Channelized T3 Interface Processor and Port Adapter

Description

The Channelized T3 Interface Processor (CT3IP) is available on Cisco 7500 series routers and Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI). The Channelized T3 dual-wide port adapter (PA-CT3/4T1) can be used in Cisco 7200 series routers.

Note Throughout this document are references to the CT3IP. However, the term CT3IP also applies to the PA-CT3/4T1. Wherever you see a description of a feature of the CT3IP, the feature is also available in the PA-CT3/4T1.

The CT3IP is a fixed-configuration interface processor based on the second-generation Versatile Interface Processor (VIP2). The CT3 channelized port adapter (PA-CT3/4T1) is a dual-wide module. The CT3IP or PA-CT3/4T1 has four T1 connections via DB-15 connectors and one DS3 connection via BNC connectors. Each DS3 interface can provide up to 28 T1 channels (a single T3 group). Each channel is presented to the system as a serial interface that can be configured individually. The CT3IP or PA-CT3/4T1 can transmit and receive data bidirectionally at the T1 rate of 1.536 Mbps. The four T1 connections use 100-ohm twisted-pair serial cables to external channel service units (CSUs) or to a MultiChannel Interface Processor (MIP) on the same router or on another router. For wide-area networking, the CT3IP or PA-CT3/4T1 can function as a concentrator for a remote site.

As mentioned above, the CT3IP or PA-CT3/4T1 provides 28 T1 channels for serial transmission of data. Each T1 channel can be configured to use a portion of the T1 bandwidth or the entire T1 bandwidth for data transmission. Bandwidth for each T1 channel can be configured for *n* x 56 kbps or *n* x 64 kbps (where *n* is 1 to 24). The unused portion of the T1 bandwidth, when not running at full T1 speeds, is filled with idle channel data. The CT3IP or PA-CT3/4T1 does not support the aggregation of multiple T1 channels (called *inverse muxing* or *bonding*) for higher bandwidth data rates.

The first three T1 channels of the CT3IP or PA-CT3/4T1 can be broken out to the three DSUP-15 connectors on the CPT3IP or PA-CT3/4T1 so the T1 can be further demultiplexed by the MIP on the same router or on another router or by other multiplexing equipment. When connecting to the MIP, you configure a channelized T1 as described in the "Configure External T1 Channels" section later in this chapter. This is referred to as an external T1 channel.

The CT3IP or PA-CT3/4T1 supports the following WAN protocols:

- Frame Relay
- HDLC
- PPP
- SMDS Data Exchange Interface (DXI)

The CT3IP or PA-CT3/4T1 meets ANSI T1.102-1987 and BELCORE TR-TSY-000499 specifications for T3 and meets ANSI 62411 and BELCORE TR499 specifications for T1. The CT3IP or PA-CT3/4T1 provides internal channel service unit (CSU) functionality and includes reporting performance data statistics, transmit and receive statistics, and error statistics. The CT3IPor PA-CT3/4T1 supports RFC 1406 (T1 MIB) and RFC 1407 (T3 MIB).

External T1 channels do not provide CSU functionality and must connect to an external CSU.

Platforms

This feature is supported on these platforms:

- Cisco 7500 series routers
- Cisco 7200 series routers
- Cisco 7000 series routers with the RSP7000 and RSP7000CI

Configuration Tasks

Perform the tasks in the following sections to configure the CT3IP (all tasks are optional except for the second task):

- Configure the T3 Controller
- Configure Each T1 Channel
- Configure External T1 Channels
- Troubleshoot the T3 and T1 Channels
- Monitor and Maintain the CT3IP

After you configure the T1 channels on the CT3IP, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the T1 channel. For more information, refer to the "Configure a Synchronous Serial Interface" section in the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*.

For CT3IP configuration examples, see the "Configuration Examples" section later in this chapter.

For information on other commands that can be used by the CT3IP interface, refer to the Cisco IOS Release 11.2 configuration guides.

Configure the T3 Controller

If you do not modify the configuration of the CT3IP, the configuration defaults shown in Table 37 are used.

Table 37 CT3IP Controller Defaults

Attribute	Default Value
Framing	auto-detect
Cable length	224 feet
Clock source	internal

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 CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Change the framing format.	**framing** {**c-bit** | **m23** | **auto-detect**}
Change the cable length (values are 0 to 450 feet).	**cablelength** *feet*
Change the clock source used by the T3 controller.	**clock source** {**internal** | **line**}

Note The port adapter and port numbers for the CT3IP are 0.

Note Although you can specify a cable length from 0 to 450 feet, the hardware only recognizes two ranges: 0 to 224 and 225 to 450. For example, entering 150 feet uses the 0 to 224 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 0 to 224 range. However, if you change the cable length to 250, the 225 to 450 range is used. The actual number you enter is stored in the configuration file.

Configure Each T1 Channel

You must configure the timeslots used by each T1 channel on the CT3IP. Optionally you can specify the speed, framing format, and clock source used by each T1 channel. If you do not specify the speed, framing format, and clock source used by each T1 channel, the configuration defaults shown in Table 38 are used.

Table 38 CT3IP T1 Channel Defaults

Attribute	Default Value
Speed	64 kbps
Framing	esf
Clock source	internal
Linecode	b8zs
T1 yellow alarm	detection and generation

To specify the timeslots used by each T1 channel, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Step 2	Configure the timeslots (values are 1 to 24) for the T1 channel (values are 1 to 28) and optionally specify the speed for each T1 channel.	**t1** *channel* **timeslot** *range* [**speed** {**56** | **64**}]

Note The 56-kbps speed is valid only for T1 channels 21 through 28.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

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 CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Change the framing format used by the T1 channel (values are 1 to 28).	**t1** *channel* **framing** {**esf** | **sf**}
Change the clock source used by the T1 channel (values are 1 to 28).	**t1** *channel* **clock source** {**internal** | **line**}
Change the line coding used by the T1 channel (values are 1 to 28).	**t1** *channel* **linecode** {**ami** | **b8zs**}
Disable detection or generation of a yellow alarm on the T1 channel (values are 1 to 28).	**no t1** *channel* **yellow** {**detection** | **generation**}

Note If you select **ami** line coding, you must also invert the data on the T1 channel by using the **invert data** interface command. To do so, first use the **interface serial** global configuration command to select the T1 channel and enter interface configuration mode.

Note If you select **sf** framing, you should consider disabling yellow alarm detection because the yellow alarm can be incorrectly detected with **sf** framing.

After you configure the T1 channels on the CT3IP, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the T1 channel. For more information, 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 channel, perform the following task in global configuration mode:

Task	Command
Define the serial interface for a T1 channel (values are 1 to 28) and enter interface configuration mode.	**interface serial** *slot*/*port-adapter*/*port*:*t1-channel* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **interface serial** *slot*/*port*:*t1-channel* (Cisco 7200 series)

Note The port adapter and port numbers for the CT3IP are 0.

In addition to the commands in the "Configure a Synchronous Serial Interface" chapter, the **invert data** interface command can be used to configure the T1 channels on the CT3IP. If the T1 channel on the CT3IP is using AMI line coding, you must invert the data. For information on the **invert data** interface command, refer to the "Synchronous Serial Port Adapters" chapter later in this document. For more information, see the **t1 linecode** controller command.

Configure External T1 Channels

The first three T1 channels (1, 2, and 3) of the CT3IP can be broken out to the DSUP-15 connectors on the CPT3IP. This way, the T1 channel can be further demultiplexed by the MIP on the same router, another router, or other multiplexing equipment.

Note If a T1 channel that was previously configured as a serial interface is broken out to the external T1 port, that interface and its associated configuration remain intact while the channel is broken out to the external T1 port. The serial interface is not usable during the time the T1 channel is broken out to the external T1 port; however, the configuration remains to facilitate the return of the T1 channel to a serial interface with the **no t1 external** command.

To configure a T1 channel as an external port, complete the following tasks beginning in EXEC mode:

Task		Command
Step 1	Determine if the external device connected to the external T1 port is configured and cabled correctly by locating the line `Ext1...` in the display output. If the line status is `OK,` a valid signal is being received and the signal is not an all-ones signal.	**show controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show controller t3** *slot*/*port* (Cisco 7200 series)
Step 2	Enter configuration mode.	**configure terminal**

Task		Command
Step 3	Select the CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Step 4	Configure the T1 channel (values are 1, 2, and 3) as an external port and optionally specify the cable length and linecode. The default cable length is 133 feet, and the default linecode is b8zs.	**t1 external** *channel* [**cablelength** *feet*] [**linecode** {**ami** | **b8zs**}]

Note Only T1 channels 1 through 3 can be configured as an external T1.

Note Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

After you configure the external T1 channel, you can continue configuring it as a channelized T1 from the MIP. All channelized T1 commands might not be applicable to the T1 interface. To define the T1 controller and enter controller configuration mode, perform the following task in global configuration mode:

Task	Command
Select the MIP and enter controller configuration mode.	**controller t1** *slot*/*port*

After you configure the channelized T1 on the MIP, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the T1 interface. To enter interface configuration mode and configure the serial interface that corresponds to a T1 channel group, perform the following task beginning in global configuration mode:

Task	Command
Define the serial interface for a T1 channel on the MIP (values are 1 to 28) and enter interface configuration mode.	**interface serial** *slot*/*port*:*t1-channel*

For more information, refer to the "Configure Channelized T1" section and the "Configure a Synchronous Serial Interface" section in the "Configuring Interfaces" chapter of the *Configuration Fundamentals Configuration Guide*. For an example of configuring an external T1 channel, see the "Configuration Examples" section later in this chapter.

Troubleshoot the T3 and T1 Channels

You can use the following methods to troubleshoot the CT3IP using Cisco IOS software:

- Test the T1 by using the **t1 test** controller configuration command and the test port
- Loop the T1 by using **loopback** interface configuration commands
- Loop the T3 by using **loopback** controller configuration commands

Enable Test Port

You can use the T1 test port available on the CT3IP to break out any of the 28 T1 channels for testing (for example, 24-hour BERT testing as is commonly done by telephone companies before a line is brought into service).

The T1 test port is also available as an external port. For more information on configuring an external port, see the previous section, "Configure External T1 Channels."

Note If a T1 channel that was previously configured as a serial interface is broken out to the T1 test port, that interface and its associated configuration remain intact while the channel is broken out to the T1 test port. The serial interface is not usable during the time the T1 channel is broken out to the T1 test port; however, the configuration remains to facilitate the return of the T1 channel to a serial interface with the **no t1 test** command.

To enable a T1 channel as a test port, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Determine if the external device connected to the external T1 port is configured and cabled correctly by locating the line `Ext1...` in the display output. If the line status is `OK,` a valid signal is being received and the signal is not an all-ones signal.	**show controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show controller t3** *slot*/*port* (Cisco 7200 series)
Step 2	Select the CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Step 3	Enable the T1 channel (values are 1 to 28) as a test port and optionally specify the cable length and linecode. The default cable length is 133 feet, and the default linecode is b8zs.	**t1 test** *channel* [**cablelength** *feet*] [**linecode** {**ami** | **b8zs**}]

To disable a T1 channel as a test port, complete the following tasks beginning in global configuration mode:

Task		Command
Step 1	Select the CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Step 2	Disable the T1 channel (values are 1 to 28) as a test port.	**no t1 test** *channel*

Note Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

Loopback T1 Channels

You can perform the following types of loopbacks on a T1 channel:

- Local—Loops the router output data back toward the router at the T1 framer and sends an AIS signal out toward the network (see Figure 6).
- Network line—Loops the data back toward the network before the T1 framer and automatically sets a local loopback (see Figure 7).
- Network payload—Loops just the payload data back toward the network at the T1 framer and automatically sets a local loopback (see Figure 8).
- Remote line inband—Sends a repeating 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback (see Figure 9).
- Remote payload FDL ANSI—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.
- Remote line FDL ANSI—Sends a repeating, 16-bit ESF data link code word (00001110 11111111) to the remote CSU end requesting that it enter into a network line loopback.
- Remote line FDL Bellcore—Sends a repeating, 16-bit ESF data link code word (00001110 11111111) to the remote SmartJack end requesting that it enter into a network line loopback.

To enable loopbacks on a T1 channel, complete the first task beginning in global configuration mode followed by any one of the following tasks:

Task	Command
Select the T1 channel (values are 1 to 28) on the CT3IP and enter interface configuration mode.	**interface serial** *slot*/*port-adapter*/*port*:*t1-channel* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **interface serial** *slot*/*port*:*t1-channel* (Cisco 7200 series)
Enable the local loopback on the T1 channel.	**loopback local**
Enable the network line loopback on the T1 channel.	**loopback network line**

Task	Command
Enable the network payload loopback on the T1 channel.	**loopback network payload**
Enable the remote end loopback on the T1 channel.	**loopback remote line inband**
Enable the remote line FDL ANSI bit loopback or remote SmartJack loopback on the T1 channel.	**loopback remote line fdl** {**ansi** | **bellcore**}
Enable the remote payload FDL ANSI bit loopback on the T1 channel.	**loopback remote payload** [**fdl**] [**ansi**]

Note The port adapter and port numbers for the CT3IP are 0.

Figure 6 shows an example of a local loopback in which the loopback occurs in the T1 framer.

Figure 6 CT3IP Local Loopback

Figure 7 shows an example of a network line loopback in which just the data is looped back toward the network (before the T1 framer).

Figure 7 CT3IP Network Line Loopback

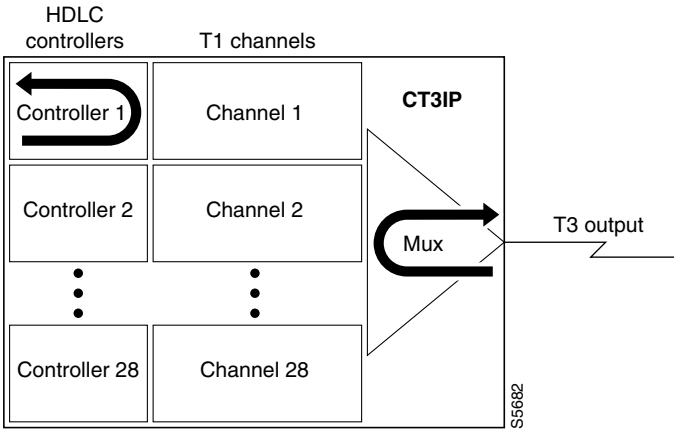


Figure 8 shows an example of a network payload loopback in which just the payload data is looped back toward the network at the T1 framer.

Figure 8 CT3IP Network Payload Loopback

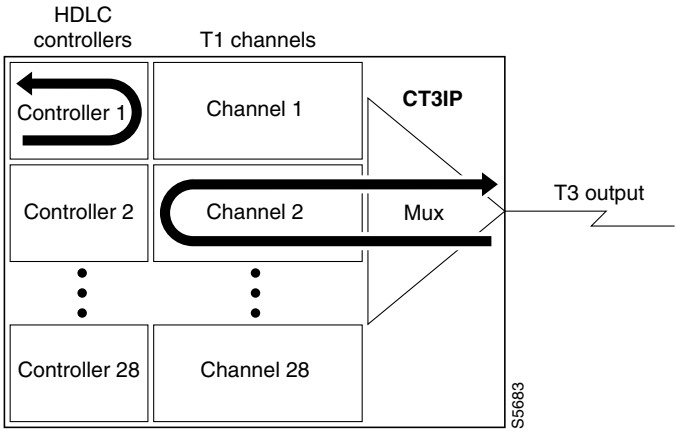
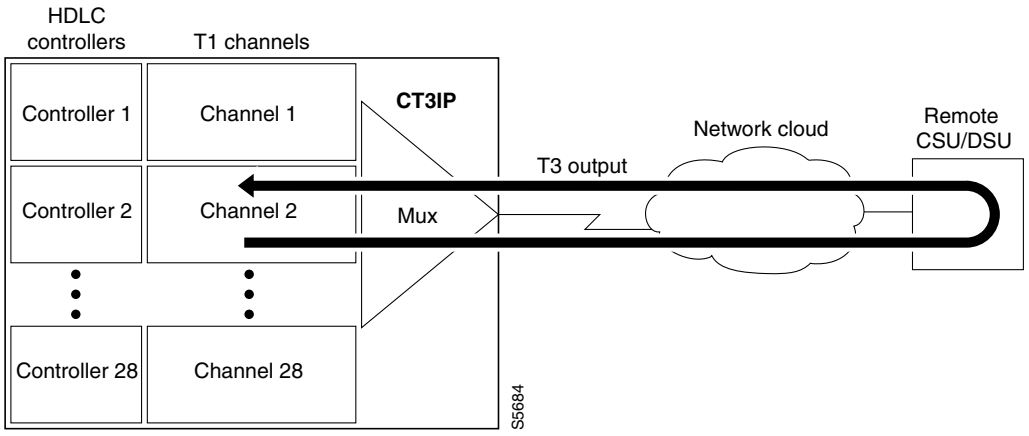


Figure 9 shows an example of a remote inband loopback in which the network line enters a line loopback.

Figure 9 CT3IP Remote Loopback



Loopback T3

You can put the entire T3 line into loopback mode (that is, all T1 channels are looped) by using the following types of loopbacks:

- Local—Loops the router output data back toward the router at the T1 framer and sends an AIS signal out toward the network.
- Network—Loops the data back toward the network (before the T1 framer).
- Remote —Sends a FEAC (far-end alarm control) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are only possible when the T3 is configured for C-bit framing. The type of framing used is determined by the equipment you are connecting to. (For more information, see the **framing** controller command.)

To enable loopbacks on the T3 (and all T1 channels), complete the first task beginning in global configuration mode followed by any one of the following tasks:

Task	Command
Select the CT3IP and enter controller configuration mode.	**controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **controller t3** *slot*/*port* (Cisco 7200 series)
Enable the local loopback.	**loopback local**
Enable the network loopback.	**loopback network**
Enable the remote loopback.	**loopback remote**

Note The port adapter and port numbers for the CT3IP are 0.

Monitor and Maintain the CT3IP

After configuring the new interface, you can monitor the status and maintain the CT3IP in the Cisco 7000 series routers with an RSP7000 or in the Cisco 7500 series routers by using the **show** commands. To display the status of any interface, complete one of the following tasks in EXEC mode:

Task	Command
Display the internal status of each interface processor and list each interface.	**show controller cbus**
Display the status of the T3 and T1 channels (values are 1 to 28) including the T3 alarms and T1 alarms for all 28 T1 channels or only the T1 channel specified.	**show controller t3** *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show controller t3** *slot*/*port* (Cisco 7200 series)
Display statistics about the serial interface for the specified T1 channel (values are 1 to 28) on the router.	**show interfaces serial** *slot*/*port-adapter*/*port*:*t1-channel* [**accounting** | **crb**] (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI) **show interfaces serial** *slot*/*port*:*t1-channel* [**accounting** | **crb**] (Cisco 7200 series)

Configuration Examples

The examples in this section show how to configure the Channelized T3 Interface Processor (CT3IP). The first example shows how to configure two of the T1 channels of the channelized T3 controller. The second example shows how to configure one of the T1 channels of the channelized T3 controller as an external port for further channelization on the Multichannel Interface Processor (MIP).

For more information, refer to the "Configure the T3 Controller" and "Configure External T1 Channels" sections earlier in this chapter.

CT3IP Configuration with Default Values Accepted

In the following example, timeslots 1 through 24 (the entire T1 bandwidth) are assigned to T1 channel 16 and timeslots 1 through 5 and 20 through 23 (fractional T1 bandwidth) are assigned to T1 channel 10 for the CT3IP in slot 9. The default framing, cable length, and clock source are accepted for the T3, and the default speed, framing, clock source, and line code are accepted for each T1 channel. Each T1 channel is assigned an IP address. Other interface configuration commands can be assigned to the T1 channel at this time.

```
router(config)# controller t3 9/0/0
router(config-controll)# t1 16 timeslot 1-24
router(config-controll)# t1 10 timeslot 1-5,20-23
router(config-controll)# exit
router(config)# interface serial 9/0/0:16
router(config-if)# ip address 10.20.20.1 255.255.255.0
router(config-if)# exit
router(config)# interface serial 9/0/0:10
router(config-if)# ip address 10.20.20.3 255.255.255.0
router(config-if)# exit
router(config)#
```

CT3IP External Ports Configuration

In the following example, T1 channel 1 on the CT3IP in slot 9 is broken out as an external port so that it can be further channelized on the MIP in slot 3. The cable length is 300 feet, and the default line coding format on the T1 channel is used. Because the default line coding format on the T1 channel is B8ZS and the default line coding on the MIP is AMI, the line coding on the MIP is changed to B8ZS.

```
router(config)# controller t3 9/0/0
router(config-controll)# t1 external 1 cablelength 300
router(config-controll)# exit
router(config)# controller t1 3/0
router(config-controll)# linecode b8zs
router(config-controll)# channel-group 1 timeslots 1
router(config)# interface serial 3/0:1
router(config-if)# ip address 10.20.20.5 255.255.255.0
router(config-if)# exit
router(config)#
```

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 11.2 command references.

- **cablelength**
- **clear interface**
- **clock source**
- **controller t3**
- **description (controller)**
- **framing (T3)**
- **loopback (T1)**
- **loopback (T3)**
- **show controller t3**
- **show interfaces serial**
- **shutdown (controller)**
- **t1 clock source**
- **t1 external**
- **t1 framing**
- **t1 linecode**
- **t1 test**
- **t1 timeslot**
- **t1 yellow**

cablelength

To specify the distance of the cable from the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers to the network equipment, use the **cablelength** controller configuration command. Use the **no** form of this command to restore the default cable length.

cablelength *feet*
no cablelength

Syntax Description

feet	Number of feet in the range of 0 to 450. The default is 224 feet.

Default

224 feet

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

If you do not specify the **cablelength** command, the default cable length of 224 feet is used by the CT3IP.

Note Although you can specify a cable length from 0 to 450 feet, the hardware only recognizes two ranges: 0 to 224 and 225 to 450. For example, entering 150 feet uses the 0 to 224 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 0 to 224 range. However, if you change the cable length to 250, the 225 to 450 range is used. The actual number you enter is stored in the configuration file.

Example

In the following example, the cable length for the CT3IP is set to 300:

```
controller t3 9/0/0
 cablelength 300
```

clear interface

To reset the hardware logic on an interface, use the **clear interface** EXEC command.

clear interface *type number*
clear interface *type slot*/*port* (Cisco 7000 series, Cisco 7200 series, and Cisco 7500 series with a Packet OC-3 Interface Processor)
clear interface [*type slot*/*port-adapter*/*port*] (ports on VIP2s in the Cisco 7000 series and Cisco 7500 series)
clear interface [*type slot*/*port*] (ports on VIP2s in the Cisco 7200 series)
clear interface *type slot*/*port* [**:***channel-group*] (Cisco 7000 series MIP T1 interface)
clear interface *type slot*/*port-adapter*/*port* [**:***t1-channel*] (CT3IP in Cisco 7000 series routers with RSP7000 and Cisco 7500 series)
clear interface *type slot*/*port* [**:***t1-channel*] (PA-CT3/4T1 in Cisco 7200 series routers)

Syntax Description

type — Interface type; one of the keywords listed in the section "Usage Guidelines" later in this chapter.

number — Port, connector, or interface card number.

slot — Backplane slot number. The value varies depending on the platform.

port — Port number of the interface. For the Cisco 7500 series, if the interface type is *pos*, the value must be 0. On the Cisco 7000 series, this argument is required, and the value can be 0, 1, 2, 3, 4, or 5 depending on the type of interface, as follows:

- AIP (ATM Interface Processor): 0
- EIP (Ethernet Interface Processor): 0, 1, 2, 3, 4, or 5
- FIP (FDDI Interface Processor): 0
- HIP (HSSI Interface Processor): 0
- MIP (Multichannel Interface Processor): 0 or 1
- TRIP (Token Ring Interface Processor): 0, 1, 2, or 3

(Optional) Port number of the interface. For the VIP, this argument is optional, and the value can be the following:

- 1-port Fast Ethernet interfaces: 0
- 4-port Ethernet interfaces: 0, 1, 2, or 3
- 4-port serial interfaces: 0, 1, 2, or 3
- 4-port Token Ring interfaces: 0, 1, 2, or 3
- 1-port FDDI interfaces: 0

The port adapter and port numbers for the CT3IP are 0.

port-adapter — (Optional) On the Cisco 7000 with RSP7000 and Cisco 7500 series, specifies the port adapter on a VIP2. The value can be 0 or 1. The port adapter and port numbers for the CT3IP are 0.

:*channel-group* (Optional) On the Cisco 7000 series supporting channelized T1, specifies the channel and can be between 0 and 23.

:*t1-channel* (Optional) For the CT3IP, the T1 channel is a number between 1 and 28.

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Command Mode

EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0.

This command was modified in Cisco IOS Release 11.1 CA to include command syntax for the CT3IP.

Under normal circumstances, you do not need to clear the hardware logic on interfaces.

Table 39 lists the type keywords available for the **clear interface** command.

Table 39 Interface Type Keywords

Keyword	Interface Type
async	Async interface
atm	Asynchronous Transfer Mode (ATM) interface
bri	Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI)
ethernet	Ethernet interface
fddi	Fiber Distributed Data Interface (FDDI)
hssi	High-Speed Serial Interface (HSSI)
loopback	Loopback interface
null	Null interface
pos	Packet OC-3 Interface Processor
serial	Synchronous serial interface
tokenring	Token Ring interface
tunnel	Tunnel interface

Examples

The following example resets the interface logic on HSSI interface 1:

```
clear interface hssi 1
```

The following example resets the interface logic on Packet OC-3 interface 0 on the POSIP in slot 1:

```
clear interface pos 1/0
```

The following example resets the interface logic on T1 0 on the CT3IP in slot 9:

```
clear interface serial 9/0/0:0
```

clock source

To specify where the clock source is obtained for use by the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **clock source** controller configuration command. Use the **no** form of this command to restore the default clock source.

clock source {**internal** | **line**}
no clock source

Syntax Description

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 CA.

If you do not specify the **clock source** command, the default clock source of internal is used by the CT3IP.

Select line clocking when the CT3IP is connected to a device known to provide a good DS3 clock signal.

Note When performing a coaxial loop between the transmit and receive ports, you must select internal clocking because there is no external equipment connected that can provide a clock signal.

You can also set the clock source for each T1 channel by using the **t1 clock source** controller configuration command.

Example

In the following example, the clock source for the CT3IP is set to line:

```
controller t3 9/0/0
 clock source line
```

Related Command

t1 clock source

controller t3

To configure the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers or to configure the PA-CT3/4T1 in Cisco 7200 series routers, use the **controller t3** global configuration command.

controller t3 *slot*/*port-adapter*/*port* (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI)
controller t3 *slot*/*port* (Cisco 7200 series)

Syntax Description

slot	Backplane slot number.The value varies depending on the platform.
port-adapter	Port adapter and port numbers for the CT3IP are 0.
port	Port adapter and port numbers for the CT3IP are 0.

Default

No T3 controller is configured.

Command Mode

Global configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

This command is used to configure the CT3IP and the 28 T1 channels. After the T1 channels are configured, continue to configure each T1 channel as a serial interface by using the **interface serial** global configuration command.

Example

In the following example, the CT3IP in slot 3 is configured:

```
controller t3 3/0/0
```

Related Command

interface serial

description (controller)

To add a description to an E1 or T1 controller or the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **description** controller configuration command. Use the **no** form of this command to remove the description.

description *string*
no description

Syntax Description

string	Comment or a description to help you remember what is attached to the interface. Up to 80 characters.

Default

No description is added.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 10.3.

This command was modified in Cisco IOS Release 11.1 CA to include the CT3IP controller.

The **description** command is meant solely as a comment to be put in the configuration to help you remember what certain controllers are used for. The description affects the CT3IP and MIP interfaces only and appears in the output of the **show controller t3**, **show controller e1**, **show controller t1,** and **show running-config** EXEC commands.

Example

The following example describes a 3174 controller:

```
controller t1
 description 3174 Controller for test lab
```

Related Commands

show controller e1
show controller t1
show controller t3
show running-config

framing (T3)

To specify the type of framing used by the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **framing** controller configuration command. Use the **no** form of this command to restore the default framing type.

framing {**c-bit** | **m23** | **auto-detect**}
no framing

Syntax Description

c-bit	Specifies that the C-bit framing is used as the T3 framing type.
m23	Specifies that the M23 framing is used as the T3 framing type.
auto-detect	Specifies that the CT3IP detects the framing type it receives from the far-end equipment. This is the default.

Default

auto-detect

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

If you do not specify the **framing** command, the default **auto-detect** is used by the CT3IP to automatically determine the framing type received from the far-end equipment.

Because the CT3IP supports the Application Identification Channel (AIC) signal, the setting for the framing might be overridden by the CT3IP firmware.

You can also set the framing for each T1 channel by using the **t1 framing** controller configuration command.

Example

In the following example, the framing for the CT3IP is set to C-bit:

```
controller t3 9/0/0
 framing c-bit
```

Related Command

t1 framing

loopback (T1)

To loop individual T1 channels on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **loopback** interface configuration command. Use the **no** form of this command to remove the loopback.

loopback [**local** | **network** {**line** | **payload**} | **remote** {**line** {**fdl** {**ansi** | **bellcore**} | **inband**} | **payload** [**fdl**] [**ansi**]}]
no loopback

Syntax Description

local	(Optional) Loops the router output data back toward the router at the T1 framer and sends an AIS signal out toward the network.
network {**line**	**payload**}	(Optional) 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).
remote line fdl {**ansi**	**bellcore**}	(Optional) Sends a repeating, 16-bit ESF data link code word (00001110 11111111) to the remote end requesting that it enter into a network line loopback. Specify the **ansi** keyword to enable the remote line Facility Data Link (FDL) ANSI bit loopback on the T1 channel, per the ANSI T1.403 Specification. Specify the **bellcore** keyword to enable the remote SmartJack loopback on the T1 channel, per the TR-TSY-000312 Specification.
remote line inband	(Optional) Sends a repeating, 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback.
remote payload [**fdl**] [**ansi**]	(Optional) 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 bit loopback on the T1 channel. You can optionally specify **fdl** and **ansi**, but it is not necessary.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Use this command for troubleshooting purposes.

To better diagnose T1 provisioning problems, you can place the the remote CSU or remote SmartJack into loopback. The **loopback remote line fdl** interface configuration command allows you to place either the CSU or the SmartJack into loopback:

- **ansi**—Places the CSU into loopback, per the ANSI T1.403 Specification
- **bellcore**—Places the SmartJack into loopback, per the TR-TSY-000312 Specification

When both are configured, transmission of LOF indication (yellow alarm) takes priority over transmission of some FDL messages.

If the remote loopback appears not to be working, use the **show controllers t3** command to determine if the given T1 is currently attempting to transmit a LOF indication (yellow alarm):

```
Router# show controllers t3 0/0/0:2
 T3 0/0/0 is up.
   CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
   Mx H/W version: 2, Mx ucode ver: 1.34
   T1 2 is down, speed: 1536 kbs, non-inverted data
   timeslots: 1-24
   FDL per AT&T 54016 spec.
   Transmitter is sending LOF Indication.
   Receiver is getting AIS.
```

If the transmitter is sending a LOF indication, as in the previous example, stop the transmission of the LOF indication (yellow alarm) with the **no t1 yellow generation** configuration command as shown in the following example:

```
Router(config)# controllers t3 0/0/0
Router(config-controll)# no t1 2 yellow generation
Router(config-controll)# ^D
```

To verify that the transmission of the LOF indication (yellow alarm) has stopped, use the **show controllers t3** command:

```
Router# show controllers t3 0/0/0:2
 T3 0/0/0 is up.
   CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
   Mx H/W version: 2, Mx ucode ver: 1.34
   T1 2 is down, speed: 1536 kbs, non-inverted data
   timeslots: 1-24
   FDL per AT&T 54016 spec.
   Receiver is getting AIS.
   Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
   Yellow Alarm Generation is disabled
```

Now retry the remote loopback command. When diagnosis is complete, remember to re-enable the LOF indication (yellow alarm). You can also loopback all the T1 channels by using the **loopback (CT3IP)** interface configuration command.

For more information, refer to the "Troubleshoot the T3 and T1 Channels" section earlier in this chapter.

Example

The following example configures T1 channel 5 for a local loopback:

```
interface serial 3/0/0:5
 loopback local
```

Related Command

loopback (T3)

loopback (T3)

To loop the entire T3 (all 28 T1 channels) on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **loopback** controller configuration command. Use the **no** form of this command to remove the loopback.

loopback [**local** | **network** | **remote**]
no loopback

Syntax Description

local	(Optional) Loops the data back toward the router and sends an AIS signal out toward the network.
network	(Optional) Loops the data toward the network at the T1 framer.
remote	(Optional) Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are only possible when the T3 is configured for C-bit framing. The type of framing used is determined by the equipment you are connecting to (for more information, see the **framing** controller command).

Default

Disabled

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

Use this command for troubleshooting purposes.

You can also loopback each T1 channel by using the **loopback** interface configuration command.

For more information, refer to the "Troubleshoot the T3 and T1 Channels" section earlier in this chapter.

Example

The following example configures the CT3IP for a local loopback:

```
controller t3 3/0/0
 loopback local
```

Related Command

loopback (T1)

show controller t3

To display information about the Channelized T3 Interface Processor (CT3IP) on Cisco 7000 series routers with the RSP7000 and RSP7000CI and in Cisco 7500 series routers or to display information about the PA-CT3/4T1 in Cisco 7200 series routers, use the **show controller t3** privileged EXEC command.

show controller t3 [*slot*/*port-adapter*/*port* [**:***t1-channel*]] [**remote performance** [**brief** | **tabular**]] (Cisco 7500 series and Cisco 7000 series routers with the RSP7000 and RSP7000CI)

show controller t3 [*slot*/*port* [**:***t1-channel*]] [**remote performance** [**brief** |**tabular**]] (Cisco 7200 series)

Syntax Description

slot	(Optional) Backplane slot number. The value varies depending on the platform.
port-adapter	(Optional) The port adapter and port numbers for the CT3IP are 0.
port	(Optional) The port adapter and port numbers for the CT3IP are 0.
:*t1-channel*	(Optional) For the CT3IP, the T1 channel is a number between 1 and 28.
remote performance	(Optional) Displays the far-end ANSI performance monitor information when enabled on the T1 channel with the **t1 fdl ansi** controller command.
brief	(Optional) Displays a subset of information.
tabular	(Optional) Displays information in a tabular format.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

This command displays controller status that is specific to the controller hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Sample Displays

The following is partial sample output from the **show controller t3** command:

```
Router# show controller t3 3/0/0
```

```
T3 3/0/0 is up.
  CT3 H/W Version: 4, CT3 ROM Version: 0.116, CT3 F/W Version: 0.10.0
  Mx H/W version: 2, Mx ucode ver: 1.24
  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.
  Ext1: LOS, Ext2: LOS, Ext3: LOS, Test: OK
  Data in current interval (39 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 1 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, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  No alarms detected.
  Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
  Data in current interval (50 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 1 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
...

  T1 15 is up, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  No alarms detected.
  Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
  Data in current interval (69 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 1 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
```

The following is partial sample output from the **show controller t3 brief** command:

```
router# show controller t3 3/0/0 brief
T3 3/0/0 is up.
  CT3 H/W Version: 4, CT3 ROM Version: 0.116, CT3 F/W Version: 0.10.0
  Mxt H/W version: 2, Mxt ucode ver: 1.24
  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.
  Ext1: LOS, Ext2: LOS, Ext3: LOS, Test: OK

  T1 1 is up, speed: 1536 kbs, non-inverted data
```

```
  timeslots: 1-24
  No alarms detected.
  Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
...
T1 28 is up, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  No alarms detected.
  Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
```

The following is partial sample output from the **show controllers t3 tabular** command:

```
router# show controllers t3 3/0/0 tabular
T3 3/0/0 is up.
  CT3 H/W Version: 4, CT3 ROM Version: 1.2, CT3 F/W Version: 2.1.0
  Mx H/W version: 2, Mx ucode ver: 1.25
  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.
  Ext1: AIS, Ext2: LOS, Ext3: LOS, Test: LOS
  INTERVAL      LCV   PCV   CCV   PES  PSES  SEFS   UAS   LES   CES  CSES
  08:56-09:11     0     0     0     0     0     0     0     0     0     0
  08:41-08:56     0     0     0     0     0     0     0     0     0     0
  08:26-08:41     0     0     0     0     0     0     0     0     0     0
  Total           0     0     0     0     0     0     0     0     0     0

  T1 2 is up, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  INTERVAL      LCV   PCV   CSS  SELS   LES    DM    ES   BES   SES   UAS    SS
  08:56-09:11     0     0     0     0     0     0     0     0     0     0     0
  08:41-08:56     0     0     0     0     0     0     0     0     0     0     0
  08:26-08:41     0     0     0     0     0     0     0     0     0     0     0
  Total           0     0     0     0     0     0     0     0     0     0     0
```

Table 40 describes the **show controller t3** display fields.

Table 40 Show Controller T3 Field Descriptions

Field	Description
T3 3/0/0 is up	The T3 controller in slot 3 is operating. The controller's state can be up, down, administratively down. Loopback conditions are shown by (Locally looped) or (Remotely Looped).
CT3 H/W Version	The version number of the hardware.
CT3 ROM Version	The version number of the ROM.
CT3 F/W Version	The version number of the firmware.
Mx HW version	The hardware version number of the HDLC controller chip.
Mx ucode ver	The microcode version of the HDLC controller chip.
Applique type	The controller type.

Table 40 Show Controller T3 Field Descriptions (Continued)

Field	Description
No alarms detected	Any alarms detected by the controller are displayed here. Possible alarms are as follows: • 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.
MDL transmission is disabled	Status of the maintenance data link (either enabled or disabled).
FEAC code received	Whether or not a far-end alarm code request is being received. Possible values are as follows: • DS3 Eqpt. Failure (SA) • DS3 LOS/HBER • DS3 Out-of-Frame • DS3 AIS Received • DS3 IDLE Received • DS3 Eqpt. Failure (NSA) • Common Eqpt. Failure (NSA) • Multiple DS1 LOS/HBER • DS1 Eqpt. Failure • Single DS1 LOS/HBER • DS1 Eqpts Failure (NSA) • No code is being received
Framing is M23	The framing type on the CT3IP. Values are: M23, C-Bit, and Auto-detect.
Line Code is B3ZS	Line coding format on the CT3IP.
Clock Source is Internal	The clock source on the CT3IP. Values are: internal or line.
Ext1: LOS, Ext2: LOS, Ext3: LOS, Test: OK	Line status of each of the four T1 ports (external 1, 2, and 3, and the test port). This information is displayed even if the external or test ports are not configured. This allows the user to determine the health of the external equipment and cabling before configuring the external or test port. Status can be one of the following: • LOS—loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port. • AIS—alarm indication signal indicates that the port is receiving an all-ones signal. • OK—a valid signal is being received and the signal is not an all-ones signal.
Data in current interval (39 seconds elapsed)	Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. Accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.

Table 40 Show Controller T3 Field Descriptions (Continued)

Field	Description
Line Code Violations	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.
P-bit Coding Violation	For all DS3 applications, a P-bit coding violation (PVC) error event is a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code.
C-bit Coding Violation	For C-bit parity and SYNTRAN DS3 applications, the C-bit coding violation (CCV) is the count of coding violations reported via the C-bits. For C-bit parity, it is the count of CP-bit parity errors occurring in the accumulation interval. For SYNTRAN, it is a count of CRC-9 errors occurring in the accumulation interval.
P-bit Err Secs	P-bit errored seconds (PES) is a second with one or more PVCs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.
P-bit Severely Err Secs	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.
Severely Err Framing Secs	Severely errored framing seconds (SEFS) is a second with one or more out of frame defects or a detected incoming AIS.
Unavailable Secs	Unavailable seconds (UAS) are calculated by counting the number of seconds that the interface is unavailable. For more information, refer to RFC 1407.
Line Err Secs	Line errored seconds (LES) is a second in which one or more code violations occurred or one or more LOS defects.
C-bit Errored Secs	C-bit errored seconds (CES) is a second with one or more C-bit code violations (CCV), one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
C-bit Severely Errored Secs	C-bit severely errored seconds (CSES) is a second with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.
Total Data (last 1 15 minute intervals)	Shows the last 15-minute accumulation period.
T1 1 is up	The T1 channel is operating. The channel's state can be up, down, administratively down. Loopback conditions are shown by (Locally looped) or (Remotely looped).
speed	Speed of the T1 channel in kbps.
non-inverted data	Whether or not the T1 channel is configured for inverted data.
timeslots	Timeslots assigned to the T1 channel.
FDL per AT&T 54016 spec.	Performance monitoring is via Facility Data Link per ANSI T1.403.

Table 40 Show Controller T3 Field Descriptions (Continued)

Field	Description
No alarms detected	Any alarms detected by the T1 controller are displayed here. Possible alarms are as follows: • 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 ESF	Type of framing used on the T1 channel. Values are: ESF or SF.
LineCode is B8ZS	Type of line coding used on the T1 channel. Values are: B8ZS or AMI.
Clock Source is Internal	Clock source on the T1 channel. Values are: internal or line.
Path Code Violations	Path coding violation (PCV) error event is a frame synchronization bit error in the D4 and E1-noCRC formats or a CRC error in the ESF and E1-CRC formats.
Slip Secs	Controlled slip second (CSS) is a one-second interval containing one or more controlled slips.
Fr Loss Secs	Frame loss seconds (SELS) is the number of seconds an out-of-frame error is detected.
Line Err Secs	Line errored seconds (LES) is a second in which one or more line code violation errors are detected.
Degraded Mins	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.
Errored Secs	Errored seconds (ES) is a second with one or more path coding violations, one or more out-of-frame defects, or one or more controlled slip events or a detected AIS defect.
Bursty Err Secs	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.
Severely Err Secs	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.
Stuffed Secs	Stuffed seconds (SS) is a second in which one more bit stuffings take place. This happens when the Pulse Density Enforcer detects a potential violation in the output stream and inserts a 1 to prevent it. Such bit stuffings corrupt user data and indicate the network is misconfigured. This counter can be used to help diagnose this situation.

show interfaces serial

To display information about a serial interface, use the **show interfaces serial** privileged EXEC command.

show interfaces serial [*number*] [**accounting**]
show interfaces serial [*number* [**:***channel-group*] [**accounting**] (Cisco 4000 series)
show interfaces serial [*slot*/*port* [**:***channel-group*]] [**accounting**] (Cisco 7000 series)
show interfaces serial [*slot*/*port-adapter*/*port*] [**serial**] (ports on VIPs in the Cisco 7000 and Cisco 7500 series)
show interfaces serial [*slot*/*port*] [**serial**] (ports on VIPs in the Cisco 7200 series)
show interfaces serial [*slot*/*port-adapter*/*port*] [**:***t1-channel*] [**accounting | crb**] (CT3IP in Cisco 7000 series routers with RSP7000 and Cisco 7500 series)
show interfaces serial [*slot*/*port*] [**:***t1-channel*] [**accounting | crb**] (PA-CT3/4T1 in Cisco 7200 series)

Syntax Description

number	(Optional) Port number.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
:*channel-group*	(Optional) On the Cisco 4000 series with an NPM or Cisco 7000 series with a MIP, specifies the T1 channel-group number in the range of 0 to 23 defined with the **channel-group** controller configuration command.
slot	(Optional) On the Cisco 7000 series, slot location of the interface processor.
port	(Optional) Port number on the interface. For the VIP, the port value can be 0, 1, 2, or 3 for 4-port serial interfaces. The port adapter and port numbers for the CT3IP are 0.
port-adapter	(Optional) On the Cisco 7000 and 7500 series, specifies the ports on a VIP. The value can be 0 or 1. The port adapter and port numbers for the CT3IP are 0.
:*t1-channel*	(Optional) For the CT3IP, the T1 channel is a number between 1 and 28. T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.
crb	(Optional) Show interface routing and bridging information.

Command Mode

Privileged EXEC

Usage Guidelines

This command first appeared in Cisco IOS Release 10.0 for the Cisco 4000 series.
This command first appeared in Cisco IOS Release 11.0 for the Cisco 7000 series.

This command was modified in Cisco IOS Release 11.1 CA to include the CT3IP.

Sample Displays

The following is sample output from the **show interfaces** command for a synchronous serial interface:

```
Router# show interfaces serial
Serial 0 is up, line protocol is up
   Hardware is MCI Serial
   Internet address is 150.136.190.203, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation HDLC, loopback not set, keepalive set (10 sec)
   Last input 0:00:07, output 0:00:00, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 0 packets/sec
   Five minute output rate 0 bits/sec, 0 packets/sec
       16263 packets input, 1347238 bytes, 0 no buffer
       Received 13983 broadcasts, 0 runts, 0 giants
       2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
1 carrier transitions

     22146 packets output, 2383680 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets, 0 restarts
```

Table 41 describes significant fields shown in the display.

Table 41 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 if 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 if it has been taken down by an administrator.
Hardware is	Specifies the hardware type.
Internet address is	Specifies the Internet address and subnet mask.
MTU	Maximum transmission unit of the interface.
BW	Indicates the 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. If the interface is attached to a serial line with a line speed that does not match the default (1536 or 1544 for T1 and 56 for a standard synchronous serial line), use the **bandwidth** command to specify the correct line speed for this serial line.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.

Table 41 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
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.
Last 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 of a transmission that 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.
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
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 input	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.
no buffers	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.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input error	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. On a serial line, this is usually the result of noise or other transmission problems.
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.

Table 41 Show Interfaces Serial Field Descriptions (Continued)

Field	Description
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 output	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, as 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 multiport transceivers). Some collisions are normal. However, if your collision rate climbs to around 4 or 5%, you should consider verifying that there is no faulty equipment on the segment and/or moving some existing stations to a new segment. A packet that collides is counted only once in output packets.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds' time. 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.
restarts	Number of times the controller was restarted because of errors.
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 will increment two times. Indicates modem or line problems if the carrier detect line is changing state often.
alarm indications, remote alarms, rx LOF, rx LOS	Number of CSU/DSU alarms, and number of occurrences of receive loss of frame and receive loss of signal.
BER inactive, NELR inactive, FELR inactive	Status of G.703-E1 counters for bit error rate (BER) alarm, near-end loop remote (NELR), and far-end loop remote (FELR). Note that you cannot set the NELR or FELR.

The following is sample output of the **show interfaces serial** command for the CT3IP serial interface:

```
Router# show interfaces serial 3/0/0:25
Serial3/0/0:25 is up, line protocol is up
  Hardware is cyBus T3
  Internet address is 25.25.25.2/24
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 12/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 00:19:01, output 00:11:49, output hang never
  Last clearing of "show interface" counters 00:19:39
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 69000 bits/sec, 90 packets/sec
  5 minute output rate 71000 bits/sec, 90 packets/sec
     762350 packets input, 79284400 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     150 input errors, 0 CRC, 0 frame, 150 overrun, 0 ignored, 0 abort
     763213 packets output, 80900472 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions no alarm present
  Timeslot(s) Used:1-24, Transmitter delay is 0 flags, transmit queue length 5
  non-inverted data
```

Most fields are described in Table 41. Fields relevant to the CT3IP are described in Table 42.

Table 42 Show Interfaces Serial Field Descriptions—CT3IP

Field	Description
Timeslot(s) Used	Number of timeslots assigned to the T1 channel.
Transmitter delay	Number of idle flags inserted between each HDLC frame.
transmit queue length	Number of packets allowed in the transmit queue.
non-inverted data	Whether or not the interface is configured for inverted data.

The following is sample output of the **show interfaces serial** command for the HDLC synchronous serial interface on a Cisco 7000:

```
Router# show interfaces serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is cxBus Serial
  Internet address is 150.136.190.203, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 0:00:07, output 0:00:00, output hang never
  Last clearing of "show interface" counters 2w4d
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     16263 packets input, 1347238 bytes, 0 no buffer
     Received 13983 broadcasts, 0 runts, 0 giants
     2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
     22146 packets output, 2383680 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets, 0 restarts
     1 carrier transitions
```

The following is sample output of the **show interfaces serial** command for a G.703 interface on which framing is enabled:

```
Router# show interfaces serial 2/3
Serial2/3 is up, line protocol is up
  Hardware is cxBus Serial
  Internet address is 5.4.4.1, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 0:00:21, output 0:00:21, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     53 packets input, 7810 bytes, 0 no buffer
     Received 53 broadcasts, 0 runts, 0 giants
     2 input errors, 2 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
     56 packets output, 8218 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets, 0 restarts
     1 carrier transitions
     2 alarm indications, 333 remote alarms, 332 rx LOF, 0 rx LOS
     RTS up, CTS up, DTR up, DCD up, DSR up
     BER inactive, NELR inactive, FELR inactive
```

Table 41 describes significant fields shown in the display.

Sample Display with Frame Relay Encapsulation

When using the Frame Relay encapsulation, use the **show interfaces** command to display information on the multicast DLCI, the DLCI of the interface, and the LMI DLCI used for the local management interface.

The multicast DLCI and the local DLCI can be set using the **frame-relay multicast-dlci** and the **frame-relay local-dlci** configuration commands, or provided through the local management interface. The status information is taken from the LMI, when active.

The following is sample output from the **show interfaces serial** command when using Frame Relay encapsulation:

```
Router# show interfaces serial
Serial 2 is up, line protocol is up
   Hardware type is MCI Serial
   Internet address is 131.108.122.1, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation FRAME-RELAY, loopback not set, keepalive set (10 sec)
   multicast DLCI 1022,  status defined, active
   source DLCI    20, status defined, active
   LMI DLCI 1023, LMI sent 10, LMI stat recvd 10, LMI upd recvd 2
   Last input 7:21:29, output 0:00:37, output hang never
   Output queue 0/100, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 0 packets/sec
   Five minute output rate 0 bits/sec, 0 packets/sec
       47 packets input, 2656 bytes, 0 no buffer
       Received 5 broadcasts, 0 runts, 0 giants
       5 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 57 abort
       518 packets output, 391205 bytes
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
       1 carrier transitions
```

In this display, the multicast DLCI has been changed to 1022 with the **frame-relay multicast-dlci** interface configuration command.

The display shows the statistics for the LMI are the number of status inquiry messages sent (LMI sent), the number of status messages received (LMI recvd), and the number of status updates received (upd recvd). See the *Frame Relay Interface* specification for additional explanations of this output.

Sample Display with ANSI LMI

For a serial interface with the ANSI LMI enabled, use the **show interfaces** command to determine the LMI type implemented.

The following is a sample display from the **show interfaces** output for a serial interface with the ANSI LMI enabled:

```
Router# show interfaces serial
Serial 1 is up, line protocol is up
   Hardware is MCI Serial
   Internet address is 131.108.121.1, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation FRAME-RELAY, loopback not set, keepalive set
   LMI DLCI    0, LMI sent 10, LMI stat recvd 10
   LMI type is ANSI Annex D
   Last input 0:00:00, output 0:00:00, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 1 packets/sec
   Five minute output rate 1000 bits/sec, 1 packets/sec
       261 packets input, 13212 bytes, 0 no buffer
       Received 33 broadcasts, 0 runts, 0 giants
       0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       238 packets output, 14751 bytes, 0 underruns
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
```

Notice that the **show interfaces** output for a serial interface with ANSI LMI shown in this display is very similar to that for encapsulation set to Frame Relay, as shown in the previous display. Table 43 describes the few differences that exist.

Table 43 Show Interfaces Serial Field Description—With ANSI LMI

Field	Description
LMI DLCI 0	Identifies the DLCI used by the LMI for this interface. Default: 1023.
LMI sent 10	Number of LMI packets the router sent.
LMI type is ANSI Annex D	Indicates that the interface is configured for the ANSI-adopted Frame Relay specification T1.617 Annex D.

Sample Display with LAPB Encapsulation

Use the **show interfaces** command to display operation statistics for an interface using LAPB encapsulation.

The following is sample output from the **show interfaces** command for a serial interface using LAPB encapsulation:

```
Router# show interfaces
LAPB state is DISCONNECT, T1 3000, N1 12000, N2 20, K7, TH 3000
Window is closed
IFRAMEs 12/28 RNRs 0/1 REJs 13/1 SABMs 1/13 FRMRs 3/0 DISCs 0/11
```

Table 44 shows the fields relevant to all LAPB connections.

Table 44 Show Interfaces Serial Field Descriptions—With LAPB Enabled

Parameter	Description
LAPB state is DISCONNECT	State of the LAPB protocol.
T1 3000, N1 12000,...	Current parameter settings.
Window is closed	Indicates that no more frames can be transmitted until some outstanding frames have been acknowledged.
IFRAMEs 12/28 RNRs 0/1...	Count of the different types of frames in the form of sent/received.

Table 45 show the fields relevant to PPP connections.

Table 45 Show Interfaces Serial Field Descriptions—With PPP Encapsulation

Field	Description
lcp state	Link Control Protocol
ncp ipcp state	Network Control Protocol Internet Protocol Control Protocol
ncp osicp state	Network Control Protocol OSI (CLNS) Control Protocol
ncp ipxcp state	Network Control Protocol IPX (Novell) Control Protocol
ncp xnscp state	Network Control Protocol XNS Control Protocol
ncp vinescp state	Network Control Protocol VINES Control Protocol
ncp deccp state	Network Control Protocol DECnet Control Protocol
ncp bridgecp state	Network Control Protocol Bridging Control Protocol
ncp atalkcp state	Network Control Protocol AppleTalk Control Protocol

Sample Display with SDLC Connections

Use the **show interfaces** command to display the SDLC information for a given SDLC interface. The following is sample output from the **show interfaces** command for an SDLC primary interface supporting the SDLLC function:

```
Router# show interfaces
Serial 0 is up, line protocol is up
Hardware is MCI Serial
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation SDLC-PRIMARY, loopback not set
    Timers (msec): poll pause 100 fair poll 500. Poll limit 1
```

```
    [T1 3000, N1 12016, N2 20, K 7] timer: 56608 Last polled device: none
    SDLLC [ma: 0000.0C01.14--, ring: 7 bridge: 1, target ring: 10
             largest token ring frame 2052]
SDLC addr C1 state is CONNECT
     VS 6, VR 3, RCNT 0, Remote VR 6, Current retransmit count 0
     Hold queue: 0/12 IFRAMEs 77/22 RNRs 0/0 SNRMs 1/0 DISCs 0/0
     Poll: clear, Poll count: 0, chain: p: C1 n: C1
     SDLLC [largest SDLC frame: 265, XID: disabled]
 Last input 00:00:02, output 00:00:01, output hang never
 Output queue 0/40, 0 drops; input queue 0/75, 0 drops
 Five minute input rate 517 bits/sec, 30 packets/sec
 Five minute output rate 672 bits/sec, 20 packets/sec
     357 packets input, 28382 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     926 packets output, 77274 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets, 0 restarts
     2 carrier transitions
```

Table 46 shows the fields relevant to all SDLC connections.

Table 46 Show Interfaces Serial Field Descriptions—With SDLC Enabled

Field	Description
Timers (msec): poll pause, fair poll, Poll limit	Current values of these timers, as described in the configuration section, for this interface.
T1, N1, N2, K	Values for these parameters, as described in the configuration section, for this interface.

Table 47 shows other data given for each SDLC secondary configured to be attached to this interface.

Table 47 SDLC Secondary Descriptions

SDLC Secondary	Description
addr	Address of this secondary.
state is	Current state of this connection, which is one of the following: • DISCONNECT—No communication is being attempted to this secondary. • CONNECT—A normal connect state exists between this router and this secondary. • DISCSENT—This router has sent a disconnect request to this secondary and is awaiting its response. • SNRMSENT—This router has sent a connect request (SNRM) to this secondary and is awaiting its response. • THEMBUSY—This secondary has told this router that it is temporarily unable to receive any more information frames. • USBUSY—This router has told this secondary that it is temporarily unable to receive any more information frames. • BOTHBUSY—Both sides have told each other that they are temporarily unable to receive any more information frames. • ERROR—This router has detected an error and is waiting for a response from the secondary acknowledging this.

Table 47 SDLC Secondary Descriptions (Continued)

SDLC Secondary	Description
VS	Sequence number of the next information frame this station sends.
VR	Sequence number of the next information frame from this secondary that this station expects to receive.
Remote VR	Last frame transmitted by this station that has been acknowledged by the other station.
Current retransmit count:	Number of times the current I-frame or sequence of I-frames has been retransmitted.
Hold Queue	Number of frames in hold queue/Maximum size of hold queue.
IFRAMEs, RNRs, SNRMs, DISCs	Sent/received count for these frames.
Poll	"Set" if this router has a poll outstanding to the secondary; "clear" if it does not.
Poll Count	Number of polls in a row that have been given to this secondary at this time.
Chain	Shows the previous (p) and next (n) secondary address on this interface in the *round robin loop* of polled devices.

Sample Display with SDLLC

Use the **show interfaces serial** command to display the SDLLC statistics for SDLLC configured interfaces.

The following is sample output from the **show interfaces serial** command for an a serial interface configured for SDLLC:

```
Router# show interfaces serial
Serial 0 is up, line protocol is up
   Hardware is MCI Serial
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation SDLC-PRIMARY, loopback not set
       Timers (msec): poll pause 100 fair poll 500. Poll limit 1
       [T1 3000, N1 12016, N2 20, K 7] timer: 56608 Last polled device: none
       SDLLC [ma: 0000.0C01.14--, ring: 7 bridge: 1, target ring: 10
             largest token ring frame 2052]
   SDLC addr C1 state is CONNECT
       VS 6, VR 3, RCNT 0, Remote VR 6, Current retransmit count 0
       Hold queue: 0/12 IFRAMEs 77/22 RNRs 0/0 SNRMs 1/0 DISCs 0/0
       Poll: clear, Poll count: 0, chain: p: C1 n: C1
       SDLLC [largest SDLC frame: 265, XID: disabled]
   Last input 00:00:02, output 00:00:01, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 517 bits/sec, 30 packets/sec
   Five minute output rate 672 bits/sec, 20 packets/sec
       357 packets input, 28382 bytes, 0 no buffer
       Received 0 broadcasts, 0 runts, 0 giants
       0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       926 packets output, 77274 bytes, 0 underruns
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
       6608 Last polled device: none
       SDLLC [ma: 0000.0C01.14--, ring: 7 brid2 carrier transitions
```

Most of the output shown in the display is generic to all SDLC encapsulated interfaces and is described in the "LLC2 and SDLC Commands" chapter in the *Bridging and IBM Networking Command Reference*. Table 48 shows the parameters specific to SDLLC.

Table 48 SDLLC Parameter Descriptions

Field	Description
SDLLC ma	Lists the MAC address configured for this interface. The last byte is shown as "--" to indicate that it is filled in with the SDLC address of the connection.
ring, bridge, target ring	Lists the parameters as configured by the **sdllc traddr** command.
largest token ring frame	Shows the largest Token Ring frame that is accepted on the LLC2 side of the connection.
largest SDLC frame	Shows the largest SDLC frame that is accepted and will be generated on the SDLC side of the connection.
XID	Enabled or disabled: Shows whether XID processing is enabled on the SDLC side of the connection. If enabled, it will show the XID value for this address.

Sample Display with Accounting Option

The following example illustrates the **show interfaces serial** command with the **accounting** option on a Cisco 7000 series router:

```
Router# show interfaces serial 1/0 accounting

Serial1/0
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

shutdown (controller)

To disable the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **shutdown** controller configuration command. To restart a disabled CT3IP, 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.

Shutting down the CT3IP disables all functions on the interface and sends a blue alarm to the network. This command marks the interface as unavailable. To check if the CT3IP is disabled, use the **show controller t3** command.

Example

In the following example, the CT3IP is shutdown:

```
controller t3 9/0/0
 shutdown
```

Related Command

show controller t3

t1 clock source

To specify where the clock source is obtained for use by each T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **t1 clock source** controller configuration command.

t1 *channel* **clock source** {**internal** | **line**}

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
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 CA.

If you do not specify the **t1 clock source** command, the default clock source of **internal** is used by all the T1s on the CT3IP.

You can also set the clock source for the CT3IP by using the **clock source** controller configuration command.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Example

In the following example, the clock source for T1 6 and T1 8 on the CT3IP are set to line:

```
controller t3 9/0/0
 t1 6 clock source line
 t1 8 clock source line
```

Related Command

clock source

t1 external

To specify that a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers is used as an external port so the T1 channel can be further multiplexed on the Multichannel Interface Processor (MIP) or other multiplexing equipment, use the **t1 external** controller configuration command. Use the **no** form of this command to remove a T1 as an external port.

t1 external *channel* [**cablelength** *feet*] [**linecode ami | b8zs**]
no t1 external *channel*

Syntax Description

channel	Number 1, 2, or 3 that indicates the T1 channel.
cablelength *feet*	(Optional) Specifies the cable length in feet from the T1 channel to the external CSU or MIP. Values are 0 to 655 feet. The default is 133 feet.
linecode ami | b8zs	(Optional) Specifies the line coding used by the T1. Values are alternate mark inversion (AMI) or bipolar 8 zero suppression (B8ZS). The default is B8ZS.

Default

No external T1 is specified.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

The first three T1 channels (1, 2, and 3) of the CT3IP can be broken out to the DSUP-15 connectors on the CPT3IP so the T1 channel can be further demultiplexed by the MIP on the same router or on another router.

After you configure the external T1 channel, you can continue configuring it as a channelized T1 (also referred to as *fractional* T1) from the MIP. All channelized T1 commands might not be applicable to the T1 interface. After you configure the channelized T1 on the MIP, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the T1 interface.

The line coding on the T1 channel and the MIP must be the same. Because the default line coding format on the T1 channel is B8ZS and the default line coding on the MIP is AMI, you must change the line coding on the MIP or on the T1 so that they match.

To determine if the external device connected to the external T1 port is configured and cabled correctly before configuring an external port, use the **show controller t3** command and locate the line `Ext1...` in the display output. The line status can be one of the following:

- LOS—Loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port.
- AIS—Alarm indication signal indicates that the port is receiving an all-ones signal.
- OK—A valid signal is being received and the signal is not an all-ones signal.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Note Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

Example

In the following example, the T1 1 on the CT3IP is configured as an external port using AMI line coding and a cable length of 300 feet:

```
controller t3 9/0/0
 t1 external 1 cablelength 300 linecode ami
```

Related Command

show controller t3

t1 framing

To specify the type of framing used by the T1 channels on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **t1 framing** controller configuration command.

t1 *channel* **framing** {**esf** | **sf**}

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
esf	Specifies that extended super frame is used as the T1 framing type. This is the default.
sf	Specifies that super frame is used as the T1 framing type.

Default

Extended super frame (ESF)

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

If you do not specify the **t1 framing** command, the default ESF is used.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Example

In the following example, the framing for the T1 6 and T1 8 on the CT3IP are set to sf:

```
controller t3 9/0/0
 t1 6 framing sf
 t1 8 framing sf
```

t1 linecode

To specify the type of line coding used by the T1 channels on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **t1 linecode** controller configuration command.

t1 *channel* **linecode** {**ami** | **b8zs**}

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
ami	Specifies that alternate mark inversion (AMI) line coding is used by the T1 channel.
b8zs	Specifies that bipolar 8 zero suppression (B8ZS) line coding is used by the T1 channel. This is the default.

Default

B8ZS

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

If you do not specify the **t1 linecode** command, the default B8ZS is used.

If you select **ami** line coding for the T1 channel, you must also invert the data on the T1 channel by using the **invert data** interface command. This is required because the T1 channel is bundled into the T3 signal, so there are no local T1 line drivers and receivers associated with it. Therefore, the **t1 channel linecode ami** command does not modify local line driver settings. Rather, it advises the CT3IP what line code the remote T1 is using. The CT3IP uses this information solely for the purpose of determining whether or not to enable the pulse density enforcer for that T1 channel.

When you select **b8zs** line coding, the pulse density enforcer is disabled. When you select **ami** line coding, the pulse density enforcer is enabled. To avoid having the pulse density enforcer corrupt data, the T1 channel should be configured for inverted data.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Example

In the following example, the line coding for T1 channel 16 on the CT3IP is set to AMI:

```
controller t3 9/0/0
 t1 16 linecode ami
 exit
interface serial 9/0/0:16
 invert data
```

Related Command

loopback (T1)

t1 test

To break out a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers to the test port for testing, use the **t1 test** controller configuration command. Use the **no** form of this command to remove the T1 channel from the test port.

t1 test *channel* [**cablelength** *feet*] [**linecode** {**ami** | **b8zs**}]
no t1 test *channel*

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
cablelength *feet*	(Optional) Specifies the cable length from the T1 channel to the external CSU or MIP. Values are 0 to 655 feet. The default cable length is 133 feet.
linecode {**ami** | **b8zs**}	(Optional) Specifies the line coding format used by the T1 channel. Values are alternate mark inversion (AMI) or bipolar 8 zero suppression (B8ZS). The default is B8ZS.

Default

No test port is configured

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

You can use the T1 test port available on the CT3IP to break out any of the 28 T1 channels for testing (for example, 24-hour BERT testing as is commonly done by telephone companies before a line is brought into service).

The T1 test port is also available as an external port. For more information on configuring an external port, see the **t1 external** controller configuration command.

To determine if the external device connected to the T1 test port is configured and cabled correctly before configuring a test port, use the **show controller t3** command and locate the line `Ext1...` in the display output. The line status can be one of the following:

- LOS—loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port.
- AIS—alarm indication signal indicates that the port is receiving an all-ones signal.
- OK—a valid signal is being received and the signal is not an all-ones signal.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Note Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

Example

In the following example, T1 6 on the CT3IP is configured as a test port using the default cable length and line coding:

```
controller t3 9/0/0
 t1 test 6
```

Related Commands

show controller t3
t1 external

t1 timeslot

To specify the timeslots and data rate used on each T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **t1 timeslot** controller configuration command. Use the **no** form of this command to remove the configured T1 channel.

t1 *channel* **timeslot** *range* [**speed** {**56** | **64**}]
no t1 *channel* **timeslot**

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
timeslot *range*	Specifies the timeslots assigned to the T1 channel. 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.
speed {**56**	**64**}	(Optional) Specifies the data rate for the T1 channel. Values are 56 kbps or 64 kbps. The default is 64 kbps. The 56-kbps speed is valid only for T1 channels 21 through 28.

Default

No timeslots are specified for the T1 channel.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

You must specify the timeslots used by each T1 channel.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Examples

In the following example, timeslots 1 through 24 are assigned to T1 1 for full T1 bandwidth usage:

```
controller t3 9/0/0
 t1 1 timeslots 1-24
```

In the following example, timeslots 1 to 5 and 20 to 23 are assigned to T1 6 for fractional T1 bandwidth usage:

```
controller t3 9/0/0
 t1 6 timeslots 1-5,20-23
```

In the following example, T1 8 is configured for *n* x 56 (where *n* is 24) bandwidth usage:

```
controller t3 9/0/0
 t1 8 timeslots 1-24 speed 56
```

t1 yellow

To enable detection and generation of yellow alarms for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7000 series routers with RSP7000 and Cisco 7500 series routers, use the **t1 yellow** controller configuration command. Use the **no** form of this command to disable the detection and generation of yellow alarms.

t1 *channel* **yellow** {**detection** | **generation**}
no *channel* **yellow** {**detection** | **generation**}

Syntax Description

channel	Number between 1 and 28 that indicates the T1 channel.
detection	Detect yellow alarms.
generation	Generate yellow alarms.

Default

Yellow alarms are detected and generated on the T1 channel.

Command Mode

Controller configuration

Usage Guidelines

This command first appeared in Cisco IOS Release 11.1 CA.

If the T1 framing type is superframe (SF), you should consider disabling yellow alarm detection because the yellow alarm can be incorrectly detected with SF framing.

Note T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

Example

In the following example, the yellow alarm detection is disabled on T1 channel 6 on the CT3IP:

```
controller t3 9/0/0
 t1 6 framing sf
 no t1 6 yellow detection
```

Supported MIBs

The CT3IP supports RFC 1406 (T1 MIB) and RFC 1407 (T3 MIB).

What to Do Next

For more information on the CT3IP, refer to the *Channelized T3 Interface Processor (CT3IP) Installation and Configuration* publication. For more information on the PA-CT3/4T1, refer to the *Channelized T3 Dual-Wide Port Adapter Installation and Configuration* publication.