



Maintaining the Cisco 6400

This chapter provides maintenance information for the Cisco 6400 carrier-class broadband aggregator. All cards, modules, and components support online insertion and removal (often referred to as hot-swapping). Hot-swapping allows you to remove, replace, and rearrange cards without turning off the system power. When the system detects that a card or module is added or removed, it automatically runs diagnostic and discovery routines, acknowledges the presence or absence of the card or module, and resumes system operation without any operator intervention.



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, refer to the [“Obtaining Technical Assistance”](#) section on page xiv.



Note

The illustrations in this guide depict the original Cisco 6400 chassis. Your chassis may appear or look slightly different.

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Tools and Equipment Required

You need the following tools and equipment to remove and replace modules. If you need additional equipment, see the [“Obtaining Technical Assistance” section on page xiv](#).

- One number 2 Phillips screwdriver and one flat-blade screwdriver
- Electrostatic discharge (ESD) grounding strap (disposable ESD strap provided with system)

General Safety Precautions and Maintenance Guidelines

General Safety Precautions

ESD, EMI, and Safety Precautions



Caution

Static voltages as low as 30 volts can cause latent damage to circuitry. Be sure to observe all standard anti-static procedures (for example, wear a grounding strap) when handling electronic equipment and components.



Warning

Blank faceplates (filler panels) serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards and faceplates are in place. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Laser Safety Precautions



Warning

Class 1 laser product. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Invisible laser radiation present. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Statement for Sweden



Warning!

Osynlig laserstrålning när denna del är öppen och förregleringen är urkopplad. Rikta inte blicken in mot strålen.

Warning Statement for Finland



Varoitus

Alleviates ja suojalukitus ohitettaessa olet alttiina näkymättömälle lasersäteilylle. Äjä katso säteeseen.

Lifting and Reaching Safety Precautions



Warning

To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules (such as power supplies, fans, or cards); these types of handles are not designed to support the weight of the unit. Lift the unit only by using handles that are an integral part of the chassis, or by grasping the chassis underneath its lower edge. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

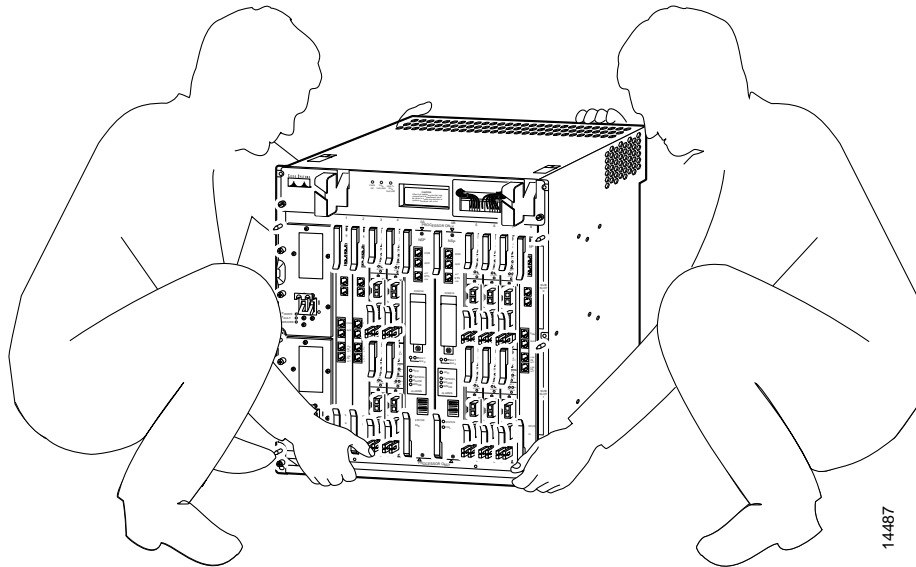


Warning

Two people are required to lift the chassis. To prevent injury, keep your back straight and lift with your legs, not your back. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

[Figure 5-1](#) shows the proper way to lift the Cisco 6400 chassis.

Figure 5-1 Lifting the Cisco 6400 Chassis



Hot-Swapping Modules and Line Cards

The Cisco 6400 system has a hot-swap feature that allows you to install and remove modules and line cards while the system is operating. With hot swapping, you do not need to power down the system.

When unconfigured node line cards (NLCs) are installed for the first time, the system identifies them as present but unconfigured. Read the instructions for initial interface configurations in the *Cisco 6400 Software Setup Guide*.

If a card or module similar to the one that was removed is reinserted into a slot, the Cisco 6400 automatically configures its ports and brings it online up to the port count of the original card.



Note

You must administratively shut down the card or module; otherwise alarms are activated.



Caution

To avoid erroneous failure messages, allow at least 15 seconds for the system to reinitialize. Note the current configuration of all interfaces before you remove or insert another card.

Plug-In Module or Card Replacement Suggestions

The following are examples of recommended module and card insertion practices:

- Do not force the faceplate into its slot. This action can damage the pins on the backplane if they are not aligned properly with the module or card.
- Fully depress the ejector levers to ensure that the card connector mates with the backplane correctly. Ensure that the card or module is firmly seated in the slot.
- Use the installation screws (top and bottom of carrier) to secure the module or card firmly in place in the chassis.

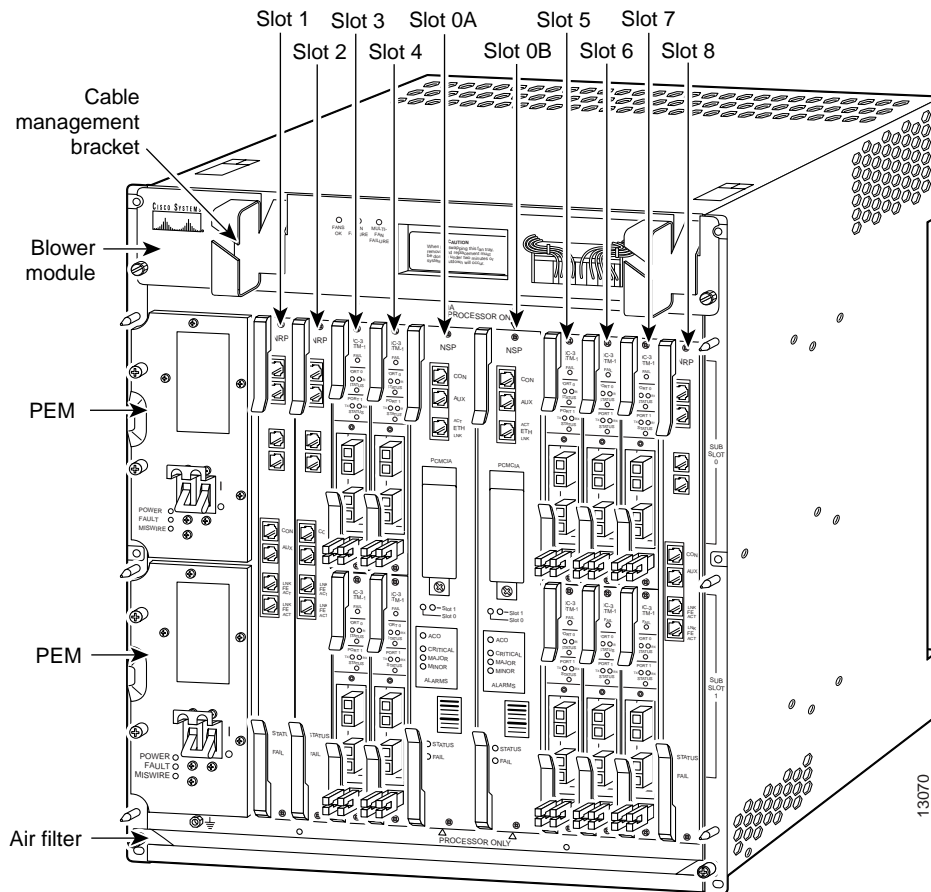


Note Any module that is only partially connected to the backplane can disrupt system operation.

Cisco 6400 System Component Identification

Figure 5-2 identifies the major components of the Cisco 6400 system. Card slots 1 through 8 can contain a combination of node route processor (NRP) and node line card (NLC) modules; only node switch processor (NSP) modules can be inserted into card slots 0A and 0B.

Figure 5-2 Cisco 6400 System Components—Front View



Replacing the Front Cover



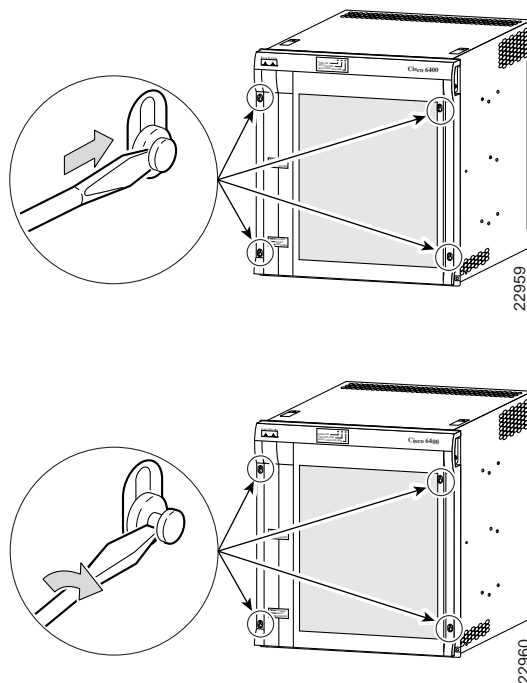
Note The Cisco 6400 no longer ships with the plastic front cover that was included in shipments made before June 2002. This section covering removal and replacement procedures is included only for reference purposes.

Removing the Front Cover

To remove the front cover, first remove the bezel plugs:

- Step 1 Insert the tip of a flat-blade screwdriver into the indentation between the top and bottom of the plug.
- Step 2 Rotate the screwdriver blade 90 degrees, pushing out the top of the plug (Figure 5-3).
- Step 3 Remove the plug with your fingers.
- Step 4 Then firmly grasp the cover with both hands, lift upward as far as possible (about one inch), and pull forward.

Figure 5-3 Removing Bezel Plugs



Note

The cover is secured by four posts. Avoid bending or twisting cables and connectors.

Installing the Front Cover

To install the front cover:

- Step 1 Line up the hole in each corner of the cover with the four posts on the chassis (Figure 5-4).
- Step 2 Gently but firmly push the cover onto the posts and slide downward to secure.
- Step 3 Insert one of the bezel plugs into a corner hole, below the post.

- Step 4** When the plug is lined up in the hole (Figure 5-5), use your thumb to gently but firmly press on the top of the plug until the top collapses against the bottom.
- Step 5** Repeat Steps 3 and 4 for the remaining three corners. Avoid bending or twisting cables and connectors.

Figure 5-4 Installing the Front Cover

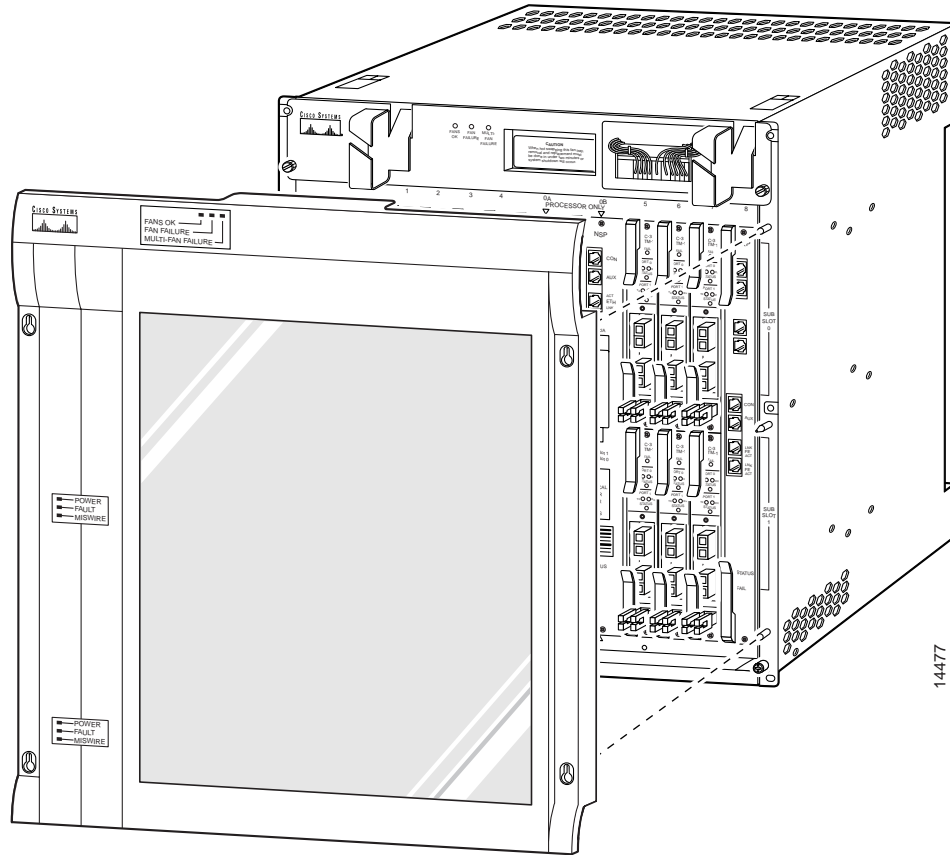
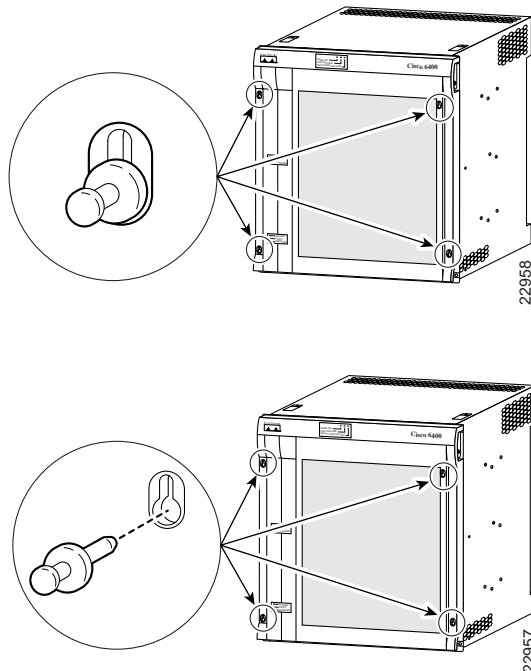


Figure 5-5 Installing Bezel Plugs



Powering Down the System

To power down the Cisco 6400 system:

-
- Step 1** Notify appropriate personnel that you plan to shut down the Cisco 6400 system and that this will result in total loss of service. Appropriate personnel includes the regional alarm or network monitoring center, central office personnel, and key customers.
 - Step 2** Before shutting down the Cisco 6400, use the **copy** command to save any configuration changes to NVRAM and also to a PCMCIA card. (Refer to the *Cisco 6400 Command Reference* for instructions on using the **copy** command.)
 - Step 3** Complete all copy or write operations involving Flash media (PCMCIA slots or boot Flash) before you power down the Cisco 6400.
 - Step 4** To power down the Cisco 6400, turn off the switch on all PEMs (your system can be configured with one or two PEMs).
-

Backing Up the PCMCIA Card

We recommend that you create a duplicate PCMCIA card that contains the current boot software image and the current software configuration. You can use the duplicate to recover from a major system failure with less disruption. If you have a backup PCMCIA card, you can use that card to load a new node switch processor (NSP) module and avoid a time-consuming reconfiguration process. For instructions on creating a backup PCMCIA card, refer to *Cisco 6400 Software Setup Guide*.

Maintaining the Air Filter

The Cisco 6400 automatically powers down if the system overheats. If the blower module's air filters are too dirty or clogged, the system might have insufficient air flow and might overheat.

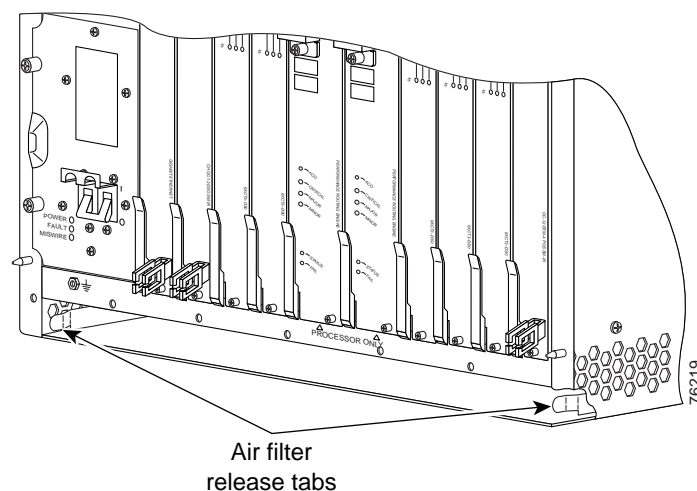
You should replace the Cisco 6400 air filters every six months. In certain environments, you might have to replace the air filter more frequently.

Removing the Air Filter

The Cisco 6400 ships with either a screw-type or tab-type air filter.

To remove a tab-type air filter, press the release tabs on each side of the chassis to release the air filter and slide it out of the chassis. (See [Figure 5-6](#).)

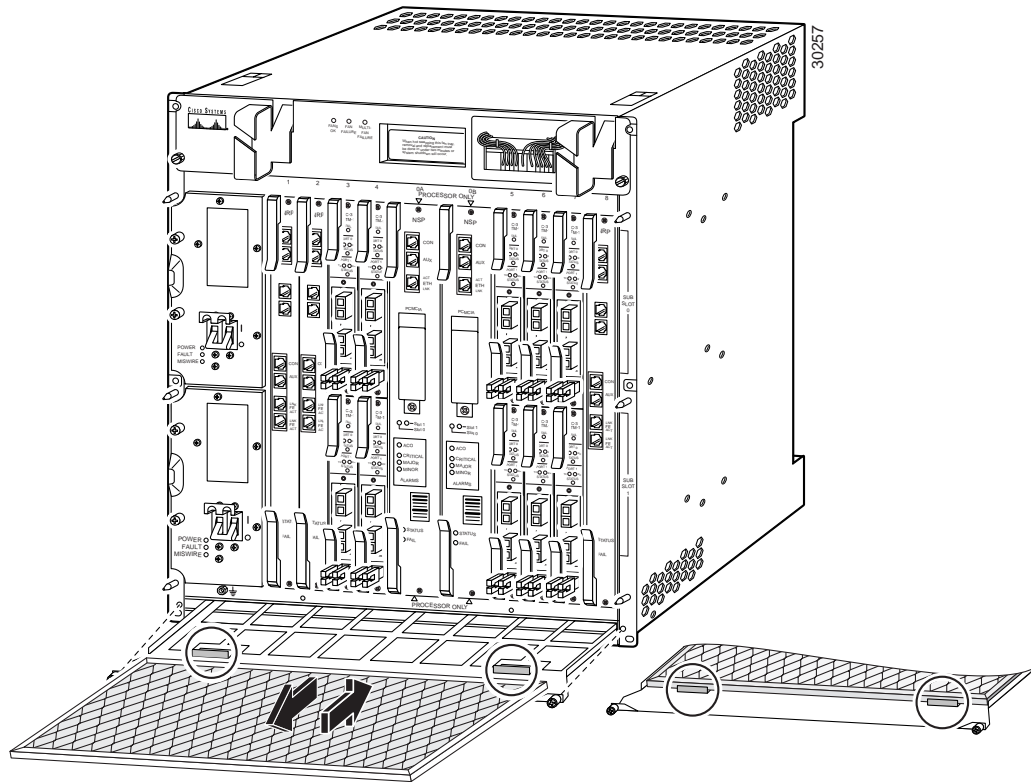
Figure 5-6 Tab-type Air Filter Release Tabs



To remove a screw-type air filter, refer to [Figure 5-7](#) and perform the following steps.

-
- Step 1** Locate the filter tray at the bottom front of the chassis, below the plug-in modules. Use a number 2 Phillips screwdriver to unlock the filter tray.
 - Step 2** Gently pull the filter toward you to remove it from the chassis.
 - Step 3** If you are replacing the filter, discard the old filter and go to the section "[Replacing the Air Filter](#)."

Figure 5-7 Removing a Screw-type Air Filter from the Chassis

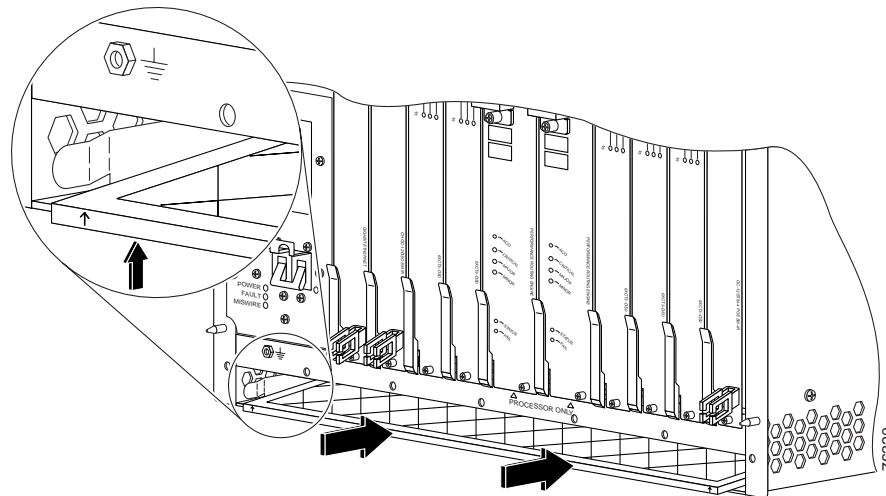


Replacing the Air Filter

The Cisco 6400 ships with either a screw-type or tab-type air filter.

To install a new tab-type air filter, slide the new filter all the way into the chassis and lift it up until it snaps into place. The directional arrows located on the metal frame of the filter should be pointing up. (See [Figure 5-8](#).)

Figure 5-8 Inserting a Tab-Type Air Filter



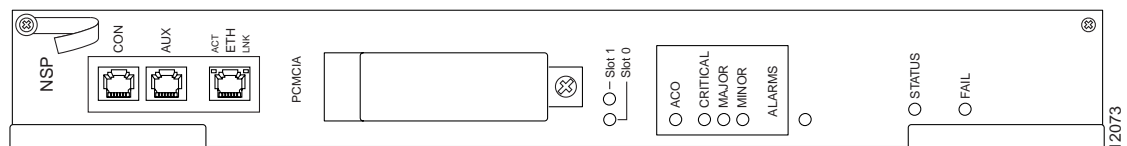
To install a new screw-type air filter, refer to [Figure 5-7](#) and perform the following steps:

-
- Step 1 Hold the air filter with the arrows (located on the metal frame) facing up.
 - Step 2 Slide the air filter into the bottom tray of the chassis.
 - Step 3 Secure the tray by tightening the retaining screws.
-

Replacing an NSP Module

The Cisco 6400 can contain one or two NSP modules, which are located in slots 0A and 0B (in the middle of the chassis). [Figure 5-9](#) shows the NSP faceplate.

Figure 5-9 NSP Faceplate



Caution

Removing an active NSP in a redundant configuration causes a switchover. Removing an active NSP in a nonredundant configuration causes a system shutdown.

Removing the NSP Module

To remove an NSP module:

-
- Step 1 Attach a ground strap to your wrist.
 - Step 2 Unscrew the upper and lower retaining screws.
 - Step 3 Disconnect any cables connected to the NSP module that you are about to remove.
 - Step 4 Grasp the upper and lower extraction levers. Pull up on the upper lever while pushing down on the lower lever. This action disengages the module from the connectors on the backplane.
 - Step 5 Slide the NSP module out of the slot.
 - Step 6 Place the NSP module on an antistatic surface. If the module will be out of the chassis for several minutes or longer, put it in a static-shielding bag or in a box lined with antistatic material.
 - Step 7 Install another NSP module or a blank faceplate in the empty slot.
-



Warning

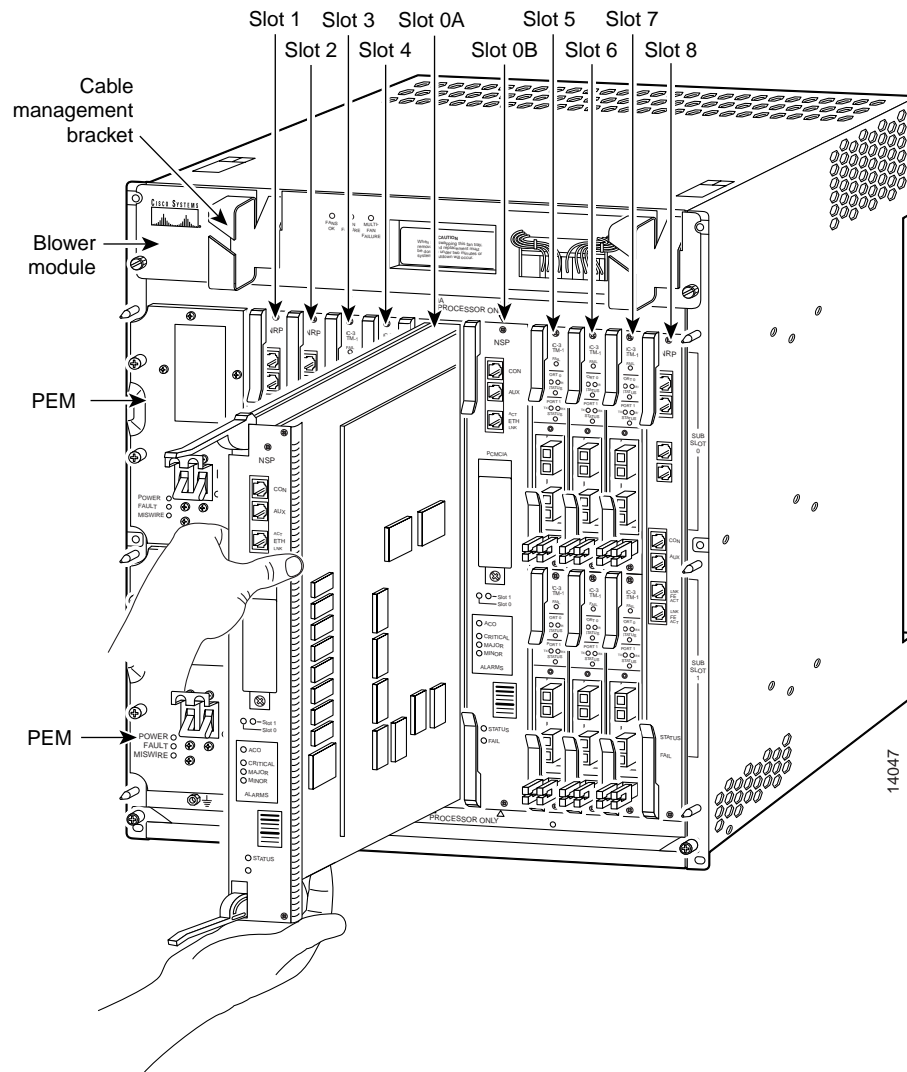
Blank faceplates (filler panels) serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they reduce electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards and faceplates are in place. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Installing the NSP Module

The NSP module can be inserted only in slot 0A or 0B. To install an NSP module in the Cisco 6400 chassis:

-
- Step 1 Remove the blank filler panel from the selected slot, if a blank panel is present.
 - Step 2 Hold the NSP module vertically, with the NSP faceplate toward you and the backplane connectors away from you. Ensure that the module is right side up by noting the lettering on the faceplate.
 - Step 3 Carefully align the upper and lower edges of the NSP carrier with the upper and lower guides in the chassis ([Figure 5-10](#)).

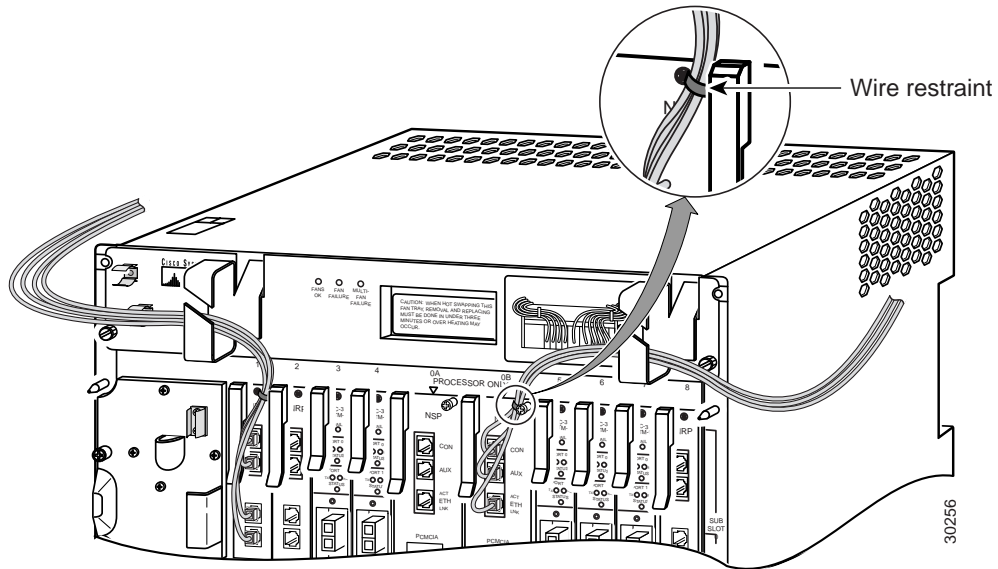
Figure 5-10 Inserting an NSP into the Chassis

**Caution**

To ensure that the NSP module mates properly with all backplane connector pins, the card length and card slots have been designed with very close tolerances. To slide the module into the slot requires gentle pressure with each hand, at the top and bottom of the faceplate.

- Step 4** Gently slide the module into the slot until it makes contact with the backplane.
- Step 5** Press the upper lever down and the lower lever up at the same time.
- Step 6** Secure the card by tightening the upper and lower retaining screws.
- Step 7** Connect the cables.
- Step 8** Pull the cables across the wire restraint and bend the restraint upward to trap the cables (Figure 5-11).

Figure 5-11 Wire Restraint on the NSP

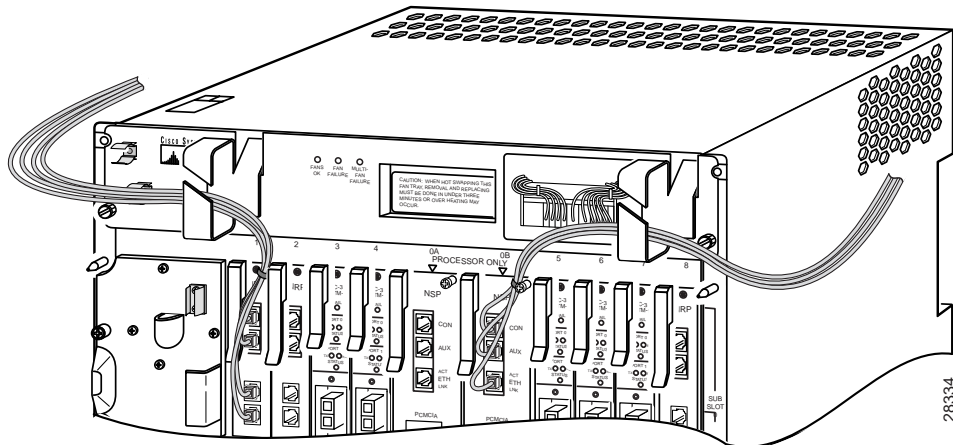


Step 9 Route the cables through the cable management bracket, creating a 20-inch (or larger) service loop (Figure 5-12).



Note A minimum 20-inch loop is critical to hot swapping the blower.

Figure 5-12 Routing the NSP Cables Through the Cable Management Bracket



Step 10 Install blank filler panels to cover any unused slots. Like cards and modules, each filler panel is held in place by two retaining screws.

Replacing an NSP Module PCMCIA Card

There are two PCMCIA slots in the NSP module. To replace a PCMCIA card:

-
- Step 1** Unscrew the locking fastener on the bottom of the PCMCIA slot cover.
 - Step 2** Lift the cover and press the eject button on the PCMCIA slot for the card you are removing. The card ejects.
 - Step 3** Remove the PCMCIA card and insert the new card. Push firmly to seat the new PCMCIA card.
 - Step 4** Close the cover and tighten the locking fastener.
-

**Note**

If you seat a PCMCIA Type II card in Slot 0, you cannot use Slot 1. However, if you seat a Type I card in Slot 0, you can insert either a Type I or Type II card in Slot 1.

Replacing an NSP Module SIMM

General SIMM Information

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

**Caution**

To upgrade DRAM, you must install identical SIMMs in both DRAM SIMM connectors.

The default DRAM configuration is 64 MB, contained in two 32-MB SIMMs. The DRAM can be increased to 128 MB by adding two more 32-MB SIMMs. The amount of DRAM required on the NSP module is determined by the number of active physical and logical ports (virtual path tunnels) and the expected number of active switched virtual channels (SVCs) through the switch.

In a 64-MB DRAM configuration, the two accessible SIMM sockets (U51 and U63) are empty. To upgrade to 128-MB DRAM, you must purchase an upgrade kit from Cisco and insert the SIMMs into the two empty sockets.

**Note**

You must use SIMMs obtained from Cisco Systems.

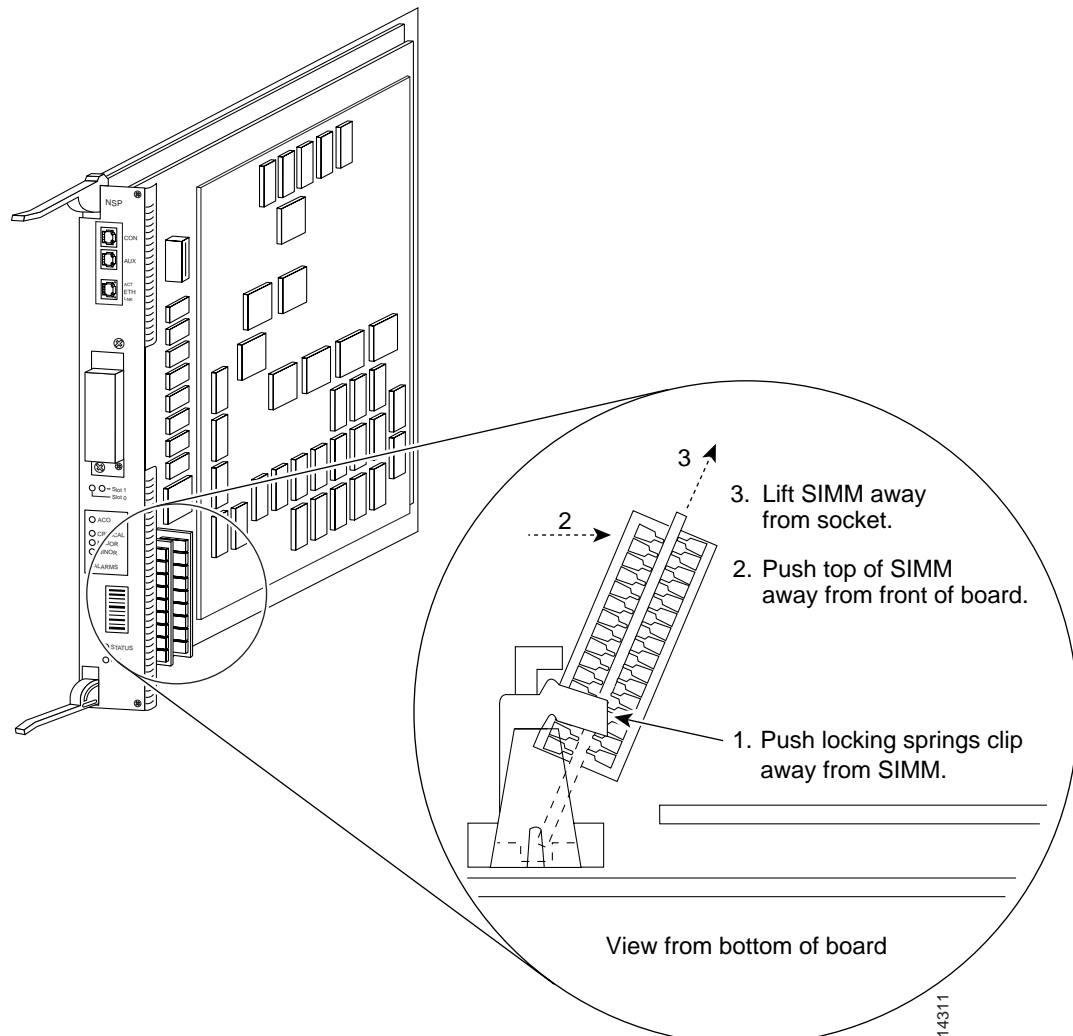
Removing NSP Module SIMMs

To remove the existing SIMMs:

-
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
 - Step 2** Disconnect the console and auxiliary cables from the NSP module.
 - Step 3** Loosen the captive installation screws on the NSP module.

- Step 4** Place the NSP on an antistatic mat or pad. Position the NSP so that the faceplate is away from you and the edge connector is toward you.
- Step 5** Locate the SIMMs. The DRAM SIMMs occupy sockets U51 and U63 (Figure 5-13).

Figure 5-13 Removing an NSP SIMM Module



- Step 6** Release the spring clips from the SIMM that you wish to remove and lift the SIMM from the socket (Figure 5-13).
- Step 7** When both ends of the SIMM are released from the socket, use your thumb and forefinger to grasp the ends of the SIMM and pull the SIMM completely out of the socket. Handle the edges of the SIMM only; avoid touching the memory module, pins, or metal traces (fingers) along the socket edge.
- Step 8** Place the SIMM in an antistatic bag to protect it from ESD damage.
- Step 9** Repeat steps 5 through 8 for the remaining SIMMs, as required for your upgrade.

Installing an NSP SIMM Module

To replace a SIMM module:

-
- Step 1** Keep the NSP in the same orientation as in the previous procedure (with the handle facing away and the edge connector toward you).
- Step 2** Remove a new SIMM from the antistatic bag.



Caution

Handle SIMMs by the card edges only. SIMMs are sensitive components that can short out if mishandled.

-
- Step 3** Hold the SIMM component side up with the connector edge (the metal fingers) closest to you.
- Step 4** Hold the sides of the SIMM between your thumb and middle finger, with your forefinger against the far edge, opposite the connector edge (Figure 5-13).
- Step 5** Tilt the SIMM to approximately the same angle as the socket, and insert the entire connector edge into the socket. Insert the first SIMM in the socket farther from you.



Caution

When inserting SIMMs, use firm but not excessive pressure. If you damage a socket, you must return the NSP to the factory for repair.

-
- Step 6** Gently push the SIMM into the socket until the spring clips snap over the ends of the SIMM. If necessary, rock the SIMM gently back and forth to seat it properly.
- Step 7** Repeat Steps 2 through 6 for the remaining SIMM. Insert the second SIMM in the socket closer to you.
- Step 8** When both SIMMs are replaced, check all four alignment holes (two on each SIMM) and ensure that each spring retainer is visible. If it is not, the SIMM is not seated properly. If a SIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SIMM firmly back into the socket until the retainer springs snap into place.
-

Verifying SIMM Operation

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 are installed correctly. Check the SIMMs by looking straight down on them and then observe them at eye level. The SIMMs should both be aligned at the same angle and should be at the same height. If one SIMM appears to stick out or rests in the socket at an angle different from the other, remove the SIMM and reinsert it. Replace the NSP and reboot the system for another installation check.
- Each DRAM SIMM bank must contain SIMMs of the same size and speed, or the system does not operate. Contact Cisco Systems to order the NSP DRAM upgrade package. Other vendors' parts might not work properly. (To contact Cisco Systems, see the [“Obtaining Technical Assistance” section on page xiv.](#))

If the system fails to restart properly after several attempts, contact a service representative for assistance. Before you contact Cisco Systems, make note of any error messages, unusual LED states, or any other indications that might help identify the problem.

Replacing an NRP Module

NRP modules can be installed in slots 1 through 8 in the Cisco 6400 chassis. The procedure for replacing an NRP module is basically the same for the NRP-1 and NRP-2SV modules. The only difference is that for the NRP-1, the attached cables are directed up to wire restraints; and for the NRP-2SV, the cable is directed down to cable management brackets. This is clarified in [Step 8](#) in the “[Installing an NRP-2SV Module](#)” section.

Removing an NRP Module

To remove an NRP module from the Cisco 6400 chassis:

-
- Step 1** Attach an ESD-preventive wrist strap.
 - Step 2** Disconnect any cables connected to the NRP module that you are about to remove.
 - Step 3** Unfasten the upper and lower retaining screws.
 - Step 4** Grasp the upper and lower extraction levers. Pull up on the upper lever while pushing down on the lower lever. This action disengages the NRP carrier from the connectors on the backplane.
 - Step 5** Slide the module out of the slot.
 - Step 6** Place the NRP module on an antistatic surface. If it will be out of the chassis for several minutes or longer, put it in a static-shielding bag or in a box lined with antistatic material.
 - Step 7** Insert another NRP module or a blank faceplate in the empty slot.
-



Warning

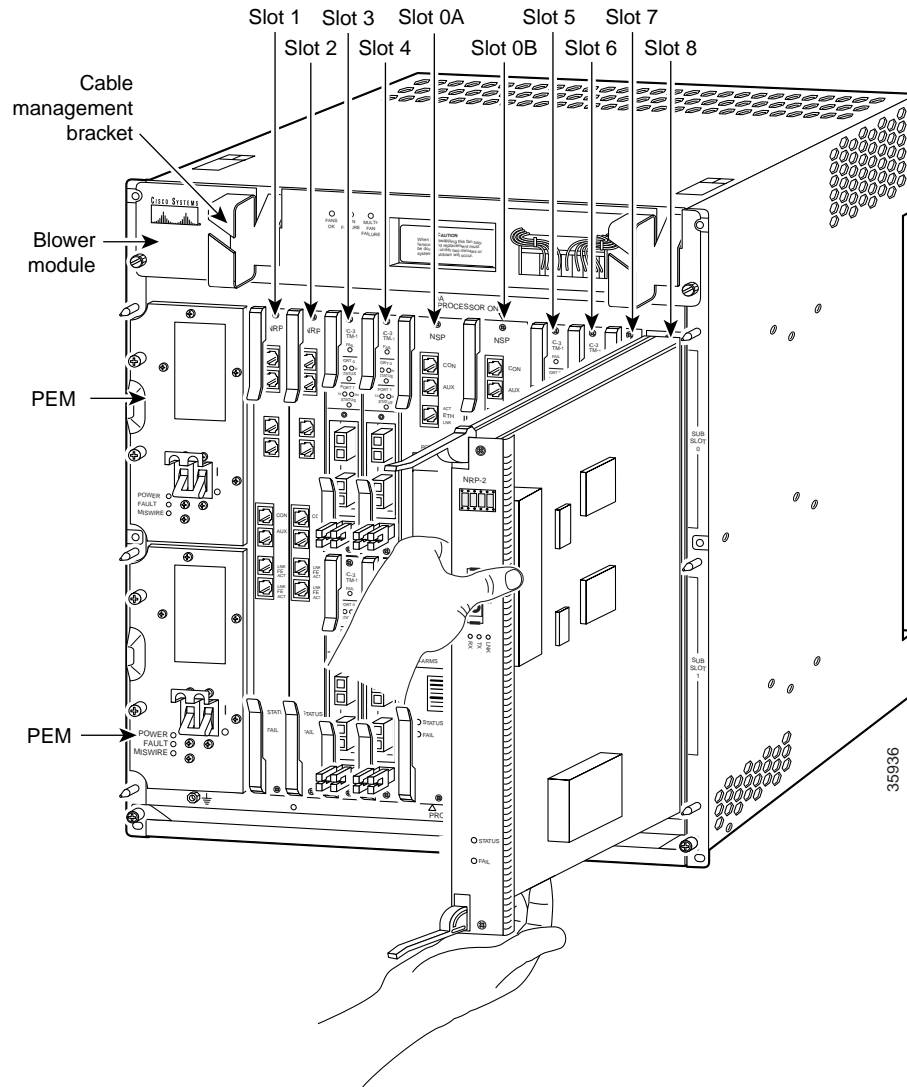
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Installing an NRP-2SV Module

To install an NRP-2SV module in the Cisco 6400 chassis:

-
- Step 1** Remove the blank filler panel from the selected slot if a blank panel is present.
 - Step 2** Hold the NRP-2SV module vertically with the NRP-2SV faceplate toward you and the backplane connectors away from you. Ensure that the module is right side up by noting the lettering on the faceplate.
 - Step 3** Carefully align the upper and lower edges of the NRP-2SV carrier with the upper and lower guides in the chassis. See [Figure 5-14](#) for an example of inserting an NRP-2SV module in the chassis.

Figure 5-14 Inserting an NRP-2SV into the Chassis



The following warnings apply to the NRP-2SV module.


Warning

Class 1 laser product. To see translations of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.


Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. To see translations of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

**Warning**

Invisible laser radiation present. To see translations of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Statement for Sweden**Varning!**

Osynlig laserstrålning när denna del är öppen och förregleringen är urkopplad. Rikta inte blicken in mot strålen.

Warning Statement for Finland**Varoitus**

Alleviates ja suojalukitus ohitettaessa olet alttiina näkymättömälle lasersäteilylle. Äjä katso säteeseen.

**Caution**

To ensure that the NRP-2SV module connects properly with all backplane connector pins, the card length and card slots have been designed with very close tolerances. To slide the module into the slot requires gentle pressure with each hand at the top and bottom of the faceplate.

- Step 4** Gently slide the NRP module into the slot until it makes contact with the backplane.
- Step 5** Press the upper lever down and the lower lever up at the same time.
- Step 6** Secure the carrier by tightening the upper and lower retaining screws.
- Step 7** Connect the cables.
- Step 8** For an NRP-1 module, follow the first step; for an NRP-2SV module, go to the second step:
- For an NRP-1 module, pull the cables across the wire restraint and bend the restraint upward to trap the cables ([Figure 5-15](#)). Route the cables through the cable management bracket, creating a 20-inch (or larger) service loop ([Figure 5-16](#)).

**Note**

A minimum 20-inch loop is critical to hot swapping the blower.

- For an NRP-2SV module, direct the cable down ([Figure 5-17](#)).

Figure 5-15 Pulling Wires Across the Wire Restraint on the NRP-1 Module

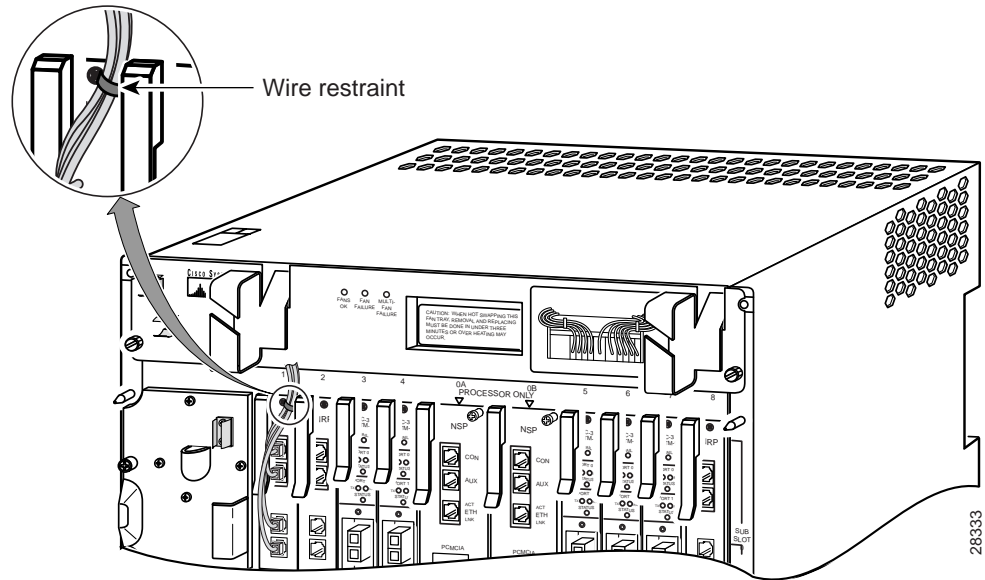


Figure 5-16 Routing the NRP-1 Cables Through the Cable Management Bracket

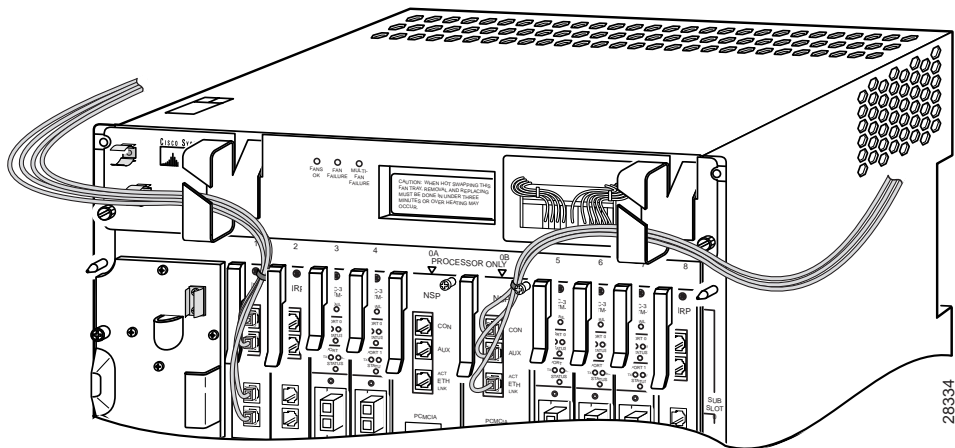
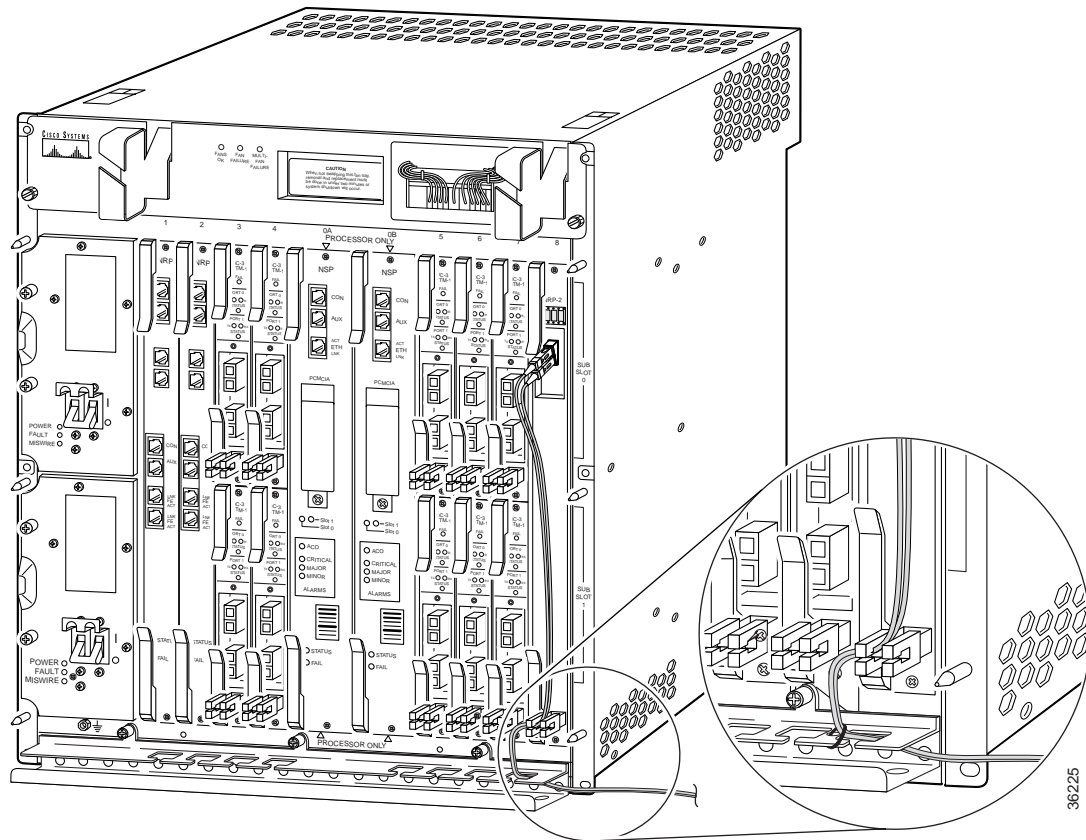


Figure 5-17 NRP-2SV Fiber-Optic Cable Management



- Step 9** Install blank filler panels to cover any unused slots. Use two retaining screws to secure each filler panel.

Replacing an NRP-1 Module SIMM

This section describes how to remove and replace an NRP-1 SIMM module.

General SIMM Information

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

Figure 5-18 shows the locations of the DRAM and Flash SIMMs on the NRP-1 module. The procedures for removing, installing, and verifying the DRAM and Flash SIMMs are identical.



Caution

To upgrade DRAM, you must install identical SIMMs in both DRAM SIMM connectors.

NRP-1 Memory Description

The default DRAM configuration is 64 MB, contained in two 32-MB SIMMs. The DRAM can be increased to 128 MB by replacing them with two 64-MB SIMMs. The amount of DRAM required on the NRP-1 module is determined by the number of routed and bridged sessions the NRP-1 is configured to handle.

The default Flash configuration is 8 MB, but you can upgrade to a 16-MB Flash SIMM. The amount of Flash memory required on the NRP-1 module is determined by the number and sizes of images and configuration files stored in Flash memory.

To upgrade either DRAM or Flash memory on the NRP-1 module, you must purchase an upgrade kit from Cisco Systems and replace the current SIMMs.



Note You must use SIMMs obtained from Cisco Systems.

Removing an NRP-1 Module SIMM

To remove the SIMM from the Cisco 6400 chassis:

-
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
 - Step 2** Disconnect the signal and control cables from the NRP.
 - Step 3** Loosen the captive installation screws on the NRP module and remove the module from the chassis.
 - Step 4** Place the NRP module on an antistatic mat or pad. Position the NRP module so that the faceplate is away from you, and the edge connector is toward you.
 - Step 5** Locate the SIMMs on the NRP module ([Figure 5-18](#)).
 - Step 6** Release the spring clips from the SIMM that you wish to remove and lift the SIMM from the socket ([Figure 5-19](#)).
 - Step 7** When both ends of the SIMM are released from the socket, use your thumb and forefinger to grasp the ends of the SIMM and pull the SIMM completely out of the socket. Handle the edges of the SIMM only; avoid touching the memory module, pins, or metal traces (fingers) along the socket edge.
 - Step 8** Place the SIMM in an antistatic bag to protect it from ESD damage.

Installing the NRP-1 Module SIMM

To replace the SIMM:

-
- Step 1** Keep the NRP in the same orientation as in the previous procedure (with the handle facing away and the edge connector toward you).
- Step 2** Remove a new SIMM from the antistatic bag.



Caution Handle SIMMs by the card edges only. SIMMs are sensitive components that can short out if mishandled.

- Step 3** Hold the SIMM component side up with the connector edge (the metal fingers) closest to you.
- Step 4** Hold the sides of the SIMM between your thumb and middle finger, with your forefinger against the far edge, opposite the connector edge.
- Step 5** Tilt the SIMM to approximately the same angle as the socket, and insert the entire connector edge into the socket. If you are installing the DRAM SIMMs, insert the first DRAM SIMM in the socket farther from you.



Caution When inserting SIMMs, use firm but not excessive pressure. If you damage a socket, you must return the NRP to the factory for repair.

- Step 6** Gently push the SIMM into the socket until the spring clips snap over the ends of the SIMM. If necessary, rock the SIMM gently back and forth to seat it properly.
- Step 7** Repeat steps 2 through 6 for each remaining new SIMM.
- Step 8** For each SIMM you installed, check both alignment holes and ensure that each spring retainer is visible. If it is not, the SIMM is not seated properly. If a SIMM appears misaligned, carefully remove it and reseat it in the socket. Push the SIMM firmly back into the socket until the retainer springs snap into place.
-

Verifying SIMM Operation

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 are installed correctly. Check the SIMMs by looking straight down on them and then observe them at eye level. The SIMMs should both be aligned at the same angle and should be at the same height. If a SIMM appears to stick out or rests in the socket at an angle different from the others, remove the SIMM and reinsert it. Reinstall the NRP module and reboot the system for another installation check.
- Ensure that the DRAM SIMMs are the same size and speed.

If the system fails to restart properly after several attempts, contact a service representative for assistance. Before you contact Cisco Systems, make note of any error messages, unusual LED states, or any other indications that might help identify the problem.

Replacing an NRP-2SV Dual Inline Memory Module

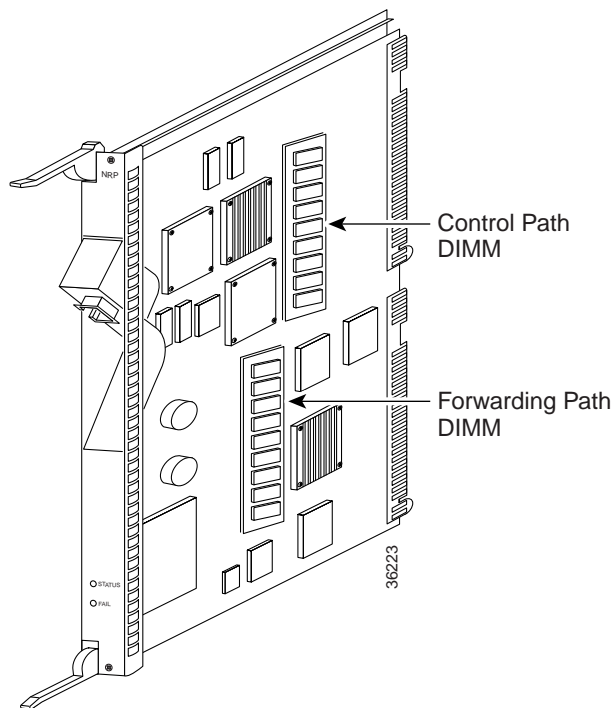
This section describes how to remove and replace an NRP-2SV dual inline memory module (DIMM). There are two DRAMs on the NRP-2SV module: The control path DIMM and the forwarding path DIMM.

General DIMM Information

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

Figure 5-20 shows the location of the DIMMs on the NRP-2SV module.

Figure 5-20 NRP-2SV Module DIMM



Each of these DIMMs is 512 MB. (Older models may have 256 MB. An upgrade kit is available from Cisco Systems, Inc.) The amount of DRAM required on the NRP-2 module is determined by the number of routed and bridged sessions the NRP-2 is configured to handle.

There is no Flash memory on the NRP-2SV module.



Note

You must use DIMMs obtained from Cisco Systems.

Removing an NRP-2SV Module DIMM

To remove a DIMM:

-
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
 - Step 2** Disconnect the cables from the NRP-2SV.
 - Step 3** Loosen the captive installation screws on the NRP-2SV module and remove it from the chassis.
 - Step 4** Place the NRP-2SV on an antistatic mat or pad. Position the NRP-2SV module, so that the faceplate is away from you and the edge connector is toward you.
 - Step 5** Locate the DIMMs on the NRP-2SV module ([Figure 5-20](#)).



Note Be sure to note the orientation of the DIMM in the socket. The card is notched so that it can be inserted only one way to align the notches on the DIMM with the socket. When you insert the new NRP-2SV, align the new DIMM the same as the old DIMM to avoid damaging the unit and to ensure proper operation.

- Step 6** Pull the levers on the socket to the “outside” to release the DIMM, and then lift the DIMM from the socket.
 - Step 7** When both ends of the DIMM are released from the socket, use your thumb and forefinger to grasp the ends of the DIMM and pull the DIMM completely out of the socket. Handle the edges of the DIMM only; avoid touching the memory module, pins, or metal traces (fingers) along the socket edge.
 - Step 8** Place the DIMM in an antistatic bag to protect it from ESD damage.
-

Installing the NRP-2SV Module DIMM

To replace the DIMM:

-
- Step 1** Keep the NRP-2SV in the same orientation as in the previous procedure (with the handle facing away and the edge connector toward you).
 - Step 2** Remove a new DIMM from the antistatic bag.



Caution Handle DIMMs by the card edges only. DIMMs are sensitive components that can be shorted by mishandling.

- Step 3** Align the new DIMM to the same orientation the old DIMM was in when you removed it from the socket.
- Step 4** Hold the sides of the DIMM between your thumb and middle finger, with your forefinger against the far edge, opposite the connector edge.
- Step 5** Align the two notches on the DIMM with the socket and insert the connector edge into the socket.
- Step 6** Gently push the DIMM into the socket until the notches on the DIMM align with the levers on the socket. The DIMM will “click” into place. The DIMM is “self-locking” when properly seated.

**Caution**

When inserting DIMMs, use firm but not excessive pressure. If you damage a socket, you must return the NRP-2SV to the factory for repair.

Verifying DIMM Operation

If the system fails to boot properly, or if the console terminal displays a checksum or memory error, ensure that the DIMM is installed correctly. Check by looking straight down on the DIMM and then observe it at eye level. Reinstall the NRP-2SV module and reboot the system for another installation check.

If the system fails to restart properly after several attempts, contact a service representative for assistance. Before you contact Cisco Systems, make note of any error messages, unusual LED states, or any other indications that might help identify the problem.

Installing or Replacing a Half-Height Node Line Card

The Cisco 6400 supports three half-height node line card (NLC) modules:

- OC-3/STM-1 SM NLC (see [Figure 5-21](#))
- OC-3/STM-1 MM NLC (see [Figure 5-22](#))
- DS3 45-Mbps bidirectional NLC (see [Figure 5-23](#))

To install a half-height NLC module in the Cisco 6400 chassis, you must do the following:

- Install a full-height carrier module in the chassis.
- Mount the NLC module on a full-height carrier module.

The carrier module can accommodate two half-height NLCs.

Because the NLCs support different media and interface types, configuration commands used with the cards can vary according to type. For complete NLC configuration information, refer to these documents:

- *Cisco 6400 Software Setup Guide*
- *Cisco 6400 Command Reference*
- *Release Notes for Cisco 6400 for Cisco IOS Release 12.x (Information for the latest release and for previous releases is available on Cisco.com.)*

Figure 5-21 OC-3/STM-1 SM NLC Faceplate

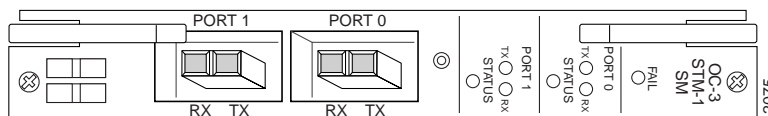
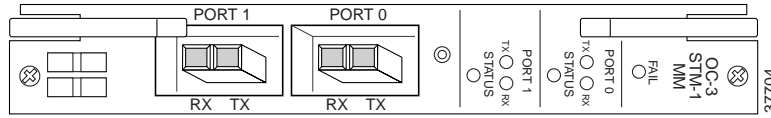


Figure 5-22 OC-3/STM-1 MM NLC Faceplate



Warning

Class 1 laser product. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Invisible laser radiation present. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Statement for Sweden



Varning!

Osynlig laserstrålning när denna del är öppen och förregleringen är urkopplad. Rikta inte blicken in mot strålen.

Warning Statement for Finland



Varoitus

Alleviätes ja suojalukitus ohitettaessa olet alttiina näkymättömälle lasersäteilylle. Äjä katso säteeseen.

Figure 5-23 DS3 NLC Faceplate

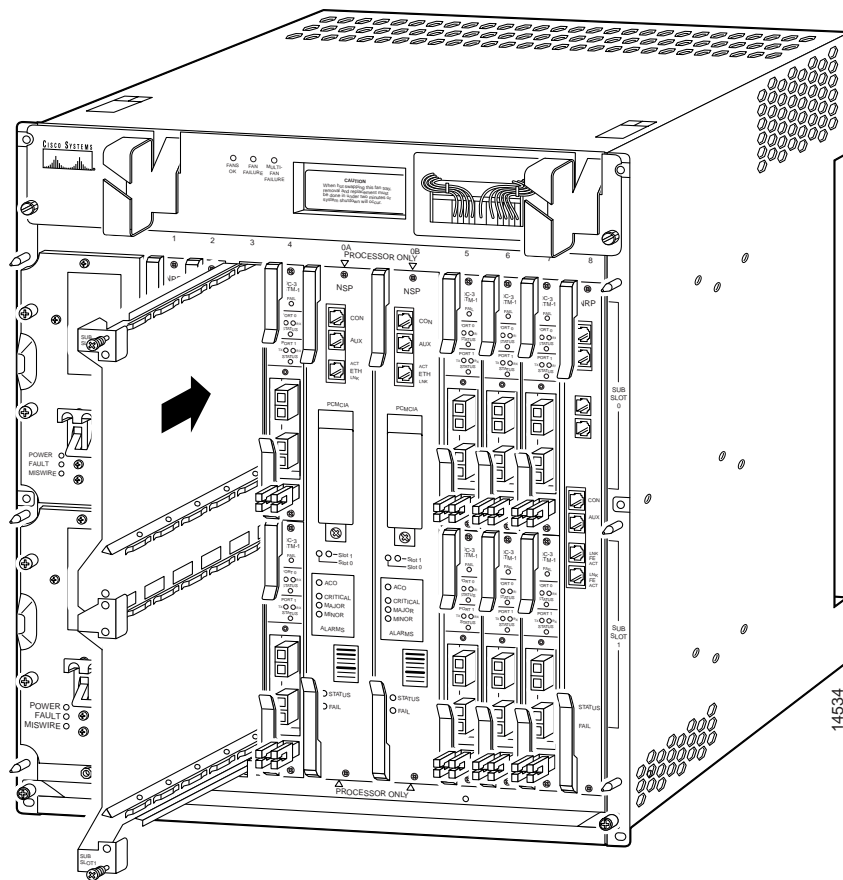


Installing a Full-Height NLC Carrier in the Chassis

The full-height carrier module is used to accommodate one or two half-height NLCs. To install a carrier into the Cisco 6400 chassis:

- Step 1 Attach an ESD-preventive wrist strap.
- Step 2 Remove the filler panel, if one is present.
- Step 3 While holding the carrier module vertically, align the upper and lower edges with the slot and gently slide the carrier module into the slot until it makes contact with the backplane (Figure 5-24).
- Step 4 Tighten the upper and lower retaining screws to secure the carrier module.

Figure 5-24 Installing a Full-Height Carrier Module for Half-Height NLCs



- Step 6** Secure the carrier module by tightening the upper and lower retaining screws.
- Step 7** Install blank filler panels to cover any unused slots. Like cards, each filler panel is held in place by two retaining screws.
-

Connecting Cables to the Half-Height NLC

After you install the half-height NLC, you must connect the cables as described in this section.

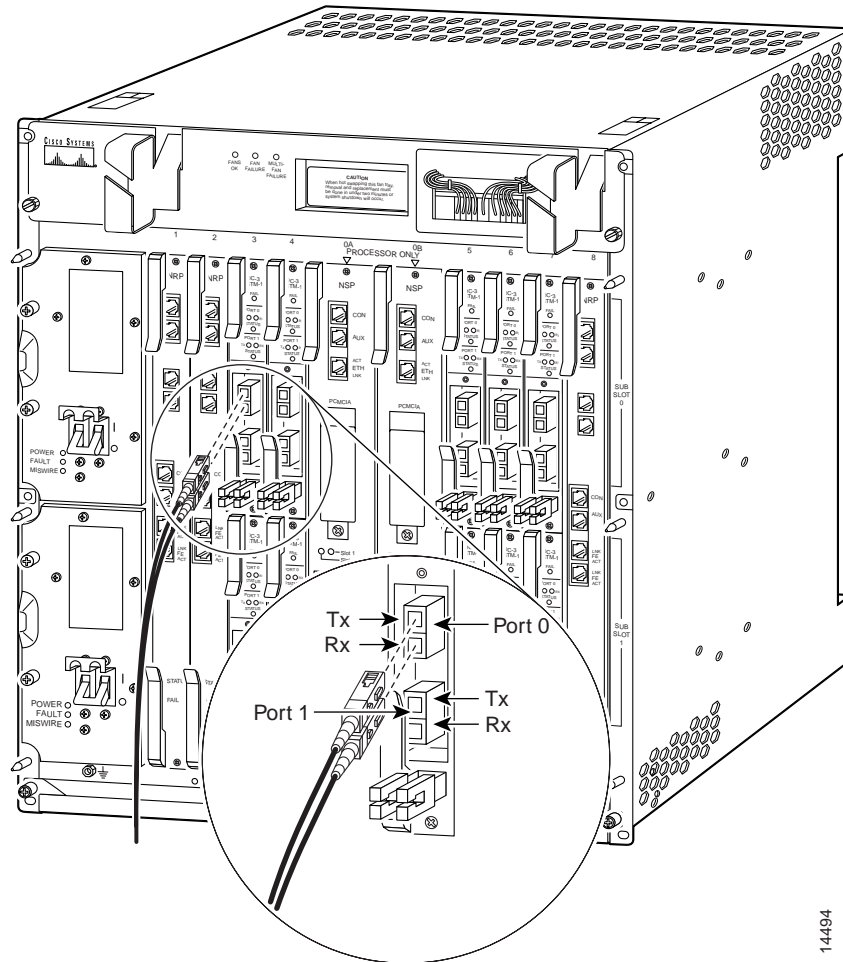
OC-3/STM-1 Node Line Card

Cable connections are the same for the OC-3/STM-1 SM NLC and OC-3/STM-1 MM NLC. However:

- The OC-3/STM-1 SM NLC has two ports for *single-mode intermediate reach* fiber connection on the front of each NLC.
- The OC-3/STM-1 MM NLC has two ports for *multimode* fiber connection on the front of each NLC.

Each port provides an interface to the ATM switching fabric for transmitting and receiving data at rates up to 155 Mbps bidirectionally. Install the fiber-optic cables as shown in [Figure 5-26](#).

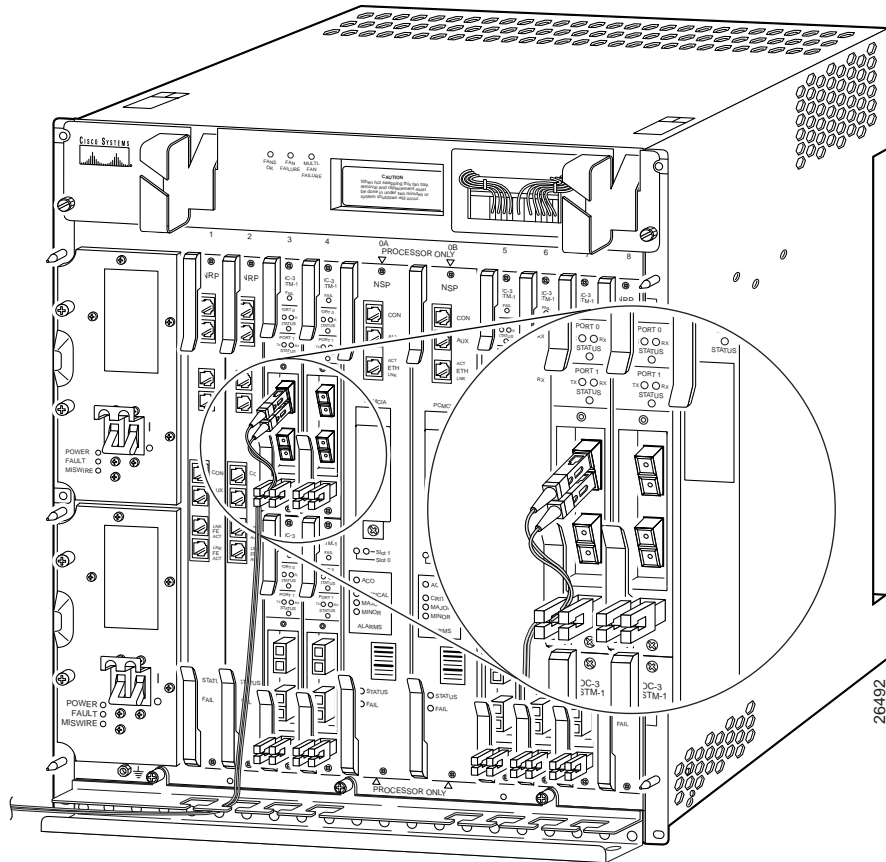
Figure 5-26 Connecting Cables to an OC-3/STM-1 NLC



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Figure 5-27 shows suggested cable management for the OC-3/STM-1 SM (single mode) and OC-3/STM-1 MM (multimode) fiber-optic cable.

Figure 5-27 OC-3 Fiber-Optic Cable Management



DS3 Node Line Card

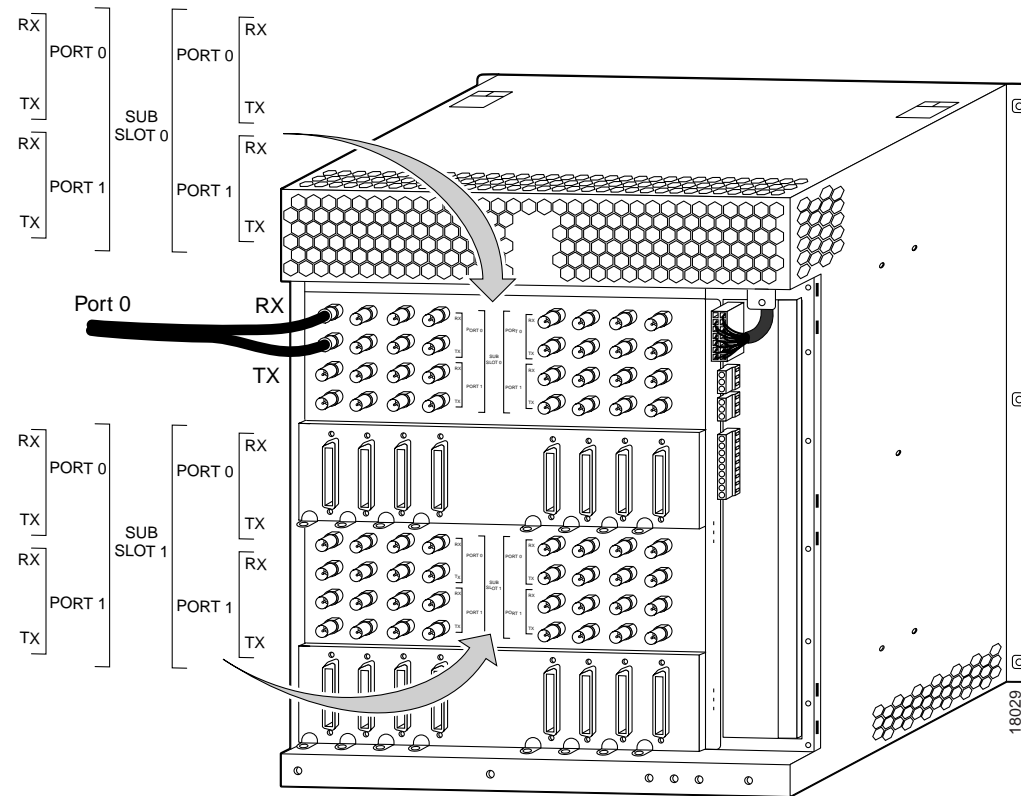
The cable connections for the DS3 NLC are different from those for the OC-3 NLCs. The DS3 NLC has two ports that connect to the ATM switching fabric using 75-ohm single or bundled coaxial cables with bayonet-style twist-lock (BNC) connectors attached to the back of the chassis for each DS3 port (Figure 5-28).



Warning

The DS3 ports are not intended to be connected to cables that run outside the building where it is installed. For any connections outside the building, the DS3 ports must be connected to a network termination unit (NTU). NTU devices should comply with appropriate national safety standards such as UL 1950, CSA 950, EN 60950, IEC 950, and AS 3260. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Figure 5-28 Connecting Cables to a DS3 Node Line Card



Removing a Half-Height NLC

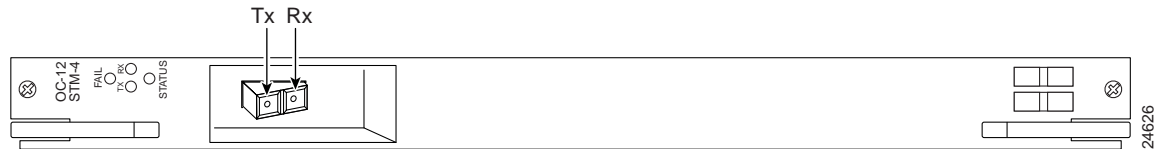
To remove a half-height NLC from the Cisco 6400 chassis:

-
- Step 1** Attach an ESD-preventive strap between you and the chassis surface.
 - Step 2** Remove any connections to the modules. Be sure to cover any fiber-optic connections to prevent contamination from moisture or dirt.
 - Step 3** Loosen the two (top and bottom) cross-slotted screws securing the NLC metal carrier to the full-height carrier.
 - Step 4** Grasp the two lever handles on the NLC, and gently pull the handles away from the carrier unit to loosen the unit.
 - Step 5** Carefully slide the NLC out of the full-height carrier. Avoid damaging the connectors on the rear of the plug-in unit.
 - Step 6** Place the NLC on an antistatic surface.
-

Installing or Replacing a Full-Height Node Line Card

The Cisco 6400 supports one full-height NLC module: OC-12/STM-4 NLC (Figure 5-29). The full-height NLC is premounted on its carrier.

Figure 5-29 OC-12 NLC Faceplate



Warning

Class 1 laser product. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Invisible laser radiation present. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device. Class 1 laser product. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, avoid exposure to radiation and do not stare into open apertures. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.



Warning

Invisible laser radiation present. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Warning Statement for Sweden



Varning! Osynlig laserstrålning när denna del är öppen och förregleringen är urkopplad. Rikta inte blicken in mot strålen.

Warning Statement for Finland



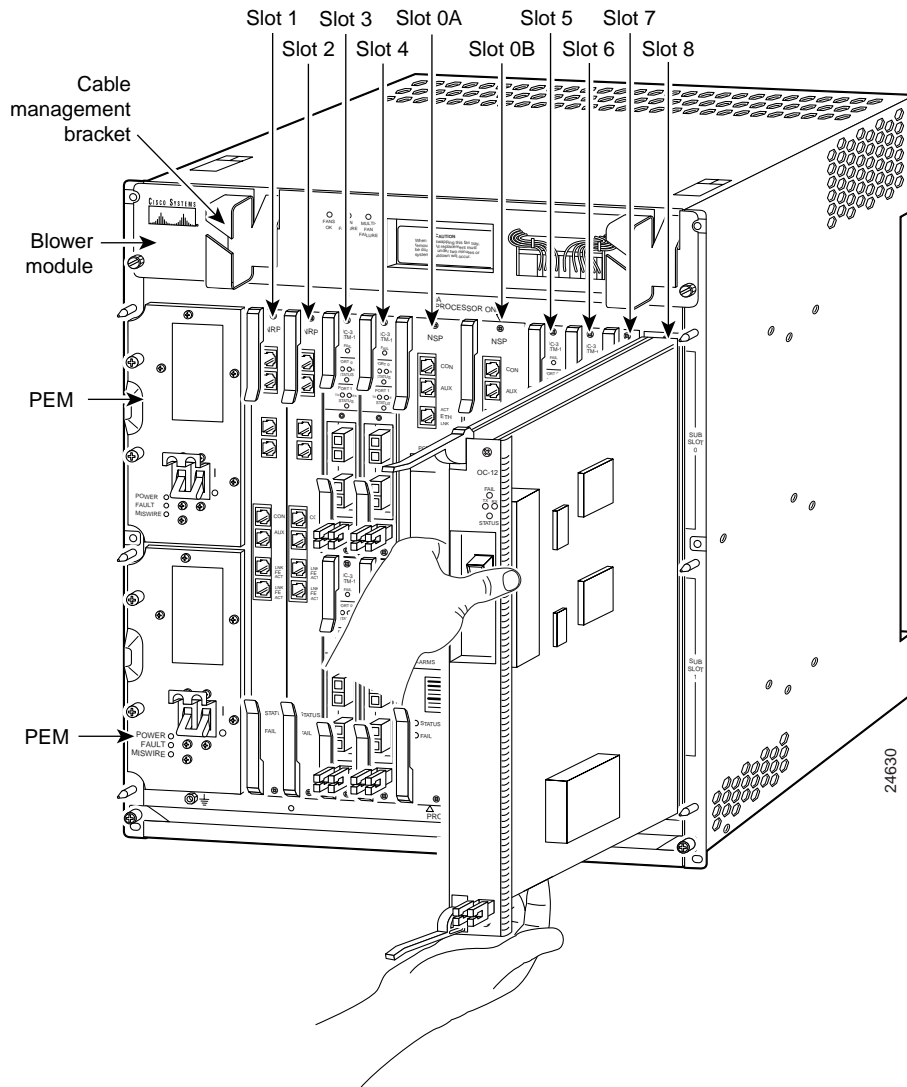
Varoitus Alleviätes ja suojalukitus ohitettaessa olet alltiina näkymättömälle lasersäteilylle. Äjä katso säteeseen.

Installing a Full-Height NLC

To install a full-height NLC in the Cisco 6400 chassis:

-
- Step 1** Remove the blank filler panel from the selected slot, if a blank panel is present.
 - Step 2** Hold the NLC module vertically, with the NLC faceplate toward you and the backplane connectors away from you. Ensure that the module is right side up by noting the lettering on the faceplate.
 - Step 3** Carefully align the upper and lower edges of the NLC carrier with the upper and lower guides in the chassis. [Figure 5-30](#) shows how to insert a module in the chassis.

Figure 5-30 Installing a Full-Height NLC

**Caution**

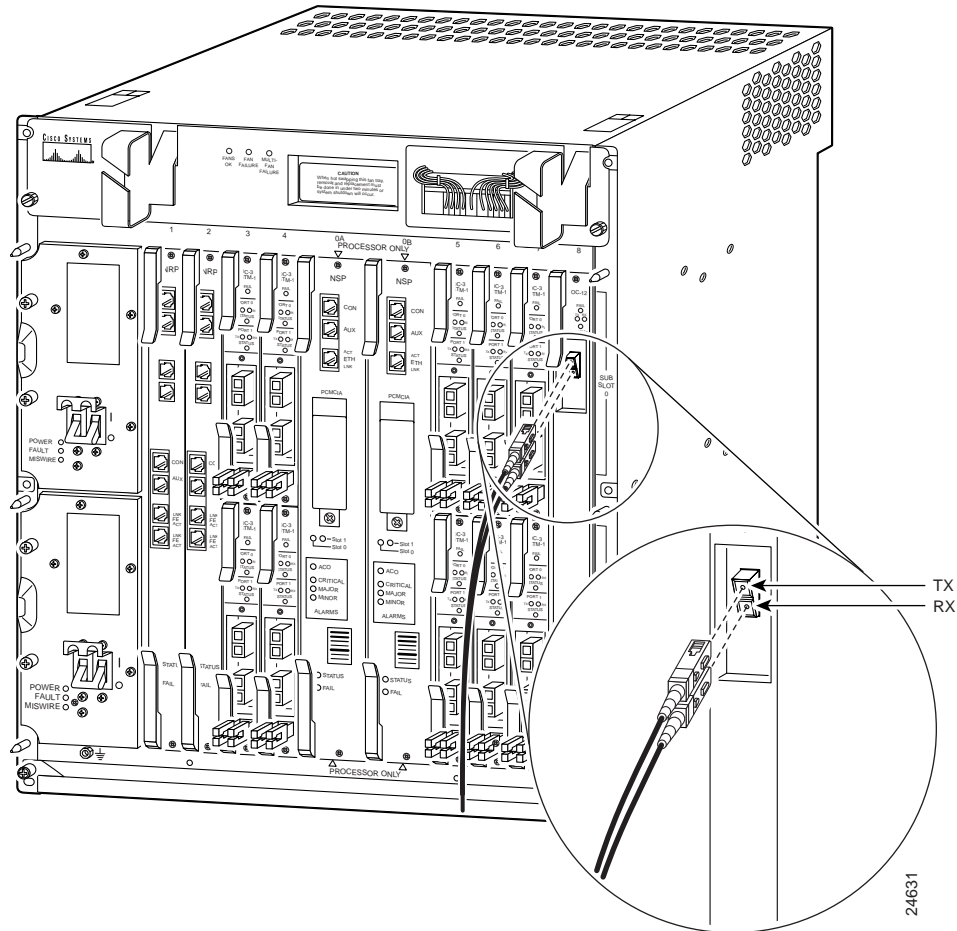
To ensure that the NLC module mates properly with all backplane connector pins, the module length and module slots have been designed with very close tolerances. To slide the module into the slot requires gentle pressure with each hand, at the top and bottom of the faceplate.

- Step 4** Gently slide the NLC module into the slot until it makes contact with the backplane.
- Step 5** Press the upper lever down and the lower lever up at the same time.
- Step 6** Secure the carrier by tightening the upper and lower retaining screws.
- Step 7** Connect the cables.
- Step 8** Install blank filler panels to cover any unused slots. Use two retaining screws to secure each filler panel.

Connecting Cables to the Full-Height NLC

The OC-12/STM-4 NLC has one port for single-mode intermediate reach fiber connection on the front of each NLC. This port provides an interface to the ATM switching fabric for transmitting and receiving data at rates up to 622 Mbps bidirectionally. Install the fiber-optic cables (Figure 5-31).

Figure 5-31 Connecting Cables to an OC-12 Node Line Card

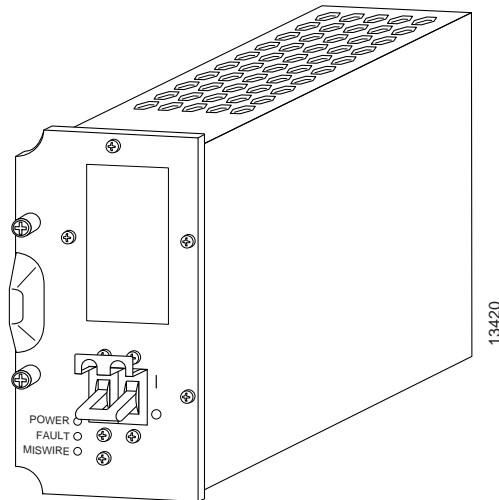


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Replacing a DC Power Entry Module

This section describes procedures for removing and installing a DC power entry module (PEM) plug-in unit in the Cisco 6400 chassis (Figure 5-33).

Figure 5-33 DC Power Entry Module



There are two PEM power bays in the system for redundancy. The PEM power bays are located at the front left side of the chassis:

- The top bay is wired to power circuit A
- The bottom bay is wired to power circuit B



Note

The circuits are identified at the power terminals on the backplane.

The PEMs meet critical safety, isolation, and EMC requirements associated with the connection of the CO DC-input power distribution system.



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 weld the metal object to the terminals. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Removing a DC Power Entry Module

If you remove a redundant DC PEM, the chassis continues to operate normally. If you plan to remove the only operating PEM from a chassis, you must first power down the Cisco 6400 system. Refer to the procedure in the [“Powering Down the System” section on page 5-8](#).

To remove a PEM from the Cisco 6400 chassis:

-
- Step 1** Ensure that the circuit breaker on the DC PEM you are removing is turned Off.
 - Step 2** Unscrew the retaining screws on the DC PEM faceplate.
 - Step 3** Grasp the DC PEM by the handle on the faceplate and pull it out of the chassis.
-

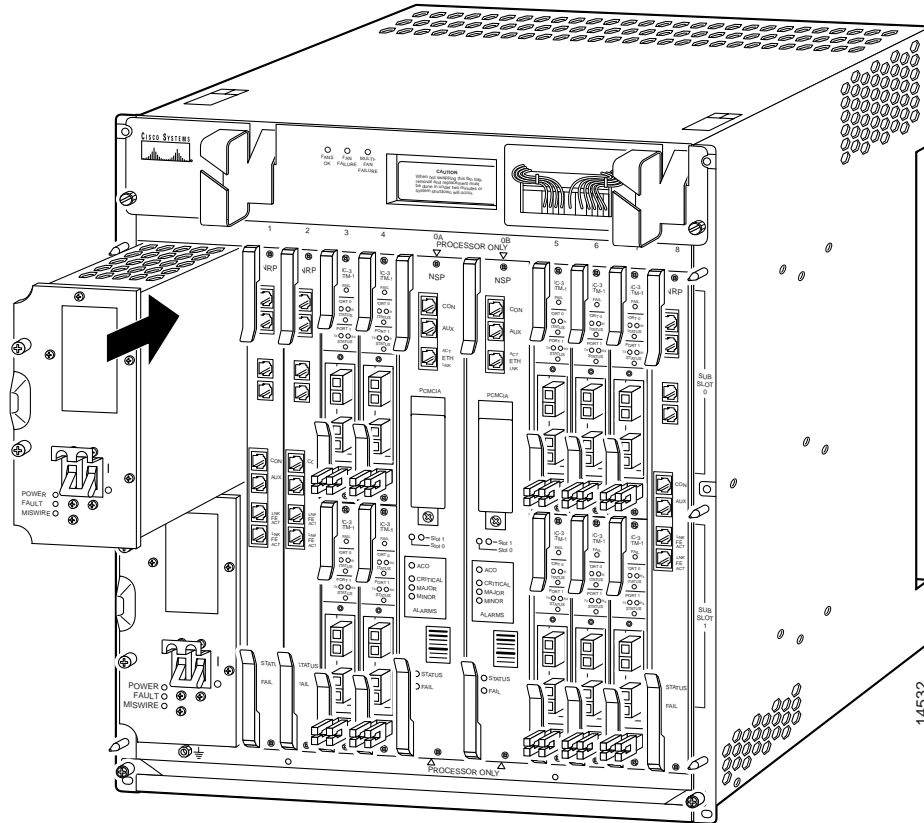
**Caution**

Always install a filler panel over an empty PEM power bay to protect the connectors from contamination and to ensure proper air flow.

Installing a DC Power Entry Module

[Figure 5-34](#) shows a DC PEM unit being installed in the Cisco 6400 chassis. You can insert a PEM unit into the Cisco 6400 without powering down the system.

Figure 5-34 Installing a DC Power Entry Module



To install a DC PEM in the Cisco 6400 chassis:

-
- Step 1** Ensure that the circuit breaker on the DC PEM is turned to Off.
 - Step 2** Align the PEM and insert it into the power bay.
 - Step 3** Firmly push the PEM all the way into the power bay to ensure that the power connectors mate.
 - Step 4** Tighten the captive screws on the faceplate of the PEM to secure the PEM to the chassis.
 - Step 5** If the chassis is connected to power, turn the circuit breaker on the DC PEM to On. The green POWER LED on the faceplate turns on to indicate that the DC PEM is providing power to the chassis. The yellow FAULT LED goes out.
-



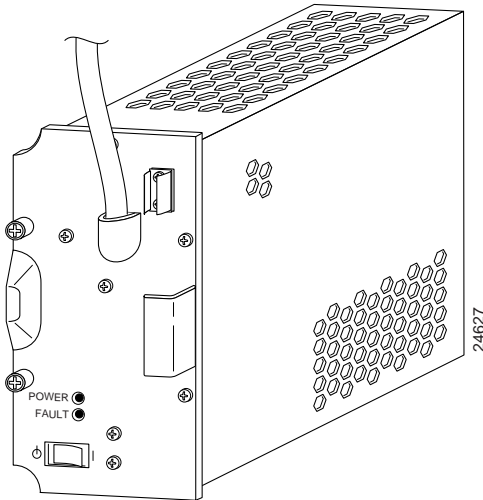
Note

If the miswire LED is on, reverse the connections on the DC PEM.

Replacing an AC Power Entry Module

This section describes procedures for removing and installing an AC power entry module (PEM) plug-in unit in the Cisco 6400 chassis (Figure 5-35).

Figure 5-35 AC Power Entry Module



There are two PEM power bays in the system for redundancy. The PEM power bays are located at the front left side of the chassis:

- The top bay is wired to power circuit A
- The bottom bay is wired to power circuit B



Note

The circuits are identified at the power terminals on the backplane.



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 weld the metal object to the terminals. Translations of this warning can be found in the *Regulatory Compliance and Safety Information* document that accompanied this device.

Removing an AC Power Entry Module

If you remove a redundant AC PEM, the chassis continues to operate normally. If you plan to remove the only operating PEM from a chassis, you must first power down the Cisco 6400 system. Refer to the procedure in the [“Powering Down the System”](#) section on page 5-8.

To remove a PEM from the Cisco 6400 chassis:

-
- Step 1** Turn OFF the power enable switch on the AC PEM you are removing.
 - Step 2** Unplug the AC power cable.
 - Step 3** Unscrew the retaining screws on the AC PEM faceplate.
 - Step 4** Grasp the AC PEM by the handle on the faceplate and pull it out of the chassis.
-

**Caution**

Always install a filler panel over an empty PEM power bay to protect the connectors from contamination and to ensure proper air flow.

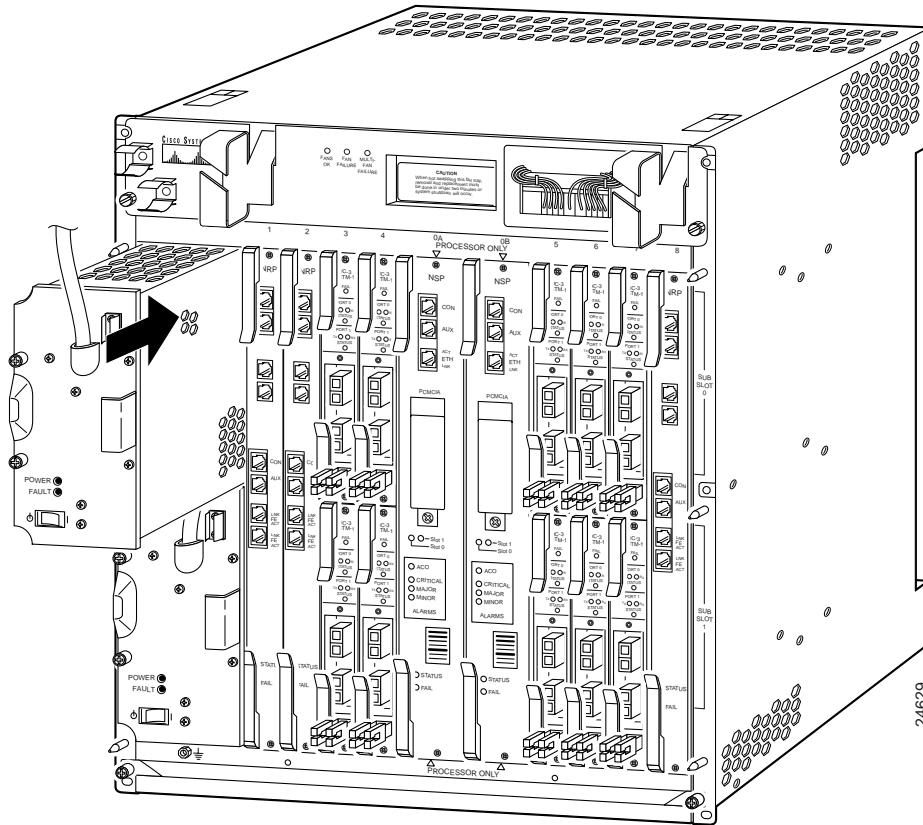
Installing an AC PEM

[Figure 5-36](#) shows an AC PEM unit being installed in the Cisco 6400 chassis. You can insert a PEM unit into the Cisco 6400 without powering down the system.

To install an AC PEM in the Cisco 6400 chassis:

-
- Step 1** Ensure that the power enable switch on the AC PEM is turned to Off.
 - Step 2** Align the PEM and insert it into the power bay.
 - Step 3** Firmly push the PEM all the way into the power bay to ensure that the power connectors mate.
 - Step 4** Tighten the captive screws on the faceplate of the PEM to secure the PEM to the chassis.
 - Step 5** Plug in the AC power cable.
 - Step 6** Turn the power enable switch on the AC PEM to On. The green POWER LED on the faceplate turns on to indicate that the AC PEM is providing power to the chassis. The yellow FAULT LED goes out.

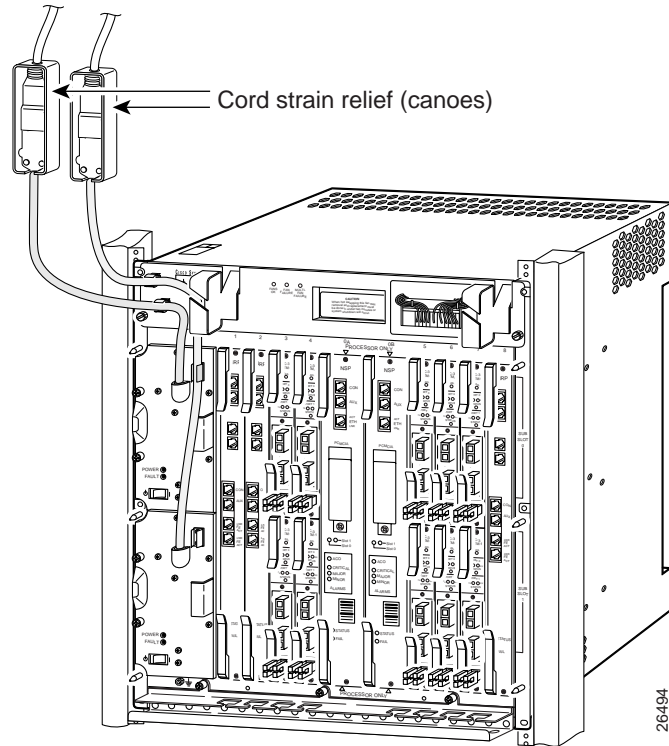
Figure 5-36 Installing an AC Power Entry Module



Note When a single PEM is used, it should be installed in the top slot.

Figure 5-37 shows suggested power cord connections for the AC PEM.

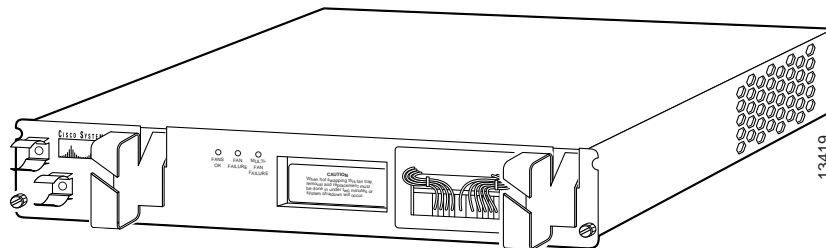
Figure 5-37 AC PEM Power Cord Connections



Replacing the Blower Module

This section describes procedures for removing and installing the blower module in the Cisco 6400 chassis. The blower module is located in the top part of the chassis, above the plug-in modules and cards. [Figure 5-38](#) shows the blower module.

Figure 5-38 Blower Module

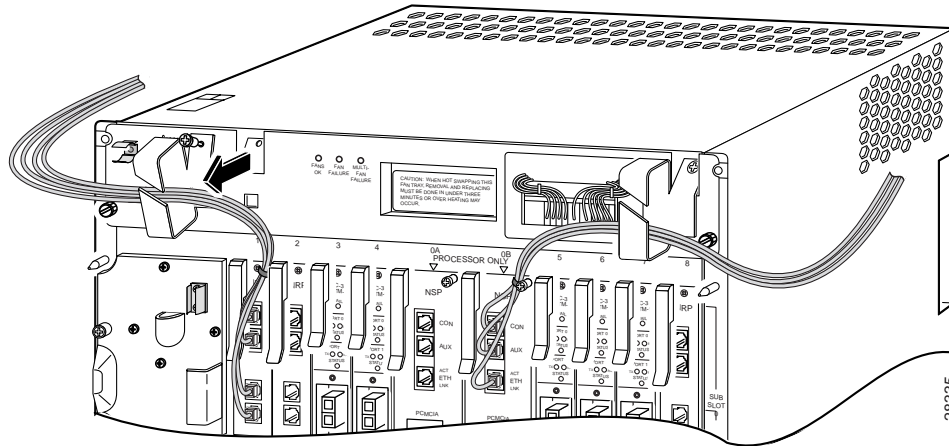


Removing the Blower Module

To remove the blower module from the Cisco 6400 chassis:

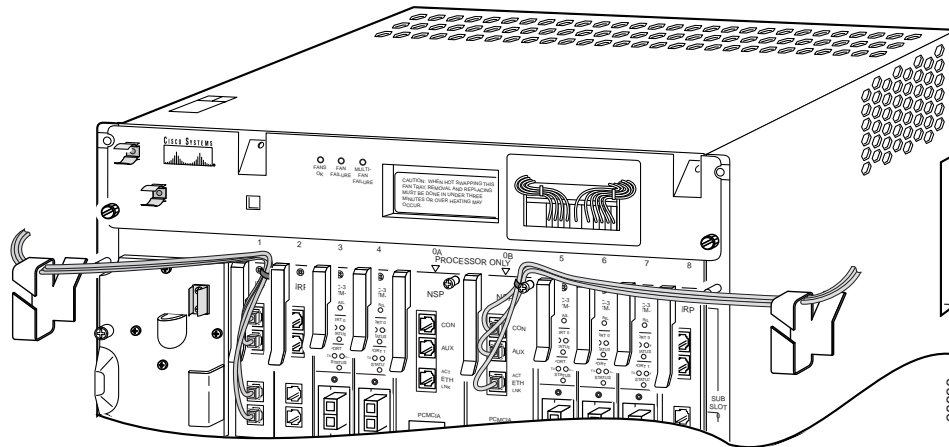
- Step 1 If you are using AC PEMs, remove the AC power cords from the clips on the blower module.
- Step 2 Detach the cable management brackets (Figure 5-39).

Figure 5-39 Detaching a Cable Management Bracket



- Step 3 Fold the loaded brackets to either side of the Cisco 6400 chassis, leaving the cables attached. The 20-inch service loop will allow you to pull the cables out of the way of the blower (Figure 5-40).

Figure 5-40 Folding Cables and Brackets away from the Blower



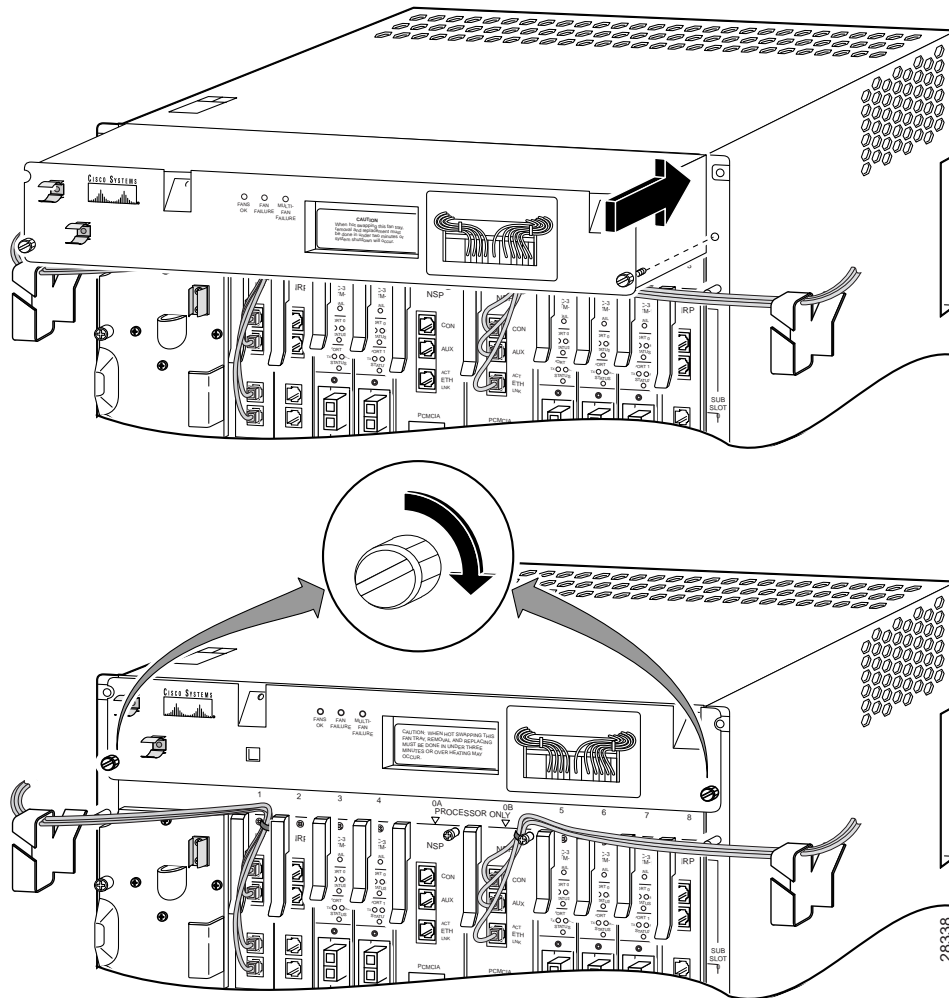
- Step 4 Remove the two screws on the front of the blower module (Figure 5-41).
- Step 5 Carefully slide the blower out of the chassis.
- Step 6 Place the blower module on a flat work surface.

Installing the Blower Module

To replace the blower module:

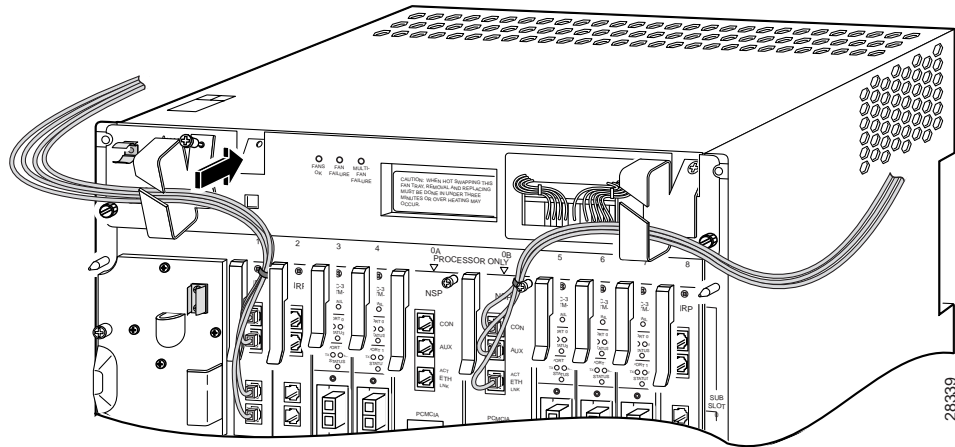
- Step 1 Slide the new blower module in until the rear connector engages (Figure 5-42).

Figure 5-42 Installing the Blower Module



- Step 2 Tighten the screws that secure the blower module to the chassis.
- Step 3 Reattach the loaded cable brackets, reestablishing the service loops (Figure 5-43).
- Step 4 Check the front panel of the blower module to make sure the FANS OK LED is On and both FAN FAILURE LEDs are Off.

Figure 5-43 Reattaching the Cable Management Brackets



Verifying Plug-In Module and Component Installation

After you perform a replacement procedure, verify that any new plug-in module or component is installed correctly. To verify the installation, check the status of the interfaces:

- If this item is a replacement card, use the **show configuration** or **show atm interface [slot_num/mod_num/port_num]** command to verify that the system acknowledges the new interfaces and that they are online.
- Refer to *Cisco 6400 Software Setup Guide* and *Cisco 6400 Command Reference* for all software instructions and information.

