Doc. No. 78-0998-04

Upgrading Memory in the Cisco 4000 and Cisco 4000-M

Product Numbers: MEM-NP4S=, MEM-NP16M=, MEM-NP4M-M=, MEM-NP8M-M=, MEM-NP16M-M=, MEM-NP32M-M=, and MEM-NP8F-M=

This document describes upgrade and replacement procedures for the main, shared, and Flash memory for the memory-enhanced Cisco 4000-M and the main and shared memory for the original Cisco 4000. Read this entire publication before upgrading your system. This publication contains the following sections which step you through the upgrade procedures:

- Safety Recommendations
- Safety with Electricity
- Required Tools
- SIMM Replacement Overview
- Accessing the Internal Components of the Router
- Removing Network Processor Modules
- Removing the Flash EPROM Memory Card in the Cisco 4000
- Removing Main Memory SIMMS
- Inserting Main Memory SIMMs
- Removing Shared Memory SIMMs
- Inserting Shared Memory SIMMs
- Upgrading Flash Memory in the Cisco 4000-M
- Reinstalling the Flash EPROM Card
- Replacing Network Processor Modules
- Replacing the Component Tray

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- Replacing the Final Connections to the Router
- Cisco Connection Online

Figure 1 shows the front panel of the Cisco 4000-M. The Cisco 4000-M front panel reads *Cisco 4000 Series*; the original Cisco 4000 front panel reads *Cisco 4000*. In addition, the Cisco 4000-M rear label reads *Cisco 4000-M*.

Figure 1 Memory-Enhanced Cisco 4000 Series Router (Cisco 4000-M)—Front View

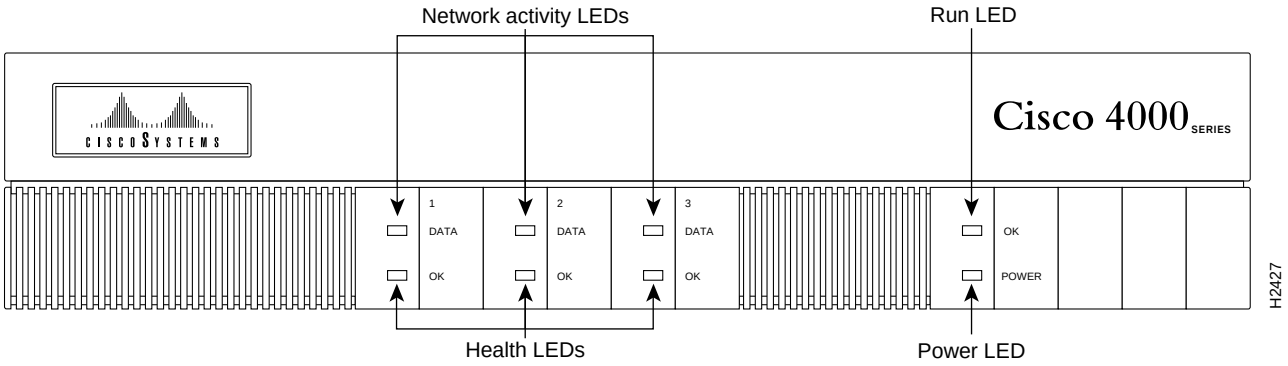


Table 1 lists comparisons of the original Cisco 4000 and the Cisco 4000-M.

Table 1 Comparison of Cisco 4000 Series Routers

Memory Feature	Cisco 4000-M	Cisco 4000
Main Memory (CPU-Local DRAM)[1]	4, 8, 16, 32 MB	4 or 16 MB
Flash Memory	4 or 8 MB	2 or 4 MB
Shared Memory	4 MB	1 or 4 MB

1. CPU—Central Processing Unit. DRAM—Dynamic random-access memory.

Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.

Note All warnings in this document appear in multiple languages in the appendix "Translated Safety Warnings" in the *Cisco 4000 Series Installation Guide*.

Caution To avoid damaging electrostatic discharge (ESD)–sensitive components, ensure that you have discharged all static electricity from your body before opening the chassis. Before performing the procedures described in this document, review the following sections "Safety Recommendations" and "Safety with Electricity."

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Put the removed chassis cover in a safe place. Keep tools away from walk areas where you or others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

Safety with Electricity

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or can weld to the terminals.

Follow these guidelines when working on equipment powered by electricity:

- Locate the emergency power-off switch in the room in which you are working. Then, if an electrical accident occurs, you can act quickly to shut the power OFF.
- Before working on the system, turn OFF the power and unplug the power cord.
- Disconnect all power before doing the following:
  - Installing or removing a chassis
  - Working near power supplies
  - Accessing internal components of the router
- Never assume that power is disconnected from a circuit. Always check.
- Do not work alone if potentially hazardous conditions exist.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn OFF power to the system.
  - If possible, send another person to get medical aid. Otherwise, assess the victim’s condition and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

ESD can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures.

Always follow ESD prevention procedures when removing and replacing cards. Ensure that the chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively.

If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Required Tools

The following tools are required to remove and upgrade main, shared, Flash, and ROM monitor memory.

- ESD cord and wrist strap
- Number 1 and Number 2 Phillips screwdrivers

In addition, the ROM monitor device upgrade requires the following:

- EPROM removal tool or small flat-blade screwdriver

Proceed to the next section, “SIMM Replacement Overview.”

SIMM Replacement Overview

The Cisco 4000 and Cisco 4000-M contain two DRAM memory systems. One is the shared memory, which is the interface that the network processor modules send data to or transmit data from, and the second is the primary or main memory, which is reserved for the CPU. This document describes the procedure for upgrading both memory systems.

Caution To avoid damaging ESD-sensitive components, observe all ESD precautions. To avoid damaging the underlying system card, avoid excessive force when removing or replacing SIMMs.

The Cisco 4000 main memory upgrade requires replacing the main memory configuration of 4 MB (four 1 MB SIMMs) with 16 MB of memory (four 4 MB SIMMs). The shared memory upgrade requires replacing the shared memory configuration of 1 MB (four 256 KB SIMMs) with 4 MB of memory (four 1 MB SIMMs). When replacing your DRAM SIMMs, you must fully populate all the SIMM sockets.

The Cisco 4000-M main memory upgrade requires replacing the main memory configuration of 4 MB (one 4 MB SIMM) with 8, 16, or 32 MB of memory (one 8, 16, or 32 MB SIMM). The shared memory replacement calls for you to replace the shared memory configuration of one 4 MB SIMM with another 4 MB SIMM, if necessary. The Flash memory upgrade calls for you to replace the Flash memory configuration of 4 MB (one 4 MB SIMM) with 8 MB of Flash memory (two 4 MB SIMMs).

Accessing the Internal Components of the Router

You must open the router chassis to gain access to the router’s internal components: the network processor modules, boot ROMs, and jumpers.

Refer to the previous section, “Required Tools,” for the tools needed for the following procedures.

Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages.

Warning Do not work on the system or connect or disconnect cables during periods of lightning activity.

Warning Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is off and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected.

Removing the Component Tray Procedure

Some Cisco 4000 series routers have a safety latch tab on the chassis that affects removing the component tray. (See Figure 2 and Figure 3.)

If you have a chassis with a safety latch tab, follow the procedure in the next section "Removing the Component Tray from a Chassis with a Safety Latch."

If you have a chassis without a safety latch tab, follow the procedure in the section "Removing the Component Tray from a Chassis without a Safety Latch."

Removing the Component Tray from a Chassis with a Safety Latch

Warning Before performing any of the following procedures, 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.

Take the following steps to remove the component tray from a chassis with a safety latch:

Step 1 Turn OFF the system power.

Step 2 Attach your ESD-preventive wrist strap.

Step 3 Remove all network and power cables.

Step 4 If you have a DC-powered router, take the following steps to remove the power cables:

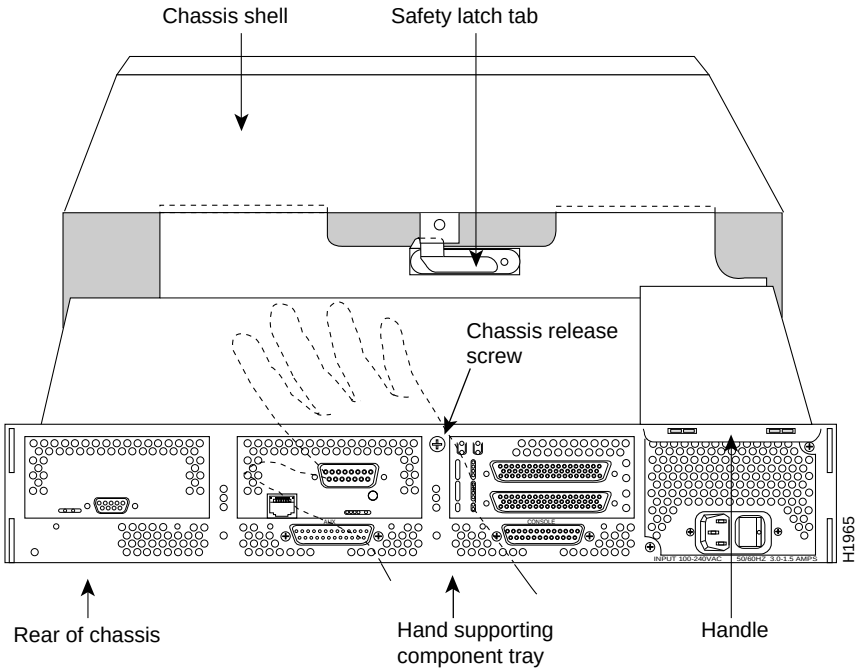
- Use a screwdriver to loosen the captive installation screws on the terminal block cover.
- Lift and remove the terminal block cover.
- Use a screwdriver to remove the three power leads from the terminal block in the following order: negative, positive, then ground.

Step 5 Loosen the nonremovable chassis release screw on the rear panel of the chassis. (See Figure 2.)

Step 6 Pull on the handle located on the upper right corner of the chassis to slide the component tray out of the chassis shell until the safety latch catches. (See Figure 2.)

Warning Before releasing the safety latch, support the component tray from underneath, either on your work surface or with your hands, to prevent personal injury. (See Figure 2.)

Figure 2 Component Tray Removal for Chassis with a Safety Latch



Step 7 Support the component tray with one hand, push down on the safety latch tab, and pull the component tray out completely.

Step 8 Set the component tray on your work surface.

Proceed to the next section, "Removing Network Processor Modules."

Removing the Component Tray from a Chassis without a Safety Latch

Warning Before performing any of the following procedures, 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.

Take the following steps to remove the component tray from a chassis without a safety latch:

Step 1 Turn OFF the system power.

Step 2 Attach your ESD-preventive wrist strap.

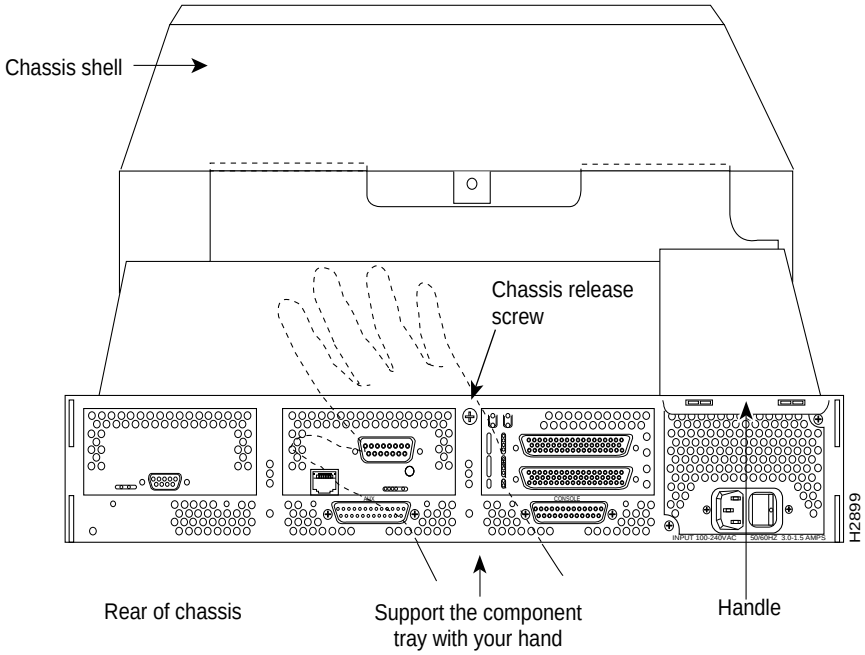
Step 3 Remove all network and power cables.

Step 4 If you have a DC-powered router, take the following steps to remove the power cables:

- Use a screwdriver to loosen the captive installation screws on the terminal block cover.
- Lift and remove the terminal block cover.
- Use a screwdriver to remove the three power leads from the terminal block in the following order: negative, positive, then ground.

Step 5 Loosen the nonremovable chassis release screw on the rear panel of the chassis. (See Figure 3.)

Figure 3 Component Tray Removal for Chassis without a Safety Latch



Warning Support the component tray from underneath, either on your work surface or with your hands, to prevent it from falling. (See the hand in Figure 3.)

Step 6 Pull on the handle located on the upper right corner of the chassis to slide the component tray out of the chassis shell while you support the component tray with one hand.

Step 7 Set the component tray on your work surface.

Proceed to the next section, “Removing Network Processor Modules.”

Removing Network Processor Modules

Caution Some network processor modules are mounted to the rear of the chassis with two external screws. On modules with external rear mounting screws, which include multimode FDDI modules, You must remove these screws before the module can be safely lifted out of the chassis because damage to the module could occur.

Note Other types of modules may not have the two external rear mounting screws attached to the chassis.

Take the following steps to remove a network processor module:

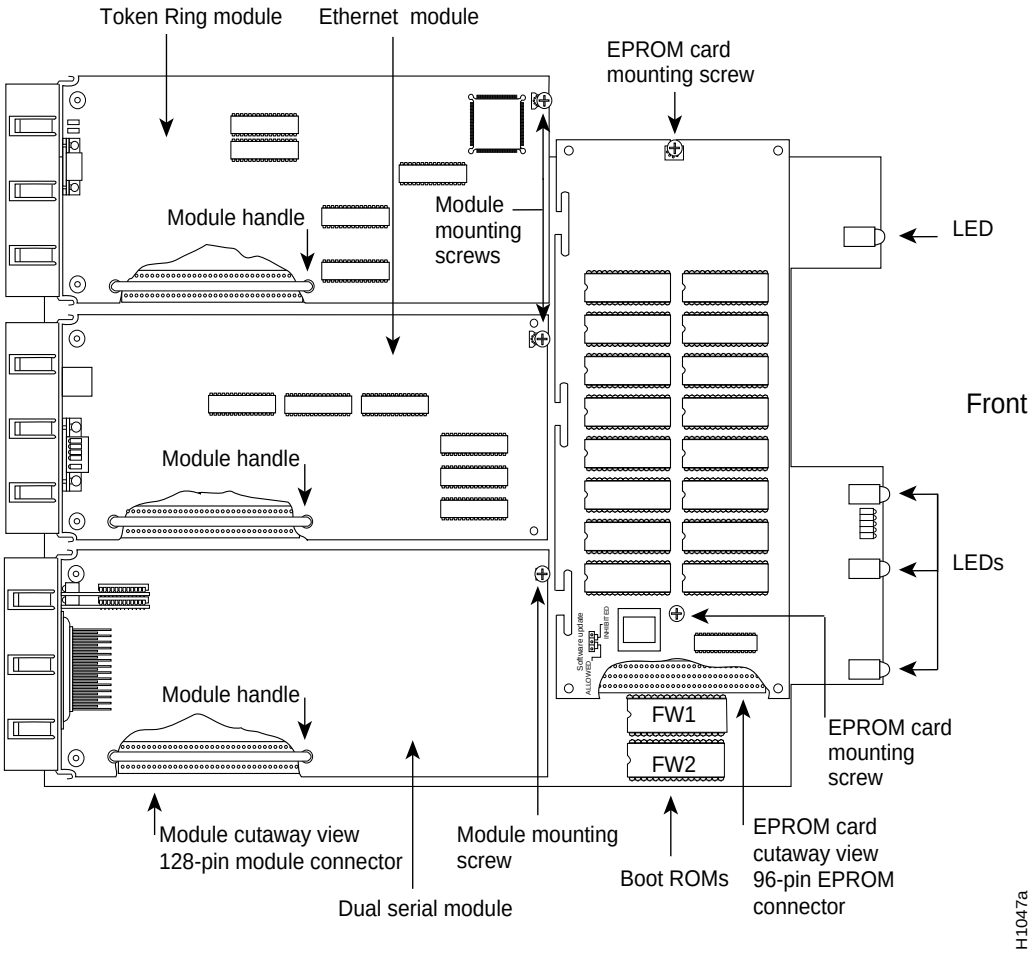
Step 1 With the component tray in front of you (as shown in Figure 4), remove the module mounting screw from the top end of the network processor module and the two external rear mounting screws if the module has them, and set the screws aside.

Step 2 To lift the module out of its connector after removing the mounting screws, grasp the network processor module handle and pull straight up. (See Figure 5.)

Caution Do not wiggle the handle when handling the network processor module, and do not exert any side-to-side pressure, because the handle might work loose and damage the network processor module.

Step 3 Place the removed module on an ESD mat.

Figure 4 Cisco 4000 Series Component Tray—Cisco 4000 Shown



Caution If any of the network processor modules have daughter cards projecting at right angles to the module (see Figure 6), be careful to not cause the module to bow during installation because the daughter cards can become disconnected. If this happens, carefully reseat the daughter card connectors by handling the card by its edges without touching any of the components on the card.

Figure 5 Network Processor Module Locations

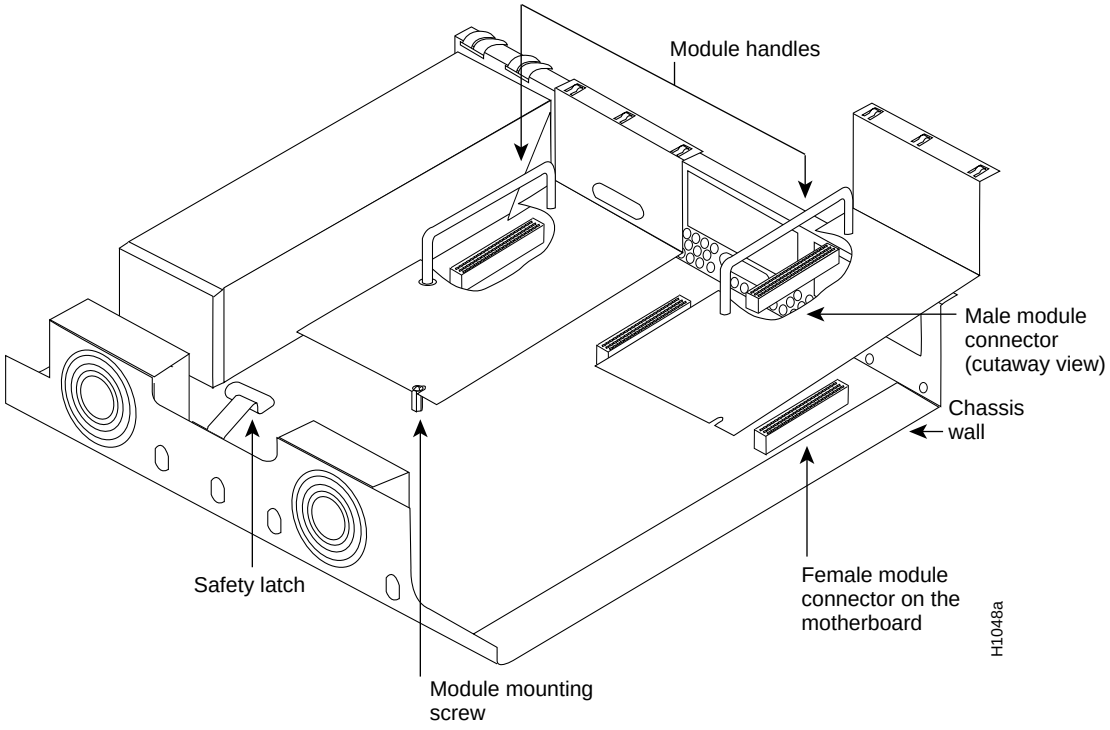
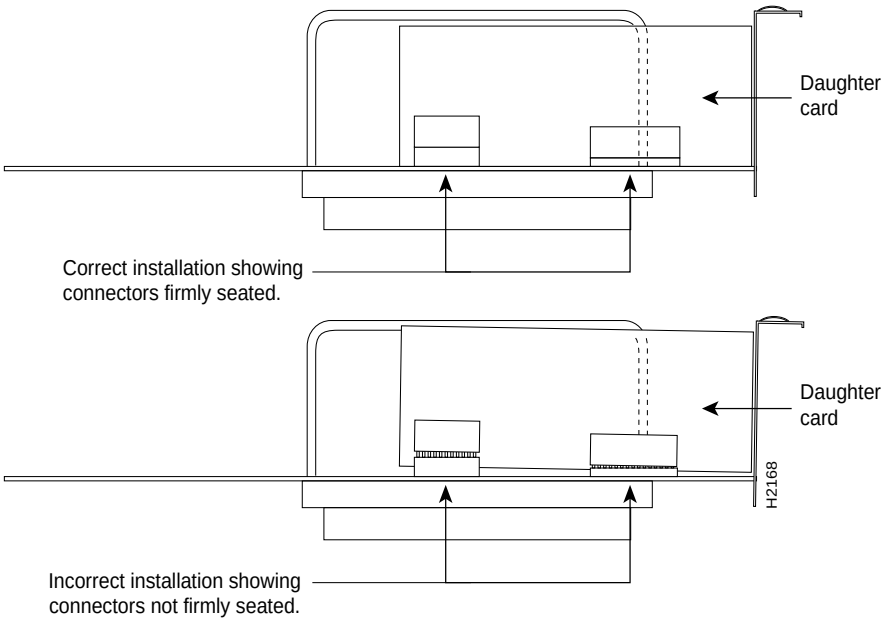


Figure 6 Network Processor Module Daughter Card Connections



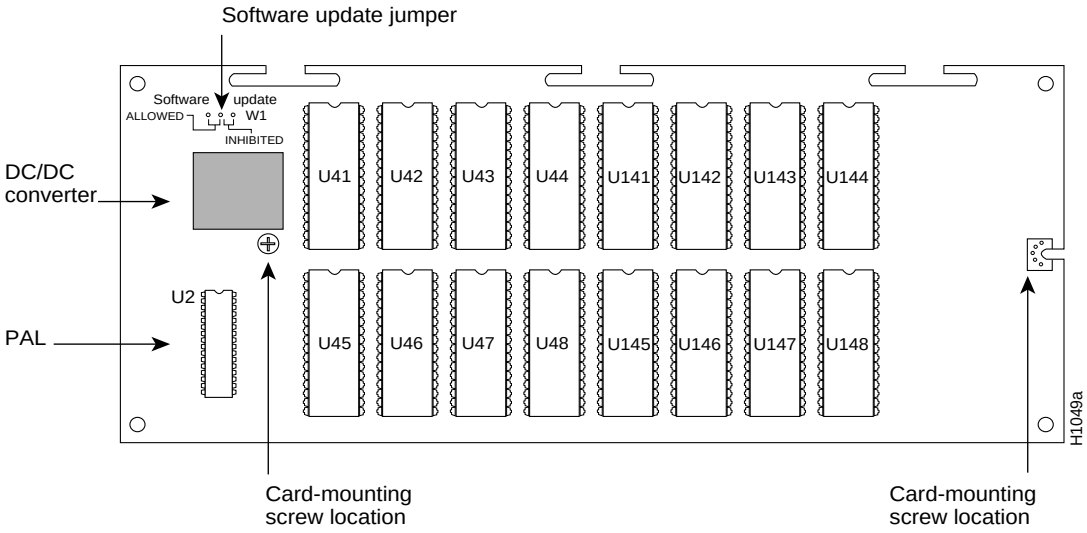
If you are upgrading main memory SIMMs in the Cisco 4000, proceed to the section "Removing the Flash EPROM Memory Card in the Cisco 4000."

If you are upgrading main memory SIMMs in the Cisco 4000-M, proceed to the section "Removing Main Memory SIMMS."

Removing the Flash EPROM Memory Card in the Cisco 4000

The Cisco 4000 contains Flash memory on a separate daughter card; the Cisco 4000-M does not. To remove or install main memory SIMMs in the Cisco 4000, first remove the Flash EPROM card. (See Figure 7.)

Figure 7 Flash EPROM Card



Take the following steps to remove the Flash EPROM card:

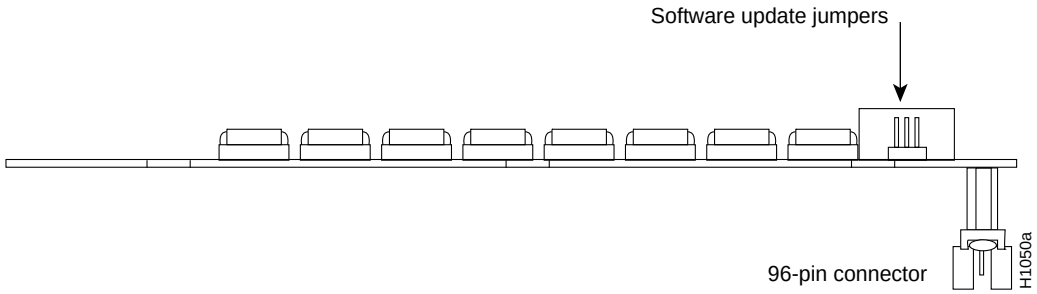
Step 1 Start with the component tray in front of you as in Figure 4. Remove the two card mounting screws from the top of the Flash EPROM card and set the screws aside.

Caution To prevent damage to the Flash EPROM card, handle it only by the sides.

Step 2 Holding the Flash EPROM card by its edges, pull straight up to lift the card out of its connector. (See Figure 8.) The main memory SIMMs will now be exposed.

Proceed to the section "Removing Main Memory SIMMS."

Figure 8 Flash EPROM Card and Connector—Side View



Removing Main Memory SIMMS

Take the following steps to remove main memory SIMMs:

Step 1 On the motherboard, locate the main memory SIMM sockets shown in the upper right corner of Figure 9 (original Cisco 4000) and Figure 11 (Cisco 4000-M). All the sockets should contain SIMMs (as shown in Figure 9 and Figure 11).

Figure 9 Original Cisco 4000 SIMM Locations

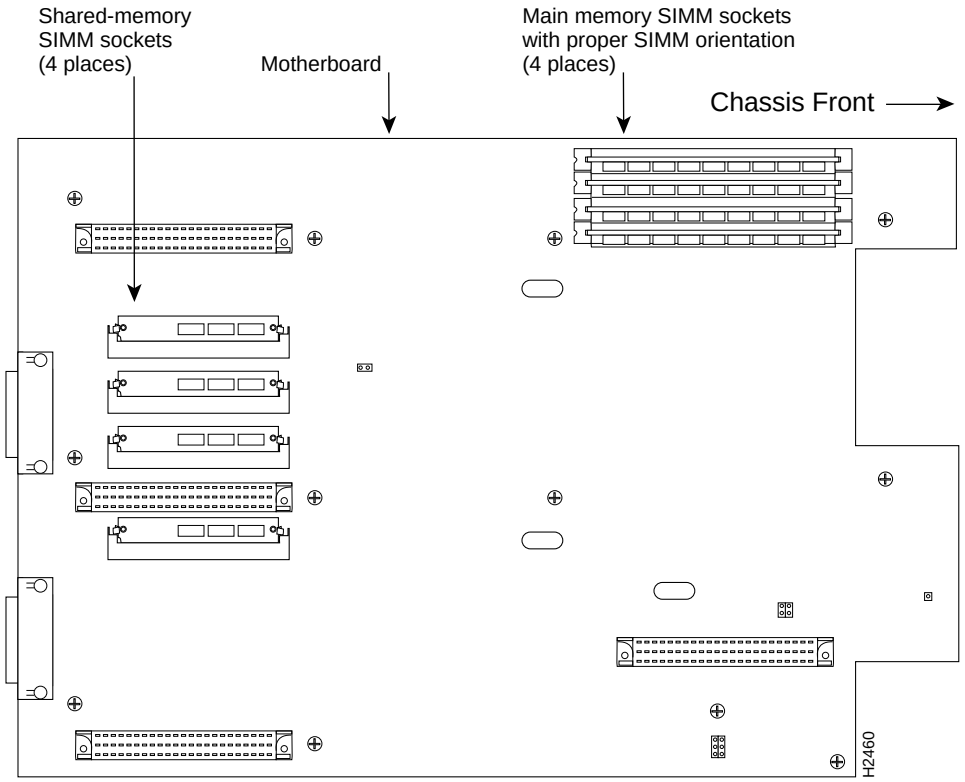


Figure 10 and Figure 12 show the polarization notch and locations of the alignment holes on a main memory SIMM. The main memory SIMMs are installed with the connector edge down and the component side facing away from the edge of the motherboard, as shown in Figure 9 and Figure 11.

Figure 10 Original Cisco 4000 Main Memory SIMM

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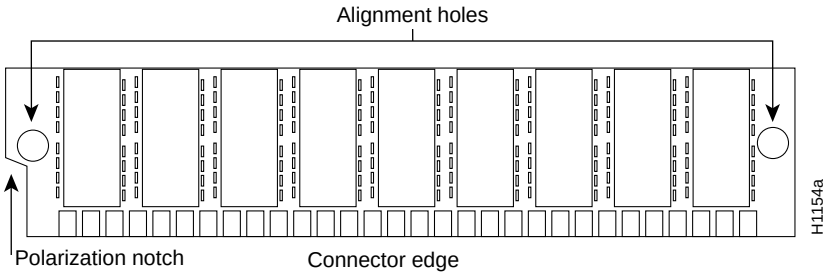


Figure 11 Cisco 4000-M SIMM Locations

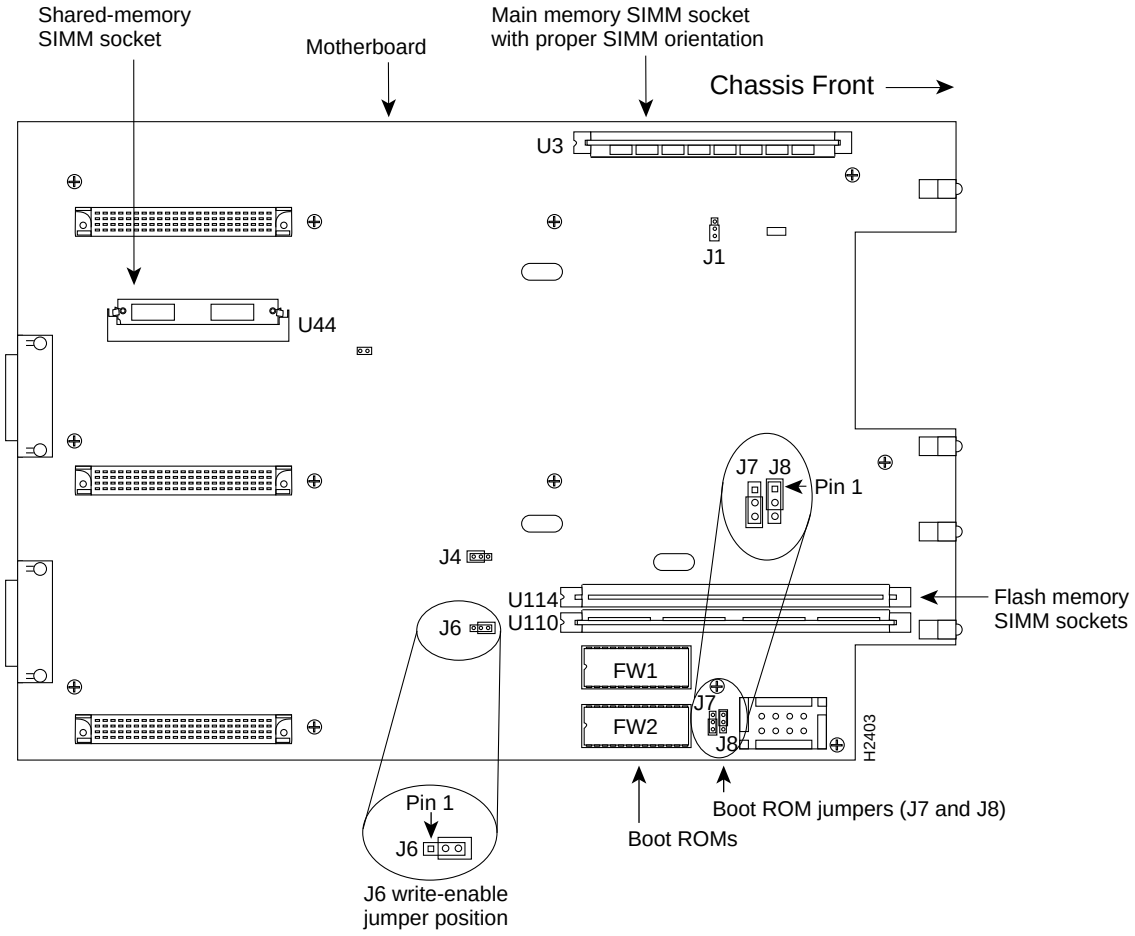
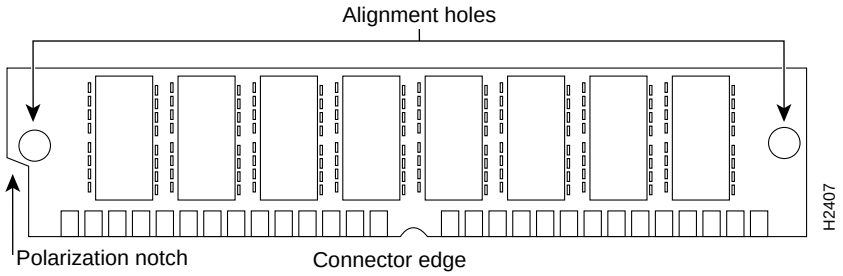


Figure 12 Cisco 4000-M Main Memory SIMM



Caution Handle SIMMs by the edges only. SIMMs are ESD-sensitive components and can be damaged by mishandling.

Step 2 Remove one SIMM at a time, beginning with the SIMM farthest from the edge of the motherboard. (The Cisco 4000-M has only one main memory SIMM.)

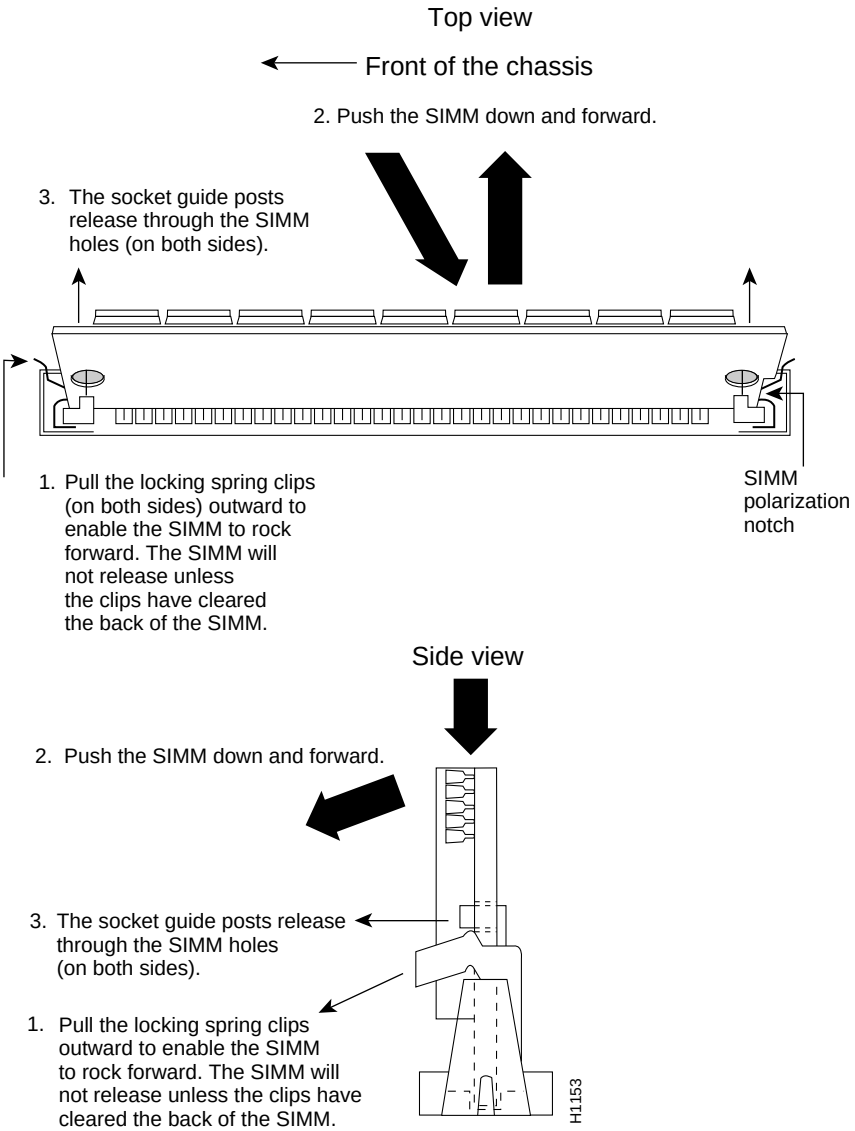
Step 3 To lift the SIMM out of its socket, pull the locking spring clips on both sides outward and tilt the SIMM free of the clips. (See Figure 13.)

Step 4 Hold the SIMM by the edges with your thumb and index finger and lift it out of the socket. Place the removed SIMM in an antistatic bag to protect it from ESD damage.

Step 5 Repeat Step 2 through Step 4 for each main memory SIMM.

Proceed to the section, “Inserting Main Memory SIMMs.”

Figure 13 Removing Main Memory SIMMs



Inserting Main Memory SIMMs

Take the following steps to install main memory SIMMs:

Step 1 On the motherboard, locate the main memory SIMM sockets shown in the upper right corner of Figure 9 and Figure 11. All the sockets should be empty. If not, follow the steps in the section, "Removing Main Memory SIMMS."

Caution Handle SIMMs by the edges only. SIMMs are ESD-sensitive components and can be damaged by mishandling.

Step 2 SIMMs are manufactured with a *polarization notch* to prevent them from being installed backwards. Hold the SIMM with the polarization notch on the right and the component side away from you with the connector edge at the bottom. (See Figure 9 and Figure 11.)

Step 3 Beginning with the SIMM nearest the edge of the motherboard on the Cisco 4000, insert the main memory SIMM at a 45-degree angle and rock it into its vertical position. (See Figure 14.) When the SIMM is properly seated, the socket guide posts will insert through the alignment holes, and the connector springs will click into place. Use the minimum amount of force required.

Caution You will feel some resistance, *but do not use excessive force on the SIMM and do not touch the surface components to avoid damaging them.*

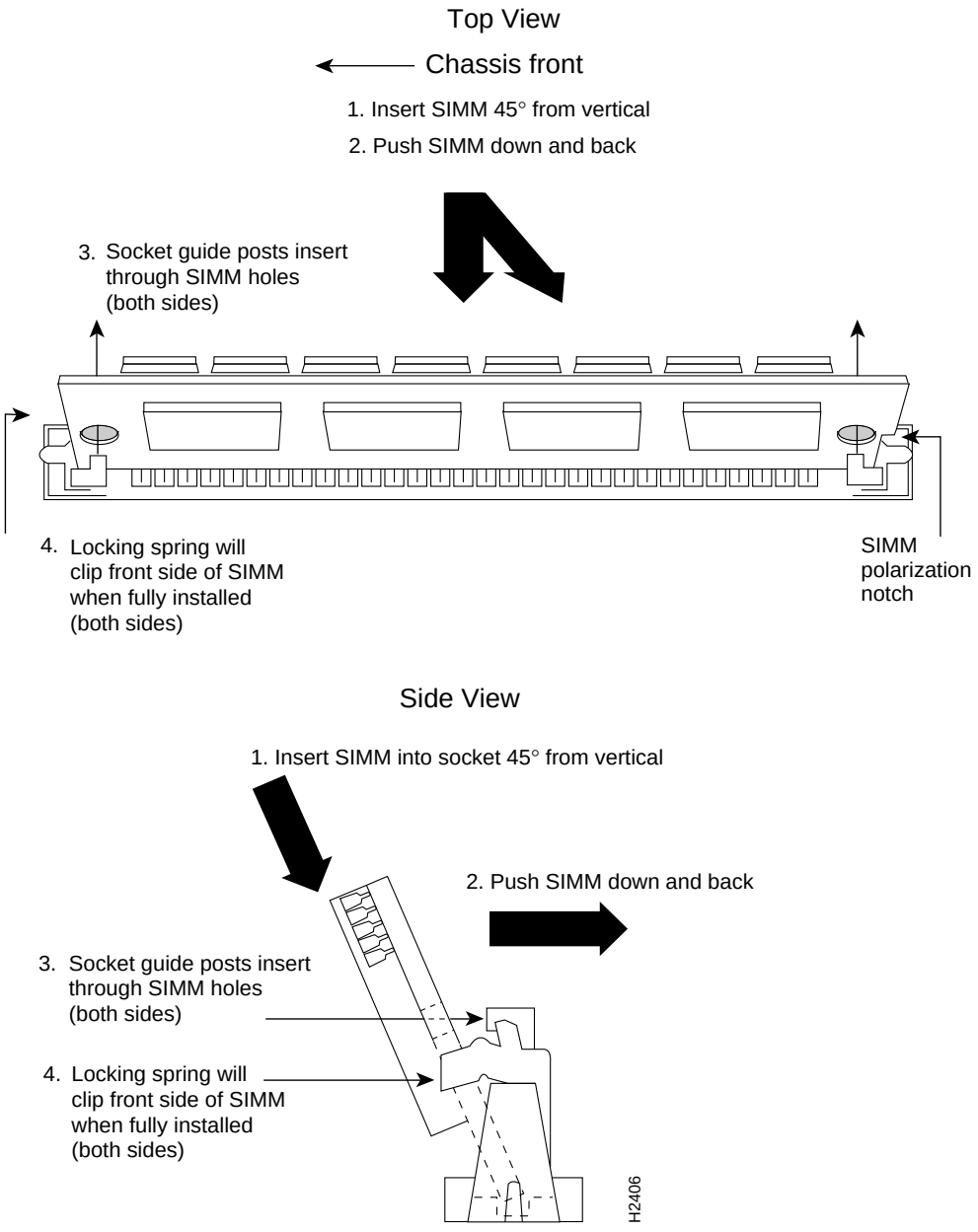
Step 4 Check the alignment of each SIMM to make sure that it is straight and that the alignment holes are lined up with the plastic tabs on the socket. (See Figure 14.)

Step 5 Repeat Step 2 through Step 4 for each main memory SIMM.

When finished with the router upgrade, proceed to the section "Reinstalling the Flash EPROM Card" or "Replacing Network Processor Modules."

If you are upgrading shared memory, proceed to the section "Removing Shared Memory SIMMs."

Figure 14 Installing Main Memory SIMMs in the Cisco 4000-M



Removing Shared Memory SIMMs

Take the following steps if you are replacing the shared memory SIMMs:

Step 1 Unplug the chassis power cord and network connections.

Step 2 Attach an ESD-preventive wrist strap and ensure that it makes good contact with your skin. Connect the equipment end of the wrist strap to the metal back plate of the chassis, avoiding contact with the connectors.

Step 3 Remove the chassis cover as described in "Accessing the Internal Components of the Router."

Step 4 Remove all installed network processor modules as described in "Removing Network Processor Modules." Safely store them for later reinstallation.

Step 5 On the motherboard, locate the shared memory SIMM sockets (four on the Cisco 4000 or one on the Cisco 4000-M) shown on the left of the motherboard. (See Figure 9 and Figure 11.) All the sockets should contain a SIMM.

Step 6 Turn the chassis so that the chassis rear is closest to you.

Step 7 The SIMMs are held in place at each end by small metal spring clasps. To remove a shared memory SIMM, push the two metal clasps apart. Angle the SIMM upward and pull it out.

Caution D*o not exert pressure on the components on the SIMM surface because it might get damage*d. The sides of the SIMM must clear the metal clasps before the SIMM can be safely removed.

Step 8 Place the removed SIMM in an antistatic bag to protect it from ESD damage.

Step 9 Repeat Step 7 through Step 8 for each SIMM.

Proceed to the section "Inserting Shared Memory SIMMs."

Inserting Shared Memory SIMMs

Take the following steps to install shared memory SIMMs:

Step 1 Unplug the chassis power cord.

Step 2 Attach an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the equipment end of the wrist strap to the metal back plate of the chassis, avoiding contact with the connectors.

Step 3 Remove the chassis cover as described in "Accessing the Internal Components of the Router."

Step 4 On the left of the motherboard, locate the shared memory SIMM socket locations. (See Figure 9 and Figure 11.) All the sockets should be empty. If not, remove the shared memory SIMMs following the procedures in the section "Removing Shared Memory SIMMs."

Step 5 Turn the chassis so that the side with the shared memory SIMMs is closest to you.

Caution Handle SIMMs by the edges only. SIMMs are sensitive components and can be shorted by mishandling.

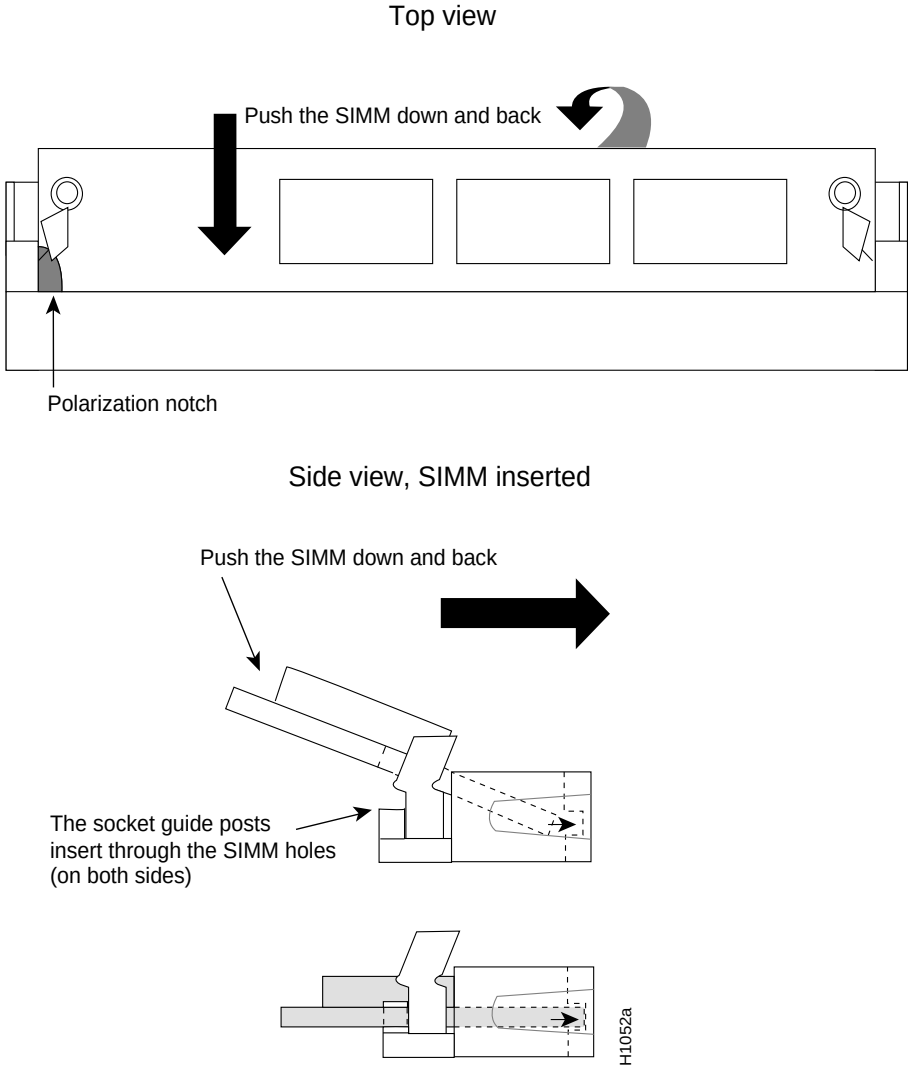
Step 6 SIMMs are manufactured with a *polarization notch* to prevent them from being installed backwards. Hold the SIMM with the connector edge at the bottom, the component side facing you, and the polarization notch on the left, as in Figure 15.

Step 7 To insert a SIMM, angle it into position, then carefully push down and back on the edges, holding each edge so that it securely snaps in place. (See Figure 15.) When it snaps into place, the two metal holders clip over the edge of the SIMM, and it sits horizontally.

Caution SIMMs can be damaged by rough handling or ESD. Also avoid damaging the SIMM socket.

Step 8 Check that the SIMM is straight and that the holes are aligned with the plastic tabs on the socket. (See Figure 15.)

Figure 15 Inserting Shared Memory SIMMs in the Cisco 4000 Series



Upgrading Flash Memory in the Cisco 4000-M

Take the following steps to add Flash memory SIMMs in the Cisco 4000-M:

Note To upgrade Flash memory to 4 MB, add a second 2 MB SIMM to the empty Flash memory socket.

Step 1 On the motherboard, locate the Flash memory SIMM sockets shown in the lower right corner of Figure 11 (Cisco 4000-M).

Caution Handle SIMMs by the edges only. SIMMs are ESD-sensitive components and can be damaged by mishandling.

Step 2 SIMMs are manufactured with a *polarization notch* to prevent them from being installed backwards. Hold the SIMM with the polarization notch on the right and the component side away from you with the connector edge at the bottom. (See Figure 16.)

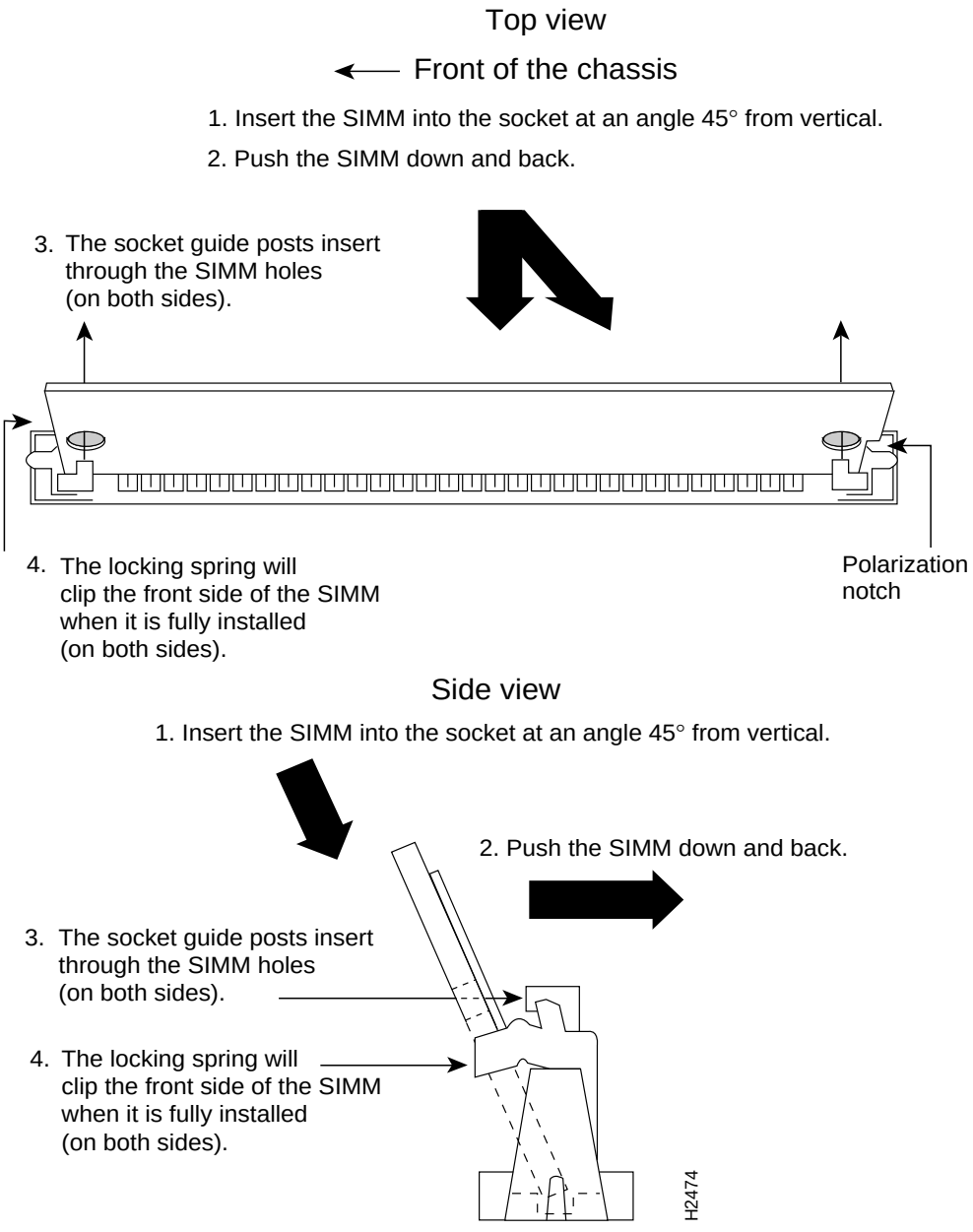
Step 3 Using Figure 16 as a guide, insert the Flash memory SIMM at a 45-degree angle and rock it into its vertical position in socket location U114. (See Figure 11.) When the SIMM is properly seated, the socket guide posts will insert through the alignment holes, and the connector springs will click into place. Use the minimum amount of force required.

Caution You will feel some resistance, *but do not use excessive force on the SIMM and do not touch the surface components to avoid damaging them.*

Step 4 Check the alignment of each SIMM to make sure that it is straight and that the alignment holes are lined up with the plastic tabs on the socket.

If you are finished with all memory upgrade procedures, proceed to the section “Replacing the Component Tray.”

Figure 16 Inserting Flash Memory SIMMs in the Cisco 4000-M



Reinstalling the Flash EPROM Card

Take the following steps to reinstall the Flash EPROM card in the Cisco 4000:

Step 1 Line up the Flash EPROM card with the 96-pin connector and screw holes. (See Figure 8.)

Step 2 Insert the Flash EPROM card into the 96-pin connector, being careful not to bend the pins.

Step 3 Reinstall the two card-mounting screws.

Caution Do not overtorque the screw. The card or the underlying motherboard could be damaged. The maximum screw torque is 7 inch-lb.

Replacing Network Processor Modules

Take the following steps to replace a network processor module:

Step 1 Hold the network processor module by its handle, align it with the grooves in the chassis (not shown) and over its connector, and push the network processor module lightly against the chassis wall. (See Figure 6.)

Step 2 Gently, without bending the connector pins, push the network processor module into place, inserting the male network processor module connector into the female network processor module connector on the motherboard.

Step 3 Replace the module mounting screw in its place on the end of the network processor module. (See Figure 4.)

Step 4 If the module requires external rear mounting screws to attach to the chassis rear, replace the screws at this time.

Caution Do not overtorque the screw. The network processor module or the underlying motherboard could be damaged. The maximum screw torque is 7 inch-lb.

Replacing the Component Tray

Take the following steps to replace the component tray in the chassis shell:

Step 1 Reinsert the component tray into the shell.

Step 2 Push on the back of the tray while at the same time pressing on the chassis release screw (as shown in Figure 4) with the thumb of your right hand.

Step 3 Retighten the chassis release screw.

Replacing the Final Connections to the Router

Take the following steps to make the final connections to the router:

Step 1 Plug the system power cord into a 3-terminal, single-phase power source that provides power within the accepted range (100 to 240 VAC, 50 to 60 Hz).

Step 2 Turn ON the system power switch. The LED on the front marked *Power* should go ON. (See Figure 1.)

Step 3 Check the OK light located on the right side of the front panel (see Figure 1) to verify that it goes ON after a few seconds delay when booting.

Step 4 For further information on software configuration, refer to the router software publications on the world wide web, CD-ROM, or the printed publications. Refer to "Cisco Connection Online."

This completes *Upgrading Memory in the Cisco 4000 and Cisco 4000-M.*

Cisco Connection Online

Cisco Connection Online (CCO), formerly Cisco Information Online (CIO), is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional content and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously—a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, Internet e-mail, and fax download options, and is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

- WWW: `http://www.cisco.com`.
- Telnet: `cco.cisco.com`.
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact `cco-help@cisco.com`. For additional information, contact `cco-team@cisco.com`.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or `tac@cisco.com`. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or `cs-rep@cisco.com`.

This document is to be used in conjunction with the *Cisco 4000 Hardware Installation and Maintenance* and the *Cisco 4000 Series Installation Guide* publications.

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