td>10</td>
<td>SDRAM DIMM (U15)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2-13 NPE-225 and NPE-175 Processor and Memory Specifications**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-175 and NPE-225 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPE-175 - R5270</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>R5270 200-MHz RISC¹</td>
<td>U4</td>
</tr>
<tr>
<td>NPE-225 - R5271</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>R5271 262-MHz RISC</td>
<td>U4</td>
</tr>
<tr>
<td></td>
<td>SDRAM</td>
<td>64, 128, or 256 MB²</td>
<td>1</td>
<td>configurable bank with 1 SDRAM slot</td>
<td>U15</td>
</tr>
<tr>
<td></td>
<td>Boot ROM</td>
<td>512 KB</td>
<td>1</td>
<td>OTP³ ROM for the ROM monitor program</td>
<td>U1</td>
</tr>
</tbody>
</table>

¹ R5270 200-MHz RISC
² 64, 128, or 256 MB
³ OTP
Chapter 2  
SDRAM and DRAM Memory Systems Overview

Table 2-13  
NPE-225 and NPE-175 Processor and Memory Specifications (continued)

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-175 and NPE-225 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary cache</td>
<td>16 KB (instruction), 16 KB (data)</td>
<td>—</td>
<td>R5270 processor internal cache</td>
<td>U4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 KB (instruction), 32 KB (data)</td>
<td>—</td>
<td>R5271 processor internal cache</td>
<td>U4</td>
<td></td>
</tr>
<tr>
<td>Secondary cache</td>
<td>2 MB</td>
<td>4 chips, each 512 KB by 8 bits wide</td>
<td>R527x processor unified, external cache</td>
<td>U5, U6, U7, U8^4</td>
<td></td>
</tr>
</tbody>
</table>

1. RISC = reduced instruction set computing
2. 256 MB supported on the NPE-225 processor only
3. OTP = one time programmable
4. Located on the processor engine board

Table 2-14  
NPE-225 SDRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>SDRAM Bank</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 MB^1</td>
<td>U15</td>
<td>1 64-MB DIMM</td>
<td>MEM-SD-NPE-64MB</td>
</tr>
<tr>
<td>128 MB</td>
<td>U15</td>
<td>1 128-MB DIMM</td>
<td>MEM-SD-NPE-128MB</td>
</tr>
<tr>
<td>256 MB</td>
<td>U15</td>
<td>1 256-MB DIMM</td>
<td>MEM-SD-NSE-256MB</td>
</tr>
</tbody>
</table>

1. The 64-MB memory configuration is not supported on the NPE-225 on a Cisco uBR7200 series router, which requires a minimum of 128 MB memory. The 64-MB memory configuration is supported on the Cisco 7200 series routers, but 128 MB is the minimum recommended memory configuration.

Table 2-15  
NPE-175 SDRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total SDRAM</th>
<th>SDRAM Bank</th>
<th>Quantity</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>64 MB</td>
<td>U15</td>
<td>1 64-MB DIMM</td>
<td>MEM-SD-NPE-64MB</td>
</tr>
<tr>
<td>128 MB</td>
<td>U15</td>
<td>1 128-MB DIMM</td>
<td>MEM-SD-NPE-128MB</td>
</tr>
</tbody>
</table>

NPE-200 Memory Information

Note

To prevent DRAM errors in the 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 can 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.

Use the following figure and tables for information about the NPE-200 memory location, specifications, and configurations.
Chapter 2  SDRAM and DRAM Memory Systems Overview

Network Processing Engine or Network Services Engine Memory Information

Figure 2-8  NPE-200

1. System controller
2. R5000 microprocessor
3. 4-MB SRAM (U6, U10, U13, U14, U28, U29, U38, and U39)
4. Captive installation screw
5. Handle
6. Temperature sensor
7. Midplane connectors
8. Temperature sensor
9. Boot ROM (U92)
10. DRAM SIMMs
11. Bank 1
12. Bank 0
Table 2-16  
**NPE-200 Processor and Memory Specifications**

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-200 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>R5000</td>
<td>DRAM²</td>
<td>32 to 128 MB</td>
<td>2 to 4</td>
<td>16- or 32-MB SIMMs (based on maximum DRAM required)</td>
<td>Bank 0: U11 and U25</td>
</tr>
<tr>
<td></td>
<td>SRAM³</td>
<td>4 MB</td>
<td>8</td>
<td>8 chips, each being 512 KB x 8 bits wide</td>
<td>Bank 1: U42 and U52</td>
</tr>
<tr>
<td></td>
<td>Boot ROM⁴</td>
<td>256 KB</td>
<td>1</td>
<td>EPROM for the ROM monitor program</td>
<td>U92</td>
</tr>
<tr>
<td></td>
<td>Primary cache</td>
<td>—</td>
<td>—</td>
<td>R5000 internal cache</td>
<td>U44</td>
</tr>
</tbody>
</table>

1. RISC = reduced instruction set computing  
2. DRAM = dynamic random-access memory  
3. SRAM = static random-access memory  
4. ROM = read-only memory  
5. EPROM = erasable programmable read-only memory

Table 2-17  
**NPE-200 DRAM Configurable Memory**

<table>
<thead>
<tr>
<th>Total DRAM¹</th>
<th>DRAM Bank 0</th>
<th>Quantity - Bank 0</th>
<th>DRAM Bank 1</th>
<th>Quantity - Bank 1</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 MB</td>
<td>U11 and U25</td>
<td>2 16-MB SIMMs</td>
<td>U42 and U52</td>
<td>—</td>
<td>MEM-NPE-32MB²</td>
</tr>
<tr>
<td>64 MB</td>
<td>U11 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U42 and U52</td>
<td>—</td>
<td>MEM-NPE-64MB³</td>
</tr>
<tr>
<td>128 MB</td>
<td>U11 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U42 and U52</td>
<td>2 32-MB SIMMs</td>
<td>MEM-NPE-128MB²</td>
</tr>
</tbody>
</table>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed on Cisco.com 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

**Note**  
To prevent DRAM errors in the NPE-150 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 can 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.

Use the following figure and tables for information about the NPE-150 memory location, specifications, and configurations.
Figure 2-9  NPE-150

1. System controller
2. R4700 microprocessor
3. 1-MB SRAM (U700 through U703, U800 through U803)
4. Captive installation screw
5. Handle
6. Temperature sensor
7. Midplane connectors
8. Temperature sensor
9. DRAM SIMMs
10. Bank 1
11. Bank 0
Network Processing Engine or Network Services Engine Memory Information

Chapter 2  SDRAM and DRAM Memory Systems Overview

Table 2-18  NPE-150 Processor and Memory Specifications

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-150 Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>R4700</td>
<td>RISC</td>
<td>1</td>
<td></td>
<td>R4700 150-MHz RISC</td>
<td>U201</td>
</tr>
</tbody>
</table>
| DRAM^2     | Main memory | 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                     |
| SRAM^3     | 1 MB        | 8      |          | 8 chips, each being 128 KB x 9 bits wide         | U700 through U703  
             |             |        |          |                                                 | U800 through U803                     |
| Primary cache | —          | —      | —        | R4700 internal cache                             | U201                                   |
| Secondary cache | 512 KB   | 4      |          | R4700 unified, external cache                     | U2, U10, U14, and U26                  |

1. RISC = reduced instruction set computing
2. DRAM = dynamic random-access memory
3. SRAM = static random-access memory

Table 2-19  NPE-150 DRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total DRAM^1</th>
<th>DRAM Bank 0</th>
<th>Quantity - Bank 0</th>
<th>DRAM Bank 1</th>
<th>Quantity - Bank 1</th>
<th>Product Number^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 MB</td>
<td>U18 and U25</td>
<td>2 16-MB SIMMs</td>
<td>U4 and U12</td>
<td>—</td>
<td>MEM-NPE-32MB</td>
</tr>
<tr>
<td>64 MB</td>
<td>U18 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U4 and U12</td>
<td>—</td>
<td>MEM-NPE-64MB^2</td>
</tr>
<tr>
<td>128 MB</td>
<td>U18 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U4 and U12</td>
<td>2 32-MB SIMMs</td>
<td>MEM-NPE-128MB</td>
</tr>
</tbody>
</table>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed on Cisco.com 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-100 Memory Information

Note  To prevent DRAM errors in the NPE-100, 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 can 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.

Use the following figure and tables for information about the NPE-100 memory location, specifications, and configurations.
Chapter 2  SDRAM and DRAM Memory Systems Overview

Network Processing Engine or Network Services Engine Memory Information

Figure 2-10  NPE-100

Table 2-20  NPE-100 Processor and Memory Specifications

<table>
<thead>
<tr>
<th>Processor</th>
<th>Memory Type</th>
<th>Size</th>
<th>Quantity</th>
<th>Description</th>
<th>Component Location on the NPE-100 Board</th>
</tr>
</thead>
</table>
| R4700      | DRAM\(^2\)  | 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 | U201 |
| R4700      | Primary cache | —          | —       | R4700 internal cache                        | U201 |
| R4700      | Secondary cache | 512 KB     | 4       | R4700 unified, external cache               | U2, U10, U14, and U26 |

1. RISC = reduced instruction set computing
2. DRAM = dynamic random-access memory
### NPE-100 DRAM Configurable Memory

<table>
<thead>
<tr>
<th>Total DRAM</th>
<th>DRAM Bank 0</th>
<th>Quantity - Bank 0</th>
<th>DRAM Bank 1</th>
<th>Quantity - Bank 1</th>
<th>Product Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 MB</td>
<td>U18 and U25</td>
<td>2 16-MB SIMMs</td>
<td>U4 and U12</td>
<td>—</td>
<td>MEM-NPE-32MB</td>
</tr>
<tr>
<td>64 MB</td>
<td>U18 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U4 and U12</td>
<td>—</td>
<td>MEM-NPE-64MB</td>
</tr>
<tr>
<td>128 MB</td>
<td>U18 and U25</td>
<td>2 32-MB SIMMs</td>
<td>U4 and U12</td>
<td>2 32-MB SIMMs</td>
<td>MEM-NPE-128MB</td>
</tr>
</tbody>
</table>

1. Refer to the Cisco AS5800 Universal Access Server documentation listed on Cisco.com 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 3

Preparing for Installation

This chapter provides hardware and software requirements, and a list of parts and tools you need to remove main memory DRAM and SDRAM modules and PC (Flash memory) cards, or Flash Disks or CompactFlash Disks from Cisco 7200 series routers and 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.

Parts and Tools

You need the following tools and parts to replace the main memory modules in the network processing engine or network services engine, PC cards or Flash Disks in the I/O controller, and CompactFlash Disks in the NPE-G1 or NPE-G2:

- New DRAM SIMMs, SDRAM DIMMs, SDRAM SODIMM, CompactFlash Disks, Flash Disks, or PC cards

**Note**
For information on replacing the Compact Flash Disk in the NPE-G1 or NPE-G2, or UBR7200-NPE-G1 or UBR7200-NPE-G2, refer to the Using the Flash Disk document online at: http://www.cisco.com/en/US/products/hw/routers/ps341/prod_installation_guide09186a00802a6394.html

- Number 2 Phillips and a 3/16-inch flat-blade screwdriver
- 8-mm wrench or nut driver, or adjustable wrench (for connecting a grounding lug to a Cisco uBR7200 series DC-input power supply)
- 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)
- 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 upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat or surface, or static shielding bag

If you need additional equipment, contact a service representative for ordering information.
Software and Hardware Requirements

Some network processing engines and the network services engine are compatible only with certain chassis. See Table 3-1.

**Table 3-1 Routers and Supported NPEs or NSE**

<table>
<thead>
<tr>
<th>Router</th>
<th>NPE or NSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7200 routers</td>
<td>NPE-100, NPE-150, NPE-175, NPE-200, and NPE-225</td>
</tr>
<tr>
<td>Cisco 7200 VXR routers</td>
<td>All NPEs and the NSE-1</td>
</tr>
<tr>
<td>Cisco 7206 as a router shelf in a Cisco AS5800 Universal Access Server</td>
<td>NPE-200</td>
</tr>
<tr>
<td>Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server</td>
<td>NPE-300 and the NPE-400</td>
</tr>
<tr>
<td>Cisco uBR7246VXR universal broadband router</td>
<td>NPE-225, NPE-300, NPE-400, UBR7200-NPE-G1, and UBR7200-NPE-G2</td>
</tr>
<tr>
<td>Cisco uBR7246 universal broadband router</td>
<td>NPE-150, NPE-200, and NPE-225</td>
</tr>
<tr>
<td>Cisco uBR7223 universal broadband router</td>
<td>NPE-150, NPE-200, and NPE-225</td>
</tr>
</tbody>
</table>

1. Previous documents stated that the NPE-175 was also supported on the Cisco uBR7200 series routers. Because the NPE-175 has reached its end of life and was never made orderable on the Cisco uBR7200 series routers, it is shown as no longer supported for Cisco uBR7200 series routers.

Note

The NPE-300, NPE-400, NSE-1, NPE-G1, and the NPE-G2 are compatible with the Cisco 7200 VXR routers. The NPE-300, NPE-400, UBR7200-NPE-G1 and the UBR7200-NPE-G2 are compatible with the Cisco 7246VXR router. They cannot be used in the Cisco 7200 series routers (Cisco 7202, Cisco 7204, and Cisco 7206) and the Cisco uBR7246.

Note

The NPE-100, NPE-150, NPE-175, NPE-200, and NPE-300 have reached their end-of-life and are no longer sold, although they are still supported in existing installations. For information about each processor’s end-of-life cycle, see the Product Bulletins at the following URL: http://www.cisco.com/en/US/products/hw/routers/ps341/prod_bulletins_list.html.

We recommend that your boot helper image correspond to the minimum software release required for your platform. To upgrade your boot helper image, see the “Upgrading the Boot Helper Image” section on page 3-6.

The following tables list the recommended minimum Cisco IOS software release required to use the network processing engine or network services engine in supported router platforms:

- **Table 3-2** lists the software requirements for the NPE-G2 and NPE-G1.
- **Table 3-3** lists the software requirements for the NSE-1, NPE-400, and NPE-300.
- **Table 3-4** lists the software requirements for the NPE-225 and NPE-175.
- **Table 3-5** lists the software requirements for the NPE-200, NPE-150, and NPE-100.
### Table 3-2  Software Requirements for the NPE-G2 and NPE-G1

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-G2/UBR7200-NPE-G2</th>
<th>NPE-G1/ UBR7200-NPE-G1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco 7200 series</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR and Cisco 7206VXR</td>
<td>Cisco IOS Release 12.4(4)XD or later releases of 12.4XD</td>
<td>Cisco IOS Release 12.2(4)BW or later releases of 12.2B Cisco IOS Release 12.1(14)E or later releases of 12.1E</td>
</tr>
<tr>
<td>• Cisco 7204 and Cisco 7206</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco 7202</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Cisco AS5800 Universal Access Server</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7206VXR router shelf</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco 7206 router shelf</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Cisco uBR7200 series</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246 VXR</td>
<td>Cisco IOS Release 12.2(33)SCA or later releases of 12.2SC</td>
<td>Cisco IOS Release 12.2(11)CX with a special boot helper image of 12.2(11)CX</td>
</tr>
<tr>
<td>• Cisco uBR7246</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

1. For information about the Cisco 7206 or 7206VXR as router shelves in the Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation listed on Cisco.com.

### Table 3-3  Software Requirements for the NSE-1, NPE-400, and NPE-300

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE or NSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NSE-1</td>
</tr>
<tr>
<td><strong>Cisco 7200 series</strong></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR and Cisco 7206VXR</td>
<td>Cisco IOS Release 12.1E or Cisco IOS Release 12.1(5)T or later releases of 12.1T</td>
</tr>
<tr>
<td>• Cisco 7204 and Cisco 7206</td>
<td>—</td>
</tr>
<tr>
<td>• Cisco 7202</td>
<td>—</td>
</tr>
</tbody>
</table>
### Software and Hardware Requirements

#### Table 3-3  Software Requirements for the NSE-1, NPE-400, and NPE-300 (continued)

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NSE-1</th>
<th>NPE-400</th>
<th>NPE-300</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco AS5800 Universal Access Server</strong>&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7206VXR router shelf</td>
<td>—</td>
<td>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]</td>
<td>Cisco IOS Release 12.0(4)XJ or later releases of 12.0 XJ</td>
</tr>
<tr>
<td>• Cisco 7206 router shelf</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Cisco uBR7200 series</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246 VXR</td>
<td>—</td>
<td>Cisco IOS Release 12.1(6)EC or later releases of 12.1 EC with a special boot helper image of 12.0(15)SC [ubr7200-boot-mz.120-15.SC]</td>
<td>Cisco IOS Release 12.0(6)SC or later releases of 12.0SC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2 BC</td>
<td>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC</td>
</tr>
<tr>
<td>• Cisco uBR7246</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

---

1. Cisco IOS Release 12.1(5)T and later releases of 12.1 T require a minimum of 12 MB of SRAM or SDRAM.
2. For information about the Cisco 7206 or 7206VXR as router shelves in the Cisco AS5800 Universal Access Server, refer to the Cisco AS5800 Universal Access Server documentation on Cisco.com.
3. Cisco IOS Release 12.1(8)EC or later is required to use the MEM-SD-NSE-256MB memory module in the NPE-300.
### Table 3-4  Software Requirements for the NPE-225 and NPE-175

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-225¹</th>
<th></th>
<th>NPE-175</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco 7200 series</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR and</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
<td></td>
</tr>
<tr>
<td>Cisco 7206VXR</td>
<td>12.0(4)XE or later releases of 12.0XE</td>
<td>12.0(5)T or later releases of 12.0T</td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204 and</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
<td></td>
</tr>
<tr>
<td>Cisco 7206</td>
<td>12.0(4)XE or later releases of 12.0XE</td>
<td>12.0(5)T or later releases of 12.0T</td>
<td></td>
</tr>
<tr>
<td>• Cisco 7202</td>
<td>—</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td><strong>Cisco uBR7200 series²</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246 VXR</td>
<td>Cisco IOS</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cisco IOS Release 12.0(6)SC or later releases of 12.0SC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco uBR7246</td>
<td>Cisco IOS</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Cisco IOS Release 12.2(4)BC1 or later releases of 12.2BC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Cisco IOS Release 12.1(5)T and later releases of 12.1T require a minimum of 128 MB of SRAM or SDRAM.
2. Previous documentation stated that the NPE-175 was also supported on the Cisco uBR7200 series routers. Because the NPE-175 has reached its end of life and was never made orderable on the Cisco uBR7200 series routers, it is shown as no longer supported for the Cisco uBR7200 series routers.
3. Cisco IOS Release 12.1(8)EC or later is required to use the MEM-SD-NSE-256MB memory module in the NPE-225.

### Table 3-5  Software Requirements for the NPE-200, NPE-150, and NPE-100

<table>
<thead>
<tr>
<th>Router Platform</th>
<th>NPE-200¹</th>
<th>NPE-150¹</th>
<th>NPE-100¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cisco 7200 series</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7204VXR and</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
</tr>
<tr>
<td>Cisco 7206VXR</td>
<td>12.0(2)XE2 or later releases of 12.0XE</td>
<td>12.0(3)T or later releases of 12.0T</td>
<td>11.1(8)</td>
</tr>
<tr>
<td>• Cisco 7204 and</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
<td>Cisco IOS</td>
</tr>
<tr>
<td>Cisco 7206</td>
<td>11.1(13)CA or later releases of 11.1CA</td>
<td>11.1(5)</td>
<td>11.1(8)</td>
</tr>
<tr>
<td>Cisco IOS Release 11.1(17)CC or later releases of 11.1CC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco IOS Release 11.2(12)P or later releases of 11.2P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco IOS Release 11.3(2)T or later releases of 11.3T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco IOS Release 11.3(2)AA or later releases of 11.3AA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cisco 7202</td>
<td>—</td>
<td>Cisco IOS</td>
<td>—</td>
</tr>
<tr>
<td>Cisco IOS Release 11.1(19)CC1 or later releases of 11.1CC</td>
<td>11.3AA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Upgrading the Boot Helper Image

The boot helper image resides in Flash memory on the I/O controller 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 image should correspond to the Cisco IOS release that is running on your router. When you upgrade your Cisco IOS software to the minimum required software release (see Table 3-3, Table 3-4, and Table 3-5), we recommend that you also upgrade your boot helper image.

Also see the Cisco 7200 Series Routers Boot Images Information document for boot image information.

Note

The Cisco 7200 boot image in Cisco IOS Release 12.0 and Cisco IOS Release 12.1 is oversized. If you need to upgrade the Cisco 7200 boot image, use the boot image in Cisco IOS Release 12.0S in place of the boot image in Cisco IOS Release 12.0 or Cisco IOS Release 12.1 releases. See the field notice Oversized Cisco 7200/uBR7200 BootImage document.

Make sure you upgrade the boot helper (boot loader) image on any previously purchased I/O controller before attempting to boot a Cisco 7200 VXR router or Cisco uBR7246VXR router that has a newly installed NPE-175, NPE-225, NPE-300, or NPE-400. When you install or upgrade the NPE-G1, NPE-G2, UBR7200-NPE-G1, or UBR7200-NPE-G2 you do not need to update the boot image because it is already installed on the processor at the factory.

To upgrade your boot helper 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 ix.

To obtain a boot helper image from Cisco.com and upgrade your bootflash, do the following:
Step 1  Download the boot helper image from Cisco.com to a 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 image. For more detailed instructions on loading and maintaining system images and microcode, including boot helper images, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide* and the *Cisco 7200 Series Routers Boot Images Information* document.
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, replace, or service 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

**Warning**

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

**Warning**

TÄRKEÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käänökset löytyvät laitteen mukana toimitetujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET
Attention  IMPORTANTES INFORMATIONS DE SÉCURITÉ


CONSERVEZ CES INFORMATIONS

Warnung  WICHTIGE SICHERHEITSHINWEISE


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 SIKKERHETSNSTRUKSJONER

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyr, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutt 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

Warning!

VIKTIGA SÄKERHETSANVISNINGAR


SPARA DESSA ANVISNINGAR

Figyelem

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezet jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott 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 mellékel biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto 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
### Safety Guidelines

**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 befinner dig i en situation med risiko for legemesbeskadigelse. For 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**

**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。警告の各言語版は、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. 장비의 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고 를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

**アドバイス**
**重要安全注意事項**

この警告マークは危険を意味します。あなたは、人間の怪我を引き起こす可能性の高い危険な状況にあります。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。警告の各言語版は、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。

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**주의**
** 중요 안전 지침**

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비의 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고 를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.
Safety Guidelines

Chapter 3      Preparing for Installation

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 práci na jakémkoliv vybavení si uvedomte nebezpečí související s elektrickými obvody a seznámte se se standardními opatřením pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY

Производитељ  ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ

Авто то произвоицелко съмволо сегааиве киндуно. Брикакеесте се кааташата пул мопореи ва прокаалезе травматизм. Прир эргастеителе оопводдипоте экзотилиамо, ва як оклоимас саас туюс киндуноус пул схетизонта мета та електрики куклоимата кай ва як екзокеийзиге му тис сунйснис практикес ги тай апофугг атукиматас. Хризимопоиитете тон ариби дилявиси пул парехетаи сто тэлос каще произвоицелкошиси, ги ва энтпиписте ти метахрасиси тис стис метахрасимеевес произвоицелкоииси асфалеиас пул сунодхеовус ти сискеви.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

הוראות בטיחות和尚ד תיבת

סימון אזהרה זה מסמל כי この הה_animation נמצאת באופסיה וגןAGED. אם תנהגו בתזוזה עם אי- הולכי, עליך להופט תלווח הכורisses במעגלים השטיחים לוחמי את ההלוגים המוקבלים למתעמל תנועה. כשהתומך בהוראה זו נסכן בזוזה של אל תראה את התזוזה או בזוזה המצריך מוטורי בהלוגים

שנימ沔 הוראות אלה

Opomena  ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА

Символот за предупредување значи опасност. Се наохрите во ситуација што може да предизвики телесни повреди. Пред да работете со опремата, бидете свесни за ризикот што постои кај електричните копа и треба да ги познавате стандардните поставки за спречување на нередни случаи. Искористете го бројот на изјавата што се наохрите на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.

ЧУВАЈТЕ ГИ ОВИЕ НАПАТСТВИЈА
Safety Guidelines

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 or memory SIMMs or DIMMs are improperly handled and results in complete or intermittent failures.

The I/O controller and network processing engine or network services engine consist of a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Hold the I/O controller and network processing engine or network services engine by their carrier edges and handle; never touch the printed circuit board or connector pins.

*Figure 3-1* shows the location of a printed circuit board in a network processing engine or network services engine and an I/O controller metal carrier. Do not touch the printed circuit board when handling any of the components.

*Figure 3-1  Handling the I/O Controller and the Network Processing Engine or Network Services Engine*

| 1 Printed circuit board | 2 Metal carrier |

Handle SIMMs or DIMMs by the edges only. Avoid touching the memory modules, pins, or traces—the metal *fingers* along the connector edge of the SIMM or DIMM. (See *Figure 3-2*.) Always wear a preventive antistatic wrist strap whenever you handle SIMMs or DIMMs.

*Figure 3-2  Handling a SIMM or DIMM*
Although the metal carrier helps to protect the I/O controller and the network processing engine or network services engine from ESD, wear a preventive antistatic strap whenever handling the I/O controller, network processing engine, or network services engine. Ensure that the strap makes good skin contact and connect the strap’s clip to an unpainted chassis surface to safely channel unwanted ESD voltages 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 modem 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 modem 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 I/O controller, network processing engine or network services engine, Cisco uBR7200 series cable modem cards, or port adapters. Ensure that the ESD strap makes contact with your skin.
- Handle the I/O controller, network processing engine or network services engine, Cisco uBR7200 series cable modem cards, or port adapters by their metal carrier edges and handles; avoid touching the printed circuit board or any connector pins.
- When removing the I/O controller, network processing engine or network services engine, Cisco uBR7200 series cable modem cards, or port adapters, 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, Cisco uBR7200 series cable modem card, or port adapter 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 and 10 megohms (Mohms).

---

**Ensuring Easy Access to the Router**

If your Cisco 7200 series router or Cisco uBR7200 series router is installed in a standard 19-inch, four-post rack 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 Chapter 4, “Installing and Removing SDRAM and DRAM.”

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 (0.9 to 1.3 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 them) and use cable ties to anchor them away from the rear of the router.
Ensuring Easy Access to 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 or network services engine, and the subchassis from the router. Detailed steps for detaching the router from the rack are contained in the “Removing the Network Processing Engine or Network Services Engine” section on page 4-8.

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.
CHAPTER 4

Installing and Removing SDRAM and DRAM

This chapter explains how to remove and replace the main memory modules on the network processing engine or network services engine. For the location of the memory module you are replacing, find the illustration that corresponds to your network processing engine or network services engine in Chapter 2, “SDRAM and DRAM Memory Systems Overview,” the “Network Processing Engine or Network Services Engine Memory Information” section on page 2-4.

Before you can replace the main memory modules, you need to first complete the following:

- Power down the router.
- Disconnect the router from the power source.
- Remove the power supplies (if needed—Cisco 7200 series routers).
- Remove the network processing engine or network services engine.

After you have removed and replaced the DRAM or SDRAM, complete the procedure by doing the following:

- Replace the network processing engine or network services engine.
- Reconnect the router to the power source.
- Power up the router.

Note

The procedures for removing and replacing the network processing engine or network services engine in Cisco 7200 series routers and in the Cisco AS5800 Universal Access Server router shelf are the same. Therefore, the illustrations and procedures in the following sections apply to Cisco 7200 series routers and the Cisco AS5800 Universal Access Server router shelf unless indicated otherwise.

The tasks for removing and replacing the network processing engine in Cisco uBR7200 series routers are slightly different from the platforms mentioned above. The differences are indicated in the following procedures.
Powering Down the Router

Warning
This unit might have more than one power cord. To prevent the risk of electric shock, disconnect the two power cords before servicing the unit. Statement 14

To power down a Cisco 7200 series router or a 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
After 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 or NPE-G1 or NPE-G2 turn off.
- The LEDs on the port adapters turn off.
- On a Cisco uBR7200 series router, the LEDs on the cable modem cards turn off.

This completes the procedure for powering down a Cisco 7200 series router or Cisco uBR7200 series router.

Caution
When the power switch on a Cisco uBR7200 series power supply is turned to the off (O) position, the power supply will enter 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 will not restart.

Disconnecting Input Power

The following procedures explain how to disconnect input power from a Cisco 7200 series router or a Cisco uBR7200 series router.

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

If you have a DC-input power supply installed in your router, proceed to the “Disconnecting DC-Input Power” section on page 4-4. Otherwise, proceed to the next section, “Disconnecting AC-Input Power.”
Disconnecting AC-Input Power

To disconnect AC-input power from a Cisco 7200 series router or a Cisco uBR7200 series router, complete the following steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unplug the input power cable from the power source.</td>
</tr>
<tr>
<td>2</td>
<td>Release the cable-retention clip.</td>
</tr>
<tr>
<td></td>
<td>• On a Cisco 7200 series router, push up on the cable-retention clip that secures the input power cable to the router’s power supply.</td>
</tr>
<tr>
<td></td>
<td>• On a Cisco uBR7200 series router, push the cable-retention clip to the left.</td>
</tr>
<tr>
<td>3</td>
<td>Unplug the other end of the input power cable from the power supply. (For a Cisco 7200 series router, see Figure 4-1. For a Cisco uBR7200 series router, see Figure 4-2.)</td>
</tr>
</tbody>
</table>

**Figure 4-1  Disconnecting Power from a Cisco 7200 Series AC-Input Power Supply**

| 1 | AC-input receptacle |
| 2 | Internal fans       |
| 3 | Power switch        |
| 4 | AC-input power supply |
**Powering Down the Router**

**Chapter 4  Installing and Removing SDRAM and DRAM**

**Figure 4-2  Disconnecting Power from a Cisco uBR7200 Series AC-Input Power Supply—Cisco uBR7246 Shown**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC-input receptacle</td>
</tr>
<tr>
<td>2</td>
<td>Power switch</td>
</tr>
<tr>
<td>3</td>
<td>Handle</td>
</tr>
<tr>
<td>4</td>
<td>Network processing engine</td>
</tr>
<tr>
<td>5</td>
<td>AC-input power supply</td>
</tr>
</tbody>
</table>

### 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 a Cisco uBR7200 series router.

### Disconnecting DC-Input Power

To disconnect DC-input power from a Cisco 7200 series router or a Cisco uBR7200 series router, use the following procedures.

- For the Cisco uBR7200 series routers, go to the “Disconnecting Power from the Cisco uBR7200 Series Routers” section on page 4-5.
- For the Cisco 7200 series routers, go to the “Disconnecting Power from the Cisco 7200 Series Routers” section on page 4-7.

**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 202

---

**Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller**

OL-8358-04
Disconnecting Power from the Cisco uBR7200 Series Routers

Step 1  At the rear of the router, check that the power switch on the power supply is in the off (O) position. See Figure 4-3.

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  Remove the strain-relief cover from the Cisco uBR7200 series router power supply. See Figure 4-3.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power switch</td>
</tr>
<tr>
<td>2</td>
<td>Power receptacle</td>
</tr>
<tr>
<td>3</td>
<td>Captive installation screw</td>
</tr>
<tr>
<td>4</td>
<td>M5 grounding receptacles</td>
</tr>
<tr>
<td>5</td>
<td>M5 grounding lug</td>
</tr>
<tr>
<td>6</td>
<td>–V lead Power receptacle</td>
</tr>
<tr>
<td>7</td>
<td>+V lead</td>
</tr>
<tr>
<td>8</td>
<td>Strain-relief cover</td>
</tr>
<tr>
<td>9</td>
<td>M4 nuts</td>
</tr>
</tbody>
</table>

Figure 4-3  Removing the Strain-Relief Cover from a Cisco uBR7200 Series DC-Input Power Supply
Powering Down the Router

Chapter 4 Installing and Removing SDRAM and DRAM

Memory Replacement Instructions for the Network Processing Engine or Network Services Engine and Input/Output Controller

4-6

4-6

OL-8358-04

Figure 4-4 Disconnecting Power from a Cisco uBR7200 Series DC-Input Power Supply

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power switch</td>
</tr>
<tr>
<td>2</td>
<td>Power receptacle</td>
</tr>
<tr>
<td>3</td>
<td>DC power supply</td>
</tr>
<tr>
<td>4</td>
<td>M5 grounding receptacles</td>
</tr>
<tr>
<td>5</td>
<td>M5 grounding lug</td>
</tr>
<tr>
<td>6</td>
<td>−V lead</td>
</tr>
<tr>
<td>7</td>
<td>M4 studs</td>
</tr>
<tr>
<td>8</td>
<td>+V lead</td>
</tr>
<tr>
<td>9</td>
<td>Handle</td>
</tr>
</tbody>
</table>

Step 4 Disconnect the −V and +V leads from the power source. You can leave the ground cable connected. Remove the restraints that secure the −V, +V, and ground leads from the Cisco uBR7200 series power supply. 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 +V leads to the power supply faceplate. Remove the strain-relief cover. (See Figure 4-3.)

Step 5 Disconnect the lead wires from the power supply. Repeat this step for the −V lead only. 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. (See Figure 4-4.)

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/yellow is used for ground. Make certain the lead color coding you choose for the DC-input power supply matches lead color coding used at the DC power source.

Step 6 Repeat Step 4 through Step 6 if a second power supply is installed.

This completes the procedure for disconnecting DC-input power from a Cisco uBR7200 series router.
Disconnecting Power from the Cisco 7200 Series Routers

**Figure 4-5**  Disconnecting Power from a Cisco 7200 Series DC-Input Power Supply

1. Ground lead service loop
2. DC power leads
3. Cable tie
4. Power switch

**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 and save the cable tie that secures the –V, +V, and ground leads to the power supply faceplate.

**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**  Use a 3/16-inch flat-blade screwdriver to loosen the screw below the –V lead and the ground lead receptacle, and pull the lead from the connector. (See Figure 4-5.)

**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/yellow is used for ground. Make certain the lead color coding you choose for the DC-input power supply matches lead color coding used at the DC power source.

**Step 5**  Repeat Step 4 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.
Removing the Network Processing Engine or Network Services Engine

To remove the network processing engine or network services engine from a Cisco 7200 series router or a 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 or network services engine. If you have difficulty, consider removing power supplies from the chassis and then removing the network processing engine or network services engine. See the “Removing and Replacing an AC-Input or DC-Input Power Supply” section on page 4-36 for information on removing and replacing an installed power supply.

This note does not apply to Cisco uBR7200 series routers; the network processing engine is installed above the power supplies in Cisco uBR7200 series routers.

---

**Step 1** Power down the router and disconnect its input power cable. See the “Powering Down the Router” section on page 4-2.

**Step 2** If you are removing an NPE-G1, disconnect the GBIC cables or RJ-45 cables from the interface ports, as well as any console or auxiliary port cables. If you are removing an NPE-G2, disconnect the SFP cables or RJ-45 cables from the interface ports, as well as any console or auxiliary port cables.

**Step 3** If the optional NPE-G1 or NPE-G2 cable-management bracket is installed, remove it. Loosen the captive installation screws, lift the right side of the bracket off the captive installation screw, then slide the left side of the bracket off the other captive installation screw.

**Step 4** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

**Step 5** 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 or network services engine. (For the Cisco 7200 series router, see Figure 4-7. For the Cisco uBR7200 series router, see Figure 4-8.) If the router is not installed in a standard 19-inch rack (four-post) or in a two-post, skip to Step 9. 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 with Step 6.

**Step 6** Using a 3/16-inch flat-blade screwdriver, loosen the four screws that secure the router to the front mounting strips of the rack.

**Step 7** Position at least one person in front of the rack to support the front underside of the router.

**Step 8** 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 or network services engine.

**Step 9** Grasp the network processing engine or network services engine handle and carefully pull the engine from its chassis slot.

---

**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. (See Figure 4-6.)
**Figure 4-6** Handling the Network Processing Engine or Network Services Engine

1. Printed circuit board
2. Metal carrier

**Figure 4-7** Cisco 7200 Series Network Processing Engine Captive Installation Screws and Handle

1. Captive installation screw
2. Handle
3. Network processing engine or network services engine
4. AC-input power supply
Chapter 4  Installing and Removing SDRAM and DRAM

Removing and Replacing SDRAM or DRAM

This section explains how to remove and replace DRAM or SDRAM that is installed on your network processing engine or network services engine.

- For instructions on replacing the SDRAM DIMM for the NPE-G2, go to “Removing and Replacing the NPE-G2 or UBR7200-NPE-G2 SDRAM DIMM” section on page 4-11.
- For instructions on replacing SDRAM SODIMMs for the NPE-G1, go to the “Removing and Replacing NPE-G1 and UBR7200-NPE-G1 SDRAM SODIMMs” section on page 4-12.
- For instructions on replacing a SDRAM SODIMM for the NPE-400, go to the “Removing and Replacing the NPE-400 SDRAM SODIMM” section on page 4-14.
- For instructions on replacing SDRAM DIMMs for the NSE-1, NPE-300, NPE-225, or NPE-175, go to the “Removing and Replacing SDRAM DIMMs” section on page 4-17.
- For instructions on replacing DRAM SIMMs for the NPE-100, NPE-150 and NPE-200, go to the “Removing and Replacing DRAM SIMMs” section on page 4-20.

Step 10  Place the network processing engine or network services engine on an antistatic surface with its printed circuit board components facing upward.

This completes the procedure for removing the network processing engine or network services engine.
Removing and Replacing the NPE-G2 or UBR7200-NPE-G2 SDRAM DIMM

This section provides a procedure for removing and replacing the DIMM on the NPE-G2.

The synchronous dynamic random-access memory (SDRAM) on the NPE-G2 is contained in a dual in-line memory modules (DIMMs) (see Figure 4-10).

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only SDRAM from the Cisco Systems should be used. A Cisco part number appears on the DIMM.</td>
</tr>
</tbody>
</table>

To prevent ESD damage, handle the DIMM by the card edges only (see Figure 4-17). Place the removed DIMM on an antistatic mat and store it in an antistatic container.

Follow these steps to remove and insert the DIMM:

**Figure 4-9 Removing or Installing the DIMM on the NPE-G2**

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Remove the DIMM by pressing against the release latches until the DIMM releases.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Gently remove the DIMM from the DIMM socket.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Gently insert a DIMM into the DIMM socket.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Push the release latches until they slip into the notch on the edge of the DIMM, holding it securely in place.</td>
</tr>
</tbody>
</table>

You have finished replacing the SDRAM DIMM. To install the NPE-G2 in the chassis, go to the “Replacing the Network Processing Engine or Network Services Engine” section on page 4-24.
Removing and Replacing NPE-G1 and UBR7200-NPE-G1 SDRAM SODIMMs

This section provides a procedure for removing and replacing the SODIMMs on the NPE-G1 and UBR7200-NPE-G1.

The synchronous dynamic random-access memory (SDRAM) on the NPE-G1 and UBR7200-NPE-G1 is contained in two small outline dual in-line memory modules (SODIMMs) (see Figure 4-10). Depending on your system configuration, you might need to upgrade SDRAM. Also, if a system problem is determined to be caused by a SODIMM, a SODIMM replacement might be required.

Note
Only SDRAM from Cisco Systems should be used. A Cisco part number appears on the SODIMM.

To prevent ESD damage, handle the SODIMMs by the card edges only (see Figure 4-14). Place the removed SODIMM on an antistatic mat and store it in an antistatic container.

Removing the NPE-G1 and UBR7200-NPE-G1 SODIMMs

Follow these steps to remove SODIMMs:

Figure 4-10 Locating the SODIMMs on the NPE-G1 and UBR7200-NPE-G1

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SODIMM 1</td>
</tr>
<tr>
<td>2</td>
<td>SODIMM 2</td>
</tr>
</tbody>
</table>

Step 1  If you have not done so, power off the router.
Step 2  Remove the network processing engine (NPE) from the system.
Step 3  Place the NPE on an antistatic mat or pad and ensure that you are wearing an antistatic device, such as a wrist strap.
Step 4  Locate the SODIMMs on the NPE-G1 or UBR7200-NPE-G1.
Both SODIMMs must be of the same size and type, and both SODIMM sockets must be populated.

**Figure 4-11 Removing or Installing an SDRAM SODIMM**

---

**Step 5** Remove the SODIMM you wish 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.

**Step 6** Remove the SODIMM from the socket.

---

**Installing the NPE-G1 or UBR7200-NPE-G1 SODIMM**

**Step 1** Align the new SODIMM notch with the connector and insert the SODIMM into the socket.

**Step 2** Gently press on the SODIMM to lower it until the SODIMM spring latches snap into place.

**Step 3** Repeat Step 1 and Step 2 if you are replacing both SODIMMs.

You have finished replacing the SDRAM SODIMMs. To install the NPE-G1 or UBR7200-NPE-G1 in the chassis, go to the “Replacing the Network Processing Engine or Network Services Engine” section on page 4-24.
Removing and Replacing the NPE-400 SDRAM SODIMM

This section provides a procedure for removing and 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 4-12). Depending on your system configuration, you might need to upgrade SDRAM. Also, if a system problem is determined to be caused by a SODIMM, a SODIMM replacement might be required.

Note

Only SDRAM from Cisco Systems should be used. A Cisco part number appears on the SODIMM.

To prevent ESD damage, handle the SODIMM by the card edges only (see Figure 4-14). Place the removed SODIMM on an antistatic mat and store it in an antistatic container.

Removing the NPE-400 SDRAM SODIMM

Follow these steps to remove SODIMMs:

**Figure 4-12** Locating the SDRAM SODIMM on the NPE-400

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Temperature sensor (U31)</td>
</tr>
<tr>
<td>2</td>
<td>Keying post</td>
</tr>
<tr>
<td>3</td>
<td>RM7000 microprocessor</td>
</tr>
<tr>
<td>4</td>
<td>System controller</td>
</tr>
<tr>
<td>5</td>
<td>Captive installation screw</td>
</tr>
<tr>
<td>6</td>
<td>Handle</td>
</tr>
<tr>
<td>7</td>
<td>Midplane connectors</td>
</tr>
<tr>
<td>8</td>
<td>Boot ROM (U7)</td>
</tr>
<tr>
<td>9</td>
<td>Temperature sensor (U6)</td>
</tr>
<tr>
<td>10</td>
<td>SODIMM (J1)</td>
</tr>
<tr>
<td>11</td>
<td>Standoff and screw</td>
</tr>
</tbody>
</table>
Step 1 If you have not done so, power off the router.
Step 2 Remove the NPE-400 from the system.
Step 3 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 4 Locate the SODIMM.
Step 5 Locate the standoff and screw on the SODIMM.
Step 6 Using a Phillips screwdriver, remove the screw from the SODIMM. Keep the screw to install the new SODIMM.
Step 7 Release the spring latches from the SODIMM, and release the SODIMM from the socket.

Figure 4-13 Releasing the SODIMM Spring Latches

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spring latches on the release latch</td>
</tr>
<tr>
<td>2</td>
<td>SDRAM SODIMM</td>
</tr>
</tbody>
</table>

Step 8 When both ends of the SODIMM are released from the socket, grasp the ends of the SODIMM with your thumb and forefinger and pull the SODIMM completely out of the socket. Handle the edges of the SODIMM only; avoid touching the memory module, pins, or traces (the metal fingers along the connector edge of the SODIMM).

Caution To prevent ESD damage, handle the SODIMM by the card edges only (see Figure 4-14). Place the removed SODIMM on an antistatic mat and store it in an antistatic container.

Step 9 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 the NPE-400 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 4-14).

**Note**

Only SDRAM from Cisco Systems should be used. A Cisco part number appears on the SODIMM.

**Caution**

SDIMMs 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 4-14.)

**Figure 4-14 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**
Hold the sides of the SODIMM between your thumb and index finger (see Figure 4-14).

**Step 4**
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 5**
Press the SODIMM down until it is secured by the spring latches.

**Step 6**
When the SODIMM is installed, check both alignment holes on the SODIMM and ensure that the spring latch is visible. If it is not, the SODIMM is not seated properly. If the SODIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SODIMM firmly back into the socket until the spring latches snap into place.
Removing and Replacing 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 2, “SDRAM and DRAM Memory Systems Overview,” Figure 2-5.) 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 Systems.

Removing SDRAM DIMMs

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 Network Processing Engine or Network Services Engine” section on page 4-8.)

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 module you want to remove.

Step 4 Open the DIMM latches on the DIMM to release the DIMM from the socket. (See Figure 4-15.) The DIMM is under tension in the socket; therefore, the DIMM might be released from the socket with some force.
**Removing and Replacing SDRAM or DRAM**

**Step 5** With the DIMM latches open, grasp the ends of the DIMM between your thumbs and forefingers and pull the DIMM completely out of the socket. (See Figure 4-15.)

**Figure 4-15 Opening DIMM Latches**

![Figure 4-15 Opening DIMM Latches](image)

<table>
<thead>
<tr>
<th>1</th>
<th>Release latches</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>SDRAM DIMM</td>
</tr>
</tbody>
</table>

Handle the edges of the DIMM only; avoid touching the memory module, pins, or traces (the metal fingers along the connector edge of the DIMM). (See Figure 4-16.)

**Figure 4-16 Removing the DIMM**

![Figure 4-16 Removing the DIMM](image)

<table>
<thead>
<tr>
<th>1</th>
<th>Notch</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Metal fingers</td>
</tr>
</tbody>
</table>
Chapter 4      Installing and Removing SDRAM and DRAM

Removing and Replacing SDRAM or DRAM

Figure 4-17   Handling the DIMM

| 1 | SDRAM DIMM |

Caution
To prevent ESD damage when working with DIMMs: 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.

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 4-17.

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 2, “SDRAM and DRAM Memory Systems Overview,” Figure 2-5.) 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 4-17.)
Removing and Replacing SDRAM or DRAM

Chapter 4 Installing and Removing SDRAM and DRAM

Removing and Replacing SDRAM or DRAM

Note
The 64-MB DIMM should be facing component-side down.

Step 3
Insert the connector edge of the DIMM straight into the socket.

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 4
Gently push the DIMM into the socket until the socket latches close over the ends of the DIMM. (See Figure 4-18.) If necessary, rock the DIMM gently back and forth to seat it properly.

Figure 4-18 Inserting the DIMM

Step 5
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 latch moves into place.

Step 6
If you have a network processing engine with more than one DIMM socket and are replacing the second DIMM also, repeat Step 1 through Step 5 above.

This completes the DIMM replacement procedure.

Removing and Replacing DRAM SIMMs

The procedures in this section are required only if you have an NPE-100, NPE-150, or NPE-200, and need to upgrade or replace the SDRAM SIMMs.

Removing DRAM SIMMs

To remove the installed DRAM SIMMs, complete the following steps:

Step 1
Attach an ESD-preventive wrist strap between you and an unpainted router surface.

Step 2
Place the I/O controller or 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 I/O controller or the network processing 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 2, “SDRAM and DRAM Memory Systems Overview,” the “Network Processing Engine or Network Services Engine Memory Information” section on page 2-4.

**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 4-19.)

**Figure 4-19 Releasing the SIMM Spring Latches**

1. **Latch**
2. **Latch holes**
3. **Faceplate edge of the SIMM**

**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 module, 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 2, “SDRAM and DRAM Memory Systems Overview,” Figure 2-9 and Figure 2-10.)
- U11, U25, U42, and U52 on the NPE-200 (See Chapter 2, “SDRAM and DRAM Memory Systems Overview,” Figure 2-8.)

Figure 4-20 Handling a SIMM

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 4-20.)

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-200, NPE-150, or NPE-100, 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.

Step 3
Orient the SIMM so its connector edge (the metal fingers) is down and the component side is facing you. (See Figure 4-21.)
Removing and Replacing SDRAM or DRAM

Step 4 Hold the sides of the SIMM between your thumb and index finger. (See Figure 4-20.)

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 I/O controller or the network processing 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 “Replacing the Network Processing Engine or Network Services Engine” section on page 4-24.

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.
Replacing the Network Processing Engine or Network Services Engine

Check the following chassis compatibility requirements before installing a network processing engine or network services engine in the chassis:

- The NPE-300, NPE-400, NSE-1, NPE-G1 and the NPE-G2 are compatible with the Cisco 7200 VXR routers. The NPE-300, NPE-400, UBR7200-NPE-G1 and the UBR7200-NPE-G2 are compatible with the Cisco 7246VXR router. They cannot be used in the Cisco 7200 series routers (Cisco 7202, Cisco 7204, and Cisco 7206) and the Cisco uBR7246.

To replace the network processing engine or network services engine in the router, complete the following steps:

**Step 1** Ensure that the router is powered down and its input power cable is disconnected from the router and the power source. See the “Powering Down the Router” section on page 4-2.

**Step 2** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

**Step 3** Using both hands, grasp the network processing engine or network services engine by its metal carrier edges and orient it so that its printed circuit board components are upward (so that you can see the components).

**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 4** Align the left and the right edge of the network processing engine’s or network services engine’s metal carrier with the chassis slot guides. (For a Cisco 7200 series router, see Figure 4-22. For a Cisco uBR7200 series router, see Figure 4-23.)

**Note** The NPE-G2, NPE-G1, NSE-1, NPE-400, and the NPE-300 carrier has metal posts that slide into grooves cut into the Cisco 7200 VXR and Cisco uBR7246VXR network processing engine or network services engine slot. This feature does not alter the installation procedure for the NPE-G1, NPE-G2, NSE-1, NPE-400, or NPE-300. (See Chapter 2, “SDRAM and DRAM Memory Systems Overview,” Figure 2-2, Figure 2-3, Figure 2-4, or Figure 2-5.)

Do not align the network processing engine’s or network service engine’s metal carrier between the slot guides. Doing so will damage components on the engine’s printed circuit board as you slide the network processing engine or network services engine into its chassis slot.
Step 5  Gently slide the network processing engine or network services engine all the way into its chassis slot until you feel the connectors make contact with the router midplane.

Step 6  Seat the network processing engine or network services engine in the router midplane by tightening its captive installation screws with a number 2 Phillips or a 3/16-inch flat-blade screwdriver.
Replacing the Network Processing Engine or Network Services Engine

Step 7 If you are replacing the NPE-G1 or NPE-G2 cable-management bracket, slide the left side of the bracket over the loosened left captive installation screw. Then rotate the bracket down and over the right captive installation screw. Tighten both installation screws.

Note The network processing engine or network services 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 4-36 when replacing an AC-input or DC-input power supply in a Cisco 7200 series router.)

Step 9 If you pushed 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 four screws that secure the router to the front mounting strips of the rack.

This completes the procedure for replacing the network processing engine or network services engine in a Cisco 7200 series router or a Cisco uBR7200 series router.

Installing the Network Processing Engine or Network Services Engine

To install the network processing engine (NPE) or network services engine (NSE) in the router, complete the following steps:

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” section on page 4-2.
Step 2 Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

Step 3 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 4-25.)

Figure 4-25 Aligning the NPE-G1 Between the Slot Guides on a Cisco 7200 VXR Series Router

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Slot guides</td>
</tr>
<tr>
<td>2</td>
<td>NPE-G1</td>
</tr>
<tr>
<td>3</td>
<td>Printed circuit board</td>
</tr>
<tr>
<td>4</td>
<td>Metal carrier</td>
</tr>
</tbody>
</table>

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

Step 4 If you have an NPE-G1, NPE-G2, UBR7200-NPE-G1, or UBR7200-NPE-G2 go to Step 5. If you do not, go to the “Connecting Input Power and Powering Up the Router” section on page 4-27.

Step 5 Reattach any interface, console, or auxiliary cables to the NPE-G1, UBR7200-NPE-G1, NPE-G2, or UBR7200-NPE-G2 and run the cables through the cable-management brackets, if installed.

This completes the steps for installing the network processing engine or network services engine.

Connecting Input Power and Powering Up the Router

The following procedures explain how to reconnect input power to a Cisco 7200 series router or a 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

If you have a DC-input power supply installed in your router, proceed to the “Reconnecting DC-Input Power” section on page 4-30. Otherwise, proceed to the next section, “Reconnecting AC-Input Power.”
Reconnecting AC-Input Power

To reconnect AC-input power to a Cisco 7200 series router or a 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 up (Cisco 7200 series) or to the left (Cisco uBR7200 series), 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 (Cisco 7200 series) or to the right (Cisco uBR7200 series) until it snaps around the connector.

The cable-retention clip provides strain relief for the AC power cable. (For a Cisco 7200 series router, see Figure 4-26. For a Cisco uBR7200 series router, see Figure 4-27.)

---

*Figure 4-26  Connecting AC-Input Power to a Cisco 7200 Series Router*

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power switch</td>
</tr>
<tr>
<td>2</td>
<td>AC power cable</td>
</tr>
<tr>
<td>3</td>
<td>POWER OK LED</td>
</tr>
<tr>
<td>4</td>
<td>Hole for nylon cable tie</td>
</tr>
<tr>
<td>5</td>
<td>Cable-retention clip</td>
</tr>
</tbody>
</table>
**Step 4** Plug the AC power supply cable into the AC power source.

**Note**

For a Cisco 7200 series router, each AC-input power supply operating at 120 VAC requires a minimum of 5A service.

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

We recommend powering Cisco 7200 series routers and Cisco uBR7200 series routers from a 120 VAC, 15A receptacle United States (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 a Cisco uBR7200 series router. Proceed to the “Powering Up the Router” section on page 4-34.
Reconnecting DC-Input Power

To reconnect DC-input power to a Cisco 7200 series router or a Cisco uBR7200 series 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/yellow is used for ground. Make certain the lead color coding you choose for the DC-input power supply matches 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 202

**Step 1**
Ensure that the –V and +V leads are carrying no current.

**Step 2**
At the rear of the router, check that the power switch on the power supply is in the off (O) position. (For a Cisco 7200 series router, see Figure 4-28. For a Cisco uBR7200 series router, see Figure 4-29.)

**Figure 4-28  Connecting DC-Input Power to a Cisco 7200 Series Router**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power switch</td>
</tr>
<tr>
<td>2</td>
<td>Ground lead service loop</td>
</tr>
<tr>
<td>3</td>
<td>Cable tie</td>
</tr>
<tr>
<td>4</td>
<td>DC power leads</td>
</tr>
</tbody>
</table>

Statement 322

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

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**Step 1**
Ensure that the –V and +V leads are carrying no current.

**Step 2**
At the rear of the router, check that the power switch on the power supply is in the off (O) position. (For a Cisco 7200 series router, see Figure 4-28. For a Cisco uBR7200 series router, see Figure 4-29.)
Step 3  
If necessary, use a wire stripper to strip approximately 0.55 in. (14 mm) from the –V, +V, and ground leads. (See Figure 4-30.)

**Figure 4-30**  
Stripping the DC-Input Leads

| 1  | 0.55 in. (14 mm) |

**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.
Step 4  Insert the ground lead.

- For Cisco 7200 series 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. (See Figure 4-28.)

- For Cisco uBR7200 series routers, 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 4-29.)

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 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 you insert the lead into its receptacle, remove the lead, use the wire stripper to cut the stripped end of the lead, and repeat Step 3 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.

- For the Cisco 7200 series, use the cable tie you saved earlier in removing the DC-input leads to secure the three leads.

Note  For a Cisco 7200 series router, 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 4-28.)

- For a Cisco uBR7200 series router, run the +V and –V leads between the two strain-relief studs on the power supply faceplate. (See Figure 4-29.)

Note  A service loop is not required in the lead attached to the grounding lug on Cisco uBR7200 series routers because this lead is separate from the +V and –V leads and is secured by two M5 nuts to the M5 receptacles.

Step 7  For Cisco uBR7200 series routers, replace the strain-relief cover over the +V and –V leads, and using the 7-mm wrench or nut driver (or adjustable wrench), secure the cover to the strain-relief studs with the two M4 nuts. (See Figure 4-31.)
Step 8

Restore current to the +V and –V leads.

Note

For 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.

For Cisco uBR7200 series routers, each DC-input power supply rating is 14A, 700 volt amperes (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 9

Repeat Step 1 through Step 8 if a second power supply is installed.
This completes the steps for connecting DC-input power to a Cisco 7200 series router or a Cisco uBR7200 series router.

## Powering Up the Router

To power up a Cisco 7200 series router or a Cisco uBR7200 series router that has an installed AC-input or DC-input 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 or retention clip is in the locked position.
- The network processing engine or network services 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 modem card is inserted in its slot, and its respective captive installation screws are tightened (Cisco uBR7200 series routers only).
- A CompactFlash Disk, Flash Disk, or PC card is installed in its PC card slot (if present).
- 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 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).
- For installed DC-input power supplies, 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 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 will enter 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 will 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.

**Note** After powering on the router, wait a minimum of 30 seconds before powering it off again.
Verifying a Successful Boot

After you have turned on the power switch, the router boots. If the following steps occur, you have verified that a successful boot process has occurred.

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

Step 1
Check that the green OK LED on the power supply turns on.

Step 2
Listen for the fans; you should immediately hear them operating.

Step 3
During the boot process, observe the system’s LEDs. The LEDs on most of the port adapters and the Cisco uBR7200 series cable modem cards go on and off in irregular sequence. Some may go on, go out, and go on again for a short time. On the I/O controller, the IO power OK LED comes on immediately, on the NPE-G1, the POWER OK LED comes on immediately and stays on, and on the NPE-G2, the PWR OK LED comes on immediately and stays on.

Step 4
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, Cisco uBR7200 series cable modem cards, 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 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), Version 11.1(17)CA [smith 100]
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Sun 21-Apr-98 04:10 by smith

If the system fails to boot properly, or if the console terminal displays a checksum or memory error, check the following:

- Ensure that all SIMMs, DIMMs, or SODIMMs are installed correctly. If necessary, shut down the system and remove the I/O controller or the network processing engine or network services engine. Check the SIMMs, DIMMs, or SODIMMs by looking straight down on them and then at eye level. The SIMMs or DIMMs should all be aligned at the same angle and the same height when properly installed. If a SIMM, DIMM, or SODIMM appears to stick out or rest in the socket at a different angle from the others, remove the SIMM, DIMM, or SODIMM and reinsert it. Then replace the I/O controller or the network processing engine or network services engine and reboot the system for another installation check.

- Each DRAM SIMM bank must contain SIMMs of the same size and speed or the system will not operate. SIMMs must be 60 ns or faster. The speed is silk-screened along one edge of the SIMM.

- Each SDRAM SODIMM bank must contain SODIMMs of the same size and type and both sockets must be populated, or the system will not operate.

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.

This completes the procedures for reconnecting input power and powering up the router.
Removing and Replacing an AC-Input or DC-Input Power Supply

The weight of power supplies installed in a Cisco 7200 series router might make it difficult for you to pull the network processing engine or network services engine from its chassis slot. If this is the case, consider removing installed power supplies from the chassis and then removing the network processing engine or network services 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- and DC-input power supplies in the same router.

Removing a Power Supply

The steps for removing an AC-input or 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.

**Step 2**
Make sure no current is flowing through the DC –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. (See the “Powering Down the Router” section on page 4-2.)

**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 power supply. (See Figure 4-32.)

If the router is not installed in a standard 19-inch, four-post or two-post 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 power supply. If a rack fixture is obstructing access to the power supply, proceed to Step 4.
**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 power supply.

**Step 7**
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 router 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 8**
Repeat Step 1 through Step 7 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. Proceed to the following section, “Replacing a Power Supply.”
Replacing a Power Supply

To replace an AC-input or DC-input power supply in a Cisco 7200 series router, complete the following steps:

**Step 1** Make sure the power switch on the power supply is in the off (O) position. (See Figure 4-1 for AC and Figure 4-5 for DC.)

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

**Step 2** Grasp the power supply handle with one hand and place your other hand underneath the power supply for support. (See Figure 4-33.)

![Figure 4-33 Holding the Power Supply—Cisco 7200 Series AC-Input Power Supply Shown](image)

**Step 3** Align the power supply with the power supply bay.

**Step 4** Slide the power supply completely into the power supply bay until its faceplate is flush with the rear panel of the router.

*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 power 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.

**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 out of 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.

⚠️ 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.

This completes the power supply replacement procedure.
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