



Removing and Installing Port Adapters

This chapter describes how to remove the PA-2H port adapter from supported platforms, how to install a new or replacement port adapter, and how to connect cables. This chapter contains the following sections:

- [Handling Port Adapters, page 3-1](#)
- [Online Insertion and Removal, page 3-2](#)
- [Warnings and Cautions, page 3-3](#)
- [Port Adapter Removal and Installation, page 3-4](#)
- [Connecting PA-2H Interface Cables, page 3-16](#)

Each port adapter circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.



Note

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the port adapters. If you plan to install a new port adapter in a slot that is not in use, you must first remove the blank port adapter.



Caution

When powering off the router, wait a minimum of 30 seconds before powering it on again.

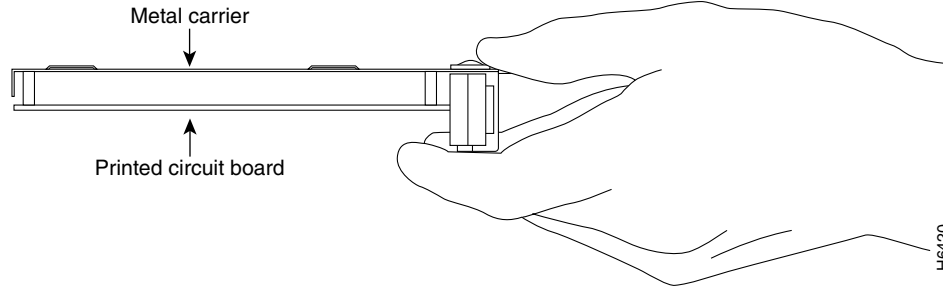
Handling Port Adapters



Caution

Always handle the port adapter by the carrier edges and handle; never touch the port adapter components or connector pins. (See [Figure 3-1](#).)

Figure 3-1 Handling a Port Adapter



Online Insertion and Removal

Several platforms support online insertion and removal (OIR) of port adapters; therefore, you do not have to power down routers when removing and replacing a PA-2H on Cisco 7100 series routers, Cisco 7200 series routers, Cisco uBR7200 series routers, Cisco 7301 routers, or Cisco 7401ASR routers.

Although the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, and the Catalyst RSM/VIP2 support online insertion and removal, individual port adapters do not. To replace port adapters, you must first remove the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, or Catalyst RSM/VIP2 from the chassis and then install or replace port adapters as required. If a blank port adapter is installed on the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, or Catalyst RSM/VIP2 on which you want to install a new port adapter, you must first remove the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, or Catalyst RSM/VIP2 from the chassis and then remove the blank port adapter.



Caution

To prevent system problems, do not remove port adapters from the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, or Catalyst RSM/VIP2 motherboard or attempt to install other port adapters on the motherboard when the system is operating. To install or replace port adapters, first remove the Cisco 7304 PCI Port Adapter Carrier Card, the VIP, the Catalyst 6000 family FlexWAN module, or Catalyst RSM/VIP2 from its interface processor slot.

It is wise to gracefully shut down the system before removing a port adapter that has active traffic moving through it. Removing a module while traffic is flowing through the ports can cause system disruption. Once the module is inserted, the ports can be brought back up.



Note

As you disengage the module from the router or switch, online insertion and removal (OIR) administratively shuts down all active interfaces in the module.

OIR allows you to install and replace modules while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the module you are removing while it is being removed. OIR is a method that is seamless to end users on the network, maintains all routing information, and preserves sessions.

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a module in a supported platform, refer to the [“Port Adapter Removal and Installation”](#) section on page 3-4.

Each module has a bus connector that connects it to the router. The connector has a set of tiered pins in three lengths that send specific signals to the system as they make contact with the module. The system assesses the signals it receives and the order in which it receives them to determine if a module is being removed from or introduced to the system. From these signals, the system determines whether to reinitialize a new interface or to shut down a disconnected interface.

Specifically, when you insert a module, the longest pins make contact with the module first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a module, the pins send signals to notify the system of changes. The router then performs the following procedure:

1. Rapidly scans the system for configuration changes.
2. Initializes newly inserted port adapters or administratively shuts down any vacant interfaces.
3. Brings all previously configured interfaces on the module back to their previously installed state. Any newly inserted interface is put in the administratively shutdown state, as if it was present (but not configured) at boot time. If a similar module type is reinserted into a slot, its ports are configured and brought online up to the port count of the originally installed module of that type.

**Note**

Before you begin installation, read [Chapter 2, “Preparing for Installation,”](#) for a list of parts and tools required for installation.

Warnings and Cautions

Observe the following warnings and cautions when installing or removing port adapters.

**Caution**

Do not slide a port adapter all the way into the slot until you have connected all required cables. Trying to do so disrupts normal operation of the router or switch.

**Note**

If a port adapter lever or other retaining mechanism does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter halfway out of the slot, reinsert it, and move the port adapter lever or other mechanism to the locked position.

**Caution**

To prevent jamming the carrier between the upper and the lower edges of the port adapter slot, and to ensure that the edge connector at the rear of the port adapter mates with the connection at the rear of the port adapter slot, make certain that the carrier is positioned correctly, as shown in the cutaway in the following illustrations.

**Warning**

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the card. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

Port Adapter Removal and Installation

In this section, the illustrations that follow give step-by-step instructions on how to remove and install port adapters in each of the following supported platforms:

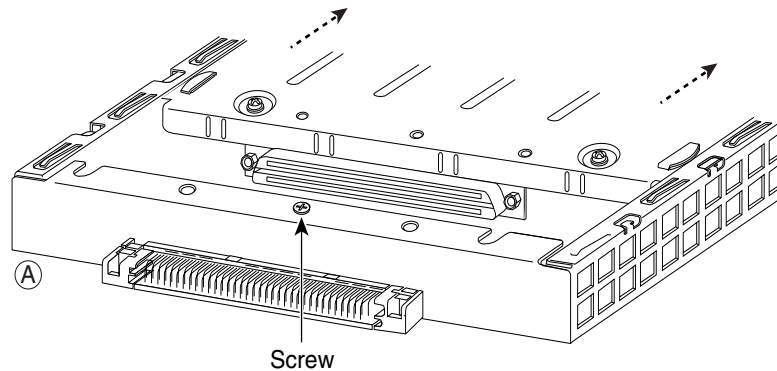
- [Catalyst RSM/VIP2—Removing and Installing a Port Adapter, page 3-5](#)
- [Catalyst 6000 Family FlexWAN Module—Removing and Installing a Port Adapter, page 3-6](#)
- [Cisco 7100 Series—Removing and Installing a Port Adapter, page 3-7](#)
- [Cisco 7200 Series—Removing and Installing a Port Adapter, page 3-8](#)
- [Cisco uBR7200 Series—Removing a Port Adapter, page 3-9](#)
- [Cisco uBR7200 Series—Installing a Port Adapter, page 3-10](#)
- [Cisco 7301 Router—Removing and Installing a Port Adapter, page 3-11](#)
- [Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter, page 3-12](#)
- [Cisco 7401ASR Router—Removing and Installing a Port Adapter, page 3-14](#)
- [VIP—Removing and Installing a Port Adapter, page 3-15](#)

Catalyst RSM/VIP2—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst RSM/VIP2 from the chassis before removing a port adapter from the Catalyst RSM/VIP2.

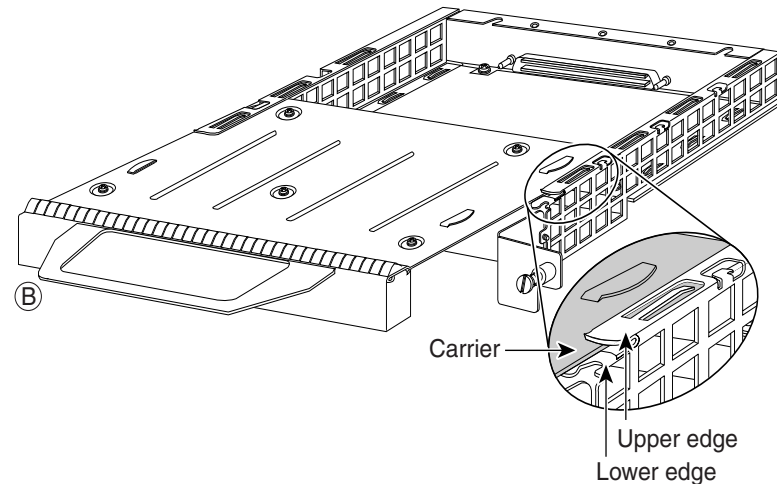
Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)



Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)



Step 3

To install the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

Step 4

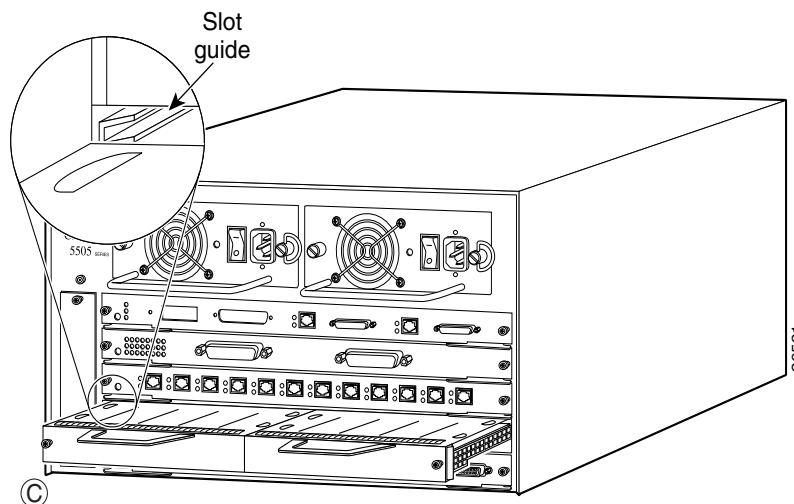
Install the screw in the rear of the port adapter slot. Do not overtighten the screw. (See A.)

Step 5

Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 6

Reinstall the Catalyst RSM/VIP2 motherboard in the chassis and tighten the captive installation screw on each side of the Catalyst RSM/VIP2 faceplate. (See C.)

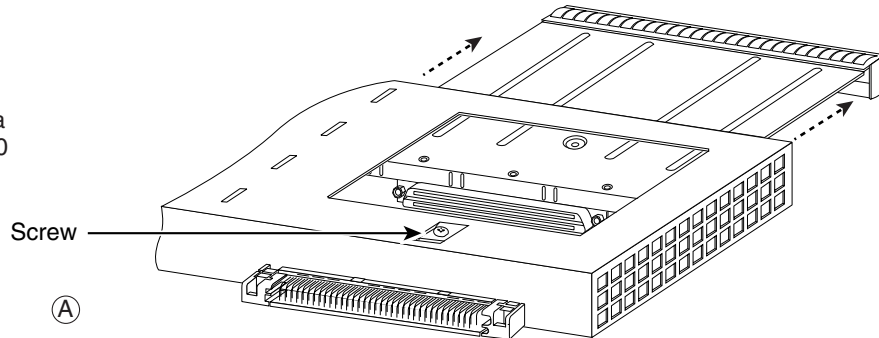


Catalyst 6000 Family FlexWAN Module—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst 6000 FlexWAN module from the chassis before removing a port adapter from the Catalyst 6000 FlexWAN module.

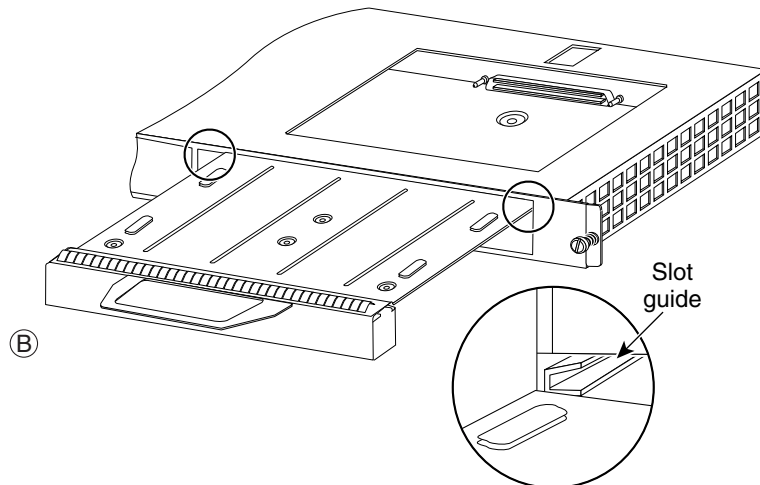
Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)



Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its bay, away from the edge connector at the rear of the bay. (See A.)



Step 3

To install the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter bay. (See B.)

Step 4

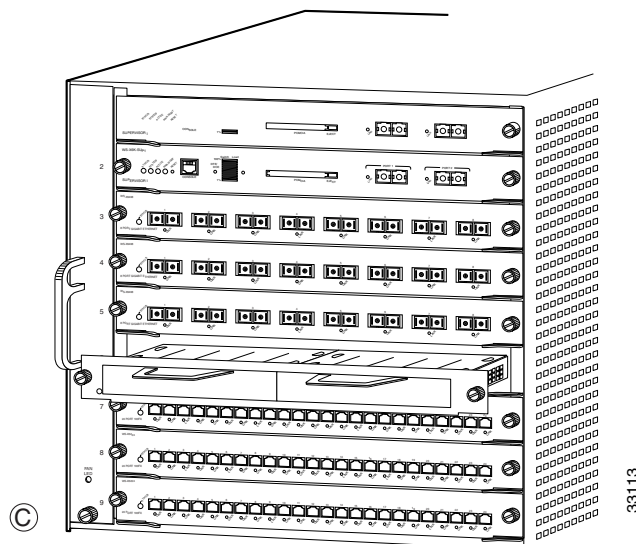
Carefully slide the new port adapter into the port adapter bay until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 5

Install the screw in the rear of the port adapter bay. Do not overtighten the screw. (See A.)

Step 6

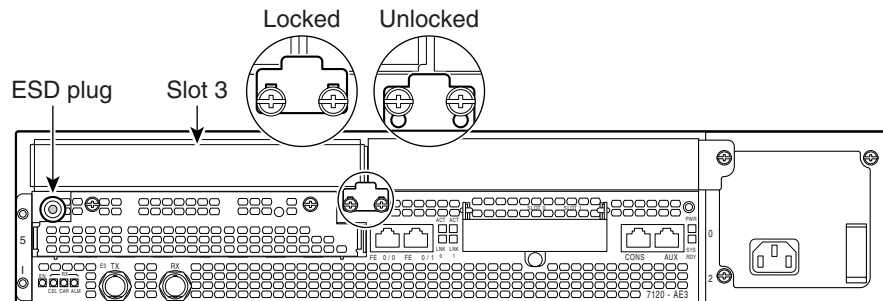
Reinstall the Catalyst 6000 FlexWAN module in the chassis, and tighten the captive installation screw on each side of the Catalyst 6000 FlexWAN module faceplate. (See C.)



Cisco 7100 Series—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, use a number 2 Phillips screwdriver to loosen the screws on the locking tab. Then slide the tab down to the unlocked position.



Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 3

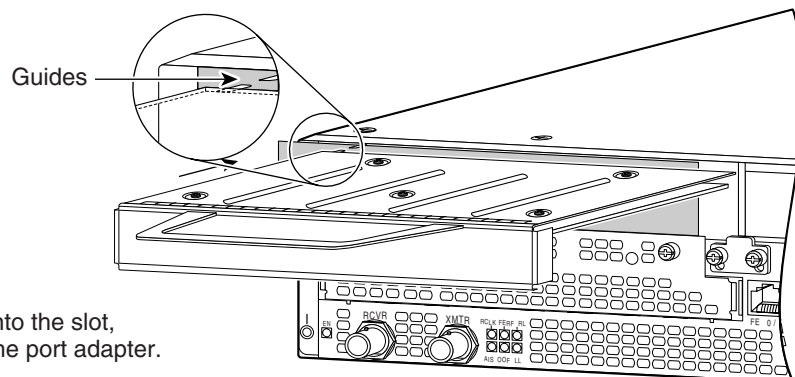
With the port adapter halfway out of the slot, disconnect all cables from the port adapter.

Step 4

After disconnecting the cables, pull the port adapter from its chassis slot.

Step 5

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot.



Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter.

Step 7

After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 8

After the port adapter is properly seated, lock the port adapter retaining mechanism.

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Cisco 7200 Series—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, place the port adapter lever in the unlocked position. (See A.) The port adapter lever remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Step 4

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

Step 5

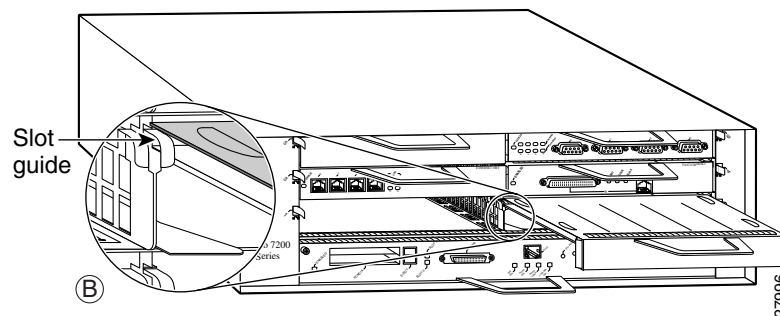
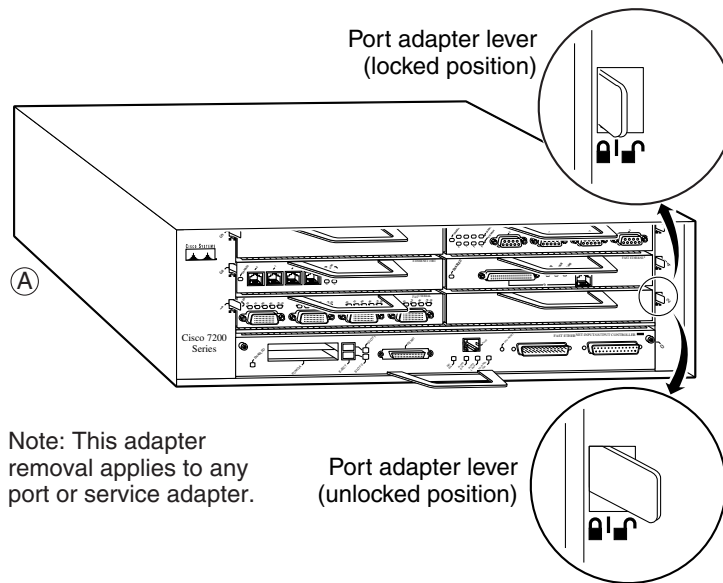
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 7

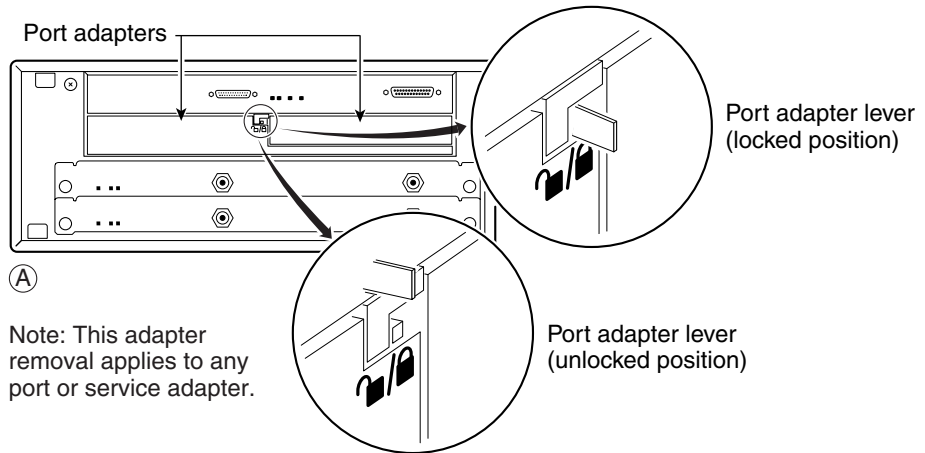
After the port adapter is properly seated, lock the port adapter lever. (See A.)



Cisco uBR7200 Series—Removing a Port Adapter

Step 1

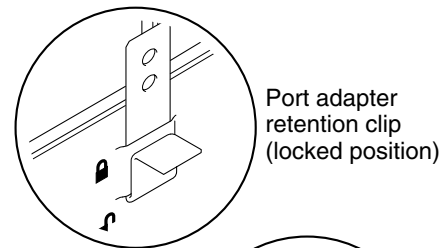
To remove the port adapter, unlock the port adapter retaining mechanism. The port adapter lever remains in the unlocked position.



Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

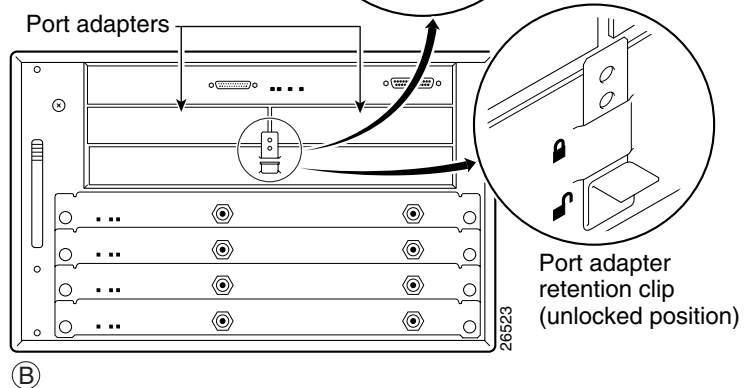
Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.



Step 3

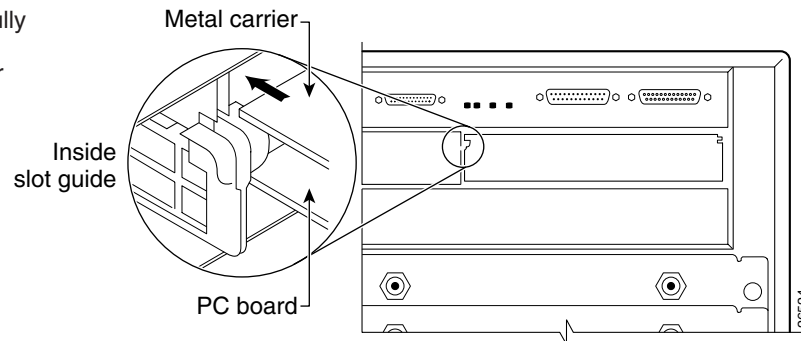
With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.



Cisco uBR7200 Series—Installing a Port Adapter

Step 1

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot.



Step 2

Carefully slide the new port adapter halfway into the port adapter slot.

Step 3

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 4

After the port adapter is properly seated, lock the port adapter lever or retention clip, depending on your system. (See illustration on preceding page.)

Cisco 7301 Router—Removing and Installing a Port Adapter

Step 1

Use an ESD wrist strap to ground yourself to the router.

Step 2

To remove a port adapter, use a Phillips screwdriver to turn the screw holding the port adapter latch. The screw should be loose enough to allow the latch to rotate to an unlocked position. (See A.) The latch can rotate 360°.

Step 3

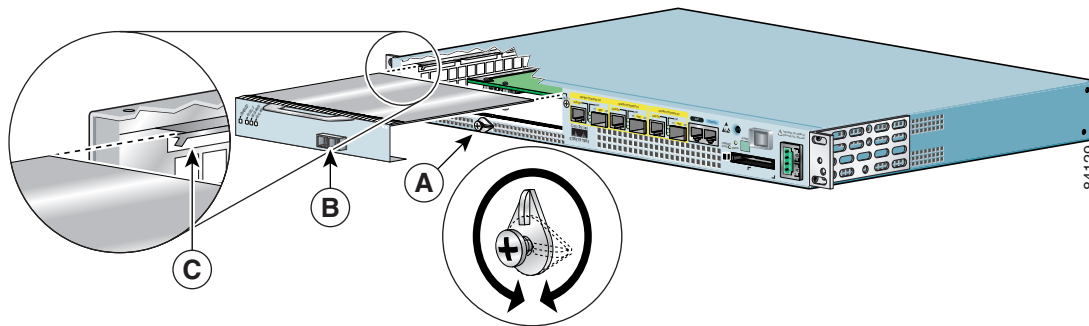
Grasp the handle and pull the port adapter from the router, about halfway out of its slot. (See B.) If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 4

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Caution

The port adapter must slide into the slot guides close to the chassis lid. (See C.) Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.



Step 5

To insert the port adapter, carefully align the port adapter carrier in the slot guides. (See C.) Slide the new port adapter halfway into the chassis.

Step 6

Connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the midplane.

Step 7

After the port adapter is properly seated, turn and secure the port adapter latch in the upright, locked position. (See A.) Tighten the screw to ensure the port adapter remains firmly in place.

Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter

You can install one single-width port adapter in a Cisco 7304 PCI Port Adapter Carrier Card. This section provides step-by-step instructions for removing and installing a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card.

**Warning**

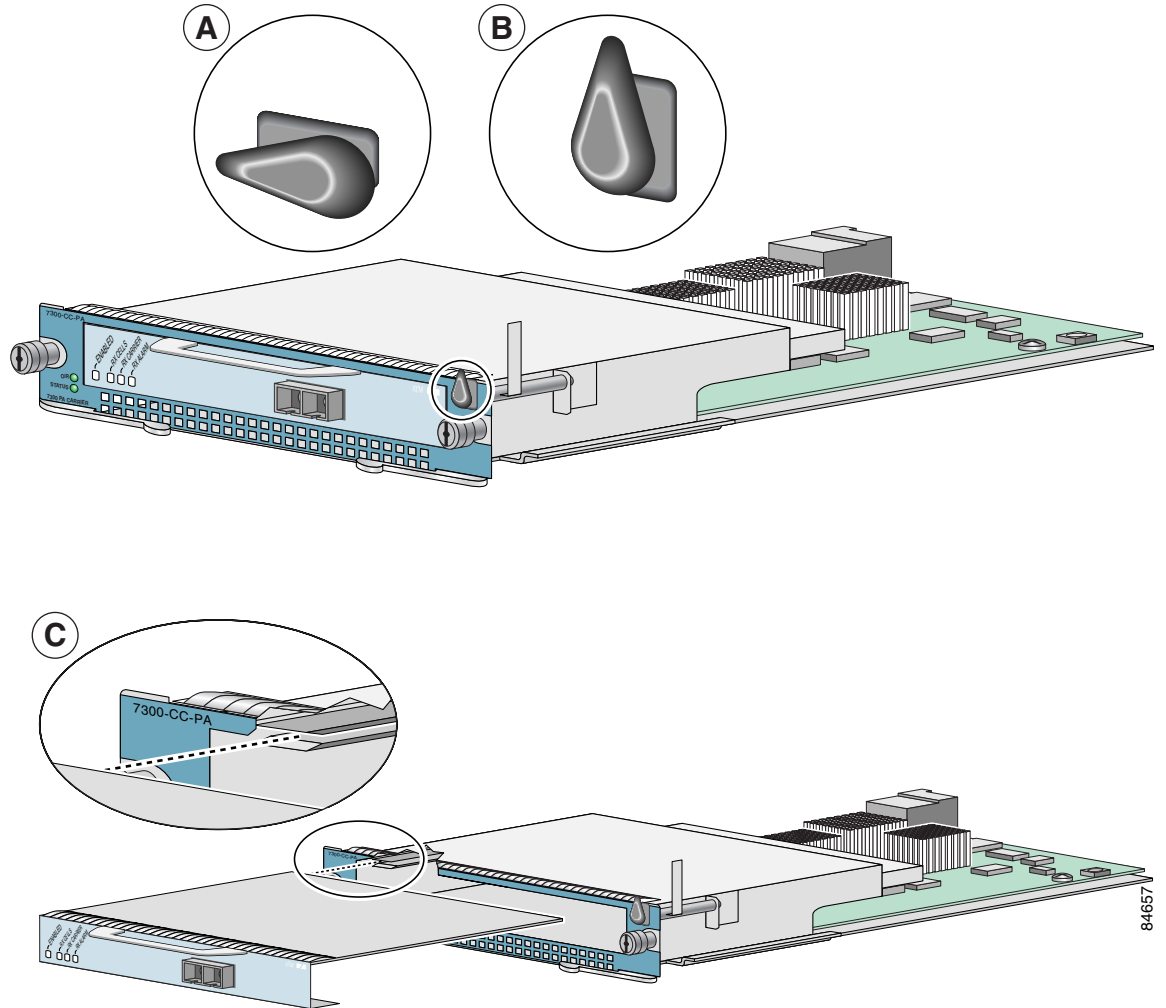
When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the Cisco 7304 PCI Port Adapter Carrier Card. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

To remove and install a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card, refer to [Figure 3-2](#) and do the following:

-
- Step 1** If the Cisco 7304 PCI Port Adapter Carrier Card is still in the router, you must remove the Cisco 7304 PCI Port Adapter Carrier Card before removing a port adapter.
 - Step 2** To remove the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card, turn the port adapter lock from its locked and horizontal position shown in A of [Figure 3-2](#) to its unlocked and vertical position shown in B of [Figure 3-2](#).
 - Step 3** Grasp the handle of the port adapter and pull the port adapter from the Cisco 7304 PCI Port Adapter Carrier Card. (You have already disconnected the cables from the port adapter when removing the Cisco 7304 PCI Port Adapter Carrier Card).
 - Step 4** To insert the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card, locate the guide rails inside the Cisco 7304 PCI Port Adapter Carrier Card that hold the port adapter in place. They are at the top left and top right of the port adapter slot and are recessed about an inch, as shown in C of [Figure 3-2](#).
 - Step 5** Carefully slide the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card until the port adapter makes contact with the port adapter interface connector. When fully seated, the port adapter front panel should be flush with the face of the Cisco 7304 PCI Port Adapter Carrier Card.
 - Step 6** After the port adapter is properly seated, turn the port adapter lock to its locked and horizontal position, as shown in A of [Figure 3-2](#).
-

Figure 3-2 illustrates how to remove and install a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card.

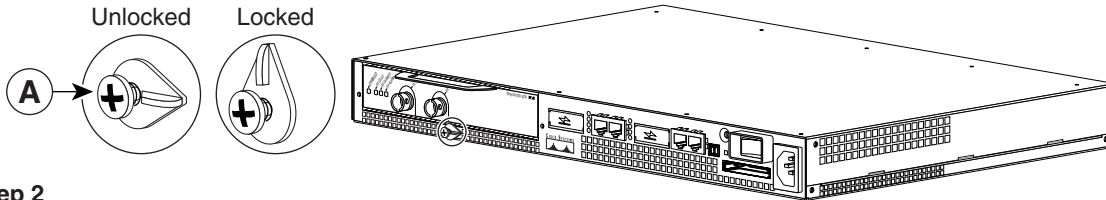
Figure 3-2 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Removal and Installation



Cisco 7401ASR Router—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, use a number 2 Phillips screwdriver to loosen the screw on the port adapter latch. Rotate the port adapter latch until it clears the faceplate of the port adapter. (See A.) The latch can rotate 360°.



Step 2

Pull the port adapter from the router, about halfway out of its slot. (If you remove a blank port adapter, keep the blank port adapter for use in the router if you should ever remove the port adapter. The port adapter slot must always be filled.)

Step 3

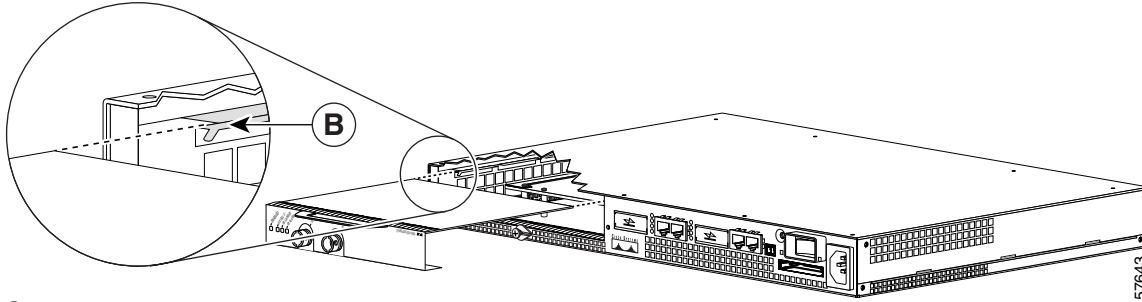
With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter completely out of the chassis slot.

Step 4

To insert the port adapter, locate the port adapter slot guides inside the Cisco 7401ASR router. They are near the top, and are recessed about 1/2 inch. (See B.)

Caution

The port adapter must slide into the slot guides under the chassis lid. Do not allow the port adapter components to come in contact with the system board, or the port adapter could be damaged.



Step 5

Insert the port adapter in the slot guides halfway, and then reconnect the port adapter cables.

Step 6

After the cables are connected, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane. When installed, the port adapter input/output panel should be flush with the face of the router.

Step 7

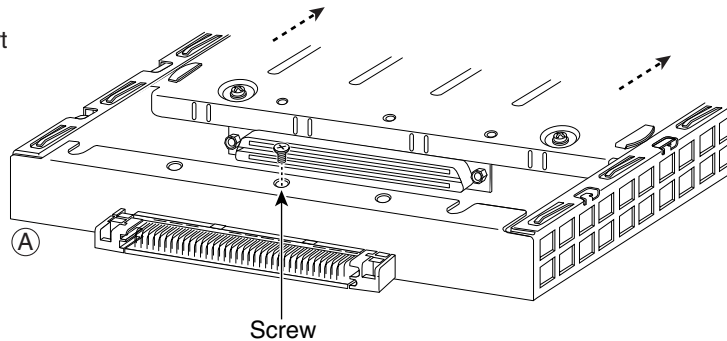
After the port adapter is properly seated, rotate the port adapter latch to the upright locked position and use a number 2 Phillips screwdriver to tighten the latch screw. If needed, loosen the latch screw to rotate the latch over the port adapter. Finish the installation by tightening the latch screw.

VIP—Removing and Installing a Port Adapter

Note: You must first remove the VIP from the chassis before removing a port adapter from the VIP.

Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)

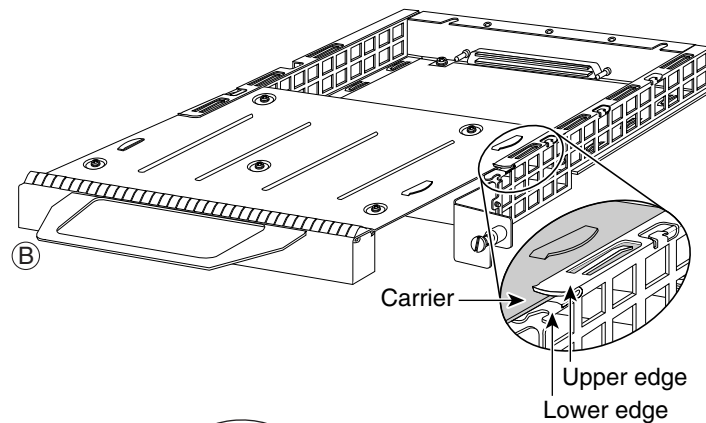


Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)

Step 3

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

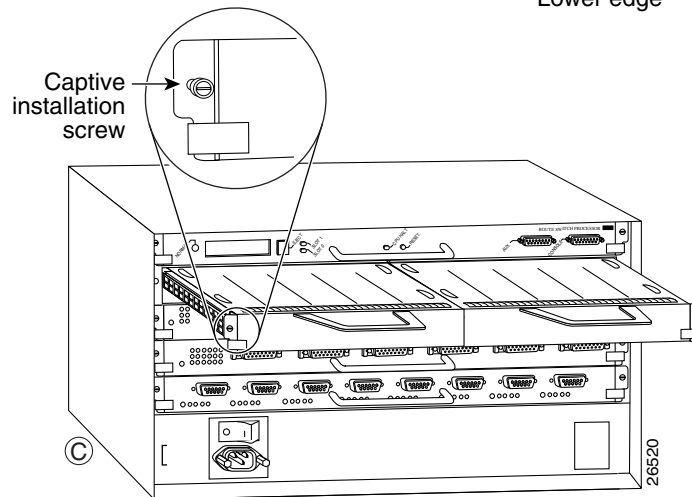


Step 4

Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 5

Install the screw in the rear of the port adapter slot on the VIP. Do not overtighten the screw. (See A.)



Step 6

Carefully slide the VIP motherboard into the interface processor slot until the connectors at the rear of the VIP are completely seated in the connectors at the rear of the interface processor slot. Use the ejector levers to seat the VIP in the interface processor slot. Tighten the captive installation screws on the VIP. (See C.)

Connecting PA-2H Interface Cables

This section describes the procedures for connecting HSSI cables and null modem cables to the PA-2H.

Connecting the HSSI Cables

This section describes the procedure for connecting HSSI cables to a PA-2H port adapter.

On a single PA-2H, you can use up to two HSSI connections. HSSI cables are available only from Cisco Systems; they are not available from outside commercial cable vendors.



Caution

Although the HSSI connector and the HSSI cable are similar to the SCSI-II format, they are not identical. The HSSI cable specification is more restrictive than that for the SCSI-II. If a SCSI-II cable is used instead of an HSSI cable, proper operation cannot be guaranteed.

Use the following procedure to connect HSSI cables to a PA-2H:

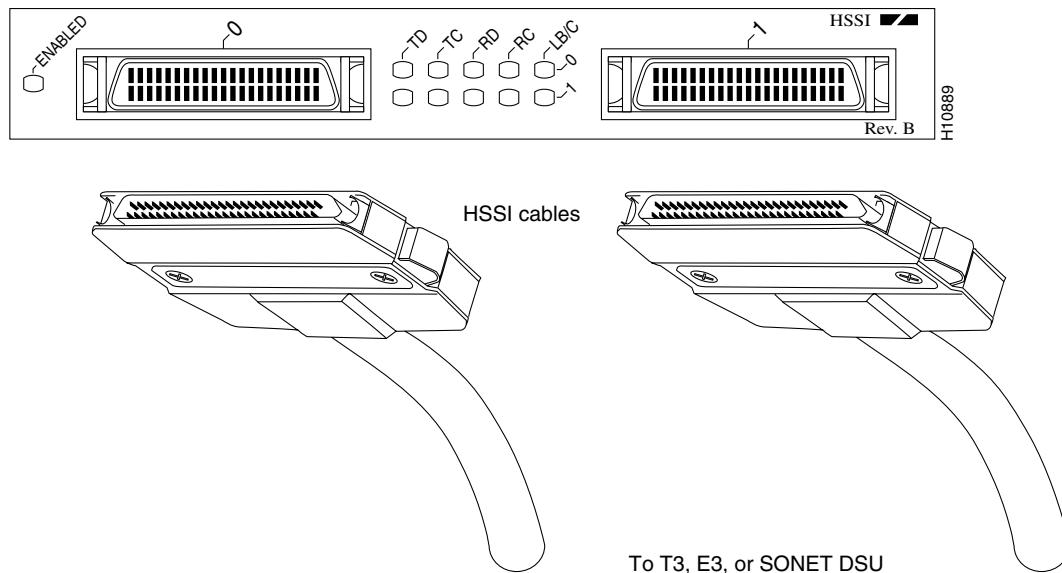
- Step 1** Attach the HSSI cable directly to each port on the PA-2H. (See [Figure 3-3](#).)



Note

Port adapters have a handle attached, but this handle is not shown in [Figure 3-3](#). The HSSI cable plug and HSSI port receptacle are keyed for proper connection. Use the HSSI cable strain relief slide locks whenever HSSI cables are connected to the receptacles on the PA-2H.

Figure 3-3 Connecting HSSI Cables—Front View, PA-2H Shown Without Handle



- Step 2** Attach the network end of your HSSI cables to your T3, E3, or SONET DSU, or other external HSSI equipment.

This completes the procedure for attaching HSSI cables to the PA-2H. If you require a null modem cable for your HSSI connection, see the “[Connecting a Null Modem Cable](#)” section that follows; otherwise, proceed to the Chapter 4, “[Configuring the PA-2H.](#)”

Connecting a Null Modem Cable

This section describes the procedure for connecting a null modem cable to a PA-2H port adapter.

The null modem cable can connect two routers directly back to back. The two routers must be in the same location, and can be two Cisco 7000 series routers, two Cisco 7100 series routers, two Cisco 7200 series routers, two Cisco uBR7200 series routers, two Cisco 7301 routers, two Cisco 7304 routers, two Cisco 7401ASR routers, two Cisco 7500 series routers, or one of each. In this setup, you can verify the operation of the HSSI or to directly link the routers in order to build a larger node. The null modem cable uses the same 50-pin connectors as the HSSI cable, but uses the pinouts listed in [Table 1-3](#) in the “[HSSI Null Modem Cable](#)” section on page 1-5.

To connect two routers, attach a null modem cable between an HSSI port on each router. Enable the internal transmit clock in both routers by entering the command **hssi internal-clock**. All router platforms use the same **hssi internal-clock** command to enable the internal transmit clock on the HSSI.

You define Cisco 7000 series and Cisco 7500 series interfaces by type and *interface-processor-slot-number/port-adapter-slot-number/interface-port* locations. You define Cisco 7100 series, Cisco 7200 series, Cisco uBR7200 series, Cisco 7301 router, Cisco 7304 router and Cisco 7401ASR router interfaces by type and *port-adapter-slot-number/interface-port* locations. You define the Catalyst RSM/VIP2 in Catalyst 5000 family switches by *port-adapter-slot-number/interface-port* locations. (The output of the **show interfaces** command displays the logical unit number on all supported platforms and the *interface-processor-slot-number/port-adapter-slot-number/interface-port* location in the Cisco 7000 series and Cisco 7500 series, or the *port-adapter-slot-number/interface-port* location in the Cisco 7100 series, Cisco 7200 series, Cisco 7301 router, Cisco 7304 router, Cisco 7401ASR router, and Cisco uBR7200 series routers, and the Catalyst RSM/VIP2.)



Note

In the Cisco 7206 and Cisco 7206VXR router shelves, you define interfaces by type and *physical-shelf/port-adapter/port* locations. For information on Cisco 7206 and Cisco 7206VXR router shelf physical port addresses, see the “[Identifying Interface Addresses](#)” section on page 1-13 in Chapter 1.

The following examples show the configuration commands needed to prepare for a null modem cable connection in all supported platforms:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#

Enter configuration commands...
```

- For Cisco 7000 series and Cisco 7500 series routers with VIP:

```
Router(config)# interface hssi 1/0/0
Router(config-if)# hssi internal-clock
Router(config-if)# Ctrl-Z
```

- For Catalyst 5000 family switches with Catalyst RSM/VIP2:

```
Router(config)# interface hssi 0/0
Router(config-if)# hssi internal-clock
Router(config-if)# Ctrl-Z
```

- For Catalyst 6000 family switches with Catalyst 6000 FlexWAN module:

```
Router(config)# interface hssi 3/0/0
Router(config-if)# hssi internal-clock
Router(config-if)# Ctrl-Z
```

- For Cisco 7100 series:

```
Router(config)# interface hssi 3/0
Router(config-if)# hssi internal-clock
Router(config-if)# Ctrl-Z
```

- For Cisco 7200 series, Cisco uBR7200 series, Cisco 7301 routers, Cisco 7304 routers, and Cisco 7401ASR routers:

```
Router(config)# interface hssi 1/0
Router(config-if)# hssi internal-clock
Router(config-if)# Ctrl-Z
```

**Note**

For the Cisco 7206 and Cisco 7206VXR router shelves, the interface address specified in the Cisco 7200 series example above would be preceded by a shelf number. For example, the command **interface hssi 5/1/0** specifies the first interface of the port adapter in slot 1 of Cisco 7206 or Cisco 7206VXR router shelf 5.

Be sure to configure the HSSI port on both routers for an internal transmit clock. When the internal clock is enabled, the TC LED on the PA-2H goes on. When the internal clock is enabled in both routers, the TC and RC LEDs on both of the connected HSSI ports go on.

When you disconnect the null modem cable, you must also disable the internal transmit clock with the command **no hssi internal-clock**. Use this command to turn off the transmit clock for each interface on both routers.

This completes the procedure for attaching a null modem cable to your PA-2H.

Proceed to Chapter 4, “[Configuring the PA-2H](#).”