Installing and Upgrading Internal Modules and FRUs

This document describes how to install and upgrade internal modules and field replaceable units (FRUs) in Cisco 2900 and Cisco 3900 series integrated services routers (ISRs). The install and upgrade information is contained the following sections:

Internal Modules
- Accessing Internal Modules, page 5-4
- Locating Internal Modules, page 5-7
- Installing and Removing DRAM DIMMs, page 5-13
- Installing and Removing ISMs, page 5-16
- Installing and Removing PVDM3, page 5-20
- Installing and Removing PVDM2s, page 5-23
- Replacing Power Supplies and Redundant Power Supplies, page 5-28
- Installing a FIPS Louver, page 5-50

FRUs
- Replacing a Fan Tray or Air Filter, page 5-44
- 2911 Front to Back Air Flow Converter, page 5-51
- Removing and Installing CompactFlash Memory Cards, page 5-58
- Installing SFP Modules, page 5-61

⚠️ Caution
Read the Safety Warnings section and disconnect the power supply before you perform any module replacement.

See the “Accessing Internal Modules” section on page 5-4 for instructions on how to install and replace internal components.
## Safety Warnings

<table>
<thead>
<tr>
<th>Warning</th>
<th>Description</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warning</strong></td>
<td>Read the installation instructions before connecting the system to the power source.</td>
<td>1004</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>Only trained and qualified personnel should be allowed to install, replace, or service this equipment.</td>
<td>1030</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>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.</td>
<td>1043</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>This unit might have more than one power supply connection. All connections must be removed to de-energize the unit.</td>
<td>1028</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>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.</td>
<td>1024</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>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.</td>
<td>1026</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>Before opening the unit, disconnect the telephone-network cables to avoid contact with telephone-network voltages.</td>
<td>1041</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>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.</td>
<td>43</td>
</tr>
<tr>
<td><strong>Warning</strong></td>
<td>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.</td>
<td>1035</td>
</tr>
</tbody>
</table>
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: No user-serviceable parts inside. Do not open. Statement 1073

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
Accessing Internal Modules

See the following sections for instructions about accessing the internal modules on the router.

- Cisco 2900 series routers—Removing and Replacing the Chassis Cover, page 5-4
- Cisco 3900 series routers—Removing and Replacing the Services Performance Engine, page 5-6

Removing and Replacing the Chassis Cover

Cisco 2900 series routers have a removable cover. Cisco 3900 routers do not have a removable cover. All serviceable components and assemblies are easily removed on the Cisco 3900 series ISR by simply sliding them out of the chassis.

⚠️ 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.

Removing the Cover

To remove the cover, perform the following steps.

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

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 toward you to disengage the slots along the front (bezel) edge of the chassis. See Figure 5-1.

Replacing the Cover

To replace the cover, perform the following steps.

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

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.

Figure 5-1      Installing Cover on Cisco 2900 Series Routers

<table>
<thead>
<tr>
<th></th>
<th>Cover tabs</th>
<th></th>
<th>Cover screws (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Removing and Replacing the Services Performance Engine

Modular motherboards, also known as Services Performance Engines (SPEs), are field replaceable units (FRUs) for Cisco 3900 series ISRs. Install and replace SPEs in the Cisco 3900 series routers without removing the chassis from the rack. After the SPE is removed, you can access internal modules for replacement or upgrade.

Note
Use a number-2 Phillips screwdriver for this task.

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

Step 2
Loosen the two captive thumbscrews on each side of the SPE. See Figure 5-2.

Step 3
Rotate the ejector levers outward on each side of the SPE and carefully slide it straight out of the router. Place it on an antistatic surface.

Caution
The SPE is an ESD-sensitive component. To avoid damage, read and observe all ESD precautions noted in the “Safety Warnings” section on page 5-2.

Figure 5-2 Removing the Services Performance Engine from a Cisco 3925 and 3945 Router

1 Captive thumbscrews
2 Ejector levers
Step 4  Install or replace DRAM DIMMs, ISMs, or PVDMs. See the “Locating Internal Modules” section on page 5-7 to locate the slots on the router.

or

Install or replace the Services Performance Engine. Check that the ejector levers on the replacement SPE are fully open outward. Carefully slide the SPE into the router tray until the connector is engaged, and then close the ejector levers to fully seat the SPE.

Step 5  Tighten the two captive retention screws on each side of the motherboard.

Locating Internal Modules

The following illustrations show the locations of internal modules on the router motherboard. Internal modules include DIMMs, Internal Services Modules (ISMs), next-generation Packet Voice Data Modules (PVDM3s), and power supply on Cisco 2900 series ISR.

- Cisco 2901—Figure 5-3
- Cisco 2911—Figure 5-4
- Cisco 2921 and Cisco 2951—Figure 5-5
- Cisco 3925 and Cisco 3945—Figure 5-6
- Cisco 3925E and Cisco 3945E—Figure 5-7
### Figure 5-3  Module Locations in Cisco 2901 Router

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply (Cisco 2901 router shown)</td>
</tr>
<tr>
<td>2</td>
<td>PVDM3 1</td>
</tr>
<tr>
<td>3</td>
<td>PVDM3 0</td>
</tr>
<tr>
<td>4</td>
<td>DIMM socket</td>
</tr>
<tr>
<td>5</td>
<td>ISM</td>
</tr>
</tbody>
</table>
Figure 5-4  Module Locations in Cisco 2911 Router

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Removable fan tray</td>
</tr>
<tr>
<td>2</td>
<td>PVDM3 1</td>
</tr>
<tr>
<td>3</td>
<td>PVDM3 0</td>
</tr>
<tr>
<td>4</td>
<td>DIMM socket</td>
</tr>
<tr>
<td>5</td>
<td>ISM</td>
</tr>
</tbody>
</table>
Figure 5-5   Module Locations in Cisco 2921 and Cisco 2951 Router

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PVDM3 0</td>
</tr>
<tr>
<td>2</td>
<td>PVDM3 1</td>
</tr>
<tr>
<td>3</td>
<td>PVDM3 2</td>
</tr>
<tr>
<td>4</td>
<td>DIMM 0 socket (Cisco 2921 has only 1 (one) DIMM0 socket)</td>
</tr>
<tr>
<td>5</td>
<td>DIMM 1 (2951 only)</td>
</tr>
<tr>
<td>6</td>
<td>ISM</td>
</tr>
</tbody>
</table>
Figure 5-6  Module Locations in Cisco 3925 and Cisco 3945 Router

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PVDM3 0</td>
</tr>
<tr>
<td>2</td>
<td>PVDM3 1</td>
</tr>
<tr>
<td>3</td>
<td>PVDM3 2</td>
</tr>
<tr>
<td>4</td>
<td>PVDM3 3</td>
</tr>
<tr>
<td>5</td>
<td>DIMM 0 socket</td>
</tr>
<tr>
<td>6</td>
<td>DIMM 1 socket</td>
</tr>
<tr>
<td>7</td>
<td>ISM</td>
</tr>
</tbody>
</table>
Figure 5-7  Module Locations on Cisco 3925E and 3945E

1. PVDM-3 0
2. PVDM-3 1
3. PVDM-3 2
4. DIMM 0 socket
5. DIMM 1 socket
Installing and Removing DRAM DIMMs

Remove the chassis cover or remove the SPE as described in the “Accessing Internal Modules” section on page 5-4.

Warning
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.

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

Locating and Orienting DRAM DIMM

Cisco 2901, 2911, and 2921 routers have a single DRAM DIMM socket on the system board. Cisco 2951 and Cisco 3900 series have two DRAM DIMM sockets on the system board that are identified as DIMM 0 and DIMM 1. See the “Locating Internal Modules” section on page 5-7 to find DIMM connectors on the router.

DRAM DIMMs have a polarization notch on the mating edge to prevent incorrect insertion. Figure 5-8 shows the polarization notch on a DRAM DIMM.

Warning
DIMMs and PVDM3s plug into similarly sized sockets. Only the polarization notch differs. Look for the polarization notch shown in Figure 5-8 before inserting a DRAM DIMM in the socket.

Figure 5-8 DRAM DIMM Showing Polarization Notch

1 Polarization notch
Removing a DRAM DIMM

Follow these steps to remove a DRAM DIMM:

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

**Step 2**  Remove the chassis cover. For Cisco 2900 series ISRs, see the “Removing and Replacing the Chassis Cover” section on page 5-4. For Cisco 3900 series ISRs, see the “Removing and Replacing the Services Performance Engine” section on page 5-6.

**Step 3**  Locate the DRAM DIMM module. See the “Locating Internal Modules” section on page 5-7 to find the DRAM DIMM sockets on the router.

**Step 4**  Pull the latches away from the DRAM DIMM at both ends to lift the DIMM slightly. Pull the DIMM out of the socket as shown in Figure 5-9.

**Figure 5-9  Removing a DRAM DIMM**

**Step 5**  Place the DIMM in an antistatic bag to protect it from ESD damage.

**Step 6**  Replace the chassis cover. For Cisco 2900 series ISRs, see the “Removing and Replacing the Chassis Cover” section on page 5-4. For Cisco 3900 series ISRs, see the “Removing and Replacing the Services Performance Engine” section on page 5-6.
Installing a DRAM DIMM

**Note**
Unregistered DIMMs (UDIMMs) and very low profile (VLP) RDIMMs are not interchangeable.

Follow these steps to install a DRAM DIMM:

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

**Step 2** Remove the chassis cover. For Cisco 2900 series ISRs, see the “Removing and Replacing the Chassis Cover” section on page 5-4. For Cisco 3900 series ISRs, see the “Removing and Replacing the Services Performance Engine” section on page 5-6.

**Step 3** Locate the DRAM DIMM module. See the “Locating Internal Modules” section on page 5-7 to find the DRAM 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 5-10.

**Caution** DIMMs and PVDM3s plug into similarly sized sockets. Only the polarization notch differs. Look for the polarization notch shown in Figure 5-10 before inserting a DRAM DIMM in the socket.

**Figure 5-10 DRAM DIMM Showing Polarization Notch**

**Step 6** Insert the DIMM into the connector.

**Step 7** Carefully and firmly press the DRAM DIMM into the connector until the latches close onto the DIMM. Make sure that both latches rotate to the closed position against the DIMM. See Figure 5-11.
Installing and Removing ISMs

A Integrated Service Modules (ISMs) plug into the ISM slot on the motherboard. ISMs are sold as a spare part, and they have a label that identifies the ISM type. See the following sections for ISM installation tasks:

- Software Requirement for ISMs, page 5-17
- Locating an ISM, page 5-17
- Removing an ISM, page 5-17
- Installing an ISM, page 5-18
- Verifying ISM Installation, page 5-20

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

Caution
Handle ISMs by the edges only. ISMs are ESD-sensitive components and can be damaged by mishandling.
Software Requirement for ISMs

Cisco IOS software of a specified release or later release is required for using an ISM. 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
2900 Software (C2900-ADVENTERPRISEK9-M), Version 12.3(8.2)T, INTERIM SOFTWARE

Locating an ISM

See the “Locating Internal Modules” section on page 5-7 to locate the ISM slot on the Services Performance Engine (SPE).

Removing an ISM

Use the following procedure to remove an ISM:

1. **Step 1** Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you perform any module replacement.
2. **Step 2** Access the ISM slot. For Cisco 2900 series, see the “Removing and Replacing the Chassis Cover” section on page 5-4. For Cisco 3900 series, see the “Removing and Replacing the Services Performance Engine” section on page 5-6.
3. **Step 3** Locate the ISM to be removed. See the “Locating Internal Modules” section on page 5-7.
4. **Step 4** Remove the four screws from the ISM. See Figure 5-12.

![Figure 5-12 Removing Screws from the ISM](image)

| 1 | ISM screws (4) |

5. **Step 5** Lift the ISM off of the connector and the plastic standoff. Keep the ISM parallel with the motherboard to prevent damage to the slot and standoff.
6. **Step 6** Place the ISM in an antistatic bag to protect it from ESD damage.
Installing an ISM

To install an ISM, use a number 2 Phillips screwdriver or flat-blade screw drive, and a 1/4-inch nut driver or wrench. Cisco 2900 and Cisco 3900 series routers have one ISM connector on the system board.

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

**Step 2** Access the ISM slot. For Cisco 2900 series, see the “Removing and Replacing the Chassis Cover” section on page 5-4. For Cisco 3900 series, see the “Removing and Replacing the Services Performance Engine” section on page 5-6.

**Step 3** Locate the four standoffs from the accessory kit. See Figure 5-13.

**Figure 5-13  Standoffs**

**Step 4** Install the four standoffs into the system board in the attachment locations, as shown in Figure 5-14. Use a 1/4-inch nut driver to tighten the standoffs. The locations for ISM standoffs have white plastic grommets surrounding the mounting hole location.
Figure 5-14 Connecting the ISM to the Cisco 2900 and 3900 Series System Board

<table>
<thead>
<tr>
<th></th>
<th>ISM</th>
<th></th>
<th>Standoffs (4)</th>
</tr>
</thead>
</table>

Caution Make sure that the standoffs are straight when installed. Tighten them gently but firmly. The shoulder must be seated tightly against the system board.

Step 5 Insert the connector on the ISM and attach it to the system board. See Figure 5-15.

Note Be sure to press firmly on the ISM until the board seats onto the connector.

Step 6 Insert the screws from the accessory kit through the ISM into the standoffs. See Figure 5-13. Carefully tighten the screws with a Phillips screwdriver (torque 6 to 8 in-lb or 0.7 to 1.1 Nm.).

Step 7 Check that the ISM is installed correctly on the system board. See Figure 5-15.

Figure 5-15 Correctly Installed ISM

Step 8 Cisco 2900, See the “Accessing Internal Modules” section on page 5-4.  
or  
Cisco 3900, See the “Removing and Replacing the Services Performance Engine” section on page 5-6.
Verifying ISM Installation

Use the `show diag` command to verify that the ISM has been installed correctly. In the following example, one ISM is recognized by the system.

```
Router# show diag

ISM Slot 0:
   Internal-Service-Module
   Internal-Service-Module is analyzed
   Internal-Service-Module insertion time 13:25:34 ago
   EEPROM contents at hardware discovery:
   Hardware Revision : 1.0
   Part Number       : 73-11709-01
   Board Revision    : 01
   Deviation Number  : 0-0
   Fab Version       : 01
   PCB Serial Number : FHH1228P02T
   RMA Number        : 0-0-0-0
   RMA History       : 00
   RMA Test History  : 00
   Top Assy. Part Number : 800-30779-01
   Product (FRU) Number  : ISM-SRE-200-K9
   Version Identifier : V01
   CLEI Code          : CLEITBDXXX
   EEPROM format version 4
   EEPROM contents (hex):
   0x00: 04 FF 40 06 31 41 01 00 82 49 2D BD 01 42 30 31
   0x10: 80 00 00 00 00 02 01 C1 8B 48 48 31 32 32 38
   0x20: 50 32 52 81 00 00 00 00 04 00 03 00 D9 03 40
   0x30: C1 CB C0 46 03 20 00 78 3B 01 CB 8E 49 53 4D 2D
   0x40: 53 52 4E 2D 30 30 4D 96 89 56 30 31 00 C6
   0x50: 8A 43 4C 45 49 54 42 44 42 44 58 38 FF FF FF FF FF
   0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
   0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Slot 1:
   N2G SM Test Card 1GE Port adapter, 1 port
   Port adapter is analyzed
   Port adapter insertion time 13:26:22 ago
   EEPROM contents at hardware discovery:
```

Installing and Removing PVDM3

The Cisco 2900 and 3900 series ISRs support next generation Packet Voice Data Modules (PVDM3) for enhanced digital signal processors (DSPs). Each router holds a different number of PVDM3s on the motherboard. See Table 5-1 for details.

<table>
<thead>
<tr>
<th>Router</th>
<th>Motherboard</th>
<th>Number of Supported PVDM3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 2921, 2951</td>
<td>Default</td>
<td>2</td>
</tr>
<tr>
<td>Cisco 2921, 2951</td>
<td>Default</td>
<td>3</td>
</tr>
<tr>
<td>Cisco 3925</td>
<td>Services Performance Engine 100</td>
<td>4</td>
</tr>
<tr>
<td>Cisco 3945</td>
<td>Services Performance Engine 150</td>
<td>4</td>
</tr>
</tbody>
</table>
PVDMs must be used in an homogeneous fashion. In other words, do not mix PVDM2s with PVDM3s in the same router.

PVDM slot numbering is defined in the “Locating Internal Modules” section on page 5-7. When using only one PVDM, ensure the module is installed in slot0.

PVDM2s must be installed in a PVDM II adapter for use in the PVDM3 slot on Cisco 2900 series and Cisco 3900 series ISRs. See the “Installing and Removing PVDM2s” section on page 5-23.

Caution
When you remove or install PVDMs, 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 PVDMs by the edges only. PVDMs are ESD-sensitive components and can be damaged by mishandling.

PVDM3 Location and Orientation

The PVDM3 connectors are located on the motherboard and are identified as PVDM3 0 through 3. See the “Locating Internal Modules” section on page 5-7 for locations.

PVDM3s have a polarization notch on the mating edge to prevent incorrect insertion.

Caution
PVDM3s and DIMMs plug into similarly sized connectors. Only the polarization notch differs. Be sure that you are inserting the PVDM3 into the PVDM3 connector. See Figure 5-10 for an example of the DIMM polarization notch.

Removing a PVDM3

To remove a PVDM3 from the motherboard, follow these steps:

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

Step 2
Locate the PVDM3 on the motherboard. See the “Locating Internal Modules” section on page 5-7.

Step 3
Pull the PVDM3 retaining clips away from the PVDM3 at both ends, and then lift the PVDM3 straight up from the connector. See Figure 5-16.
Installing and Removing PVDM3

To install a PVDM3, follow these steps.

**Note** Fill PVDM3s slots sequentially, starting with connector 0.

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

**Step 2** Locate the PVDM3 connector on the system board. See the “Locating Internal Modules” section on page 5-7 for the PVDM3 locations.

**Step 3** Orient the PVDM3 so that the polarization notch lines up with the polarization key on the connector. See Figure 5-17.
Installing and Removing PVDM2s

A PVDM adapter must be used to insert a PVDM2 into the PVDM3 slot. The PVDM adapter is a small circuit board with connectors and clips that securely mount the PVDM2 into the PVDM3 slot. The clips are on the side of the adapter and require physical manipulation to secure the module in place. The following video clip shows how to install and remove a PVDM2 from the adapter.


- PVDM Adapter—Figure 5-18 on page 5-24
- Clips and Guide Post—Figure 5-19 on page 5-25
- Clips Open—Figure 5-20 on page 5-26
- Clips Closed—Figure 5-21 on page 5-26
To install a PVDM2 into the PVDM3 slot, perform the following steps:

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

**Step 2**  Ensure that *both* retainer clips are open (the UP position). (See Figure 5-19, Figure 5-20, and Figure 5-21.)

*Figure 5-19* shows the retainer clip, connector clip, and guide post locations on the adapter.
Figure 5-19  Adapter Retainer Clip, Connector Clips, and Guide Posts

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Retainer clip</td>
</tr>
<tr>
<td>2</td>
<td>Connector clip</td>
</tr>
<tr>
<td>3</td>
<td>Guide post</td>
</tr>
</tbody>
</table>
Figure 5-20 shows a retainer clip open.

Figure 5-20  Retainer Clip Open (Up Position)

Figure 5-21 shows a retainer clip closed (DOWN).

Figure 5-21  Retainer Clip Closed (Down Position)

Step 3 Insert the PVDM2 at a 45-degree angle to the adapter while aligning the key notch. Ensure that the entire connector seats into the adapter across its entire length, and push the PVDM2 firmly into the adapter.
Step 4  Push the PVDM onto the guide posts. The guide posts should protrude through the guide holes. The connector clips seat themselves on top of the PVDM2, holding the PVDM2 in the adapter.

Step 5  Push both retainer clips over their respective catches. The retainer clips prevent the connector clips from releasing the PVDM2. Figure 5-23 shows the PVDM2 properly installed in the adapter.
Replacing Power Supplies and Redundant Power Supplies

Except for the Cisco 2901 router, all Cisco 2900 series routers have replaceable power supply modules and external redundant power supplies (RPS). The Cisco 3900 series routers cannot use an external RPS, and instead use one or two (optional) internal power supplies. All of the internal power supplies for the 2900 series and the 3900 series are modular and do not have internal cabling. These modular power supplies can be removed or installed using only a screwdriver.

- Replacing the Cisco 2901 Router Power Supply, page 5-29
- Replacing the Cisco 2911 Router Power Supply, page 5-31
- Installing and Removing the Cisco 2911 Router Optional DC Power Supply, page 5-32
- Installing the Cisco 2911 Router Power Supply Blank, page 5-33
- Replacing the Cisco 2911 Router Redundant Power Supply, page 5-35
- Replacing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Power Supply, page 5-35
  - Inserting POE supply in an Ethernet Switch Network Module, page 5-38
- Installing and Removing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply, page 5-39
- Installing and Removing a Redundant Power Supply Adapter, page 5-41

Note Replace power supplies with the types shown in Table 1-9.
Replacing the Cisco 2901 Router Power Supply

**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

To replace the power supply in a Cisco 2901 router, perform the following steps. See Figure 5-3 for the locations of connectors and other components within the Cisco 2901 router.

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

**Step 2** Disconnect the router from the external AC power supply.

**Step 3** Remove the cover from the chassis. See the “Removing and Replacing the Chassis Cover” section on page 5-4.

**Step 4** Disconnect the power supply cable from the main power supply connector. See Figure 5-24.
Step 5  Remove the screw that fastens the main power supply to the chassis.

Step 6  Lift the main power supply out of the chassis. See Figure 5-25.
Replacing Power Supplies and Redundant Power Supplies

Figure 5-25 Lifting the 2901 Power Supply In or Out

Step 7 Insert the replacement power supply into the chassis. See Figure 5-25. Insert the screws that fasten the power supply to the chassis. See Figure 5-24.

Step 8 Connect the power supply cable to the power supply connector. Replace the chassis cover and connect power to the router.

Replacing the Cisco 2911 Router Power Supply

Several power supply options are available for the Cisco 2911 router. See Table 1-9. All of the power supply options have the same modular form factor for easy removal and replacement.

Perform the following steps to replace the 2911 power supply:

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

Figure 5-26 Cisco 2911 Power Supply Components

<table>
<thead>
<tr>
<th>1</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Power supply fastening screws (2)</td>
</tr>
</tbody>
</table>
Replacing Power Supplies and Redundant Power Supplies

Step 2  Loosen the two captive screws on the power supply module. See Figure 5-26.
Step 3  Slide the power supply module out of the chassis.
Step 4  Insert the replacement power supply module and tighten the captive screws.
Step 5  If you are not immediately replacing the power supply, install the blank cover over the empty supply slot. See the “Installing the Cisco 2911 Router Power Supply Blank” section on page 5-33.

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

Installing and Removing the Cisco 2911 Router Optional DC Power Supply

Several power supply options are available for the Cisco 2911 router. See Table 1-9. All of the power supply options have the same modular form factor for easy removal and replacement.

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

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

Installing the 2911 DC Power Supply

Perform the following steps to install the 2911 DC or DC+POE power supply:

Step 1  Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module removal or installation.
Step 2  Remove the AC power supply module from the system by loosening the two captive screws using a number 1 Phillips head screwdriver (See Figure 5-26) and pulling the power supply out slowly from the I/O side (See Figure 5-27) of the chassis.
Step 3  Slide the power supply module out of the chassis.
Step 4  Insert the replacement DC power supply module and tighten the captive screws. Torque to 8 to 10 in-lbf (0.9 to 1.1 N-m).
Removing the 2911 DC Power Supply

Perform the following steps to remove the 2911 DC power supply:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module removal or installation.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Remove the power supply module from the system by loosening the two captive screws using a number 1 Phillips head screwdriver (See Figure 5-26) and pulling the power supply out slowly from the I/O side (See Figure 5-27) of the chassis.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Slide the power supply module out of the chassis.</td>
</tr>
<tr>
<td>Step 4</td>
<td>If you are not immediately replacing the power supply, install the blank cover over the empty supply slot. See the “Installing the Cisco 2911 Router Power Supply Blank” section on page 5-33.</td>
</tr>
</tbody>
</table>

Installing the Cisco 2911 Router Power Supply Blank

For safety reasons, the power supply blank cap and panel must be installed immediately if the power supply is removed from the system and the system stays or will be energized before the power supply is replaced.

- **Note**: This procedure applies to customers who will maintain or supply power to the system with the RPS module.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement.</td>
</tr>
<tr>
<td>Step 2</td>
<td>If the power supply is present, make sure it is turned off and the power cord is detached.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Remove it from the system by loosening the two captive screws using a number 1 Phillips head screwdriver and pulling the power supply out slowly from the I/O side of the chassis. See Figure 5-27.</td>
</tr>
</tbody>
</table>
Step 4  Remove the bezel assembly from the bezel side of the router by pulling the bezel away from the face of the router. See Figure 5-28
Step 5  Install the power switch blank cap by slowly pushing it into the power supply opening on the bezel side of the chassis. Make sure that the “THIS SIDE UP” label is on top when installing the blank cap. You will feel it snap into place when it is fully seated. See Figure 5-28

Step 6  Replace the bezel assembly by lining up the holes in chassis with the connectors on the bezel. Slowly push the bezel assembly into place until it is fully seated.

Step 7  Install the power supply blank panel into the power supply opening on the I/O side of the chassis by pushing it into place, as shown in Figure 5-27. Make sure that the flange with the marking “THIS SIDE UP” is facing up.

Step 8  Tighten the two captive screws with a number 1 Phillips head screw driver after the power supply blank panel is fully seated.

Replacing the Cisco 2911 Router Redundant Power Supply

The redundant power supply (RPS) for the Cisco 2911 router is an external RPS. The external RPS attaches to a connector on the front of the router. For an RPS to be attached, the Cisco 2911 must be fitted with an RPS adapter. See Figure 5-29. See the “Installing and Removing a Redundant Power Supply Adapter” section on page 5-41.

![Figure 5-29 Cisco 2911 Redundant Power Supply Adapter]

Replacing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Power Supply

⚠️ 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
Several power supply options are available for the Cisco 2921, 2951, and 3900 series routers. See Table 1-9. All of the power supply and RPS options have a similar modular form factor, with no cabling, for easy removal and replacement. If an RPS is attached, the power supply may be hot-swapped.

**Note**  
The 3900 series routers do not use an external RPS, and instead use an optional secondary internal power supply.

**Note**  
Read this entire procedure and have all of your tools and the replacement power supply ready before performing a hot-swap. The hot-swap procedure requires removal of the cooling fans. You have only a few minutes to replace the fans before the router powers off, because the router has reached the upper temperature limits.

## Replacing the Power Supply on the Cisco 2921 and Cisco 2951 Routers

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Remove the fan tray and bezel assembly by pulling the fan tray and bezel assembly straight out. See Figure 5-30.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Loosen the two captive screws on the power supply module. See Figure 5-30.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Pull on the two captive power supply fastening screws to leverage the power supply from its connector, and then slide the power supply module out of the chassis.</td>
</tr>
<tr>
<td>Step 5</td>
<td>Insert the replacement power supply module, and tighten the captive screws.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Reinstall the fan tray and bezel assemblies.</td>
</tr>
</tbody>
</table>
Replacing the Power Supply on the Cisco 3900 Series Routers

Step 1  Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement.
Step 2  Remove the bezel.
Step 3  Loosen the four captive screws on each corner of the fan tray and pull out the fan tray. See Figure 5-31.
Step 4  Loosen the two captive screws on the power supply module. See Figure 5-31.
Step 5  Pull on the two captive power supply fastening screws to leverage the power supply from its connector, and then slide the power supply module out of the chassis.
Step 6  Insert the replacement power supply module, and tighten the captive screws.
Step 7  Reinstall the fan tray and bezel.

Inserting POE supply in an Ethernet Switch Network Module

The POE power supply for Ethernet Switch Network Modules supports online insertion feature. The POE power supply does not support online removal.
Replacing Power Supplies and Redundant Power Supplies

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

Aug 10 18:29:40.331: %ILPM_FAULT-5-ILPM_NOTICE: Notice: Inline power supply is being started.
*Aug 10 18:29:40.331: %ILPM_FAULT-5-ILPM_WARNING: Warning: Ethernet Switch Network Modules with PoE Support need to be reloaded to function properly.
*Aug 10 18:29:40.691: %SYS-5-RESTART: System restarted -- Cisco IOS Software, C2900 Software (C2900-UNIVERSALK9-M), Version 15.0(1)M2, RELEASE SOFTWARE (fc2)

This Warning message is not an indication of any ERROR in the system but a WARNING upon system reload or POE power supply restoration.

Upon POE power supply insertion, inline power supply restores automatically in the router. After the insertion, reset is 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 will supply power.

Installing and Removing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply

**Warning**

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

**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 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**

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

Several power supply options are available for the Cisco 2921, 2951, and 3900 series routers. See Table 1-9. All of the power supply and RPS options have a similar modular form factor, with no cabling, for easy removal and replacement. If an RPS is attached, the power supply may be hot-swapped.

**Note**

The 3900 series routers do not use an external RPS, and instead use an optional secondary internal power supply.
Replacing Power Supplies and Redundant Power Supplies

Chapter 5  Installing and Upgrading Internal Modules and FRUs

Note  Read this entire procedure and have all of your tools and the replacement power supply ready before performing a hot-swap. The hot-swap procedure requires removal of the cooling fans. You have only a few minutes to replace the fans before the router powers off, because the router has reached the upper temperature limits.

Installing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply

Perform the following steps to install the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply:

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

**Step 2** Remove the fan tray and bezel assembly:
- For the Cisco 3900 series routers, pull straight out on the bezel to remove the bezel along with the optional air filter from the fan tray assembly.
- For the 2900 series routers, remove the bezel assembly, then loosen the four captive screws on each corner of the fan tray assembly and pull out the fan tray assembly. See Figure 5-30.

**Step 3** Loosen the two captive screws on the AC power supply module. See Figure 5-30.

**Step 4** Pull on the two captive AC power supply fastening screws to leverage the AC power supply from its connector, and then slide the power supply module out of the chassis.

**Step 5** Insert the DC power supply module, and tighten the captive screws.

**Step 6** Reinstall the fan tray and bezel assemblies.

Removing the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply

Perform the following steps to remove the Cisco 2921, Cisco 2951, or Cisco 3900 Series Optional DC Power Supply:

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

**Step 2** Remove the fan tray and bezel assembly:
- For the Cisco 3900 series routers, pull straight out on the bezel to remove the bezel along with the optional air filter from the fan tray assembly.
- For the 2900 series routers, remove the bezel assembly, then loosen the four captive screws on each corner of the fan tray assembly and pull out the fan tray assembly. See Figure 5-30.

**Step 3** Loosen the two captive screws on the DC power supply module. See Figure 5-30.

**Step 4** Pull on the two captive DC power supply fastening screws to leverage the AC power supply from its connector, and then slide the power supply module out of the chassis.

**Step 5** Reinstall the fan tray and bezel assemblies.
Installing and Removing a Redundant Power Supply Adapter

The redundant power supply (RPS) for the Cisco 2911, 2921, or 2951 router is an external Cisco RPS 2300. To connect the RPS, the router must be fitted with an RPS adapter. A blank panel must be removed before installing the RPS adapter. The external RPS attaches to a connector on the front of the adapter. See Figure 5-32.

Note
After connecting to the RPS2300, Cisco 2900 series routers require a reboot.

Tip
For information specific to the RPS 2300, see the Cisco Redundant Power Supply System Hardware Installation Guide at:


Depending upon RPS configuration, more than one router can be backed up.

Caution
Failure to follow the RPS Installation or Removal procedures can cause damage to the router, RPS adapter, RPS cable, or RPS.

Figure 5-32 Cisco 2911 Redundant Power Supply Adapter

Table 5-2 shows RPS 2300 backup capabilities when coupled with Cisco 2900 series ISRs.

Table 5-2 RPS 2300 Backup Capabilities

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Quantity 1 C3K-PWR-750W AC</th>
<th>Quantity 2 C3K-PWR-750W AC</th>
<th>Quantity 1 C3K-PWR-1150W AC</th>
<th>Quantity 2 C3K-PWR-1150W AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2911 in RPS</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2921, 2951 in RPS</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Installing an RPS Adapter

To install an RPS adapter, perform the following steps:

**Caution**
The RPS adapter must be in the router chassis before connecting to the RPS.

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

**Step 2**
Ensure AC or DC power is disconnected from the router power supply.

**Step 3**
If connected, place the RPS 2300 into standby mode. Consult the *Cisco Redundant Power System 2300 Hardware Installation Guide* for operating the RPS 2300.

**Step 4**
If an RPS Adapter had never been installed, a blank panel is in its place. Remove the RPS Adapter blank panel.

**Step 5**
Insert the RPS adapter into the router (Figure 5-29 or Figure 5-30) and tighten the screws.

**Step 6**
Connect the RPS 2300 cable into the RPS adapter connector.

**Step 7**
Connect the other end of the RPS 2300 cable to the RPS 2300.

**Step 8**
Power up the router.

**Step 9**
Place the RPS into Active mode.

Removing an RPS Adapter

To remove an RPS adapter, perform the following steps:

**Step 1**
Read the Safety Warnings section and disconnect the power supply before you perform any module replacement.

**Step 2**
If connected, place the RPS 2300 into standby mode. Consult the *Cisco Redundant Power System 2300 Hardware Installation Guide* for operating the RPS 2300.

**Step 3**
Power off and disconnect the AC or DC power from the router power supply.

**Step 4**
Remove the RPS cable from the RPS 2300.

**Step 5**
Remove the other end of the RPS 2300 cable from the RPS adapter.

**Table 5-2**  
**RPS 2300 Backup Capabilities (continued)**

<table>
<thead>
<tr>
<th>Power Mode</th>
<th>Quantity 1 C3K-PWR-750W AC</th>
<th>Quantity 2 C3K-PWR-750W AC</th>
<th>Quantity 1 C3K-PWR-1150W AC</th>
<th>Quantity 2 C3K-PWR-1150W AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2911 in POE Boost</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2921, 2951 in POE Boost</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Step 6  Remove the RPS adapter.

Step 7  Install the RPS blank panel.

Cisco 2911, 2921, and 2951 Power and RPS Error Messages

There are many RPS error messages unique to the Cisco 2911, 2921, and 2951 routers. The messages appear on the router console terminal. Table 5-3 lists the messages and their meanings.

Table 5-3  Cisco 2911, 2921, and 2951 Power and RPS Error Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>An unsupported RPS is connected or cable is not inserted properly</td>
<td>During reload, IOS cannot read the RPS2300 PID, or the RPS2300 PID does not match. The RPS2300 PID is read over the I2C link between the Router and the RPS2300. The error could also indicate there is a cable connectivity problem.</td>
</tr>
<tr>
<td>Power supplies inserted in RPS are incompatible</td>
<td>RPS 2300 FRUs are different. FRUs can be either 1150W or 750W. The RPS does not support differing FRUs. See Table 1-9.</td>
</tr>
<tr>
<td>RPS has a critical fault</td>
<td>During reload, the RPS2300 has an over-current, over-temperature, or under-voltage condition.</td>
</tr>
<tr>
<td>RPS is not ready for configuration</td>
<td>RPS2300 is busy handling control or configuration commands from the connected LUs, and the router is trying to send command to the RPS2300.</td>
</tr>
<tr>
<td>RPS is not available for backup</td>
<td>RPS2300 is backing up other LUs and it cannot backup the current router.</td>
</tr>
<tr>
<td>One critical RPS fault has occurred or RPS power supply is not good</td>
<td>During runtime, the RPS2300 encountered an over-current, over-temperature, or under-voltage condition, or the power supplies is faulty.</td>
</tr>
<tr>
<td>RPS is disconnected or powered off</td>
<td>RPS2300 is disconnected or powered off.</td>
</tr>
<tr>
<td>An unsupported RPS is connected.</td>
<td>During reload or runtime, an unsupported RPS2300 is connected to the router.</td>
</tr>
<tr>
<td>RPS OIR insertion is not supported. Reload the router for power redundancy.</td>
<td>During runtime, the supported RPS2300 is connected to the router.</td>
</tr>
<tr>
<td>Chassis power is not good in PSU 1</td>
<td>During runtime, the power input source was removed from the internal power supply.</td>
</tr>
<tr>
<td>Input source is removed from PSU 1</td>
<td>During runtime, the power input source was removed from the internal power supply.</td>
</tr>
<tr>
<td>PSU's PoE power is not good in slot 1</td>
<td>During runtime, the PoE power from the internal power supply failed.</td>
</tr>
<tr>
<td>PSU is removed in slot 1</td>
<td>Internal power supply is removed.</td>
</tr>
</tbody>
</table>

1. LU=Load Unit.
Replacing a Fan Tray or Air Filter

The Cisco 2900 series and 3900 series routers have hot-swappable fan trays and air filters that are field replaceable units (FRUs). The fan tray includes all of the router fans in one assembly. If a fan fails, replace the tray using a flat-blade or Phillips screwdriver.

Note

We recommended replacing fan filters every six months, or when dirty, whichever comes first.

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, it is recommended to change the fans within the following times to ensure the router does not overheat:
  – Cisco 2911 within 2 minutes
  – Cisco 2921 or 2951 within 2 minutes
  – Cisco 3900 series within 1.5 minutes

Cisco 2911

• Replacing the Cisco 2911 Fan Tray, page 5-44
• Replacing the Cisco 2911 Air Filter, page 5-45

Cisco 2921 and Cisco 2951

• Replacing the Cisco 2921 or 2951 Fan Tray, page 5-46

Cisco 2900 and Cisco 3900 Series

• Replacing the Cisco 3900 Series Fan Tray, page 5-47
• Replacing the Cisco 3900 Series Air Filter, page 5-48

Replacing the Cisco 2911 Fan Tray

To hot-swap a fan tray, complete the following steps:

Note

If hot-swapping the fan tray, it is recommended to complete the operation within 2 minutes to ensure the router remains within operating temperature.

Step 1

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

Step 2

Unsnap the bezel by pulling it straight out from the chassis. See Figure 5-33.
Replacing a Fan Tray or Air Filter

**Figure 5-33  Cisco 2911 Fan Tray Replacement**

1. Fan tray captive screws (2)
2. Bezel

**Step 3**  Loosen the two captive screws on the fan tray.
**Step 4**  Pull the fan tray out.
**Step 5**  Insert the replacement fan tray and tighten the two captive screws.
**Step 6**  Snap the bezel back in place.

---

Replacing the Cisco 2911 Air Filter

To replace the air filter, complete the following steps:

**Step 1**  Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement.
**Step 2**  Unsnap the bezel by pulling it straight out from the chassis. See Figure 5-34.
Replacing a Fan Tray or Air Filter

Figure 5-34 Cisco 2911 Filter Replacement

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Remove the screw from the air filter cover and remove the filter.</td>
</tr>
<tr>
<td>4</td>
<td>Install the replacement air filter, the air filter cover, and the bezel.</td>
</tr>
</tbody>
</table>

Replacing the Cisco 2921 or 2951 Fan Tray

To replace the fan tray, complete the following steps:

**Note** If hot-swapping the fan tray, it is recommended to complete the operation within two minutes to ensure the router remains within operating temperature. See Figure 5-35.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement.</td>
</tr>
<tr>
<td>2</td>
<td>Pry open the fan tray screw covers on the four captive fan tray screws.</td>
</tr>
<tr>
<td>3</td>
<td>Completely loosen the four captive fan tray screws.</td>
</tr>
<tr>
<td>4</td>
<td>Pull the fan tray out.</td>
</tr>
<tr>
<td>5</td>
<td>Insert the replacement fan tray and tighten the four captive screws.</td>
</tr>
<tr>
<td>6</td>
<td>Snap the screw covers in place.</td>
</tr>
</tbody>
</table>
Replacing the Cisco 3900 Series Fan Tray

To hot-swap the Cisco 3900 series router fan tray, perform the following steps:

Note If hot-swapping the fan tray, it is recommended to complete the operation within 1.5-minutes to ensure the router remains within operating temperature.

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

Step 2 Unsnap the bezel by pulling it straight out from the chassis. Initially, the bezel fits very tightly. See Figure 5-36.
Replacing a Fan Tray or Air Filter

Step 3  Loosen the four captive screws on the fan tray.

Step 4  Pull out the fan tray.

Step 5  Insert the replacement fan tray, and tighten the four captive screws as shown in Figure 5-37.

Replacing the Cisco 3900 Series Air Filter

Perform the following steps to replace the air filter:

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

Step 2  Unsnap the bezel by pulling it straight out from the chassis. See Figure 5-38.
Step 3  Locate the filter, recessed inside the bezel.
Step 4  Remove the filter and insert the replacement filter inside the bezel.
Step 5  Snap the bezel back in place. See Figure 5-39.

Figure 5-39  Replacing the Cisco 3900 Series Air Filters

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bezel</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Snaps (stationary)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Air filter</td>
<td></td>
</tr>
</tbody>
</table>
Installing a FIPS Louver

A Federal Information Processing Standards (FIPS) louver can be installed to make a Cisco 2911 system compliant with FIPS 140-2. Complete the following steps to install the louver.

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

**Step 2** Remove the screws to gain access to the side of the router as shown in Figure 5-40.

**Step 3** Insert the four 8-32 screws through the FIPS louver plate, then position the FIPS spacers over the screws. See Figure 5-40.

**Figure 5-40  FIPS Louver Components and Installation**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Screws</td>
</tr>
<tr>
<td>2</td>
<td>FIPS louver</td>
</tr>
<tr>
<td>3</td>
<td>FIPS louver spacer</td>
</tr>
</tbody>
</table>

**Step 4** Tighten the screws to secure the louver and spacers onto the router.

**Figure 5-41  Properly Installed FIPS Louver**
2911 Front to Back Air Flow Converter

The 2911 Air Converter forces the routers to take in (intake) air from the front (bezel) (Figure 5-42) and allow it to go out through (exhaust) the back (business) (Figure 5-43). Installation of the 2911 Front to Back Air Converter still allows the router to run over its full temperature operating range. The pieces of the 2911 Air Converter are symmetric, and hence, if required, instead of the default 2911 side to opposite side venting direction, they can be reversed to facilitate back-to-front air flow. The 2911 with 2911 Front to Back Air Converter installed adds width to the router and requires it to be installed only in a EIA 23-inch rack. Based on the requirement, the rack mount brackets can be positioned on the front, centre, Inside, or outside.

**Note**  
The installation of the 2911 Air Converter requires only two rack-mount brackets.

*Figure 5-42  Front View of the Cisco 2911 Router with the 2911 Air Converter*

| 1 | Rack mount brackets |

**Note**  
The 2911 router view shows the rack mount brackets installed at all possible locations. You can choose one of these four positions to install rack mount brackets.
Follow these steps to install the 2911 Air Converter:

**Step 1**  Remove the screws (three on top and three at the bottom) of the 2911 Air Converter. See Figure 5-45.

---

**Note**  Set aside these six screws for joining the inner and outer piece in Step 4.
Figure 5-45  The 2911 Air Converter

<table>
<thead>
<tr>
<th></th>
<th>8-32 x 0.25 inch (0.63 cm) long countersunk Screws (48-0965-01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
Step 2  Slide apart the inner and outer pieces. See Figure 5-46.

*Figure 5-46  Inner and Outer Pieces of the 2911 Air Converter*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inner piece</td>
</tr>
</tbody>
</table>

Step 3  Assemble the inner piece of the 2911 Air Converter on the chassis using the twelve pan head screws. See Figure 5-47.

*Note*  Tighten all the pan head screws to a minimum torque of 15 in-lb.
**Step 4** Slide the outer piece along with the rack-mount brackets attached, into the inner piece. See “Attaching Rack-Mount Brackets to Cisco 2911, Cisco 2921, and Cisco 2951 Routers” section on page 3-6 for details on attaching rack-mount brackets. Insert and tighten the flat head screws (three on top and three at the bottom). See Figure 5-48.
Step 5 Repeat the same steps and assemble the 2911 Air Converter on the other side of the router. The rack mount brackets can stay in the position, as shown, or can be moved to any of the positions shown. See Figure 5-49.

Note The hexagonal vent patterns on each Air Converter assembly should be oriented in different directions when installed on opposite sides of the router, to facilitate front-to-back or back-to-front air movement.

Note Once both 2911 air converters are attached to the opposite sides of the router and all screws used to attach the converter pieces are tightened to at least 15 in-lb, user can then install the 2911 with air converter into an EIA 23” rack. See the “Mounting the Router in a Rack” section on page 3-10” for details on how to install router in a rack.
Figure 5-49 The Cisco 2911 Router After the installation of the 2911 Air Converter

| 1 | Rack mount bracket |
| 2 | Other possible positions for rack mount bracket |
Removing and Installing CompactFlash Memory Cards

This section describes installing and replacing CompactFlash (CF) memory cards in Cisco 2900 and 3900 series integrated services routers. It contains the following sections:

- Preventing Electrostatic Discharge Damage, page 5-58
- Removing a CompactFlash Memory Card, page 5-58
- Installing a CompactFlash Memory Card, page 5-60

Preventing 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 will 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 the body only; 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).

Removing a CompactFlash Memory Card

To remove a CF memory card from the chassis, perform the following steps: See Figure 5-52.

⚠️ Caution

Do not remove a CF memory card from the chassis while it is being accessed. The CF LED blinks to indicate when flash memory is being accessed. Removing the CF memory card from the router while flash memory is being accessed can cause data corruption and erratic operation.

| Step 1 | Read the “Safety Warnings” section on page 5-2 section and disconnect the power supply before you perform any module replacement. |
| Step 2 | Remove the CF cover by placing a flat-blade screwdriver in the slot and pushing sideways against the tensioner to release the cover door. (See Figure 5-50 and Figure 5-51.) |
Step 3  Press the ejector button next to the CompactFlash memory card. The ejector button moves outward so that it projects from the panel.
Removing and Installing CompactFlash Memory Cards

Chapter 5 Installing and Upgrading Internal Modules and FRUs

Removing and Installing CompactFlash Memory Cards

Figure 5-52 CompactFlash Memory Card Slot in Cisco 2900 Series Routers

<table>
<thead>
<tr>
<th>Step 4</th>
<th>Press the ejector button again. See Figure 5-52. This ejects the CompactFlash memory card partially out of its slot.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 5</td>
<td>Pull the CF memory card out of its slot.</td>
</tr>
<tr>
<td>Step 6</td>
<td>Push the ejector button in until the button is flush with the bezel.</td>
</tr>
</tbody>
</table>

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 memory card.

Installing a CompactFlash Memory Card

To install a CompactFlash memory card, perform the following steps (see Figure 5-52):

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Read the “Safety Warnings” section on page 5-2 and disconnect the power supply before you perform any module replacement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Make sure that the ejector button is fully seated until it is flush with the bezel.</td>
</tr>
</tbody>
</table>

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

| Step 3 | 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.
Chapter 5 Installing and Upgrading Internal Modules and FRUs

Installing SFP Modules

This section describes how to install optional small-form-factor pluggable (SFP) modules in Cisco 2900 and Cisco 3900 series integrated services routers 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`. 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 Cisco 2900 series and Cisco 3900 series routers. Table 5-4 lists supported SFPs on Cisco 2900 and 3900 ISRs.

See Cisco Transceiver Modules Compatibility Information for compatibility issues.

<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=</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=</td>
<td>1000Base-ZX</td>
<td>9/125</td>
<td>1550</td>
<td>Single</td>
<td>100 km</td>
</tr>
<tr>
<td>CWDM-SFP-1470=</td>
<td>1000Base-CWDM</td>
<td>50</td>
<td>1470</td>
<td>Single</td>
<td>100 km</td>
</tr>
<tr>
<td>CWDM-SFP-1490=</td>
<td></td>
<td></td>
<td>1490</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CWDM-SFP-1510=</td>
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<td></td>
<td>1510</td>
<td></td>
<td></td>
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<tr>
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<td>1531.90</td>
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<td>DWDM-SFP-3425</td>
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<td>DWDM-SFP-3504</td>
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<td>1539.98</td>
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<td>DWDM-SFP-4056</td>
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<td>—</td>
<td>1540.56</td>
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</table>
### Table 5-4  SFPs Supported on Cisco 2900 and 3900 Series Routers (continued)

<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>
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<tbody>
<tr>
<td>DWDM-SFP-4214</td>
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<td>DWDM-SFP-5413</td>
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<td>DWDM-SFP-5979</td>
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<td>1560.61</td>
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<td></td>
</tr>
<tr>
<td>GLC-BX-D</td>
<td>1490 TX</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1310 RX</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLC-BX-U</td>
<td>1310 TX</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1490 RX</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLC-FE-100FX</td>
<td>—</td>
<td>—</td>
<td>1310</td>
<td>Multi</td>
<td>2 km</td>
</tr>
<tr>
<td>GLC-FE-100LX</td>
<td>—</td>
<td>—</td>
<td>1310</td>
<td>Single</td>
<td>10 km</td>
</tr>
<tr>
<td>GLC-FE-100EX</td>
<td>100BASE-FX</td>
<td>—</td>
<td>1310</td>
<td>Single</td>
<td>40 km</td>
</tr>
<tr>
<td>GLC-FE-100ZX</td>
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<td>1550</td>
<td>Single</td>
<td>80 km</td>
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<tr>
<td>GLC-FE-100BX-U</td>
<td>1310 TX</td>
<td>—</td>
<td>—</td>
<td>Single</td>
<td>10 km</td>
</tr>
<tr>
<td></td>
<td>1550 RX</td>
<td>—</td>
<td>—</td>
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<td></td>
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<td>GLC-FE-100BX-D</td>
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<td>—</td>
<td>Single</td>
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</tr>
<tr>
<td></td>
<td>1310 RX</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLC-GE-100FX</td>
<td>—</td>
<td>—</td>
<td>1310</td>
<td>Multi</td>
<td>2 km</td>
</tr>
</tbody>
</table>
Tip
Use the `show controller` command at the Cisco IOS prompt to determine whether you are using an SFP certified by Cisco.

**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**

*Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.* Statement 1051

**Warning**

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

Follow these steps to install an SFP module in a Cisco 2900 or 3900 series router:

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

**Step 2**
Slide the SFP into the router connector until it locks into position (see Figure 5-53).

**Tip**
If the SFP uses a bale-clasp latch (see Figure 5-53), the handle should be on top of the SFP module.

**Figure 5-53 Installing an 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.
Removing SFP Modules

Follow these steps to remove an SFP from a Cisco 2900 series or Cisco 3900 series router:

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

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

**Warning** Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

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

**Step 3**  Disconnect the SFP latch. See Figure 5-54.

**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 5-54  Disconnecting SFP Latch Mechanisms**

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