CHAPTER 5

Configuring the PA-8T-V.35 Interfaces

To continue your Cisco PA-8T-V.35 port adapter installation, you must configure the PA-8T-V.35 interfaces. The instructions that follow apply to all supported platforms. Minor differences between the platforms are noted. This chapter contains the following sections:

- Using the EXEC Command Interpreter, page 5-1
- Configuring Half-Duplex and Binary Synchronous Communications, page 5-15
- Checking the Configuration, page 5-17

Using the EXEC Command Interpreter

You modify the configuration of your router through the software command interpreter called the *EXEC*. You must enter the privileged level of the EXEC command interpreter (also called enable mode) with the **enable** command before you can use the **configure** command to configure a new interface or to 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#
```

Configuring the Interface

After you verify that the new PA-8T-V.35 is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Have the following information available:

- Protocols you plan to route on each new interface
- IP addresses if you will configure the interfaces for IP routing
- Bridging protocols you plan to use
- Timing source for each new interface and clock speeds for external timing

If you installed a new PA-8T-V.35 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-8T-V.35 that was previously configured, the system recognizes the new PA-8T-V.35 interfaces and brings each of them up in their existing configuration.

For a summary of the configuration options available and instructions for configuring interfaces on a PA-8T-V.35, refer to the publications listed in the "Related Documentation" section on page iv.

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 5-1 for an explanation of the privileged level of the EXEC.)

This section contains the following subsections:

- Shutting Down an Interface, page 5-2
- Performing a Basic Configuration, page 5-8
- Configuring Timing (Clock) Signals, page 5-10
- Configuring NRZI Format, page 5-13
- Configuring Cyclic Redundancy Checks, page 5-14

Shutting Down an Interface

Before you remove an interface that you will not replace, replace a compact serial 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 interface processor. 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 5-1 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 Crtl-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. Table 5-1 shows the command syntax.

When you are done, 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 5-1 Syntax of the shutdown Command

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)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 1/1`
		`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)	The example is for interface 0 and interface 1 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`
		`Router(config-if)# interface serial 3/0/1`
		`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)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 3.
		`Router(config-if)# interface serial 3/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 3/1`
		`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)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 4.
		`Router(config-if)# interface serial 4/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 4/1`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Cisco 7200 series routers	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 6.
		`Router(config-if)# interface serial 6/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 6/1`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

Table 5-1 Syntax of the shutdown Command (continued)

Platform	Command	Example

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

Cisco uBR7246 router	**interface**, followed by the *type* (**serial**) and *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 2.
		`Router(config-if)# interface serial 2/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 2/1`
		`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)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 1/1`
		`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)	The example is for interface 0 and interface 1 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`
		`Router(config-if)# interface serial 3/1`
		`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)	The example is for interface 0 and interface 1 on a port adapter in port adapter slot 1.
		`Router(config-if)# interface serial 1/0`
		`Router(config-if)# shutdown`
		`Router(config-if)# interface serial 1/1`
		`Router(config-if)# shutdown`
		`Ctrl-Z`
		`Router#`

VIP in Cisco 7000 series 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)	The example is for interface 1 and 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 1/1/1`
		`Router(config-if)# shutdown`
		`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 (shutdown) using the **show interfaces serial** command (followed by the interface address of the interface) to display the specific interface. Table 5-2 provides examples.

Table 5-2 Examples of the show interfaces Command

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 in module slot 3.
		`Router# show interfaces serial 3/0/0`
		`Serial 3/0/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Cisco 7120 series 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 3.
		`Router# show interfaces serial 3/0`
		`Serial 3/0 is administratively down, line protocol is down`
		`[Additional display text omitted from this example]`

Table 5-2 Examples of the show interfaces Command (continued)

Platform	Command	Example

Cisco 7140 series 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 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	**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]`

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 7301routers	**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]`

Table 5-2 Examples of the show interfaces Command (continued)

Platform	Command	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]`

Cisco 7401ASR 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 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 or 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 serial** command followed by the interface address of the interface.

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

Performing a Basic Configuration

Following are instructions for a basic configuration: 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 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 Crtl-Z.
Router(config)#
```

Step 2 Specify the first interface to configure by entering the **interface serial** subcommand, followed by the interface address of the interface you plan to configure. Table 5-3 provides examples.

Table 5-3 Examples of the interface serial Subcommand

Platform	Command	Example

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

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

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

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

Cisco 7200 series routers	**interface serial**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 6.
		`Router(config)# interface serial 6/0`
		`Router(config-if)#`

Table 5-3 Examples of the interface serial Subcommand (continued)

Platform	Command	Example

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

Cisco uBR7246 router	**interface serial**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 2.
		`Router(config)# interface serial 2/0`
		`Router(config-if)#`

Cisco 7301 routers	**interface serial**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1.
		`Router(config)# interface serial 1/0`
		`Router(config-if)#`

Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	**interface 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(config)# interface serial 3/0`
		`Router(config-if)#`

Cisco 7401ASR routers	**interface serial**, followed by *slot/port* (port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1.
		`Router(config)# interface serial 1/0`
		`Router(config-if)#`

VIP in Cisco 7000 series or Cisco 7500 series routers	**interface serial**, followed by *slot/port adapter/port* (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number)	The example is for interface 0 of a port adapter in port adapter slot 1 of a VIP in interface processor slot 1.
		`Router(config)# interface serial 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** configuration subcommand, as in the following example:

```
Router(config-if)# ip address 10.10.10.10 255.255.255.255
```

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.

Step 5 Set the clock rate with the **clock rate** command. (See the "Configuring Timing (Clock) Signals" section on page 5-10.)

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

Step 6 Re enable the interfaces by using the **no shutdown** command. (See the "Shutting Down an Interface" section on page 5-2 for **no shutdown** command examples.)

Step 7 Configure additional interfaces as required.

Step 8 When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** (hold down the **Control** key while you press **Z**) or enter **end** 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. Proceed to the next section, "Configuring Timing (Clock) Signals."

Configuring Timing (Clock) Signals

All PA-8T-V.35 interfaces support both DTE and DCE mode, depending on the mode of the interface 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 interface 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 5-4 on page 5-10 summarizes some of the commands used to configure the clock rate. See the specific sections that follow for further details.

Table 5-4 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 5-4 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-txc`
			"Inverting the Clock Signal"

Setting the Clock Rate

The default operation on a PA-8T-V.35 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 (PA-8T-V.35). 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-8T-V.35 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 later or 11.1(10)CA or later supports nonstandard clock rates (any value from 1200 to 8000000) on PA-8T-V.35 interfaces installed in Cisco 7204 and Cisco 7206 routers, and Cisco 7000 series or Cisco 7500 series routers with a VIP.

Cisco IOS Release 11.1(19)CC1 or later or 11.3(4)AA or later supports nonstandard clock rates on PA-8T-V.35 interfaces installed in Cisco 7202 routers.

Cisco IOS Release 12.0(3)T or later or 12.0(2)XE or later supports nonstandard clock rates on PA-8T-V.35 interfaces installed in Cisco 7204VXR and Cisco 7206VXR routers.

Cisco IOS Release 12.0(3)T or later or Cisco IOS Release 11.3(7)NA or later supports nonstandard clock rates on PA-8T-V.35 interfaces installed in Cisco uBR7200 series routers.

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-8T-V.35 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 VIP or FlexWAN module)

 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 the higher transmission speeds. If a PA-8T-V.35 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 PA-8T-V.35 interface is a DTE, the **invert-txc** command inverts the TxC signal the interface receives from the remote DCE. When the PA-8T-V.35 interface is a DCE, this 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 the interface on the PA-8T-V.35 is used 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 or DSU or the interface. To invert the data stream coming out of the PA-8T-V.35, use the **invert data** command. By inverting the High-Level Data Link Control (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-8T-V.35 interface *or* on the CSU/DSU; inverting both cancels out both data inversions.

Configuring NRZI Format

Table 5-5 summarizes NRZI format commands. For more information, see the remainder of this section.

Table 5-5 NRZI Format Commands

Purpose	Command	Example	Further Information

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`
			"Configuring NRZI Format"

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`
			"Configuring NRZI Format"

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.

All PA-8T-V.35 interfaces support non return-to-zero (NRZ) and non return-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 transition. NRZI uses relational encoding to decode signals rather than determining absolute values.

NRZ format, the factory default on all interfaces, is more common. NRZI format, which is configured with a software command, is commonly used with EIA/TIA-V.35 connections in IBM environments.

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-8T-V.35 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* publication. For more information, see the "Obtaining Documentation" section on page vi and the "Obtaining Technical Assistance" section on page vii.

Configuring Cyclic Redundancy Checks

Table 5-6 summarizes cyclic redundancy check (CRC) commands. For more information, see the remainder of this section.

Table 5-6 CRC Commands

Purpose	Command	Example	Further Information

Enable 32-bit CRC.	**crc** *size*	The example enables 32-bit CRC on a serial interface:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# crc 32`
			"Configuring Cyclic Redundancy Checks"

Return to default 16-bit CRC.	**no crc** *size*	The example disables 32-bit CRC on a serial interface and returns to the default 16-bit CRC:
		`Router(config)# interface serial 3/0`
		`Router(config-if)# no crc 32`
			"Configuring Cyclic Redundancy Checks"

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. All interfaces use a 16-bit CRC (CRC-CITT) by default but also support a 32-bit CRC. The sender of a data frame calculates the *frame check sequence* (FCS). Before it sends a frame, the sender appends the FCS value to the message. The receiver recalculates the FCS and compares its calculation to the FCS from the sender. If there is a difference between the two calculations, the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

Enable 32-bit CRC using the **crc 32** command. Before you can enable 32-bit CRC, 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 32-bit CRC. This command functions in the same way on all supported platforms.

In the example that follows, 32-bit CRC is specified:

```
Router(config-if)# crc 32
```

The preceding command example applies to all systems in which the PA-8T-V.35 is supported. Use the **no crc 32** command to disable CRC-32 and return the interface to the default CRC-16 (CRC-CITT) setting.

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 command descriptions, refer to the *Configuration Fundamentals Configuration Guide* publication. For more information, see the "Obtaining Documentation" section on page vi and the "Obtaining Technical Assistance" section on page vii.

Note If you are configuring a PA-8T-V.35 on a Cisco 7200 series router and you want to configure the interface for half-duplex or Binary Synchronous Communication Protocol (Bisync) operation, proceed to the next section "Configuring Half-Duplex and Binary Synchronous Communications"; otherwise, proceed to the "Checking the Configuration" section on page 5-17.

Configuring Half-Duplex and Binary Synchronous Communications

This section explains how to configure PA-8T-V.35 interfaces for half-duplex and Bisync operation in Cisco 7100 series and Cisco 7200 series routers.

Note Cisco IOS Release 11.2(7a)P or later supports half-duplex and Bisync operation on PA-8T-V.35 interfaces installed in Cisco 7204 and Cisco 7206 routers.

Cisco IOS Release 11.1(19)CC1 or later or 11.3(4)AA or later supports half-duplex and Bisync operation on PA-8T-V.35 interfaces installed in Cisco 7202 routers.

Cisco IOS Release 12.0(3)T or later or 12.0(2)XE or later supports half-duplex and Bisync operation on PA-8T-V.35 interfaces installed in Cisco 7204VXR and Cisco 7206VXR routers.

The Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco uBR7200 series routers, and VIP do not support half-duplex and Bisync operation on PA-8T-V.35 port adapters.

Use the **half-duplex** command to configure PA-8T-V.35 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 PA-8T-V.35 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 a PA-8T-V.35 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 a PA-8T-V.35 interface:

Step 1 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 Crtl-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 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:

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 5-7 lists the default delay settings and the *value* argument for each timer you can use with the **half-duplex timer** command.

Table 5-7 Half-Duplex Timer Default Delay Settings

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

1. Clear To Send
2. Data Carrier Detect
3. Request To Send

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

Step 5 Write the new configuration to nonvolatile memory as follows:

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

This completes the procedure for configuring controlled-carrier mode on a PA-8T-V.35 interface. For additional information on configuring half-duplex operation on low-speed serial interfaces, refer to the chapter "Configuring Interfaces" of the *Configuration Fundamentals Configuration Guide*. For more information, see the "Obtaining Documentation" section on page vi and the "Obtaining Technical Assistance" section on page vii.

Note To configure PA-8T-V.35 interfaces for Bisync operation in Cisco 7200 series 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*.

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** and **loopback** commands to check connectivity. This section includes the following subsections:

- Using show Commands to Verify the New Interface Status, page 5-17
- Using the ping Command to Verify Network Connectivity, page 5-29
- Using loopback Commands, page 5-29

Using show Commands to Verify the New Interface Status

Table 5-8 on page 5-17 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-8T-V.35 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 iv.

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 5-8 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`

Table 5-8 Using show Commands (continued)

Command	Function	Example
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 *type* **0** or **1/** *interface-port-number*	Displays status information about a specific type of interface (for example, serial) on a Catalyst RSM/VIP2	`Router# show interfaces serial 1/0`
show interfaces *type module-slot-number/port-adapter-bay-number/ interface-port-number*	Displays status information about a specific type of interface (for example, serial) on a Catalyst 6000 family FlexWAN module	`Router# show interfaces serial 3/0/0`
show interfaces *type* **3/***interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco 7120 series router	`Router# show interfaces serial 3/1`
show interfaces *type* **4/***interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco 7140 series router	`Router# show interfaces serial 4/1`
show interfaces *type port-adapter-slot-number/ interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco 7200 series router	`Router# show interfaces serial 1/0`
show interfaces *type* **1/***interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco uBR7223 router	`Router# show interfaces serial 1/1`
show interfaces *type* **1** or **2/** *interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco uBR7246 router	`Router# show interfaces serial 2/0`
show interfaces *type* **1/** *interface-port-number*	Displays status information about a specific type of interface (for example, ethernet) in a Cisco 7301 router	`Router# show interfaces serial 1/0`
show interfaces *type* **2** or **3** or **4** or **5/** *interface-port-number*	Displays status information about a serial interface on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router	`Router# show interfaces serial 3/0`

Table 5-8 Using show Commands (continued)

Command	Function	Example
show interfaces *type* **1/** *interface-port-number*	Displays status information about a specific type of interface (for example, ethernet) in a Cisco 7401ASR router	`Router# show interfaces serial 1/0`
show interfaces *type interface-processor-slot-number/port-adapter-slot-number/ interface-port-number*	Displays status information about a specific type of interface (for example, serial) on a VIP in a Cisco 7000 series or Cisco 7500 series router	`Router# show interfaces serial 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 5-19
- Using the show diag Commands, page 5-23
- Using the show interfaces Commands, page 5-25

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command to Verify Network Connectivity" section on page 5-29 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. This section provides output examples for some of the supported platforms.

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.

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches

Following is an example of the **show version** command from a Catalyst 5000 family switch with the PA-8T-V.35:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) C5RSM Software (C5RSM-JSV-M), Version 11.2(9)P
```

```
Copyright (c) 1986-1997 by cisco Systems, Inc.
Compiled Tue 24-Jun-97 17:09 by shj
Image text-base: 0x600108E0, data-base: 0x6095E000

ROM: System Bootstrap, Version 11.2(15707)
BOOTFLASH: C5RSM Software (C5RSM-JSV-M), Version 11.2

yosemite_3 uptime is 17 hours, 17 minutes
System restarted by reload
System image file is "dirt/yosemite/c5rsm-jsv-mz.7P", booted via tftp from 192.255.254.254

cisco RSP2 (R4700) processor with 32768K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0
Last reset from power-on
G.703/E1 software, Version 1.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software.
1 C5IP controller (15 Vlan).
2 MIP controllers (4 E1).
1 VIP2 controller (2 E1)(4 Token Ring).
6 Channelized E1/PRI ports.
123K 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 0x100

Router#
```

Catalyst 6000 Family FlexWAN Module

Following is an example of the **show version** command from a Catalyst 6000 family switch with the PA-8T-V.35:

```
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.
Primary Rate ISDN software, Version 1.1.
6 FlexWAN controllers (13 Serial)(8 E1)(8 T1)(2 HSSI)(2 ATM)(1 Channelized T3)(1
Channelized E3)(2 POS).
1 Virtual Ethernet/IEEE 802.3  interface(s)
```

```
17 Serial network interface(s)
2 HSSI network interface(s)
2 ATM network interface(s)
2 Packet over SONET network interface(s)
1 Channelized T3 port(s)
1 Channelized E3 port(s)
123K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

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

Cisco 7200 Series, Cisco 7100 Series, Cisco uBR7200 Series, and Cisco 7401ASR Routers

Following is an example of the **show version** command from a Cisco 7200 series router with the PA-8T-V.35:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(7)CA [biff 105]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 04-Aug-96 06:00 by biff
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 11.1(7)CA RELEASED SOFTWARE

Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "c7200-j-mz", booted via slot0
cisco 7206 (NPE150) processor with 12288K/4096K 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).
Chassis Interface.
4 Ethernet/IEEE 802.3 interfaces.
2 FastEthernet/IEEE 802.3 interfaces.
4 Token Ring /IEEE802.5 interfaces.
12 Serial network interfaces.
1 Compression port adapter.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM 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
```

Cisco 7301 Routers

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7301 Software (C7300-JS-M), Experimental Version 12.2(20020904:004736) [biff 107]
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Mon 09-Sep-02 18:02 by biff
Image text-base:0x600088F8, data-base:0x61A94000

ROM:System Bootstrap, Version 12.2(20020730:200705) [biff-TAZ2_QA_RELEASE_16B 101],
DEVELOPMENT SOFTWARE
```

```
BOOTLDR:7301 Software (C7301-BOOT-M), Experimental Version 12.2(20020813:014224)
[biff-TAZ2_QA_RELEASE_17B 101]

7301p2b uptime is 0 minutes
System returned to ROM by reload at 00:01:51 UTC Sat Jan 1 2000
System image file is "tftp://10.1.8.11/tazii/images/c7301-js-mz"

cisco 7301 (NPE-G1) processor (revision A) with 491520K/32768K bytes of memory.
Processor board ID 0
BCM1250 CPU at 700Mhz, Implementation 1, Rev 0.2, 512KB L2 Cache
1 slot midplane, Version 2.0

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.
3 Gigabit Ethernet/IEEE 802.3 interface(s)
509K bytes of non-volatile configuration memory.

62976K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
32768K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x102
```

VIP in Cisco 7000 Series and Cisco 7500 Series Routers

Following is an example of the **show version** command from a Cisco 7500 series router with the PA-8T-V.35:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(471) [biff 125]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sat 10-Aug-96 17:56 by biff
Image text-base: 0x600108A0, data-base: 0x60952000

ROM: System Bootstrap, Version 5.3(16645) [biff 571]
ROM: GS Software (RSP-BOOT-M), Version 11.1(6), RELEASE SOFTWARE (fc1)

gshen_7500 uptime is 5 days, 4 minutes
System restarted by reload
System image file is "rsp-jv-mz", booted via slot0

cisco RSP2 (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.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Chassis Interface.
1 EIP controller (6 Ethernet).
1 VIP2 controller (8 Ethernet)(1 HSSI).
14 Ethernet/IEEE 802.3 interfaces.
1 HSSI network interface.
125K bytes of non-volatile configuration memory.

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

Using the show diag Commands

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 Cisco 7100 series, Cisco 7200 series, Cisco uBR7200 series, Cisco 7301 routers, and Cisco 7401ASR router and the *interface processor slot* in a Cisco 7000 series or Cisco 7500 series router with a VIP. This section provides output examples for some of the supported platforms.

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 for the Catalyst 5000 or 6000 family switches.

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches

Following is an example of the **show diag** command that shows a PA-8T-V.35 on a Catalyst RSM/VIP2:

```
Router# show diag
Slot 0:
        Physical slot 0, ~physical slot 0xF, logical slot 0, CBus 1
        Microcode Status 0x4
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: Console I/O, Debug I/O
        EEPROM format version 1
        C5IP controler, HW rev 1.0, board revision A0
        Serial number: 00000001  Part number: 00-0000-01
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 1C 01 00 00 00 00 01 00 00 00 01 00 00 00 00
          0x30: 50 00 00 00 00 00 00 00 00 00 00 78 00 00 00 00

Slot database information:
        Flags: 0x4      Insertion time: 0xFAC (17:24:40 ago)
Slot 7:
        EEPROM format version 1
        Route/Switch Processor 2, HW rev 1.0, board revision A0
        Serial number: 00000001  Part number: 00-0000-01
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 1C 01 00 00 00 00 01 00 00 00 01 00 00 00 00
          0x30: 50 00 00 00 00 00 00 00 00 00 00 78 00 00 00 00
.
.
.
        PA Bay 0 Information:
                Mueslix Serial PA, 8 ports
                EEPROM format version 1
                HW rev FF.FF, Board revision UNKNOWN
                Serial number: 4294967295  Part number: 255-65535-255
```

```
PA Bay 1 Information:
        Fast-Serial PA, 4 ports
        EEPROM format version 1
        HW rev 1.0, Board revision A0
        Serial number: 02024473  Part number: 73-1389-05
```

Catalyst 6000 Family FlexWAN Module

Following is an example of the **show diag** command that shows a PA-8T-V.35 on a Catalyst 6000 family FlexWAN module:

```
Router# show diag

(display text omitted)

Slot 8: Logical_index 17
     Board is analyzed ipc ready FlexWAN controller

     Slot database information:
     Flags: 0x2004Insertion time: unknown

     CWAN Controller Memory Size: Unknown

     PA Bay 1 Information:
          Mx Serial PA, 8 ports
          EEPROM format version 0
          HW rev 0.00, Board revision UNKNOWN
          Serial number: 00000000  Part number: 00-0000-00
```

Cisco 7200 Series, Cisco 7100 Series, Cisco uBR7200 Series, and Cisco 7401ASR Routers

Following is an example of the **show diag** *slot* command that shows a PA-8T-V.35 in port adapter slot 1 of a Cisco 7200 series router:

```
Router# show diag 1

Slot 1:
Mueslix serial (V.35) port adapter, 8 ports
Port adapter is analyzed
Port adapter insertion time 2d09h ago
Hardware revision 255.255               Board revision UNKNOWN
Serial number     4294967295    Part number    255-65535-255
Test history      0xFF          RMA number     255-255-255
EEPROM format version 1
EEPROM contents (hex):
0x20: 01 0D 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
```

Cisco 7301 Routers

Note Input/output data for the console port, auxiliary port, Gigabit Ethernet ports, and CompactFlash Disk are listed in the output of the **show c7300** command, rather than in the output of the **show diag** command. Use the **show diag** command for port adapter information.

```
Router# sh diag
```

```
Slot 1:
        POS Single Width, Multi Mode Port adapter, 1 port
        Port adapter is analyzed
        Port adapter insertion time 01:38:29 ago
        EEPROM contents at hardware discovery:
        Hardware revision 2.2           Board revision A0
        Serial number     28672741      Part number    73-3192-06
        FRU Part Number:PA-POS-OC3MM=

        Test history      0x0           RMA number     00-00-00
        EEPROM format version 1
        EEPROM contents (hex):
          0x20:01 96 02 02 01 B5 82 E5 49 0C 78 06 00 00 00 00
          0x30:50 00 00 00 02 08 19 00 00 00 FF FF FF FF FF FF
```

VIP in Cisco 7000 Series and Cisco 7500 Series Routers

Following is an example of the **show diag** *slot* command that shows a PA-8T-V.35 in port adapter slot 0 on a VIP in interface processor slot 9:

```
Router# show diag 9
Slot 9:
        Physical slot 9, ~physical slot 0x7, logical slot 8, CBus 0
        Microcode Status 0xC
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: Console I/O
        EEPROM format version 1
        VIP controller, HW rev 2.3, board revision UNKNOWN
        Serial number: 03513619  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 9D 13 49 06 94 03 00 00 00 00
          0x30: 06 3D 00 2A 1A 00 00 00 00 00 00 00 00 00 00 00

        Slot database information:
        Flags: 0x4      Insertion time: 0x12A0 (08:56:58 ago)

        Controller Memory Size: 8 MBytes

        PA Bay 0 Information:
                Mueslix Serial PA, 8 ports
                EEPROM format version 1
                HW rev FF.FF, Board revision UNKNOWN
                Serial number: 4294967295  Part number: 255-65535-255

        PA Bay 1 Information:
                Fast-Serial PA, 4 ports
                EEPROM format version 1
                HW rev 1.0, Board revision A0
                Serial number: 02024473  Part number: 73-1389-05
```

Using the show interfaces Commands

The **show interfaces** command displays status information (including the physical slot and interface address) for the interfaces you specify. This section provides output examples for some of the supported platforms; all of the examples specify serial interfaces.

For complete descriptions of interface subcommands and the configuration options available for Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7100 series, Cisco 7200, Cisco uBR7200 series, Cisco 7301 routers, Cisco 7401ASR router, and VIP interfaces, refer to the publications listed in the "Related Documentation" section on page iv.

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.

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches

In these examples, the serial interfaces are in port adapter slot 1; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
    Hardware is cxBus Serial
  Internet address is 10.0.0.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)

Router# show interfaces serial 1/1
Serial1/1 is up, line protocol is up
    Hardware is cxBus Serial
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)
```

Catalyst 6000 Family FlexWAN Module

In these examples, the serial interfaces are on a port adapter in port adapter bay 1 of a Catalyst 6000 family FlexWAN module in module slot 8; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 8/1/0
Serial8/1/0 is administratively down, line protocol is down
  Hardware is Serial
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
(display text omitted)

Router# show interfaces serial 8/1/1
Serial8/1/1 is administratively down, line protocol is down
  Hardware is Serial
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
(display text omitted)

Router# show interfaces serial 8/1/2
Serial8/1/2 is administratively down, line protocol is down
  Hardware is Serial
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
(display text omitted)
```

Cisco 7200 Series, Cisco 7100 Series, Cisco uBR7200 Series, and Cisco 7401ASR Routers

The following example of the **show interfaces serial** *slot/port* command shows all of the information specific to the first PA-8T-V.35 interface port (interface port 0) in port adapter slot 1:

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M8T-V.35
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output 1d17h, output hang never
  Last clearing of "show interface" counters never
  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 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
24 packets output, 5137 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions     DCD=down  DSR=down  DTR=down  RTS=down  CTS=down
```

Cisco 7301 Router

Following is an example of the **show interfaces** command for Cisco 7301 routers. Most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
outer# show interfaces
GigabitEthernet0/0 is up, line protocol is up
  Hardware is BCM1250 Internal MAC, address is 0005.dd2c.7c1b (bia 0005.dd2c.7c1b)
  Internet address is 10.1.3.153/16
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Half-duplex, 100Mb/s, media type is RJ45
  output flow-control is off, input flow-control is off
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:01, output 00:00:07, output hang never
  Last clearing of "show interface" counters 19:00:50
  Input queue:0/75/63658/0 (size/max/drops/flushes); Total output drops:0

(display text omitted)

GigabitEthernet0/1 is up, line protocol is up
  Hardware is BCM1250 Internal MAC, address is 0005.dd2c.7c1a (bia 0005.dd2c.7c1a)
  Internet address is 192.18.1.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 5/255, rxload 6/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, link type is autonegotiation, media type is SX
  output flow-control is off, input flow-control is off
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 18:56:46, output 00:00:09, output hang never
  Last clearing of "show interface" counters 19:00:52
  Input queue:0/75/16176489/0 (size/max/drops/flushes); Total output drops:0

(display text omitted)
```

```
GigabitEthernet0/2 is up, line protocol is up
  Hardware is BCM1250 Internal MAC, address is 0005.dd2c.7c19 (bia 0005.dd2c.7c19)
  Internet address is 1.1.1.1/24
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 5/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, link type is autonegotiation, media type is SX
  output flow-control is off, input flow-control is off
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:04:42, output 00:00:01, output hang never
  Last clearing of "show interface" counters 19:00:54
  Input queue:0/75/22087/0 (size/max/drops/flushes); Total output drops:0

(display text omitted)
```

VIP in Cisco 7000 Series and Cisco 7500 Series Routers

In these examples, the eight serial interfaces (0–7) are in chassis slot 3, in port adapter slot 1; also, most of the status information for each interface is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router# show interfaces serial 3/1/0
Serial3/1/0 is up, line protocol is up
    Hardware is cyBus Serial
  Internet address is 10.0.0.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)

Router# show interfaces serial 3/1/1
Serial3/1/1 is up, line protocol is up
    Hardware is cyBus Serial
  Internet address is 10.0.0.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)

Router# show interfaces serial 3/1/2
Serial3/1/2 is up, line protocol is up
    Hardware is cyBus Serial
  Internet address is 10.0.0.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)

Router# show interfaces serial 3/1/3
Serial3/1/3 is up, line protocol is up
    Hardware is cyBus Serial
  Internet address is 10.0.0.3
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted)
```

The following example of the **show interfaces serial** *slot/port-adapter/port* command shows all of the information specific to the first PA-8T-V.35 interface port (interface port 0) in chassis slot 3, port adapter slot 1:

```
Router# show interfaces serial 3/1/0
Serial3/1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.0
```

```
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d18h, output 00:00:54, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
16 packets input, 1620 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 1 ignored, 0 abort
     3995 packets output, 1147800 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
     RTS up, CTS up, DTR up, DCD up, DSR up
```

Using the ping Command to Verify Network Connectivity

Using the **ping** command, you can verify that an interface port is functioning properly. This section provides brief descriptions of this command. Refer to the publications listed in the "Related Documentation" section on page iv 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 command 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 that the connection failed.

Following is an example of a successful **ping** command to a remote server with the 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.

Proceed to the next section, "Using loopback Commands," to finish checking network connectivity.

Using loopback Commands

The loopback test allows you to detect and isolate equipment malfunctions by testing the connection between the PA-8T-V.35 interface and a remote device such as a modem or a CSU or DSU. The **loopback** subcommand places an interface in loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device or interface cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or interface cable in the path of the loopback test.

Note You must configure a clock rate on the port *before* performing a loopback test. However, if no cable is attached to the port, the port is administratively up, and the port is in loopback mode. You do not have to configure a clock rate on the port *before* performing a loopback test.

Depending on the mode of the port, entering the **loopback** command checks the following path:

- When no interface cable is attached to the PA-8T-V.35 interface, or if a DCE cable is attached to a port that is configured as line protocol up, the **loopback** command tests the path between the network processing engine and the interface port only (without leaving the network processing engine and port adapter).
- When a DTE cable is attached to the port, the **loopback** command tests the path between the network processing engine and the near (network processing engine) side of the DSU or modem to test the PA-8T-V.35 interface and interface cable.