

# PA-H and PA-2H HSSI Port Adapter Installation and Configuration

# Product Numbers: PA-H(=) and PA-2H(=)

This configuration note describes the installation and configuration of the PA-H and PA-2H High-Speed Serial Interface (HSSI) port adapters, which can be used in the Cisco 7200 series routers, and on the second-generation Versatile Interface Processor (VIP2) in all Cisco 7500 series and in Cisco 7000 series routers using the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). (Refer to the section "Software and Hardware Requirements" on page 4.)

**Note** For VIP2 users, use this configuration note in conjunction with the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.

For Cisco 7200 series router users, use this configuration note in conjunction with the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series router.

For complete descriptions of interface subcommands and the configuration options available for interfaces, and which support HSSI port adapter functionality, refer to the appropriate software configuration publication listed in the section "If You Need More Information."

**Corporate Headquarters** 

Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134-1706 USA

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# **Document Contents**

This configuration note is organized into the following three parts:

- 1 The following sections include general information and information about port adapter installation:
  - If You Need More Information, page 2
  - HSSI Port Adapter Installation Prerequisites, page 3
- 2 The following section includes information specific to the HSSI port adapters:
  - What Are the HSSI Port Adapters?, page 6
- **3** The following sections include information specific to the HSSI port adapter's use with the VIP2 in Cisco 7000 series and Cisco 7500 series routers, and in the Cisco 7200 series routers:
  - VIP2 and HSSI Port Adapters, page 12
  - Cisco 7200 Series and HSSI Port Adapters, page 27

The section "Cisco Connection Online," on page 38, includes general reference information.

## If You Need More Information

The Cisco Internetwork Operating System (Cisco IOS) software running your router contains extensive features and functionality. The use of many of many of these features is easier if you have more information at hand. For information on configuring the Cisco 7000 series or 7500 series routers and VIP2, or the Cisco 7200 series, the following documentation resources are available:

Cisco Connection Documentation, Enterprise Series CD-ROM

This publication and additional Cisco Systems publications are available on a CD-ROM called Cisco Connection Documentation, Enterprise Series, which is Cisco's online library of product information. The CD-ROM is updated and shipped monthly, so it might be more up to date than printed documentation. To order Cisco Connection Documentation, Enterprise Series CD-ROM, contact a Cisco Sales or Customer Service representative.

- Refer to the following modular configuration and modular command reference publications, as appropriate for your configuration:
  - Configuration Fundamentals Configuration Guide
  - Configuration Fundamentals Command Reference
  - Wide-Area Networking Configuration Guide
  - Wide-Area Networking Command Reference
  - Network Protocols Configuration Guide
  - Network Protocols Command Reference
  - Bridging and IBM Networking Configuration Guide
  - Bridging and IBM Networking Command Reference
  - Configuration Builder Getting Started Guide
  - Troubleshooting Internetworking Systems

- For hardware installation and maintenance information on the Cisco 7000 series and Cisco 7500 series routers, and the VIP2, refer to the following publications:
  - Cisco 7000 Hardware Installation and Maintenance
  - Cisco 7010 Hardware Installation and Maintenance
  - Cisco 7505 Hardware Installation and Maintenance
  - Cisco 7507 Hardware Installation and Maintenance
  - Cisco 7513 Hardware Installation and Maintenance
  - Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration
- For hardware installation and maintenance information on the Cisco 7200 series routers, refer to the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series router.
- To obtain information about documentation, refer to the Cisco Connection Documentation, Enterprise Series CD-ROM, in the section "Cisco Connection Online," on page 38, or call Customer Service at 800 553-6387 or 408 526-7208. Customer Service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding company holidays). You can also send e-mail to cs-rep@cisco.com. You can also refer to the *Cisco Information Packet* that shipped with your router.

# **HSSI Port Adapter Installation Prerequisites**

This section provides software requirements, a list of parts and tools you will need to perform the port adapter installation, and safety and ESD-prevention guidelines to help you avoid injury and damage to the equipment during installation. Also included is information on the systems in which port adapters can be installed and overview information on interface specifications.

The following sections discuss general information and information about port adapter installation requirements:

- Software and Hardware Requirements, page 4
- List of Parts and Tools, page 4
- Safety Guidelines, page 5
- What Are the HSSI Port Adapters?, page 6

## Software and Hardware Requirements

The HSSI port adapters (PA-H and PA-2H) require that the host Cisco 7000 series, Cisco 7500 series, or Cisco 7200 series router is running Cisco IOS Release 11.1(6)CA or later.



**Caution** The VIP2 requires that the host Cisco 7000 series router has the RSP7000 and RSP7000CI installed. The VIP2 will *not* operate properly with the Route Processor (RP), Switch Processor (SP), or Silicon Switch Processor (SSP) installed in the host Cisco 7000 series router.

**Note** The PA-H and PA-2H port adapters can be installed on the VIP2-20 and VIP2-40 motherboards; however, installation on the VIP2-10 is not recommended. PA-H and PA-2H are considered *high-bandwidth* port adapters.

In the Cisco 7000 series and Cisco 7500 series routers, there are no restrictions on slot locations or sequence; however, in the Cisco 7200 series routers, there are specific configuration guidelines that must be observed for high-bandwidth port adapters.

Refer to the publication *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* (Document Number 78-3471-xx), which shipped with your Cisco 7200 series chassis and is also available on the Cisco Connection Documentation, Enterprise Series CD-ROM.

#### List of Parts and Tools

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

- PA-H or PA-2H port adapter
- VIP2-20 or VIP2-40 motherboard, or a Cisco 7200 series router, in which to install the HSSI port adapter
- HSSI cables appropriate for the port adapter's interfaces (HSSI cables are available *only* from Cisco Systems; they are *not* available from outside commercial cable vendors.)



**Caution** Although the port adapter's HSSI connector and the HSSI cable are similar to SCSI-II format, they are not identical. The HSSI cable specification is more stringent 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 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

## Safety Guidelines

Following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

#### **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 and 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.

#### Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

#### 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 consist of 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 component board-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.

## What Are the HSSI Port Adapters?

The HSSI port adapters (PA-H and PA-2H) provide up to two high-speed serial interfaces. (See Figure 1 and Figure 2.)

Figure 1 PA-H Port Adapter, Faceplate View



Figure 2 PA-2H Port Adapter, Faceplate View



The PA-H and PA-2H port adapters can be installed on a VIP2 in port adapter slot 0 and port adapter slot 1, or in the Cisco 7200 series routers in any of the chassis' port adapter slots; slots 1 through 6 in the Cisco 7206, or slots 1 through 4 in the Cisco 7204.

Each HSSI port is a female, 50-pin, SCSI-II-type connector. You must use an HSSI interface cable to connect the interface with an external data service unit (DSU). Refer to the section "HSSI Port Adapter Receptacles, Cables, and Pinouts," on page 10, for descriptions of HSSI cables.

Both HSSI port adapters conform to BABT/TC/130 and EIA/TIA-612 and EIA/TIA-613 standards. PA-H provides a single network interface for Cisco 7000 series or Cisco 7500 series routers, and PA-2H provides two interfaces. HSSI network interfaces reside on modular port adapters, which provide a direct connection between the high-speed bus in the router and the external networks. Each HSSI provides a full-duplex synchronous serial interface for transmitting and receiving data at rates of up to 52 megabits per second (Mbps).

HSSI, which was recently standardized as EIA/TIA 612/613, 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 data service unit (DSU) and the type of service to which it is connected.

The port adapter supports both 16- and 32-bit cyclic redundancy checks (CRCs). The default is 16-bit CRCs; to enable 32-bit CRCs, you use a configuration command. For a description of the CRC function, refer to the section "Configuring Cyclic Redundancy Checks" on page 22.

**Note** While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters in the Cisco 7000 series and Cisco 7500 series routers, you must first remove the VIP2 from the chassis, then replace port adapters as required. OIR is supported for port adapters in the Cisco 7200 series routers. 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's faceplate.

The BABT605559 marking on the HSSI port adapters signifies that the (HSSI) port adapters meet United Kingdom directive 605559 and have been designed to BABT/TC/130 standards. The BABT label is located on the top of each HSSI port adapter (PA-H and PA-2H); Figure 3 shows the BABT label for HSSI port adapters.

#### Figure 3 BABT Label for HSSI Port Adapters



The following additional sections discuss information specific to the HSSI port adapters:

- Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Router, page 8
- HSSI Port Adapter LEDs, page 9
- HSSI Port Adapter Receptacles, Cables, and Pinouts, page 10

# Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Router

Figure 4 shows a VIP2 with installed port adapters. With the VIP2 oriented as shown in Figure 4, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. Port adapters have handles that allow for easy installation and removal; however, they are occasionally not shown in this publication to highlight port adapter faceplate detail. In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis the VIP2 is installed vertically. In the Cisco 7010 and Cisco 7505 chassis the VIP2 is installed horizontally.



Figure 4 Two Port Adapters on the VIP2 (Horizontal Orientation Shown)

Figure 5 shows a Cisco 7206 with port adapters installed. In the Cisco 7206, port adapter slot 1 is in the lower left position, and port adapter slot 6 is in the upper right position. (The Cisco 7204 is not shown, but has four port adapter slots; PA-H and PA-2H can be installed in any of these four slots.)

Figure 5 Port Adapter Slots in the Cisco 7206



## HSSI Port Adapter LEDs

The HSSI port adapter has two rows of five status LEDs, one row of five for each HSSI port on the port adapter (TD, TC, RD, RC, and LB/C), and one ENABLED LED for the port adapter. (See Figure 6.)

Figure 6 LEDs on the HSSI Port Adapter (Partial Front View of PA-2H Shown)



After system initialization, the enabled LED, which is present on all interface processors, goes on to indicate that the port adapter has been enabled for operation.

The following conditions must be met before the HSSI port adapter is enabled:

- The port adapter contains a valid microcode version that has successfully been downloaded
- The port adapter is correctly connected to the backplane and receiving power in Cisco 7000 series and Cisco 7500 series routers, or to the midplane and receiving power in Cisco 7200 series routers
- The bus recognizes the port adapter or HSSI-equipped VIP2

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

The five additional status LEDs on the HSSI port adapter indicate the following:

- TD—When on, the transmit data LED indicates that the port adapter has been detected by, and is able to send packets to, the external DSU.
- TC—When on, the transmit clock LED indicates that the port adapter is transmitting a transmit clock signal to the external DSU. During normal operation, this signal is derived from the RT signal from the external DSU. During loopback, this signal is generated internally.
- RD—When on, the receive data LED indicates that the port adapter has detected, and is able to receive packets from, the external DSU.
- RC—When on, the receive clock LED indicates that the port adapter has detected a Receive Clock signal. During normal operation, this signal is received from the external DSU. During loopback, this signal is generated internally.
- LB/C—When green, this dual-color, loopback/connected LED indicates normal operation in that
  the port adapter is properly connected to the external DSU, and the TA (data terminal equipment
  [DTE] Available) and CA (data communications equipment [DCE] Available) signals are active.
  (See Table 1.) When yellow, this LED indicates that the port adapter is in loopback (LB) mode
  or is otherwise not physically connected to the DSU. When off, the port is neither connected or
  in loopback mode.

## HSSI Port Adapter Receptacles, Cables, and Pinouts

Two types of cables are available for use with the HSSI port adapter: the HSSI interface cable used to connect your router to an external DSU (and HSSI network) and a null modem cable, which allows you to connect two routers back to back. Both HSSI cables conform to EIA/TIA-612 and EIA/TIA-613 specifications. The HSSI ports on PA-H and PA-2H are considered to be DTE devices.

## **HSSI Interface Cable**

The HSSI cable connects the HSSI port adapter with the external DSU. The HSSI cable is 10-feet (3.048 meters) long. The maximum HSSI cable length allowed is 50 feet (15.24 meters). Figure 7 shows the 50-pin connector used at each end of the HSSI interface cable. Table 1 lists the pinout.

Figure 7 HSSI Interface Cable Connector



#### Table 1 HSSI Interface Cable Pinout

			Direction <sup>1</sup>
Signal Name	+ Side Pin No.	– Side Pin No.	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 can connect two routers directly back to back. The null modem cable is 10-feet (3.048 meters) long. 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, or any combination of each. A null modem connection allows you to verify the operation of the HSSI or to link the routers directly in order to build a larger node.

The null modem cable uses the same 50-pin connectors as the HSSI cable, but uses the pinout listed in Table 2. For connection and configuration instructions, refer to the section "Attaching a Null Modem Cable" on page 18.

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

Table 2 HSSI Null Modern Cable Pinou
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**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 stringent than that for the SCSI-II. If a SCSI-II cable is used instead of an HSSI cable, proper operation cannot be guaranteed.

# **VIP2 and HSSI Port Adapters**

The HSSI port adapters are used on the VIP2, and can be installed in either port adapter slot 0 or port adapter slot 1. Figure 8 shows two HSSI port adapters installed on a VIP2 in port adapter slot 0 (PA-H) and slot 1 (PA-2H).





The following sections include information specific to the HSSI port adapters and their use on the VIP2 in Cisco 7000 series and Cisco 7500 series routers:

- Installing or Replacing a Port Adapter on a VIP2, page 13
- Attaching HSSI Port Adapter Interface Cables, page 17
- Configuring the HSSI Interfaces, page 19
  - Determining Chassis Slot, Port Adapter, and HSSI Port Numbers, page 19
  - Configuring an Interface, page 21
  - Checking the Configuration, page 23

## Installing or Replacing a Port Adapter on a VIP2

Depending on the circumstances you might need to install a new port adapter on a VIP2 motherboard or replace a failed port adapter in the field. In either case, you need a number 1 Phillips screwdriver, an antistatic mat onto which you can place the removed interface processor, and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

**Note** The PA-H and PA-2H port adapters can be installed on the VIP2-20 and VIP2-40 motherboards; however, installation on the VIP2-10 is not recommended.



**Caution** To prevent system problems, do not remove port adapters from the VIP2 motherboard, or attempt to install other port adapters on the VIP2 motherboard while the system is operating. To install or replace port adapters, first remove the VIP2 from its interface processor slot.

**Note** Each port adapter circuit board is mounted to a metal carrier and is sensitive to ESD damage. The following procedures should be performed by a Cisco-certified service provider only. While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then install or replace port adapters as required. If a blank port adapter is installed on the VIP2 in which you want to install a new port adapter, you must first remove the VIP2 from the chassis, then remove the blank port adapter.

When only one port adapter is installed on a VIP2, a blank port adapter must fill the empty slot to allow the VIP2 and router chassis to conform to electromagnetic interference (EMI) emissions requirements, and so that air flows through the chassis properly. If you plan to install a new port adapter, you must first remove the blank port adapter.

**Note** The BABT605559 marking on the HSSI port adapters signifies that the (HSSI) port adapters meet United Kingdom directive 605559 and have been designed to BABT/TC/130 standards.

Following is the standard procedure for removing and replacing any type of port adapter on the VIP2:

**Step 1** Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

**Note** If you want to install a new port adapter on a VIP2 with a single port adapter, you must first remove the blank port adapter from the port adapter slot in which you want to install the new port adapter.

**Step 2** For a new port adapter installation or a port adapter replacement, disconnect any interface cables from the ports on the front of the port adapter, although this is not required. You can remove VIP2s with cables attached; however, we do not recommend it.

- **Step 3** To remove the VIP2 from the chassis, follow the steps in the section "Removing a VIP2" in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.
- Step 4 Place the removed VIP2 on an antistatic mat.
- Step 5 Locate the screw at the rear of the port adapter (or blank port adapter) to be replaced. (See Figure 9.) This screw secures the port adapter (or blank port adapter) to its slot.

Figure 9 Location of Port Adapter Screw, Partial Port Adapter View



- **Step 6** Remove the screw that secures the port adapter (or blank port adapter).
- **Step 7** 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 Figure 10.)

Figure 10 Pulling a Port Adapter Out of a Slot, Partial Port Adapter View



**Step 8** If you removed a port adapter, place it in an antistatic container for safe storage or shipment back to the factory. If you removed a blank port adapter, no special handling is required; however, store the blank port adapter for potential future use.

**Step 9** Remove the new port adapter from its antistatic container and position it at the opening of the slot. (See Figure 11.)

**Caution** To prevent jamming the carrier between the upper and lower edges of the port adapter slot, and to assure that the edge connector at the rear of the port adapter mates with the connector at the rear of the port adapter slot, make certain that the leading edges of the carrier are between the upper and lower slot edges, as shown in the cutaway in Figure 11.

Figure 11 Removing a Port Adapter



**Step 10** Before you begin to insert the new port adapter in its slot, verify that the port adapter carrier is between the upper and lower slot edges, as shown in Figure 12. Do not jam the carrier between the slot edges.



**Caution** To ensure a positive ground attachment between the port adapter carrier and the VIP2 motherboard and port adapter slot, and to ensure that the connectors at the rear of the port adapter and slot mate properly, the carrier must be between the upper and lower slot edges, as shown in Figure 12.

**Step 11** Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely mated with the connector on the motherboard.



Figure 12 Aligning the Carrier Edge with Upper and Lower Slot Edges, Partial View

- **Step 12** Install the screw in the rear of the port adapter slot. (See Figure 9 for its location.) Do not overtighten this screw.
- **Step 13** To replace the VIP2 in the chassis, follow the steps in the section "Installing a VIP2" in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.

Step 14 If disconnected, reconnect the interface cables to the interface processor.

This completes the procedure for installing a new port adapter or replacing a port adapter on a VIP2.

# Attaching HSSI Port Adapter Interface Cables

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



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

Connect HSSI cables to an HSSI port adapter as follows:

**Step 1** Attach the HSSI cable directly to the port on the HSSI port adapter. (See Figure 13.)

**Note** Port adapters have a handle attached, but this handle is not shown in Figure 13. The HSSI cable plug and HSSI port receptacle are keyed for proper connection. Use the HSSI cable strain relief slide lock whenever the HSSI cable is connected to the HSSI port adapter.

#### Figure 13 Connecting HSSI Cables (Front View—PA-H Shown without Handle)



# **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 HSSI port adapter. If you require a null-modem cable for your HSSI connection, refer to the section "Attaching a Null Modem Cable," which follows; otherwise, proceed to the section "Configuring the HSSI Interfaces" on page 19.

## Attaching a Null Modem Cable

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, or one of each. This setup allows you to verify the operation of the HSSI or to directly link the routers in order to build a larger node. The null modem cable uses the same 50-pin connectors as the HSSI cable, but uses the pinouts listed in Table 2.

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

You define Cisco 7000 series and Cisco 7500 series interfaces by interface type and physical slot/port adapter/port locations. (The output of the **show interfaces** command displays the logical unit number in both router types and the physical slot/port adapter/port location in the Cisco 7000 series and Cisco 7500 series.) Both router platforms use the same **hssi internal-clock** command to enable the internal transmit clock on the HSSI.

The following examples show the **configure** command syntax for the Cisco 7000 series and Cisco 7500 series. For complete configuration descriptions and examples, refer to the appropriate software publications.

```
Cisco7000/7500Series# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Enter configuration commands...
Cisco7000/7500Series(config)# interface hssi 1/0/0
Cisco7000/7500Series(config-int)# hssi internal-clock
Cisco7000/7500Series(config-int)# ^z
```

Be sure to configure the HSSI port on both routers for an internal transmit clock. When the internal clock is enabled, the TC LED 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.

To disconnect the null modem cable, disable the internal transmit clock with the command **no hssi internal-clock.** Use this command to turn off the transmit clock for each port on both routers. This completes the procedure for attaching a null-modem cable to your HSSI port adapter. Proceed to the section "Configuring the HSSI Interfaces."

## Configuring the HSSI Interfaces

If you installed a new HSSI port adapter or if you want to change the configuration of an existing interface, you must enter Configuration mode using the **configure** command. If you replaced an HSSI port adapter that was previously configured, the system will recognize the new HSSIs and bring them up in their existing configuration.

After you verify that the new HSSI port adapter is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you plan to configure the interfaces for IP routing
- Whether the new interfaces will use bridging

For a summary of the configuration options available and instructions for configuring HSSI port adapters on the VIP2, refer to the appropriate configuration publications listed in the section "If You Need More Information" on page 2. The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Contact your system administrator if necessary to obtain EXEC-level access.

#### Determining Chassis Slot, Port Adapter, and HSSI Port Numbers

The following section describes how to identify chassis slot, port adapter, and Ethernet 10BASE-T interface port numbers.

**Note** Although the processor slots in the seven-slot Cisco 7000 and Cisco 7507 and 13-slot Cisco 7513 are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 are horizontally oriented, all models use the same method for slot and port numbering.

In the router, physical port addresses specify the actual physical location of each interface port on the router interface processor end. (See Figure 14.) This address is composed of a three-part number in the format *chassis slot/port-adapter/interface port*, as follows:

- The first number identifies the chassis slot in which the VIP2 is installed (as shown in the example system in Figure 14).
- The second number identifies the physical port adapter slot on the VIP2, and is either 0 or 1.
- The third number identifies the interface ports on each HSSI port adapter, which are always numbered as interface 0 for PA-H, or as interface 0 and 1 for PA-2H.

Interface ports on the VIP2 maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP2 to a different slot, the first number in the address changes to reflect the new chassis slot number.

Figure 14 shows the port adapter slots and interface ports of a sample Cisco 7505 system. On the VIP2, the first port adapter slot number is always 0. The second port adapter slot number is always 1. The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter.

For example, the HSSI port on an HSSI port adapter in the first port adapter slot in chassis slot 3, is numbered 3/0/0. (See Figure 14.) If the HSSI port adapter was in port adapter slot 1, this same port would be numbered 3/1/0. Port adapters can occupy either port adapter slot; there are no restrictions.

**Note** If you removed the HSSI-equipped VIP2 from chassis slot 3 (shown in Figure 14) and installed it in chassis slot 2, the addresses of those same HSSI ports becomes 2/0/0, and 2/1/0 and 2/1/1.



#### Figure 14 HSSI Port Number Example (Cisco 7505 Shown)

You can identify interface ports by physically checking the slot/port-adapter/interface port location on the back of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

#### Configuring an Interface

The following steps describe a basic interface configuration. 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>

Following is an example of a basic configuration procedure:

**Step 1** At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be 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 At the prompt, specify the first interface to configure by entering the subcommand interface, followed by the *type* (hssi) and *slot/port-adapter/port* (interface processor slot number, port adapter slot number, and interface port number). The example that follows is for the first interface of the first port adapter on a VIP2 in interface processor slot 1:

Router(config)# interface hssi 1/0/0

**Step 3** If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

Router(config-int)# ip address 1.1.1.10 255.255.255.0

- **Step 4** Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.
- **Step 5** Change the shutdown state to up and enable the interface as follows:

Router(config-int)# no shutdown

- **Step 6** Configure additional interfaces as required.
- **Step 7** When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.
- **Step 8** Write the new configuration to nonvolatile memory as follows:

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

#### Configuring Cyclic Redundancy Checks

The HSSI port adapter 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 and sends a request to the sender to resend the frame.

**Note** To enable 32-bit CRC on an interface, follow steps 1 and 2 of the preceding procedure (enter Configuration mode and specify the slot and port address of the HSSI), then enter the command **crc32**. Enter **Ctrl-Z** to exit from configuration mode.

In the example that follows, a single HSSI interface, on a VIP2 in interface processor slot 1, 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-int)# 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. For complete command descriptions and instructions, refer to the related software documentation.

**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 "Checking the Configuration."

#### Checking the Configuration

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

#### Using show Commands to Verify the VIP2 Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

- **Step 1** Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.
- **Step 2** Display all the current interface processors and their interfaces with the **show controllers cbus** command. Verify that the new HSSI-equipped VIP2 appears in the correct slot.
- **Step 3** Specify one of the new interfaces with the **show interfaces** *type slot/port adapter/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.
- Step 4 Display the protocols configured for the entire system and specific interfaces with the show protocols command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.
- **Step 5** Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

#### Using show Commands to Display Interface and System Information

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port-adapter/port*].

Following is an example of how the **show interfaces** [*type slot/port-adapter/port*] command displays status information (including the physical slot and port address) for the interfaces you specify. In this example, the HSSI-configured VIP2 is in chassis slot 1, in port adapter slot 0.

```
Router# sh int h 1/0/0
Hssi1/0/0 is up, line protocol is up
  Hardware is cyBus HSSI
  Internet address is 5.8.1.1/24
  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
```

With the **show interfaces** *type slot/port-adapter/port* command, use arguments such as the interface type (hssi, and so forth) and the slot, port adapter, and port numbers (slot/port-adapter/port) to display information about a specific HSSI only.

**Note** For complete VIP2 command descriptions and examples, refer to the publications listed in the section "If You Need More Information" on page 2.

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command used with a Cisco 7000 series system with an RSP7000 processor:

Router# show version

```
Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(6)CA(2.0) [mpo 105]
Copyright (c) 1986-1995 by cisco Systems, Inc.
Compiled Fri 06-Oct-95 12:22 by mpo
Image text-base: 0x600088A0, data-base: 0x605A4000
ROM: System Bootstrap, Version 5.3(16645)
ROM: GS Bootstrap Software (RSP-BOOT-M), Version 11.1(1.2), MAINTENANCE INTERIME
Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "slot0:rsp-al11-6-20", 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/El software, Version 1.0.
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
Chassis Interface.
(additional displayed text omitted from this example)
2 HSSI network interfaces.
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
```

To determine which type of port adapter is installed on a VIP2 in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of a PA-2H HSSI port adapter in chassis slot 1:

```
Router# show diag 1
Slot 1:
       Physical slot 1, ~physical slot 0xE, logical slot 1, CBus 0
       Microcode Status 0xC
       Master Enable, LED, WCS Loaded
       Board is analyzed
       Pending I/O Status: Console I/O
       EEPROM format version 1
       VIP2 controller, HW rev 2.3, board revision A0
       Serial number: 03516552 Part number: 73-1684-03
       Test history: 0x00 RMA number: 00-00-00
       Flags: cisco 7000 board; 7500 compatible
       EEPROM contents (hex):
         0x20: 01 15 02 03 00 35 A8 88 49 06 94 03 00 00 00 00
         Slot database information:
                     Insertion time: 0x14E8 (3d00h ago)
       Flags: 0x4
       VIP Controller Memory Size: Unknown
       PA Bay 0 Information:
              HSSI PA, 2 ports
              EEPROM format version 1
              HW rev FF.FF, Board revision UNKNOWN
              Serial number: 4294967295 Part number: 255-65535-255
```

Display all the current interface processors and their interfaces with the **show controllers cbus** command. Following is an example of the **show controller cbus** command that shows HSSI ports 1/0/0 and 1/0/1 on a PA-2H HSSI port adapter installed on a VIP2 in chassis slot 1:

```
Router# sh cont cbus
MEMD at 40000000, 2097152 bytes (unused 4416, recarves 3, lost 0)
  RawQ 48000100, ReturnQ 48000108, EventQ 48000110
  BufhdrQ 48000130 (2647 items), LovltrQ 48000148 (19 items, 1632 bytes)
  IpcbufQ 48000150 (24 items, 4096 bytes)
  3570 buffer headers (48002000 - 4800FF10)
  pool0: 13 buffers, 256 bytes, queue 48000138
  pool1: 704 buffers, 1536 bytes, queue 48000140
  pool2: 159 buffers, 4480 bytes, queue 48000158
  pool3: 4 buffers, 4512 bytes, queue 48000160
(additional displayed text omitted from this example)
  slot1: VIP2, hw 2.3, sw 21.40, ccb 5800FF30, cmdq 48000088, vps 8192
    software loaded from flash slot0:vip2_21-40
    FLASH ROM version 255.255
   Mueslix HSSI(2) HW Revision 0x2, FW Revision 1.23
   Hssi1/0/0, applique is Hssi DTE
      gfreeq 48000158, lfreeq 480001C8 (4480 bytes), throttled 0
      rxlo 4, rxhi 159, rxcurr 0, maxrxcurr 0
      txq 48001A00, txacc 48001A02 (value 106), txlimit 106
    Hssi1/0/1, applique is Hssi DTE
      gfreeq 48000158, lfreeq 480001D0 (4480 bytes), throttled 0
      rxlo 4, rxhi 159, rxcurr 0, maxrxcurr 0
      txq 48001A08, txacc 48001A0A (value 106), txlimit 106
```

(additional displayed text ommitted from this example)

#### Using the ping Command to Verify Network Connection

The *packet internet groper* (**ping**) command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of the **ping** command. After you verify that the system and VIP2 have booted successfully and are operational, you can use this command to verify the status of interface ports. Refer to the publications listed in the section "If You Need More Information," on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified time-out 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 that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, 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 server and that the server is active (powered on), and repeat the **ping** command. For complete descriptions of interface subcommands and the configuration options available for VIP2-related interfaces, and which support VIP2 functionality, refer to the publications listed in the section "If You Need More Information" on page 2.

# **Cisco 7200 Series and HSSI Port Adapters**

The HSSI port adapters are used in the Cisco 7200 series routers and can be installed in any of the available port adapter slots. Figure 15 shows an HSSI port adapter installed in port adapter slot 3 of a Cisco 7206.





The following sections include information that is specific to the HSSI port adapters and their use in the Cisco 7200 series routers:

- Installing or Replacing a Port Adapter in Cisco 7200 Series Routers
- Attaching HSSI Port Adapter Interface Cables, page 31
- Configuring the HSSI Interfaces, page 32
  - Selecting Port Adapter Slot and HSSI Port Numbers, page 32
  - Configuring Interfaces, page 33
  - Checking the Configuration, page 34

## Installing or Replacing a Port Adapter in Cisco 7200 Series Routers

Depending on your circumstances, you might need to install a new port adapter in a Cisco 7200 series router or replace a failed port adapter in the field. In either case, no tools are necessary; all port adapters available for the Cisco 7200 series connect directly to the router midplane and are locked into position by a port adapter lever. When removing and replacing a port adapter, you will need an antistatic mat onto which you can place a removed port adapter and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

**Note** The Cisco 7200 series routers support OIR; therefore, you do not have to power down the Cisco 7200 series routers when removing and replacing an HSSI port adapter.

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router to conform to EMI emissions requirements and to allow proper air flow 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 a blank port adapter.

#### Removing a Port Adapter

Following is the procedure for removing a port adapter from a Cisco 7200 series router:

- Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.
- **Step 2** Place the port adapter lever for the desired port adapter slot in the unlocked position. The port adapter lever remains in the unlocked position. (See Figure 16.)

Figure 16 Placing the Port Adapter Lever in the Unlocked Position (Cisco 7206 shown)



**Step 3** Grasp the handle on the port adapter and pull the port adapter from the midplane, about half way out of its slot. If you are removing a blank port adapter, pull the blank port adapter from the chassis slot.

**Note** As you disengage the port adapter from the router midplane, OIR administratively shuts down all active interfaces on the port adapter.

**Step 4** With the port adapter half way out of the slot, disconnect all cables from the port adapter.

Step 5 After disconnecting the cables, pull the port adapter from its chassis slot.



**Caution** Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (See Figure 17.)





**Step 6** Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing a port adapter from a Cisco 7200 series router.

#### Replacing a Port Adapter

Following is the procedure for installing a new port adapter in a Cisco 7200 series router:

- Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.
- **Step 2** Use both hands to grasp the port adapter by its metal carrier edges and position the port adapter so that its components are downward. (See Figure 17).
- **Step 3** Align the left and right edge of the port adapter metal carrier between the guides in the port adapter slot. (See Figure 18.)





**Step 4** With the metal carrier aligned in the slot guides, gently slide the port adapter half way into the slot.



**Caution** Do not slide the port adapter all the way into the slot until you have connected all required cables. Trying to do so will disrupt normal operation of the router.

Step 5 With the port adapter half way in the slot, connect all required cables to the port adapter.

- **Step 6** After connecting all required port adapter cables, carefully slide the port adapter all the way into the slot until you feel the port adapter's connectors mate with the midplane.
- Step 7 After feeling the connector's mate, move the port adapter lever to the locked position.Figure 19 shows the port adapter lever in the locked position.

**Note** If the port adapter lever does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter half way out of the slot, reinsert it, and move the port adapter lever to the locked position.

Figure 19 Placing the Port Adapter Lever in the Locked Position (Cisco 7206 shown)



This completes the procedure for installing a new port adapter in a Cisco 7200 series router.

## Attaching HSSI Port Adapter Interface Cables

On a single HSSI port adapter, you can use up to two HSSI connections. HSSI cables are available from Cisco Systems; they are *not* available from outside commercial cable vendors.



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

Connect HSSI cables to an HSSI port adapter as follows:

Step 1 Attach the HSSI cable directly to the HSSI port on the HSSI port adapter. (See Figure 20.)



#### Figure 20 Connecting HSSI Cables

**Note** Port adapters have a handle attached, but it is not shown in Figure 20 to allow a full view of the detail on each port adapter's faceplate.

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

This completes the procedure for attaching HSSI port adapter cables.

**Note** The procedure for using null-modem cables with Cisco 7200 series routers is identical to their use with the Cisco 7000 series and Cisco 7500 series routers; therefore, refer to the section "Attaching a Null Modem Cable," on page 18, if the use of a null-modem cable is required; otherwise, proceed to the section "Configuring the HSSI Interfaces" on page 32.

## Configuring the HSSI Interfaces

If you installed a new HSSI port adapter or if you want to change the configuration of an existing interface, you must enter Configuration mode using the **configure** command. If you replaced an HSSI port adapter that was previously configured, the system will recognize each new HSSI and bring it up in its existing configuration.

After you verify that the new HSSI port adapter is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you plan to configure the interfaces for IP routing
- Whether the new interfaces will use bridging

For a summary of the configuration options available and instructions for configuring the HSSIs on a Cisco 7200 series router, refer to the appropriate configuration publications listed in the section "If You Need More Information" on page 2.

The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Contact your system administrator if necessary to obtain EXEC-level access.

#### Selecting Port Adapter Slot and HSSI Port Numbers

The following section describes how to identify port adapter slot and HSSI port numbers.

Physical port addresses specify the actual physical location of each interface port on the router. (See Figure 21.) This address is composed of a two-part number in the format *port adapter slot number/interface port number*, as follows:

- The first number identifies the chassis slot in which the HSSI port adapters are installed.
- The second number identifies the interface port(s) on each HSSI port adapter; always numbered as interface 0 for PA-H and 0 and 1 for PA-2H.

Interface ports maintain the same address regardless of whether other port adapters are installed or removed from the slot. However, when you move a port adapter to a different slot, the first number in the address changes to reflect the new chassis slot number.

Figure 21 shows the port adapter slots and interface ports of a Cisco 7206. The port adapter slot numbers start with 1 and continue through 6 (slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present). The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter.

For example, the two HSSI ports on an HSSI port adapter in port adapter slot 3 would have the following addresses: 3/0 and 3/1. (See Figure 21.) If the HSSI port adapter was in port adapter slot 1, these same interface ports would be numbered 1/0 and 1/1.

**Note** PA-H and PA-2H are considered high-bandwidth port adapters; there are specific configuration guidelines that must be observed. Refer to the publication *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* (Document Number 78-3471-xx), which shipped with your Cisco 7200 series chassis and is also available on the Cisco Connection Documentation, Enterprise Series CD-ROM.



Figure 21 Cisco 7206 HSSI Port Number Example

You can identify interface ports by physically checking the slot/interface port location on the front of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

#### **Configuring Interfaces**

The following steps describe a basic interface configuration. 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>

Following is an example of a basic configuration procedure:

**Step 1** At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be 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 At the prompt, specify the first interface to configure by entering the subcommand interface, followed by the *type* (hssi) and *slot/port* (port adapter slot number and interface port number). The example that follows is for the first interface of the port adapter in slot 2:

Router(config)# interface hssi 2/0

**Step 3** If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

Router(config-int)# ip address 1.1.1.10 255.255.255.0

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

**Step 5** Change the shutdown state to up and enable the interface as follows:

Router(config-int)# no shutdown

- **Step 6** Configure additional interfaces as required.
- **Step 7** When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.
- **Step 8** Write the new configuration to nonvolatile memory as follows:

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

To check the interface configuration using **show** commands, proceed to the section "Checking the Configuration."

#### 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.

#### Using show Commands to Verify the New Interface Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

- **Step 1** Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new interfaces.
- **Step 2** Display all the current port adapters and their interfaces with the **show controllers** command. Verify that the new HSSI port adapter appears in the correct slot.
- **Step 3** Specify one of the new interfaces with the **show interfaces** *port adapter type slot/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.
- Step 4 Display the protocols configured for the entire system and specific interfaces with the show protocols command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.
- **Step 5** Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

#### Using show Commands to Display Interface and System Information

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port*].

The following example of the **show interfaces hssi** *type slot/port* command shows all of the information specific to the first HSSI port (interface port 0) in port adapter slot 5:

```
Router# show int h 5/0
Hssi5/0 is up, line protocol is up
  Hardware is M2T-HSSI
  Internet address is 5.8.1.2/24
  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
```

With the **show interfaces** *type slot/port* command, use arguments such as the interface type (hssi, and so forth), and the port adapter slot and port number (slot/port) to display information about a specific HSSI only.

Display all the current interface processors and their interfaces with the **show controllers** command. Following is an example of the **show controller** command that shows HSSI ports 1/0 and 1/1 on a PA-2H HSSI port adapter installed in chassis slot 1:

```
Router# show cont
(additional display text ommitted from this example)
M2T-HSSI: show controller:
PAS unit 0, subunit 0, f/w version 1-23, rev ID 0x1, version 2
idb = 0x608E3340, ds = 0x608E50C0, ssb=0x608E5A84
Clock mux=0x35, ucmd_ctrl=0x8, port_status=0x25
maxdgram=4474, bufpool=64Kb, 128 particles
    TM=down CA=up LC=down
line state: up
HSSI DTE cable, received clockrate 51838976
(additional display text ommitted from this example)
```

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each port adapter type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the output from the **show version** command:

Router# show version Cisco Internetwork Operating System Software IOS (tm) 7200 Software (C7200-J-M), Version 11.1(6)CA(2.0) [biff 103] Copyright (c) 1986-1996 by cisco Systems, Inc. Compiled Fri 09-Aug-96 21:14 by biff Image text-base: 0x60010890, data-base: 0x605F0000 ROM: System Bootstrap, Version 11.1(11855) [beta 2], INTERIM SOFTWARE ROM: 7200 Software (C7200-J-M), Version 11.1(13027) [biff 100] Router uptime is 23 hours System restarted by reload System image file is "biff/c7200-j-mz", booted via tftp from 1.1.1.254 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 ommitted from this example) 2 HSSI network interfaces. 125K bytes of non-volatile configuration memory. 8192K bytes of Flash internal SIMM (Sector size 256K). Configuration register is 0x0

To determine which type of port adapter is installed in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of an HSSI port adapter in chassis slot 5:

Router# **show diag 5** 

For complete command descriptions and examples for the Cisco 7200 series routers, refer to the publications listed in the section "If You Need More Information" on page 2.

#### Using the ping Command to Verify Network Connection

The *packet internet groper* (**ping**) command allows you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of the **ping** command. After you verify that the system has booted successfully and is operational, you can use this command to verify the status of interface ports. Refer to the publications listed in the section "If You Need More Information" on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified time-out 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 that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, 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 server and that the server is active (powered on), and repeat the **ping** command.

For complete descriptions of interface subcommands and the configuration options available for Cisco 7200 series-related interfaces and functionality, refer to the publications listed in the section "If You Need More Information" on page 2.

## **Cisco Connection Online**

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You can access CCO in the following ways:

- WWW: http://www.cisco.com.
- WWW: http://www-europe.cisco.com.
- WWW: http://www-china.cisco.com.
- Telnet: cco.cisco.com.
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

**Note** If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

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