PA-H HSSI Port Adapter Installation and Configuration

Product Number: PA-H(=)
Platforms Supported: Catalyst 5000 Family Switches with RSM/VIP2, Catalyst 6000 Family Switches with Catalyst 6000 Family FlexWAN Module, Cisco 7100 Series Routers, Cisco 7200 Series Routers, Cisco uBR7200 Series Routers, Cisco 7200 VXR Routers, Cisco 7201 Router, Cisco 7301 Router, Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 Router, Cisco 7401ASR Router, and VIP in the Cisco 7000 Series and Cisco 7500 Series Routers

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PA-H HSSI Port Adapter Installation and Configuration

CONTENTS

Preface

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

Document Revision History

The Document Revision History table below, beginning with version OL-3503-04, records technical changes to this document.

Document Version	Date	Change Summary
OL-3503-04	April, 2007	Adds Cisco 7201 router information.

Objectives

This document describes how to install and configure the single-port High-Speed Serial Interface (HSSI) port adapter (PA-H, Rev. B), hereafter referred to as the PA-H, which is used in the following platforms:

- Catalyst 5000 family switches with the Route Switch Module (RSM)/second-generation Versatile Interface Processor (VIP2)
- Catalyst 6000 family FlexWAN module in the Catalyst 6000 family switches
- Cisco 7100 series routers, consisting of the Cisco 7120 series and Cisco 7140 series

- Cisco 7200 series routers and Cisco 7200 VXR routers, consisting of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR

Note The Cisco 7206 and Cisco 7206VXR can be used as router shelves in a Cisco AS5800 Universal Access Server. For information about the Cisco 7206 and Cisco 7206VXR as router shelves, refer to the Cisco AS5800 Universal Access Server documentation listed in the "Related Documentation" section on page ix.

- Cisco uBR7200 series broadband routers, consisting of the three-slot Cisco uBR7223 and the six-slot Cisco uBR7246 and Cisco uBR7246VXR
- Cisco 7201 router
- Cisco 7301 router
- Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 router
- Cisco 7401ASR router
- VIP in Cisco 7500 series and Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the PA-H port adapter and its LEDs, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	Removing and Installing Port Adapters	Describes the procedures for installing and removing PA-H port adapters in all supported platforms.
Chapter 4	Configuring the PA-H	Provides instructions for configuring the interface on PA-H port adapters on the supported platforms.

Related Documentation

Your router or switch and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- Cisco IOS software:

  For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.

  Note You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

- Catalyst 5000 family switches with RSM/VIP2:
  - For an online directory to quickly access documents for Cisco Catalyst 5000 series switches, refer to the *Cisco Catalyst 5000 Series Switches Install and Upgrade Guides* index at the following URL:

    http://www.cisco.com/en/US/products/hw/switches/ps679/prod_installation_guides_list.html
  - For hardware installation and maintenance information, refer to the following documents:
    - *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note*
    - *Catalyst 5000 Series Route Switch Module Installation and Configuration Note*
    - The installation and configuration guide and quick start for your Cisco Catalyst 5000 series switch
- Cisco AS5800 Universal Access Server:

  For hardware installation and maintenance information and software configuration information, refer to the following publications:
  - *Cisco AS5800 Universal Access Server Hardware Installation and Configuration Guide*
  - *Cisco AS5800 Universal Access Server Software Installation and Configuration Guide*
- Catalyst 6000 family switches with FlexWAN module:
  - For an online directory to quickly access documents for Cisco Catalyst 6000 family switches, refer to the *Cisco Catalyst 6500 Series Switches Documentation Roadmaps* index at the following URL:

    http://www.cisco.com/en/US/products/hw/switches/ps708/products_documentation_roadmaps_list.html
  - For hardware installation and maintenance information, refer to the following documents:
    - *Catalyst 6000 Family FlexWAN Module Installation and Configuration Note*
    - The hardware and software publications for your Catalyst 6000 family switch

- Cisco 7000 series routers:
  - For an online directory to quickly access documents for Cisco 7000 series routers, refer to the *Cisco 7000 Series Routers Introduction* index at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps332/tsd_products_support_eol_series_home.html
  - For hardware installation and maintenance information, refer to the following documents:
    - *Cisco 7000 Hardware Installation and Maintenance* for your router.
    - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
    - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
    - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- Cisco 7100 series routers:
  - For an online directory to quickly access documents for Cisco 7100 series routers, refer to the *Cisco 7100 Series Documentation* roadmap at the following URL:

    http://www.cisco.com/en/US/products/hw/vpndevc/ps333/products_product_index09186a00800fa142.html
  - For hardware installation and configuration information refer to the *Cisco 7100 Series VPN Router Installation and Configuration Guide*.
  - For information on setting up a Virtual Private Network, refer to the *Cisco 7100 Series VPN Configuration Guide*.
- Cisco 7200 series routers:
  - For an online directory to quickly access documents for Cisco 7200 series routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
  - For hardware installation and configuration information (including the Cisco 7206 or Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server), refer to the online installation and configuration guide and quick start for your Cisco 7200 series router.
  - For port adapter hardware and memory configuration guidelines, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.
  - For information on network processing engines or network services engines, refer to the *Network Processing Engine and Network Services Engine Installation and Configuration* document.
- Cisco 7200 VXR routers:
  - For an online directory to quickly access documents for Cisco 7200 VXR routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
  - For hardware installation and maintenance information, refer to the *Cisco 7200 VXR Installation and Configuration Guide* or the *Cisco 7200 VXR Routers Quick Start Guide*.

- Cisco uBR7200 series routers:
  - For an online directory to quickly access documents for Cisco uBR7200 Universal Broadband routers , refer to the *Cisco uBR7200 Universal Broadband Router Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/cable/ps2217/products_documentation_roadmap09186a00805e0d0c.html
- Cisco 7201 router:
  - For an online directory to quickly access documents for the Cisco 7201 router, refer to the *Cisco 7201 Router Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/customer/products/hw/routers/ps341/products_documentation_roadmap09186a00807f635a.html
  - For hardware installation and maintenance information, refer to the *Cisco 7201 Installation and Configuration Guide* or the *Cisco 7201 Router Quick Start Guide*.
- Cisco 7301 router:
  - For an online directory to quickly access documents for the Cisco 7301 router, refer to the *Cisco 7301 Internet Router Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f21.html
  - For hardware installation and maintenance information, refer to the *Cisco 7301 Installation and Configuration Guide* or the *Cisco 7301 Router Quick Start Guide*.
- Cisco 7304 PCI port adapter carrier card in Cisco 7304 router:
  - For an online directory to quickly access documents for the Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7301 router, refer to the *Cisco 7304 Router Line Card, Carrier Card, Port Adapter, Modular Services Card, and Shared Port Adapter Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f5e.html
  - For hardware installation and maintenance information, refer to the *Cisco 7304 PCI Port Adapter Carrier Card Installation and Configuration Guide*.
- Cisco 7401ASR router:
  - For an online directory to quickly access documents for the Cisco 7401ASR router, refer to the *Cisco 7401ASR Router Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps354/products_documentation_roadmap09186a00801c0fd5.html
  - For hardware installation and maintenance information, refer to the *Cisco 7401ASR Installation and Configuration Guide* or the *Cisco 7401ASR Router Quick Start Guide.*

- Cisco 7500 series routers:
  - For an online directory to quickly access documents for the Cisco 7500 series routers, refer to the *Cisco 7500 Series Routers Documentation Roadmap* at the following URL:

    http://www.cisco.com/en/US/products/hw/routers/ps359/products_documentation_roadmap09186a00801c0f9b.html
  - For hardware installation and maintenance information, refer to the following documents:
    - *Cisco 7500 Series Installation and Configuration Guide* or the quick start for your Cisco 7500 series router.
    - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
    - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
    - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- For international agency compliance, safety, and statutory information for WAN interfaces, refer to the following documents. Use the documentation roadmap for your particular router to link to the appropriate documents for your router:
  - *Regulatory Compliance and Safety Information for the Catalyst 5000 Family Switches*
  - *Regulatory Compliance and Safety Information for the Catalyst 6000 Family Switches*
  - *Regulatory Compliance and Safety Information for the Cisco 7000 Series Routers*
  - *Regulatory Compliance and Safety Information for Cisco 7100 Series VPN Routers*
  - *Regulatory Compliance and Safety Information for the Cisco 7200 Series Routers*
  - *Regulatory Compliance and Safety Information for the Cisco uBR7200 Series Universal Broadband Routers*
  - *Regulatory Compliance and Safety Information for the Cisco 7301 Internet Router*
  - *Regulatory Compliance and Safety Information for the Cisco 7304 Internet Router*
  - *Regulatory Compliance and Safety Information for the Cisco 7401ASR Internet Router*
  - *Regulatory Compliance and Safety Information for the Cisco 7500 Series Routers*

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly What's New in Cisco Product Documentation, which also lists all new and revised technical documentation at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

CHAPTER 1

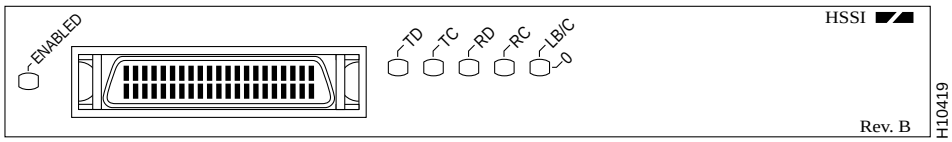
Overview

This chapter describes the PA-H (Rev. B) port adapter and contains the following sections:

Port Adapter Overview

The PA-H single-port HSSI port adapter, shown in Figure 1-1, provides one high-speed serial interface. The interface on the PA-H is considered a data terminal equipment (DTE) device. (Port adapters have a handle attached, but this handle is occasionally not shown in figures in this publication to allow a full view of detail on the port adapter faceplate.)

Figure 1-1 PA-H Port Adapter—Faceplate View



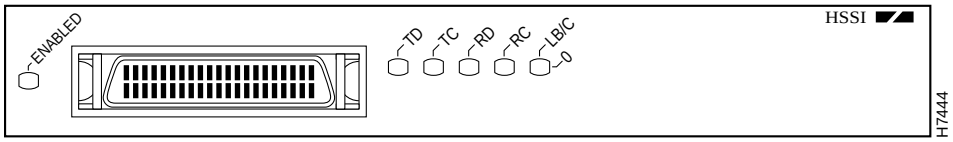
The HSSI network interface resides on a modular port adapter, which provides a direct connection between the high-speed bus in the router or switch and the external networks.

Note The Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, VIP, and Cisco 7304 PCI Port Adapter Carrier Card support online insertion and removal (OIR), but individual port adapters do not. To replace port adapters, you must first remove the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, VIP, or Cisco 7304 PCI Port Adapter Carrier Card from the chassis and then replace port adapters as required.

The Cisco 7100 series routers, Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco 7201 router, Cisco uBR7246 routers, Cisco 7301 router, and Cisco 7401ASR router support the OIR of all port adapter types.

The currently shipping single-port PA-H can be identified by *Rev. B* in the lower right corner of its front-panel label. (See Figure 1-1.) The older PA-H does *not* have Rev. B on its label. (See Figure 1-2)

Figure 1-2 Older PA-H—Pre-Rev. B—Faceplate View



To determine which PA-H model you currently have installed, examine the faceplate or, use the **show diag** command. (For information on using the **show diag** command, see Chapter 4, “Configuring the PA-H.”)

Note You should replace older PA-H port adapters with the newer PA-H Rev. B port adapter. Contact Cisco’s Technical Assistance Center (TAC) for replacement details.

Interface Specifications

The PA-H conforms with the BABT/TC/130 and EIA/TIA-612 and EIA/TIA-613 standards for HSSI. The PA-H provides one interface, which provides a full-duplex, high-speed, synchronous serial interface for transmitting and receiving data at rates of up to 52 megabits per second (Mbps).

The HSSI has been standardized as EIA/TIA 612/613 and provides access to services at T3 (45 Mbps), E3 (34 Mbps), and Synchronous Optical Network (SONET) STS-1 (51.82 Mbps) rates. The actual rate of the interface depends on the external DSU and the type of service to which it is connected.

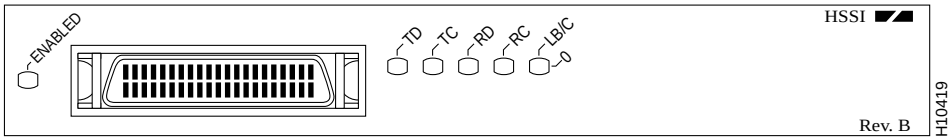
The HSSI port on the PA-H is a female 50-pin SCSI-II-type receptacle. You must use the HSSI interface cable from Cisco Systems to connect the interface to an external DSU. See the “Cables, Connectors, and Pinouts” section on page 1-4 for descriptions of HSSI cables.

The PA-H supports both 16- and 32-bit cyclic redundancy checks (CRCs). The default is 16-bit CRCs; to enable 32-bit CRCs, use a configuration command. (For a description of the CRC function, see Chapter 4, “Configuring the PA-H.”)

LEDs

The PA-H has one row of five status LEDs (TD, TC, RD, RC, and LB/C) and one ENABLED LED. (See Figure 1-3 and Table 1-1.)

Figure 1-3 PA-H LEDs-Horizontal Orientation



After system initialization, the enabled LED goes on to indicate that the port adapter has been enabled for operation.

The following conditions must be met before the PA-H is enabled:

- The PA-H is correctly connected and receiving power.
- A valid system software image for the PA-H has been downloaded successfully.
- The system recognizes the PA-H or PA-H-equipped VIP or Catalyst RSM/VIP2.

If any of the above conditions are not met, or if the initialization fails for other reasons, the enabled LED does not go on.

Table 1-1 PA-H Port LEDs

LED Label	Color	State	Function
ENABLED	Green	On	Port adapter is enabled for operation.
TD	Green	On	DTE—Transmit data out. DCE—Transmit data in.
TC	Green	On	DTE—Transmit clock in. DCE—Transmit clock in (TXCE).
RD	Green	On	DTE—Receive data in. DCE—Receive data out.
RC	Green	On	DTE—Receive clock in. DCE—Receive clock out.
LB/CD	Green	On	Indicates DTR, DSR, RTS, CTS, or DCD is active.
	Green	Flashing	Indicates RTS, CTS, or DCD is sending and receiving data in half-duplex mode.
	Yellow	On	Indicates local loop or internal loop active.

Cables, Connectors, and Pinouts

Two types of cables are available for use with the PA-H: the HSSI interface cable, which is used to connect your router to an external DSU (and HSSI network), and a null modem cable, which is used to connect two routers back-to-back. Both HSSI cables are available *only* from Cisco Systems and conform to EIA/TIA-612 and EIA/TIA-613 specifications.

HSSI Interface Cable

The HSSI cable (CAB-HSI1) connects the PA-H with the external DSU. The HSSI cable is 10 feet (3.05 meters) long. The maximum HSSI cable length allowed is 50 feet (15.24 meters). Figure 1-4 shows the HSSI cable and the 50-pin connector used at each end of the HSSI cable. For connection instructions, see Chapter 3, "Removing and Installing Port Adapters." Table 1-2 lists the pinouts.

Figure 1-4 HSSI Interface Cable and Connectors

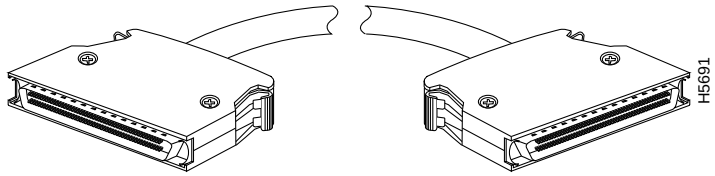


Table 1-2 HSSI Interface Cable Pinouts

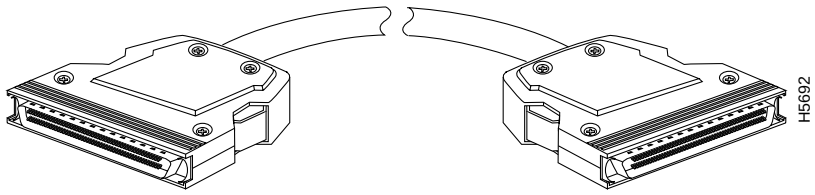
Signal Name	+ Side Pin No.	– Side Pin No.	Direction[1] Router DSU
SG (Signal Ground)	1	26	—
RT (Receive Timing)	2	27	<—
CA (DCE Available)	3	28	<—
RD (Receive Data reserved)	4	29	<—
LC (Loopback circuit C)	5	30	<—
ST (Send Timing)	6	31	<—
SG (Signal Ground)	7	32	—
TA (DTE Available)	8	33	—>
TT (Terminal Timing)	9	34	—>
LA (Loopback circuit A)	10	35	—>
SD (Send Data)	11	36	—>
LB (Loopback circuit B)	12	37	—
SG (Signal Ground)	13	38	—>
5 (Ancillary to DCE)	14–18	39–43	—
SG (Signal Ground)	19	44	<—
5 (Ancillary from DCE)	20–24	45–49	—
SG (Signal Ground)	25	50	—

1. Router is + side (DTE). DSU is – side (DCE).

HSSI Null Modem Cable

The null modem cable (CAB-HNUL) can connect two routers directly back-to-back. The null modem cable is 10 feet (3.05 meters) long. Figure 1-5 shows the null modem cable. The maximum null modem cable length allowed is 50 feet (15.24 meters). The two routers must be in the same location, and can be two Cisco 7000 series routers, two Cisco 7500 series routers, two Cisco 7200 series routers, two Cisco 7200 VXR routers, two Cisco uBR7200 series routers, two Cisco 7201 routers, two Cisco 7301 routers, two Cisco 7401ASR routers, two Cisco 7304 routers, or one of each. Using a null modem connection you can verify the operation of the HSSI, or you can link the routers directly in order to build a larger node.

Figure 1-5 Null Modem Cable and Connectors



The null modem cable uses the same 50-pin connectors as the HSSI cable, but uses the pinouts listed in Table 1-3. For connection instructions, see Chapter 3, "Removing and Installing Port Adapters."

Table 1-3 HSSI Null Modem Cable Pinouts

Signal Name	From Pins	Direction	To Pins	Signal Name
RT (Receive Timing)	2, 27	—>	9, 34	TT (Terminal Timing)
CA (DCE Available)	3, 28	—>	8, 33	TA (DTE Available)
RD (Receive Data)	4, 29	—>	11, 36	SD (Send Data)
LC (Loopback C)	5, 30	—>	10, 35	LA (Loopback A)
ST (Send Timing)	6, 31	—>	6, 31	ST (Send Timing)
TA (DTE Available)	8, 33	—>	3, 28	CA (DCE Available)
TT (Terminal Timing)	9, 34	—>	2, 27	RT (Receive Timing)
LA (Loopback A)	10, 35	—>	5, 30	LC (Loopback C)
SD (Send Data)	11, 36	—>	4, 29	RD (Receive Data)
GND (Ground)	1, 26, 7, 32, 13, 38, 19, 44, 25, 50	—	1, 26, 7, 32, 13, 38, 19, 44, 25, 50	GND (Ground)
Loopback (not connected)	12, 37	—		
			12, 37	Loopback (not connected)
Not used	14–18, 20–24, 39–43, 45–49		14–18, 20–24, 39–43, 45–49	Not used

Caution Although the HSSI connector and the HSSI cable are similar to 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.

Port Adapter Slot Locations on the Supported Platforms

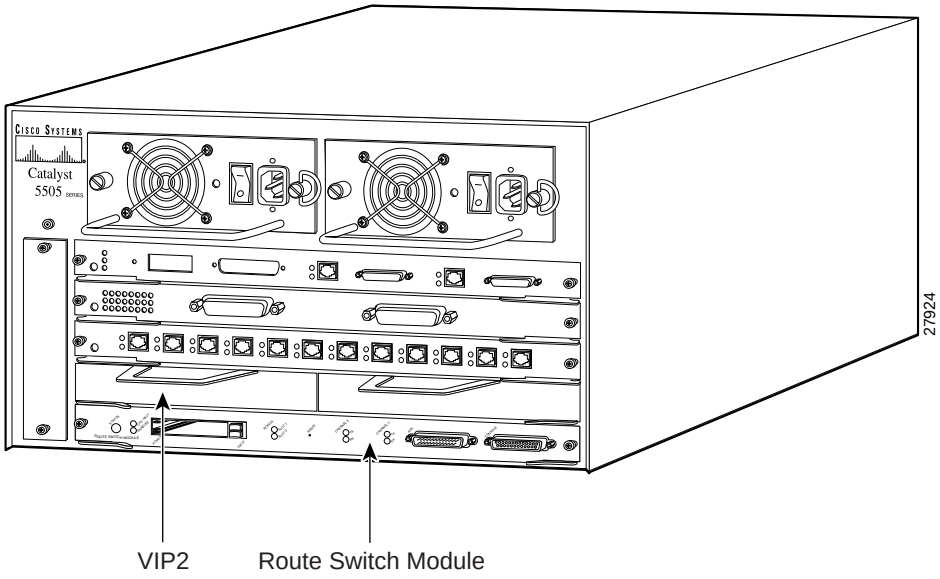
This section discusses the port adapter slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform:

Catalyst RSM/VIP2 Slot Numbering

The Catalyst RSM/VIP2 can be installed in any slot in a Catalyst 5000 family switch except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. Figure 1-6 shows a Catalyst RSM/VIP2 with two port adapters installed.

Note The Catalyst 5500 switch has 13 slots. Slot 1 is reserved for the supervisor engine module. If a redundant supervisor engine module is used, it must go in slot 2; otherwise, slot 2 can be used for other modules. Slot 13 is a dedicated slot, reserved for the ATM Switch Processor (ASP) module. Refer to the *Catalyst 5000 Series Route Switch Module Installation and Configuration Note* for any additional slot restrictions for the Catalyst RSM/VIP2.

Figure 1-6 Catalyst 5000 Family Switch with Port Adapters Installed on Catalyst RSM/VIP2

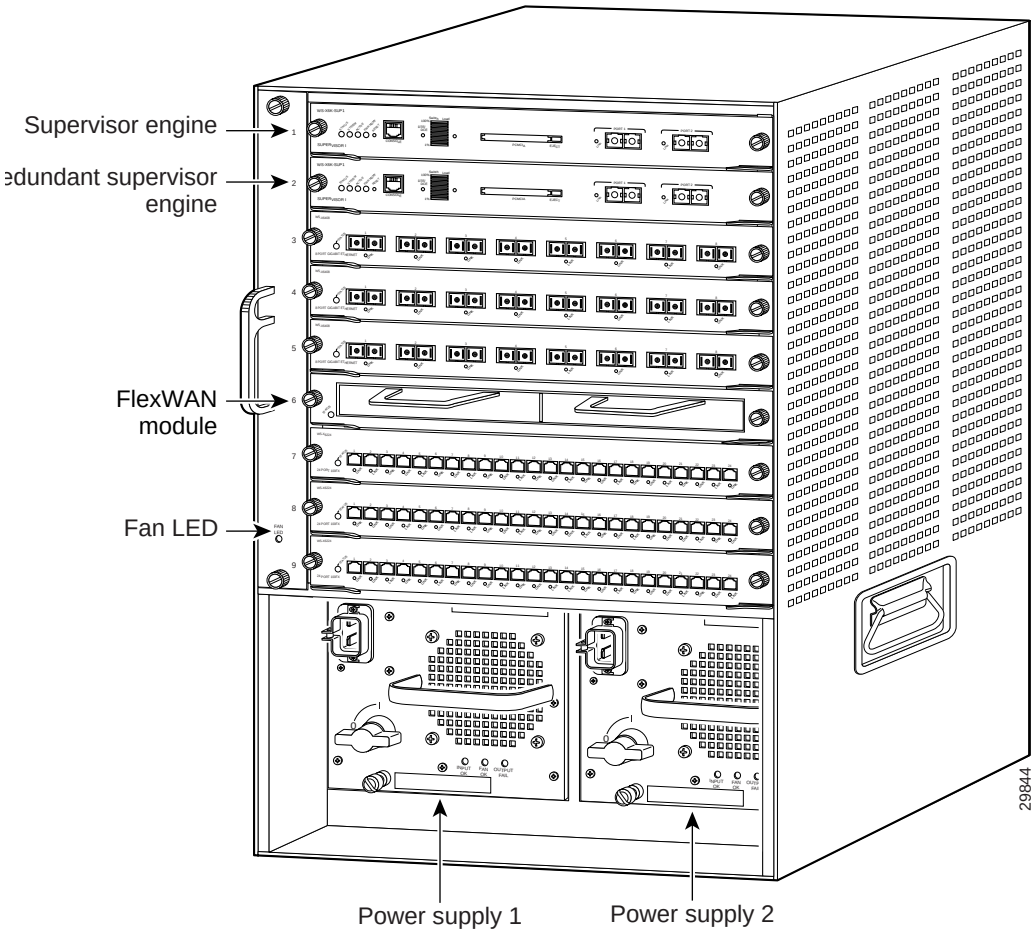


Catalyst 6000 Family FlexWAN Module Slot Numbering

The Catalyst 6000 family FlexWAN module can be installed in any slot in a Catalyst 6000 family switch except slot 1, which is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. Figure 1-7 shows a FlexWAN module with two blank port adapters installed.

Note Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it would go in slot 2; otherwise, slot 2 can be used for other modules.

Figure 1-7 Catalyst 6000 Family Switch with Port Adapters Installed on FlexWAN Module



Cisco 7100 Series Routers Slot Numbering

Port adapters can be installed in port adapter slot 3 in Cisco 7120 series routers, and in port adapter slot 4 in Cisco 7140 series routers. Figure 1-8 shows the slot numbering on a Cisco 7120 series router. Figure 1-9 shows the slot numbering on a Cisco 7140 series router.

Figure 1-8 Port Adapter Slots in the Cisco 7120 Series Router

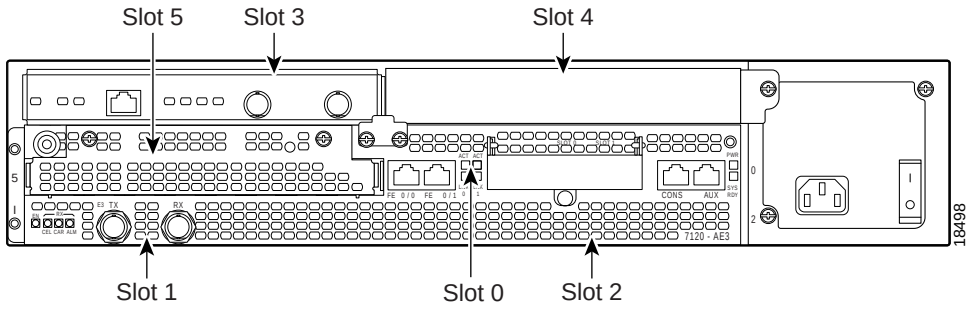
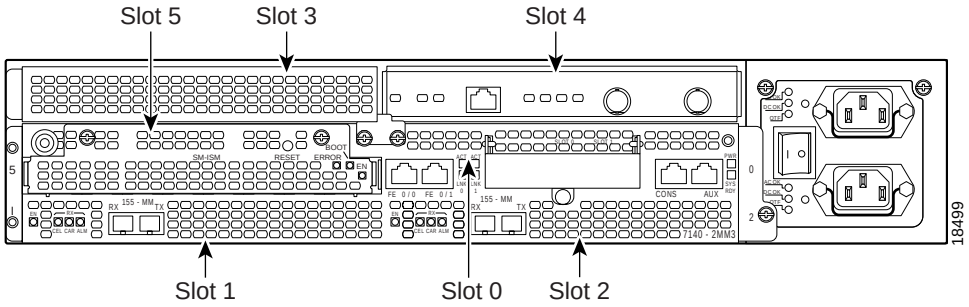


Figure 1-9 Port Adapter Slots in the Cisco 7140 Series Router



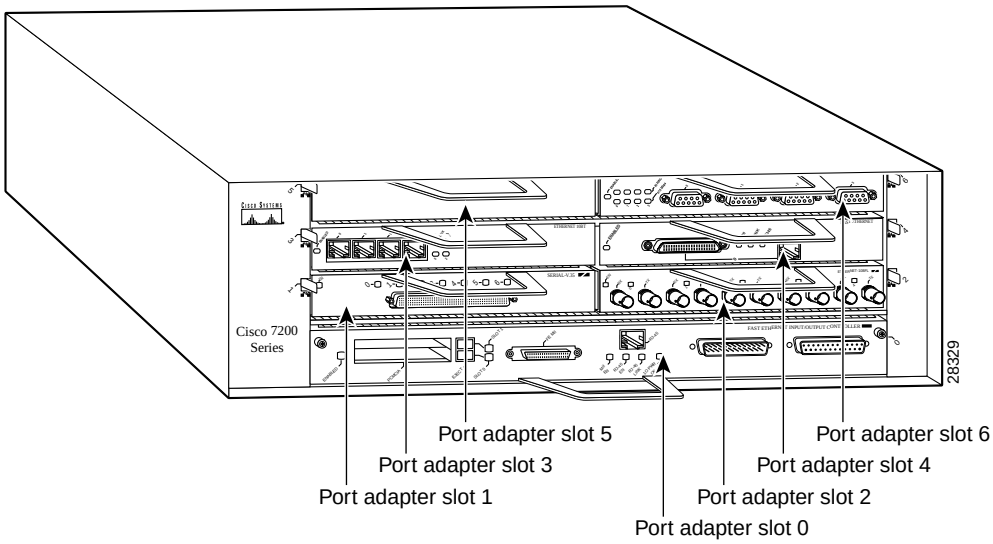
Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering

Cisco 7202 routers have two port adapter slots. The slots are numbered from left to right. You can place a port adapter in either of the slots (slot 1 or slot 2). The Cisco 7202 router is not shown.

Cisco 7204 routers and Cisco 7204VXR routers have four slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 4. You can place a port adapter in any of the slots (slot 1 through slot 4). Slot 0 is always reserved for the I/O controller. The Cisco 7204 router and Cisco 7204VXR are not shown.

Cisco 7206 routers and Cisco 7206VXR routers (including the Cisco 7206 and Cisco 7206VXR routers as router shelves in a Cisco AS5800 Universal Access Server) have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place a port adapter in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller. Figure 1-10 shows the slot numbering on a Cisco 7206 router. The Cisco 7206VXR router is not shown.

Figure 1-10 Port Adapter Slots in the Cisco 7206 Router

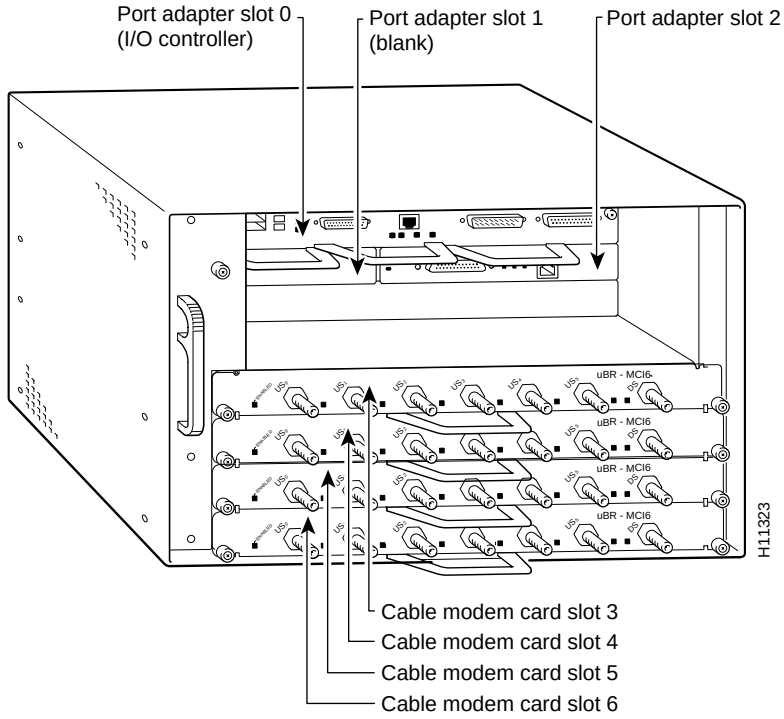


Cisco uBR7200 Series Router Slot Numbering

The Cisco uBR7223 router has one port adapter slot (slot 1). Slot 0 is always reserved for the I/O controller—if present. The Cisco uBR7223 router is not shown.

The Cisco uBR7246 router and Cisco uBR7246VXR router have two port adapter slots (slot1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. Figure 1-11 shows the slot numbering of port adapters on a Cisco uBR7246 router or Cisco uBR7246VXR router.

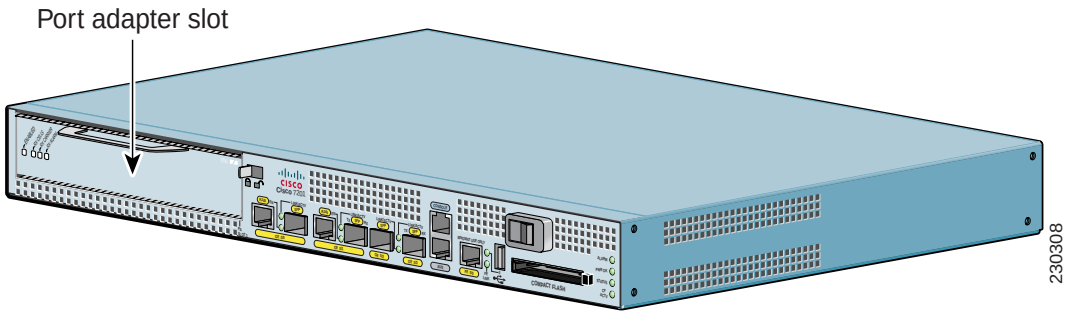
Figure 1-11 Port Adapter Slots in the Cisco uBR7246 and Cisco uBR7246 VXR Routers



Cisco 7201 Router Slot Numbering

Figure 1-12 shows the front view of a Cisco 7201 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7201 router.

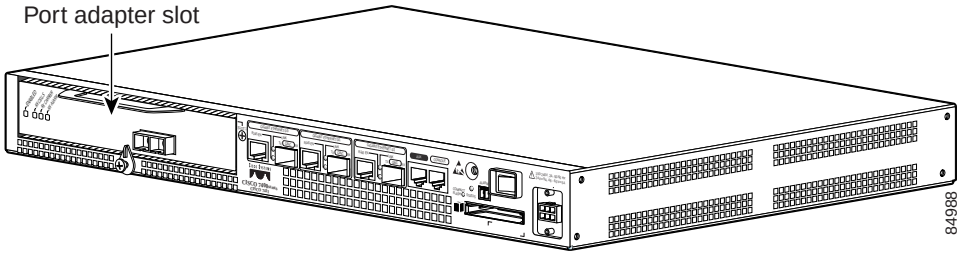
Figure 1-12 Port Adapter Slot in the Cisco 7201 Router



Cisco 7301 Router Slot Numbering

Figure 1-13 shows the front view of a Cisco 7301 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7301 router.

Figure 1-13 Port Adapter Slot in the Cisco 7301 Router



Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

The Cisco 7304 PCI port adapter carrier card installs into Cisco 7304 router module slots 2 through 5. Figure 1-14 shows a Cisco 7304 PCI port adapter carrier card with a port adapter installed. The Cisco 7304 PCI port adapter carrier card accepts one single-width port adapter.

Figure 1-15 shows the module slot numbering on a Cisco 7304 router. The port adapter slot number is the same as the module slot number. Slot 0 and slot 1 are reserved for the NPE module or NSE module.

Figure 1-14 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed

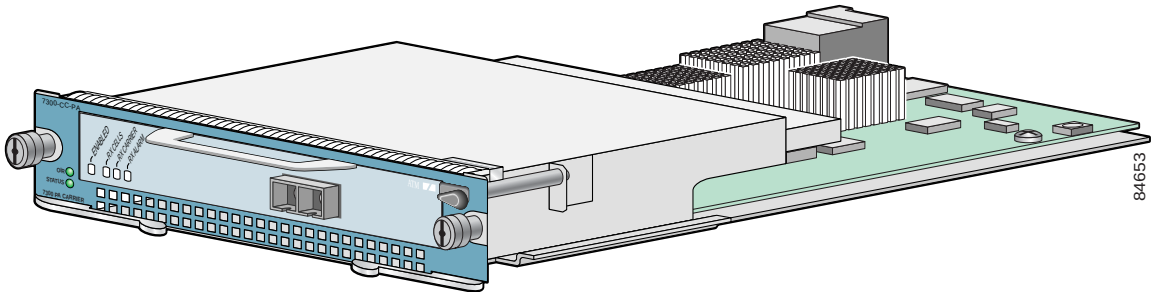
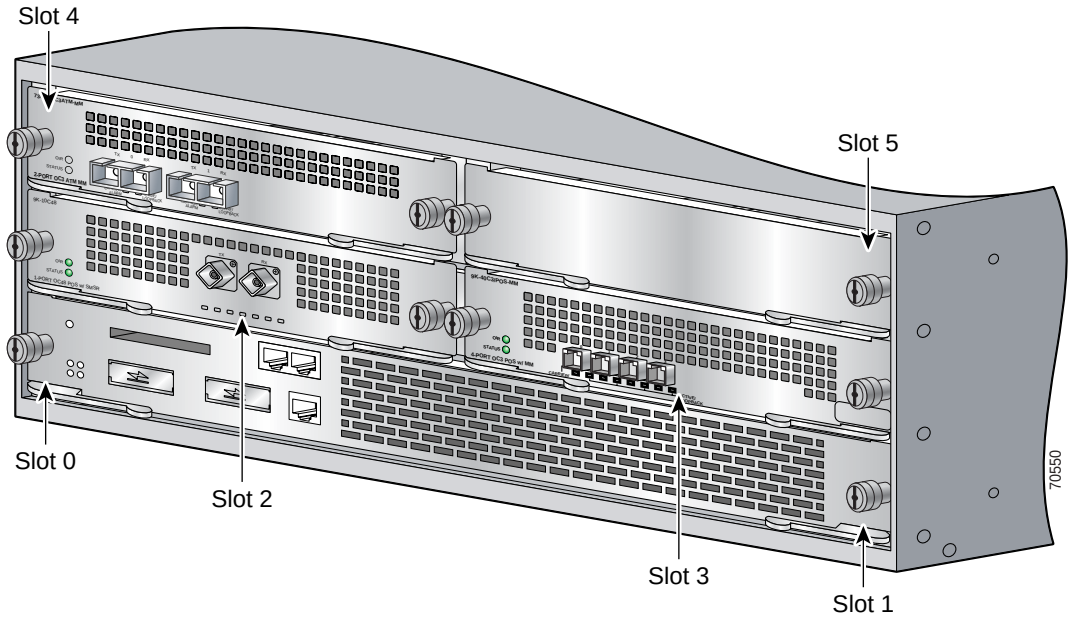


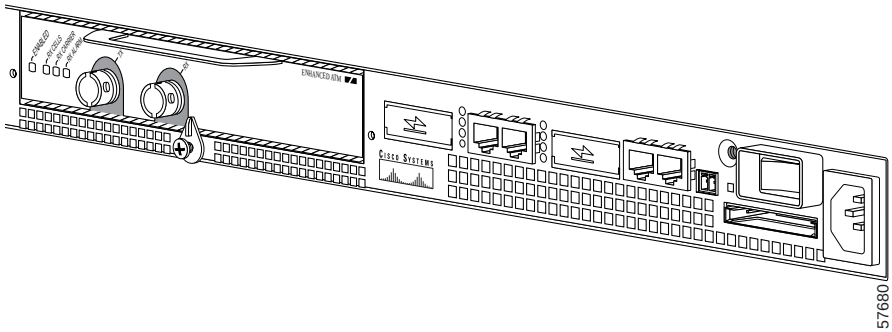
Figure 1-15 Module Slots on the Cisco 7304 Router



Cisco 7401ASR Router Slot Numbering

Figure 1-16 shows the front view of a Cisco 7401ASR router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7401ASR router.

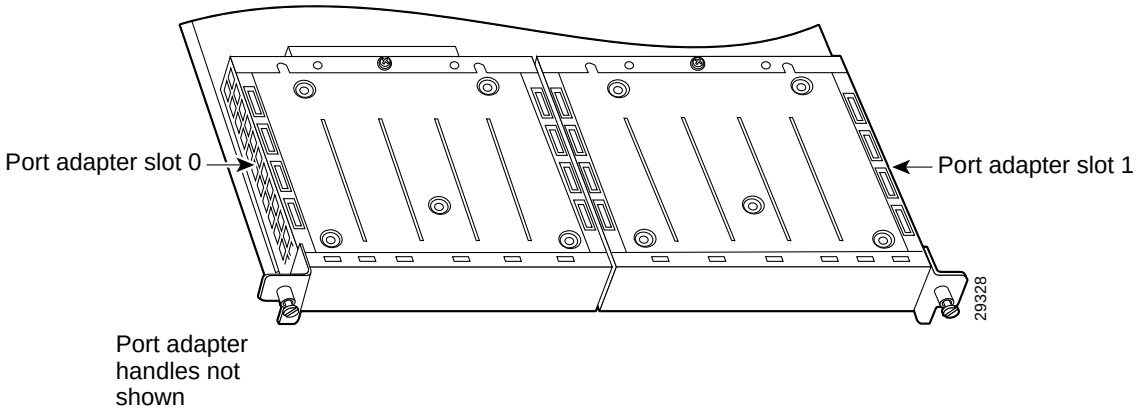
Figure 1-16 Port Adapter Slot in the Cisco 7401ASR Router



Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering

Port adapters are supported on the VIPs (versatile interface processors) used in Cisco 7000 series and Cisco 7500 series routers. In the Cisco 7010 router and Cisco 7505 router, the VIP motherboard is installed horizontally in the VIP slot. In the Cisco 7507 router and Cisco 7513 router, the VIP motherboard is installed vertically in the VIP slot. A port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. The bays are numbered from left to right on the VIP. Figure 1-17 shows the slot numbering on a VIP.

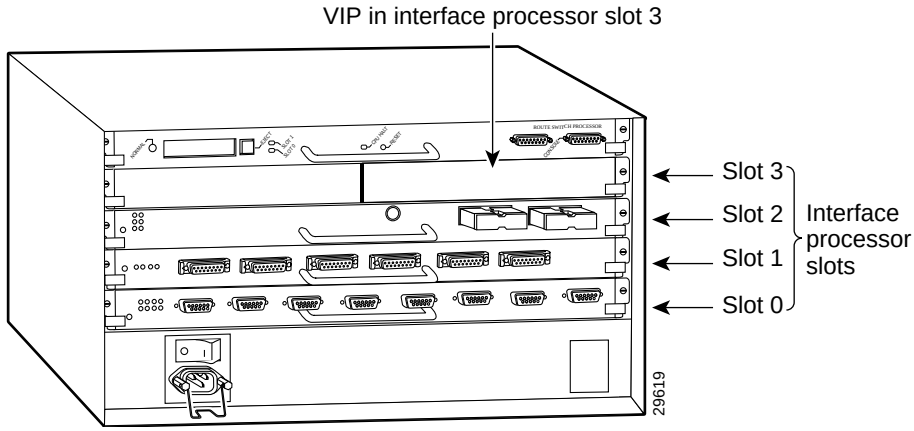
Figure 1-17 VIP Slot Locations



Cisco 7010 routers have three slots for port adapters, and two slots for Route Switch Processors (RSPs). The slots are numbered from bottom to top. You can place a port adapter in any of the VIP interface slots (slot 0 through 2). Slots 3 and 4 are always reserved for RSPs. The Cisco 7010 router is not shown.

Cisco 7505 routers have four slots for port adapters, and one slot for an RSP. The slots are numbered from bottom to top. You can place a port adapter in any of the VIP interface slots (slot 0 through 3). One slot is always reserved for the RSP. Figure 1-18 shows the slot numbering on a Cisco 7505 router.

Figure 1-18 VIP Slots in the Cisco 7505 Router



Cisco 7507 routers have five slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place a port adapter in any of the VIP interface slots (slot 0, 1, 4, 5, or 6). Slots 2 and 3 are always reserved for RSPs. The Cisco 7507 router is not shown.

Cisco 7513 routers have eleven slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place a port adapter in any of the VIP interface slots (slots 0 through 5, or slots 9 through 12). Slots 6 and 7 are always reserved for RSPs. The Cisco 7513 router is not shown.

Identifying Interface Addresses

This section describes how to identify the interface address for the PA-H in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on a PA-H installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-H installed in a VIP or FlexWAN module maintain the same address regardless of whether other interface processors or modules are installed or removed. However, when you move a VIP or FlexWAN module to a different slot, the interface processor or module slot number changes to reflect the new interface processor or module slot.

Note Interface ports are numbered from left to right starting with 0.

The following subsections describe the interface address formats for supported platforms:

Table 1-4 summarizes the interface address formats for the supported routers.

Table 1-4 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Catalyst RSM/VIP2 in Catalyst 5000 family switches	Port-adapter-slot-number/interface-port-number	Port adapter slot— 0 or 1 Interface port—0	`0/0`
Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	Module-slot-number/port-adapter-bay-number/ interface-port-number	Module slot —2[1] through 13 (depends on the number of slots in the switch) Port adapter bay— 0 or 1 Interface port—0	`3/0/0`
Cisco 7120 series router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 3 Interface port—0	`3/0`
Cisco 7140 series router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 4 Interface port—0	`4/0`
Cisco 7200 series routers and Cisco 7200 VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—1 through 6 (depends on the number of slots in the router)[2] Interface port—0	`1/0`
Cisco 7201 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0	`1/0`
Cisco uBR7223 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1[2] Interface port—0	`1/0`
Cisco uBR7246 and Cisco uBR7246 VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot— 1 or 2[2] Interface port—0	`1/0`
Cisco 7301 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0	`1/0`
Cisco 7304 PCI Port Adapter Carrier Card in Cisco 7304 router	Module-slot-number/interface-port-number	Module slot—2 through 5 Interface port—0	`3/0`
Cisco 7401ASR router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 Interface port—0	`1/0`
VIP in Cisco 7000 series routers or Cisco 7500 series routers	Interface-processor-slot-number/port-adapter-slot-number/interface-port-number	Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot— 0 or 1 Interface port—0	`3/1/0`

1. Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it must go in slot 2; otherwise, slot 2 can be used for other modules.
2. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Catalyst RSM/VIP2 Interface Addresses

In Catalyst 5000 family switches, the Catalyst RSM/VIP2 can be installed in any slot except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 in a Catalyst 5000 family switch does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. See Figure 1-6.

The interface address is composed of a two-part number in the format *port-adapter-slot number/interface-port number.* See Table 1-4. For example, if a single-port PA-H is installed in port adapter slot 1 of a Catalyst RSM/VIP2 in a Catalyst 5000 family switch, the interface address would be 1/0.

Catalyst 6000 Family FlexWAN Module Interface Addresses

In Catalyst 6000 family switches, the Catalyst 6000 family FlexWAN module can be installed in module slots 2 through 13 (depending on the number of slots in the router). Slot 1 is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. See Figure 1-7.

The interface address is composed of a three-part number in the format *module-number/port-adapter-bay-number/interface-port-number.* See Table 1-4.

The first number identifies the module slot of the chassis in which the FlexWAN module is installed (slot 2 through slot 3, 6, 9, or 13 depending on the number of slots in the chassis). These module slots are generally numbered from top to bottom, starting with 1.

The second number identifies the bay of the FlexWAN module in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the FlexWAN module.

The third number identifies the physical port number on the port adapter. The PA-H is a single-port port adapter, therefore the port is always 0.

For example, if the FlexWAN module is inserted in module slot 3, then the interface address of the port adapter is 3/0/0 (module slot 3, port adapter bay 0, and interface 0). If the port adapter is in port adapter bay 1 on the FlexWAN module, this same interface address would be numbered 3/1/0. If you remove the FlexWAN module with the port adapter from module slot 3 and install it in module slot 6, the interface address becomes 6/0/0.

Note The FlexWAN module physical port address begins with slot 0, which differs from the conventional Catalyst 6000 family port address, which begins with slot 1.

Cisco 7120 Router and Cisco 7140 Router Interface Addresses

In Cisco 7120 series router, port adapters are installed in port adapter slot 3. See Figure 1-8. In the Cisco 7140 series router, port adapters are installed in port adapter slot 4. See Figure 1-9.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed on a Cisco 7120 router, the interface address would be 3/0. If a single-port PA-H is installed on a Cisco 7140 router, the interface address would be 4/0.

Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200 series routers and Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 2 for the Cisco 7202, slot 4 for the Cisco 7204 and Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. Port adapters can be installed in any available port adapter slot from 1 through 6 (depending on the number of slots in the router). (Slot 0 is reserved for the I/O controller.) See Figure 1-10.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed in slot 1of a Cisco 7200 series router, the interface address would be 1/0. If a single-port PA-H is installed in slot 4, the interface address would be 4/0.

Cisco uBR7200 Series Routers Interface Addresses

In the Cisco uBR7223 router, only one slot accepts port adapters and it is numbered slot 1.

In the Cisco uBR7246 router and Cisco uBR7246VXR router, port adapters can be installed in two port adapter slots (slot1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. See Figure 1-11.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed in slot 1of a Cisco uBR7223 series router, the interface address would be 1/0. If the single-port PA-H is installed in slot 2 of a Cisco uBR7246 or Cisco uBR7246VXR router, the interface address would be 2/0.

Cisco 7201 Router Interface Addresses

In the Cisco 7201 router, only one slot accepts port adapters and it is numbered as slot 1. See Figure 1-12.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed in a Cisco 7201 router, the interface address would be 1/0.

Cisco 7301 Router Interface Addresses

In the Cisco 7301 router, only one slot accepts port adapters and it is numbered as slot 1. See Figure 1-13.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed in a Cisco 7301 router, the interface address would be 1/0.

Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses

In the Cisco 7304 router, port adapters are installed in a Cisco 7304 PCI port adapter carrier card, which installs in Cisco 7304 router module slots 2 through 5. The port adapter slot number is the same as the module slot number. See Figure 1-15.

The interface address is composed of a two-part number in the format *module-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed in the Cisco 7304 PCI port adapter carrier card in Cisco 7304 router module slot 3, the interface address would be 3/0.

Cisco 7401ASR Router Interface Addresses

In the Cisco 7401ASR router, only one slot accepts port adapters and it is numbered slot 1. See Figure 1-16.

The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number.* See Table 1-4. For example, if a single-port PA-H is installed on a Cisco 7401ASR router, the interface address would be 1/0.

Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses

In Cisco 7000 series routers and Cisco 7500 series routers, port adapters are installed on a versatile interface processor (VIP), which installs in interface processor slots 0 through 12 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. See Figure 1-17, and Figure 1-18.

The interface address for the VIP is composed of a three-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number.* See Table 1-4.

The first number identifies the slot in which the VIP is installed (slot 0 through 12, depending on the number of slots in the router).

The second number identifies the bay (port adapter slot) on the VIP in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the VIP.

The third number identifies the physical port number (interface port number) on the port adapter. The port numbers always begin at 0 and are numbered from left to right. The number of additional ports depends on the number of ports on the port adapter. The PA-H is a single-port port adapter, therefore the port is always 0.

For example, if a single-port PA-H is installed in a VIP in interface processor slot 3, port adapter slot 1, the interface address would be 3/1/0. If the PA-H is in port adapter slot 0 on the VIP, the same interface address would be 3/0/0.

Note Although the processor slots in the seven-slot Cisco 7507 and the thirteen-slot Cisco 7513 chassis are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 chassis are horizontally oriented, all Cisco 7500 series routers use the same method for slot and port numbering.

CHAPTER 2

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the PA-H. This chapter contains the following sections:

Required Tools and Equipment

You need the following tools and parts to install a PA-H. If you need additional equipment, contact a service representative for ordering information.

- PA-H
- Catalyst RSM/VIP2 (for installation in Catalyst 5000 family switches). For information about the specific Catalyst RSM/VIP2 models that support the PA-H, see the "Software and Hardware Requirements" section on page 2-2.
- Catalyst 6000 family FlexWAN module (for installation in the Catalyst 6000 family switches)
- VIP (for installation in Cisco 7000 series or Cisco 7500 series chassis only)
- Cisco 7304 PCI Port Adapter Carrier Card (for installation in a Cisco 7304 router)
- HSSI cables appropriate for the PA-H interface: CAB-HSI1 and CAB-HNUL. (These HSSI cables are available *only* from Cisco Systems; they are *not* available from outside commercial cable vendors.)

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

- Number 1 Phillips and a 3/16-inch flat-blade screwdriver (for VIP and Catalyst RSM/VIP2 installation only)
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares

- Antistatic mat
- Antistatic container

Software and Hardware Requirements

Table 2-1 lists the minimum Cisco IOS software release required to use the PA-H in supported router or switch platforms.

Table 2-1 PA-H Software Requirements

Platform	Recommended Minimum Cisco IOS Release
Catalyst 5000 family switches with Catalyst RSM/VIP2[1 2 3]	Cisco IOS Release 11.2(15A)P or later release of Cisco IOS Release 11.2P Cisco IOS Release 11.2(15A)P or later release of Cisco IOS Release 11.2P
• With Catalyst RSM/VIP2-15(=) and Catalyst RSM/VIP2-40(=)	
Catalyst 6000 family switches with Catalyst 6000 family FlexWAN module	
• Catalyst 6000 family MSFC[4]	Cisco IOS Release 12.1(1)EX or later release of Cisco IOS Release 12.1EX
• Supervisor engine software	Catalyst 6000 family supervisor engine software release 5.4(1) or later
Cisco 7100 series routers	
• Cisco 7120 series and Cisco 7140 series	Cisco IOS Release 12.0(5)T or a later release of Cisco IOS Release 12.0T Cisco IOS Release 12.0(4)XE or a later release of Cisco IOS Release 12.0XE
Cisco 7200 series and Cisco 7200 VXR routers	
• Cisco 7204VXR and Cisco 7206VXR	Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0T Cisco IOS Release 12.0(2)XE2 or a later release of Cisco IOS Release 12.0XE Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B
• Cisco 7204 and Cisco 7206	Cisco IOS Release 11.3(2)AA or a later release of Cisco IOS Release 11.3AA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B
• Cisco 7202	Cisco IOS Release 11.1(19)CC1 or a later release of Cisco IOS Release 11.1CC Cisco IOS Release 11.3(4)AA or a later release of Cisco IOS Release 11.3AA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B
• Cisco 7206 router shelf	Cisco IOS Release 11.3(2)AA or later release of Cisco IOS Release 11.3AA Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2B
Cisco uBR7200 series routers	
• Cisco uBR7246, Cisco uBR7246VXR, and Cisco uBR7223	Cisco IOS Release 11.3(7)NA or a later release of Cisco IOS Release 11.3NA Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0T Cisco IOS Release 12.0(7)SC or a later release of Cisco IOS Release 12.0SC Cisco IOS Release 12.0(7)XR2 or a later release of Cisco IOS Release 12.0XR2
Cisco 7201 router	Cisco IOS Release 12.4(4)XD7 or a later release of Cisco IOS Release 12.4XD Cisco IOS Release 12.2(31)SB5 or a later release of Cisco IOS Release 12.2SB
Cisco 7301 router	Cisco IOS Release 12.2(11)YZ or a later release of Cisco IOS Release 12.2(11)YZ
Cisco 7304 router	Cisco IOS Release 12.2(14)SZ or a later release of Cisco IOS Release 12.2SZ
• With Cisco 7304 PCI Port Adapter Carrier Card	

Table 2-1 PA-H Software Requirements

Platform	Recommended Minimum Cisco IOS Release
Cisco 7401ASR router	Cisco IOS Release 12.2(1) DX or a later release of Cisco IOS Release 12.2 DX Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2 B
VIP in the Cisco 7000 series routers and Cisco 7500 series routers[5][6][7][8]	Cisco IOS Release 11.1(12)CA or a later release of Cisco IOS Release 11.1 CA Cisco IOS Release 11.2(9)P or a later release of Cisco IOS Release 11.2 P Cisco IOS Release 11.1(15)CA or a later release of Cisco IOS Release 11.1 CA Cisco IOS Release 11.2(11)P or a later release of Cisco IOS Release 11.2 P Cisco IOS Release 12.0(10)S or a later release of Cisco IOS Release 12.0 S

1. The specific Catalyst RSM/VIP2 model recommended for the PA-H is the VIP2-40(=), which has 2 MB of SRAM and 32 MB of DRAM. The PA-H is also supported by the VIP2-15(=) with 1 MB of SRAM and 16 MB of DRAM, but we do not recommend its use with this model.
2. If you are using the High-Speed Serial Interface (HSSI) single- or dual-port adapter in the Catalyst 5000, 5500, 5505, or 5509 switch, you must install the port adapter on the Catalyst Versatile Interface Processor 2 (VIP2-15 or VIP2-40) Revision 2 (board part number 73-3468-XX, where XX is the version number). Do not use this port adapter in the Catalyst 5000, 5505, or 5509 switch if you are installing it on a Catalyst VIP2 (either VIP2-15 or VIP2-40) module that is not Revision 2. If you fail to comply with this restriction, your system will shut down because of an overload on the power supply.
3. You can have only two HSSI single- or dual-port adapters per chassis installed on a Catalyst VIP2-15 or VIP2-40 Revision 2 module used in the Catalyst 5500 switch.
4. MSFC = Multilayer Switch Feature Card
5. The PA-H can be used in the VIP2 in all Cisco 7500 series routers using a Route Switch Processor (RSP), and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.
6. The specific VIP2 models recommended for the PA-H in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI, are VIP2-40(=), which has 2 MB of SRAM and 32 MB of DRAM, and VIP2-50(=), which has 4 to 8 MB of SRAM and 32 to 128 MB of SDRAM; however, the PA-H is also supported by the VIP2-15(=) and VIP2-20 models, but we do not recommend its use with these VIP2 models.
7. The PA-H can be used in the VIP4 in all Cisco 7500 series routers using the Route Switch Processors (RSPs), and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.
8. The specific VIP4 model recommended for the PA-H in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI, is the VIP4-80(=), which provides 64 or 128 MB of 100-MHz synchronous dynamic random-access memory (SDRAM) as the central processing unit (CPU) memory, and 64 or 128 MB of 100-MHz SDRAM as the packet memory.

Note In the Cisco 7200 series routers, there are specific configuration guidelines that must be observed for high-bandwidth port adapters such as the PA-H Rev. B. For port adapter hardware and memory configuration guidelines for the Cisco 7200 series routers (including a Cisco 7206 as a router shelf in a Cisco AS5800 Universal Access Server), refer to the publication *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* that shipped with your Cisco 7200 series router.

Note Port adapters used with the Cisco 7200 VXR routers require the correct base hardware revision to function. The following error message will occur on bootup if the incorrect hardware revision is used:

```
PA-3-REVNOTSUPPORTED:PA in slot 1 (Mx HSSI-B) requires base h/w revision of (1.17) for this
chassis
```

Use the **show diag** command to display the hardware revision. (See the "Using the show diag Command" section on page 4-25.)

Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether modules within a system are compatible, but it does provide the minimum IOS requirements for individual hardware modules or components.

Note Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Log In** at Cisco.com and go to Support > Tools and Resources. You can also access the tool by pointing your browser directly to http://www.cisco.com/en/US/support/tsd_most_requested_tools.html.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, may harm you. A warning symbol precedes each warning statement.

Warning **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the translated safety warnings that accompanied this device.

Note: SAVE THESE INSTRUCTIONS

Note: This documentation is to be used in conjunction with the specific product installation guide that shipped with the product. Please refer to the Installation Guide, Configuration Guide, or other enclosed additional documentation for further details.

Waarschuwing **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Voor een vertaling van de waarschuwingen die in deze publicatie verschijnen, dient u de vertaalde veiligheidswaarschuwingen te raadplegen die bij dit apparaat worden geleverd.

Opmerking BEWAAR DEZE INSTRUCTIES.

Opmerking Deze documentatie dient gebruikt te worden in combinatie met de installatiehandleiding voor het specifieke product die bij het product wordt geleverd. Raadpleeg de installatiehandleiding, configuratiehandleiding of andere verdere ingesloten documentatie voor meer informatie.

Varoitus **TÄRKEITÄ TURVALLISUUTEEN LIITTYVIÄ OHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä asiakirjassa esitettyjen varoitusten käännökset löydät laitteen mukana toimitetuista ohjeista.

Huomautus SÄILYTÄ NÄMÄ OHJEET

Huomautus Tämä asiakirja on tarkoitettu käytettäväksi yhdessä tuotteen mukana tulleen asennusoppaan kanssa. Katso lisätietoja asennusoppaasta, kokoonpano-oppaasta ja muista mukana toimitetuista asiakirjoista.

Attention **IMPORTANTES INFORMATIONS DE SÉCURITÉ**

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez les consignes de sécurité traduites qui accompagnent cet appareil.

Remarque CONSERVEZ CES INFORMATIONS

Remarque Cette documentation doit être utilisée avec le guide spécifique d'installation du produit qui accompagne ce dernier. Veuillez vous reporter au Guide d'installation, au Guide de configuration, ou à toute autre documentation jointe pour de plus amples renseignements.

Warnung **WICHTIGE SICHERHEITSANWEISUNGEN**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewusst. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise sind im Lieferumfang des Geräts enthalten.

Hinweis BEWAHREN SIE DIESE SICHERHEITSANWEISUNGEN AUF

Hinweis Dieses Handbuch ist zum Gebrauch in Verbindung mit dem Installationshandbuch für Ihr Gerät bestimmt, das dem Gerät beiliegt. Entnehmen Sie bitte alle weiteren Informationen dem Handbuch (Installations- oder Konfigurationshandbuch o. Ä.) für Ihr spezifisches Gerät.

Figyelem! **FONTOS BIZTONSÁGI ELÕÍRÁSOK**

Ez a figyelmezetõ jel veszélyre utal. Sérülésveszélyt rejtõ helyzetben van. Mielõtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplõ figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található.

Megjegyzés ÕRIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Megjegyzés Ezt a dokumentációt a készülékhez mellékelt üzembe helyezési útmutatóval együtt kell használni. További tudnivalók a mellékelt Üzembe helyezési útmutatóban (Installation Guide), Konfigurációs útmutatóban (Configuration Guide) vagy más dokumentumban találhatók.

Avvertenza **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Per le traduzioni delle avvertenze riportate in questo documento, vedere le avvertenze di sicurezza che accompagnano questo dispositivo.

Nota CONSERVARE QUESTE ISTRUZIONI

Nota La presente documentazione va usata congiuntamente alla guida di installazione specifica spedita con il prodotto. Per maggiori informazioni, consultare la Guida all'installazione, la Guida alla configurazione o altra documentazione acclusa.

Advarsel **VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette varselssymbolet betyr fare. Du befinner deg i en situasjon som kan forårsake personskade. Før du utfører arbeid med utstyret, bør du være oppmerksom på farene som er forbundet med elektriske kretssystemer, og du bør være kjent med vanlig praksis for å unngå ulykker. For å se oversettelser av advarslene i denne publikasjonen, se de oversatte sikkerhetsvarslene som følger med denne enheten.

Merk TA VARE PÅ DISSE INSTRUKSJONENE

Merk Denne dokumentasjonen skal brukes i forbindelse med den spesifikke installasjonsveiledningen som fulgte med produktet. Vennligst se installasjonsveiledningen, konfigureringsveiledningen eller annen vedlagt tilleggsdokumentasjon for detaljer.

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. O utilizador encontra-se numa situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha em atenção os perigos envolvidos no manuseamento de circuitos eléctricos e familiarize-se com as práticas habituais de prevenção de acidentes. Para ver traduções dos avisos incluídos nesta publicação, consulte os avisos de segurança traduzidos que acompanham este dispositivo.

Nota GUARDE ESTAS INSTRUÇÕES

Nota Esta documentação destina-se a ser utilizada em conjunto com o manual de instalação incluído com o produto específico. Consulte o manual de instalação, o manual de configuração ou outra documentação adicional inclusa, para obter mais informações.

¡Advertencia! **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Vea las traducciones de las advertencias que acompañan a este dispositivo.

Nota GUARDE ESTAS INSTRUCCIONES

Nota Esta documentación está pensada para ser utilizada con la guía de instalación del producto que lo acompaña. Si necesita más detalles, consulte la Guía de instalación, la Guía de configuración o cualquier documentación adicional adjunta.

Varning! **VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Se översättningarna av de varningsmeddelanden som finns i denna publikation, och se de översatta säkerhetsvarningarna som medföljer denna anordning.

OBS! SPARA DESSA ANVISNINGAR

OBS! Denna dokumentation ska användas i samband med den specifika produktinstallationshandbok som medföljde produkten. Se installationshandboken, konfigurationshandboken eller annan bifogad ytterligare dokumentation för närmare detaljer.

Предупреждение ВАЖНЫЕ СВЕДЕНИЯ ПО БЕЗОПАСНОСТИ

Этот символ предупреждает о наличии опасности. При неправильных действиях возможно получение травм. Перед началом работы с любым оборудованием необходимо ознакомиться с ситуациями, в которых возможно поражение электротоком, и со стандартными действиями для предотвращения несчастных случаев. Переведенный текст предупреждений содержится в соответствующем документе, поставляемом вместе с устройством.

Примечание СОХРАНЯЙТЕ ЭТУ ИНСТРУКЦИЮ
Примечание Эта инструкция должна использоваться вместе с руководством по установке конкретного изделия, входящим в комплект поставки. Дополнительные сведения см. в руководстве по установке, руководстве по настройке и другой документации, поставляемой с изделием.

警告 有关安全的重要说明

这个警告符号指有危险。您所处的环境可能使身体受伤。操作设备前必须意识到电流的危险性，务必熟悉操作标准，以防发生事故。如果需要了解本说明中出现的警告符号的译文，请参阅本装置所附之安全警告译文。

注意 保存这些说明
注意 本文件应与本产品附带的具体安装说明一并阅读。如欲了解详情，请参阅《安装说明》、《配置说明》或所附的其他文件。

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止対策に留意してください。このマニュアルに記載されている警告の各国語版は、装置に付属の「Translated Safety Warnings」を参照してください。

注 これらの注意事項を保管しておいてください。
注 この資料は、製品に付属のインストレーション ガイドと併用してください。詳細は、インストレーション ガイド、コンフィギュレーション ガイド、または添付されているその他のマニュアルを参照してください。

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Примечание СОХРАНЯЙТЕ ЭТУ ИНСТРУКЦИЮ
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警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止対策に留意してください。このマニュアルに記載されている警告の各国語版は、装置に付属の「Translated Safety Warnings」を参照してください。

注 これらの注意事項を保管しておいてください。
注 この資料は、製品に付属のインストレーション ガイドと併用してください。詳細は、インストレーション ガイド、コンフィギュレーション ガイド、または添付されているその他のマニュアルを参照してください。

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- 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.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

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

FCC Class A Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

Note The PA-H has been designed to meet these requirements. Modifications to this product that are not authorized by Cisco Systems, Inc., could void the various approvals and negate your authority to operate the product.

CHAPTER 3

Removing and Installing Port Adapters

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

This chapter contains the following sections:

Handling Port Adapters

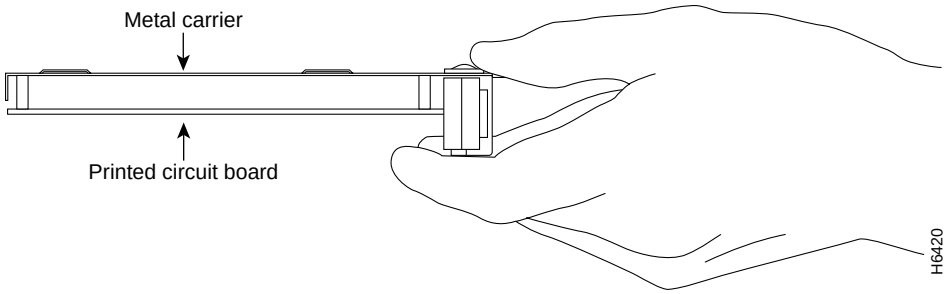
Each port adapter circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.

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.

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-H in the Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series routers, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router.

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

Caution To prevent system problems, do not remove port adapters from the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP or attempt to install other port adapters on the motherboard when the system is operating. To install or replace port adapters, first remove the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP 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 port adapter while traffic is flowing through the ports can cause system disruption. Once the port adapter is inserted, the ports can be brought back up.

Note As you disengage the port adapter from the router or switch, OIR administratively shuts down all active interfaces in the port adapter.

OIR allows you to install and replace port adapters 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 port adapter 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 port adapter in a supported platform, refer to the "Port Adapter Removal and Installation" section on page 3-4.

Each port adapter 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 port adapter. The system assesses the signals it receives and the order in which it receives them to determine if a port adapter 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 port adapter, the longest pins make contact with the port adapter 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 port adapter, 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 port adapter 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 port adapter type is reinserted into a slot, its ports are configured and brought online up to the port count of the originally installed port adapter of that type.

Note Before you begin installation, read Chapter 2, "Preparing for Installation," for a list of tools and equipment 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 illustrations in the "Port Adapter Removal and Installation" section on page 3-4.

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

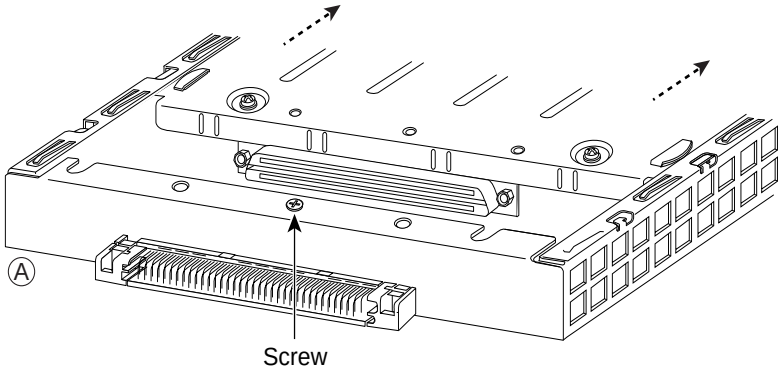
In this section, the illustrations that follow give step-by-step instructions on how to remove and install port adapters in each of the following supported platforms:

Catalyst RSM/VIP2—Removing and Installing a Port Adapter

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.)

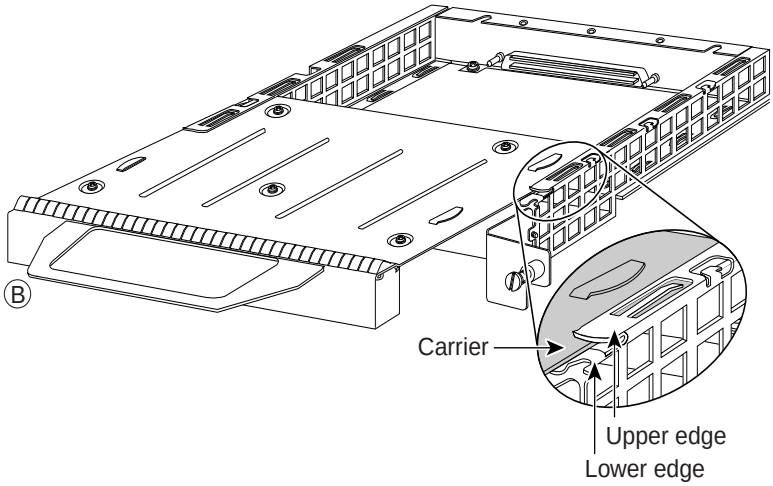


Step 2

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

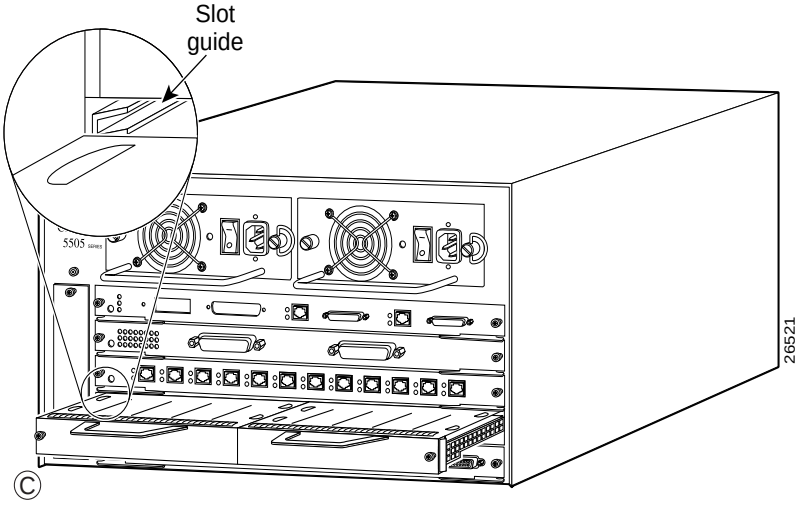
Install the screw in the rear of the port adapter slot. Do not overtighten the screw. (See A.)

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.)

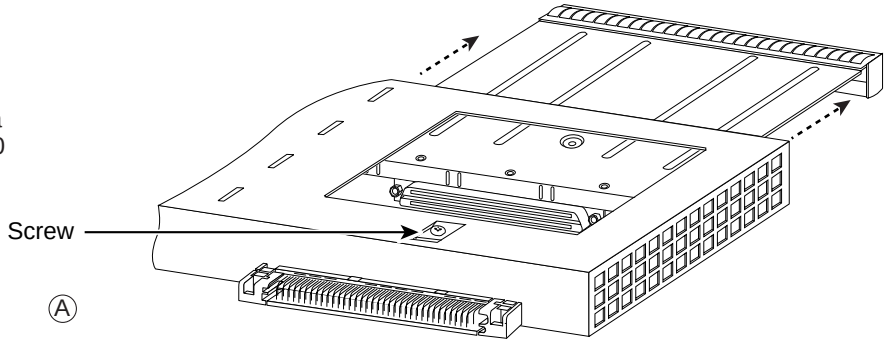


Catalyst 6000 Family FlexWAN Module—Removing and Installing a Port Adapter

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.)



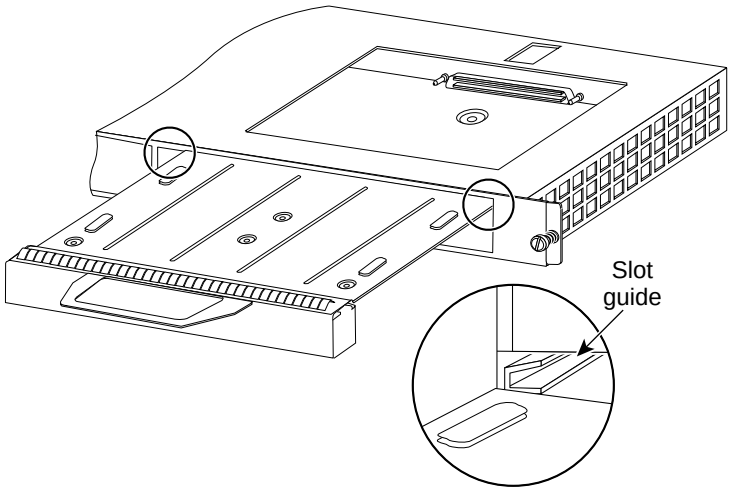
Ⓐ

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

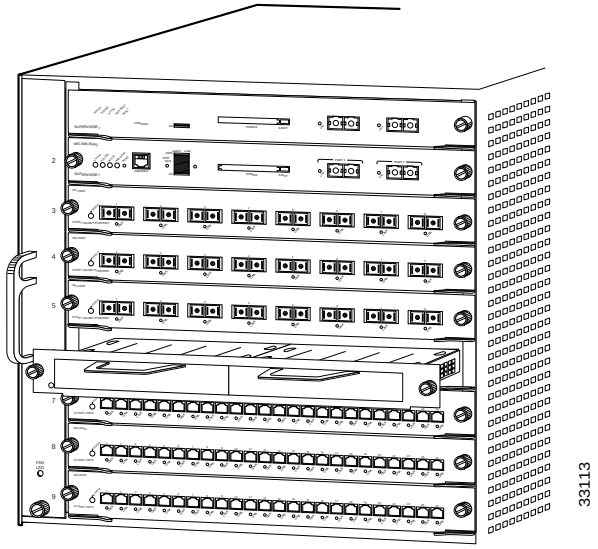
Carefully slide the new port adapter into the port adapter bay until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

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.)

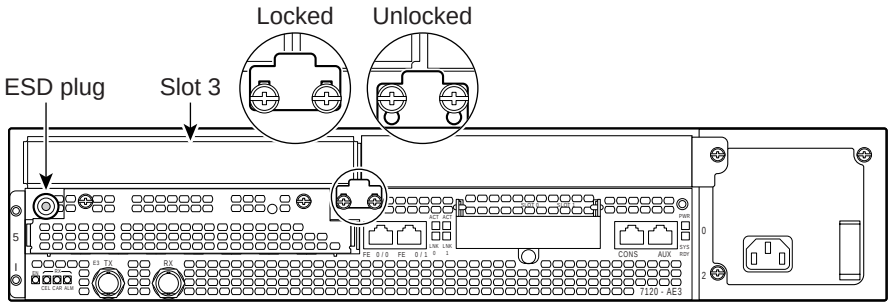


Ⓒ

Cisco 7100 Series Routers—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

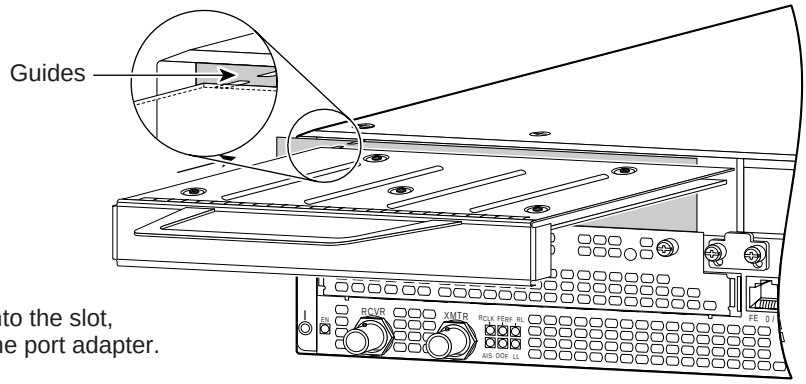
With the port adapter halfway out of the slot, disconnect all cables from the port adapter.

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 Routers and Cisco 7200 VXR Routers—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

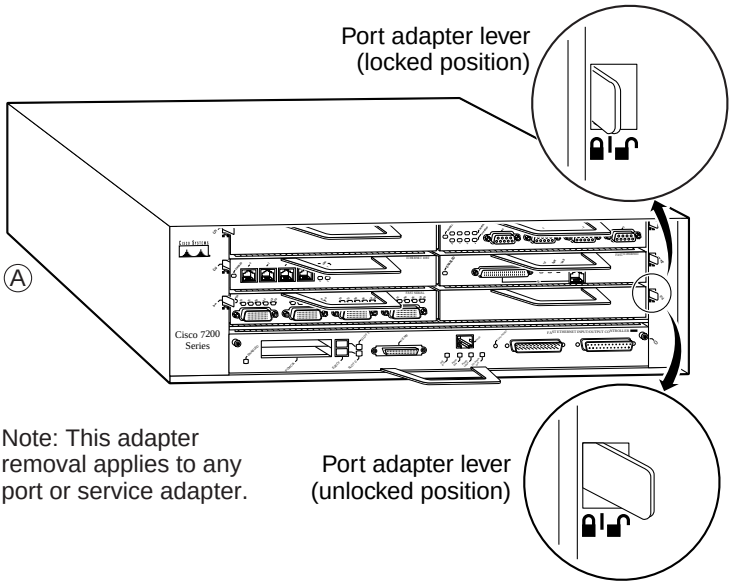
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

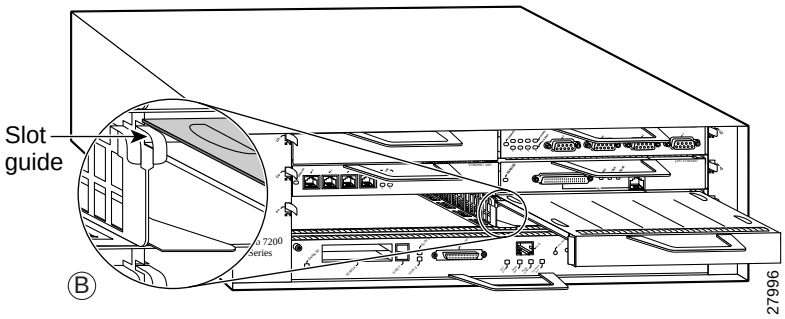
Step 6

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.)

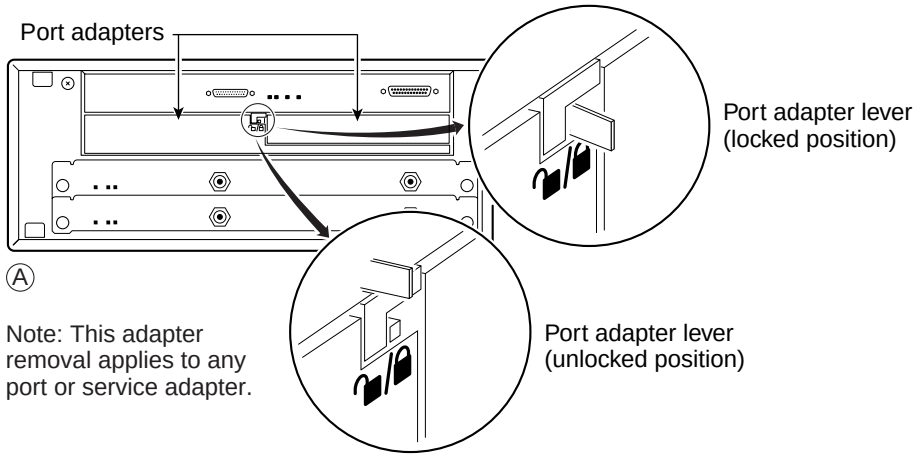




Cisco uBR7200 Series Routers—Removing a Port Adapter

Step 1

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



Note: This adapter removal applies to any port or service adapter.

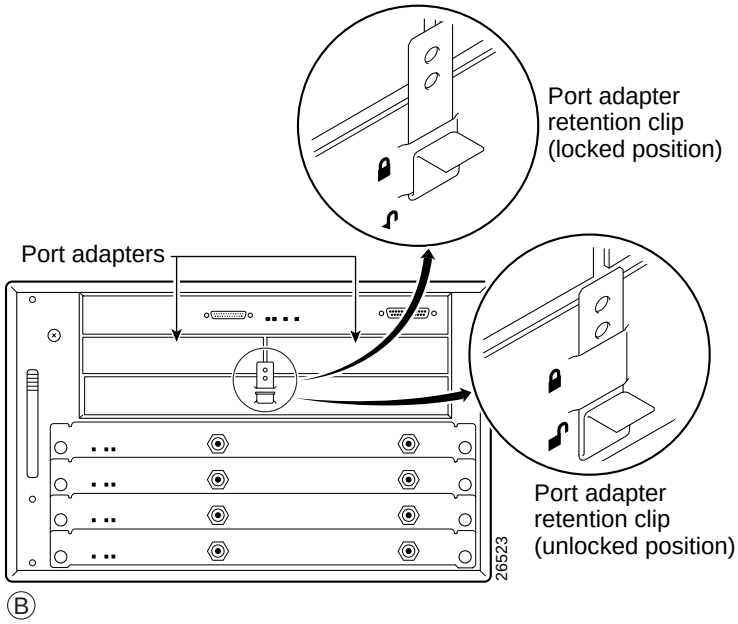
Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

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

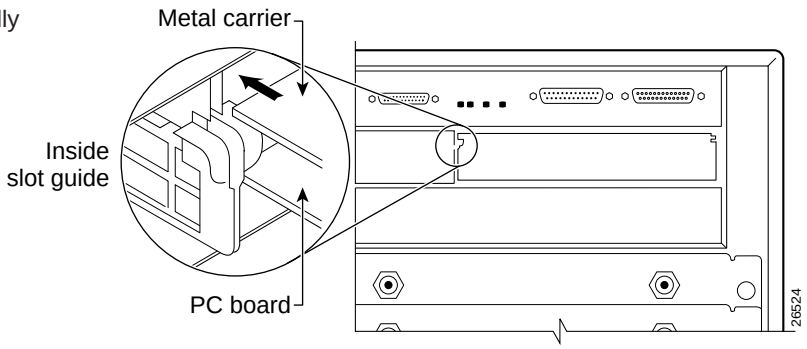
With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.



Cisco uBR7200 Series Routers—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 7201 Router—Removing and Installing a Port Adapter

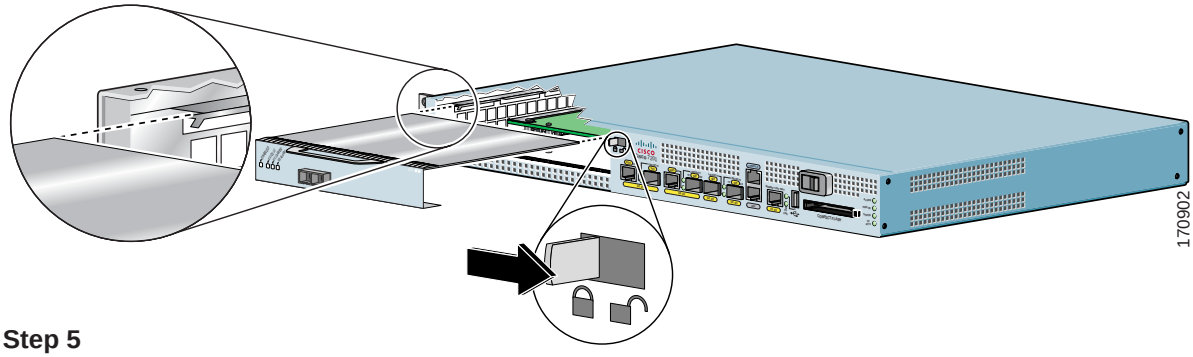
Step 1
Use an ESD wrist strap to ground yourself to the router.

Step 2
To remove the port adapter, place the port adapter lever in the unlocked position. The port adapter lever remains in the unlocked position.

Step 3
Grasp the handle of the port adapter and pull the port adapter 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 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 the chassis slot.

Caution
The port adapter must slide into the slot guides close to 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
To insert the port adapter, carefully align the port adapter carrier in the slot guides. Slide the new port adapter halfway into the chassis.

Step 6
Connect all the 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, lock the port adapter lever.

Cisco 7301 Router—Removing and Installing a Port Adapter

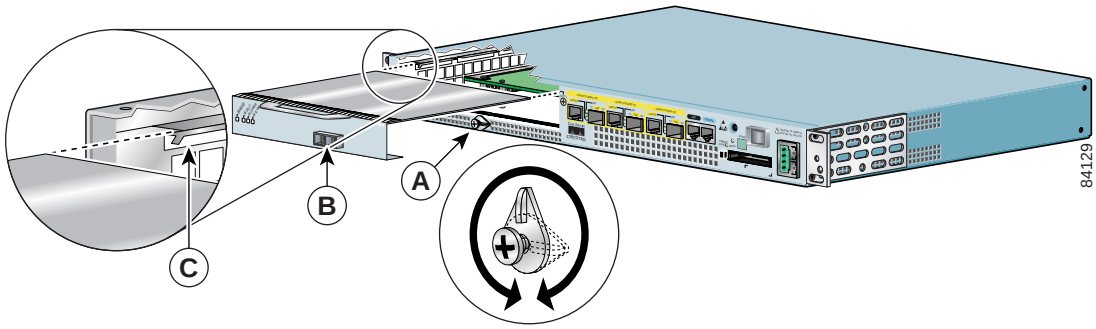
Step 1
Use an ESD wrist strap to ground yourself to the router.

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, diconnect 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).

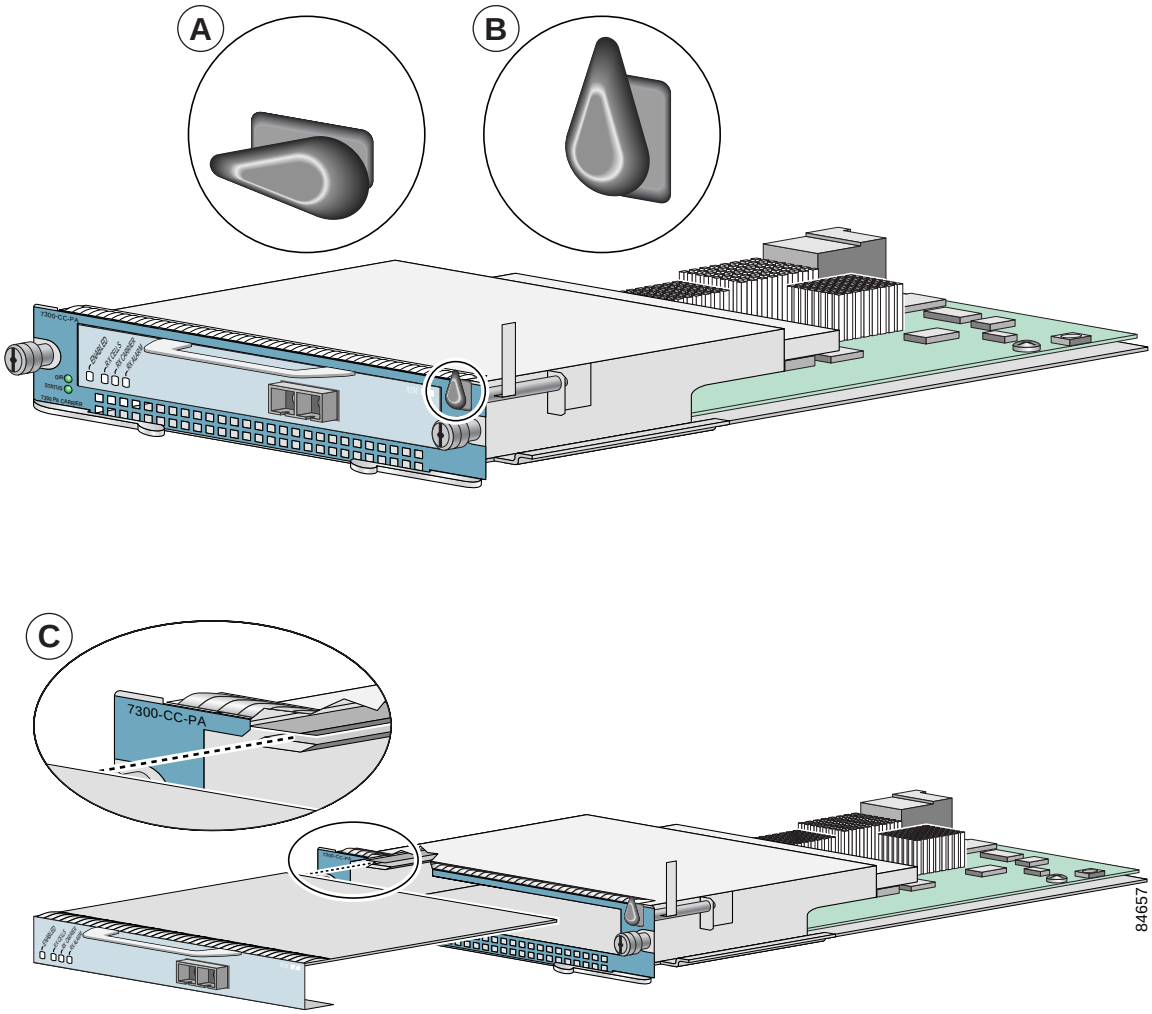
Step 4 To insert the port adapter in the Cisco 7304 PCI Port Adapter Carrier Card, locate the guide rails inside the Cisco 7304 PCI Port Adapter Carrier Card that hold the port adapter in place. They are at the top left and top right of the port adapter slot and are recessed about an inch, as shown in 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.

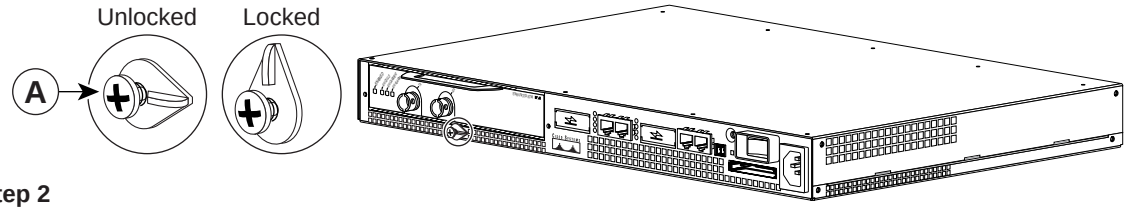
Figure 3-2 illustrates how to remove and install a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card.

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˚.

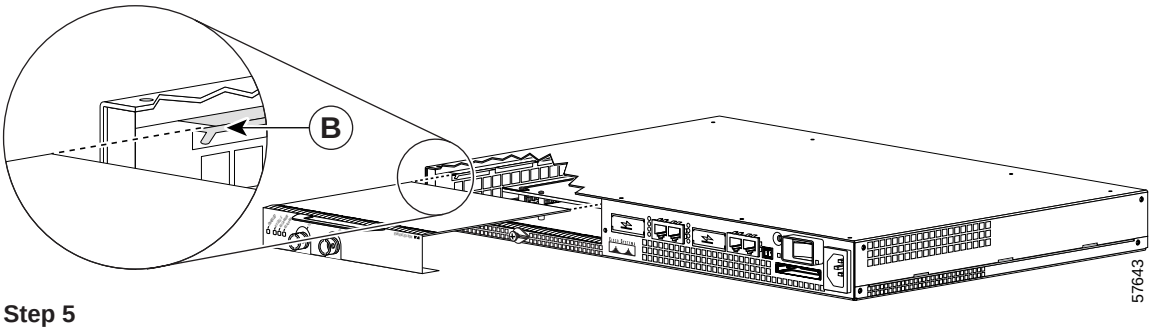


Step 2
Pull the port adapter from the router, about halfway out of its slot. (If you remove a blank port adapter, keep the blank port adapter for use in the router if you should ever remove the port adapter. The port adapter slot must always be filled.)

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

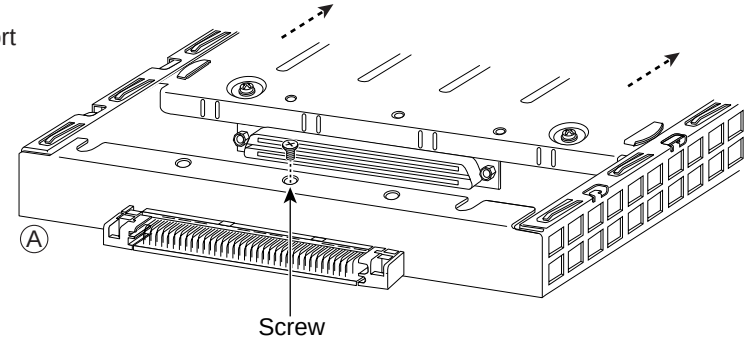
Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

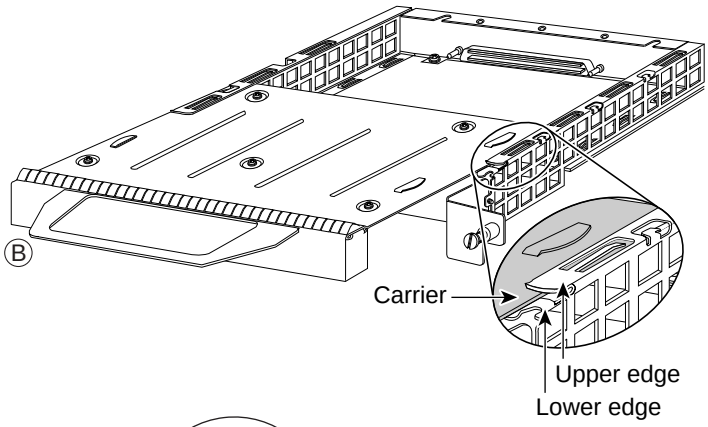
Step 5

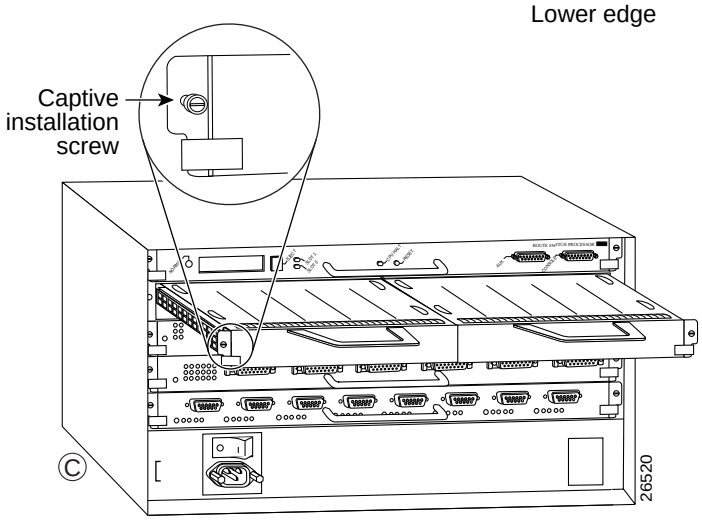
Install the screw in the rear of the port adapter slot on the VIP. Do not overtighten the screw. (See A.)

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-H Interface Cables

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

Connecting HSSI Cables

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

On a single PA-H, you can use one HSSI connection. HSSI cables are available only from Cisco Systems; they are not available from outside commercial cable vendors.

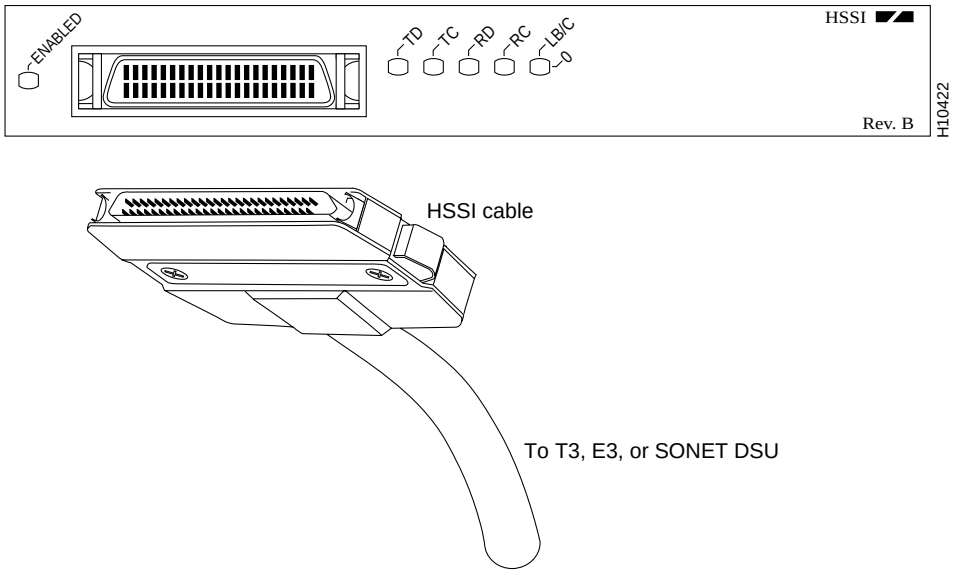
Caution Although the HSSI receptacle and the HSSI cable are similar to the SCSI-II format, they are not identical. The HSSI cable specification is more restrictive than that for the SCSI-II. If a SCSI-II cable is used instead of an HSSI cable, proper operation cannot be guaranteed

Use the following procedure to connect an HSSI cable to a PA-H:

Step 1 Attach the HSSI cable directly to the port on the PA-H. (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 lock whenever an HSSI cable is connected to the receptacle on the PA-H.

Figure 3-3 Connecting an HSSI Cable—Front View



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

This completes the procedure for attaching HSSI cables to the PA-H. If you require a null modem cable for your HSSI connection, see the "Connecting Null Modem Cables" section on page 3-18 that follows; otherwise, proceed to the "Configuring the Interfaces" section on page 4-2.

Connecting Null Modem Cables

This section describes the procedure for connecting null modem cables to the PA-H 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 7500 series routers, two Cisco 7200 series routers, two Cisco uBR7200 series routers, two Cisco 7201 routers, two Cisco 7301 routers, two Cisco 7304 routers, two Cisco 7401ASR routers, or one of each. In this setup, you can verify the operation of the HSSI or link directly 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 1-2.

To connect two routers, attach a null modem cable between the HSSI ports on the routers. 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.

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 interface addresses for the supported platforms, see the "Identifying Interface Addresses" section on page 1-15.

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 Catalyst 5000 family switches with the 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 the Catalyst 6000 FlexWAN module:

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

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

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

- For Cisco 7100 series, Cisco 7200 series, Cisco uBR7200 series routers, Cisco 7201 routers, Cisco 7301 routers, Cisco 7401ASR routers, and the Cisco 7304 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-H 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.

CHAPTER 4

Configuring the PA-H

To continue your PA-H port adapter installation, you must configure the HSSI interface. The instructions that follow apply to all supported platforms. Minor differences between the platforms—with Cisco IOS software commands—are noted.

This chapter contains the following sections:

Using the EXEC Command Interpreter

You modify the configuration of your router through the software command interpreter called the EXEC (also called enable mode). You must enter the privileged level of the EXEC command interpreter with the **enable** command before you can use the **configure** command to configure a new interface or change the existing configuration of an interface. The system prompts you for a password if one has been set.The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>).

At the console terminal, use the following procedure to enter the privileged level:

Step 1 At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password as follows:

```
Router> enable

Password:
```

Step 2 Enter the password (the password is case sensitive). For security purposes, the password is not displayed.

When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

To configure the new interfaces, proceed to the "Configuring the Interfaces" section on page 4-2.

Configuring the Interfaces

After you verify that the new PA-H is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interface. Have the following information available:

- Protocols you plan to route on each new interface
- IP addresses, if you plan to configure the interfaces for IP routing
- Bridging protocols you plan to use

If you installed a new PA-H or if you want to change the configuration of an existing interface, you must enter configuration mode to configure the new interfaces. If you replaced a PA-H that was previously configured, the system recognizes the new interfaces and brings each of them up in their existing configurations.

For a summary of the configuration options available and instructions for configuring interfaces on a PA-H, refer to the appropriate configuration publications listed in the "Related Documentation" section on page ix.

You execute configuration commands from the privileged level of the EXEC command interpreter, which usually requires password access. Contact your system administrator, if necessary, to obtain password access. (See the "Using the EXEC Command Interpreter" section on page 4-1 for an explanation of the privileged level of the EXEC.)

This section contains the following subsections:

Shutting Down an Interface

Before you remove an interface that you will not replace, replace a HSSI cable, or replace port adapters, use the **shutdown** command to shut down (disable) the interfaces to prevent anomalies when you reinstall the new or reconfigured port adapter. When you shut down an interface, it is designated administratively down in the **show** command displays.

Follow these steps to shut down an interface:

Step 1 Enter the privileged level of the EXEC command interpreter (also called enable mode). (See the "Using the EXEC Command Interpreter" section on page 4-1 for instructions.)

Step 2 At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

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

Step 3 Shut down interfaces by entering the **interface serial** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter.

Table 4-1 shows the **shutdown** command syntax for the supported platforms.

Table 4-1 Syntax of the shutdown Command for the Supported Platforms

Platform	Command	Example

Catalyst RSM/VIP2 in Catalyst 5000 family switches	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	**interface**, followed by the *type* (**serial**) and *mod_num/bay/port* (module-slot-number/ port-adapter-bay-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3.
		`Router(config-if)# interface serial 3/0/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7120 series routers	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 3.
		`Router(config-if)# interface serial 3/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7140 series routers	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 4.
		`Router(config-if)# interface serial 4/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7200 series routers and Cisco 7200 VXR routers	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 6.
		`Router(config-if)# interface serial 6/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7201 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco uBR7223 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Table 4-1 Syntax of the shutdown Command for the Supported Platforms (continued)

Platform	Command	Example

Cisco uBR7246 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 2.
		`Router(config-if)# interface serial 2/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7301 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	**interface**, followed by the *type* (**serial**) and *slot/port* (module-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router.
		`Router(config-if)# interface serial 3/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7401ASR router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

VIP in Cisco 7000 series routers or Cisco 7500 series routers	**interface**, followed by the *type* (**serial**) and *slot/port adapter/port* (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number)
	
	shutdown
		The example is for interface 0 on a port adapter in port adapter slot 1 of a VIP installed in interface processor slot 1.
		`Router(config-if)# interface serial 1/1/0`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Note If you need to shut down additional interfaces, enter the **interface serial** command (followed by the interface address of the interface) for each of the interfaces on your port adapter. Use the **no shutdown** command to enable the interface.

Step 4 Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored in NVRAM.

Step 5 Verify that new interfaces are now in the correct state (shut down) using the **show interfaces** command (followed by the interface type and interface address of the interface) to display the specific interface.

Table 4-2 provides examples of the **show interfaces serial** command for supported platforms.

Table 4-2 Examples of the show interfaces Command for the Supported Platforms

Platform	Command	Example

Catalyst RSM/VIP2 in Catalyst 5000 family switches	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router# show interfaces serial 1/0`
		`Serial 1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	**show interfaces serial**, followed by *mod_num/bay/port* (module-slot-number/ port-adapter-bay-number/ interface-port-number)	The example is for interface 0 on a port adapter in port adapter bay 0 of a FlexWAN module installed in slot 3.
		`Router# show interfaces serial 3/0/0`
		`Serial 3/0/0 is adminstratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7120 series router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 3.
		`Router# show interfaces serial 3/0`
		`Serial 3/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7140 series router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 4.
		`Router# show interfaces serial 4/0`
		`Serial 4/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7200 series routers and Cisco 7200 VXR routers	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 6.
		`Router# show interfaces serial 6/0`
		`Serial 6/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Table 4-2 Examples of the show interfaces Command for the Supported Platforms (continued)

Platform	Command	Example

Cisco 7201 router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router# show interfaces serial 1/0`
		`Serial 1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco uBR7223 router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router# show interfaces serial 1/0`
		`Serial 1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco uBR7246 router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 2.
		`Router# show interfaces serial 2/0`
		`Serial 2/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7301 router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router# show interfaces serial 1/0`
		`Serial 1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	**show interfaces serial**, followed by *slot/port* (module-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router.
		`Router# show interfaces serial 3/0`
		`Serial 3/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Table 4-2 Examples of the show interfaces Command for the Supported Platforms (continued)

Platform	Command	Example

Cisco 7401ASR router	**show interfaces serial**, followed by *slot/port* (port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1.
		`Router# show interfaces serial 1/0`
		`Serial 1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

VIP in Cisco 7000 series routers and Cisco 7500 series routers	**show interfaces serial**, followed by *slot/port adapter/port* (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)	The example is for interface 0 on a port adapter in port adapter slot 1 of a VIP in interface processor slot 1.
		`Router# show interfaces serial 1/1/0`
		`Serial 1/1/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Step 6 Re-enable interfaces by doing the following:

a. Repeat Step 3 to re-enable an interface. Substitute the **no shutdown** command for the **shutdown** command.

b. Repeat Step 4 to write the new configuration to memory. Use the **copy running-config startup-config** command.

c. Repeat Step 5 to verify that the interfaces are in the correct state. Use the **show interfaces** command followed by the interface type and interface address of the interface.

For complete descriptions of software configuration commands, refer to the publications listed in the "Related Documentation" section on page ix.

Performing a Basic Interface Configuration

Following are instructions for a basic configuration, which include enabling an interface, specifying IP routing, and setting up external timing on a DCE interface. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for serial interfaces, refer to the appropriate software documentation.

In the following procedure, press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Step 1 Enter configuration mode and specify that the console terminal is the source of the configuration subcommand, as follows:

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

Step 2 Specify the interface to configure by entering the **interface hssi** subcommand, followed by the interface address of the interface you plan to configure.

Table 4-3 gives examples of the **interface hssi** subcommand for the supported platforms.

Table 4-3 Examples of the interface hssi Subcommand for the Supported Platforms

Platform	Command	Example

Catalyst RSM/VIP2 in Catalyst 5000 family switches	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1.
		`Router(config)# interface hssi 1/0`
		`Router(config-if)#`

Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches	**interface hssi**, followed by *mod_num/bay/port* (module-slot-number/ port-adapter-bay-number/ interface-port-number)	The example is for interface 0 on a PA-H in port adapter bay 0 of a FlexWAN module in module slot 3.
		`Router# interface hssi 3/0/0`
		`Router(config-if)#`

Cisco 7120 series router	**interface hssi**, followed by **3***/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 3.
		`Router(config)# interface hssi 3/0`
		`Router(config-if)#`

Cisco 7140 series router	**interface hssi**, followed by **4***/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 4.
		`Router(config)# interface hssi 4/0`
		`Router(config-if)#`

Cisco 7200 series routers and Cisco 7200 VXR routers	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 6.
		`Router(config)# interface hssi 6/0`
		`Router(config-if)#`

Cisco 7201 router	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1.
		`Router(config)# interface hssi 1/0`
		`Router(config-if)#`

Cisco uBR7223 router	**interface hssi**, followed by *slot/port* (port-adapter-slot- number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1.
		`Router(config)# interface hssi 1/0`
		`Router(config-if)#`

Cisco uBR7246 router and Cisco uBR7246 VXR router	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 2.
		`Router(config)# interface hssi 2/0`
		`Router(config-if)#`

Table 4-3 Examples of the interface hssi Subcommand for the Supported Platforms (continued)

Platform	Command	Example

Cisco 7301 router	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1.
		`Router(config)# interface hssi 1/0`
		`Router(config-if)#`

Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	**interface hssi**, followed by *slot/port* (module-slot-number/ interface-port-number)	The example is for the interface on a port adapter in a Cisco 7304 PCI Port Adapter Carrier Card in module slot 3 of a Cisco 7304 router.
		`Router(config-if)# interface hssi 3/0`
		`Router(config-if)#`

Cisco 7401ASR router	**interface hssi**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1.
		`Router(config)# interface hssi 1/0`
		`Router(config-if)#`

VIP in Cisco 7000 series routers and Cisco 7500 series routers	**interface hssi**, followed by *slot/port-adapter/port* (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number)	The example is for the interface on a PA-H in port adapter slot 1 of a VIP in interface processor slot 1.
		`Router(config)# interface hssi 1/1/0`
		`Router(config-if)#`

Step 3 Assign an IP address and subnet mask to the interface (if IP routing is enabled on the system) by using the **ip address** subcommand, as in the following example:

```
Router(config-if)# ip address 10.0.0.0 10.255.255.255
```

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Note If you are configuring a DTE interface, proceed to Step 6. If you are configuring a DCE interface, you need to configure the external clock signal, which is described in Step 5.

The example in Step 5 applies to all systems in which the PA-H is supported.

Step 5 Set the clock rate using the **clock rate** command. (See the next section, "Configuring Timing [Clock] Signals.")

```
Router(config-if)# clock rate 64000
```

Step 6 Re-enable the interfaces using the **no shutdown** command. (See the "Shutting Down an Interface" section on page 4-2.)

Step 7 Configure all additional port adapter interfaces as required.

Step 8 After including all of the configuration subcommands to complete your configuration, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt.

Step 9 Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

This completes the procedure for creating a basic configuration.

Note If you want to configure cyclic redundancy checks (CRCs) for your port adapter, proceed to the next section, "Configuring Cyclic Redundancy Checks." Otherwise, proceed to the "Configuring Half-Duplex and Binary Synchronous Communications in Cisco 7200 Series Routers" section on page 4-15.

Configuring Timing (Clock) Signals

All EIA/TIA-232 interfaces support both DTE and DCE mode, depending on the mode of the compact serial cable attached to the port. To use a port as a DTE interface, you need only connect a DTE compact serial cable to the port. When the system detects the DTE mode cable, it automatically uses the external timing signal. To use a port in DCE mode, you must connect a DCE compact serial cable and set the clock speed with the **clock rate** configuration command. You must also set the clock rate to perform a loopback test. This section describes how to set the clock rate on a DCE port and, if necessary, how to invert the clock to correct a phase shift between the data and clock signals.

Table 4-4 summarizes some of the commands used to configure the clock rate. See the specific sections that follow for further details.

Table 4-4 Clock Rate Configuration Commands

Purpose	Command	Example	Additional Information

Set standard clock rate.	**clock rate**	The example is for a serial interface with a standard clock rate of 72 kbps.
		`Router(config)# interface serial 3/0`
		`Router(config-if)# clock rate 7200`
			"Setting the Clock Rate"

Set nonstandard clock rate.	**clock rate**	The example is for a serial interface with a nonstandard clock rate of 1234567 kbps.
		`Router(config)# interface serial 3/0`
		`Router(config-if)# clock rate 1234567`
			"Setting the Clock Rate"

Remove a clock rate that has been set.	**no clock rate**	The example is for a serial interface and removes a standard clock rate of 72 kbps.
		`Router(config)# interface serial 3/0`
		`Router(config-if)# clock rate 7200`
		`Router(config-if)# no clock rate`
			"Setting the Clock Rate"

Invert the transmit clock signal.	**invert-txc**	The example inverts the transmit clock signal for a serial interface.
		`Router(config)# interface serial 3/0`
		`Router(config-if)# invert-txc`
			"Inverting the Clock Signal"

Table 4-4 Clock Rate Configuration Commands (continued)

Purpose	Command	Example	Additional Information

Change the clock signal back to its original phase.	**no invert-txc**	The example sets the transmit clock signal for a serial interface back to its original phase.
		`Router(config)# interface serial 3/0`
		`Router(config-if)# no invert-txc`
			"Inverting the Clock Signal"

Invert the data signal.	**invert data**	The example inverts the data stream for both transmit and receive for a serial interface:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# invert data`
			"Inverting the Data Signal"

Setting the Clock Rate

The default operation on a PA-H DCE interface is for the DCE device to generate its own clock signal (TxC) and send it to the remote DTE. The remote DTE device returns the clock signal to the DCE (the PA-H). Set the clock rate of an interface using the **clock rate** subcommand, which specifies the clock rate as a bits-per-second value. This subcommand functions in the same way on all supported platforms.

Before you can assign a clock rate, you must use the **interface serial** command (followed by the interface address of the interface) to select the interface to which you want to assign the clock rate value.

In the following example, the clock rate is specified as 72 kbps:

```
Router(config-if)# clock rate 72000
```

The preceding command example applies to all systems in which the PA-H is supported. Use the **no clock rate** command to remove the clock rate.

Following are the standard clock rates:

1200, 2400, 4800, 9600, 19200 38400, 56000, 64000,
72000, 125000 148000, 250000, 500000, 800000, 1000000,
1300000, 2000000, 4000000, 8000000

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt. Then write the new configuration to NVRAM using the **copy running-config startup-config** command.

Note Cisco IOS Release 11.2(7a)P or a later release of 11.2 P, or Release 11.1(10)CA or a later release of 11.1CA loaded on your Cisco 7200 series router or on your Cisco 7000 series router or Cisco 7500 series router with a VIP2-40(=) supports nonstandard clock rates (any value from 1200 to 8000000) on PA-H interfaces.

Cisco IOS Release 12.0(3)T or a later release of 12.0T, or Release 12.0(1)XE or a later release of 12.0XE supports nonstandard clock rates on PA-H interfaces installed in the Cisco 7204VXR router and Cisco 7206VXR router.

Cisco IOS Release 11.3(7)NA or a later release of 11.3 NA, or Release 12.0(3)T or a later release of 12.0T loaded on your Cisco uBR7246 router supports nonstandard clock rates (any value from 1200 to 8000000) on PA-H interfaces.

Nonstandard clock rates are rounded (if necessary) to the nearest clock rate that the hardware can support.

Set a nonstandard clock rate for an interface using the **clock rate** subcommand. Before you can assign a nonstandard clock rate, you must use the **interface serial** command (followed by the interface address of the interface) to select the interface to which you want to assign the nonstandard clock rate value.

In the following example, a nonstandard clock rate of 1234567 bps is specified:

```
Router(config-if)# clock rate 1234567
```

The preceding command example applies to all systems in which the PA-H is supported.
Use the **no clock rate** command to remove the clock rate.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt. Then write the new configuration to NVRAM using the **copy running-config startup-config** command.

The following example shows how to use the **show running-config** command to determine the exact clock rate to which the nonstandard clock rate was rounded:

```
Router# show running-config
Building configuration...
...
!
interface Serial1/0 (interface Serial3/1/0 on a VIP2)

 no ip address
 clockrate 1151526
!
...
```

In the preceding example, only the relevant output from the **show running-config** command is shown; other information is omitted.

Inverting the Clock Signal

Systems that use long cables or cables that are not transmitting the TxC (clock) signal might experience high error rates when operating at higher transmission speeds. If a PA-H DCE port is reporting a high number of error packets, a phase shift might be the problem: inverting the clock might correct this phase shift.

When the EIA/TIA-232 interface is a DTE, the **invert-txc** command inverts the TxC signal the DTE receives from the remote DCE. When the EIA/TIA-232 interface is a DCE, the **invert-txc** command inverts the clock signal to the remote DTE port. Use the **no invert-txc** command to change the clock signal back to its original phase.

Inverting the Data Signal

If you use an EIA/TIA-232 interface on the PA-H port adapter to drive a dedicated T1 line that does not have B8ZS encoding—a method to avoid 15 zeros—you must invert the data stream (both TXD and RXD) either in the connecting CSU/DSU or on the interface. To invert the data stream coming out of the PA-H, use the **invert data** command. By inverting the HDLC data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements.

Note Invert data *only* on the PA-H interface *or* on the CSU/DSU; inverting both cancels out both data inversions.

Configuring NRZI Format

All EIA/TIA-232 interfaces on the PA-H support nonreturn-to-zero (NRZ) and nonreturn-to-zero inverted (NRZI) formats. Both formats use two different voltage levels for transmission. NRZ signals maintain constant voltage levels with no signal transitions—no return to a zero voltage level—during a bit interval and are decoded using absolute values: 0 and 1. NRZI uses the same constant signal levels but interprets the absence of data—a space—at the beginning of a bit interval as a signal transition and the presence of data—a mark—as no signal transition. NRZI uses relational encoding to interpret signals rather than determining absolute values.

NRZ format—the factory default on all interfaces—is more common. NRZI format is commonly used with EIA/TIA-232 connections in IBM environments.

Table 4-5 summarizes NRZI format commands.

Table 4-5 NRZI Format Commands

Purpose	Command	Example

Enable NRZI encoding.	**nrzi-encoding** [**mark**][1]	The example is for a serial interface with NRZI mark encoding specified:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# nrzi-encoding mark`
		The example is for a serial interface with NRZI space encoding specified:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# nrzi-encoding`

Disable NRZI encoding.	**no nrzi-encoding**	The example disables NRZI encoding on a serial interface:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# no nrzi-encoding`

1. *Mark* is an optional argument. When *mark* is used, it means there is no signal transition; there is data (a mark) at the beginning of a bit interval. When *mark* is not used, it means there is a signal transition; there is no data (a space) at the beginning of a bit interval.

Enable NRZI encoding on any interface using the **nrzi-encoding** [**mark**] command, where no argument after the command is interpreted as a signal transition, and **mark** is interpreted as no signal transition. This command functions in the same way on all supported platforms. Before you can enable NRZI encoding, you must use the **interface serial** command (followed by the interface address of the interface) to select the interface on which you want to enable NRZI encoding.

In the example that follows, NRZI encoding with a signal transition—no argument—is specified:

```
Router(config-if)# nrzi-encoding
```

In the example that follows, NRZI encoding with no signal transition—with argument—is specified:

```
Router(config-if)# nrzi-encoding mark
```

The preceding command examples apply to all systems in which the PA-H is supported.
Use the **no nrzi-encoding** command to disable NRZI encoding.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt. Then write the new configuration to NVRAM using the **copy running-config startup-config** command.

For complete command descriptions and instructions, refer to the *Configuration Fundamentals Configuration Guide* on Cisco.com.

Configuring Cyclic Redundancy Checks

This section provides an example of how you can configure cyclic redundancy checks (CRCs) on the PA-H.

The PA-H uses a 16-bit CRC by default; it also supports a 32-bit CRC. CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The sender of a data frame divides the bits in the frame message by a predetermined number to calculate a remainder or *frame check sequence* (FCS). Before it sends the frame, the sender appends the FCS value to the message so that the frame contents are exactly divisible by the predetermined number. The receiver divides the frame contents by the same predetermined number that the sender used to calculate the FCS. If the result is not 0, the receiver assumes that a transmission error occurred.

To enable 32-bit CRC on an interface, enter configuration mode and specify the slot and port address of the interface using the **interface hssi** subcommand, and then enter the **crc32** command. Enter **Ctrl-Z** to exit from configuration mode.

Note The syntax for the **interface hssi** subcommand is given in Table 4-3 for all supported platforms.

In the example that follows, the interface on a PA-H on a VIP installed in interface processor slot 1 of a Cisco 7000 series router or Cisco 7500 series router is configured for 32-bit CRC:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)# interface hssi 1/0/0
Router(config-if)# crc32
Ctrl-z
```

To disable CRC-32 and return to the default CRC-16 setting, specify the slot and port address and use the **no crc32** command.

Note When enabling a 32-bit CRC on an interface, ensure that the remote device is also configured for a 32-bit CRC. Both the sender and the receiver must use the same CRC setting.

To check the interface configuration using **show** commands, proceed to the section "Configuring Half-Duplex and Binary Synchronous Communications in Cisco 7200 Series Routers." (For additional configuration options and instructions for configuring the PA-H, refer to the appropriate configuration publications listed in the "Related Documentation" section on page ix.)

Configuring Half-Duplex and Binary Synchronous Communications in Cisco 7200 Series Routers

This section explains how to configure EIA/TIA-232 interfaces for half-duplex and Bisync operation in Cisco 7200 series routers, including Cisco 7200 VXR routers and the Cisco 7201 router.

Note Cisco IOS Release 11.2(7a)P or a later release of 11.2P supports half-duplex and Bisync operation on the PA-H in Cisco 7200 series routers.

Cisco IOS Release 11.1(19)CC1 or a later release of 11.1CC, or Release 11.3(4)AA or a later release of 11.3AA supports half-duplex and Bisync operation on the PA-H installed in Cisco 7202 routers.

Cisco IOS Release 12.0(3)T or a later release of 12.0T, or Release 12.0(2)XE or a later release of 12.0XE supports half-duplex and Bisync operation on the PA-H in the Cisco 7204VXR router and Cisco 7206VXR router.

The Catalyst RSM/VIP2, Cisco 7100 series routers, Cisco uBR7246 routers, and the VIP2 do *not* support half-duplex and Bisync operation on the PA-H.

Use the **half-duplex** command to configure EIA/TIA-232 interfaces for half-duplex mode; full-duplex mode is the default for low-speed serial interfaces. Serial DCE interfaces in half-duplex mode can be configured for controlled-carrier mode or constant-carrier mode; constant-carrier mode is the default.

Controlled-carrier mode sets the EIA/TIA-232 interface to deactivate Data Carrier Detect (DCD) until a transmission is sent to the interface. After a transmission is received, DCD is activated and the interface waits a user-configured amount of time and then transmits the data. After the transmission, the interface waits a user-configured amount of time and then deactivates DCD. Constant-carrier mode activates DCD at all times.

Use the **half-duplex controlled-carrier** command to configure an EIA/TIA-232 interface for controlled-carrier mode. Use the **no half-duplex controlled-carrier** command to return the interface to constant-carrier mode.

Follow these steps to configure controlled-carrier mode on an EIA/TIA-232 interface:

Step 1 Enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

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

Step 2 Specify the interface to configure for controlled-carrier mode using the **interface serial** subcommand (followed by the interface address of the interface) and then enter the **half-duplex controlled-carrier** subcommand.

The following example is for the first interface of the port adapter in port adapter slot 1:

```
Router(config)# interface serial 1/0
Router(config-if)# half-duplex controlled-carrier
```

Step 3 Specify the length of the timer delay the interface uses when it is configured for controlled-carrier mode by using the following command:

```
Router(config-if)# half-duplex timer {cts-delay value | cts-drop-timeout value |
dcd-drop-delay value | dcd-txstart-delay value | rts-drop-delay value | rts-timeout value
| transmit-delay value}
```

where *value* is the length of the timer delay in milliseconds.

The following example specifies a Data Carrier Detect (DCD) drop delay of 100 milliseconds on the first interface of a port adapter in port adapter slot 1:

```
Router(config)# interface serial 1/0
Router(config-if)# half-duplex timer dcd-drop-delay 100 ms
```

Table 4-6 lists the default delay settings and the *value* argument for each timer you can use with the **half-duplex timer** command.

Table 4-6 Half-Duplex Timer Default Delay Settings

Timer	Command Syntax	Default Settings[1]
CTS delay[2]	**half-duplex timer cts-delay**	0
CTS drop timeout	**half-duplex timer cts-drop-timeout**	250
DCD drop delay[3]	**half-duplex timer dcd-drop-delay**	100
DCD transmission start delay	**half-duplex timer dcd-txstart-delay**	100
RTS drop delay[4]	**half-duplex timer rts-drop-delay**	3
RTS timeout	**half-duplex timer rts-timeout**	3
Transmit delay	**half-duplex transmit-delay**	0

1. In milliseconds (ms).
2. Clear To Send (CTS).
3. Data Carrier Detect (DCD).
4. Request To Send (RTS).

Step 4 Complete the configuration by pressing **Ctrl-Z**—hold down the **Control** key while you press **Z**—or entering **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt.

Step 5 Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

This completes the procedure for configuring controlled-carrier mode on an EIA/TIA-232 interface. For additional information on configuring half-duplex operation on low-speed serial interfaces, refer to the chapter “Configuring Interfaces” in the *Configuration Fundamentals Configuration Guide* on Cisco.com.

Note To configure EIA/TIA-232 interfaces for Binary Synchronous (Bisync) operation in Cisco 7200 routers, refer to the “Block Serial Tunneling (BSTUN)” section of the “Configuring Serial Tunnel (STUN) and Block Serial Tunnel (BSTUN)” chapter of the *Bridging and IBM Networking Configuration Guide* on Cisco.com.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** command to check connectivity.

This section includes the following subsections:

Using show Commands to Verify the New Interface Status

Table 4-7 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-H appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the "Related Documentation" section on page ix.

Note The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Table 4-7 Using show commands

Command	Function	Example
show version or **show hardware**	Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images	`Router# show version`
show controllers	Displays all the current interface processors and their interfaces	`Router# show controllers`
show diag *slot* **Note** The *slot* argument is not required with Catalyst 5000 family switches.	Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot	`Router# show diag 2`
show interfaces hssi 0 or **1**/*interface-port-number*	Displays status information about the interface on a PA-H in a Catalyst RSM/VIP2	`Router# show interfaces hssi 1/0`
show interfaces hssi *slot-number*/*port-adapter-slot-number*/*interface-port-number*	Displays status information about the interface on a PA-H in a Catalyst 6000 family FlexWAN module	`Router# show interfaces hssi 7/0/0`
show interfaces hssi 3/*interface-port-number*	Displays status information about the interface on a PA-H in a Cisco 7120 series router	`Router# show interfaces hssi 3/1`

Table 4-7 Using show commands (continued)

Command	Function	Example
show interfaces hssi **4**/*interface-port-number*	Displays status information about the interface on a PA-H in a Cisco 7140 series router	`Router# show interfaces hssi 4/1`
show interfaces hssi *port-adapter-slot-number/ interface-port-number*	Displays status information about the interface on a PA-H in a Cisco 7200 series router, Cisco 7200 VXR router, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router	`Router# show interfaces hssi 1/0`
show interfaces hssi **1**/*interface-port-number*	Displays status information about the interface on a PA-H in a Cisco uBR7223 router	`Router# show interfaces hssi 1/1`
show interfaces hssi 1 or **2**/ *interface-port-number*	Displays status information about the interface on a PA-H in a Cisco uBR7246 or Cisco uBR7246 VXR router	`Router# show interfaces hssi 2/0`
show interfaces hssi 2 or **3** or **4** or **5**/ *interface-port-number*	Displays status information about the interface on a PA-H on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	`Router# show interfaces hssi 3/0`
show interfaces hssi *interface-processor-slot-number/port-adapter-slot-number/ interface-port-number*	Displays status information about the interface on a PA-H on a VIP in a Cisco 7000 series router or Cisco 7500 series router	`Router# show interfaces hssi 3/1/0`
show protocols	Displays protocols configured for the entire system and for specific interfaces	`Router# show protocols`
show running-config	Displays the running configuration file	`Router# show running-config`
show startup-config	Displays the configuration stored in NVRAM	`Router# show startup-config`

If an interface is shut down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the interface is properly connected and terminated. If you still have problems bringing up the interface, contact a service representative for assistance. This section includes the following subsections:

- Using the show version or show hardware Commands, page 4-20
- Using the show diag Command, page 4-25
- Using the show interfaces Command, page 4-29

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command" section on page 4-33 when you have finished using the **show** commands.

Using the show version or show hardware Commands

Display the configuration of the system hardware, the number of each interface type installed, the Cisco IOS software version, the names and sources of configuration files, and the boot images, using the **show version** (or **show hardware**) command.

Note The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following sections provide platform-specific output examples using the **show version** command:

- Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command, page 4-20
- Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show version Command, page 4-21
- Cisco 7100 Series Routers—Example Output of the show version Command, page 4-22
- Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command, page 4-22
- Cisco 7201 Router—Example Output of the show version Command, page 4-23
- Cisco 7401ASR Router—Example Output of the show version Command, page 4-24
- VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show version Command, page 4-24

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command

Caution If you are using the PA-H in the Catalyst 5000, 5500, 5505, or 5509 switch, you must install the port adapter on the Catalyst RSM/VIP2-15 or -40 Revision 2 (Part Number 73-3468-XX, where XX is the version number). Do not use the PA-H in the Catalyst 5000, 5505, or 5509 switch if you are installing it on a Catalyst RSM/VIP2-15 or -40 that is *not* Revision 2. If you fail to comply with this restriction, your system will shut down because of an overload of the power supply.

Caution You can only have two PA-H port adapters per chassis when they are installed on a Catalyst RSM/VIP2-15 or -40 module Revision 2 and used in the Catalyst 5500 switch.

Following is an example of the **show version** command from a Catalyst 5000 family switch:

```
Switch# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software (C5RSM-JV-MZ), Released Version 11.2(15)A
Copyright (c) 1986-1995 by cisco Systems, Inc.
Compiled Mon 10-May-99 06:02 by biff
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 5.3(5)
ROM: GS Bootstrap Software (RSP-BOOT-M), Version 11.2(15), RELEASED SOFTWARE

Switch uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "slot0:c5rsm-jv-mz", booted via slot0
```

```
cisco RSP7000 (R4600) processor with 16384K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
Chassis Interface.

(additional display text omitted from this example)

1 VIP2 controllers (1 HSSI).
1 HSSI network interface.

(additional display text omitted from this example)

125K bytes of non-volatile configuration memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
   Configuration register is 0x2
```

Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show version Command

Following is an example of the **show version** command for a Catalyst 6000 Family FlexWAN module:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) MSFC Software (C6MSFC-JSV-M), Experimental Version 12.1(20000209:134547)
[amcrae-cosmos_e_nightly 163]
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 09-Feb-00 07:10 by
Image text-base: 0x60008900, data-base: 0x6140E000

ROM: System Bootstrap, Version 12.0(3)XE, RELEASE SOFTWARE

const-uut uptime is 5 minutes
System returned to ROM by reload
System image file is "bootflash:c6msfc-jsv-mz.Feb9"

cisco Cat6k-MSFC (R5000) processor with 122880K/8192K bytes of memory.
Processor board ID SAD03457061
R5000 CPU at 200Mhz, Implementation 35, Rev 2.1, 512KB L2 Cache
Last reset from power-on
Channelized E1, Version 1.0.
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.

(additional display text omitted from this example)

1 HSSI network interface(s)

(additional display text omitted from this example)

16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x1
```

Cisco 7100 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7100 series router:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) EGR Software (C7100-JS-M), Version 12.0(5)XE, EARLY DEPLOYMENT RELEASE SOFTWARE
(fc1)
TAC:Home:SW:IOS:Specials for info
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Thu 19-Aug-99 23:16 by rnapier
Image text-base:0x60008900, data-base:0x612DA000

ROM:System Bootstrap, Version 12.0(19990324:032255) [100], DEVELOPMENT SOFTWARE
BOOTFLASH:EGR Software (C7100-JS-M), Version 12.0(5)XE, EARLY DEPLOYMENT RELEASE SOFTWARE
(fc1)

7100_reg_UUT uptime is 19 minutes
System returned to ROM by power-on
System image file is "slot0:c7100-js-mz.120-5.XE"

cisco 7140-2FE (EGR) processor with 61440K/69632K bytes of memory.
R7000 CPU at 262Mhz, Implementation 39, Rev 1.0, 256KB L2, 2048KB L3 Cache
Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
2 FastEthernet/IEEE 802.3 interface(s)
1 HSSI network interface(s)
125K bytes of non-volatile configuration memory.

16384K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7200 series router:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.3(2)AA
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Mon 10-May-99 06:02 by biff
Image text-base: 0x60010890, data-base: 0x605F0000

ROM: System Bootstrap, Version 11.3(2), RELEASED SOFTWARE
ROM: 7200 Software (C7200-J-M), Version 11.3(2)AA, RELEASED SOFTWARE

Router uptime is 23 hours
System restarted by reload
System image file is “biff/c7200-j-mz”, booted via tftp from 10.10.10.254

cisco 7200 (R4700) processor with 22528K/10240K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
```

```
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).

(additional display text omitted from this example)

1 HSSI network interfaces.

(additional display text omitted from this example)

125K bytes of non-volatile configuration memory.

8192K bytes of Flash internal SIMM (Sector size 256K).
   Configuration register is 0x0
```

Cisco 7201 Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7201 router:

```
Router# show version

Cisco IOS Software, 7200 Software (C7200P-ADVENTERPRISEK9-M), Version
12.4(biffDEV.061001), INTERIM SOFTWARE Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Sun 01-Oct-06 23:42 by biff
ROM: System Bootstrap, Version 12.4(4r)XD5, RELEASE SOFTWARE (fc1)
BOOTLDR: Cisco IOS Software, 7200 Software (C7200P-KBOOT-M), Version 12.4(TAZ3DEV.060927),
INTERIM SOFTWARE
c7201alpha1 uptime is 5 days, 18 hours, 32 minutes System returned to ROM by power-on
System image file is "disk0:c7200p-adventerprisek9-mz.2006-10-01.biffdev"
This product contains cryptographic features and is subject to United States and local
country laws governing import, export, transfer and use. Delivery of Cisco cryptographic
products does not imply third-party authority to import, export, distribute or use
encryption.
Importers, exporters, distributors and users are responsible for compliance with U.S. and
local country laws. By using this product you agree to comply with applicable laws and
regulations. If you are unable to comply with U.S. and local laws, return this product
immediately.
A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html
If you require further assistance please contact us by sending email to export@cisco.com.
Cisco 7201 (c7201) processor (revision A) with 917504K/65536K bytes of memory.
Processor board ID 2222222222222
MPC7448 CPU at 1666Mhz, Implementation 0, Rev 2.2
1 slot midplane, Version 2.255
Last reset from power-on
1 FastEthernet interface
4 Gigabit Ethernet interfaces
2045K bytes of NVRAM.
62443K bytes of USB Flash usbflash0 (Read/Write)
250880K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
65536K bytes of Flash internal SIMM (Sector size 512K).
Configuration register is 0x2
```

Cisco 7401ASR Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7401ASR router:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7401ASR Software (C7401ASR-J-M), Version 11.3(2)AA
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Mon 10-May-99 06:02 by biff
Image text-base: 0x60010890, data-base: 0x605F0000

ROM: System Bootstrap, Version 11.3(2), RELEASED SOFTWARE
ROM: 7401ASR Software (C7401ASR-J-M), Version 11.3(2)AA, RELEASED SOFTWARE

Router uptime is 23 hours
System restarted by reload
System image file is "biff/c7200-j-mz", booted via tftp from 10.10.10.254

cisco 7401ASR (R4700) processor with 22528K/10240K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).

(additional display text omitted from this example)

1 HSSI network interfaces.

(additional display text omitted from this example)

125K bytes of non-volatile configuration memory.

8192K bytes of Flash internal SIMM (Sector size 256K).
   Configuration register is 0x0
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7500 series router with a VIP4:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) RSP Software (RSP-JV-M), Released Version 12.0(8)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Mon 10-May-99 06:02 by biff
Image text-base:0x60010900, data-base:0x60FE2000

ROM:System Bootstrap, Version 12.0(8), RELEASE SOFTWARE (fc1)
BOOTFLASH:RSP Software (RSP-BOOT-M), Released Version 12.0(8)

Router uptime is 18 hours, 18 minutes
System returned to ROM by reload at 17:21:25 PDT Wed Oct 13 1999
System restarted at 17:25:09 PDT Wed Oct 13 1999
System image file is "rsp-jv-mz"

cisco RSP2 (R4600) processor with 65536K/1072K bytes of memory.
R4600 CPU at 100Mhz, Implementation 32, Rev 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
```

```
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Bridging software.
TN3270 Emulation software.
Chassis Interface.

(additional display text omitted from this example)

1 VIP4 RM7000 controller (2 HSSI).
1 HSSI network interface(s)

(additional display text omitted from this example)

123K bytes of non-volatile configuration memory.

8192K bytes of Flash internal SIMM (Sector size 256K).
No slave installed in slot 7.
Configuration register is 0x0
```

Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag** *slot* command, where *slot* is the *port adapter slot* in a Catalyst 5000 family switch, a Cisco 7100 series router, Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router, the *module slot* in a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router, and the *interface processor slot* in a Cisco 7000 series router or Cisco 7500 series router with a VIP. In the FlexWAN module, the **show diag** command is used without the *slot* designation.

Note The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Note The *slot* argument is not required with Catalyst 5000 family switches and the Catalyst RSM/VIP2.

The following sections provide platform-specific output examples using the **show diag** command:

- Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command, page 4-26
- Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show diag Command, page 4-26
- Cisco 7100 Series Routers—Example Output of the show diag Command, page 4-27
- Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command, page 4-27
- Cisco 7201 Router—Example Output of the show diag Command, page 4-27
- Cisco 7401ASR Router—Example Output of the show diag Command, page 4-28
- VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show diag Command, page 4-29

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command

Following is an example of the **show diag** command from a Catalyst 5000 family switch:

```
Switch# show diag
Slot 0:
HSSI-B port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 2d13h ago
Hardware revision 1.17          Board revision A0
Serial number     4518292       Part number    73-1801-05
Test history      0x0           RMA number     00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20:01 74 01 11 00 44 F1 94 49 07 09 05 00 00 00 00
0x30:50 00 00 00 97 04 21 00 FF FF FF FF FF FF FF FF

        Slot database information:
        Flags: 0x4      Insertion time: 0x14E8 (3d00h ago)

        VIP Controller Memory Size: Unknown

        PA Bay 0 Information:
                HSSI-B PA, 1 ports
                EEPROM format version 1
                HW rev 1.17, Board revision A0
                Serial number: 12345678   Part number: 73-2559-01
```

Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show diag Command

Following is an example of the **show diag** command from a a Catalyst 6000 family FlexWAN module:

```
Router# show diag

(additional display text omitted from this example)

Slot 7: Logical_index 15
Board is analyzed ipc ready FlexWAN controller

     Slot database information:
     Flags: 0x2004Insertion time: unknown

     CWAN Controller Memory Size: Unknown

     PA Bay 1 Information:
          HSSI-B PA, 1 port
          EEPROM format version 0
          HW rev 0.00, Board revision UNKNOWN
          Serial number: 00000000  Part number: 00-0000-00
```

Note For complete Catalyst 6000 family FlexWAN module command descriptions and examples, refer to the documentation resources listed in the "Related Documentation" section on page ix.

Cisco 7100 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7100 series router:

```
Router# show diag 4
Mx HSSI-B Port adapter, 1 port
        Port adapter is analyzed
        Port adapter insertion time 00:38:20 ago
        EEPROM contents at hardware discovery:
        Hardware revision 1.17          Board revision A0
        Serial number     12379034      Part number    73-2559-05
        Test history      0x0           RMA number     00-00-00
        EEPROM format version 1
        EEPROM contents (hex):
          0x20:01 74 01 11 00 BC E3 9A 49 09 FF 05 00 00 00 00
          0x30:50 00 00 00 99 02 20 00 FF FF FF FF FF FF FF FF
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7200 series router:

```
Router# show diag 2
Slot 2:
        HSSI-B port adapter, 1 port
        Port adapter is analyzed
        Port adapter insertion time 2d13h ago
        Hardware revision 1.17          Board revision A0
        Serial number     12345678      Part number    73-2559-01
        Test history      0x0           RMA number     00-00-00
        EEPROM format version 1
        EEPROM contents (hex):
          0x20: 01 74 01 01 00 44 F1 94 49 07 09 05 00 00 00 00
          0x30: 50 00 00 00 97 04 21 00 FF FF FF FF FF FF FF FF
```

Note Port adapters used with the Cisco 7200 VXR routers and Cisco uBR7246 VXR routers require the correct base hardware revision in order to function. The following error message will occur on bootup if the incorrect hardware revision is used:

```
PA-3-REVNOTSUPPORTED:PA in slot 1 (Mx HSSI-B) requires base h/w revision of (1.17) for this
chassis
```

Use the **show diag** command to display the hardware revision.

Cisco 7201 Router—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7201 router:

```
Router# show diag 1
Slot 1:
    Dual OC3 POS Port adapter, 2 ports
    Port adapter is analyzed
    Port adapter insertion time 00:02:19 ago
    EEPROM contents at hardware discovery:
    Hardware Revision : 1.0
    PCB Serial Number : JAE07520DYL
    Part Number : 73-8220-02
    Board Revision : A0
```

```
    RMA Test History : 00
    RMA Number : 0-0-0-0
    RMA History : 00
    Deviation Number : 0
    Product (FRU) Number : PA-POS-2OC3
    Top Assy. Part Number : 800-21857-02
    EEPROM format version 4
    EEPROM contents (hex):
        0x00: 04 FF 40 03 E3 41 01 00 C1 8B 4A 41 45 30 37 35
        0x10: 32 30 44 59 4C 82 49 20 1C 02 42 41 30 03 00 81
        0x20: 00 00 00 00 04 00 88 00 00 00 00 CB 94 50 41 2D
        0x30: 50 4F 53 2D 32 4F 43 33 20 20 20 20 20 20 20 20
        0x40: 20 C0 46 03 20 00 55 61 02 FF FF FF FF FF FF FF
        0x50: FF FF FF FF FF FF FF FF FF FF FF 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
```

Cisco 7401ASR Router—Example Output of the show diag Command

The following example shows the **show diag** command output from a Cisco 7401ASR router:

```
Router# show diag 1
pxf:tmc type TMC ASIC revision 3
ucode:filename 'system:pxf/ucode0' revision 1.1
state: is running, number of starts 1
uptime:2d04h
Memory Configuration:
Bank Name Total Reserved In-use Free
 tmc internal memory column 0 16 Kb 6656 bytes 0 bytes 9728 bytes
 tmc column 0 memory bank 0 32 Mb 26 Mb 0 bytes 5703 Kb
 tmc internal memory column 1 16 Kb 512 bytes 0 bytes 15 Kb
 tmc column 1 memory bank 0 32 Mb 480 Kb 352 Kb 31 Mb
 tmc internal memory column 2 16 Kb 1536 bytes 512 bytes 14 Kb
 tmc column 2 memory bank 0 32 Mb 23 Kb 32 Kb 31 Mb
 tmc internal memory column 3 16 Kb 10 Kb 0 bytes 5632 bytes
 tmc column 3 memory bank 0 32 Mb 471 Kb 0 bytes 31 Mb
Slot 0:
    C7401 GigabitEthernet I/O Controller Port adapter, 2 ports
    Port adapter is analyzed
    Port adapter insertion time 2d04h ago
    EEPROM contents at hardware discovery:
    Hardware Revision :0.0
    EEPROM format version 4
    EEPROM contents (hex):
        0x00:04 FF 40 02 80 41 00 00 FF FF FF FF FF FF FF FF
        0x10:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x20:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x30:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x40:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
        0x50:FF FF FF FF FF FF FF FF FF FF FF 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:
    Channelized T1 (CSU) Port adapter, 8 ports
    Port adapter is analyzed
    Port adapter insertion time 00:29:09 ago
    EEPROM contents at hardware discovery:
    Hardware revision 1.0 Board revision A0
    Serial number 21713084 Part number 73-2488-07
    Test history 0x0 RMA number 00-00-00
    EEPROM format version 1
    EEPROM contents (hex):
```

```
0x20:01 72 01 00 01 4B 50 BC 49 09 B8 07 00 00 00 00
0x30:50 00 00 00 00 09 23 00 FF FF FF FF FF FF FF FF
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7500 series router with a VIP4:

```
Router# show diag 8
Slot 8:
        Physical slot 8, ~physical slot 0x7, logical slot 8, CBus 0
        Microcode Status 0x4
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status:None
        EEPROM format version 2
        VIP4 RM7000 controller, HW rev 2.01, board revision A0
        Serial number:12345678  Part number:211-18700-71
        Test history:0x02        RMA number:00-00-00
        Flags: unknown flags 0x7F; 7500 compatible

        EEPROM contents (hex):
          0x20:02 22 02 01 00 AF 7B C9 D3 49 0C 47 02 00 00 00
          0x30:02 3A 0C FF FF FF FF FF FF FF FF FF FF FF FF FF

        Slot database information:
        Flags:0x4      Insertion time:0x3EC4FE0 (00:02:08 ago)

        Controller Memory Size:64 MBytes DRAM, 65536 KBytes SRAM

        PA Bay 0 Information:
                HSSI-B PA, 1 port
                EEPROM format version 1
                HW rev 1.17, Board revision A0
               Serial number:12345678   Part number:73-2559-01
```

Using the show interfaces Command

Display status information (including the physical slot and interface address) for the interfaces you specify using the **show interfaces** command.

For complete descriptions of interface subcommands and the configuration options available for the individual platforms, refer to the publications listed in the "Related Documentation" section on page ix.

Note The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following sections provide platform-specific output examples using the **show interfaces** command:

- Cisco 7401ASR Router—Example Output of the show interfaces Command, page 4-32
- VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command, page 4-32

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command

Following is an example of the **show interfaces hssi** command for a PA-H on a Catalyst RSM/VIP2 in a Catalyst 5000 family switch:

```
Switch# show interfaces hssi 0/0
Hssi0/0 is up, line protocol is up
 Hardware is HSSI-B
  Internet address is 10.1.1.10
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d22h, output 00:00:19, output hang never
  Last clearing of "show interface" counters 2d20h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4084 packets output, 1298712 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

Catalyst 6000 Family FlexWAN Module—Example Output of the show interfaces Command

Following is an example of the **show interfaces hssi** command for a PA-H on a FlexWAN module in a Catalyst 6000 family switch:

```
Switch# show interfaces hssi 7/0/0
Hssi7/0/0 is up, line protocol is up
 Hardware is HSSI-B
  Internet address is 10.1.1.10
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d22h, output 00:00:19, output hang never
  Last clearing of "show interface" counters 2d20h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4084 packets output, 1298712 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

Cisco 7100 Series Routers, Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces hssi** command for a PA-H in a Cisco 7200 series router:

```
Router# show interfaces hssi 2/0
Hssi2/0 is up, line protocol is up
Hardware is HSSI-B
  Internet address is 10.1.1.10
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 252/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
              0 parity
     1 input errors, 1 CRC, 0 frame, 1 overrun, 0 ignored, 0 abort
     1 packets output, 24 bytes, 0 underruns
     0 output errors, 0 applique, 1 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions     TM=down  CA=up  LC=down
```

Note For the Cisco 7206 router and Cisco 7206VXR router shelves, the **show interfaces** command requires a shelf number in the format **show interfaces** *type shelf-number/port-adapter-slot-number/interface-port*.

Cisco 7201 Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces** command for the Cisco 7201 router:

```
Router# show interfaces
GigabitEthernet0/0 is up, line protocol is up
  Hardware is MV64460 Internal MAC, address is 0019.56c5.2adb (bia
0019.56c5.2adb)
  Internet address is 209.165.200.225
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 45/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, media type is RJ45
  output flow-control is XON, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:07:03, output 00:00:07, output hang never
  Last clearing of "show interface" counters 00:00:04
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 180240000 bits/sec, 430965 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
```

```
     2222975 packets input, 133378500 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 0 multicast, 0 pause input
     0 input packets with dribble condition detected
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
```

Cisco 7401ASR Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces hssi** command for a Cisco 7401ASR router:

```
Router# show interfaces hssi 1/0
POS1/0 is up, line protocol is up
Hardware is Packet over Sonet
Internet address is 1.1.1.2/8
MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation HDLC, crc 16, loopback not set
Keepalive not set
Scramble disabled
Last input 00:00:16, output never, output hang never
Last clearing of "show interface" counters never
Queueing strategy:fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
7 packets input, 1158 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 parity
10 input errors, 10 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
7 packets output, 1158 bytes, 0 underruns
0 output errors, 0 applique, 1 interface resets
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces hssi** command for a PA-H in a Cisco 7000 series router or Cisco 7500 series router:

```
Router# show interfaces hssi 1/0/0
Hssi1/0/0 is up, line protocol is up
 Hardware is HSSI-B
  Internet address is 10.1.1.10
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d22h, output 00:00:19, output hang never
  Last clearing of "show interface" counters 2d20h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4084 packets output, 1298712 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
```

```
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
```

Using the ping Command

Using the **ping** command, you can verify that an interface port is functioning properly. This section provides a brief description of this command. Refer to the publications listed in the "Related Documentation" section on page ix for detailed command descriptions and examples.

The **ping** command sends echo request packets out to a remote device at an IP address that you specify. After sending an echo request, the system waits a specified time for the remote device to reply. Each echo reply is displayed as an exclamation point (!) on the console terminal; each request that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate a bad connection.

Following is an example of a successful **ping** command to a remote server with the IP address 10.0.0.10:

```
Router# ping 10.0.0.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.0.0.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination and that the device is active (powered on), and repeat the **ping** command.