



## CHAPTER 5

# Configuring the Channelized Mode

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To continue your Cisco PA-MC-T3-EC port adapter installation, you must configure the PA-MC-T3-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, page 5-1](#)
- [PA-MC-T3-EC Hardware Accelerated Features and Restrictions, page 5-2](#)
- [Using the EXEC Command Interpreter, page 5-7](#)
- [Replacing an Existing Port Adapter, page 5-7](#)
- [Configuring a Channelized T3 Link, page 5-8](#)
- [Performing a Basic Serial Interface Configuration, page 5-24](#)
- [Checking the Configuration, page 5-25](#)

## 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](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](http://www.cisco.com/en/US/docs/routers/7200/configuration/feature_guides/fpd.html).

## PA-MC-T3-EC Hardware Accelerated Features and Restrictions

The Multilink PPP (MLPPP), Multilink Frame Relay (FRF.16), and Frame Relay Fragmentation (FRF.12) features are accelerated in hardware by default. The following information is in this section:

- [Using the show ppp multilink Command to Determine if MLPPP Is Hardware Accelerated, page 5-2](#)
- [Restrictions for MLP to Be in the Hardware Accelerated Mode, page 5-3](#)
- [Using the show frame-relay multilink Command to Determine if MLFR Is Hardware Accelerated, page 5-4](#)
- [Restrictions for MLFR to Be in the Hardware Accelerated Mode, page 5-5](#)
- [Using the show frame-relay fragment Command to Determine if Frame Relay Fragmentation Is Hardware Accelerated, page 5-6](#)
- [Restrictions for Frame Relay Fragmentation to Be in the Hardware Accelerated Mode, page 5-6](#)

### Using the show ppp multilink Command to Determine if MLPPP Is Hardware Accelerated

The **show ppp multilink** command provides information that the MLPPP is accelerated in hardware.

```

Router # show ppp multilink
Multilink27
  Bundle name: mu27
  Remote Endpoint Discriminator: [1] mu27
  Local Endpoint Discriminator: [1] mu27
  Bundle up for 18:26:12, total bandwidth 128, load 1/255
  Receive buffer limit 24000 bytes, frag timeout 1500 ms
  0 lost fragments, 0 reordered, 0 unassigned
  0 discarded, 0 lost received
  received sequence unavailable, 0x0 sent sequence
Multilink is hardware enabled
  Member links: 2 active, 0 inactive (max not set, min not set)
    Se1/0/27:0, since 18:26:12
    Se1/0/27:1, since 18:26:12

```

## Restrictions for MLP to Be in the Hardware Accelerated Mode

If the restrictions in this section are met, the Multilink PPP (MLP) bundle operates in hardware mode by default.

- The maximum supported member link bandwidth is T1. If a clear channel interface is made part of a Multilink bundle, the bundle will operate in software mode.
- All links in the bundle must be of equal bandwidth. Adding a link of unequal bandwidth causes the Multilink bundle to go into software mode.
- All links must be from the same port adapter. Adding any additional link from another port adapter causes the bundle to switch to software mode.
- A maximum of 12 links per bundle is supported. Adding any additional links to the bundle causes the Multilink bundle to go into software mode.
- Configuring **ppp multilink multiclass** MLP causes the Multilink bundle to go into software mode.
- Fragment sizes supported in the hardware mode are 128, 256, and 512 bytes. If different fragmentation sizes are configured, and if the bundle is in hardware mode, fragment size is adjusted to the nearest of the supported fragment sizes, and the hardware is programmed accordingly.
- The bundle will operate in software mode if MLPPP is configured using Virtual-Templates as described in the following link.

[http://cco/en/US/tech/tk713/tk507/technologies\\_configuration\\_example09186a00800a3e98.shtml](http://cco/en/US/tech/tk713/tk507/technologies_configuration_example09186a00800a3e98.shtml)

Use the **show ppp multilink** command to display fragmentation size if the fragment size has been configured.

```

Router # show ppp multilink

(display text omitted)

Fragment size in hardware 256
Member links: 2 active, 0 inactive (max not set, min not set)
  Se1/0/27:0, since 18:26:12
  Se1/0/27:1, since 18:26:12

```

- If interleaving is enabled, and no fragmentation has been configured, the fragment size is selected based on the link size displayed in **show ppp fragment**.

```

Router# show ppp fragment
(display text omitted)

Fragment size in hardware 256.
Member links: 1 active, 0 inactive (max not set, min not set)

```

Se3/0/11:0, since 1d20h, 480 weight, 472 frag size

- If interleaving is enabled, the bundle is in hardware mode only if there is only one link in the bundle and the fragment size configured (or selected) is 128 bytes and above. The bundle switches to software mode if any additional link is added or the fragment size that is configured or selected is less than 128 bytes.
- A maximum of 168 bundles per port adapter are supported in hardware mode. For calculating the maximum number of bundles in hardware mode, MLP and Multilink Frame Relay bundles in hardware mode are included, and the MLP bundles that have interleaving enabled and are in hardware mode are excluded. Configuring any additional bundle makes the bundle operating in software mode.
- Fragmentation counters on the transmit (TX) side are not available because the hardware does not support these counters.

## MLPPP/MLFR Scale Recommendations

Table 5-1 lists the recommendations to consider when you use PA-MC-T3-EC/PA-MC-2T3-EC to configure MLPPP/MLFR bundles on 7200 router:

**Table 5-1** MLPPP/MLFR Bundles Recommendations

Maximum MLPPP/MFR Bundles	Number of Links in the Bundle
56	2
28	4
14	8



### Note

The MLPPP/MFR bundles with links across different port adapters on the Cisco 7200 router are supported for backward compatibility. Cisco recommends that the MLPPP/MLFR bundles using PA-MC-T3-EC/ PA-MC-2T3-EC are from the same port adapter.

## Using the show frame-relay multilink Command to Determine if MLFR Is Hardware Accelerated

The **show frame-relay multilink** command provides information on whether or not the Multilink Frame Relay (FRF.16) bundle is in hardware mode.

```
Router# show frame-relay multilink
Bundle: MFR1, State = up, class = A, fragmentation disabled
  BID = MFR1
  MFR is hardware enabled
Bundle links:
  Serial1/0/23:0, HW state = up, link state = Up, LID = Serial1/0/23:0
  Serial1/0/22:0, HW state = up, link state = Up, LID = Serial1/0/22:0
```

## Restrictions for MLFR to Be in the Hardware Accelerated Mode

If the restrictions in this section are met, the Multilink Frame Relay (MLFR FRF.16) bundle operates in hardware mode by default.

- The maximum supported member link bandwidth is T1. If a clear channel interface is made part of a MLFR bundle, the bundle will operate in software mode.
- All links in the bundle must be of equal bandwidth. Adding a link of unequal bandwidth causes the MLFR bundle to go into software mode.
- All links must be from the same port adapter. Adding any additional links from a different port adapter causes the MLFR bundle to switch to software mode.
- A maximum of 12 links per bundle is supported. Adding any additional links to the bundle will cause the MLFR bundle to go into software mode.

- Transmit (TX) fragmentation with hardware-enabled MLFR is not supported.
- A maximum of 168 bundles per port adapter is supported in hardware mode. For calculating the maximum number of bundles in hardware mode, MLP and MLFR bundles in hardware mode are included, and the MLP bundles that have interleaving enabled and are in hardware mode are excluded. Configuring any additional bundle makes the bundle operate in software mode.

## Using the show frame-relay fragment Command to Determine if Frame Relay Fragmentation Is Hardware Accelerated

The **show frame-relay fragment** command provides information on whether Frame Relay Fragmentation (FRF.12) on a data-link connection identifier (DLCI) is enabled in hardware.

```
Router# show frame-relay fragment
interface          dlci frag-type  size  in-frag  out-frag  dropped-frag
Se1/0/28:0.1      200  end-to-end  256   Hardware FRF12:    No Counter Support
Se1/0/28:0.2      201  VoFR-cisco  300   129      2662      0
MF1                214  VoFR-cisco  300   112      112       0
```

## Restrictions for Frame Relay Fragmentation to Be in the Hardware Accelerated Mode

If the restrictions in this section are met, the Frame Relay Fragmentation (FRF.12) bundle operates in hardware mode by default.

- The hardware mode supports only three fragment sizes: 128, 256, and 512 bytes. If the user configures a different fragment size, the fragment size is adjusted to the supported fragment size.
- If the **vofr** command is configured on a data-link connection identifier (DLCI), FRF.12 goes into software mode, and is configured in software. Removing the **vofr** command again reconfigures the FRF.12 bundle to be in hardware mode.
- If the **frame-relay fragmentation voice-adaptive** command is configured on an interface, the FRF.12 bundles on all DLCIs on that interface switch to software mode. Removing the command again reconfigures the FRF.12 bundle to be in hardware mode.
- FRF.12 for MFR interfaces are always in software mode.
- The **frame-relay fragment <size> end-to-end** command is not supported on a MFR interface which is hardware enabled. An error message like below is generated by the router.
 

```
%MFR1 : is Hardware enabled.
% Use map-class for configuring frf.12 on this interface.
```
- If PPP over Frame Relay (PPPoFR) or Multilink PPP over Frame Relay (MLPoFR) is configured on any DLCI, all the DLCIs configured with the hardware FRF.12 on that interface switch to software mode.
- Removing the PPPoFR or MLPoFR configuration on the DLCI does not switch back the DLCIs to operate in hardware mode. Moving to hardware mode can be done only after removing all PPPoFR or MLPoFR configuration on all DLCIs on the interface and reloading the router.

## 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 5-7 for instructions.)

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

```
Router# configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
Router(config)#
```

- Step 3** Shut down the T3 controller on the PA-MC-T3-EC with the **shutdown** controller 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)# controller T3 1/0  
Router(config-controller)# shutdown
```

```
Router(config)# controller T3 1/1  
Router(config-controller)# shutdown
```



**Note** Both T3 ports of the PA-MC-T3-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-MC-T3-EC in port adapter slot 6 of a Cisco 7200 VXR router:

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

Router# show controller T3 6/1
T3 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 “[Replacing an Existing Port Adapter](#)” section on page 5-7 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.

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For complete descriptions of software configuration commands, refer to the publications listed in the “[Related Documentation](#)” section on page iv.

## Configuring a Channelized T3 Link

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

After you verify that the new PA-MC-T3-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.

## Configuring the T3 Controller

This section provides procedures and examples for configuring the T3 controller on the PA-MC-T3-EC, and includes information on the following topics:

- [Selecting a T3 Controller, page 5-9](#)
- [Setting Channelized Mode for the T3 Controller, page 5-9](#)
- [Setting the Framing Type for the T3 Controller, page 5-10](#)
- [Specifying the Cable Length for the T3 Controller, page 5-10](#)
- [Setting the Clock Source for the T3 Controller, page 5-10](#)
- [Configuring MDL Messages for the T3 Controller, page 5-11](#)
- [Examples of MDL Message Configuration, page 5-11](#)
- [Configuring Loopback Mode for the T3 Controller, page 5-12](#)
- [Configuring the T3 Controller to Enable Remote Loopback, page 5-13](#)
- [Shutting Down the T3 Controller, page 5-13](#)

### Selecting a T3 Controller

You must enter the following controller command, before any other configuration commands, to select the T3 controller you want to configure:

**controller T3** *chassis-slot/T3-port for Cisco 7200 series router*

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

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller t3 1/0
Router(config-controller)#
```

### Setting Channelized Mode for the T3 Controller



**Note**

Channelized mode is the default, so you only need to configure the T3 controller for channelized mode if it had previously been set to “no channelized” mode.

To configure the T3 for channelized mode, use the **channelized** command. The following example is for a PA-MC-T3-EC in port adapter slot 1 of a Cisco 7200 VXR router:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router (config)# channelized
```

Change to channelized mode will cause cbus complex reset. Proceed? [yes/no]:

When the PA-MC-T3-EC is configured for channelized T3 mode, its default MTU size is set to 1500 for compatibility with other T3 equipment and port adapters.

When the T3 controller is configured to be channelized, 28 T1 lines are created. To configure the T1 lines, refer to the “[Configuring T1 Lines](#)” section on page 5-13.

## Setting the Framing Type for the T3 Controller

At the prompt, specify the framing type using the **framing [c-bit | m23 | auto-detect]** controller command.

You can set c-bit framing format as follows:

```
Router(config-controller)# framing c-bit
```

You can set M23 framing format as follows:

```
Router(config-controller)# framing m23
```

You can request the PA-MC-T3-EC to detect the framing type it is receiving from the far end and transmit that same framing type as follows:

```
Router(config-controller)# framing auto-detect
```

## Specifying the Cable Length for the T3 Controller

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

- *feet* is a numeral from 0 to 450.
- The default value is 49 feet.

An example follows:

```
Router(config-controller)# 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-MC-T3-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 T3 Controller

At the prompt, set the internal or line clock source for the selected T3 controller with the **clock source {internal | line}** controller 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-MC-T3-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)# controller T3 1/0
```

```
Router(config-controller)# clock source line
```

- Instruct the PA-MC-T3-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)# controller T3 1/0
Router(config-controller)# clock source internal
```

## Configuring MDL Messages for the T3 Controller

You can configure maintenance data link (MDL) messages (which are defined in the ANSI T1.107a-1990 specification) on the PA-MC-T3-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 T3 Controller”](#) section on page 5-10.)

To configure MDL messages, use the **mdl {transmit {path | idle-signal | test-signal} | string {eic | lic | fic | unit | pfi | port | generator} string}** controller 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 controller configuration mode first.

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

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)#
```

- 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-controller)# mdl transmit idle-signal
```

- Enable the MDL test signal message transmission as follows:

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

- Enter the equipment identification code as follows:  
Router(config-controller)# **mdl string eic router A**
- Enter the location identification code as follows:  
Router(config-controller)# **mdl string lic tst network**
- Enter the frame identification code as follows:  
Router(config-controller)# **mdl string fic building b**
- Enter the unit identification code as follows:  
Router(config-controller)# **mdl string unit abc**
- Enter the facility identification code to send in the MDL path message as follows:  
Router(config-controller)# **mdl string pfi string**
- Enter the port number to send in the MDL idle signal message as follows:  
Router(config-controller)# **mdl string port string**
- Enter the generator number to send in the MDL test signal message as follows:  
Router(config-controller)# **mdl string generator string**

## Configuring Loopback Mode for the T3 Controller

With loopbacks, you can detect and isolate equipment malfunctions by testing the connection between the PA-MC-T3-EC interface and a remote T3 device such as a DS3 MUX. Remote loopback sends a command to loop the T3 line at the far end (central office). It can be used to diagnose problems with cables from the port adapter to the switching office. Network loopback loops the PA-MC-T3-EC port back to the network, allowing the remote end to test the connection to the PA-MC-T3-EC.

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

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 and cables. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or cables in the path of the loopback test.

You can configure the T3 controller for loopback modes using the **loopback {local | network line| remote}** controller command.

The default is no loopback.

To return the T3 controller to its default unlooped condition, use the **no** form of the command.

[Table 5-2](#) provides examples of the **loopback {local | network line| remote}** command.

**Table 5-2** Using loopback Commands

<b>loopback local</b>	Sets the T3 port into local loopback mode. Local loopback loops the router output data back toward the router at the framer.	Router(config)# <b>controller T3 10/0/0</b> Router(config-controller)# <b>loopback local</b>
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**Table 5-2** Using loopback Commands (continued)

<b>loopback network line</b>	Sets the T3 port into network line loopback mode. Network line loopback loops the data back toward the network (before the framer).	Router(config)# <b>controller T3 10/0/0</b> Router(config-controller)# <b>loopback network line</b>
<b>loopback remote<sup>1</sup></b>	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)# <b>controller T3 10/0/0</b> Router(config-controller)# <b>loopback remote</b>

1. Remote loopback mode works with C-bit framing only. The other loopback modes listed above work with c-bit and M23 framing. Refer to the “[Setting the Framing Type for the T3 Controller](#)” section on page 5-10 for information on configuring c-bit framing.

## Configuring the T3 Controller to Enable Remote Loopback

The **equipment customer loopback** command enables the PA-MC-T3-EC port adapter to respond to remote T3 loopback and T1 loopback requests it receives from the remote site, while the **equipment network loopback** command causes the port adapter to ignore remote T3 and T1 loopback commands.

**equipment [customer | network] loopback**

```
Router(config)# controller T3 3/0
Router(config-controller)# equipment customer loopback
```

```
Router(config)# controller T3 3/0
Router(config-controller)# equipment network loopback
```



**Note** T3 remote loopbacks are only available when you use c-bit parity framing.

## Shutting Down the T3 Controller

You can shut down the T3 controller on the PA-MC-T3-EC with the **shutdown** controller 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 (with an NPE-G1 or NPE-G2):

```
Router(config)# controller t3 1/0
Router(config-controller)# shutdown
```

## Configuring T1 Lines

This section provides procedures and examples for configuring T1 lines on the T3 link of the PA-MC-T3-EC, and includes information on the following topics:

- [Creating a Logical Channel Group on a T1 Line](#), page 5-14
- [Removing a Logical Channel Group from a T1 Line](#), page 5-15
- [Setting the Framing Format on a T1 Line](#), page 5-15
- [Setting the Yellow Alarm Configuration for a T1 Line](#), page 5-16
- [Setting the Clock Source on a T1 Line](#), page 5-16
- [Setting the FDL Configuration for a T1 Line](#), page 5-16

- [Setting Loopbacks on a T1 Line](#), page 5-16
- [Configuring a BER Test on a T1 Line](#), page 5-19
- [Sending a BER Test Pattern on a T1 Line](#), page 5-19
- [Viewing the Results of a BER Test](#), page 5-20
- [Terminating a BER Test](#), page 5-23

**Note**

For consistency throughout the following configuration examples and whenever possible, the port addresses 1/0 and 1/0/1:1 are used for Cisco 7200 VXR routers.

Your PA-MC-T3-EC port addressing might be different depending on the Cisco 7200 VXR router chassis slot in which your PA-MC-T3-EC is installed.

## Creating a Logical Channel Group on a T1 Line

You can create a logical channel group on a T1 line using the **t1 *t1-line-number* channel-group *channel-group-number* timeslots *list-of-timeslots* [speed {56 | 64}]** controller command where:

- *t1-line-number* is 1 to 28.
- **channel-group** defines a logical channel group.
- *channel-group-number* is 0 to 23.
- **timeslots *list-of-timeslots*** can be 1 to 24 or a combination of subranges within 1 to 24 (each subrange is a list of time slots of the T1 line).
- **speed {56 | 64}** is an optional argument that specifies the speed of a time slot to be either 56 kbps or 64 kbps.

The following example configures logical channel group 20 on T1 line 1 and assigns channelized time slots 1 to 5 and 20 to 23.

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

```
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 channel-group 20 timeslots 1-5, 20-23
```

**Note**

Each T1 link may have up to 24 channel groups with an overall limit of 128 for the 28 T1 links on each T3 port. Unused channel groups in one T3 port may not be used by the other T3 port.

**Note**

Each channel group defined with this command causes a serial interface to be created. Refer to the [“Performing a Basic Serial Interface Configuration”](#) section on page 5-24 for instructions on configuring these interfaces.

**Note**

All the encapsulation formats, such as PPP, HDLC, SMDS, Frame Relay, and switching types are applicable to the serial interface and can be set using the serial interface configuration commands.

## Removing a Logical Channel Group from a T1 Line

You can remove a logical channel group from a T1 line with the **no t1 *t1-line-number* channel-group *channel-group-number*** controller command where:

- *t1-line-number* is 1 to 28.
- *channel-group-number* is 0 to 23.

The following example removes logical channel group 10 from channelized T1 line 1.

The example is for a port adapter in slot 1 of a Cisco 7200 VXR router.

```
Router(config)# controller T3 1/0
Router(config-controller)# no t1 1 channel-group 10
```



### Note

If logical channel groups have previously been configured on a port, and you switch to no channelized mode, first remove all channel groups before invoking the **no channelized** command.

## Setting the Framing Format on a T1 Line

You can specify the T1 framing format using the **t1 *t1-line-number* framing {esf | sf}** controller command where:

- *t1-line-number* is 1 to 28.
- The default framing format is Extended Super frame (ESF).

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

```
Router(config)# controller T3 1/0
Router(config-controller)# t1 6 framing sf
```

Other options for setting Super Frame (SF) include:

```
Router(config-controller)# t1 6 framing ?
  esf  Extended Superframe Framing format
  sf   Superframe Framing Format
```

```
Router(config-controller)# t1 6 framing sf ?
  hdlc-idle Specify the HDLC idle pattern on a T1
  <cr>
```

```
Router(config-controller)# t1 6 framing sf hdlc-idle ?
  0x7E Use 0x7E as HDLC idle pattern
  0xFF Use 0xFF as HDLC idle pattern
```

```
Router(config-controller)# t1 6 framing sf hdlc-idle 0x7e ?
```

The following example sets ESF framing format for T1 line 16.

```
Router(config)# controller T3 1/0
Router(config-controller)# t1 16 framing esf
```



### Note

Use of the 0xFF HDLC idle pattern may help prevent false yellow alarms in the remote T1 device when SF framing is used.

## Setting the Yellow Alarm Configuration for a T1 Line

You can use the `[no] t1 t1-line-number yellow {detection | generation}` command (where *t1-line-number* is 1 to 28) to turn the detection or generation of a yellow alarm on and off. When you select SF framing, you should consider using the `no t1-line-number yellow detection` command to turn off yellow alarm detection, because the yellow alarm can be incorrectly detected with SF framing.

## Setting the Clock Source on a T1 Line

You can set the internal or line (network) clock source for a T1 line with the `t1 t1-line-number clock source {internal | line}` controller command where:

- *t1-line-number* is 1 to 28.
- **internal** selects an internal clock source.
- **line** selects a network clock source.

The default clock source is internal.

Examples follow:

- Instruct T1 line 1 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)# controller T3 1/0
Router(config-controller)# t1 1 clock source internal
```

- Instruct T1 line 16 to use a line clock source received from the network.

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

```
Router(config)# controller T3 1/0
Router(config-controller)# t1 16 clock source line
```



### Note

Normally the T1 link should be configured to use the line clock recovered from the network. In cases where the network does not provide the clock, such as two PA-MC-T3-EC port adapters connected back-to-back, one end of the T1 link must be set to internal clock and the other end to line clock.

## Setting the FDL Configuration for a T1 Line

To enable and disable one-second transmissions of performance reports through the facility data link (FDL) (per ANSI T1.403 specification), you must use the `t1 t1-line-number fdl ansi` command where: *t1-line-number* is 1 to 28 on both ends of the connection.



### Note

You can use this command *only* when the T1 framing is ESF.

Use the **no** form of the command to disable remote performance reports.

## Setting Loopbacks on a T1 Line

If you have difficulty with the PA-MC-T3-EC configuration or installation, you can troubleshoot the port adapter using the **loopback** command. Specify loopback for a T1 line using the following `t1 t1-line-number loopback [local | network | remote]` command where: *t1-line-number* is 1 to 28.



**Note** This command requires that you are in T3 controller mode.



**Note** The **fdl loopback** commands are available only for T1 lines configured for ESF framing.

Explanations of specific loopback modes follow:

<b>local</b>	Loops the router output data back toward the router at the T1 framer and sends an AIS out toward the network.
<b>network {line   payload}</b>	Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the HDLC controllers (line), or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the HDLC controllers (payload).
<b>remote line fdl {ansi   bellcore}</b>	<p>Sends a repeating, 16-bit ESF data link code word (00001110 11111111 for ANSI; 00010010 11111111 for Bellcore) to the remote end, requesting that it enter into a network line loopback.</p> <p>Specify the <b>ansi</b> keyword to enable the remote line facility data link (FDL) ANSI loopback on the T1 channel, per the ANSI T1.403 specification.</p> <p>Specify the <b>bellcore</b> keyword to enable the remote SmartJack loopback on the T1 channel, per the TR-TSY-000312 specification.</p>
<b>remote line inband</b>	Sends a repeating, 5-bit inband pattern (00001) to the remote end, requesting that it enter into a network line loopback.
<b>remote payload [fdl] [ansi]</b>	<p>Sends a repeating, 16-bit ESF data link code word (00010100 11111111) to the remote end, requesting that it enter into a network payload loopback. Enables the remote payload facility data link (FDL) ANSI loopback on the T1 channel.</p> <p>You can optionally specify <b>fdl</b> or <b>ansi</b>, but it is not necessary.</p>

Examples of the **loopback** commands follow. Examples are for a port adapter in slot 1 of a Cisco 7200 VXR router.

- Set the first T1 line into local loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loopback local
```

In the preceding examples, local loopback loops the router output data back toward the router at the T1 framer and sends an AIS out toward the network.

- Set the first T1 line into network line loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loopback network line
```

In the preceding example, network line loopback loops the data back toward the network (before the T1 framer).

- Set the first T1 line into network payload loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loopback network payload
```

In the preceding examples, network payload loopback loops just the payload data back toward the network at the T1 framer.

- Set the first T1 line into remote line inband loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loop remote line inband
```

In the preceding example, remote line inband loopback sends a repeating five-bit in-band pattern (of 00001) to the remote end, requesting that it enter into a network line loopback.

- Set the first T1 line into remote line FDL ANSI loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loop remote line fdl ansi
```

In the preceding examples, remote line FDL ANSI loopback sends a repeating 16-bit ESF data link code word (of 00001110 11111111) to the remote end, requesting that it enter into a network line loopback.

- Set the first T1 line into remote line FDL bellcore loopback

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router (config)# controller t3 1/0
Router (config-controller)# t1 1 loop remote line fdl bellcore
```

In the preceding example, remote line FDL Bellcore loopback sends a repeating 16-bit ESF data link code word (of 00010010 11111111) to the remote end, requesting that it enter into a network line loopback.

- Set the first T1 line into remote payload FDL ANSI loopback.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# controller T3 1/0
Router(config-controller)# t1 1 loop remote payload fdl ansi
```

In the preceding example, remote payload ANSI loopback sends a repeating 16-bit ESF data link code word (of 00010100 11111111) to the remote end, requesting that it enter into a network payload loopback.

## Configuring a BER Test on a T1 Line

Bit error rate test (BERT) circuitry is built into the PA-MC-T3-EC. With BER tests, you can test cables and signal problems in the field. You can configure BER tests on each of the 28 T1 lines, but only one BER test can be active at a time.

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:
  - $2^{11}$  (per CCITT/ITU O.151)
  - $2^{15}$  (per CCITT/ITU O.151)
  - $2^{20}$  (per CCITT/ITU O.153)
  - $2^{20}$  QRSS (per CCITT/ITU O.151)
  - $2^{23}$  (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.

**Note**

---

BER testing for the T3 link is not supported in channelized T3 mode. It is only supported for unchannelized T3 ports.

---

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 a T1 Line

You can send a BERT pattern on a T1 line with the **t1 *t1-line-number* bert pattern *pattern* interval *time* [unframed]**controller command, where:

- *t1-line-number* is 1 to 28.
- *time* is 1 to 14400 minutes.
- *pattern* is one of the following:
  - 0s, repetitive test pattern of all zeros (as 00000...)
  - 1s, repetitive test pattern of all ones (as 11111...)
  - $2^{11}$ , pseudorandom test pattern (2,048 bits long)

- 2<sup>15</sup>, pseudorandom O.151 test pattern (32,768 bits long)
- 2<sup>20</sup>-O153, pseudorandom O.153 test pattern (1,048,575 bits long)
- 2<sup>20</sup>-QRSS, pseudorandom O.151 QRSS test pattern (1,048,575 bits long)
- 2<sup>23</sup>, 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)

The unframed option causes the BERT pattern to use the entire T1 bandwidth including the T1 framing as well as payload bits. If **unframed** is omitted, then the T1 line will be either SF or ESF framed as configured by the T1 **framing** command and the BERT pattern will occupy only the T1 payload bits.

Examples follow:

- Send a BERT pseudorandom pattern of 2<sup>23</sup> through T1 line 10 for 5 minutes.

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

```
Router(config)# controller T3 1/0
Router(config-controller)# t1 10 bert pattern 2^23 interval 5 unframed
```

- Send a repetitive pattern of all ones through T1 line 10 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)# controller T3 1/0
Router(config-controller)# t1 10 bert pattern 1s interval 14400 unframed
```



#### Note

You can terminate a BER test during the specified test period with the **no t1 bert** command.

## Viewing the Results of a BER Test

You can view the results of a BER test using the **show controllers T3 chassis-slot/t3-port/t1-line-number controller** command where: *t1-line-number* is 1 to 28.

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

- After you terminate the test using the **no t1 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 T3 5/0

T3 5/0 is up. Hardware is 2CT3-EC single wide port adapter
CT3 H/W Version: 0.1.1, CT3 ROM Version: 0.95, CT3 F/W Version: 1.4.4
FREEDM version: 1, reset 0
Applique type is Channelized 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 Internal
Rx throttle total 0, equipment customer loopback
Data in current interval (63 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
```

```
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 1:
    4905 Line Code Violations, 4562 P-bit Coding Violation
    5167 C-bit Coding Violation, 2 P-bit Err Secs
    1 P-bit Severely Err Secs, 3 Severely Err Framing Secs
    58 Unavailable Secs, 1 Line Errored Secs
    3 C-bit Errored Secs, 3 C-bit Severely Errored Secs
Data in Interval 2:
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

(additional display text omitted)

T1 1
    Not configured.

T1 2
    Not configured.

T1 3
    Not configured.

T1 4
    Not configured.

T1 5
    Not configured.

T1 6
    Not configured.

T1 7
    Not configured.

T1 8
    Not configured.

T1 9
    Not configured.

T1 10
    Not configured.
BERT test result (running)
    Test Pattern : All 1's, Status : Sync, Sync Detected : 1
    Interval : 14400 minute(s), Time Remain : 14400 minute(s)
    Bit Errors (since BERT started): 0 bits,
    Bits Received (since BERT started): 92 Mbits
    Bit Errors (since last sync): 0 bits
    Bits Received (since last sync): 92 Mbits

T1 11
    Not configured.

T1 12
    Not configured.

T1 13
    Not configured.

T1 14
    Not configured.
```

```
T1 15
  Not configured.

T1 16
  Not configured.

T1 17
  Not configured.

T1 18
  Not configured.

T1 19
  Not configured.

T1 20
  Not configured.

T1 21
  Not configured.

T1 22
  Not configured.

T1 23
  Not configured.

T1 24
  Not configured.

T1 25
  Not configured.

T1 26
  Not configured.

T1 27
  Not configured.

T1 28
  Not configured.
```

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 : 2^11, Status : Sync, Sync Detected : 1	This line indicates the test pattern you selected for the test (2^11), 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”.



#### Note

Unless unframed is selected, the BER test runs over the currently configured framing option for the specified T1 line (SF or ESF). Before running a BER test, you should configure the framing option that is appropriate to your application. (Refer to the [“Setting the Framing Format on a T1 Line”](#) section on page 5-15.)

## Terminating a BER Test

You can terminate a BER test with the **no t1 t1-line-number bert** controller command, where: *t1-line-number* is 1 to 28.

Examples follow:

The following example terminates the BER test running on T1 line 10.

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

```
Router(config)# controller T3 1/0
Router(config-controller)# no t1 10 bert
```

To check your configurations using **show** commands, proceed to the [“Checking the Configuration”](#) section on page 5-25; otherwise, proceed to the [“Performing a Basic Serial Interface Configuration”](#) section on page 5-24.

# Performing a Basic Serial Interface Configuration



## Note

The Cisco 7200 VXR Port Adapter Jacket Card requires no configuration. Configure a port adapter in it as you would any other port adapter.

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

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

```
Router# disable

Router>
```

- Step 1** Enter configuration mode and specify that the console terminal is the source of the configuration subcommands, 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** subcommand, followed by the interface address of the interface you plan to configure. [Table 5-3](#) provides an example.

**Table 5-3** Examples of the interface serial Subcommand

Platform	Command	Example
Cisco 7200 VXR routers	<b>interface serial</b> , <i>port-adapter-slot/T3-port/T1-line-number:channel-group-number</i>	The example is for T3 port 0, T1 1, channel group 0 of a port adapter in port adapter slot 6. <pre>Router(config)# <b>interface serial</b> 6/0/1:0 Router(config-if)#</pre>

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

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

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

- Step 5** Re-enable the interfaces using the **no shutdown** command. (See the “[Replacing an Existing Port Adapter](#)” section on page 5-7.)

- Step 6** Configure all additional port adapter interfaces as required.

- Step 7** After including all of the configuration subcommands to complete your configuration, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter prompt.

**Step 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, page 5-25](#)
- [Using the ping Command to Verify Network Connectivity, page 5-34](#)
- [Using loopback Commands to Troubleshoot Network Problems, page 5-34](#)

## Using show Commands to Verify the New Interface Status

[Table 5-4](#) demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the PA-MC-T3-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 5-4** Using show Commands

Command	Function	Example
<b>show version</b> or <b>show hardware</b>	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# <b>show version</b>
<b>show controllers</b>	Displays all the current interface processors and their interfaces	Router# <b>show controllers</b>
<b>show diag slot</b>	Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot	Router# <b>show diag 2</b>

Table 5-4 Using show Commands (continued)

Command	Function	Example
<b>show interfaces</b> <i>type</i> <i>port-adapter-slot-number/</i> <i>T3-port-/T1-line-number:</i> <i>channel-group number</i>	Displays status information about a specific type of interface (for example, serial) in a Cisco 7200 VXR router	Router# <b>show interfaces serial 1/0/2:0</b>
<b>show protocols</b>	Displays protocols configured for the entire system and for specific interfaces	Router# <b>show protocols</b>
<b>show running-config</b>	Displays the running configuration file	Router# <b>show running-config</b>
<b>show startup-config</b>	Displays the configuration stored in NVRAM	Router# <b>show startup-config</b>

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:

- [Using the show version or show hardware Commands, page 5-26](#)
- [Using the show diag Command, page 5-28](#)
- [Using the show interfaces Command, page 5-28](#)
- [Using the show controllers Command, page 5-29](#)

Choose the subsection appropriate for your system. Proceed to the “[Using the ping Command to Verify Network Connectivity](#)” section on page 5-34 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. Following are 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.

Following is an example of the **show version** command from a Cisco 7200 VXR router (with an NPE-G2) with the PA-MC-T3-EC:

```
Router# show version
```

```
Cisco IOS Software, 7200 Software (C7200-JS-M), Experimental Version 12.4(20060505:140248)
[sprafull-CJ-G2 102]
Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Fri 05-May-06 20:21 by
```

```
ROM: System Bootstrap, Version 12.4(4r)XD3, RELEASE SOFTWARE (fc1)
```

```
reg2 uptime is 14 hours, 35 minutes
System returned to ROM by reload at 07:19:23 UTC Sun Jan 16 2000
System image file is "disk2:c7200p-js-mz.CJ_DTHO_20060505"
```

Last reload reason: Reload Command

Cisco 7206VXR (NPE-G2) processor (revision B) with 917504K/65536K bytes of memory.  
Processor board ID 34149641  
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 660 bandwidth points.  
The set of PA-2FE, PA-POS-2OC3, and I/O-2FE qualify for "half bandwidth points" consideration, when full bandwidth point counting results in oversubscription, under the condition that only one of the two ports is used. With this adjustment, current configuration on bus mb1 has a total of 660 bandwidth points.  
This configuration has oversubscribed the PCI bus and is not a supported configuration.

PCI bus mb2 (Slots 2, 4 and 6) has a capacity of 600 bandwidth points.  
Current configuration on bus mb2 has a total of 960 bandwidth points.  
The set of PA-2FE, PA-POS-2OC3, and I/O-2FE qualify for "half bandwidth points" consideration, when full bandwidth point counting results in oversubscription, under the condition that only one of the two ports is used. With this adjustment, current configuration on bus mb2 has a total of 660 bandwidth points.  
This configuration has oversubscribed the PCI bus and is not a supported configuration.

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.

WARNING: PCI bus mb1 Exceeds 600 bandwidth points  
WARNING: PCI bus mb2 Exceeds 600 bandwidth points

3 FastEthernet interfaces  
3 Gigabit Ethernet interfaces  
56 Serial interfaces  
2 Packet over SONET interfaces  
8 Channelized T3 ports  
2045K bytes of NVRAM.

250880K bytes of ATA PCMCIA card at slot 2 (Sector size 512 bytes).  
65536K bytes of Flash internal SIMM (Sector size 512K).  
Configuration register is 0x0

## Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag slot** command, where *slot* is the *port adapter slot* in a Cisco 7200 VXR router (with an NPE-G1 or NPE-G2).



### 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-MC-T3-EC in port adapter slot 2 of a Cisco 7200 VXR router with an NPE-G1 or NPE-G2.

```
Router# show diag 2

Slot 2:
Enhanced 2 port T3 multichannel Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time 00:00:50 ago
EEPROM contents at hardware discovery:
PCB Serial Number : JAE103394R8
Hardware Revision : 1.1
Part Number : 73-10698-02
Board Revision : 06
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 85586
Product (FRU) Number : PA-MC-2T3-EC
Version Identifier : V01
Top Assy. Part Number : 68-2713-02
CLEI Code :
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF C1 8B 4A 41 45 31 30 33 33 39 34 52 38 40
0x10: 05 44 41 01 01 82 49 29 CA 02 42 30 36 03 00 81
0x20: 00 00 00 00 04 00 88 00 01 4E 52 CB 94 50 41 2D
0x30: 4D 43 2D 32 54 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 99 02
0x50: C6 8A 20 20 20 20 20 20 20 20 20 20 20 20 20 20
0x60: 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
```

## Using the show interfaces Command

The **show interfaces** command displays status information (including the physical slot and interface address) for the interfaces you specify. Following is an example that specifies serial interfaces.

For complete descriptions of interface subcommands and the configuration options available for Cisco 7200 VXR routers, 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.

Following is an example of the **show interfaces serial** command for a Cisco 7200 VXR router. In this example, the port adapter is in slot 1 of a Cisco 7200 VXR router with an NPE-G1 or NPE-G2.

```
Router# show interfaces serial 1/0/1:0
Serial 1/0/1:0 is up, line protocol is up
  Hardware is PA-MC-2T3E
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Last input 00:00:08, output 03:29:07, output hang never
  Last clearing of "show interface" counters 01:08:09
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 1152 kilobits/sec
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    73 packets input, 22338 bytes, 0 no buffer
    Received 71 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    70 packets output, 19838 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions

(additional displayed text not shown)
```

## Using the show controllers Command

You can display information for all T1 lines within a PA-MC-T3-EC with the **show controllers T3 slot/port-adapter/port [brief | tabular | remote performance]** command where:

- **brief** displays a list of configurations only.
- **tabular** displays a list of configurations and MIB data in a tabular format.
- **remote performance** displays a list of performance data from the remote end of a T1 connection.



### Note

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

You can also display brief configuration information or tabular configuration and MIB information about a specific T1 line within a PA-MC-T3-EC with the **show controllers T3 slot/port-adapter/t3-port/t1-line-number [brief | tabular | remote performance]** command where:

- *t1-line-number* is 1 to 28.
- **brief** displays a list of configurations only.
- **tabular** displays a list of configurations and MIB data in a tabular format.
- **remote performance** displays performance data from the remote T1 equipment.

The syntax is as follows:

- **show controllers T3 chassis-slot/t3-port brief**

- **show controllers T3 chassis-slot/t3-port tabular**
- **show controllers T3 chassis-slot/t3-port remote performance**

Examples of these **show controllers T3** commands for Cisco 7200 VXR routers are shown below.

The **show controllers** command with no arguments displays information about every controller and interface in the router. Use the **show controllers T3** command to display information about the PA-MC-T3-EC port adapter:

```
Router# show controllers T3
T3 1/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  Framing is M23, Line Code is B3ZS, Clock Source is Internal
  Equipment customer loopback
  Data in current interval (77 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 50 15 minute intervals):
    0 Line Code Violations, 0 P-bit Coding Violation,
    0 C-bit Coding Violation, 0 P-bit Err Secs,
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
    0 Unavailable Secs, 0 Line Errored Secs,
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

T1 1 is up
timeslots: 1-24
FDL per AT&T 54016 spec.
No alarms detected.
Framing is ESF, Clock Source is Internal
Data in current interval (77 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
Total Data (last 50 15 minute intervals):
  0 Line Code Violations, 0 Path Code Violations,
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs, 0 Stuffed Secs
```

(additional displayed text not shown)

### Using the show controllers T3 brief Command

The following example of the **show controllers T3 chassis-slot/t3-port brief** command output displays a list of configurations only.

```
Router# show controllers T3 2/0 brief
T3 2/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  Framing is M23, Line Code is B3ZS, Clock Source is Internal
  Equipment customer loopback

T1 1 is up
timeslots: 1-24
FDL per ANSI T1.403 and AT&T 54016 spec.
No alarms detected.
Framing is ESF, Clock Source is Internal
```

```

T1 2 is up
  timeslots: 1-24
  FDL per ANSI T1.403 and AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Clock Source is Internal

T1 3 is up
  timeslots: 1-24
  FDL per ANSI T1.403 and AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Clock Source is Internal
(additional displayed text not shown)

```

### Using the show controllers T3 tabular Command

The following example of the **show controllers T3 chassis-slot/t3-port tabular** command output displays a list of configurations and MIB data in a tabular format.

```

Router# show controllers T3 2/0 tabular
T3 2/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  Framing is M23, Line Code is B3ZS, Clock Source is Internal
  Equipment customer loopback

```

INTERVAL	LCV	PCV	CCV	PES	PSES	SEFS	UAS	LES	CES	CSES
22:30-22:34	0	0	0	0	0	0	0	0	0	0
22:15-22:30	0	0	0	0	0	0	0	0	0	0
22:00-22:15	0	0	0	0	0	0	0	0	0	0
21:45-22:00	0	0	0	0	0	0	0	0	0	0
21:30-21:45	0	0	0	0	0	0	0	0	0	0
21:15-21:30	0	0	0	0	0	0	0	0	0	0
21:00-21:15	0	0	0	0	0	0	0	0	0	0
20:45-21:00	0	0	0	0	0	0	0	0	0	0
20:30-20:45	0	0	0	0	0	0	0	0	0	0
20:15-20:30	0	0	0	0	0	0	0	0	0	0
20:00-20:15	0	0	0	0	0	0	0	0	0	0
19:45-20:00	0	0	0	0	0	0	0	0	0	0
19:30-19:45	0	0	0	0	0	0	0	0	0	0
19:15-19:30	0	0	0	0	0	0	0	0	0	0
19:00-19:15	0	0	0	0	0	0	0	0	0	0
18:45-19:00	0	0	0	0	0	0	0	0	0	0
18:30-18:45	0	0	0	0	0	0	0	0	0	0
18:15-18:30	0	0	0	0	0	0	0	0	0	0
18:00-18:15	0	0	0	0	0	0	0	0	0	0
17:45-18:00	0	0	0	0	0	0	0	0	0	0
17:30-17:45	0	0	0	0	0	0	0	0	0	0
17:15-17:30	0	0	0	0	0	0	0	0	0	0
17:00-17:15	0	0	0	0	0	0	0	0	0	0
16:45-17:00	0	0	0	0	0	0	0	0	0	0
16:30-16:45	0	0	0	0	0	0	0	0	0	0
16:15-16:30	0	0	0	0	0	0	0	0	0	0
16:00-16:15	0	0	0	0	0	0	0	0	0	0
15:45-16:00	0	0	0	0	0	0	0	0	0	0
15:30-15:45	0	0	0	0	0	0	0	0	0	0
15:15-15:30	0	0	0	0	0	0	0	0	0	0
15:00-15:15	0	0	0	0	0	0	0	0	0	0
14:45-15:00	0	0	0	0	0	0	0	0	0	0
14:30-14:45	0	0	0	0	0	0	0	0	0	0
14:15-14:30	0	0	0	0	0	0	0	0	0	0
14:00-14:15	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0

## Checking the Configuration

13:15-13:30	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0
12:00-12:15	0	0	0	0	0	0	0	0	0	0
11:45-12:00	0	0	0	0	0	0	0	0	0	0
11:30-11:45	0	0	0	0	0	0	0	0	0	0
11:15-11:30	0	0	0	0	0	0	0	0	0	0
11:00-11:15	0	0	0	0	0	0	0	0	0	0
10:45-11:00	0	0	0	0	0	0	0	0	0	0
10:30-10:45	0	0	0	0	0	0	0	0	0	0
10:15-10:30	0	0	0	0	0	0	0	0	0	0
10:00-10:15	0	0	0	0	0	0	0	0	0	0
09:45-10:00	0	0	0	0	0	0	0	0	0	0
09:30-09:45	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0

T1 1 is up  
timeslots: 1-24  
FDL per ANSI T1.403 and AT&T 54016 spec.  
No alarms detected.

Framing is ESF, Clock Source is Internal

INTERVAL	LCV	PCV	CSS	SELS	LES	DM	ES	BES	SES	UAS	SS
22:30-22:34	0	0	0	0	0	0	0	0	0	0	0
22:15-22:30	0	0	0	0	0	0	0	0	0	0	0
22:00-22:15	0	0	0	0	0	0	0	0	0	0	0
21:45-22:00	0	0	0	0	0	0	0	0	0	0	0
21:30-21:45	0	0	0	0	0	0	0	0	0	0	0
21:15-21:30	0	0	0	0	0	0	0	0	0	0	0
21:00-21:15	0	0	0	0	0	0	0	0	0	0	0
20:45-21:00	0	0	0	0	0	0	0	0	0	0	0
20:30-20:45	0	0	0	0	0	0	0	0	0	0	0
20:15-20:30	0	0	0	0	0	0	0	0	0	0	0
20:00-20:15	0	0	0	0	0	0	0	0	0	0	0
19:45-20:00	0	0	0	0	0	0	0	0	0	0	0
19:30-19:45	0	0	0	0	0	0	0	0	0	0	0
19:15-19:30	0	0	0	0	0	0	0	0	0	0	0
19:00-19:15	0	0	0	0	0	0	0	0	0	0	0
18:45-19:00	0	0	0	0	0	0	0	0	0	0	0
18:30-18:45	0	0	0	0	0	0	0	0	0	0	0
18:15-18:30	0	0	0	0	0	0	0	0	0	0	0
18:00-18:15	0	0	0	0	0	0	0	0	0	0	0
17:45-18:00	0	0	0	0	0	0	0	0	0	0	0
17:30-17:45	0	0	0	0	0	0	0	0	0	0	0
17:15-17:30	0	0	0	0	0	0	0	0	0	0	0
17:00-17:15	0	0	0	0	0	0	0	0	0	0	0
16:45-17:00	0	0	0	0	0	0	0	0	0	0	0
16:30-16:45	0	0	0	0	0	0	0	0	0	0	0
16:15-16:30	0	0	0	0	0	0	0	0	0	0	0
16:00-16:15	0	0	0	0	0	0	0	0	0	0	0
15:45-16:00	0	0	0	0	0	0	0	0	0	0	0
15:30-15:45	0	0	0	0	0	0	0	0	0	0	0
15:15-15:30	0	0	0	0	0	0	0	0	0	0	0
15:00-15:15	0	0	0	0	0	0	0	0	0	0	0
14:45-15:00	0	0	0	0	0	0	0	0	0	0	0
14:30-14:45	0	0	0	0	0	0	0	0	0	0	0
14:15-14:30	0	0	0	0	0	0	0	0	0	0	0
14:00-14:15	0	0	0	0	0	0	0	0	0	0	0
13:45-14:00	0	0	0	0	0	0	0	0	0	0	0
13:30-13:45	0	0	0	0	0	0	0	0	0	0	0
13:15-13:30	0	0	0	0	0	0	0	0	0	0	0
13:00-13:15	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	0	0	0	0	0	0	0	0	0	0	0

12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0
12:00-12:15	0	0	0	0	0	0	0	0	0	0	0	0
11:45-12:00	0	0	0	0	0	0	0	0	0	0	0	0
11:30-11:45	0	0	0	0	0	0	0	0	0	0	0	0
11:15-11:30	0	0	0	0	0	0	0	0	0	0	0	0
11:00-11:15	0	0	0	0	0	0	0	0	0	0	0	0
10:45-11:00	0	0	0	0	0	0	0	0	0	0	0	0
10:30-10:45	0	0	0	0	0	0	0	0	0	0	0	0
10:15-10:30	0	0	0	0	0	0	0	0	0	0	0	0
10:00-10:15	0	0	0	0	0	0	0	0	0	0	0	0
09:45-10:00	0	0	0	0	0	0	0	0	0	0	0	0
09:30-09:45	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0

(additional displayed text not shown)

**Note**

The PA-MC-T3-EC does not support slip buffers and always reports local controlled slip seconds (CSS) as 0.

**Note**

To enable and display remote performance reports, see the [“Setting the FDL Configuration for a T1 Line”](#) section on page 5-16, and the [“Using the show controllers T3 remote performance Command”](#) section on page 5-33.

### Using the show controllers T3 remote performance Command

Use the **show controllers T3 chassis-slot/t3-port remote performance** command to display performance data from the remote T1 equipment.

```
Router# show controllers T3 2/0 remote performance
```

```
T3 2/0 is up.
```

```
T1 1 - Remote Performance Data
```

```
Data in current interval (273 seconds elapsed):
```

```
0 Line Code Violations, 0 Path Code Violations
```

```
0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
```

```
0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
```

```
0 Unavail Secs
```

```
T1 2 - Remote Performance Data
```

```
Data in current interval (5 seconds elapsed):
```

```
0 Line Code Violations, 0 Path Code Violations
```

```
0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
```

```
0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
```

```
5 Unavail Secs
```

```
T1 3 - Remote Performance Data
```

```
Data in current interval (4 seconds elapsed):
```

```
0 Line Code Violations, 0 Path Code Violations
```

```
0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
```

```
0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
```

```
4 Unavail Secs
```

(additional displayed text not shown)

**Note**

If you do not first enable remote performance data with the **t1 t1-line-number fdl ansi** command, the following message is displayed:

```
T1 1 - Remote Performance Data (Not available)
```

**Note**

Although the PA-MC-T3-EC does not support local controlled slip seconds (CSS), remote T1 equipment may report CSS values in the remote performance reports.

## 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.

## Using loopback Commands to Troubleshoot Network Problems

If you have difficulty with the PA-MC-T3-EC configuration or installation, you can troubleshoot the port adapter using the **loopback** command. Refer to the [“Configuring Loopback Mode for the T3 Controller” section on page 5-12](#) 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-MC-T3-EC in local loopback using the **loop 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-MC-T3-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-MC-T3-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 a problem exists for: the T3 link to the remote site, the remote server, the DSU configuration, or the hardware.
-

