CHAPTER 2

SDRAM and DRAM Memory Systems Overview

Product Numbers: MEM-NPE-32MB=, MEM-NPE-64MB=, MEM-NPE-128MB=, MEM-SD-NPE-32MB=, MEM-SD-NPE-64MB=, MEM-SD-NPE-128MB=, MEM-SD-NSE-256MB=, MEM-NPE-400-128MB=, MEM-NPE-400-256MB=, MEM-NPE-400-512MB=, NPE-100=, NPE-150=, NPE-175=, NPE-200=, NPE-225=, NPE-300=, NPE-400=, NSE-1=, NPE-G1=, UBR7200-NPE-G1=, NPE-G2=, UBR7200-NPE-G2

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-G1or 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 rocessor.

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

Router Platform	NPE-G2	NPE-G1	NSE-1	NPE-400	NPE-225
Cisco 7200 series					
• Cisco 7204VXR, Cisco 7206VXR	Yes	Yes	Yes	Yes	Yes
• Cisco 7202, 7204, and 7206	No	No	No	No	Yes
Cisco AS5800					
• Cisco 7206VXR router shelf	No	No	No	Yes	—
• Cisco 7206 router shelf	No	No	No	No	—

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)

Router Platform	NPE-G2	NPE-G1	NSE-1	NPE-400	NPE-225
Cisco uBR7200 series					
• Cisco uBR7246VXR	Yes[1]	Yes[2]	No	Yes	Yes
• Cisco uBR7246	No	No	No	No	Yes

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

Router Platform	NPE-300	NPE-200	NPE-175[1]	NPE-150	NPE-100
Cisco 7200 series					
• Cisco 7204VXR, Cisco 7206VXR	Yes	Yes	Yes	Yes	Yes
• Cisco 7202, 7204, and 7206	No	Yes	Yes	Yes	Yes
Cisco AS5800					
• Cisco 7206VXR router shelf	Yes	Yes	—	—	—
• Cisco 7206 router shelf	No	Yes	—	—	—
Cisco uBR7200 series					
• Cisco uBR7246VXR	Yes	No	No	No	—
• Cisco uBR7246	No	Yes	No	Yes	—

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, Flask 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:

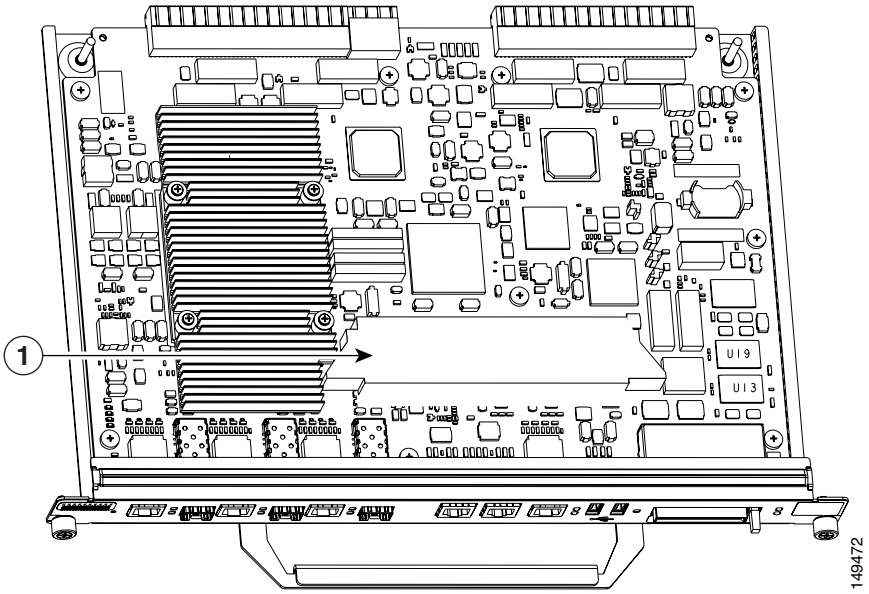
- NPE-G2 and UBR7200-NPE-G2 Memory Information, page 2-5
- NPE-G1 and UBR7200-NPE-G1 Memory Information, page 2-6
- NSE-1 Memory Information, page 2-8
- NPE-400 Memory Information, page 2-10
- NPE-300 Memory Information, page 2-11
- NPE-225 and NPE-175 Memory Information, page 2-14
- NPE-200 Memory Information,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



1	DIMM		

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

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

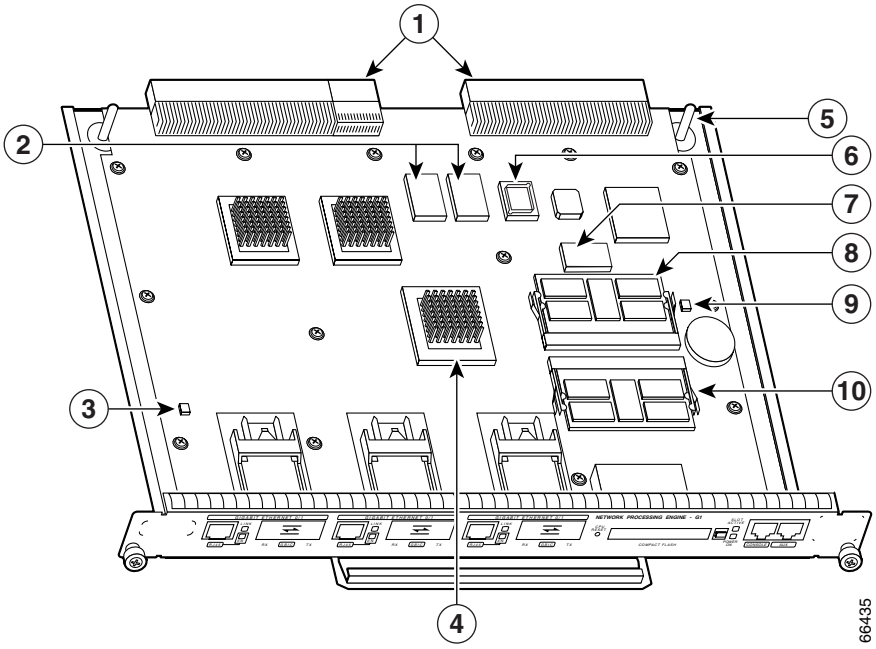
Table 2-4 NPE-G2 SDRAM DIMM Configuration—Configurable Memory Only

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

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



1	Midplane connectors	**6**	Boot ROM (U1)
2	Flash memory	**7**	NVRAM (U7)
3	Temperature sensor	**8**	SODIMM 2 (J4)
4	BCM 1250 processor (U22)	**9**	Temperature sensor
5	Keying post	**10**	SODIMM 1 (J3)

Table 2-5 NPE-G1 and UBR7200-NPE-G1 Processor and Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-G1 Board
SDRAM	128MB, 256MB, 512 MB	2	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)	J3 and J4
Boot ROM	512 KB	1	Reprogrammable Boot ROM for the ROM monitor program	U1
Flash memory	16 MB	1	Contains the default boot helper (boot loader) image[1]	U25 and U26
NVRAM	512 KB	1	Nonvolatile EPROM for the system configuration file	U7
Primary cache	32 KB (16 KB instruction, 16 KB data)	—	BCM 1250 processor internal cache	U22
Secondary cache	512 KB	—	BCM 1250 system unified, internal cache	U22

1. The NPE-G1 and UBR7200-NPE-G1 processors contain different boothelper 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

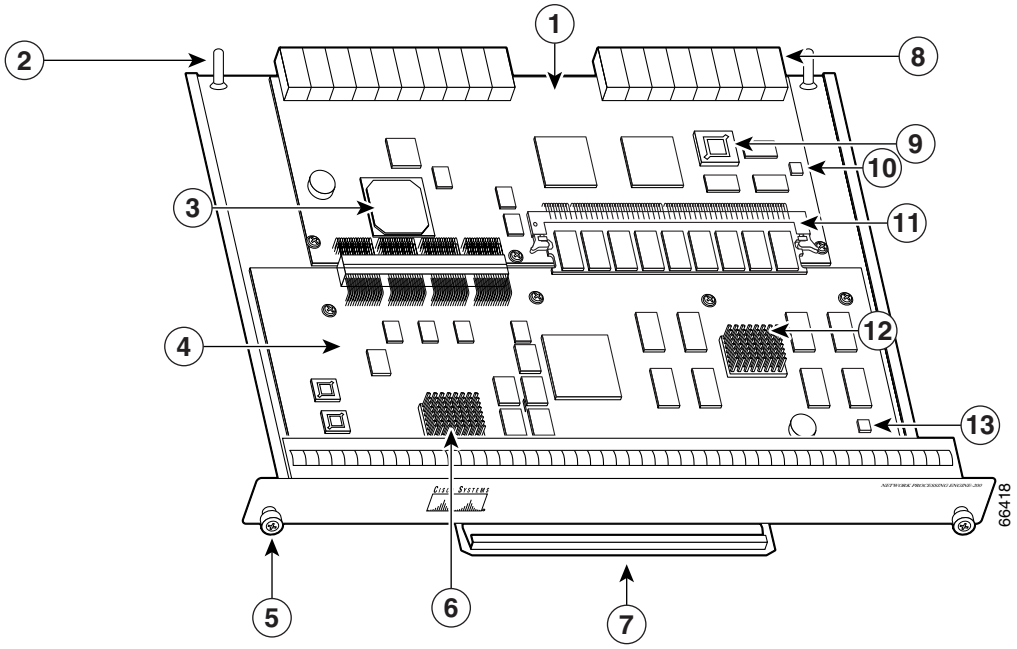
Total SDRAM	Bank[1]	Quantity	Product Number
256 MB (default)	J3 and J4	2 128-MB SODIMMs	MEM-NPE-G1-256MB
512 MB	J3 and J4	2 256-MB SODIMMs	MEM-NPE-G1-512MB
1 GB	J3 and J4	2 512-MB SODIMMs	MEM-NPE-G1-1GB

1. 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



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

Table 2-7 NSE-1 Processor and Memory Specifications

Processor	Memory Type	Size	Quantity	Description	Component Location on the NSE-1 Board
RM7000 processor	—	—	1	262-MHz RM7000 RISC	U22
PXF processor	—	—	1	—	U34
	SDRAM	128, 256 MB	1	128- or 256-MB DIMM	U15
	Boot ROM	512 KB	1	OTP[1] ROM for the ROM monitor program	U1

Table 2-7 NSE-1 Processor and Memory Specifications (continued)

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

1. OTP = one time programmable

Table 2-8 NSE-1 SDRAM Configurable Memory

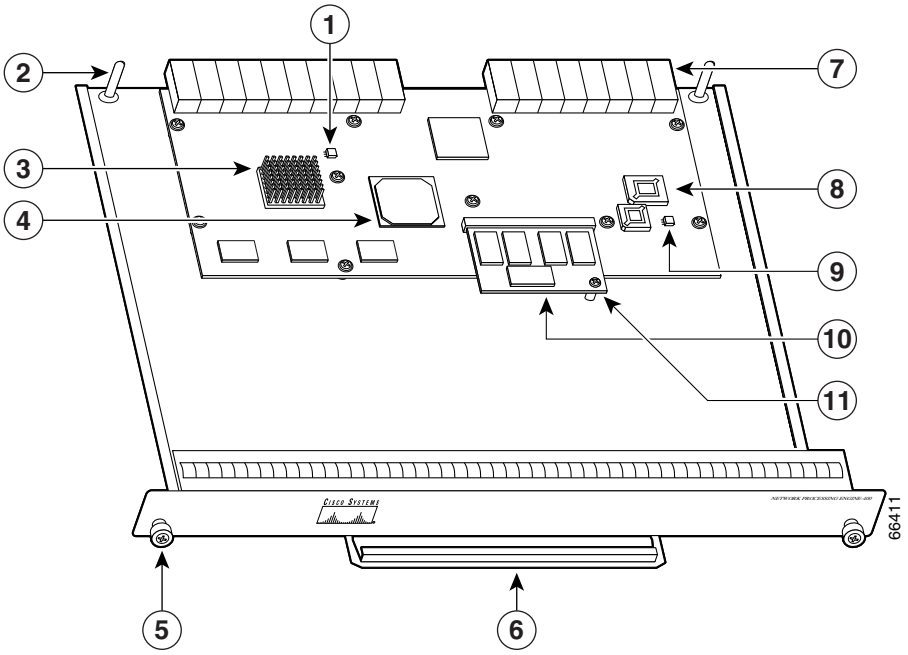
Total SDRAM	SDRAM Bank	Quantity	Product Number
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB
256 MB	U15	1 256-MB DIMM	MEM-SD-NSE-256MB

NPE-400 Memory Information

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

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

Figure 2-4 NPE-400



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

Table 2-9 NPE-400 Processor and Memory Specifications

Memory Type	Size	Quantity	Description	Component Location on the NPE-400 Board
SDRAM-configurable	128, 256, or 512 MB	1	128-, 256-, or 512-MB SODIMM	J1
Boot ROM	512 KB	1	OTP ROM for the ROM monitor program	U7
Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor integrated cache	U38

Table 2-9 NPE-400 Processor and Memory Specifications (continued)

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

Table 2-10 NPE-400 SDRAM Configurable Memory

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

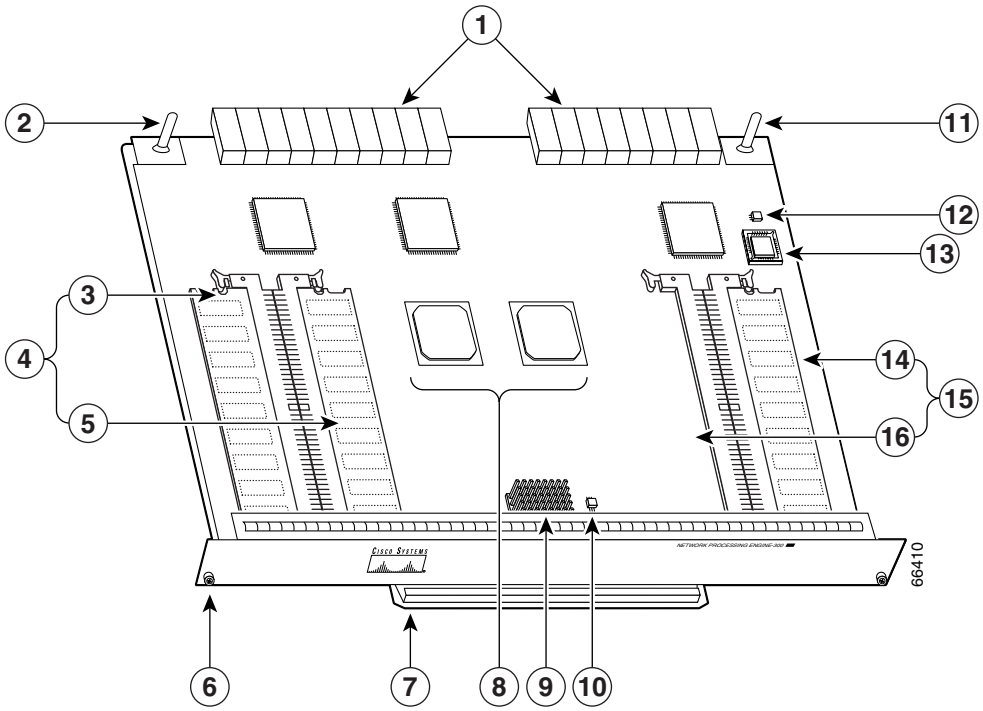
NPE-300 Memory Information

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.

Figure 2-5 NPE-300



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

Table 2-11 NPE-300 Processor and Memory Specifications

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-300 Board
RM7000	—	—	1	262-MHz RM7000 RISC	U49
	Fixed SDRAM	32-MB	1	32– MB DIMM	Bank 0[1]: U16
	Configurable SDRAM	32 to 256 MB	1 configurable bank with 2 SDRAM slots	32-, 64-, 128-, or 256-MB DIMMs (based on maximum SDRAM required)	Bank 1: U45 and U44
	Boot ROM	512 KB	1	OTP[2] ROM for the ROM monitor program	Socket U1[3]

Table 2-11 NPE-300 Processor and Memory Specifications (continued)

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-300 Board
	Primary cache	16 KB (instruction), 16 KB (data)	—	RM7000 processor internal cache	U49
	Secondary cache	256 KB (unified instruction and data)	—	RM7000 processor unified, internal cache	U49
	Tertiary cache	2 MB (fixed)	—	RM7000 processor external cache	U7, U8, U9, U10, U17

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

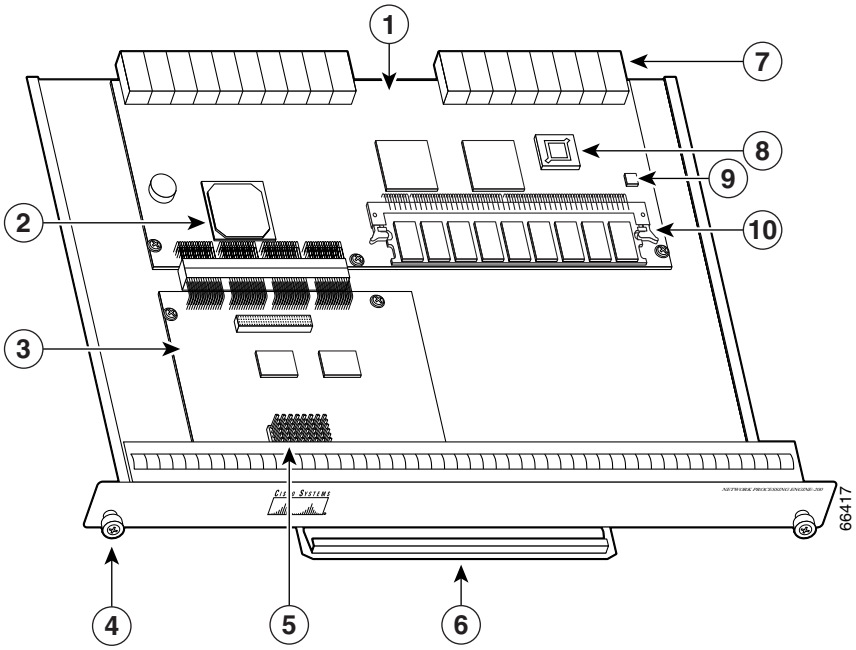
Total SDRAM[1]	SDRAM Bank 1[2]	Quantity	Product Number[3]
32 MB[4] + 32 MB	U45 (DIMM slot 2 only)	1 32-MB DIMM	MEM-SD-NPE-32MB
32 MB[4] + 64 MB	U45 and U44 or U45	2 32-MB DIMMs or 1 64-MB DIMM	MEM-SD-NPE-32MB MEM-SD-NPE-64MB
32 MB[4] + 128 MB	U45 and U44 or U45	2 64-MB DIMMs or 1 128-MB DIMM	MEM-SD-NPE-64MB MEM-SD-NPE-128MB
32 MB[4] + 256 MB	U45 and U44 or U45	2 128-MB DIMMs or 1 256-MB DIMM	MEM-SD-NPE-256MB MEM-SD-NSE-256MB

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

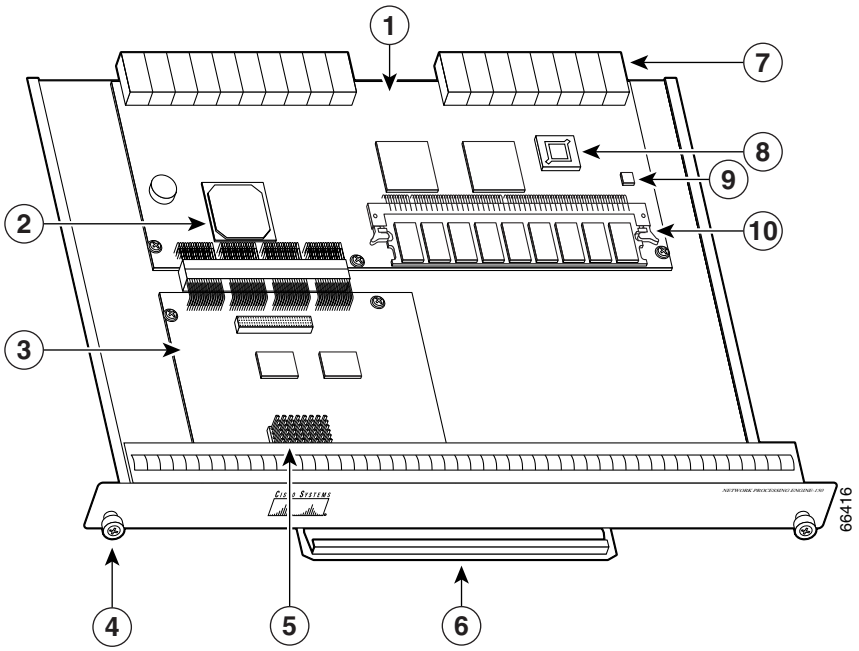
Use the following figure and tables for information about the NPE-225 and NPE-175 memory location, specifications, and configurations.

Figure 2-6 NPE-225



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

Figure 2-7 NPE-175



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

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

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-175 and NPE-225 Board
NPE-175 - R5270	—	—	1	R5270 200-MHz RISC[1]	U4
NPE-225 - R5271	—	—	1	R5271 262-MHz RISC	U4
	SDRAM	64, 128, or 256 MB[2]	1 configurable bank with 1 SDRAM slot	DIMM	U15
	Boot ROM	512 KB	1	OTP[3] ROM for the ROM monitor program	U1

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

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

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

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

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

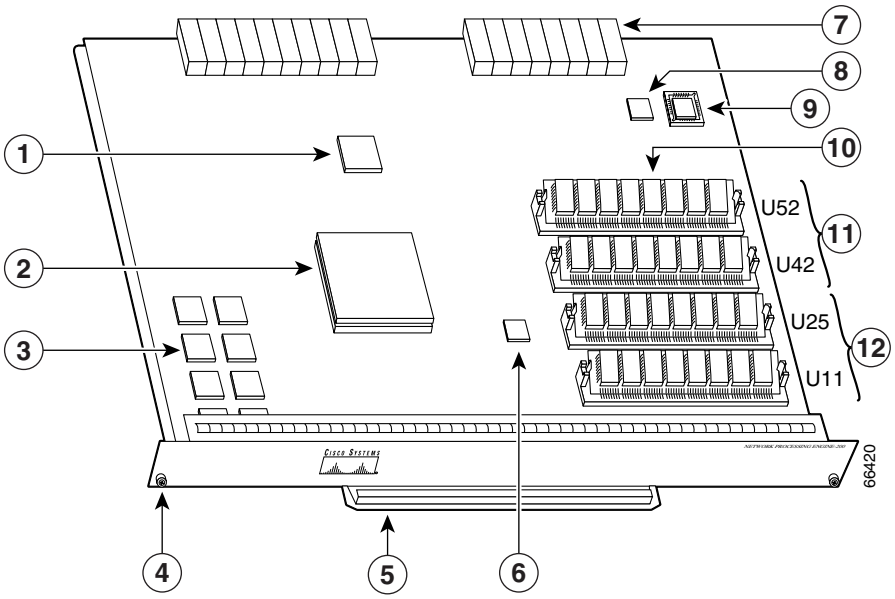
Total SDRAM	SDRAM Bank	Quantity	Product Number
64 MB	U15	1 64-MB DIMM	MEM-SD-NPE-64MB
128 MB	U15	1 128-MB DIMM	MEM-SD-NPE-128MB

NPE-200 Memory Information

Note To prevent DRAM errors in the NPE-200and 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.

Figure 2-8 NPE-200



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

Table 2-16 NPE-200 Processor and Memory Specifications

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-200 Board
R5000			1	R5000 200-MHz RISC[1]	U44
	DRAM[2]	32 to 128 MB	2 to 4	16- or 32-MB SIMMs (based on maximum DRAM required)	Bank 0: U11 and U25 Bank 1: U42 and U52
	SRAM[3]	4 MB	8	8 chips, each being 512 KB x 8 bits wide	U6, U10, U13, U14, U28, U29, U38, and U39
	Boot ROM[4]	256 KB	1	EPROM[5] for the ROM monitor program	U92
	Primary cache	—	—	R5000 internal cache	U44

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

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

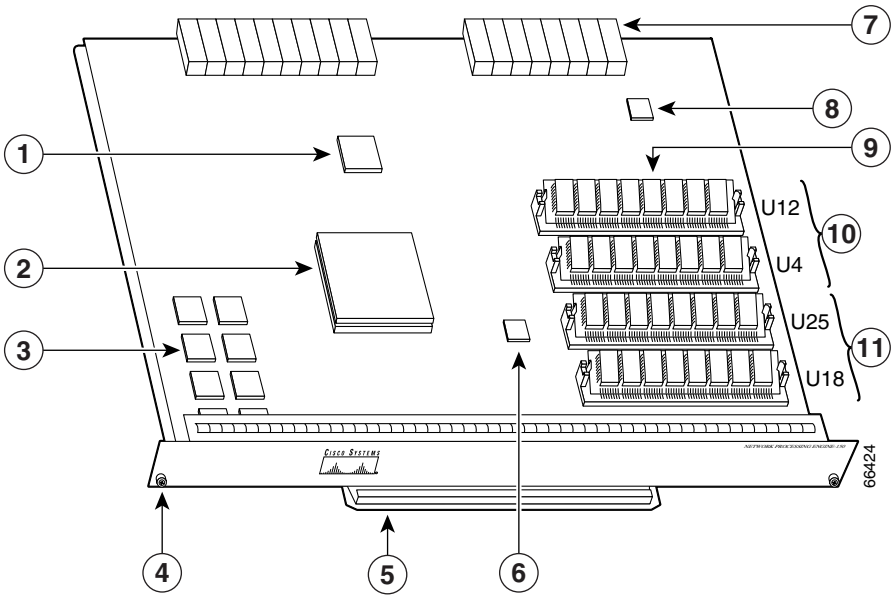
1. Refer to the Cisco AS5800 Universal Access Server documentation listed on Ciso.com for Cisco AS5800 Universal Access Server DRAM options.
2. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order Product Number MEM-NPE-64MB=.

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

Table 2-18 NPE-150 Processor and Memory Specifications

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-150 Board
R4700			1	R4700 150-MHz RISC[1]	U201
	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

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

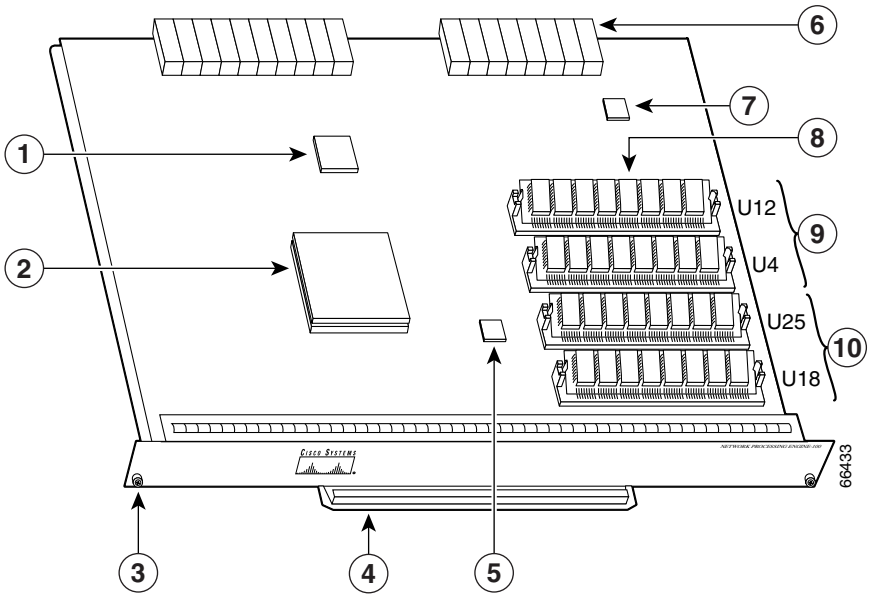
1. Refer to the Cisco AS5800 Universal Access Server documentation listed on Cisco.co m for Cisco AS5800 Universal Access Server DRAM options.
2. These products are also available as DRAM upgrades. For example, to upgrade a network processing engine from 32 MB to 64 MB of DRAM, order Product Number MEM-NPE-64MB=.

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.

Figure 2-10 NPE-100



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

Table 2-20 NPE-100 Processor and Memory Specifications

Processor	Memory Type	Size	Quantity	Description	Component Location on the NPE-100 Board
R4700			1	R4700 150-MHz RISC[1]	U201
	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
	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

Table 2-21 NPE-100 DRAM Configurable Memory

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

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