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, page 4-2
- Performing a Basic Interface Configuration, page 4-7
- Configuring Timing (Clock) Signals, page 4-10
- Configuring NRZI Format, page 4-13
- Configuring Cyclic Redundancy Checks, page 4-14

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

⚠
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

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:

- Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command, page 4-30
- Catalyst 6000 Family FlexWAN Module—Example Output of the show interfaces Command, page 4-30
- Cisco 7100 Series Routers, Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command, page 4-31
- Cisco 7201 Router—Example Output of the show interfaces Command, page 4-31

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.