C H A P T E R **4**

Configuring the T3 Mode

To continue your Cisco PA-T3/E3-EC port adapter installation, you must configure the PA-T3/E3-EC 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:

Upgrading the Field-Programmable Device Before Configuring the T3 Mode

Before you can configure the T3 mode, you must upgrade the field-programmable device (FPD), if an upgrade is required. An FPD upgrade requirement message appears when the hardware is installed and it is recognized. The FPD upgrade is first available in Cisco IOS Release 12.4(15)T and is available in future releases of Cisco IOS Release 12.4T.

You can perform the upgrade automatically or manually. The automatic upgrade method is preferred.

See the *Field-Programmable Device Upgrades* document for complete information at http://www.cisco.com/en/US/docs/routers/7200/configuration/feature_guides/fpd.html

Use the following FPD packages for your product:

- c7200p-fpd-pkg for NPE-G2
- c7301-fpd-pkg for Cisco 7301
- c7200-fpd-pkg for NPE-G1 and NPE-400

To upgrade the FPD automatically, follow these instructions:

Step 1   At the command prompt, enter the following command:

```
Router(config)# upgrade fpd auto
```

The following is example text of what is displayed:

```
Router(config)# upgrade fpd path ?
bootflash: Locate FPD image package from bootflash:
disk2: Locate FPD image package from disk2:
ftp: Locate FPD image package from ftp:
http: Locate FPD image package from http:
https: Locate FPD image package from https:
pram: Locate FPD image package from pram:
rcp: Locate FPD image package from rcp:
scp: Locate FPD image package from scp:
tftp: Locate FPD image package from tftp:
Router(config)# upgrade fpd path tftp://0.0.0.0/biff
```

Step 2   Reload the router or do a OIR of the port adapter with the FPD upgrade image at the /tftpboot/xxxxx location, or place it in some other location such as mentioned in the example.

To manually upgrade the FPD, use the following CLI:

```
Router# upgrade hw-module slot slotno fpd file tftp://0.0.0.0/biff/[c7200p-fpd-pkg |
c7301-fpd-pkg |  c7200-fpd-pkg]
```

See the *Field-Programmable Device Upgrades* document for complete information at
http://www.cisco.com/en/US/docs/routers/7200/configuration/feature_guides/fpd.html

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#
```

Replacing an Existing Port Adapter

Before you remove or replace a port adapter, use the **shutdown** command to disable the port adapter to prevent anomalies when you remove and reinstall the 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 4-2 for instructions.)

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

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

Step 3   Shut down the T3 controller on the PA-T3/E3-EC with the **shutdown** command.

This command sends a DS3 idle signal toward the network. You can bring the T3 controller back up with the **no shutdown** controller command.

The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

```
Router(config)# interface serial 1/0
Router(config-controller)# shutdown

Router(config)# interface serial 1/1
Router(config-controller)# shutdown
```

> **Note**   Both T3 ports of the PA-T3/E3-EC should be shut down before removing the port adapter.

Step 4   Verify that the two T3 ports are now shut down using the **show controller T3** command.

The following example is for a PA-T3/E3-EC in port adapter slot 6 of a Cisco 7200 VXR router:

```
Router(config-controller)# end
Router# interface serial 6/0
T3 6/0 is administratively down.

Router# interface serial 6/1
6/1 is administratively down.
```

Step 5   Save the shutdown configuration to nonvolatile memory.

```
Router# copy running-config startup-config
```

Step 6   Replace the port adapter in the slot. See the "Removing and Installing Port Adapters" section on page 3-1 for more information.

Step 7   Re-enable the port adapter by doing the following:

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

    b.   Repeat Step 4 to verify that the interfaces are in the correct state and no longer shut down. Use the **show controller T3** command.

   c. Repeat Step 5 to write the new configuration to memory. Use the **copy running-config startup-config** command.

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

Configuring the Card Type

Use the **card type** command to configure or change the card type to T3 or E3 when the card is first inserted into the router. You must use this command before you can proceed with any other configuration tasks.

To enable the card type, issue the command **card type** {**t3** | **e3**} *slot*

Note If you change the card type, you must reboot the router for the configuration to take effect.

Configuring an Unchannelized T3 Link

If you installed a new PA-T3/E3-EC or if you want to change the configuration of an existing PA-T3/E3-EC link, you must enter the privileged level of the EXEC command interpreter and then use the **configure** command. If you replace a PA-T3/E3-EC that was previously configured, the system recognizes the new PA-T3/E3-EC link and brings it up in its existing configuration.

After you verify that the new PA-T3/E3-EC is installed correctly (the ENABLED LED goes on), use the privileged-level **configure** command to configure the new interface. Be prepared with the information you need, such as the following:

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

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

Setting the Framing Type for the Serial Interface

In interface configuration mode, specify T3 framing by entering the **framing** {**c-bit** | **m13**} configuration command where:

- **c-bit** is —c-bit parity DS3 framing.
- **m13 is** —M13 Multiplex DS3 framing.

Use the **no** form of this command to return to the default, c-bit framing.

Specifying the Cable Length for the Serial Interface

At the prompt, specify the cable length using the **cablelength** *feet* interface command**,** where:

- *feet* is a numeral from 0 to 450.

- The default value is 10 feet.

An example follows:

```
Router(config-if)# cablelength 40
```

Note For the **cablelength** *feet* command, user-specified T3 cable lengths are structured into ranges: 0–49 and 50–450 to represent short and long cables.

If the numerical value entered by the user falls within the lower range, then the PA-T3/E3-EC T3 port is set for short cable output levels. If the value falls into higher range, the long cable output levels will be used.

In the preceding example, a cable length of 40 is specified, which means that the 0–49 range is used. If you change the cable length to 45, then the 0–49 range still applies. Further, if you specify a cable length of 100 or 200, the 50–450 range applies in both cases. Only moving from one range (0–49) to the other range (50–450) has an effect. The actual cable-length number you enter is stored in the configuration file. It is recommended that the actual cable length be entered to ensure future compatibility.

Setting the Clock Source for the Serial Interface

At the prompt, set the internal or line clock source for the selected T3 controller with the **clock source** {**line** | **internal**} interface command, where:

- **line** selects a network clock source.
- **internal** selects an internal clock source.

The default is clock source internal.

Examples follow:

- Instruct the PA-T3/E3-EC to use a line clock source.

  The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

  ```
  Router(config)# interface serial 1/0
  Router(config-if)# clock source line
  ```

- Instruct the PA-T3/E3-EC to use an internal clock source.

  The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

  ```
  Router(config)# interface serial 1/0
  Router(config-if)# clock source internal
  ```

Configuring MDL Messages for the Serial Interface

You can configure maintenance data link (MDL) messages (which are defined in the ANSI T1.107a-1990 specification) on the PA-T3/E3-EC.

Note MDL messages are only supported when the T3 framing is set for c-bit parity. (See the "Setting the Framing Type for the Serial Interface" section on page 4-4.)

To configure MDL messages, use the **mdl** {**transmit** {**path** | **idle-signal** | **test-signal**} | **string** {**eic** | **lic** | **fic** | **unit** | **pfi** | **port** | **generator**} *string*} interface commands, where :

- **eic** is the equipment identification code (up to 10 characters).

- **lic** is the location identification code (up to 11 characters).
- **fic** is the frame identification code (up to 10 characters).
- **unit** is the unit identification code (up to 6 characters).
- **pfi** is the facility identification code to send in the MDL path message (up to 38 characters).
- **port** is the equipment port, which initiates the idle signal, to send in the MDL idle signal message (up to 38 characters).
- **generator** is the generator number to send in the MDL test signal message (up to 38 characters).

Use the **no** form of this command to remove MDL messages. The default is that no MDL message is configured.

Examples of MDL Message Configuration

Examples of configuring MDL messages follow:

- Enter interface configuration mode first.

  The example that follows is for a port adapter in slot 1 ofa Cisco 7200 VXR router:

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

- Enable the MDL path message transmission as follows:

  ```
  Router(config-controller)# mdl transmit path
  ```

- Enable the MDL idle signal message transmission as follows:

  ```
  Router(config-if)# mdl transmit idle-signal
  ```

- Enable the MDL test signal message transmission as follows:

  ```
  Router(config-if)# mdl transmit test-signal
  ```

- Enter the equipment identification code as follows:

  ```
  Router(config-if)# mdl string eic router A
  ```

- Enter the location identification code as follows:

  ```
  Router(config-if)# mdl string lic tst network
  ```

- Enter the frame identification code as follows:

  ```
  Router(config-if)# mdl string fic building b
  ```

- Enter the unit identification code as follows:

  ```
  Router(config-if)# mdl string unit abc
  ```

- Enter the facility identification code to send in the MDL path message as follows:

  ```
  Router(config-if)# mdl string pfi string
  ```

- Enter the port number to send in the MDL idle signal message as follows:

    ```
    Router(config-if)# mdl string port string
    ```

- Enter the generator number to send in the MDL test signal message as follows:

    ```
    Router(config-if)# mdl string generator string
    ```

Setting the DSU Mode for the Serial Interface

In interface configuration mode, define the digital service unit (DSU) interoperability mode by entering the **dsu mode [0 | 1 | 2 | 3 | 4]** configuration command, as in the following example:

```
Router(config-if)# dsu mode 1
```

Use the **no** form of this command to return to the default, 0.

The local DSU mode must match the remote DSU or T3 port configuration. For example, if an ADC Kentrox DSU is at the remote end of the T3 link, then the local T3 port must be configured for mode 1.

You need to know what type of DSU is at the remote T3 end to find out if it interoperates with the PA-T3/E3-EC. Specify mode 0 for connection from a PA-T3/E3-EC to another PA-T3/E3-EC or a Digital Link DSU (DL3100). Specify mode 1 for connection from a PA-T3/E3-EC to a Kentrox DSU. Specify mode 2 for connection from a PA-T3/E3-EC to a Larscom DSU. See Table 4-1 for a list of DSUs and their corresponding bandwidth ranges.

Also see the Table 1-2 on page 1-3 for information regarding DSU feature compatibilities.

Table 4-1   DSU Mode Bandwidth Ranges

Mode	DSU	Bandwidth Range
0	PA-T3/E3-EC, PA-2T3/E3-EC Other Cisco subrate T3 equipment	22–44210 kbps
0	Digital Link 3100	300–44210 kbps
1	ADC Kentrox T3/E3 IDSU	1500–35000, 44210 kbps
2	Larscom Access T45	3100–44210 kbps
3	Adtran T3SU 300	75–44210 kbps
4	Verilink HDM 2182	1500–44210 kbps

Note   If the far-end DSU has more than one DTE (HSSI) port, connect to and configure only DTE#1. See Caution below for Verilink DSUs.

Caution   Always connect to and configure HSSI port B on the Verilink HDM 2182. Port A is not supported by the PA-T3/E3-EC.

Caution   The PA-T3/E3-EC does not support the Kentrox DSU bandwidth setting of 1.0 mbps. The Kentrox DSU speed must be set to 1.5 mbps or greater.

⚠

Caution   For all DSU modes, the DSU must be configured for the same transmit and receive speeds. Asymmetrical transmit and receive speeds are not supported.

Setting the Bandwidth for the Serial Interface

In interface configuration mode, set the bandwidth to be used by the serial interface on the T3 link by entering the **dsu bandwidth** *bandwidth* configuration command, as in the following example:

```
Router(config-if)# dsu bandwidth 16000
```

The allowable bandwidth range is 1 to 44210 kbps. Use the **no** form of this command to return to the default, 44210.

The local DSU bandwidth value must match the remote DSU or T3 port bandwidth exactly. For example, if you set the DSU bandwidth to 16000 on the local port, you must do the same on the remote DSU or T3 port.

Setting Scrambling for the Serial Interface

In interface configuration mode, enable serial interface scrambling by entering the **scramble** configuration command, as in the following example:

```
Router(config-if)# scramble
```

Use the **no** form of this command to restore the default value, disabled.

The local port configuration must match the remote DSU or T3 port configuration. For example, if you enable scrambling on the local port, you must do the same on the remote DSU or T3 port.

Configuring Loopback Mode for the Serial Interface

With loopbacks, you can detect and isolate equipment malfunctions by testing the connection between the PA-T3/E3-EC interface and a remote device such as a CSU/DSU. Remote loopback sends a command to loop the T3 line at the far end. It can be used to diagnose problems with cables from the port adapter to the switching office. Network loopback loops the PA-T3/E3-EC T3 port back to the network, allowing the remote end to test the connection to the PA-T3/E3-EC.

Local loopback loops the PA-T3/E3-EC T3 port back to itself, allowing it to be tested in isolation from the T3 cables and remote T3 equipment.

The **loopback** command places an interface in loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device and cables. If the packets complete the loop, the connection is good.

The default is no loopback.

To return the serial interface to its default unlooped condition, use the **no** form of the command.

Table 4-2 provides examples of the **loopback** {**local** | **network** {**line** | **payload**} | **remote** {**line** | **payload**} command. You can configure the serial interface for loopback modes using the **loopback** [**local** | **network** | **remote**] interface command.

Table 4-2   Using loopback Commands

loopback local	Sets the interface into local loopback mode. Local loopback loops the router output data back toward the router at the framer.	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback local**`
loopback network line	Sets the interface into network line loopback mode. Network line loopback loops the data back toward the network (before the framer).	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback network line**`
loopback network payload	Sets the interface into network payload loopback mode. Network payload loopback loops just the payload data back toward the network at the T3 framer.	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback network payload**`
loopback remote[1]	Sends a command to the remote T3 device instructing it to loop itself back toward the network (before the framer at the remote T3 device).	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback remote**`
loopback remote line[2]	Sends a command to the remote Kentrox DSU to loop itself back toward the network before the framer.	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback remote line**`
loopback remote payload[2]	Sends a command to the remote Kentrox DSU to loop only the payload after the framer back toward the network.	`Router(config)# **interface serial 10/0/0**` `Router(config-if)# **loopback remote payload**`

1. Remote loopback mode works with c-bit framing only. The other loopback modes listed above work with c-bit and M13 framing. Refer to the "Setting the Framing Type for the Serial Interface" section on page 4-4 for information on configuring c-bit framing.

2. These loopback commands are only available when the DSU mode is set to 1, Kentrox mode.

Shutting Down the Serial interface

You can shut down the serial interface on the PA-T3/E3-EC with the **shutdown** controller command.

This command sends a DS3 idle signal toward the network. You can bring the serial interface back up with the **no shutdown** command.

The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

```
Router(config)# interface serial 1/0
Router(config-controller)# shutdown
```

Configuring a BER Test on the Serial Interface

Bit error rate test (BERT) circuitry is built into the PA-T3/E3-EC. With BER tests, you can test cable and signal problems in the field.

There are two categories of test patterns that can be generated by the onboard BER test circuitry: pseudorandom and repetitive. The former test patterns are polynomial-based numbers and conform to the CCITT/ITU O.151 and O.153 specifications; the latter test patterns are zeros or ones, or alternating zeros and ones.

A list of the available test patterns follows:

- Pseudorandom test patterns:
  - 2^{15} (per CCITT/ITU O.151)
  - 2^{20} (per CCITT/ITU O.151 non-QRSS)
  - 2^{23} (per CCITT/ITU O.151)
- Repetitive test patterns:
  - All zeros (0s)
  - All ones (1s)
  - Alternating zeros (0s) and ones (1s)

Both the total number of error bits received and the total number of bits received are available for analysis. You can set the testing period from 1 minute to 14,400 minutes (240 hours), and you can also retrieve the error statistics anytime during the BER test.

When running a BER test, your system expects to receive the same pattern that it is transmitting. To accomplish this, two common options are available:

- Use a loopback somewhere in the link or network.
- Configure remote testing equipment to transmit the same BER test pattern at the same time.

Sending a BER Test Pattern on the T3 Line

You can send a BERT pattern on the T3 line with the **bert pattern** *pattern* **interval** *time* command in controller configuration mode, where:

- *pattern* is one of the following:
    - 0s, repetitive test pattern of all zeros (as 00000...)
    - 1s, repetitive test pattern of all ones (as 11111...)
    - 2^15, pseudorandom O.151 test pattern (32,768 bits long)
    - 2^20, pseudorandom O.151 non-QRSS test pattern (1,048,575 bits long)
    - 2^23, pseudorandom O.151 test pattern (8,388,607 bits long)
    - alt-0-1, repetitive alternating test pattern of zeros (0s) and ones (1s) (as 01010101)
- *time* is 1 to 14400 minutes.

Examples follow:

- Send a BERT pseudorandom pattern of 2^23 for 5 minutes.

    The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

    ```
    Router(config)# interface serial 1/0
    Router(config-controller)# bert pattern 2^23 interval 5
    ```

- Send a repetitive pattern of all ones for 14400 minutes (240 hours).

    The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

    ```
    Router(config)# interface esrial 1/0
    Router(config-controller)# bert pattern 1s interval 14400
    ```

Note   You can terminate a BER test during the specified test period with the **no bert** command.

Viewing the Results of a BER Test

You can view the results of a BER test using the **show controllers T3** *slot/t3-port* controller command.

You can view the results of a BER test at the following times:

- After you terminate the test using the **no bert** command
- After the test runs completely
- Anytime during the test (in real time)

The example that follows is for a port adapter in slot 5 of a Cisco 7200 VXR router:

```
Router# show controllers serial 6/0

G2-CC#sh controllers ser 6/0
Framing is c-bit, Clock Source is Line
Bandwidth limit is 44210, DSU mode 0, Cable length is 0
rx FEBE since last clear counter 0, since reset 0
Data in current interval (167 seconds elapsed):
4 Line Code Violations, 4 P-bit Coding Violation
2 C-bit Coding Violation
2 P-bit Err Secs, 0 P-bit Sev Err Secs
2 Sev Err Framing Secs, 2 Unavailable Secs
2 Line Errored Secs, 1 C-bit Errored Secs, 0 C-bit Sev Err Secs
Receiver has no alarms.
```

```
Configured not to accept remote request to reset subrate
BERT test result (running)
Test Pattern : All 1's, Status : Sync, Sync Detected : 1
Interval : 1 minute(s), Time Remain : 1 minute(s)
Bit Errors (since BERT started): 0 bits,
Bits Received (since BERT started): 264 Mbits
Bit Errors (since last sync): 0 bits
Bits Received (since last sync): 264 Mbits
```

The following table explains the output of the preceding command, line by line:

Output Display Line	Explanation
`BERT test result (running)`	This line indicates the current state of the test. In this case, "running" indicates that the BER test is still in process. After a test is completed, "done" is displayed.
`Test Pattern : 2^15, Status : Sync, Sync Detected : 1`	This line indicates the test pattern you selected for the test (2^15), the current synchronization state (sync), and the number of times synchronization has been detected during this test (1).
`Interval : 5 minute(s), Time Remain : 5 minute(s)`	This line indicates the time the test takes to run and the time remaining for the test to run.
`Interval : 5 minute(s), Time Remain : 2 minute(s) (unable to complete)`	For a BER test that you terminate, this line indicates the time the test would have taken to run and the time remaining for the test to run had you not terminated it; "unable to complete" signifies that you interrupted the test.

`Bit Errors(since BERT started): 6 bits,`
 `Bits Received(since BERT started): 8113 Kbits`
 `Bit Errors(since last sync): 6 bits`
 `Bits Received(since last sync): 8113 Kbits`
	These four lines show the bit errors that have been detected versus the total number of test bits that have been received since the test started and since the last synchronization was detected. Bits and errors are only counted when the test status is "sync".

Terminating a BER Test

You can terminate a BER test with the **no bert** controller command.

The following example terminates the BER test running on T3 line 0.

The example that follows is for a port adapter in slot 1 of a Cisco 7200 VXR router:

```
Router(config)# interface serial 1/0
Router(config-controller)# no bert
```

To check your configurations using **show** commands, proceed to the "Checking the Configuration" section on page 4-14; otherwise, proceed to the "Performing a Basic Serial Interface Configuration" section on page 4-13.

Performing a Basic Serial Interface Configuration

Following are instructions for a basic configuration: enabling an interface and specifying IP routing. You might also need to enter other configuration commands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration commands 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 commands, as follows:

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

Step 2   Specify the first interface to configure by entering the **interface serial** command, followed by the interface address of the interface you plan to configure. See the "Port Adapter Slot Locations on the Supported Platforms" section on page 1-5 and the "Identifying Interface Addresses" section on page 1-7.

This example is for the serial interface of T3 port 0 in port adapter slot 6 of a 7200 router.

```
Router(config)# interface serial 6/0
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** command, as in the following example:

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

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

Step 5   Re enable the interfaces using the **no shutdown** command. (See the "Replacing an Existing Port Adapter" section on page 4-3.)

Step 6   Configure all additional port adapter interfaces as required.

Step 7   After including all of the configuration commands 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 8   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.

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

Table 4-3 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-T3/E3-EC 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 4-3 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*	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**
For Cisco 7200 VXR routers: **show interfaces serial** *port-adapter/t3-port*	Displays status information about a specific type of interface	Router# **show interfaces serial 3/1/**
For Cisco 7201 and Cisco 7301 routers: **show interfaces serial** *port-adapter/t3-port*	Displays status information about a specific type of interface	Router# **show interfaces serial 3/1**

Table 4-3   Using show Commands (continued)

Command	Function	Example
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 display indicates 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:

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command to Verify Network Connectivity" section on page 4-20 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.

Following is an example of the **show version** command from a Cisco 7200 VXR router with the PA-T3/E3-EC:

```
Router# show version
Cisco IOS Software, 7200 Software (C7200P-JS-M), Experimental Version 12.4(xxx)
[biff-cf-CSCsf09954 102]
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Thu 24-Aug-06 22:55 by biff
ROM: System Bootstrap, Version 12.4(4r)XD3, RELEASE SOFTWARE (fc1)
G2_feature1 uptime is 2 days, 22 hours, 14 minutes
System returned to ROM by power-on
System restarted at 23:04:08 UTC Sun May 21 2000
System image file is "disk2:c7200p-js-mz.DTHO20060825"
Cisco 7206VXR (NPE-G2) processor (revision B) with 917504K/65536K bytes of memory.
Processor board ID 777888888
MPC7448 CPU at 1666Mhz, Implementation 0, Rev 2.1
6 slot VXR midplane, Version 2.9
Last reset from power-on
PCI bus mb1 (Slots 1, 3 and 5) has a capacity of 600 bandwidth points.
```

```
Current configuration on bus mb1 has a total of 450 bandwidth points.
This configuration is within the PCI bus capacity and is supported.
PCI bus mb2 (Slots 2, 4 and 6) has a capacity of 600 bandwidth points.
Current configuration on bus mb2 has a total of 180 bandwidth points.
This configuration is within the PCI bus capacity and is supported.
Please refer to the following document "Cisco 7200 Series Port Adaptor
Hardware Configuration Guidelines" on Cisco.com <http://www.cisco.com>
for c7200 bandwidth points oversubscription and usage guidelines.
1 FastEthernet interface
3 Gigabit Ethernet interfaces
3 Serial interfaces
4 Channelized T3 ports
2 Subrate T3/E3 ports
2045K bytes of NVRAM.
250368K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).
65536K bytes of Flash internal SIMM (Sector size 512K).
Configuration register is 0x100 (will be 0x0 at next reload)
G2_feature1#
```

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
```

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 Cisco 7200 VXR router.

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.

Following is an example of the **show diag** slot command that shows a PA-2T3/E3-EC port adapter in slot 2 of a Cisco 7200 VXR router:

```
Router#sh diag 2
Slot 2:
        Enhanced 2 port clear channel Port adapter, 2 ports
        Port adapter is analyzed
        Port adapter insertion time 22:01:44 ago
        EEPROM contents at hardware discovery:
        PCB Serial Number       : JAE1223K71S
        Hardware Revision       : 1.2
        Part Number             : 73-10788-01
        Board Revision          : B0
        RMA Test History        : 00
        RMA Number              : 0-0-0-0
        RMA History             : 00
        Deviation Number        : 0
        Product (FRU) Number    : PA-2T3/E3-EC
        Version Identifier      : V01
        Top Assy. Part Number   : 68-2769-01
        CLEI Code               : COUIAKYCAA
        EEPROM format version 4
        EEPROM contents (hex):
          0x00: 04 FF C1 8B 4A 41 45 31 32 32 33 4B 37 31 53 40
          0x10: 05 46 41 01 02 82 49 2A 24 01 42 42 30 03 00 81
          0x20: 00 00 00 00 04 00 88 00 00 00 00 CB 94 50 41 2D
          0x30: 32 54 33 2F 45 33 2D 45 43 20 20 20 20 20 20 20
          0x40: 20 89 56 30 31 20 D9 03 C1 40 CB 87 44 0A D1 01
          0x50: C6 8A 43 4F 55 49 41 4B 59 43 41 41 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
```

Using the show interfaces Command

The **show interfaces serial** command displays status information (including the physical slot and interface address) for the interfaces you specify.

For complete descriptions of interface commands and the configuration options available for Cisco 7200 VXR routers, refer to the publications listed in the .

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.

Following is an example of the **show interfaces serial** command that shows a PA-T3/E3-EC in port adapter slot 4 of a Cisco 7200 VXR router:

```
Router# show interfaces serial 5/0

Serial5/0 is up, line protocol is up
```

```
Hardware is PA-MC-2T3-EC
MTU 4470 bytes, BW 44210 Kbit/sec, DLY 200 usec,
   reliability 255/255, txload 1/255, rxload 1/255
Encapsulation FRAME-RELAY, crc 16, loopback not set
Keepalive set (5 sec)
LMI enq sent  0, LMI stat recvd 0, LMI upd recvd 0
LMI enq recvd 177, LMI stat sent  177, LMI upd sent  0, DCE LMI up
LMI DLCI 1023  LMI type is CISCO  frame relay DCE
FR SVC disabled, LAPF state down
Broadcast queue 0/256, broadcasts sent/dropped 0/0, interface broadcasts 0
Last input 00:00:01, output never, output hang never
Last clearing of "show interface" counters 00:15:12
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 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   177 packets input, 2301 bytes, 0 no buffer
   Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
           0 parity
   185 input errors, 12 CRC, 101 frame, 0 overrun, 0 ignored, 72 abort
   177 packets output, 2301 bytes, 0 underruns
   0 output errors, 0 applique, 1 interface resets
   0 unknown protocol drops
   0 output buffer failures, 0 output buffers swapped out
   1 carrier transitions no alarm present
DSU mode 0, bandwidth 44210 Kbit, scramble 0, VC 0
```

Using the show controllers Command

You can display information for the T3 controller within a PA-T3/E3-EC in Cisco 7200 VXR routers with the **show controllers t3** *port-adapter/t3-port* [**brief** | **tabular**] command, where:

- **brief** displays a list of configurations only.

- **tabular** displays a list of configurations and MIB data in a tabular format.

Note   If you use the **show controllers T3** *port-adapter/t3port* command without either of the optional arguments (**brief** or **tabular**), all information is displayed for the T3 controller you specified; therefore, the resulting display output can be extensive.

If you use the **show controllers T3** command without specifying a port address (*port-adapter/t3port*), all information is displayed for all T3 port adapters in the router; therefore, the resulting display output can be extensive.

Following is an example of the **show controllers T3** command that shows a PA-T3/E3-EC in port adapter slot 4 of a Cisco 7200 VXR router:

```
Router# show controllers t3 5/0

T3 5/0 is up.
  Applique type is Subrate T3
  No alarms detected.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Line
  Equipment customer loopback
  Configured not to accept remote request to reset subrate
  Data in current interval (48 seconds elapsed):
     145 Line Code Violations, 5 P-bit Coding Violation
     3 C-bit Coding Violation, 1 P-bit Err Secs
     0 P-bit Severely Err Secs, 1 Severely Err Framing Secs
     0 Unavailable Secs, 1 Line Errored Secs
     1 C-bit Errored Secs, 0 C-bit Severely Errored Secs
     1 Severely Errored Line Secs
     1 Far-End Errored Secs, 1 Far-End Severely Errored Secs
     0 CP-bit Far-end Unavailable Secs
     0 Near-end path failures, 0 Far-end path failures
     0 Far-end code violations, 0 FERF Defect Secs
     0 AIS Defect Secs, 0 LOS Defect Secs
  Data in Interval 1:
     157 Line Code Violations, 17 P-bit Coding Violation
     12 C-bit Coding Violation, 4 P-bit Err Secs
     0 P-bit Severely Err Secs, 4 Severely Err Framing Secs
     2 Unavailable Secs, 2 Line Errored Secs
     3 C-bit Errored Secs, 0 C-bit Severely Errored Secs
     1 Severely Errored Line Secs
     4 Far-End Errored Secs, 1 Far-End Severely Errored Secs
     11 CP-bit Far-end Unavailable Secs
     0 Near-end path failures, 1 Far-end path failures
     12 Far-end code violations, 11 FERF Defect Secs
     0 AIS Defect Secs, 0 LOS Defect Secs
  Total Data (last 1 15 minute intervals):
     157 Line Code Violations, 17 P-bit Coding Violation,
     12 C-bit Coding Violation, 4 P-bit Err Secs,
     0 P-bit Severely Err Secs, 4 Severely Err Framing Secs,
     2 Unavailable Secs, 2 Line Errored Secs,
     3 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

```
1 Severely Errored Line Secs
4 Far-End Errored Secs, 1 Far-End Severely Errored Secs
11 CP-bit Far-end Unavailable Secs
0 Near-end path failures, 1 Far-end path failures
12 Far-end code violations, 11 FERF Defect Secs
0 AIS Defect Secs, 0 LOS Defect Secs
```

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 a brief description 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 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 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 Troubleshoot Network Problems," to finish checking network connectivity.

Using loopback Commands to Troubleshoot Network Problems

If you have difficulty with the PA-T3/E3-EC configuration or installation, you can troubleshoot the port adapter using the **loopback** command. Refer to the "Configuring Loopback Mode for the Serial Interface" section on page 4-8 for instructions on setting loopbacks.

If the **ping** command to the remote IP address failed, then use loopbacks to troubleshoot the T3 connection using the following steps:

Step 1   Use the **show controller T3** and **show interfaces serial** commands to confirm that the T3 controller, serial interface, and line protocol are up.

Step 2   Place the serial interface of the PA-T3/E3-EC in local loopback using the **loopback local** command.

Step 3   Repeat the ping command using the IP address of the local serial interface. Using the previous example where the remote server's IP address was 10.0.0.10, if the local IP address is 10.0.0.5, then use the command:

```
ping 10.0.0.5
```

If the ping is successful, proceed to Step 4. A failure indicates a configuration problem or a hardware problem with the PA-T3/E3-EC.

Step 4   Remove the local loop with the **no loopback** command and place the remote server or DSU in network loopback with the **loopback remote** command.

Note   The **loopback remote** command is only available when the framing is set to c-bit parity. If the framing is not set to c-bit parity, the remote server will have to be placed into network loopback by someone at the remote site.

Step 5   Repeat Step 3. If the ping is successful, then the PA-T3/E3-EC and the T3 link to the remote site is functioning correctly. The problem is probably in the remote DSU or server configuration or hardware. If the ping fails, then one of the following has a problem: the T3 link to the remote site, the remote server or DSU configuration, or the hardware .

Checking the Configuration