Install and Upgrade Internal Modules and FRUs

This chapter describes how to install and upgrade internal modules and field replaceable units (FRUs) in Cisco 4000 Series Integrated Services Routers (ISR). The following sections provide the install and upgrade information:

**Internal and External Modules**
- Safety Warnings, page 5-2
- Modules Supported, page 5-4
- Access Internal Modules, page 5-4
- Locate Internal and External Slots, page 5-6
- Locate Internal and External Slots for Modules on Cisco 4461 ISR, page 5-7
- Locate Internal and External Slots for Modules on Cisco 4451 ISR, page 5-8
- Locate Internal and External Slots for Modules on Cisco 4351 ISR, page 5-10
- Locate Internal and External Slots for Modules on Cisco 4331 ISR, page 5-11
- Overview of NIM-HDD Card, page 5-21
- Remove and Replace Cisco NIM-SSD or NIM-HDD, page 5-23
- Install and Remove DDR DIMMs on Cisco 4400 or 4300 Series ISRs, page 5-26
- Install and Remove NIMs and SM-Xs on Cisco 4000 Series ISRs, page 5-31
- Install and Remove PVDM4 on Cisco 4400 or 4300 Series ISRs, page 5-33
- Remove and Replace the USB Flash Token Memory Stick, page 5-40
- Remove and Replace Cisco 4000 Series ISRs Power Supplies, page 5-41
- Replace Fan Blower on Cisco 4321 ISR, page 5-67
- Remove and Install the Flash Memory Card, page 5-74
- Install and Remove an SSD mSATA Storage Device, page 5-77
- Remove, Replace, and Install the Internal PoE Daughter Card, page 5-84

**FRUs**
- Replace a Fan Tray, page 5-62
- Replace Fan Tray on Cisco 4331 ISR, page 5-64
- Replace Fan Blower on Cisco 4321 ISR, page 5-67
- Install and Remove SFP Modules, page 5-80
• Remove and Replace Cisco 4000 Series ISRs Power Supplies, page 5-41

Caution

Read the Safety Warnings section and disconnect the power supply before you replace any module.

See the “Modules Supported” section on page 5-4 for instructions on how to install and replace internal components.

Safety Warnings

Warning

Read the installation instructions before connecting the system to the power source. Statement 1004

Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning

This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. Statement 1043

Warning

Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord. Statement 1

Warning

This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning

Hazardous network voltages are present in WAN ports regardless of whether power to the unit is OFF or ON. To avoid electric shock, use caution when working near WAN ports. When detaching cables, detach the end away from the unit first. Statement 1026

Warning

Before opening the unit, disconnect the telephone-network cables to avoid contact with telephone-network voltages. Statement 1041
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. Statement 43

Warning Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool. Statement 1035

Warning Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Statement 1036

Warning Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Statement 1037

Warning Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning. Statement 1038

Warning To report a gas leak, do not use a telephone in the vicinity of the leak. Statement 1039

Warning There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer’s instructions. Statement 1015

Warning Blank faceplates and cover 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, faceplates, front covers, and rear covers are in place. Statement 1029

Warning For connections outside the building where the equipment is installed, the following ports must be connected through an approved network termination unit with integral circuit protection.

T1 SFP Statement 1044
Modules Supported

For information about interfaces and modules supported by Cisco 4000 Series ISRs, refer to the Interfaces and Modules matrix.

Access Internal Modules

To access the internal modules on the router, you must first remove the chassis cover. See the Remove and Replace Chassis Cover, page 5-4 for instructions on how to remove and later replace the chassis cover on the routers.

Remove and Replace Chassis Cover

Cisco 4000 Series ISRs have a removable cover. The tasks that you perform for removing and replacing the router cover are based on the specific model of the Cisco 4000 Series ISRs.

See the relevant removing and replacing sub-section for your specific router in the Cisco 4000 Series ISRs:

- Remove Cover from Cisco 4400 or 4200 ISR
- Remove Cover from Cisco 4300 ISR
- Replace Cover on Cisco 4400 or 4200 ISR
- Replace Cover on Cisco 4300 ISR

Caution

Do not run the router with the cover off. This can cause the router to overheat quickly.

Warning

Before opening the unit, disconnect the telephone-network cables to avoid contact with telephone-network voltages. Statement 1041

Note

Use a number-2 Phillips screwdriver to perform the following tasks.

Remove Cover from Cisco 4400 or 4200 ISR

To remove the cover:

Step 1
Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

Step 2
Confirm the router is turned off and disconnected from the power supply or power supplies. If a redundant power is used, disconnect from the redundant power supply.

Step 3
Place the chassis on a flat surface.

Step 4
Remove the three cover screws at the back of the router cover. See Figure 5-1.

Step 5
Lift the cover from the back edge to a 45-degree angle.
Step 6  Pull the cover towards you to disengage the slots along the front (bezel) edge of the chassis. See Figure 5-1.

Remove Cover from Cisco 4300 ISR

To remove the cover:

Step 1  Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.
Step 2  Confirm the router is turned off and disconnected from the power supply or power supplies. If a redundant power is used, disconnect from the redundant power supply.
Step 3  Place the chassis on a flat surface.
Step 4  Remove the four cover screws on the top of the router cover and remove the two cover screws from each side of the router cover. See Figure 5-51
Step 5  Lift the cover from the back edge to a 45-degree angle.
Step 6  Pull the cover towards you to disengage the slots along the front (bezel) edge of the chassis. See Figure 5-1.

Replace Cover on Cisco 4400 or 4200 ISR

To replace the cover:

Step 1  Read the Safety Warnings, page 5-2 and disconnect the power supply before you replace any module.
Step 2  Confirm the router is turned off and disconnected from the power supply or power supplies. If a redundant power is used disconnect from the redundant power supply.
Step 3  Place the chassis on a flat surface.
Step 4  Hold the cover at a 45-degree angle and insert the cover tabs into the slots along the front (bezel) edge of the chassis. See Figure 5-1.
Step 5  Center the cover over the chassis and lower it onto the chassis.
Step 6  Install the three cover screws.
Chapter 5  Install and Upgrade Internal Modules and FRUs

Locate Internal and External Slots

Figure 5-1  Install the Cover on the Router (Shown Cisco 4451-X ISR)

---

Replace Cover on Cisco 4300 ISR

To replace the cover:

Step 1  Read the Safety Warnings, page 5-2 and disconnect the power supply before you replace any module.

Step 2  Confirm the router is turned off and disconnected from the power supply or power supplies. If a redundant power is used disconnect from the redundant power supply.

Step 3  Place the chassis on a flat surface.

Step 4  Hold the cover at a 45-degree angle and insert the cover tabs into the slots along the front (bezel) edge of the chassis. See Figure 5-1.

Step 5  Center the cover over the chassis and lower it onto the chassis.

Step 6  Install the four cover screws on the top of the router and the two cover screws at the side of the router.

---

Locate Internal and External Slots

Cisco 4400 Series ISRs and Cisco 4300 Series ISRs have replaceable internal modules.

Note  Cisco 4200 Series ISR do not have any replaceable internal modules.
See the relevant sub-section to locate internal modules for your specific router in Cisco 4000 Series ISRs:

- Locate Internal and External Slots for Modules on Cisco 4461 ISR
- Locate Internal and External Slots for Modules on Cisco 4451 ISR
- Locate Internal and External Slots for Modules on Cisco 4351 ISR
- Locate Internal and External Slots for Modules on Cisco 4331 ISR
- Locate Internal and External Slots for Modules on Cisco 4331 ISR

**Locate Internal and External Slots for Modules on Cisco 4461 ISR**

Figure 5-4 shows the locations of internal modules on Cisco 4461 ISR motherboard. Internal modules include DIMMs, PVDM4, and PoE daughter card. Figure 5-27 shows the location of the available slots that includes the Integrated Services Card (ISC) slot.

*Figure 5-2 Module Locations in Cisco 4461 ISR*

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Forwarding plane processor</td>
</tr>
<tr>
<td>2</td>
<td>Control plane processor</td>
</tr>
<tr>
<td>3</td>
<td>Control plane processor DIMM</td>
</tr>
<tr>
<td>4</td>
<td>NIM 3 (single-wide) slot</td>
</tr>
<tr>
<td>5</td>
<td>Enhanced Service Module (SM-X) slots</td>
</tr>
<tr>
<td>6</td>
<td>NIM slot 1 and 2 (shown with slot divider removed)</td>
</tr>
<tr>
<td>7</td>
<td>RJ-45 Gigabit Ethernet port (GE 0/0/3)</td>
</tr>
<tr>
<td>8</td>
<td>Forwarding plane processor DIMM</td>
</tr>
</tbody>
</table>
Locate NEBS Module

Note

We recommend that you change the air filter every 3 months. However, examine the air filter once a month (or more often in dusty environments) and replace it if it appears to be excessively dirty or damaged. To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployment, the air filter must be replaced, not cleaned.

Figure 5-3 shows the NEBS module on Cisco 4461 ISR.

Figure 5-3 NEBS Module Locations in Cisco 4461 ISR

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SM blank slot for NEBS</td>
</tr>
<tr>
<td>2</td>
<td>Power supply unit with reverse flow</td>
</tr>
<tr>
<td>3</td>
<td>PoE blank slot for NEBS. PoE is not allowed for NEBS.</td>
</tr>
<tr>
<td>4</td>
<td>NEBS fan tray with reverse flow</td>
</tr>
<tr>
<td>5</td>
<td>Air filter for NEBS</td>
</tr>
</tbody>
</table>

Locate Internal and External Slots for Modules on Cisco 4451 ISR

Figure 5-4 shows the locations of internal modules on Cisco 4451 ISR motherboard. Internal modules include DIMMs, PVDM4, and PoE daughter card. Figure 5-27 shows the location of the available slots that includes the Integrated Services Card (ISC) slot.
Figure 5-4  Module Locations in Cisco 4451-X ISR s

1. Forwarding plane processor
2. Control plane processor
3. Control plane processor DIMM
4. NIM 3 (single-wide) slot
5. Enhanced Service Module (SM-X) slots
6. NIM slot 1 and 2 (shown with slot divider removed)
7. SFP GE ports
8. Forwarding plane processor DIMM
Locate Internal and External Slots for Modules on Cisco 4351 ISR

Figure 5-5 shows an internal view of Cisco 4351 ISR chassis indicating the location of internal modules.

**Figure 5-5  Module Locations in Cisco 4351 ISR chassis**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CPU</td>
</tr>
<tr>
<td>2</td>
<td>DIMMs</td>
</tr>
<tr>
<td>3</td>
<td>Flash memory card connector</td>
</tr>
<tr>
<td>4</td>
<td>SSD mSATA connector</td>
</tr>
<tr>
<td>5</td>
<td>NIM slot 3</td>
</tr>
<tr>
<td>6</td>
<td>NIM slot 2</td>
</tr>
<tr>
<td>7</td>
<td>SM-X slots</td>
</tr>
<tr>
<td>8</td>
<td>NIM slot 1</td>
</tr>
<tr>
<td>9</td>
<td>RJ-45 GE ports</td>
</tr>
<tr>
<td>10</td>
<td>ISC slot</td>
</tr>
</tbody>
</table>
Locate Internal and External Slots for Modules on Cisco 4331 ISR

Figure 5-6 shows locations of internal modules on the Cisco 4331 ISR motherboard. Internal modules include DIMMs, PVDM4, and PoE daughter card. Figure 5-28 shows the location of the available slots that includes the Integrated Services Card (ISC) slot.

Figure 5-6 shows an internal view of Cisco 4331 ISR chassis indicating the location of internal modules.

Overview of the SSD Carrier Card NIM (NIM-SSD)

This section describes the NIM-SSD and how to remove and replace NIM-SSDs. This section contains the following sections:

- Overview
Overview

The solid state drive (SSD) carrier card network interface module (NIM) enables SSD support on the platform NIM slots. It provides flash storage to the platform and supports dual 2.5” (7mm max) SATA SSDs. The carrier card fits into the NIM slots in the router. The router supports only a single SSD Carrier Card NIM.

Note
Refer to the “Network Interface Modules” section of the Software Configuration Guide for Cisco 4000 Series ISRs for configuration information on the SSD carrier card NIM.

Note
When ISR-WAAS is operational, do not perform online insertion or replacement (OIR) of NIM-SSD.

The SSD carrier card NIM (Figure 5-7) has the following features:

- Single-wide NIM form factor
- LEDs for module and driver status
- On board PCIe x1 Gen 2(5G) dual-port SATA controller
- SFF 2.5” SATA2 or SATA3 (7mm or less) SSDs Support
- Supports module online insertion and removal (OIR): You can remove it from a bay and insert it into a bay while the router is running
- NIM-SSD support in any bay in slot 0
- Support for only one NIM-SSD module per router

Figure 5-7 shows the front panel of the SSD NIM.
Overview of the SSD Carrier Card NIM (NIM-SSD)

Figure 5-7 Front Panel of the SSD Carrier Card NIM
LEDs on NIM-SSD

Table 5-1 describes the LEDs on NIM-SSD shown in Figure 5-7.

Table 5-1 SSD Drive LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Represents</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>Module power</td>
<td>Green</td>
<td>Module is powered on.</td>
</tr>
<tr>
<td>Off</td>
<td>Module power is off.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSD0</td>
<td>Solid state drive in slot 0</td>
<td>Green</td>
<td>SSD present.</td>
</tr>
<tr>
<td>Off</td>
<td>No SSD drive in slot 0.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>SSD activity</td>
<td>Green</td>
<td>Activity in the SSD drive.</td>
</tr>
<tr>
<td>Off</td>
<td>No activity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSD1</td>
<td>Solid state drive in slot 1</td>
<td>Green</td>
<td>SSD present.</td>
</tr>
<tr>
<td>Off</td>
<td>No SSD in slot 1.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5-8 shows the rear view of the SSD carrier card NIM, which fits into the router.

Figure 5-8 Rear View of the SSD Carrier Card NIM
Table 5-2 lists the specifications of the SSD Carrier Card NIM.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical</strong></td>
<td></td>
</tr>
<tr>
<td>Dimensions (H x W x D)</td>
<td>1.5 x 3.5 x 7.5 in (3.8 x 8.9 x 19.1 cm).</td>
</tr>
<tr>
<td>Weight</td>
<td>1.0 lbs (0.454 kg)</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td></td>
</tr>
<tr>
<td>Power consumption (maximum)</td>
<td>20W</td>
</tr>
<tr>
<td><strong>Environmental</strong></td>
<td></td>
</tr>
<tr>
<td>Operating humidity</td>
<td>10 to 85% operating</td>
</tr>
<tr>
<td>Operating altitude maximum</td>
<td>• 104°F (40°C) at sea level</td>
</tr>
<tr>
<td></td>
<td>• 104°F (40°C) at 6,000 ft (1,800m)</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> De-rate 2.5°F (1.4°C) per 1,000 ft above 6,000 ft (per 300m above 2,600m)</td>
</tr>
<tr>
<td><strong>Transportation and Storage</strong></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>4 to 149°F (-20 to +65°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 95%</td>
</tr>
<tr>
<td>Altitude</td>
<td>15,000 ft (4,600m)</td>
</tr>
</tbody>
</table>
Figure 5-9 shows the top of the SSD carrier card NIM along with the serial number and the label location.

**Figure 5-9  Top View of the SSD Carrier Card NIM with Serial Number**

---

**Solid State Drives**

The routers contain two solid state drives (SSD) that provide nonvolatile storage in the form of an internal flash disk. On the front panel of the router, the SSD LED indicates activity on the hard drive.

The SSD carrier card NIM can support up to two SFF 2.5” SATA2 or SATA3 (7mm or less) SSDs. Figure 5-10 shows a top view of the SSD drive that can be inserted into a NIM carrier card. Figure 5-11 shows two SSDs in a NIM carrier card.
Overview of the SSD Carrier Card NIM (NIM-SSD)

Figure 5-10  Solid State Drive

Figure 5-11  NIM-SSD with Two Solid State Drives
Install SSD Drives into the NIM Carrier Card

To insert one or two SSD drives into the carrier NIM:

**Note**
Prior to installing the NIM-SSD card, power off the device using the `hw-module subslot slot/subslot stop` command in EXEC mode.

**Step 1**
On the NIM-SSD, loosen the captive screws retaining the SSD card slot cover (Figure 5-12).

**Figure 5-12  Opening the SSD Slot Cover**

![Diagram of SSD Slot Cover](image)

1  Captive screws on the SSD slot cover attaching the SSD Drive to the NIM Carrier Card

**Step 2**
Rotate the SSD card slot cover down, exposing the slots that hold the SSDs as shown in Figure 5-13.
Step 3 Insert an SSD in the lower slot first.
Step 4 Insert the SSD connector end first with the connector side down and serial number facing up (Figure 5-10).
Step 5 A second SSD may be inserted in the upper slot as shown in Figure 5-11.
Step 6 Rotate the SSD card slot cover up and place it over the SSDs.
Step 7 Tighten the captive fasteners on the SSD card slot cover.

Remove SSD Drives from the NIM-SSD

**Note** Prior to removing the NIM-SSD card, power off the device using the `hw-module subslot slot / subslot stop` command in EXEC mode.

To remove the SSD cards from the NIM carrier:

Step 1 On the NIM-SSD, loosen the captive screws retaining the NIM-SSD slot cover.
Step 2 Rotate the SSD card slot cover down, exposing the slots that hold the SSDs.
Step 3  To remove the SSD one at a time, pull the two tabs on the front of each SSD as shown in Figure 5-14.

Step 4  Rotate the SSD card slot cover up and place it over the SSDs.

Step 5  Tighten the captive fasteners on the SSD card slot cover.

Figure 5-14  Pulling Out the Solid State Drives

1  Carrier card slot cover
Overview of NIM-HDD Card

The NIM-HDD is a network interface module that is used to support hard disk drive (HDD) connection for Cisco 4400 Series ISR and Cisco 4300 ISR.

The NIM-HDD module has the following features:

- Provides 1 TB of memory.
- The NIM form-factor supports and houses a single field replaceable 15 mm HDD or two SSDs.
- On-board PCIe dual channel SATA controller enables the NIM-HDD in any NIM slot of the router (Controller Mode)
- Support SATA pass-through mode
- Supports module level OIR operation
- Supports hot plug of SSD/HDDs

Note

A drive is removable or insertable while the power is running on the SSD/HDD connector.
Overview of NIM-HDD Card

- On-board Quack2 for module authentication
- Power and reset
- Firmware upgrade

Note

The removal of a drive during active read-write operation is not supported. Ensure that the drive is shut down before you replace the NIM-HDD.

Figure 5-16 shows the HDD card that can be inserted into the NIM chassis shown in Figure 5-17. Figure 5-18 shows the entire Cisco NIM-HDD.

Figure 5-16  HDD Card

Figure 5-17  NIM Chassis for the HDD
Cisco NIM-HDD LEDs

Table 5-3 shows the LED description for the NIM-HDD.

<table>
<thead>
<tr>
<th>LED</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN (Enabled)</td>
<td>Green</td>
<td>The module is powered on and is functioning correctly.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Module has some failure.</td>
</tr>
<tr>
<td>Off</td>
<td></td>
<td>Default when module is powered on for the first time. Persistent until changed by the host software.</td>
</tr>
<tr>
<td>HDD0</td>
<td>Green</td>
<td>HDD0 is present.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Fault detected on HDD0.</td>
</tr>
<tr>
<td>HDD ACT</td>
<td>Green</td>
<td>Activity on HDD0 and HDD1</td>
</tr>
<tr>
<td>HDD1</td>
<td>Green</td>
<td>HDD1 is present.</td>
</tr>
<tr>
<td></td>
<td>Amber</td>
<td>Fault detected on HDD1.</td>
</tr>
</tbody>
</table>

Remove and Replace Cisco NIM-SSD or NIM-HDD

This section explains how to remove a NIM-SSD or NIM-HDD from the router chassis and replace it with a new external NIM-SSD or NIM-HDD.

Plugging additional SSD Carrier Card NIMs into a bay powers off the module. Power down the NIM-SSD module and wait for the power LED to turn off before removing the module or removing and replacing new SSD drives.

To deactivate and reactivate a NIM, see the “Deactivating and Reactivating a SSD Carrier Card NIM” section in the Software Configuration Guide for Cisco 4000 Series ISRs.
Restrictions

- Cisco SSD Carrier Card NIM with no SSD drives is not supported.
- Dynamically removing and inserting SSD drives on a NIM is not supported.
- Only a single SSD Carrier Card NIM per router is supported on any bay.
- Replacing any SSD drive can cause some data loss.

Warning

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

Before you begin, read the following:

- The form-factor internal hard drive is accessible from the front panel of the Cisco 4451-X ISR and supports the online insertion and removal feature (OIR) using the following commands for the standby:
  - request platform hardware filesystem harddisk: offline
  - To verify the SSD drive installation, use the show platform command. The following sample output from a NIM SSD installed on a 4451-X ISR platform:

```
Router# show platform
Chassis type: ISR4451/K9

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
 0        ISR4452/K9          ok                    15:57:33
0/0       ISR4451-6X1GE       ok                    15:55:24
0/3       NIM-SSD            ok                    15:55:24
 1        ISR4451/K9          ok                    15:57:33
1/0       SM-1T3/E3           ok                    15:55:24
 2        ISR4451/K9          ok                    15:57:33
2/0       SM-1T3/E3           ok                    15:55:24
 R0       ISR4451/K9          ok, active            15:57:33
 F0       ISR4451-PP          ok, active            15:57:33
 F0       Unknown             ps, fail              never
 P1       XXX-XXXX-XX         ok                    15:56:58
 P2       ACS-4450-ASSY       ok                    15:56:58

Slot      CPLD Version        Firmware Version
--------- ------------------- ---------------------------------------
 0        12090323            15.3(01r)S            [ciscouser-ISRRO...
 1        12090323            15.3(01r)S            [ciscouser-ISRRO...
 2        12090323            15.3(01r)S            [ciscouser-ISRRO...
 R0       12090323            15.3(01r)S            [ciscouser-ISRRO...
 F0       12090323            15.3(01r)S            [ciscouser-ISRRO...

- You remove an internal hard drive only when it fails. You can remove the internal drive and recover the data.
- If the drive is in active state, you can back up with the drive plugged into a USB port using the archive tar command.
Remove NIM-SSD or NIM-HDD

To remove the module from the router:

**Step 1** Slip on the ESD-preventive wrist strap that was included in the accessory kit. Loosen the screw fasteners (11) located on the SSD slots on the right of the input/output (I/O) side of the Cisco 4451-X ISR. (Figure 5-19).

*Figure 5-19  Remove the NIM-SSD or NIM-HDD from the Router*

1 Captive screws holding the NIM-SSD to the router

**Step 2** Using a Phillips screwdriver, loosen the captive screws on either side as shown in Figure 5-19.

*Figure 5-20  Remove the NIM-SSD or NIM-HDD from the Router*
Install and Remove DDR DIMMs on Cisco 4400 or 4300 Series ISRs

To access the DIMMs, you must remove the chassis cover as described in the “Remove and Replace Chassis Cover” section on page 5-4.

Caution
Always wear an ESD-preventive wrist strap and ensure that it makes good contact with your skin when you remove or install DIMMs. Connect the equipment end of the wrist strap to the metal part of the chassis.

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

Note
When you upgrade to the latest rommon image, the latest model of the Cisco 4451 ISR will support only a single DIMM operation on the device by default.

Locate and Orient DIMM

See the “Locate Internal and External Slots for Modules on Cisco 4451 ISR” section on page 5-8 to find DIMM connectors on the router.

Replace NIM-SSD or NIM-HDD

To replace the NIM-SSD or the NIM-HDD:

Step 1
Align the NIM-SSD carrier card to the router base.

Step 2
Use both hands to slide it back into the slot in the Cisco 4451-X ISR.

Step 3
Tighten the captive screws as shown in Figure 5-20.

Install and Remove DDR DIMMs on Cisco 4400 or 4300 Series ISRs

To access the DIMMs, you must remove the chassis cover as described in the “Remove and Replace Chassis Cover” section on page 5-4.

Caution
Always wear an ESD-preventive wrist strap and ensure that it makes good contact with your skin when you remove or install DIMMs. Connect the equipment end of the wrist strap to the metal part of the chassis.

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

Note
When you upgrade to the latest rommon image, the latest model of the Cisco 4451 ISR will support only a single DIMM operation on the device by default.

Locate and Orient DIMM

See the “Locate Internal and External Slots for Modules on Cisco 4451 ISR” section on page 5-8 to find DIMM connectors on the router.
DIMMs have a polarization notch on the mating edge to prevent incorrect insertion. Figure 5-21 shows the polarization notch on a DIMM.

**Figure 5-21  DIMM Showing Polarization Notch**

---

1. **Polarization notch**

**Remove DIMM**

To remove a DIMM:

**Step 1**  Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you replace any module.

**Step 2**  Remove the chassis cover. See the “Remove and Replace Chassis Cover” section on page 5-4.

**Step 3**  Locate the DIMM module. See the “Locate Internal and External Slots for Modules on Cisco 4451 ISR” section on page 5-8 to find the DIMM sockets on the router.
Step 4  Pull the latches away from the DIMM at both ends to lift the DIMM slightly. Pull the DIMM out of the socket as shown in Figure 5-22.
Install DIMM

**Note**
The DIMMS on the Cisco 4400 Series ISR and Cisco 4300 Series ISR are not interchangeable.

To install a DIMM:

**Step 1** Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you replace any module.

**Step 2** Remove the chassis cover. For the Cisco 4451-X ISRs, see the “Remove and Replace Chassis Cover” section on page 5-4.

**Step 3** Locate the DIMM module. See the “Locate Internal and External Slots for Modules on Cisco 4451 ISR” section on page 5-8 to find the DIMM sockets on the router.

**Step 4** Make sure that both latches on the DIMM connector are in the open position.

**Step 5** Orient the DIMM so that the polarization notch lines up with the polarization key on the connector. See Figure 5-23.
**Step 6** Insert the DIMM into the connector one side at a time. Figure 5-24 shows what to avoid while handling a DIMM.

**Step 7** Firmly press the DIMM into the connector until the latches close onto the DIMM. Ensure that both latches rotate to the closed position against the DIMM. See Figure 5-25.
Install and Remove NIMs and SM-Xs on Cisco 4000 Series ISRs

Network Interface Modules (NIMs), Service Modules (SM-Xs), and Cisco E-Series Server Modules plug into the various slots on the motherboard. SM-Xs are sold as spare parts with labels that identify the SM-X type. See the following sections for SM-X installation tasks:

**Note**
The procedures in this section apply to NIMs, SM-Xs, and Cisco E-Series Server modules.

- Software Requirement for SM-Xs
- Locate SM-X or NIM
- Remove SM-X or NIM
- Install SM-X
- Verify SM-X Installation

**Caution**
Always wear an ESD-preventive wrist strap and ensure that it makes good contact with your skin when you remove or install an SM-X. Connect the equipment end of the wrist strap to the metal part of the chassis.

**Caution**
Handle SM-Xs and NIMs by the edges only. SM-Xs are ESD-sensitive components and can be damaged by mishandling.

Step 8: Replace the chassis cover. See the “Remove and Replace Chassis Cover” section on page 5-4.
Software Requirement for SM-Xs

Cisco IOS XE software of a specified release or later release is required for using an SM-X. To determine the version of Cisco IOS software that is running on your router, log in to the router and enter the show version command:

```
Router> show version
```

Cisco Internetwork Operating System Software
4400 Software (C4400-ADVENTERPRISEK9-M), Version 12.3(8.2)T, INTERIM SOFTWARE

Locate SM-X or NIM

See the “Locate Internal and External Slots” section on page 5-6 to locate the SM-X or NIM slot on the motherboard.

Remove SM-X or NIM

To remove an SM-X:

1. Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.
2. Access the SM-X slot. See Figure 5-4 for the various NIM and SM-X slot locations.
3. Loosen the captive screws to open the slot cover. See Figure 5-12 and Figure 5-13.
4. Pull the SM-X out of the connector on the motherboard. Keep the SM-X parallel with the motherboard to prevent damage to the slot and standoff.
5. Place the SM-X in an antistatic bag to protect it from ESD damage.

Install SM-X

To install an SM-X, use a number 2 Phillips screwdriver or flat-blade screw drive, and a 1/4-inch nut driver or wrench.

1. Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.
2. To inset the SM-X, identify the SM-X slot.
3. Loosen the captive screws to open the slot cover. See Figure 5-12 and Figure 5-13.
4. Insert the SM-X to the system board.

Note: Press firmly on the SM-X until the board is properly installed on the connector.

5. Insert the screws from the accessory kit through the SM-X into the standoff. See Figure 5-29. Tighten the screws with a Phillips screwdriver (torque 6 to 8 in-lb or 0.7 to 1.1 Nm.).
Step 6  
Check that the SM-X is installed correctly on the system board.

Note  
For more details on installation of SM-Xs, NIMs, and Cisco E-Series Server Modules, see the hardware installation guide for the particular module you have purchased.

For a list of links to all the SM-Xs and NIMs supported on your router, see the Documentation Roadmap for the Cisco 4000 Series ISRs.

Verify SM-X Installation

Use the `show diag` command to verify that the SM-X is installed correctly. In the following example, one SM-X is recognized by the system.

```
router#show diag ?
  all      All related information
  chassis  Chassis related information
  slot     Slot location information for this command
  subslot  Subslot location information for this command

Router#show diag subslot 2/0 eeprom detail
SPA EEPROM data for subslot 2/0:
  EEPROM version : 4
  Compatible Type : 0xFF
  Controller Type : 1909
  Hardware Revision : 1.0
  PCB Part Number : 73-14154-02
  Top Assy. Part Number : 800-36532-01
  Board Revision : 06
  Deviation Number : 123598
  Fab Version : 02
  PCB Serial Number : POC15495HU1
  Asset ID : REV 2F
  Product Identifier (PID) : SM-X-1T3/E3
  Version Identifier (VID) : V01
  CLEI Code : TBD
  Base MAC Address : C4 0A CB 56 00 99
  MAC Address block size : 3
  Manufacturing Test Data : 00 00 00 00 00 00 00 00
  Environment Monitor Data : 40 0B E3 43 00 0A
  Platform features : 02 01 01 0A 00 00 00 00
                     01 01 00
```

Install and Remove PVDM4 on Cisco 4400 or 4300 Series ISRs

This section describes the installation tasks for the PVDM4 used on the router. The tasks that you perform for installing and removing the PVDM4 are based on specific models of the Cisco 4000 Series Integrated Service Routers.

See the relevant sub-section to install and remove PVDM4 for your specific router in the Cisco 4000 Series ISRs:

- **Tools and Equipment Requirements**
• Install PVDM4 on the Motherboard of Cisco 4400 Series ISRs
• Remove the PVDM4 from the Motherboard of Cisco 4400 ISRs
• Install the PVDM4 on the Motherboard of Cisco 4331 ISR
• Remove the PVDM4 from the Motherboard of Cisco 4331 ISR
• Install the PVDM4 on Cisco Fourth-Generation T1/E1 Voice and WAN NIM
• Remove the PVDM4 from Cisco Fourth-Generation T1/E1 Voice and WAN NIM

Tools and Equipment Requirements

You need the following tools and equipment when you work with PVDM4:
• Number 1 Phillips screwdriver or a small flat-blade screwdriver
• ESD-preventive wrist strap
• (For routers using DC power) Tape to secure DC circuit breaker handle

PVDM4 Location and Orientation

The PVDM4 connector is located on the motherboard. Figure 5-26 shows the PVDM4, screws, and connector. The connector on the PVDM4 must align with the corresponding connector on the motherboard.

Figure 5-26 View of PVDM4 Connector and Screws
Install PVDM4 on the Motherboard of Cisco 4400 Series ISRs

To install the PVDM4:

**Step 1** Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

**Step 2** Turn off electrical power to the router. Leave the power cable plugged in to channel ESD voltages to ground.

**Step 3** Remove the cover.

**Step 4** Identify the ISC slot on the router’s main motherboard.

**Step 5** Locate the three standoffs from the motherboard. See Figure 5-27.

**Step 6** Insert the PVDM4 into the ISC slot on the system board.

Note: Press firmly on the PVDM4 until the board seats onto the connector.

**Step 7** Insert the screws from the accessory kit through the PVDM4 into the standoffs. Tighten the screws with a Phillips screwdriver (torque 6 to 8 in-lb. or 0.7 to 1.1 Nm).

**Step 8** Check if the PVDM4 is installed correctly on the system board.

**Step 9** Replace the cover.

---

**Caution**

When you remove or install the PVDM4, always wear 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 part of the chassis.

**Caution**

Handle the PVDM4 only by the edges. PVDM4s are ESD-sensitive components and can be damaged by mishandling.

**Warning**

No user-serviceable parts inside. Do not open. Statement 1073

**Warning**

Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030
Remove the PVDM4 from the Motherboard of Cisco 4400 ISRs

To remove the PVDM4:

**Step 1**  
Turn off electrical power to the router. Leave the power cable plugged in to channel ESD voltages to ground.

**Step 2**  
Remove the router cover.

**Step 3**  
Locate the PVDM4 on the motherboard. See Figure 5-27.

*Figure 5-27  Location of PVDM4 on Cisco 4451-X ISR*

<p>| | | |</p>
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<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Screws</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Connector</td>
<td>4</td>
</tr>
</tbody>
</table>

**Step 4**  
Loosen and remove the three screws on the PVDM4.

**Step 5**  
Lift the PVDM4 up from the motherboard.

**Step 6**  
Place the PVDM4 in an antistatic bag.

**Step 7**  
Replace the cover.
Install the PVDM4 on the Motherboard of Cisco 4331 ISR

**Step 1** Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

**Step 2** Turn off electrical power to the router. Leave the power cable plugged in to channel ESD voltages to ground.

**Step 3** Remove the cover.

**Step 4** Identify the ISC slot on the router’s main motherboard.

**Step 5** Locate the three standoffs from the motherboard. See Figure 5-28.

**Step 6** Insert the PVDM4 into the ISC slot on the system board.

> **Note** Press firmly on the PVDM4 until the board seats onto the connector.

**Step 7** Insert the screws from the accessory kit through the PVDM4 into the standoffs. Tighten the screws with a Phillips screwdriver (torque 6 to 8 in-lb. or 0.7 to 1.1 Nm).

**Step 8** Check that the PVDM4 is installed correctly on the system board.

**Step 9** Replace the cover.

---

**Caution** When you remove or install the PVDM4, always wear 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 part of the chassis.

**Caution** Handle the PVDM4 by the edges only. PVDM4s are ESD-sensitive components and can be damaged by mishandling.

**Warning** No user-serviceable parts inside. Do not open. Statement 1073

**Warning** Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030
Remove the PVDM4 from the Motherboard of Cisco 4331 ISR

**Step 1** Turn off electrical power to the router. Leave the power cable plugged into the channel ESD voltages to ground.

**Step 2** Remove the router cover.

**Step 3** Locate the PVDM4 on the motherboard. See Figure 5-28.

**Figure 5-28 Location of PVDM4 on Cisco 4331 ISR**

---

<p>| | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screws</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Connector</td>
<td>4</td>
</tr>
</tbody>
</table>

**Step 4** Loosen and remove the three screws on the PVDM4.

**Step 5** Lift the PVDM4 up from the motherboard.

**Step 6** Place the PVDM4 in an anti-static bag.

**Step 7** Replace the cover.
Install the PVDM4 on Cisco Fourth-Generation T1/E1 Voice and WAN NIM

**Step 1** Shut down the electrical power to the slot in the router by either turning off the electrical power to the router or by issuing the online insertion and removal (OIR) commands. Leave the power cable plugged in to channel ESD voltages to ground. For more information on OIR, see the Appendix, “Online Insertion and Removal (OIR) and Hot-Swapping”.

**Step 2** Loosen the two captive screws on the network interface module.

**Step 3** Remove the network interface module. (See Figure 5-29.)

**Step 4** Locate the three standoffs on the network interface module where the PVDM4 resides.

**Step 5** Align the PVDM4 with the connector and the standoffs, and attach the PVDM4 with the three screws.

**Step 6** Slide the network interface module back in the router, and tighten the captive screws.
Remove and Replace the USB Flash Token Memory Stick

Remove the PVDM4 from Cisco Fourth-Generation T1/E1 Voice and WAN NIM

Step 1  Shut down the electrical power to the slot in the router by either turning off the electrical power to the router or by issuing the online insertion and removal (OIR) stop command. Leave the power cable plugged in to channel ESD voltages to ground. For more information on OIR, see the OIR Procedures.

Step 2  Loosen the two captive screws on the network interface module.

Step 3  Remove the network interface module with the PVDM4. (See Figure 5-29.)

Step 4  Loosen the three screws and standoffs on the PVDM4.

Step 5  Lift the PVDM4 up from the network interface module.

Step 6  Place the PVDM4 in an antistatic bag.

Step 7  If you are not immediately replacing the network module, install the blank cover over the empty network module slot.

Step 8  Slide the network interface module back in the router, and tighten the captive screws.

Remove and Replace the USB Flash Token Memory Stick

The Cisco 4000 Series ISRs contain ports for a 1 GB flash token memory stick to store configurations or Cisco IOS XE consolidated packages.

Note  Only Cisco USB Flash memory modules are supported on Cisco routers.

Caution  Do not remove a USB Flash memory module when you execute file access command or a read/write operation to the Flash memory module when it is processing. The router may reload or the USB Flash memory module can be damaged. You can check to see if the USB activity LED on the router front panel is flashing, prior to the removal of the USB device.

To remove and then replace a USB flash token memory stick from the router:

Step 1  Pull the memory stick from the USB port.

Step 2  To replace Cisco USB Flash memory stick, simply insert the module into the USB port 0 or 1 port as shown in Figure 5-30. The Flash memory module can be inserted in only one way, and can be inserted or removed whether the router is powered on or off.

Note  Figure 5-30 shows how the memory stick is inserted into the port and does not display the actual router faceplate.
Remove and Replace Cisco 4000 Series ISRs Power Supplies

Cisco 4400 and 4300 Series ISRs have replaceable power supply modules. These modular power supplies can be removed or installed using only a screwdriver.

- AC Power Supplies, page 5-42
- Overview of DC Power Supply, page 5-46
- Replace the Power Supply Module on the Cisco 4331 Router, page 5-53
- PoE Converter Power Supply Unit, page 5-58

Warning Blank faceplates and cover 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, faceplates, front covers, and rear covers are in place. Statement 1029

Warning This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Warning Care should be taken while removing the power supplies and power inverters (especially in boost mode of operation). If the total power consumption is higher than can be supported by one power supply alone and in this condition a power supply is removed, the hardware can be damaged. This may then result in the system being unstable or unusable.
AC Power Supplies

Overview of the AC Power Supply

Power supply has a similar modular form factor without cabling for easy removal and replacement.

Figure 5-31  Power Supply Unit (Cisco 4461 ISR Shown)
Figure 5-32  Power Supply Unit (Cisco 4451-X ISR Shown)

Replace AC Power Supply

Caution

Care should be taken while removing the power supplies and PoE power supply, especially in boost mode of operation. If the total power consumption is higher than that which can be supported by one PSU alone, and in this condition, if you remove a PSU, you may damage the hardware. This may result in the system being unstable or unusable.

Similarly, if there is only one PoE power supply and it is providing PoE power to an SM-X, and if the PoE power supply is removed, the hardware may be damaged and may result in the system being unstable or unusable.
Remove and Replace Cisco 4000 Series ISRs Power Supplies

Chapter 5    Install and Upgrade Internal Modules and FRUs

Step 1  Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you replace any module.

Step 2  Remove the router bezel. The bezel is secured with snap latches. To remove the bezel, hold the top and bottom and pull the bezel.

Step 3  Pull on the quick-release catch on the side to leverage the power supply from its connector, and then slide the power supply module out of the chassis.

Step 4  Insert the replacement power supply module.

Step 5  Replace the bezel.

Figure 5-33  Cisco 4451-X ISR Power Supply Units

1  AC power supply unit PSU (behind the bezel)  2  Router On/Off switch
### Figure 5-34  Cisco 4451-X ISR Power Supply Units

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Router fan tray (behind the bezel)</td>
</tr>
<tr>
<td>2</td>
<td>LEDs</td>
</tr>
<tr>
<td>3</td>
<td>Router On/Off switch</td>
</tr>
<tr>
<td>4</td>
<td>AC power supply unit PSU0</td>
</tr>
<tr>
<td>5</td>
<td>AC power supply unit PSU1</td>
</tr>
</tbody>
</table>
Overview of DC Power Supply

This section describes the installation procedure that is common for all Cisco 4400 and 4300 Series ISRs. The DC power supply is only supported on Cisco 4461 ISR, Cisco 4451-X ISR, Cisco 4431 ISR, and Cisco 4351 ISR.

- Remove DC Input Power from Cisco 4461 or 4431 ISR, page 5-48
- Install DC Input Power on Cisco 4431 ISR, page 5-49
- Remove DC Input Power from Cisco 4331 ISR, page 5-54
- Install DC Input Power on Cisco 4431 ISR, page 5-49
- PoE Converter Power Supply Unit, page 5-58

For the Cisco 4431 ISR, the input connector and plug must be UL recognized under UL 486 for field wiring. The connection polarity is from left to right: negative (–), positive (+), and ground.

For the Cisco 4451-X ISR and Cisco 4351 ISR, the input connector and plug must be UL recognized under UL 486 for field wiring. The connection polarity is from left to right: ground, negative (–), positive (+).

The power supply has a handle that is used for insertion and extraction. The module must be supported with one hand because of its length.

For Cisco 4461 ISR, the power supply DC input range is –40 to –72 VDC, and the maximum power is 650 W.

For Cisco 4431 ISR, the power supply DC input range is –48 to –60 VDC, and the maximum power is 350 W.

For Cisco 4451 ISR and Cisco 4351 ISR, the power supply DC input range is –48 to –60 VDC, and the maximum power is 437 W.

![Figure 5-35 Cisco 4461 DC Power Supply](image)

<table>
<thead>
<tr>
<th></th>
<th>DC Power Supply Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</table>
Figure 5-36  DC Power Supply

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Handle</td>
</tr>
<tr>
<td>2</td>
<td>FAIL and OK LEDs</td>
</tr>
<tr>
<td>3</td>
<td>DC power connector</td>
</tr>
<tr>
<td>4</td>
<td>Ejector latch</td>
</tr>
</tbody>
</table>
Remove DC Input Power from Cisco 4461 or 4431 ISR

This section describes how to remove a DC power supply from Cisco 4461 or 4431 ISR.

Note

The Cisco 4431 ISR has redundant power supplies that can be hot-swapped.

To remove a DC power supply from Cisco 4461 or 4431 ISR:

Step 1

If you have redundant power supplies, ensure that the power switch is in the standby position.

Note

You do not require to place the power switch in the standby position if you want to hot-swap a single power supply.

Warning

Before performing any of the following procedures, ensure that power is removed from the DC circuit.

Statement 1003

Warning

To reduce risk of electric shock, when installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Step 2

For Cisco 4461 ISR and Cisco 4431 ISR, unscrew the two terminal block wire connectors (negative and positive) on the unit. See Figure 5-40.

For Cisco 4451 ISR and Cisco 4351, unscrew the three terminal block wire connectors (ground, negative and positive) on the unit. For Cisco 4331 ISR, remove the power supply cable connector (See Figure 5-41) and remove the two screws that secure the power supply module to the chassis.

Step 3

[Only for Cisco 4461, 4431, and 4331 ISRs] Remove the plastic bezel from the router.

Step 4

Press the retaining latch towards the pull handle, grasp the handle with one hand, and pull the power supply out of the slot while supporting the weight of the power supply with the other hand. See Figure 5-37.
Install DC Input Power on Cisco 4431 ISR

This section describes how to install the DC power supply input power leads to the Cisco 4431 Router DC input power supply.

- The color coding of the DC input power supply leads depend on the color coding of the DC power source at your site. Ensure that the lead color coding you choose for the DC input power supply matches the lead color coding used at the DC power source. Verify that the power source is connected to the negative (–) terminal and to the positive (+) terminal on the power supply.
- Ensure that the chassis ground is connected on the chassis before you begin installing the DC power supply. Follow the steps provided in the “Chassis Grounding” section on page 3-20.

Wire the DC Input Power Source

The Cisco 4431 ISR DC power supply has a terminal block that is installed into the power supply terminal block header.

To wire the DC input power source:

**Step 1** If you have redundant power supplies, ensure that the power switch is in the standby position.
Remove and Replace Cisco 4000 Series ISRs Power Supplies

Chapter 5 Install and Upgrade Internal Modules and FRUs

Note

You do not require to place the power switch in the standby position if you want to hot-swap a single power supply.

Step 2

Insert the power supply in the power-supply slot, and gently push it into the slot. When correctly installed:

- For Cisco 4431 ISR, the DC power supply (excluding the extraction handle) is flush with the router.
- For Cisco 4451 ISR and Cisco 4351ISR, the DC power supply (excluding the extraction handle) is recessed from the router bezel.

Step 3

Wire can be stripped and terminated directly to the power supply terminal block, or a crimp style spade terminal lug can be used. If you are using a terminal lug, follow the manufacturer's instructions for terminating the lug to the wire. If terminating directly to the terminal block using bare wire, follow the instructions in the Figure 5-40. Use a wire-stripping tool to strip each of the two wires coming from the DC input power source and strip the wires to approximately 0.39 inch (10 mm) ± 0.02 inch (0.5 mm). We recommend that you use 14 AWG insulated wire. Do not strip more than the recommended length of wire because doing so could leave the wire exposed from the terminal block. Figure 5-38 shows a stripped DC input power source wire.

Figure 5-38 Stripped DC Input Power Source Wire

![Figure 5-38 Stripped DC Input Power Source Wire](image)

0.39 inch (10 mm) is the recommended wire-strip length for the terminal block.

Warning

An exposed wire lead from a DC input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC input power source wire extends from the terminal block. Statement 122

Step 4

Identify the positive and negative feed positions for the terminal block connection. The wiring sequence is:

1. Positive (+) lead wire (right)
2. Negative (−) lead wire (left)

Step 5

Remove the router bezel. See Figure 5-39. The bezel is secured with snap latches. To remove the bezel, hold the top and bottom and pull the bezel.
**Figure 5-39  Remove the Bezel**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bezel</td>
</tr>
<tr>
<td>2</td>
<td>DC power supplies</td>
</tr>
</tbody>
</table>

**Step 6**  
Insert the wires through the holes in the bezel. Replace the bezel.

**Step 7**  
Insert the exposed wire into the terminal block. Ensure that the wire lead is not placed outside the plastic cover. Only wires *with insulation* should extend from the terminal block.

**Caution**  
Do not overtighten the terminal block captive screws. Ensure that the connection is snug, but the wire is not crushed. Verify by tugging lightly on each wire to ensure that they do not move.

**Step 8**  
Use a screwdriver to tighten the terminal block captive screws, as shown in Figure 5-40.
Step 9  Repeat these steps for the remaining DC input power source wire as applicable.

Step 10  Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block by casual contact.

Step 11  Turn on the circuit breaker at the power source.

Step 12  If you have changed the standby switch to the standby position in Step 1, turn the standby switch to the On position.

The power supply LEDs illuminate green.
Chapter 5      Install and Upgrade Internal Modules and FRUs

Remove and Replace Cisco 4000 Series ISRs Power Supplies

Replace the Power Supply Module on the Cisco 4331 Router

Step 1  Read the “Safety Warnings” section on page 5-2 section, and turn off the system power before you perform the power supply module replacement.

Step 2  Remove the four cover screws from the top of the chassis.

Note  The length of the cover screw on top of the chassis is shorter.

Step 3  Remove the two cover screws from each side of the chassis, and lift the cover away from the router chassis. See Figure 5-51.

Step 4  Remove the fan tray. Follow the steps provided in the “Replace Fan Tray on Cisco 4331 ISR” section on page 5-64.

Step 5  Remove the power supply cable connector. See Figure 5-41.

Step 6  Remove the two screws that secure the power supply module to the chassis.

Step 7  Pull the power supply module out of the chassis using the power supply tab. See Figure 5-41.

Step 8  Insert the replacement power supply module and align the power supply module into the slot.

Step 9  Tighten the two screws (torque 6 to 9 in-lb) that secure the power supply module to the chassis. See Figure 5-41.

Step 10  Connect the power supply cable connector.

Step 11  Insert the fan tray and gently push down until the spring-lock is latched and fully engaged onto the slot. Follow the steps provided in the “Replace Fan Tray on Cisco 4331 ISR” section on page 5-64.

Step 12  Connect the fan connectors on the motherboard. See Figure 5-52.

Step 13  Turn on the system power and verify that the power supply module is functioning normally.

Step 14  Turn off the system power before you cover over the chassis.

Step 15  Center the cover over the chassis and lower it onto the chassis.

Step 16  Install the four cover screws (torque 5 to 6 in-lb) on the top of the chassis and install the two cover screws (torque 5 to 6 in-lb) on each side of the chassis. See Figure 5-51.
Remove DC Input Power from Cisco 4331 ISR

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003

Warning Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

This section describes how to remove a DC input power from Cisco 4331 Series ISR.

Step 1 Turn off the circuit breaker at the power source.

Step 2 Ensure that the power switch is in the standby position.
Step 3  Remove the plastic cover from the terminal block. Save the covers for re-installation after you finish wiring. See Figure 5-37.

Step 4  Use a screwdriver to loosen the terminal block captive screws, as shown in Figure 5-41.

Step 5  Repeat these steps for the remaining DC input power source wire as applicable.

Step 6  Remove the input power cable from the terminal block, and gently push it out of the terminal block.

_Install DC Input Power on Cisco 4331 ISR_

**Warning**  Before performing any of the following procedures, ensure that power is removed from the DC circuit.

Statement 1003

**Warning**  Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Statement 1030

This section describes how to install the DC power supply input power leads to the Cisco 4331 Router DC input power supply.

- The color coding of the DC input power supply leads depend on the color coding of the DC power source at your site. Ensure that the lead color coding you choose for the DC input power supply matches the lead color coding used at the DC power source and verify that the power source is connected to the negative (−) terminal and to the positive (+) terminal on the power supply.
- Ensure that the chassis ground is connected on the chassis before you begin installing the DC power supply. Follow the steps provided in the “Chassis Grounding” section on page 3-20.

**Wire the DC Input Power Source on Cisco 4331 ISR**

The Cisco 4331 ISR DC power supply supports 12V/21A output with the DC input range from 24 to 60 VDC.

**Note**
The input current should be less than 6.3 A at 48 VDC. It is recommended to use slow blow fuse and have the input fuse value less than or equal to 25 A.

The Cisco 4331 ISR DC power supply has a terminal block that is installed into the power supply terminal block header.

To wire the DC input power source:

**Step 1** Ensure that the power switch is in the standby position.

**Step 2** Insert the power supply in the power-supply slot, and gently push it into the slot.

**Step 3** Wire can be stripped and terminated directly to the power supply terminal block, or a crimp style spade terminal lug can be used. If you are using a terminal lug, follow the manufacturer's instructions for terminating the lug to the wire. If terminating directly to the terminal block using bare wire, follow the instructions in the Figure 5-37. Use a wire-stripping tool to strip each of the two wires coming from the DC input power source and strip the wires to approximately 0.39 inch (10 mm) ± 0.02 inch (0.5 mm). It is recommended that 14 AWG insulated wire be used. Do not strip more than the recommended length of wire because doing so could leave the wire exposed from the terminal block. Figure 5-38 shows a stripped DC input power source wire.

**Warning**
An exposed wire lead from a DC input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC input power source wire extends from the terminal block. Statement 122

**Step 4** Identify the positive and negative feed positions for the terminal block connection. The wiring sequence is:

1. Positive (+) lead wire (right)
2. Negative (–) lead wire (left)
Step 5  Remove the plastic cover from the terminal block. Save the covers for reinstallation after you finish wiring. See Figure 5-37.

Figure 5-44  Remove the Plastic Cover

<table>
<thead>
<tr>
<th></th>
<th>Plastic Cover</th>
<th>2</th>
<th>Cable Tie</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>DC Power Source</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Step 6  Insert the wires through the holes. Replace the plastic cover.

Step 7  Insert the exposed wire into the terminal block. Ensure that the wire lead is not placed outside the plastic cover. Only wires with insulation should extend from the terminal block.

Caution  Do not overtorque the terminal block captive screws. Ensure that the connection is snug, but the wire is not crushed. Verify by tugging lightly on each wire to ensure that they do not move.

Step 8  Use a screwdriver to tighten the terminal block captive screws, as shown in Figure 5-40.

Step 9  Repeat these steps for the remaining DC input power source wire as applicable.

Step 10  Use a tie wrap to secure the wires to the rack, so that the wires are not pulled from the terminal block by casual contact.

Step 11  Turn on the circuit breaker at the power source.

Step 12  If you have changed the standby switch to the standby position in step 1, turn the standby switch to the On position.

The power supply LEDs illuminate green.
PoE Converter Power Supply Unit

This section includes:
- Overview of the PoE Converter Power Supply Unit, page 5-58
- Remove PoE Power Supply Slot Filler, page 5-59
- Install the PoE Converter Power Supply, page 5-59
- Remove PoE Converter Power Supply, page 5-60
- Install the PoE Power Supply Slot Filler, page 5-60

Overview of the PoE Converter Power Supply Unit

The PoE converter power supply supports online insertion feature. The PoE converter power supply does not support online removal.

The optional PoE converter PSU slots come with factory-installed fillers. You must remove them to install the PoE converter power supplies.

Note

If using only one PoE converter power supply, you must install the PoE converter power supply in PoE slot 0.

Figure 5-45 shows the location of the PoE converter power supply slots located behind the bezel and fan tray.

Figure 5-45 Remove Bezel and Fan Tray to Locate PoE Slots

<table>
<thead>
<tr>
<th>PoE converter power supply slot</th>
<th>Fan tray</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Bezel</td>
<td></td>
</tr>
</tbody>
</table>
Remove PoE Power Supply Slot Filler

**Step 1** Remove the bezel and fan tray from the router.
**Step 2** Loosen the screws from the securing nuts on the chassis. See *Figure 5-46* for details.
**Step 3** Gently pull out the filler from the filler tab on the chassis.

*Figure 5-46 Install or Remove PoE Fillers*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Install tab into slot on chassis</td>
</tr>
<tr>
<td>2</td>
<td>POE filler being installed in PoE slot 0</td>
</tr>
<tr>
<td>3</td>
<td>PoE filler shown installed in PoE slot 1</td>
</tr>
<tr>
<td>4</td>
<td>PoE slot 1</td>
</tr>
<tr>
<td>5</td>
<td>Rotate to secure screw into securing nut in chassis</td>
</tr>
<tr>
<td>6</td>
<td>PoE slot 0</td>
</tr>
</tbody>
</table>

Install the PoE Converter Power Supply

**Step 1** Remove the bezel and fan tray from the router chassis. See *Replace Fan Tray*, page 5-62.
**Step 2** Remove the PoE converter power supply filler. For instructions, see “Remove PoE Power Supply Slot Filler”.
**Step 3** Open the slot latch before inserting the PoE converter power supply module.
**Step 4** Rotate latch to close it.
**Step 5** Tighten the screws on the module to secure it to the router chassis. See *Figure 5-47* for details.
Remove PoE Converter Power Supply

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Remove the bezel and fan tray from the router chassis.</td>
</tr>
<tr>
<td></td>
<td>Open the slot latch. See Figure 5-47 for details.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Remove the PoE converter power supply module.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Replace PoE converter power supply filler. See “Remove PoE Power Supply Slot Filler” section for details.</td>
</tr>
</tbody>
</table>

After you remove the PoE converter PSU, you need to either install a replacement power or put the filler.

Install the PoE Power Supply Slot Filler

You cannot keep the slot empty, you need to install the filler.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Remove the bezel and fan tray from the router.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Insert the filler tab into the slot on the chassis.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Tighten the screws into the securing nuts on the chassis. See Figure 5-46 for details.</td>
</tr>
</tbody>
</table>
Warning

Care should be taken while removing the power supplies and power inverters (especially in boost mode of operation). If the total power consumption is higher than can be supported by one power supply alone and in this condition a power supply is removed, the hardware can be damaged. This may then result in the system being unstable or unusable.

The following messages are displayed as expected when you try to reload or insert a PoE supply in a router with Ethernet Switch Network Module:

*Jul 21 22:35:23.868: %IOSXE_PEM-6-INSPEM_FM: PEM/FM slot POE0 inserted

Upon PoE converter power supply insertion, the inline power supply restores automatically in the router. After the insertion, resets are needed for the switch modules in the router for the PoE supply to work properly.

If there are two PoE supplies, the power supplies can operate in a boost mode or redundant mode. In a boost mode, the total power supplied is a sum of the two power supplies capacity. In a redundant mode, if one of the PoE supply fails, the other PoE supplies power.
Replace a Fan Tray

The Cisco 4000 Series ISRs have hot-swappable fan trays that are field replaceable units (FRUs). The fan tray includes all router fans in one assembly. If a fan fails, replace the tray using a flat-blade or Phillips screwdriver.

Note

The Cisco 4331 ISR and Cisco 4321 ISR do not have hot-swappable fan trays.

Before Hot-Swapping a Fan Tray

Before hot-swapping a fan tray, read the safety precautions below.

- Read the entire procedure and have the required tools available.
- Do not attempt the hot-swap in ambient air temperature above 90°F (32°C).
- Do not attempt the hot-swap at an altitude above 6000 feet (1829 meters).
- When the router is being operated, we recommend to change the fans in the router within 2 minutes to ensure the router does not overheat.

Replace Fan Tray

Note

If hot-swapping the fan tray, we recommend to complete the operation within two minutes to ensure the router remains within operating temperature.

Note

We recommend that you change the air filter every 3 months. However, examine the air filter once a month (or more often in dusty environments) and replace it if it appears to be excessively dirty or damaged. To comply with Telecordia GR-63-Core standard air filter requirements for NEBS deployment, the air filter must be replaced, not cleaned.

Step 1
Remove the bezel. The bezel is secured with snap latches. To remove the bezel, hold the top and bottom and pull the bezel.

Step 2
Completely loosen the three captive fan tray screws.

Step 3
Pull the fan tray out.

Step 4
Insert the replacement fan tray and tighten the three captive screws.

Step 5
Replace the bezel.
Replace a Fan Tray

Figure 5-48  Cisco 4461 ISR4 Fan Tray

1  Fan tray
2  Captive screws

Figure 5-49  Cisco 4351 ISR4 Fan Tray

1  Captive screws
2  Fan tray
Replace Fan Tray on Cisco 4331 ISR

Step 1  Remove the four cover screws from the top of the chassis.

**Note**  The length of the cover screw on top of the chassis is shorter.

Step 2  Remove the two cover screws from each side of the chassis, and lift the cover away from the router chassis. See Figure 5-51.

Step 3  Remove the fan connectors from the motherboard. See Figure 5-52.

Step 4  Press the spring-lock on both the sides of the fan tray to release the spring-lock.

Step 5  Pull the fan tray up to disengage from the slot. See Figure 5-51.

Step 6  Insert the replacement fan tray and gently push down until the spring-lock is latched and fully engaged onto the slot.

Step 7  Connect the fan connectors on the motherboard. See Figure 5-52.

**Note**  The connectors are polarized or keyed to allow easy insertion in only one orientation. Orient the connectors correctly before you insert them. Incorrect orientation can damage connector pins.

Step 8  Turn on the system power, and verify that the fan tray is functioning normally.

Step 9  Turn off the system power before you cover over the chassis.

Step 10  Center the cover over the chassis and lower it onto the chassis.

Step 11  Install the four cover screws (torque 5 to 6 in-lb) on the top of the chassis, and install the two cover screws (torque 5 to 6 in-lb) on each side of the chassis. See Figure 5-51.
**Figure 5-51  Cisco 4331 ISR Fan Tray**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chassis cover</td>
</tr>
<tr>
<td>2</td>
<td>Cover screws (4)</td>
</tr>
<tr>
<td>3</td>
<td>Fan tray</td>
</tr>
<tr>
<td>4</td>
<td>Spring-lock</td>
</tr>
<tr>
<td>5</td>
<td>Cover screws on the side of the chassis (2)</td>
</tr>
</tbody>
</table>
Figure 5-52  Cisco 4331 ISR Fan Connectors

1  Fan connectors (2)
Replace Fan Blower on Cisco 4321 ISR

**Step 1** Read the “Safety Warnings” section, and disconnect the power supply before you replace any module.

**Step 2** Remove the screws (5X) on the I/O module and both sides of the chassis. See Figure 5-54.

**Step 3** Remove the chassis cover by lifting the front edge, hinging toward the back. See Figure 5-55.

**Step 4** Disconnect the blower cable connection and remove the screws (2x) that secures the fan blower to the motherboard. See Figure 5-56.

**Step 5** Remove the fan blower from the motherboard. Use the flat-head screwdriver to disengage the fan blower from the slot. Ensure that you do not damage the motherboard when you disengage the fan blower from the slot. See Figure 5-57.

**Step 6** Remove the blue vibration isolator from the motherboard. See Figure 5-58.

**Step 7** Install the new blue vibration isolator and then the fan blower onto the motherboard.

**Step 8** Secure the fan blower onto the motherboard with 2 existing or new screws. Tighten the screws with a Phillips screwdriver. (torque 4 to 6 in-lbs). See Figure 5-54.

**Note** Ensure that you do not over tighten the screws as the isolator underneath the screws can be damaged.

**Step 9** Install the chassis cover by hinging from the back. See Figure 5-55.
Step 10  Secure the screws (5x) on the I/O module and both sides of the chassis (torque 5 to 6 in-lb).

Figure 5-54  Cisco 4321 ISR Chassis

1  Cover screws on the side of the chassis (2)
Figure 5-55 Cisco 4321 ISR Chassis Cover

| 1 | Chassis Cover |
Replace a Fan Tray

Chapter 5      Install and Upgrade Internal Modules and FRUs

Figure 5-56 Cisco 4321 ISR Blower

1. Screws
2. Blower Cable Connectors

Figure 5-57 Cisco 4321 ISR Blower

1. Blower
2. Blower Cable Connectors
Remove and Install a CompactFlash Memory Card or eMMC Flash Card

This section describes installing and replacing CompactFlash (CF) or eMMC memory cards in the router. It contains the following sections:

- Prevent Electrostatic Discharge Damage, page 5-72
- Remove the CompactFlash or eMMC Memory Card, page 5-72
- Install the CompactFlash or eMMC Memory Card, page 5-73

Note

You must turn off the power supply to the router to replace a CompactFlash Memory card. A CompactFlash memory card must be inserted in order to run a Cisco IOS XE software image.

Note

Depending on the model that you have purchased, the routers use a CompactFlash, or an eUSB flash for the internal bootflash memory. Cisco 4431 ISRs have an eMMC flash device. The device supports 8GB, 16GB, or 32 GB. The latest model of Cisco 4451x ISRs support both eUSB and CompactFlash. If a CompactFlash is installed, it will disable the eUSB. However, you can use the old CompactFlash that is available with the routers.
Prevent Electrostatic Discharge Damage

CF memory cards are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly. ESD results in complete or intermittent failures. To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place CF memory cards on an antistatic surface or in a static shielding bag. If the card is to be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the card and clothing. The wrist strap protects the card from ESD voltages on only the body; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

Caution

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

Remove the CompactFlash or eMMC Memory Card

Caution

Do not remove a CF memory card from the chassis while it is being accessed. We recommend that you don't remove the CF when in Cisco IOS-XE. Either power the system off, or fall back to the rommon prompt if remove the CF.

Step 1
Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you replace any module.

Step 2
Remove the bezel.

Step 3
Remove the fan tray. For instructions on removing the fan tray, see “Replace Fan Tray” section on page 5-62.

Step 4
Remove the CF or eMMC cover by placing a flat-blade screwdriver in the slot and pushing sideways against the tensioner to release the cover door.
Chapter 5  Install and Upgrade Internal Modules and FRUs

Remove and Install a CompactFlash Memory Card or eMMC Flash Card

Step 5  Press the ejector button next to the CompactFlash or eMMC memory card. The ejector button moves outward so that it projects from the panel.

Step 6  Press the ejector button again. This ejects the CompactFlash or eMMC memory card partially out of its slot.

Step 7  Pull the CF or eMMC memory card out of its slot.

Step 8  Push the ejector button in until the button is flush with the bezel.

Caution  To prevent damage to the ejector mechanism, the ejector button must remain pressed all the way in (flush against the bezel) when not being used to eject a CompactFlash or eMMC memory card.

Step 9  Replace the fan tray and then the bezel.

Install the CompactFlash or eMMC Memory Card

The CompactFlash memory upgrade is supported only on Cisco 4451 ISR. The Cisco 4431 ISR, Cisco 4461 ISR, and Cisco 4300 Series ISRs support the eUSB flash memory upgrade. Also, Cisco 4431 ISR, Cisco 4461 ISR, and Cisco 4300 Series ISRs do not have a CompactFlash memory slot on the chassis. After installing the eUSB flash memory upgrade, the software does not detect the on-board eMMC flash memory card.

Note  The Cisco 4200 does not support CompactFlash memory upgrade and it uses the default 8GB eMMC memory card.
Remove and Install the Flash Memory Card

This section describes installing and replacing flash memory cards in the router. It contains the following sections:

- Prevent Electrostatic Discharge Damage, page 5-72
- Install the Flash Memory Card, page 5-75
- Remove the Flash Memory Card, page 5-77

Prevent Electrostatic Discharge Damage

Flash memory cards are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly. ESD results in complete or intermittent failures. To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap, and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place flash memory cards on an antistatic surface or in a static shielding bag. If the card is to be returned to the factory, immediately place it in a static shielding bag.

Step 1
Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

Step 2
Remove the fan tray. For instructions on removing the fan tray, see “Replace Fan Tray” section on page 5-62.

Step 3
Make sure that the ejector button is fully seated until it is flush with the bezel.

Note
If the ejector button is projecting out from the panel, push it in until it is flush with the bezel.

Step 4
Insert the CompactFlash memory card into the slot until it is fully seated. The ejector button remains flush with the panel.

Note
If the ejector button is projecting from the panel after you insert the CompactFlash memory card, remove the CompactFlash memory card, press the ejector button until it clicks, and reinsert the CompactFlash memory card.

Caution
To prevent damage to the ejector mechanism, the ejector button must remain fully seated when not being used to eject a CompactFlash memory card.

Step 5
Replace the CompactFlash cover by inserting the cover lip into the chassis and pushing the cover to snap it back into place.

Step 6
Replace the fan tray.
Avoid contact between the card and clothing. The wrist strap protects the card from ESD voltages on only the body; ESD voltages on clothing can still cause damage.

Do not remove the wrist strap until the installation is complete.

---

**Caution**

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

---

### Install the Flash Memory Card

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Remove the chassis cover. For instructions on removing the chassis cover, see “Remove and Replace Chassis Cover” section on page 5-4.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Place the flash memory card on top of the flash memory card connector (see Figure 5-59).</td>
</tr>
</tbody>
</table>
Step 4  Tighten the supplied screw (see Figure 5-59) to secure the flash memory card in place.

Step 5  Replace the chassis cover. See “Remove and Replace Chassis Cover” section on page 5-4.
# Remove the Flash Memory Card

**Step 1** Read the “Safety Warnings” section on page 5-2, and disconnect the power supply before you replace any module.

**Step 2** Remove the chassis cover. For instructions on removing the chassis cover, see “Remove and Replace Chassis Cover” section on page 5-4.

**Step 3** Unscrew the flash memory card, see Figure 5-59.

**Step 4** Install a new flash memory card if needed. See Install the Flash Memory Card, page 5-75.

**Step 5** Replace the chassis cover. See “Remove and Replace Chassis Cover” section on page 5-4.

---

# Install and Remove an SSD mSATA Storage Device

This section describes installing and replacing an SSD mSATA storage device in Cisco 4300 ISR routers.

- Prevent Electrostatic Discharge Damage, page 5-72
- Install the SSD mSATA Storage Device, page 5-78
- Remove the SSD mSATA Storage Device, page 5-79

## Prevent Electrostatic Discharge Damage

The SSD mSATA storage devices are sensitive to electrostatic discharge (ESD) damage, which can occur when electronic cards or components are handled improperly. ESD results in complete or intermittent failures.

To prevent ESD damage, follow these guidelines:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Place the SSD mSATA storage devices on an antistatic surface or in a static shielding bag. If the device is to be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the device and clothing. The wrist strap protects the device from ESD voltages on only the body; ESD voltages on clothing can still cause damage.
- Do not remove the wrist strap until the installation is complete.

⚠️ **Caution**

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).
Install the SSD mSATA Storage Device

To install a SSD mSATA storage device:

**Step 1** Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

**Step 2** Remove the chassis cover. For instructions on removing the chassis cover, see “Remove and Replace Chassis Cover” section on page 5-4.

**Step 3** Place the SSD mSATA storage device on the SSD mSATA connector and align the device’s contact edge with the corresponding socket in the connector.

**Step 4** Press the device downward into the connector until it is level with the surface of the connector.

**Step 5** While holding the device down, screw the device into place (see Figure 5-60).

*Figure 5-60 Flash Memory Card and SSD mSATA Storage Device Locations*
Install and Remove an SSD mSATA Storage Device

Step 6
Replace the chassis cover. See “Remove and Replace Chassis Cover” section on page 5-4.

Remove the SSD mSATA Storage Device

Step 1
Read the “Safety Warnings” section on page 5-2, and disconnect the power supply before you replace any module.

Step 2
Remove the chassis cover. For instructions on removing the chassis cover, see “Remove and Replace Chassis Cover” section on page 5-4.

Step 3
Unscrew the screws that attach the SSD mSATA storage device to the chassis. See Figure 5-59.

Step 4
The card should popup after the screws are removed.

Step 5
Install a new SSD mSATA memory device if needed. See Install the SSD mSATA Storage Device, page 5-78.

Step 6
Replace the chassis cover. See “Remove and Replace Chassis Cover” section on page 5-4.
Install and Remove SFP Modules

This section describes how to install optional small-form-factor pluggable (SFP) modules in the router to provide optical Gigabit Ethernet connectivity.

The SFP module installs into a slot on the router rear panel. When selected in Cisco IOS software, it is assigned port gigabitethernet 0/0/0. The default is the built-in RJ-45 1000Base-T connector, which is enabled on this port.

Only SFP modules certified by Cisco are supported on the routers. Table 5-4 lists SFPs supported on the router.

See Cisco Transceiver Modules Compatibility Information for compatibility issues.

Table 5-4 SFPs Supported on the Router

<table>
<thead>
<tr>
<th>Cisco Model Number</th>
<th>SFP Transceiver</th>
<th>Fiber Diameter (micrometer)</th>
<th>Wavelength (nm)</th>
<th>Mode</th>
<th>Maximum Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLC-SX-MM=</td>
<td>1000Base-SX</td>
<td>50</td>
<td>850</td>
<td>Multi</td>
<td>550 m</td>
</tr>
<tr>
<td>GLC-LH-SM-X=</td>
<td>1000Base-LX/LH</td>
<td>9/125</td>
<td>1310</td>
<td>Single</td>
<td>10 km</td>
</tr>
<tr>
<td>GLC-ZX-SM-X=</td>
<td>1000Base-ZX</td>
<td>9/125</td>
<td>1550</td>
<td>Single</td>
<td>100 km</td>
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### Table 5-4  
**SFPs Supported on the Router (continued)**

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<tr>
<th>Cisco Model Number</th>
<th>SFP Transceiver</th>
<th>Fiber Diameter (micrometer)</th>
<th>Wavelength (nm)</th>
<th>Mode</th>
<th>Maximum Distance</th>
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<tr>
<td>GLC-BX-U</td>
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<tr>
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<td>GLC-GE-100FX</td>
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<td>Multi</td>
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</table>

**Tip**  
Use the `show controller` command at the Cisco IOS prompt to determine whether you are using an SFP certified by Cisco.
Install SFPs

Laser Safety Guidelines

Optical SFPs use a small laser to generate the fiber-optic signal. Keep the optical transmit and receive ports covered whenever a cable is not connected to the port.

Warning

Ultimate disposal of this product should be handled according to all national laws and regulations.
Statement 1040

To install an SFP module in your router:

Step 1
Read the “Safety Warnings” section on page 5-2 section, and disconnect the power supply before you replace any module.

Step 2
Slide the SFP into the router connector until it locks into position (see Figure 5-61).

Tip
If the SFP uses a bale-clasp latch (see Figure 5-61), the handle should be on top of the SFP module.

Caution

Do not remove the optical port plugs from the SFP until you are ready to connect cabling.

Step 3
Connect the network cable to the SFP module.
Remove SFP Modules:

**Step 1**  
Read the “Safety Warnings” section on page 5-2 section, and disconnect the power supply before you replace any module.

**Step 2**  
Disconnect all cables from the SFP.

**Caution**  
The latching mechanism used on many SFPs locks the SFP into place when cables are connected. Do not pull at the cabling in an attempt to remove the SFP.

**Step 3**  
Disconnect the SFP latch. See Figure 5-62.

**Note**  
SFP modules use various latch designs to secure the module in the SFP port. Latch designs are not linked to SFP model or technology type. For information on the SFP technology type and model, see the label on the side of the SFP.

**Figure 5-62 Disconnect SFP Latch Mechanisms**

<p>| | | | |</p>
<table>
<thead>
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<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Sliding latch</td>
<td>3</td>
<td>Bale-clasp latch</td>
</tr>
<tr>
<td>2</td>
<td>Swing and slide latch</td>
<td>4</td>
<td>Plastic collar latch</td>
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</table>

**Tip**  
Use a pen, screwdriver, or other small straight tool to gently release a bale-clasp handle if you cannot reach it with your fingers.

**Step 4**  
Grasp the SFP on both sides and remove it from the router.
Remove, Replace, and Install the Internal PoE Daughter Card

Step 1  Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you replace any module.

Step 2  Remove the five screws.

Step 3  Remove the power cable to motherboard.

Step 4  Access the PoE card slot. See the “Remove and Replace Chassis Cover” section on page 5-4.

Step 5  Locate the card to be removed or replaced. See Figure 5-63 for the location of the PoE card on the motherboard.

Figure 5-63  Location of the PoE Daughter Card (Shown: Cisco 4451-X ISR)

Step 6  Pull the PoE daughter card out of the connector on the motherboard. If you are replacing the card, insert the new PoE daughter card into the slot. Tighten the screws, and connect the power cable to the motherboard.

Step 7  Place the removed card in an antistatic bag to protect it from ESD damage.