

PA-MC-T3 Multi-Channel T3 Synchronous Serial Port Adapter

Feature Summary

The PA-MC-T3 Multi-Channel T3 port adapter is available on Cisco 7200 series routers, on second-generation Versatile Interface Processor (VIP2) in Cisco 7500 series routers, and on Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP) and 7000 Series Chassis Interface (RSP).

The PA-MC-T3 has one channelized T3 high-speed serial interface that provides access to services at T1 (1.544 Mb) data rates, transferring data bidirectionally. This port adapter divides the T3 signal stream into 28 T1 lines that can be further divided into the 64 kbps level, up to a total of 128 channels.

Note The aggregation of multiple T1 lines for higher speed (called inverse multiplexing or bonding) is not supported. There is support for 56-kbps timeslots.

For more information on the PA-MC-T3 port adapter, refer to the *PA-MC-T3 Multi-Channel T3 Port Adapter Installation and Configuration* publication that accompanies the hardware.

Benefits

The PA-MC-T3 port adapter provides the following key benefits:

- Reduced cost—High levels of integration eliminate the cost of external CSU/DSUs and multiplexers. Channelization allows customers to lease fewer and more cost-effective lines from service providers.
- Simplified management—Management of the internal CSU/DSUs is handled through the router. No cabling complexity is associated with large installations of external boxes.
- Flexible provisioning—A single port can be used for up to 128 64K, Nx64K, FT1, and T1 connections to IP and Frame Relay networks. As network needs change, bandwidth can be reallocated without moving any cables.
- Increased slot utilization—Double to quadruple port density over previous port adapters (up to 56 T1 lines per Cisco 7500 slot) means increased value for each router slot.
- Increased rack space utilization—Elimination of external CSUs frees up rack space. High port density reduces the number of routers required for large installations.

Platforms

This feature is supported on these platforms:

- Cisco 7200 series routers
- Cisco 7500 series routers
- Cisco 7000 series routers with the RSP

Supported MIBs and RFCs

This feature supports the following RFCs:

- RFC 1406 for T1
- RFC 1407 for T3

Configuration Tasks

Perform the tasks in the following sections to configure the PA-MC-T3 (all tasks are optional except for the first and second tasks):

- Configure the T3 Controller (required)
- Configure the T1 Lines (required)
- Troubleshoot the T3 and T1 Lines (optional)
- Monitor and Maintain the PA-MC-T3 (optional)

For more information on how to configure the PA-MC-T3, refer to the *PA-MC-T3 Multi-Channel T3 Port Adapter Installation and Configuration* publication that accompanies the hardware.

For information on other commands that can be used by the PA-MC-T3 interface, refer to the Cisco IOS Release 11.1 configuration guides.

Configure the T3 Controller

If you do not modify the T3 controller configuration of the PA-MC-T3, the configuration defaults in Table 1 are used.

Table 1 PA-MC-T3 Controller Defaults

Attribute	Default Value
Clock source	line
Idle pattern	0x7F (or 127)

If you need to change any of the default configuration attributes, complete the first task in global configuration mode followed by any of the optional tasks in controller configuration mode:

Task	Command
Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Change the clock source used by the T3 controller.	clock source { internal line }
Change the idle pattern.	idle pattern <i>hex-number</i>

Note The port number for the PA-MC-T3 is always 0.

Configure the T1 Lines

You can configure the T1 lines as:

- Channelized
- Fractional

If you assign only one channel group to a T1 line, it is a fractional T1 line. If you assign more than one channel group to a T1 line, it is a channelized T1 line.

For channelized (**t1 channel-group** command), fractional (**t1 channel-group** command) configurations, each configured channel group, which might contain individual timeslots or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3 through 7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

After you configure the T1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay. For information on configuring a serial interface, refer to the “Configure Serial Interface” section later in this document.

Change Default Settings

If you do not modify the T1 configuration of the PA-MC-T3, the configuration defaults in Table 2 are used.

Table 2 PA-MC-T3 T1 Channel Defaults

Attribute	Default Value
Clock source	line
Framing format	ESF

If you need to change any of the default configuration attributes, complete the first task in global configuration mode followed by any of the optional tasks in controller configuration mode:

Task	Command
Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Change the clock source used by the T1 line.	t1 line clock source { internal line }
Change the framing format.	t1 line framing { esf sf }

Note The port number for the PA-MC-T3 is always 0. The T1 line is a value from 1 to 28.

Configure Channelized T1 Lines

The first three T1 lines (of the 28 total T1 lines) can be configured as channelized T1 lines, but you are limited to a total of 128 logical channels. You can group the timeslots in these T1 lines into several individual logical channel groups, each of which carries data with different data link layer protocol encapsulations.

Each logical channel group can be composed of individual 56- or 64- kbps timeslots and/or ranges of timeslots, for example, 1, 9, 12 to 14. Each logical channel group can contain from 1 to 24 timeslots maximum; the same timeslot cannot be used in more than one logical channel group. Any unused timeslots are filled with programmable idle-channel data.

Note If you assign only one channel group to a T1 line, it is a fractional T1 line. If you assign more than one channel group to a T1 line, it is a channelized T1 line.

To configure a channelized T1 line, complete the following tasks beginning in global configuration mode:

Task	Command
Step 1 Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Step 2 Configure the T1 line (values are 1 to 3) in a logical channel group (values are 0 to 23) and specify the timeslots (values are 1 to 24). Only T1 lines 1 to 3 can have more than one logical channel group.	t1 line channel-group <i>number timeslots range</i>
Step 3 Repeat Step 2 for each logical channel group and exit when done.	exit

This configuration creates a serial interface. For more information on serial interfaces, refer to the “Configure Serial Interface” section later in this document.

Configure Fractional T1 Lines

You can configure any of the 28 T1 lines as fractional T1 lines. A fractional T1 line is a subset of the full T1 bandwidth, which uses Nx56 or Nx64 kbps, where N is a timeslot in the range of 1–24.

Fractional T1 lines contain only a single logical channel group that can be either a single 56- or 64-kbps timeslot or a range of timeslots; for example timeslot 1, or timeslots 15 to 23. Any unused timeslots are filled with programmable idle-channel data (**idle pattern** controller configuration command).

Note If you assign only one channel group to a T1 line, it is a fractional T1 line. If you assign more than one channel group to a T1 line, it is a channelized T1 line.

To configure a fractional T1 line, complete the following tasks beginning in global configuration mode:

Task	Command
Step 1 Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Step 2 Configure the T1 line (values are 1 to 28) in a logical channel group (values are 0 to 23) and specify the timeslots (values are 1 to 24).	t1 line channel-group <i>number timeslots range</i>

This configuration creates a serial interface. For more information on serial interfaces, refer to the “Configure Serial Interface” section later in this document.

Configure Serial Interface

After you configure the T1 lines on the PA-MC-T3, you can continue configuring the adapter as you would a normal serial interface.

Note The Cisco IOS software recognizes a configured logical channel group as a serial interface; therefore, you can use all configuration commands that are available for serial interfaces with configured logical channel groups. You can configure a logical channel group to carry data traffic using the following encapsulation methods: PPP, HDLC, SMDS, and Frame Relay. Set the encapsulation method you want using the serial interface configuration commands. For configured logical channel groups, you can use all command switches that are applicable to a serial interface (including Optimum Switching).

For more information on other commands available for serial interfaces, refer to the “Configure a Synchronous Serial Interface” section in the “Configuring Interfaces” chapter of the *Configuration Fundamentals Configuration Guide*.

To enter interface configuration mode and configure the serial interface that corresponds to a T1 line, perform the following task in global configuration mode:

Task	Command
Select the serial interface for a T1 line (the T1 line values are 1 to 28 and the channel values are 0 to 23) and enter interface configuration mode.	interface serial <i>slot/port-adapter/port/t1-line:channel</i> (Cisco 7500 series and Cisco 7000 series with RSP) interface serial <i>slot/port/t1-line:channel</i> (Cisco 7200 series)

When configuring the serial interface, you must specify the slot number, port-adapter number (for Cisco 7500 series), port number, T1 line number, and channel. For channelized and fractional T1 lines, the channel is the number specified as the channel group number (for example, interface serial 3/0/0/3:20, where 20 is the channel group number).

Troubleshoot the T3 and T1 Lines

You can use the following methods to troubleshoot the PA-MC-T3 using Cisco IOS software:

- Set Loopbacks
- Run Bit Error Rate Test

Set Loopbacks

You can configure the T3 controller for loopback modes using the **loopback** controller command. The default is no loopback. The three main loopback modes are: local, network, and remote. The T3 local loopback simultaneously loops all channels toward the router and loops the T3 link back toward the network. Use a T3 local loopback to diagnose problems with cables between the T3 controller and the central switching office at the T3 link level.

The T1 local loopback sets both local and line (remote) loopback modes simultaneously and loops data toward the router. There is also a network loopback mode. A T1 remote line loopback loops the T1 line to the remote end. Use a T1 local loopback to diagnose problems with cables between the port adapter and the central switching office at the T1 line level. You can also use this loopback mode with bit error rate (BER) tests.

To set a loopback on the T3 controller or T1 lines, perform the following optional tasks beginning in global configuration mode:

Task	Command
Step 1 Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Step 2 Set a loopback on the T3 controller.	loopback local network remote
Step 3 Set a loopback on the T1 line.	t1 line loopback local network remote

Run Bit Error Rate Test

The channelized T1 portion of the port adapter contains onboard T1 bit error rate test (BERT) circuitry. With this, the port adapter software can send and detect a programmable pattern that is compliant with CCITT/ITU O.151, O.152, and O.153 pseudo-random and repetitive test patterns. The BERT functionality is configurable to any of the T1 lines. BER tests allow you to test cables and signal problems in the field. You can configure any T1 line to connect to the onboard BERT circuitry.

When running a BER test, your system expects to receive the same pattern that it is transmitting. To help ensure 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.

Note BER testing for the T3 link is not supported.

Note The BER test is run over the currently configured framing option for the specified T1 line. Before running a BER test, you should configure the framing appropriate to your application. The BER test can be run unframed, or carried in the payload of the T1 frame.

To configure a BER test, perform the following optional tasks beginning in global configuration mode:

Task	Command
Step 1 Select the T3 controller and enter controller configuration mode.	controller t3 <i>slot/port-adapter/port</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) controller t3 <i>slot/port</i> (Cisco 7200 series)
Step 2 Specify the BERT pattern for each T1 line (the values are 1 to 28) and the duration of the test in minutes (1 to 1440 minutes).	t1 t1-line-number bert pattern pattern interval time [unframed]
Step 3 View the BERT results.	show controllers t3 <i>slot/port-adapter/port/t1-line</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) show controllers t3 <i>slot/port</i> (Cisco 7200 series)

A description of each type of test pattern follows:

- 0s—Repeating pattern of zeros (...000...).
- 1s—Repeating pattern of ones (...111...).
- 2¹¹—Pseudo-random test pattern that is 2048 bits long.
- 2¹⁵—Pseudo-random O.151 test pattern that is 32,768 bits long.
- 2²⁰-O153—Pseudo-random O.153 test pattern that is 1,048,575 bits long.
- 2²⁰-QRSS—Pseudo-random QRSS O.151 test pattern that is 1,048,575 bits long.
- 2²³—Pseudo-random O.151 test pattern that is 8,388,607 bits long.
- alt-0-1—Repeating alternating pattern of zeros and ones (...01010...).

Note Because BER testing for the T3 link is not supported, use unframed T1 to run BER tests. If you do not specify **unframed**, the port adapter uses the currently configured T1 framing option to run a BER test.

Both the total number of error bits received and the total number of bits received are available for analysis. You can select the testing period from 1 minute to 24 hours, and you can also retrieve the error statistics anytime during the BER test.

Note To terminate a BER test during the specified test period, use the **no t1 line bert** command.

You can view the results of a BER test with the **show controllers t3** command:

- After you terminate the test using the **no t1 bert** command
- After the test runs completely
- Anytime during the test (in real time)

Monitor and Maintain the PA-MC-T3

After configuring the new interface, you can monitor the status and maintain the PA-MC-T3 by using **show** commands. To display the status of any interface, complete any of the following tasks in EXEC mode:

Task	Command
Display the status of the T3 controller.	show controllers t3 [<i>slot/port-adapter/port/t1-line</i>] [brief tabular] (Cisco 7500 series and Cisco 7000 series routers with RSP) show controllers t3 [<i>slot/port/t1-line</i>] [brief tabular] (Cisco 7200 series)
Display statistics about the serial information for a specific T1 line (values are 1 to 28) and channel group (values are 0 to 23).	show interfaces serial <i>slot/port-adapter/port/t1-line:channel-group</i> (Cisco 7500 series and Cisco 7000 series routers with RSP) show interfaces serial <i>slot/port/t1-line:channel-group</i> (Cisco 7200 series)

Configuration Example

The example in this section shows how to configure the PA-MC-T3 port adapter. You can display information about a specific T1 line with a PA-MC-T3 port adapter with the command **show controller t3 slot/port-adapter/port/t1-line-number**, where *t1-line-number* is a value 1 to 28.

For example, display information for T1 line number 1 on the T3 link on a PA-MC-T3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 2 as follows:

```
Router#show cont t3 2/0/0/1
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1

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 (615 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
Data in Interval 1:
  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
Data in Interval 2:
  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 2 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
```

Note If you use the **show controller t3** command without specifying a port address (*slot/port-adapter/port/t1-line-number*), all information is displayed for all 28 T1 lines within each T3 port adapter in the router; therefore, the resulting display output can be extensive.

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.1 command references.

- **controller t3**
- **idle pattern**
- **loopback local (t3)**
- **show controllers t3**
- **show interfaces serial**
- **shutdown (controller)**
- **t1 channel-group**
- **t1 clock source**
- **t1 framing**
- **t1 loopback local**

controller t3

To configure the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **controller t3** global configuration command.

controller t3 *slot/port-adapter/port* (Cisco 7500 series and Cisco 7000 series routers with RSP)
controller t3 *slot/port* (Cisco 7200 series)

Syntax Description

<i>slot</i>	Slot location of the port adapter.
<i>port</i>	Port number on the port adapter.
<i>port-adapter</i>	On the Cisco 7500 series and Cisco 7000 series with RSP, specifies the ports on a VIP card. The value can be 0 or 1.

Default

None

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

The following example enters controller configuration mode for the card in slot 1:

```
Router# controller t3 1/0/0
```

idle pattern

To set the idle pattern that is transmitted for unused timeslots on all T1 lines on the PA-MC-T3 in Cisco 7200 series routers, Cisco 7500 series routers and Cisco 7000 series routers with RSP, use the **idle pattern** controller configuration command.

idle pattern *pattern*
no idle pattern

Syntax Description

pattern Hexadecimal value in the range 0x0 to 0xFF (hexadecimal) or 0 to 255 (decimal). You can enter this value in either hexadecimal or decimal. The default is 0x55 (or 84).

Default

0x55 hexadecimal (84 decimal)

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Example

In the following example, the idle pattern is set to 0x10 hexadecimal:

```
Router(config)# controller t3 1/1/0  
Router(config-controller)# idle pattern 0x10
```

loopback local (t3)

To set a local loopback on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **loopback local** controller configuration command. To remove the loopback, use the **no** form of this command.

```
loopback local { network | remote }  
no loopback local { network | remote }
```

Syntax Description

This command has no arguments or keywords.

Default

No loopback is set.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Local loopback simultaneously loops all channels toward the router and loops the T3 link back toward the network. Use the **loopback local** command to diagnose problems with cables between the T3 controller and the central switching office at the T3 link level.

Example

In the following example, the T3 controller is placed in a local loopback:

```
Router(config)# controller t3 1/1/0  
Router(config-controll)# loopback local
```

Related Commands

t1 loopback local

show controllers t3

To display information about all T1 lines on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **show controllers t3 EXEC** command.

show controllers t3 [*slot/port-adapter/port/t1-line*] [**brief** | **tabular**] (Cisco 7500 series and Cisco 7000 series routers with RSP)

show controllers t3 [*slot/port/t1-line*] [**brief** | **tabular**] (Cisco 7200 series)

Syntax Description

- slot* (Optional) Slot location of the port adapter.
- port-adapter* (Optional) On the Cisco 7500 series and Cisco 7000 series with RSP, specifies the ports on a VIP. The value can be 0 or 1.
- port* (Optional) Port number on the port adapter.
- t1-line* (Optional) For the PA-MC-T3, the T1 line is a number between 1 and 28.
- brief** (Optional) Displays a list of configurations only.
- tabular** (Optional) Displays a list of configurations and MIB information in a tabular format.

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

If you use the **show controllers t3** command without specifying a port address (*slot/port-adapter/port/t1-line*) or either of the two optional arguments (**brief** or **tabular**), all information is displayed for the T3 controller you specified; therefore, the resulting display output can be extensive.

Examples

The following partial sample output is from the **show controllers t3 tabular** command for a PA-MC-T3 port adapter in port adapter slot 0 installed in interface processor slot 2:

```
router#show controllers t3 2/0/0 tabular
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1
Applique type is Channelized T3
No alarms detected.
FEAC code received: No code is being received
Framing is M23, Line Code is B3ZS, Clock Source is Internal
INTERVAL      LCV   PCV   CCV   PES   PSES  SEFS   UAS   LES   CES   CSES
02:13-02:14   0     0     0     0     0     0     0     0     0     0
01:58-02:13   3    24     0     1     1     1     1     1     1     1
Total         3    24     0     1     1     1     1     1     1     1
```

```

T1 1 is up
timeslots: 1-24
FDL per 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
02:11-02:14   0    0    0    0    0    0  0  0  0  0  0
01:56-02:11   0    6    0    0    0    0  1  0  0 113  0
01:41-01:56   0    4    0    1    0    0  1  0  1  41  0
01:26-01:41   0    0    0    0    0    0  0  0  0  0  0
01:11-01:26   0    0    0    0    0    0  0  0  0  0  0
00:56-01:11   0    0    0    0    0    0  0  0  0  0  0
00:41-00:56   0    0    0    0    0    0  0  0  0  0  0
00:26-00:41   0    0    0    0    0    0  0  0  0  0  0
00:11-00:26   0    0    0    0    0    0  0  0  0  0  0
Total          0   10    0    1    0    0  2  0  1 154  0

```

Table 3 describes the **show controllers t3** display fields.

Table 3 Show Controllers T3 Field Descriptions

Field	Description
T3 2/0/0 is up	T3 controller in slot 2 is operating. The controller's state can be up, down, or administratively down. Loopback conditions are shown by (Locally looped) or (Remotely Looped).
CT3 H/W Version	Version number of the hardware.
CT3 ROM Version	Version number of the ROM.
CT3 F/W Version	Version number of the firmware.
FREEDM Version	
Applique type	Controller type.
Description	User-specified information about the T3 controller.
No alarms detected	Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> • Transmitter is sending remote alarm. • Transmitter is sending AIS. • Receiver has loss of signal. • Receiver is getting AIS. • Receiver has loss of frame. • Receiver has remote alarm. • Receiver has no alarms.
FEAC code received	
Framing is	Type of framing used on the T1 line. Values are: Super Frame (SF) or Extended Super Frame (ESF).
Line Code is	Line coding format on the T3.
Clock Source is	User-specified clock source (line or internal).
Interval	Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. The accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.

Table 3 Show Controllers T3 Field Descriptions (Continued)

Field	Description
LCV	Line Code Violations (LCV) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) occurring over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.
PCV	Path coding violation (PCV) error event is a frame synchronization bit error in the T1 line.
CCV	Not applicable.
PES	P-bit errored seconds (PES) is a second with one or more PCVs, one or more out of frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
PSES	P-bit severely errored seconds (PSES) is a second with 44 or more PCVs, one or more out of frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
SEFS	Severely errored framing seconds (SEFS) is a second with one or more out of frame defects or a detected incoming AIS.
UAS	Unavailable seconds (UAS) are calculated by counting the number of seconds that the interface is unavailable. For more information, refer to RFC 1407.
LES	Line errored seconds (LES) is a second in which one or more code violations occurred or one or more LOS defects.
CES	C-bit errored seconds (CES) is a second with one or more Out of Frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
CSES	C-bit severely errored seconds (CSES) is a second with one or more Out of Frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
Total (last 15 minute interval)	Shows the last 15-minute accumulation period.
T1 1	Displays far-end T1 status. Values are up or down.
timeslots	The range of timeslots available.
FDL per	One-second transmissions of performance reports via the facilities data link (FDL)
No alarms detected	Any alarms detected by the T1 controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> • Transmitter is sending remote alarm. • Transmitter is sending AIS. • Receiver has loss of signal. • Receiver is getting AIS. • Receiver has loss of frame. • Receiver has remote alarm. • Receiver has no alarms.
Framing is	Type of framing used on the T1 line. Values are: Super Frame (SF) or Extended Super Frame (ESF).
Clock Source is	Clock source on the T1 line. Values are internal or line.
Interval	

Table 3 Show Controllers T3 Field Descriptions (Continued)

Field	Description
LCV	
PVC	
CSS	Controlled slip second (CSS) is a one-second interval containing one or more controlled slips.
SELS	Frame loss seconds (SELS) is the number of seconds an Out Of Frame (OOF) error is detected.
LES	?
DM	Degraded minute (DM) is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3. For more information, refer to RFC 1406.
ES	Errored seconds (ES) is a second with one or more path coding violations, one or more out of frame defects, one or more controlled slip events, or a detected AIS defect.
BES	Bursty errored seconds (BES) is a second with fewer than 320 and more than one path coding violation error events, no severely errored frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.
SES	Severely errored seconds (SES) is a second with 320 or more path code violation errors events, one or more out of frame defects, or a detected AIS defect.
UAS	?
SS	Stuffed seconds (SS) is a second in which one or more bit stuffings take place.

The following partial sample output is from the **show controllers t3 brief** command for a PA-MC-T3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 2:

```
router#show controllers t3 2/0/0 brief
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1
Applique type is Channelized T3
No alarms detected.
FEAC code received: No code is being received
Framing is M23, Line Code is B3ZS, Clock Source is Internal
```

The following sample output is from the **show controller t3 brief** command for a specific T1 line on a PA-MC-T3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 2:

```
router#show controllers t3 2/0/0/1 brief
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1

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

The following sample output is from the **show controller t3 tabular** command for a specific T1 line on a PA-MC-T3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 2:

```
Router#show controllers t3 2/0/0/1 tabular
```

```
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1

T1 1 is up
timeslots: 1-24
FDL per 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
02:26-02:34   0     0     0     0     0     0     0     0     0     0     0
02:11-02:26   0     0     0     0     0     0     0     0     0     0     0
01:56-02:11   0     6     0     0     0     0     1     0     0    113    0
01:41-01:56   0     4     0     1     0     0     1     0     1     41     0
01:26-01:41   0     0     0     0     0     0     0     0     0     0     0
01:11-01:26   0     0     0     0     0     0     0     0     0     0     0
00:56-01:11   0     0     0     0     0     0     0     0     0     0     0
00:41-00:56   0     0     0     0     0     0     0     0     0     0     0
00:26-00:41   0     0     0     0     0     0     0     0     0     0     0
00:11-00:26   0     0     0     0     0     0     0     0     0     0     0
Total          0    10     0     1     0     0     2     0     1    154    0Router#
```

The following sample output is from the **show controller t3** command for a specific T1 line on a PA-MC-T3 port adapter in port adapter slot 0 on a VIP2 installed in interface processor slot 2:

```
Router#show controllers t3 2/0/0/1
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1

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 (550 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
Data in Interval 1:
  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
Data in Interval 2:
  0 Line Code Violations, 6 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  1 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  113 Unavail Secs, 0 Stuffed Secs
Total Data (last 9 15 minute intervals):
  0 Line Code Violations,10 Path Code Violations,
  0 Slip Secs, 1 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  2 Errored Secs, 0 Bursty Err Secs, 1 Severely Err Secs
  154 Unavail Secs, 0 Stuffed Secs
```

The following sample output is from the **show controllers t3** command for a specific T1 line when a BER test is running on a PA-MC-T3 port adapter:

```
Router#show controllers t3 2/0/0/1
T3 2/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.1, CT3 ROM Version: 1.1, CT3 F/W Version: 1.0.0
FREEDM version: 1

T1 1 is up
timeslots: 1-24
FDL per AT&T 54016 spec.
No alarms detected.
Framing is ESF, Clock Source is InternalBERT test result (done)
  Test Pattern : 2^11, Status : Not Sync, Sync Detected : 0
  Interval : 122 minute(s), Time Remain : 121 minute(s) (unable to complete)
  Bit Errors (since BERT started): 0 bits,
  Bits Received (since BERT started): 0 Kbits
  Bit Errors (since last sync): 0 bits
  Bits Received (since last sync): 0 Kbits
```

Table 4 describes significant fields shown in the display.

Table 4 Show Controllers T3 Field Descriptions for BERT

Field	Description
BERT test result	Current state of the test. In this case, “running” indicates that the BER test is still in process. After a test is complete, “done” is displayed.
Test Pattern : Status : Sync Detected :	Test pattern selected for the test (2 ¹¹), current synchronization state (Sync), and number of times synchronization was detected during this test (0).
Interval : Time Remain :	Time the test takes to run and time remaining for the test to run. For a BER test that you terminate, 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): Bits Received (since BERT started): Bit Errors (since last sync): Bits Received (since last sync):	Bit errors detected versus the total number of test bits received since the test started and since the last synchronization was detected.

Related Commands

controller t3

show interfaces serial

To display information about a specific serial interface on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **show interfaces serial** privileged EXEC command.

show interfaces serial [*slot/port-adapter/port/t1-line*] [*:channel-group*] (Cisco 7500 series and Cisco 7000 series routers with RSP)

show interfaces serial [*slot/port/t1-line*] [*:channel-group*] (Cisco 7200 series)

Syntax Description

<i>slot</i>	(Optional) Slot location of the port adapter.
<i>port-adapter</i>	(Optional) On the Cisco 7500 series and Cisco 7000 series with RSP, specifies the port adapters on a VIP card. The value can be 0 or 1.
<i>port</i>	(Optional) Port number on the port adapter.
<i>t1-line</i>	(Optional) Specifies the T1 line as a number between 1 and 28.
<i>:channel-group</i>	(Optional) Specifies the T1 channel-group number in the range of 0 to 23.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Examples

The following sample output is from the **show interfaces serial** command for port adapter slot 0 on a VIP2 installed in interface processor slot 5:

```
router#sh int serial 5/0/1:0
Serial5/0/1:0 is up, line protocol is up (looped)
  Hardware is CT3 Single Wide One Port
  MTU 1500 bytes, BW 256 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:04, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/256 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    31478 packets input, 1987221 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    45926 input errors, 1 CRC, 26200 frame, 0 overrun, 0 ignored, 19725 abort
    31488 packets output, 1983933 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    4 carrier transitions no alarm present
  Timeslot(s) Used: 1-4, subrate: 64Kb/s, transmit delay is 0 flags
  non-inverted data
```

Table 5 describes significant fields shown in the display.

Table 5 Show Interfaces Serial Field Descriptions

Field	Description
Serial... is {up down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) or whether it has been taken down by an administrator.
line protocol is {up down}	Indicates whether the software processes that handle the line protocol consider the line usable (that is, whether keepalives are successful) or whether it has been taken down by an administrator.
Hardware is	Hardware type.
MTU	Maximum transmission unit of the interface.
BW	Value of the bandwidth parameter that has been configured for the interface (in kilobits per second). The bandwidth parameter is used to compute IGRP metrics only.
DLY	Delay of the interface in microseconds.
reliability	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
tx load	Transmitted load of the interface as a fraction of 255 (255/255 is 100% reliability) calculated as an exponential average over 5 minutes.
rx load	Received load of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.

Table 5 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
crc	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because a transmission took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	The time when the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last set to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared.
input queue	drops—Number of dropped messages.
Total Output drops	drops—Number of dropped messages.
Queuing strategy	First-in, first-out queuing strategy.
Output Queue	Number of messages in the output queue.
Conversations	Sessions between two transaction programs.
Reserved conversations	Maximum number of allocated conversations allowed.
Five minute input rate Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium’s minimum packet size.

Table 5 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
throttles	Indicates number of throttles.
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This might never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this might not balance with the sum of the enumerated output errors, because some datagrams can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This usually is the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multipoint transreceivers). Some collisions are normal.
interface resets	Number of times an interface has been completely reset. A complete reset can occur if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
output buffer failures	Number of times that a packet was not output from the output hold queue because of a shortage of MEMD shared memory.

Table 5 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
output buffers swapped out	Number of packets stored in main memory when the output queue is full; swapping buffers to main memory prevents packets from being dropped when output is congested. The number is high when traffic is bursty.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. For example, if data carrier detect (DCD) goes down and comes up, the carrier transition counter increments two times. Indicates modem or line problems if the carrier detect line is changing state often.
Timeslot (s) used	Number of timeslots assigned to the T1 channel.
substrate	
transmit delay	Number of idle flags inserted between each HDLC frame.

shutdown (controller)

To disable the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **shutdown** controller configuration command. To enable the PA-MC-T3, use the **no** form of this command.

shutdown
no shutdown

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA. The information was modified in Cisco IOS Release 11.1 CC to support the PA-MC-T3.

Shutting down the PA-MC-T3 port adapter disables all functions on the interface. This command marks the interface as unavailable. To check if the PA-MC-T3 is disabled, use the **show controllers t3** command.

The **no shutdown** command brings the T3 controller back up and sends an alarm indication signal (AIS) to the network.

Example

In the following example, the PA-MC-T3 is shut down:

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

t1 bert pattern

To enable a BER test pattern on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **t1 bert** controller configuration command. To disable a BER test pattern, use the **no** form of this command.

```
t1 line bert pattern {0s | 1s | 2^11 | 2^15 | 2^20-O153 | 2^20-QRSS | 2^23 | alt-0-1} interval
minutes
no t1 line bert pattern {0s | 1s | 2^11 | 2^20-O153 | 2^20-QRSS | 2^23 | alt-0-1}
interval minutes
```

Syntax Description

<i>line</i>	Number of the T1 line. Range is 1 to 28.
pattern {0s 1s 2^15 2^11 2^20-O153 2^20-QRSS 2^23 alt-0-1}	<p>Specifies the length of the repeating BER test pattern. Values are:</p> <ul style="list-style-type: none"> 0s—Repeating pattern of zeros (...000...). 1s—Repeating pattern of ones (...111...). 2^11—Pseudo-random test pattern that is 2048 bits long. 2^15—Pseudo-random O.151 test pattern that is 32,768 bits long. 2^20-O153—Pseudo-random O.153 test pattern that is 1,048,575 bits long. 2^20-QRSS—Pseudo-random QRSS 0.151 test pattern that is 1,048,575 bits long. 2^23—Pseudo-random O.151 test pattern that is 8,388,607 bits long. alt-0-1—Repeating alternating pattern of zeros and ones (...01010...).
interval <i>minutes</i>	Specifies the duration of the BER test. The interval can be a value from 1 to 14,400 minutes.

Default

No BER test is performed.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

The BER test patterns from the PA-MC-T3 are framed test patterns (that is, the test patterns are inserted into the payload of the framed T1 signal).

To view the BERT results, use the **show controller t3** or **show controller t3 brief EXEC** command. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BER test
- Total bit errors
- Total bits received

When the T1 line has a BERT test running, the line state is DOWN. Also, when the BER test is running and the Status field is Not Sync, the information in the Bit Errors field is not valid. When the BER test is done, the Status field is not relevant.

The **t1 bert** command is not written to NVRAM because it is only used for testing the T1 line for a short predefined interval and to avoid accidentally saving the command, which could cause the interface not to come up the next time the router reboots.

Example

In the following example, a BER test pattern of all zeros is run for 30 minutes on T1 line 6 on the PA-MC-T3 in slot 9:

```
Router# controller t3 9/0/0  
Router(config-controll)# t1 6 bert pattern 0s interval 30
```

Related Commands

t1 loopback local

t1 channel-group

To create a channel group on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **t1 channel-group** controller configuration command. To remove a channel group, use the **no** form of this command.

```
t1 line channel-group group-number timeslots range [speed {56 |64}]  
no t1 line channel-group group-number timeslots range
```

Syntax Description

<i>line</i>	Number of the T1 line. Only T1 lines 1, 2, and 3 can be configured as a channel group.
channel-group <i>group-number</i>	Number of the channel group. Range is 0 to 23.
timeslot <i>range</i>	Specifies the timeslots assigned to the T1 line. The range can be 1 to 24. A dash represents a range of timeslots, and a comma separates timeslots. For example, 1-10,15-18 assigns timeslots 1 through 10 and 15 through 18.

Default

None

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

You must specify the timeslots used by each channel group of the T1 line. The unconfigured timeslots are not used and are filled with an idle pattern specified by the **idle pattern** controller configuration command.

If you assign only one channel group to a T1 line, it is a fractional T1 line. If you assign more than one channel group to a T1 line, it is a channelized T1 line.

For channelized (**t1 channel-group** command) and fractional (**t1 channel-group** command) configurations, each configured channel group, which might contain individual timeslots or ranges of timeslots, uses only one of the 128 available logical channels. For example, if you assign the range of timeslots 3 to 7 to a channel group, only one logical channel is used. Likewise, if you assign just timeslot 3 to a channel group, only one logical channel is used.

After you configure the T1 lines, they are recognized by the software as a serial interface, and all configuration commands for a serial interface are available. You can configure the serial interface to carry data traffic with the encapsulation of PPP, HDLC, SMDS, and Frame Relay.

Examples

In the following example, timeslots 1, 2, 3, 4, 5, 20, 21, 22, and 23 are assigned to channel group 20, and timeslots 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 are assigned to channel group 21 on T1 line 1:

```
Router# configure terminal
Router(config)# controller t3 1/1/0
Router(config-controll)# t1 1 channel-group 20 timeslot 1-5, 20-23
Router(config-controll)# t1 1 channel-group 21 timeslot 6-19
Router(config-controll)# interface serial 1/0/0/1:20
Router(config-if)# ip address 10.20.30.1 255.255.255.0
Router(config-if)# interface serial 1/0/0/1:21
Router(config-if)# ip address 10.20.40.1 255.255.255.0
```

In the following example, the full T1 bandwidth (timeslots 1 through 28) are assigned to T1 line 2:

```
Router# configure terminal
Router(config)# controller t3 1/1/0
Router(config-controll)# t1 2 fractional timeslot 1-28
Router(config-controll)# interface serial 1/1/0/2:0
Router(config-if)# ip address 10.20.50.1 255.255.255.0
```

t1 clock source

To specify where the clock source is obtained for use by each T1 channel on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **t1 clock source** controller configuration command.

```
t1 line clock source {internal | line}
```

Syntax Description

<i>line</i>	Number of the T1 line. Range is 1 to 28.
internal	Specifies that the internal clock source is used. This is the default.
line	Specifies that the network clock source is used.

Default

Internal

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

If you do not specify the **t1 clock source** command, the default clock source of **internal** is used by all the T1s on the PA-MC-T3.

You can also set the clock source for the PA-MC-T3 by using the **clock source** controller configuration command.

Example

In the following example, the clock source is set:

```
Router# controller t3 9/0/0  
Router(config-controll)# t1 6 clock source internal
```

Related Commands

clock source

t1 framing

To specify the type of framing used by the T1 channels on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **t1 framing** controller configuration command.

```
t1 line framing {sf | esf}
```

Syntax Description

<i>line</i>	Number of the T1 line. Range is 1 to 28.
sf	Specifies Super Frame as the T1 frame type.
esf	Specifies Extended Super Frame as the T1 frame type.

Default

Esf

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

Use this command in configurations where the router is intended to communicate with T1 fractional data lines. The service provider determines which framing type, either **sf** or **esf**, is required for your T1 circuit.

Example

- The following example sets ESF framing format for T1 16 as follows:

```
Router(config)# controller t3 1/0/0  
Router(config-controller)# t1 16 framing esf
```

Related Commands

channel-group
linecode

t1 loopback local

To set both a local and line (remote) loopback simultaneously on the PA-MC-T3 port adapter in Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with RSP, use the **t1 loopback local** controller configuration command. To remove a loopback, use the **no** form of this command.

```
t1 line loopback local {network | remote}  
no t1 line loopback local {network | remote}
```

Syntax Description

line Number of the T1 line. Range is 1 to 28.

Default

No loopback is set.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CC.

A local loopback loops the data toward the router, and a remote line loopback loops the T1 line to the remote end. Use the **t1 loopback local** command to diagnose problems with the port adapter and the central switching office at the T1 line level.

You can also use loopback mode with the **t1 bert** command.

Example

In the following example, T1 line 2 is placed in a local loopback:

```
Router(config)# controller t3 1/1/0  
Router(config-ctrl) # t1 2 loopback local
```

Related Commands

idle pattern

loopback local (t3)