Configure and Troubleshoot CT3 on Cisco Routers

Contents

Introduction

This document provides information on how to configure and troubleshoot Port Adapters, Multi-Channel T3 (platforms such as Cisco 7200, and Cisco 7500), and Channelized T3 Trunk Card for AS5800 and AS5400.

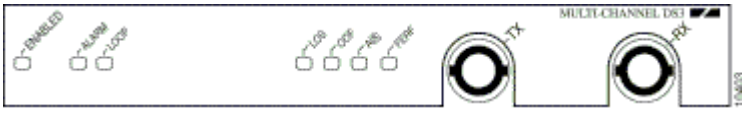
Port Adapters and Multi-Channel T3 Overview

This section describes the Port Adapters and Multi-Channel T3 (PA-MC-T3) used on the Cisco 7200 and Cisco 7500 series.

Port Adapter Overview

The PA-MC-T3 is a single-width port adapter that provides one T3 interface connection using BNC connectors. (See figure 1.) The interface can provide up to 28 T1 lines (a single T3 group). Each T1 line is presented to the system as a serial interface that can be configured individually.

Figure 1 – PA-MC-T3 —Faceplate View



Multi-Channel T3 Overview

The PA-MC-T3 link is channelized into 28 independent T1 data lines. Each T1 line can be unchannelized or channelized for serial transmission of data.

Each of the T1 lines can use the whole T1 bandwidth, a portion of the T1 bandwidth, or the T1 bandwidth in channelized form for data transmission. Usable bandwidths for each T1 line are **n x 56** kbps or **n x 64** kbps, where **n** is a number that represents time slots 1 to 24.

Channelized T1 allows up to 24 time slots (56 kbps/64 kbps) per T1 line. The unused portion of the T1 bandwidth, when it is not running at full T1 speeds, cannot be used, and is filled with idle channel data. Aggregation of multiple T1 lines is not supported. The PA-MC-T3 can support a maximum of 128 logical channels.

Note: T1 lines on the PA-MC-T3 are numbered 1 to 28, instead of 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 lines within channelized (multi-channel) T3 equipment.

The T3 section of the PA-MC-T3 supports the maintenance data link channel (when c-bit parity is used), as well as payload and network loopbacks. The T1 section of the PA-MC-T3 supports facilities data link (FDL) in Extended Superframe (ESF) framing, as well as various loopbacks. Bit error rate testing (BERT) is supported on each of the T1 lines. BERT is typically done over an unframed T1 signal.

The PA-MC-T3 supports Cisco High-Level Data Link Control (HDLC), Frame Relay, PPP, and SMDS Data Exchange Interface (DXI) encapsulations over each T1 link. For Switched Multimegabit Data Service (SMDS) only, DXI is sent on the T1 line, so it needs to connect to an SMDS switch that has direct DXI input.

The physical T3 link on the PA-MC-T3 consists of two female BNC connectors, one for receive (RX), and one for transmit (TX). You must use 75-ohm RG-59 coaxial interface cables with male BNC connectors to connect the PA-MC-T3 interface with external T3 equipment. (For cable information, see the Cables, Connectors, and Pinouts section in the Overview: PA-MC-T3 Port Adapter Installation and Configuration document.)

Any of the 28 T1 lines can be configured as channelized T1 lines. You can group the time slots in these T1 lines into several individual logical channel groups, each of which carries data with different data-link layer protocol encapsulations.

Each logical channel group can be composed of individual 56-kbps or 64-kbps time slots, or individual time slots plus ranges of time slots. For example, a channel group might be composed of time slots 1, 9, and 12-14. Each logical channel group can contain from 1 to 24 time slots maximum. However, the same time slot cannot be used in more than one logical channel group. Any unused time slots are filled with programmable idle-channel data.

Each T1 line contains onboard T1 bit error rate test (BERT) circuitry. With this, the port adapter software can send and detect programmable patterns, and you can run a BERT on any T1 line, or all

of the 28 T1 lines simultaneously.

Configure the PA-MC-T3

After you verify that the new PA-MC-T3 is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Ensure that you have this information:

- Protocols that you plan to route on each new interface.
- IP addresses, if you plan to configure the interfaces for IP routing.
- Bridging protocols that you plan to use.

If you installed a new PA-MC-T3, or if you want to change the configuration of an existing T3 link, you must enter configuration mode in order to configure the new interfaces. If you replaced a PA-MC-T3 that was previously configured, the system recognizes the new T3 link and brings it up in its existing configuration.

Note: The "/" symbol is used in commands to specify a physical location. The ":" symbol is used in commands to specify a time-multiplexed division within a physical port.

Table 1 lists various T3 commands that you can use:

Table 1 – T3 Commands

Purpose	Command	Example	Additional Information
Select a T3 controller	**controller t3** ***slot/port-adapter/port***	This example shows a port adapter on a Cisco 7200 series router in port adapter slot 1. `Router# controller t3 1/0`	You must enter this command before any other T3 configuration commands.

Set the Framing Type for a T3 controller	**framing [c-bit | m23 | auto-detect]**	This example sets c-bit framing.
		
		`Router(config-controller)# framing c-bit`
		
		This example sets m23 framing.
		
		`Router(config-controller)# framing m23`
			You can request the PA-MC-T3 to detect the framing type that it must receive from the far end as follows:
			
			`router(config-controller)# framing auto-detect`

Specify the cable length[1]	**cablelength** ***feet***	`Router(config-controller)# cablelength 40` Since a cable length of 40 is specified, the 0-49 range is used. If you change the cable length to 45, the 0-49 range still applies. Furthermore, if you specify a cable length of 100, and then change it to 200, the 50-450 range applies in each case. Therefore, these changes have no	*feet* is a numeral from 0 to 450. The default value is 49 feet.

		effect. Only moving from one range (0-49) to the other range (50-450) has an effect. The actual cable-length number you enter is store in the configuration file.	

Set the clock source for the T3 Controller	**clock source {internal | line}**	This example instructs a PA-MC-T3 on a VIP in interface processor slot 1 to use a line clock source.
		
		`Router(config)#`
		`controller t3 1/0/0`
		`Router(config-controller)#`
		`clock source line`
		
		This example instructs a PA-MC-T3 on a Cisco 7200 series router to use an internal clock source.
		
		`Router(config)#`
		`controller t3 1/0`
		`Router(config-controller)#`
		`clock source line`
			-

[1] User-specified T3 cable lengths are structured into range as follows: 0-49 and 50-450. If you enter a cable length value that falls into one of these ranges, the range within which that value applies is used.

Configure T1 lines

You can create a logical channel group on a T1 line using one of these two controller commands as appropriate for your channelized configuration:

1. **t1** ***t1-line-number*** **channel-group** ***channel-group-number*** **timeslots** ***list-of-timeslots*** **[speed {56 | 64}]**

   where:

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

     Table 4 shows the configuration of logical channel group 20 on T1 line 1 assigning channelized time slots 1 to 5 and 20 to 23.

You can remove a logical channel group from a T1 line (or a T1 line) with the controller command appropriate to your channelized configuration as follows:

2. **no t1** ***t1-line-number*** **channel-group** ***channel-group-number***

   where:

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

Table 2 shows how to remove logical channel group 10 from channelized T1 line 1.

Table 2 – Commands to Remove Logical Channel Group 10 from Channelized T1 line 1

Purpose	Command	Example	Additional Information

Create a Logical Channel group on a T1 line	**t1** ***t1-line-number*** **channel-group** ***channel-group-number***	This example is for interface 0 on a port adapter in slot 1.
		
		`Router(config)#`
		`controller t3 1/0`
		`Router(config-controller)#`
		`1 1 channel-group 20 timeslots 1-5, 20-23`
			-

Remove a Channel Group from a T1 Line	**no t1** ***t1-line-number*** **channel-group** ***channel-group-number***	This example is for interface 0 on a port adapter in slot 1.
		
		`Router(config)#`
		`controller t3 1/0`
		`Router(config-controller)#`
		`no t1 1 channel-group 10`
			-

Set the framing format on a T1 Line	**t1** ***t1-line-number*** **framing {esf | sf}**	This example sets Superframe (SF) framing for T1 line 6.
		
		`Router(config)#`
		`controller t3 1/0`
		`Router(config-controller)#`
		`t1 6 framing sf`
			Default framing format is Extended Superframe (ESF).

Turn detection or generation of a yellow alarm on and off	**[no] t1** ***t1-line-number*** **yellow {detection | generation}**	This example turns the detection of a yellow alarm off on a T1 line number 6. `Router (config-controller)#` **`no t1 6 yellow detection`**	When you select SF framing, you should consider turning off yellow alarm detection, because the yellow alarm can be incorrectly

			detected with SF framing.

Set ESF framing format for T1 line 16	**t1 16 framing esf**	This example sets ESF framing format for T1 line 16.
		
		`Router(config)#`
		`controller t3 1/0`
		`Router(config-controller)#`
		`t1 16 framing esf`
			-

Set internal clock source on a T1 line	**t1** ***t1-line-number*** **clock source {internal | line}**	This example configures T1 line 1 to use an internal clock source on a VIP in interface processor slot 1.
		
		`Router(config)#`
		`controller t3 1/0/0`
		`Router(config-controller) #`
		`t1 1 clock source internal`
			t1-line-number is 1 to 28.
			
			The default clock source is internal.
			
			You can set the clock source to use internal clocking for testing purposes. One end of a T1 circuit *must* provide the clock source.

Set line clock source on a T1 line	**t1** ***t1-line-number*** **clock source {internal | line}**	This example configures T1 line 16 using a line clock source on a VIP in interface processor slot 1.
		
		`Router(config)#`
		`controller t3 1/0/0`
		`Router(config-controller)#`
		`t1 16 clock source line`
			-

Note: After a T1 line is configured, it appears to the Cisco IOS® Software as a serial interface. Therefore, all the configuration commands for a serial interface are available. However, not all commands apply to the T1 line. All the encapsulation formats, such as PPP, HDLC, SMDS, and Frame Relay are applicable to the configured T1 line. Encapsulation can be set using the serial interface configuration commands. All the switching types that are applicable to a serial interface, which include optimum switching, are also applicable to the configured T1 line.

Verify the T3 configuration

This section provides verification information for the T3 configuration.

```
Router# show controllers t3 1/0/0/1
T3 1/0/0 is up.
CT3 H/W Version : 3, CT3 ROM Version : 0.79, CT3 F/W Version : 0.29.0
T3 1/0/0 T1 1
```

```
No alarms detected.
Clock Source is internal.
BERT test result (running)
   Test Pattern : 2^11, Status : Sync, Sync Detected : 1
   Interval : 5 minute(s), Time Remain : 5 minute(s)
   Bit Errors(Since BERT Started): 6 bits,
   Bits Received(Since BERT start): 8113 Kbits
   Bit Errors(Since last sync): 6 bits
   Bits Received(Since last sync): 8113 Kbits

7200-1#show controller t3
T3 1/0 is up.  Hardware is CT3 single wide port adapter
  CT3 H/W Version : 1.0.1, CT3 ROM Version : 1.1, CT3 F/W Version : 2.4.0
  FREEDM version: 1, reset 0 resurrect 0
  Applique type is Channelized T3
  Receiver has loss of signal.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Line
  Rx throttle total 0, equipment customer loopback
  Data in current interval (0 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
```

Table 3 describes the fields for the **show controllers t3** command.

Table 3 – Fields for the show controllers t3 Command

Field	Description
T3 1/4/0 is up	This means T3 controller connected to this Cisco AS5800 access server in shelf 1, slot 4, port 0 is up. The controller's state can be up, down, or administratively down. Loopback conditions are shown by Locally Looped or Remotely Looped.
Applique type is ...	This describes the type of controller.
No alarms detected	Any alarms detected by the controller are displayed here. Here is the list of possible alarms: • Transmitter sends remote alarm. • Transmitter sends alarm indication signal (AIS). • Receiver has loss of signal (LOS). • Receiver gets AIS. • Receiver has loss of frame (LOF).

	• Receiver has remote alarm. • Receiver has no alarms.
MDL transmission ...	Maintenance Data Link (MDL) status, which may be either enabled or disabled is indicated here. This is used for carrying performance information and control signals across the network towards the far end T3 unit. It is the counterpart of Facility Data Link (FDL) in a T1 link.
FEAC code received	This indicates whether or not a far-end alarm code request is being received. Here is the list of possible values: • T3 Eqpt. Failure (SA). • T3 LOS/HBER. • T3 Out-of-Frame. • T3 AIS Received. • T3 IDLE Received. • T3 Eqpt. Failure (NSA). • Common Eqpt. Failure (NSA). • Multiple T1/DS1 LOS/HBER. • T1/DS1 Eqpt. Failure. • Single T1/DS1 LOS/HBER. • T1/DS1 Eqpts Failure (NSA). • No code is being received.
Framing is ...	This indicates standard T3 framing type, which may be M23, C-Bit, or Auto-detect.
Line Code is ...	This indicates standard T3 line-coding format. In this example, the line-coding format is bipolar 3-zero substitution (B3ZS).
Clock Source is ...	This displays the source of the synchronization signal (clock), which may be line or internal. In this example, the line provides the clock signal.
	This provides summary statistics for T3

Data in current interval ...	signal quality for the current interval of 900 seconds (15 minutes). In this example, the statistics are for current partial interval. Statistics roll into the 24-hour accumulation buffer every 15 minutes. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.
Line Code Violations	This provides a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the Line Code Violations (LCV) by one regardless of the length of the zero string.
P-bit Coding Violation	This shows the occurrence of a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the T3 M-frame that is not identical to the corresponding locally calculated code. This is referred to as PCV.
C-bit Coding Violation	This indicates the count of coding violations reported via the C-bits. For C-bit parity, it is the count of CP-bit parity errors that occur in the accumulation interval. This is referred to as CCV.
P-bit Err Secs	This shows the number of seconds with one or more PCVs, one or more Out-of-Frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds (UAS) are counted.
P-bit Severely Err Secs	This shows the number of seconds 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	This indicates the number of seconds with one or more Out-of-Frame defects, or a detected incoming AIS.
Unavailable Secs	This shows the number of seconds during which the interface was not available in this interval. This is referred to as UAS.
Line Errored Secs	This shows the number of seconds in this interval during one or more code violations, or one or more LOS defects.
	This indicates the number of seconds

C-bit Errored Secs	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. This is referred to as CES.
C-bit Severely Errored Secs	This indicates the number of seconds 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 ... 15 minute intervals)	This provides summary statistics for T3 signal quality for 15-minute intervals. The counters in this data block are cleared every 24 hours (96 intervals).

CT3 Trunk Card Overview on Cisco AS5800/AS5850

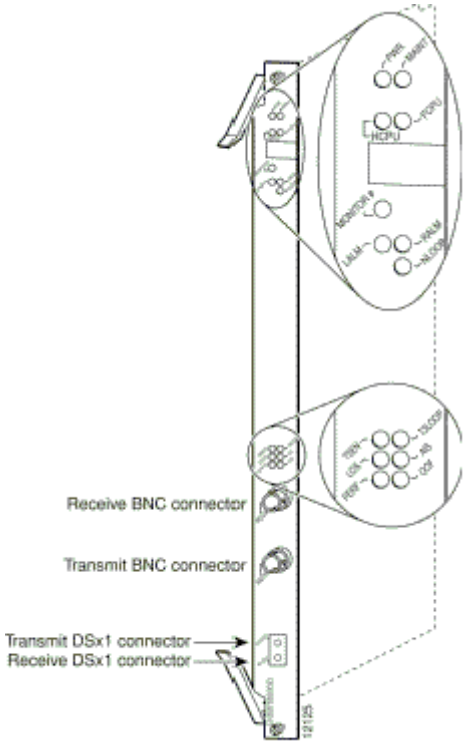
This section provides information about channelized T3 (CT3) Trunk Cards, and explains how to remove and replace a CT3 trunk card in the Cisco 5814 dial shelf chassis.

The Cisco AS5800 universal access server supports a CT3 ingress interface, which provides asynchronous aggregation of channelized interfaces, and multiplexing on a single T3 facility. The CT3 trunk card is installed in the Cisco 5814 dial shelf chassis in slots 0 to slot 5. The Cisco AS5800 currently supports two CT3 trunk cards.

The CT3 trunk card contains an onboard M13 multiplexer, which multiplexes 28 separate T1 lines into a single T3 line. Each CT3 trunk card installed in the Cisco 5814 dial shelf contains all necessary functionality to terminate link signaling and incoming digital calls.

Figure 2 shows the CT3 trunk card.

Figure 2 – CT3 Trunk Card



Each CT3 trunk card:

- Provides physical termination for as many as 672 sessions.
- Provides digital termination for as many as 256 DS0 connections (calls) using onboard High-Level Data Link Control (HDLC) controllers.

  Note: The D-channel of a PRI consumes a single channel of an HDLC controller.
- Removes framing and embedded signaling bits (or inserts them, depending on the direction of the flow), demultiplexing the calls. The framer CPU sends the data stream to onboard time-division multiplexing (TDM) resources, which break out each call, and pass each call to an appropriate call termination resource. Digital or ISDN-originated calls are terminated onboard the CT3 trunk card on HDLC controllers.

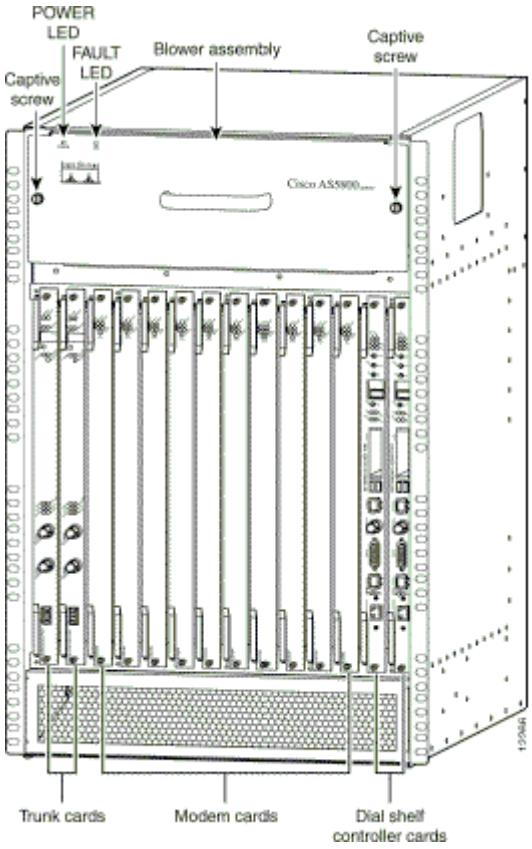
  Note: Each D-channel consumes an HDLC controller.

  Note: Analog modem-originated calls are passed over the dial shelf backplane TDM bus to an available modem resource. The system software controls modem and HDLC resource management.
- Responds to time-sensitive signaling. Each CT3 trunk card can supply two clocks from any two of its 28 ports. You can assign priorities to these clocks, or accept the default values assigned by the software.
- Processes counting information to monitor performance.
- Supports online insertion and removal (OIR), a feature that allows you to remove and replace a trunk card in the Cisco 5814 dial shelf, while the system is is in operation, but does not disrupt other cards and their associated calls. If you remove a trunk card while the system is is in operation, all calls associated with the CT3 lines on that card are dropped. However, calls that

are handled by other trunk or modem cards are not affected. For more information, see the Online Insertion and Removal section of the Card Removal and Insertion document.

Figure 3 shows two trunk cards installed in a fully-configured Cisco 5814 dial shelf chassis.

Figure 3 – Cisco 5814 Dial Shelf Chassis Fully Configured with Trunk Cards Installed



Clocking

All Cisco AS5800 access server trunk cards use the same transmit clock. This clock can originate from these sources:

- **TDM clock source**—A priority value from 1 to 50 that is applied to a clock source when multiple clock sources are used.
- **External clock source**—A clock source external to the access server.

Clocks are prioritized by slot number (slots 0 to 5). The highest-priority clock is selected from the card in slot 0, and used as the default clock. If this clock fails, the highest-priority clock from the card in slot 1 becomes the default clock, and so on.

The trunk card then forwards the clocks to the dial shelf controller. The dial shelf controller selects the highest-priority clock as the system primary clock, and the rest of the clocks remain in a prioritized backup queue.

Instead of using the default algorithm for clock selection, you can specify clocks through global configuration, and select a maximum of two clocks per trunk card.

If you configure fewer than two clocks on a trunk card, and all other configured clocks fail, clock

selection resorts to the default algorithm on that card, and the second clock is selected automatically.

CT3 Clocking

CT3 trunk cards are usually attached to an external device, such as a Digital Access and Crossconnect System (DACS) or Add-Drop Multiplexer (ADM). This point-to-point link requires a single clock source to which the CT3 link is timed. You must determine whether you want the CT3 trunk card or an external device to be used as the primary clock source, and configure it accordingly during the software configuration process.

CT1 Clocking

The CT3 trunk card has 28 T1 framers that always get their clock from the line. As a result, configuration of T1 clock sources is not allowed.

LED and Alphanumeric Indicators

The CT3 trunk card front panel is designed with LED and alphanumeric displays to indicate trunk card status (see figure 4).

Figure 4 – CT3 Trunk Card Front Panel LED and Alphanumeric Indicators

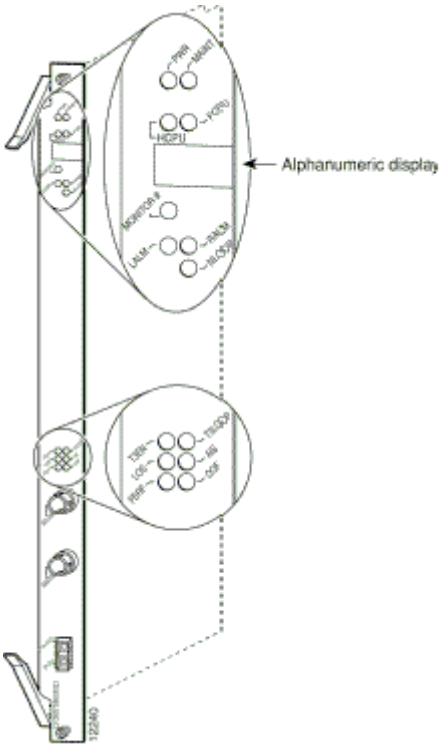


Table 4 lists the CT3 trunk card LEDs and their functions.

Table 4 – CT3 Trunk Card LEDs and Their Functions

LED	Color	Description
PWR	Green	Power—Lights when power is ON.
MAINT	Yellow	Maintenance—Lights to indicate that the feature card is ready for OIR.

HCPU	Green	Host CPU—Lights when the associated host CPU is determined to be in good working condition; shuts off when there is an error condition or code is being downloaded.
FCPU	Green	Framing data link—Lights when the associated FDL CPU is determined to be in good working condition, and shuts off when there is an error condition, or when code is being downloaded.
LALM	Yellow	Local alarm—Lights to indicate that a T1 alarm condition was encountered by software for a particular port. It remains OFF when the operating condition is normal.
RALM	Yellow	Remote alarm—Lights to indicate a T1 alarm condition was encountered by software for a particular port; remains OFF when the operating condition is normal.
NLOOP	Yellow	Network loop—Lights to indicate that at least one T1 is unavailable (status indicator). It remains OFF when the operating condition is normal.
T3EN	Green [1]	Enable—Lights to indicate a CT3 card line connection enabling normal operation.
T3LOOP[2]	Yellow [3]	Loopback—Lights to indicate that a loopback condition exists on the CT3 line, and is software controlled.
LOS	Yellow [3]	Loss-of-signal—Lights to indicate that the CT3 framer is experiencing a loss of signal (175 successive zeros).
AIS	Yellow [3]	Alarm indication signal—Lights to indicate the presence of AIS in the received CT3 line. Lights to indicate that a T3 alarm condition exists, and remains OFF when the operating condition is normal.
FERF	Yellow [3]	Far-end receive failure—Lights to indicate a far-end receive failure on the CT3 line.
OOF	Yellow [3]	Out-of-frame—Lights to indicate an out-of-frame condition on the CT3

		line.

[1] This LED must be lit for proper CT3 operation.

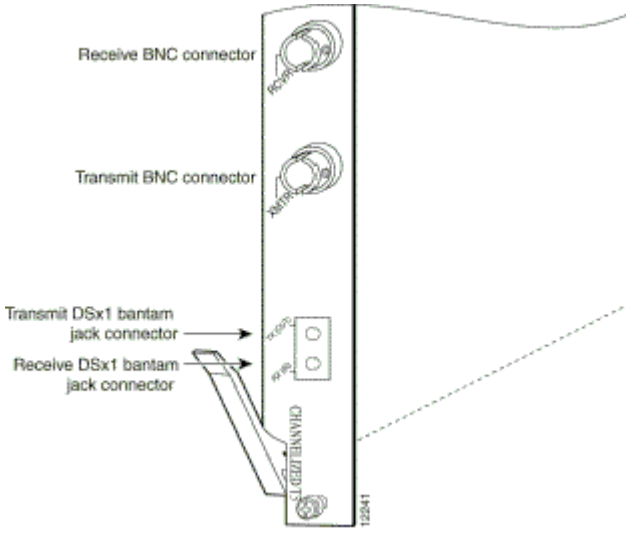
[2] When in loopback mode, this enables diagnostics to perform local CT3 testing without external support. The CT3 line is not affected by this condition, thus remaining disconnected and open.

[3] This LED must remain OFF for proper CT3 operation.

Trunk Card Connectors

The CT3 front panel is designed with two types of cable connectors (see figure 5). The BNC connectors are used to connect the cables that carry the T3 signals. The bantam jacks are used for local BERT circuit testing to the DS1 level.

Figure 5 – CT3 Trunk Card Front Panel Connectors

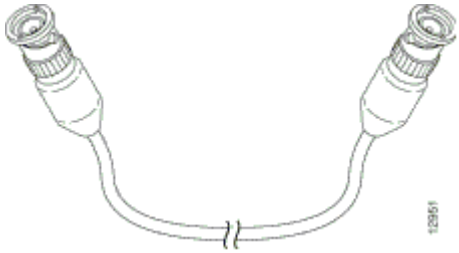


Cables

The CT3 trunk card uses common BNC coaxial cable connectors (see figure 6), to receive and transmit 45 Mbps signals through a 75-ohm cable. There are two female BNC connectors:

- One for T3 transmit data.
- One for T3 receive data.

Figure 6 – CT3 75-Ohm Coaxial Cable



CT3 Trunk Card Overview on AS5350/ AS5400

The procedure for installation and configuration of a CT3 card is identical for AS5350 and AS5400.

The figures in this section show the slot numbering and installation for AS5350 and AS5400.

Figure 7 – Slot Numbering on the Cisco AS5350 Chassis

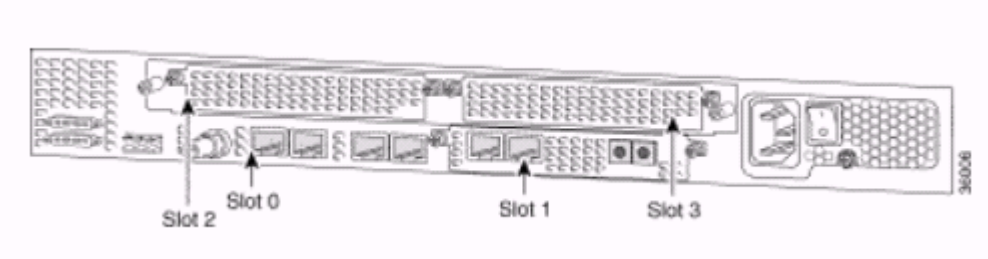


Figure 8 – For AS5350, T3 DFC (AS535-DFC-CT3)

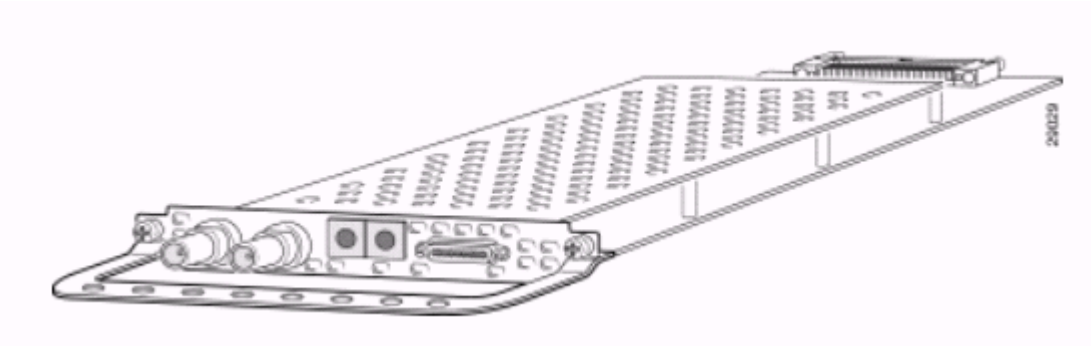


Figure 9 – Install the T3 DFC in the Cisco AS5350

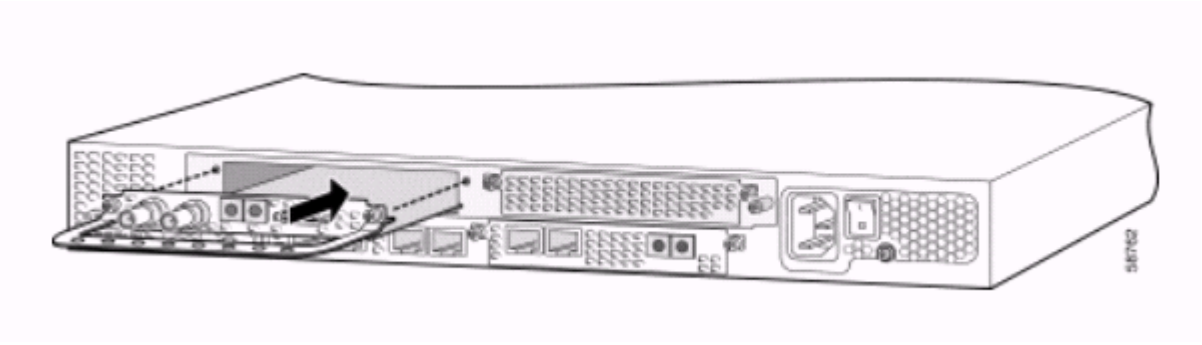


Figure 10 – Slot Numbering on the Cisco AS5400 Chassis

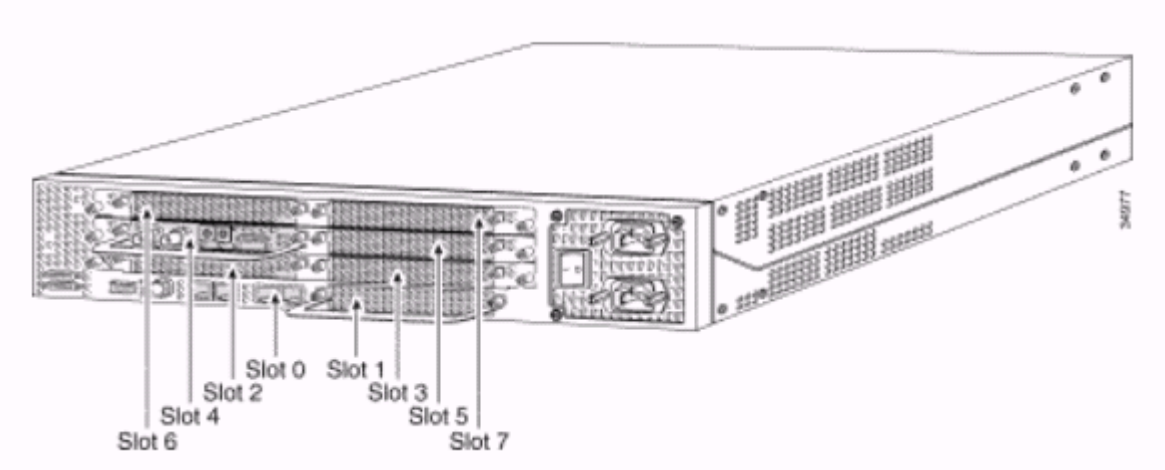
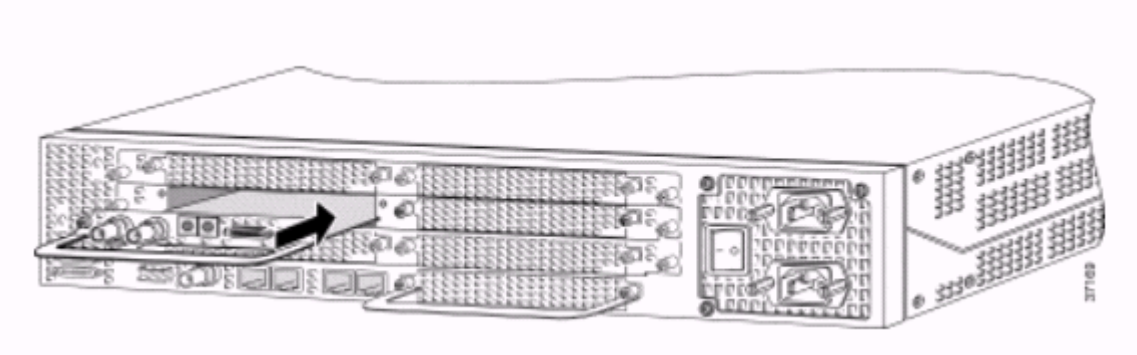


Figure 11 – Install the T3 DFC in the Cisco AS5400



Enter the **show chassis** command in privileged EXEC mode for AS5350 or AS5400 to determine the slot in which CT3-DFC is. Use that slot number is during the configuration of T3 line or controller.

```
AS5350# show chassis slot

Slot 1:
DFC type is AS5350 Empty DFC
DFC is not powered

OIR events:
        Number of insertions = 0, Number of removals = 0

Slot 2:
DFC type is AS5350 CT3 DFC

OIR events:
        Number of insertions = 0, Number of removals = 0
DFC State is DFC_S_OPERATIONAL

Slot 3:
DFC type is AS5350 Empty DFC
DFC is not powered

OIR events:
        Number of insertions = 0, Number of removals = 0
```

The AS54-DFC-CT3 trunk card for AS5400, and AS535-DFC-CT3 trunk card for AS5350, offer 28 individual T1 channels (bundled in the T3) for serial transmission of data. The CT3 link supports the maintenance data link channel in C-Bit parity mode, and also payload and network loopbacks. The T1s that are multiplexed in the CT3 link, support facilities data link (FDL) in extended super frame

(ESF) framing.

Controller Numbering

The CT3 controller numbering convention is dfc-slot/port in CLI commands. Trunk-card slot numbering starts from the motherboard, and works up from left to right. Slot 0 is reserved for the motherboard. Trunk-card slots are numbered sequentially from 1 to 7. Port number value is always 0.

Under the CT3, the CT1 controller numbering convention is dfc-slot/port:channel in CLI commands. Port numbering values range from 1 to 28.

	Command	Purpose
Step 1	`AS5400>` **enable** **Password:** ***password*** `AS5400#`	Enters enable mode. Enters the password. You are in enable mode when the prompt changes to `AS5350#` or `AS5400#`.
Step 2	`AS5400#` **configure terminal** `Enter configuration commands, one per line. End with CNTL/Z. AS5400 (config)#`	Enters global configuration mode. You are in global configuration mode when the prompt changes to `AS5350 (config)#` or `AS5400 (config)#`.
Step 3	`AS5400(config)#` **controller t3 1/0** `AS5400(config-controller)#`	Enters controller configuration mode to configure your T3 controller for slot 1 port 0. Slot values range from 1 to 7. The port number is always 0.
Step 4	`AS5400(config-controller)#` **framing c-bit**	Enters your telco's framing type: c-bit or m23.
Step 5	`AS5400(config-controller)#` **clock source line**	Enters your clock source: **internal** or **line**.
Step 6	`AS5400(config-controller)#` **cablelength 450**	Enters your cablelength: values range from 0 to 450 feet.
	`AS5400(config-`	Configures your T1 controllers. The range is 1 to 28. In this instance, all 28 T1s are configured at once.

Step 7	`controller)#` **t1 1-28 controller** or `AS5400(config-controller)#` **t1 1-10,15-20,23 controller**	or Omits specified T1 controllers, and provisions others. In this instance, T1 controllers 11-14, 21, 22, and 24-28 are unprovisioned. **Note:** This CLI command is backward compatible only.
Step 8	`AS5400(config-controller)#` **Ctrl-Z** `AS5400#`	Returns to enable mode.

Verify the Controller

To verify that your controller is up, and that no alarms have been reported, enter the **show controller** command, and specify the controller type, slot, and port numbers.

```
AS5400# show controller t3 1/0

T3 1/0 is down.
  Applique type is Channelized T3
  Transmitter is sending remote alarm.
  Receiver has loss of signal.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Line
  Data in current interval (330 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 24 hours)
     9944 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,
     86400 Unavailable Secs, 0 Line Errored Secs,
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

To configure individual T1 lines, see Configure T1 lines.

Use the Test Port

The CT3 trunk card front panel is designed with an alphanumeric display to provide trunk card status and port monitoring information (see figure 4).

Test-port functionality is supported by Cisco IOS® Software Release 12.0(6)T, and later versions.

Test Port Overview: Trunk Card Bantam Jacks

The test port is a set of bantam jack connectors located at the bottom of the CT3 front panel (see

figure 5).

The bantam jacks allow the connection of an external test device (for example, a FIREBERD test device) to test any of the 28 individual T1 circuits in drop-and-insert mode, or to monitor an individual T1 circuit in monitor mode.

- In drop-and-insert mode, the T1 line is dropped out of service. To prevent accidental use of the push button in drop-and-insert mode, use the **test trunk drop-insert** privileged EXEC command to disable the drop-and-insert mode on the specified T3 controller.
- In monitor mode, you can monitor only the ingress side of the T1 line. The T1 line being monitored is not disrupted, and the line maintains its HDLC and modem connections through TDM.

Drop-and-Insert Mode

The **test trunk drop-insert** privileged EXEC command is used to enable or disable drop-and-insert mode on a T3 controller. When the system initially boots up, the drop-and-insert mode is disabled on all T3 controllers.

To drop a particular T1 line to the test port, complete these steps:

1. Enable drop-and-insert mode by entering the **test trunk drop-insert on** privileged EXEC command.

   ```
   AS5800# test trunk drop-insert on shelf/slot/unit
   ```

   Note: The shelf/slot/unit identifies the T1 to the CT3 controller.

2. Push and quickly release the push button below the LED to toggle to the port number. The push button is labeled "MONITOR #" in figure 4.

   Note: You must release the push button within 2 seconds to advance through the port numbers (from 1 to 28). After port 28, the display returns to port 1.

3. Push and hold the push button for two or more seconds.

   The letter "D" (indicating drop-insert) is displayed in the front panel LED, indicating that the particular T1 line has been dropped to the test port.

   Note: To select another port number, press the push button again, and hold it for two or more seconds. You can now toggle to another port number.

4. Disable the drop-and-insert mode after testing the T1 lines. We recommend that you disable drop-and-insert mode to prevent accidental use of the push button on the CT3 board.

   To disable drop-and-insert mode, enter the **test trunk drop-insert off** privileged EXEC command as follows:

   ```
   AS5800# test trunk drop-insert off shelf/slot/unit
   ```

Monitor Mode

You can monitor an individual T1 circuit in monitor mode.

To monitor a particular T1 line at the test port, complete these steps:

1. Verify that drop-and-insert mode is disabled on the CT3 controller. To do so, enter the **show** command, as follows:

   ```
   AS5800# show controller t3 shelf/slot/unit
   ```

   Here is the sample output from the **show controller t3** command if drop-and-insert mode is disabled:

   ```
   AS5800# show controller t3 1/1/0
   T3 1/1/0 is up.
   Applique type is Channelized T3
   No alarms detected.
   FEAC code received: No code is being received
   Framing is M23, Line Code B3ZS, Clock Source is Internal
   Drop-insert is disabled
   Data in current interval (90 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
   AS5800#
   ```

   Note: If the display shows drop-insert is enabled, repeat Step 4 in the Drop-and-Insert Mode procedure.

2. Push and quickly release the push button below the LED to toggle to the port number. The push button is labeled "MONITOR #" in figure 4.

   Note: You must release the push button within two seconds to advance through the port numbers (from 1 to 28). After port 28, the display returns to port 1.

3. Push and hold the push button for two or more seconds.

   The letter "M" (indicating monitor) is shown in the front panel display. This indicates that you can monitor the particular T1 line at the test port.

   Note: To select another port number, press the push button again and hold it for two or more seconds. You can now toggle to another port number.

Specifications

Table 5 lists the CT3 trunk card specifications.

Table 5 – CT3 Trunk Card Specifications

Description	Specification
Dimensions H x W x L	15.4 x 0.08 x 18.7 in. (39.12 x 0.203 x 47.5 cm) without the carrier 15.5 x 1.23 x 19 in. (39.37 x 3.12 x 48.26 cm) with the carrier.

Weight	8 lb (3.6 kg).
Transmission bit rate	44,736 Mbps.
MTBF[1]	Exceeds 50,000 hr.
Power requirements	+3.3 VDC, 8A, ±5% +5.0 VDC, 15A, ± 5%.
Regulatory compliance	**Safety**: UL 1950, CSA 22.2 No. 950, EN60950, AUSTEL TS001, AS/NZS 3260, IEC 950. **Emissions**: CFR 47 Part 15 Class B (FCC), CISPR22 Class B, EN55022 Class B, AS/NRZ 3548 Class B, ICES003, VCCI Class B. **Immunity**: IEC 1000-3-2, IEC 1000-3-3, IEC-1000-4-2, IEC-1000-4-3, IEC-1000-4-4, IEC-1000-4-5, IEC-1000-4-6, IEC-1000-4-11, EN50082-1, EN50082-2. For additional compliance information, refer to the Regulatory Compliance and Safety Information document that accompanied this device.
[1] MTBF = Mean time between failures.	

Connect the Trunk Card Cables

The CT3 trunk card uses common female BNC coaxial cable connectors to receive and transmit 45-Mbps signals through a 75-ohm cable. There are two female BNC connectors:

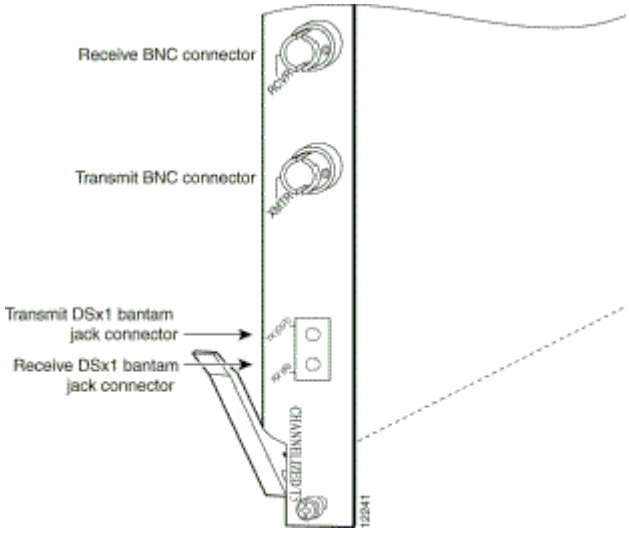
- One for T3 transmit data.
- One for T3 receive data.

Use a 75-ohm coaxial cable to connect the T3 lines (see figure 6).

To connect the T3 lines, complete these steps:

1. Attach the end of the T3 cable directly to the BNC receptacle on the trunk card (see figure 12).

   Figure 12 – CT3 Trunk Card BNC Cable Connections



2. Attach the network end of your CT3 cable to your external network.

Configure Cable Length

When you configure your CT3 trunk cards, you must include the length of the cable connected to the card. To specify this length, use the **cablelength** command, and designate the length of the DS3 cable. Cable length is a number of feet from 0 to 450.

When you configure your system for CT3 lines, you must also include additional commands to define framing, line code, clock source, signaling, and so on.

For additional software information, refer to the Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide that shipped with your system.

This completes the trunk card installation procedure.

Verify and Troubleshoot the Trunk Card Installation

This section provides information you can use to confirm your trunk card configuration is working properly.

When you first power ON your Cisco AS5800, all LEDs light while the system runs a series of diagnostics. After the system passes initial diagnostics, all LEDs shut off. The LEDs then light again as described in table 4.

To complete the hardware installation, verify that the trunk card LEDs operate properly. To do so, observe these LED states:

- **The power LED is ON.**

  If the power LED remains OFF, verify whether the card is seated properly.

  If the power LED lights on other trunk cards in the dial shelf, try to insert the trunk card in a different slot. If none of the power LEDs lights, check your dial shelf power connections, power entry modules, and AC-input power supplies (if present).

- **The HCPU LED is ON.**

If the HCPU LED is OFF but the power LED is ON, the software image might have failed to load onto the card. The dial shelf controller attempts to reload the software automatically. After a programmed number of attempts to reload the software image fails, the dial shelf controller powers OFF the trunk card, and all LEDs are shut off.

If this happens, assume that the failure is due to defective hardware. Return the card to the factory for replacement.

- **The FCPU LED is ON.**

  If the FCPU LED is OFF while the HCPU LED is ON, either the hardware is defective, or the framer processor software has crashed. To determine if the failure is software related, wait while the auto-reload feature on the dial shelf controller card attempts to reload the software image. If the software fails to reload after the programmed number of attempts, assume that the failure is due to defective hardware. Return the card to the factory for replacement.

  For further installation troubleshooting information, see the Cisco AS5800 Universal Access Server Hardware Installation Guide.

Configure the CT3 Trunk Card

The Cisco 5814 dial shelf recognizes trunk cards only in dial shelf slots 0 to 5. Therefore, install trunk cards only in the first six slots.

If you replace a dial shelf card by installing a new dial shelf card of the same type in the same slot, the system software recognizes the new dial shelf card interfaces, and brings them up automatically. No additional configuration is needed.

If you install a trunk card in a different slot than the trunk card you just removed, additional configuration is needed.

See the Cisco AS5800 Universal Access Server Operation, Administration, Maintenance, and Provisioning Guide that shipped with your system.

Configuration Commands

This section describes the procedure to configure your CT3 card.

Note: The "/" symbol is used in commands to specify a physical location. Thus 1/0/0 on a T3 port tells you where you can plug something into the dial shelf. The ":" symbol is used in commands to specify a TDM channel within a physical port.

To configure your CT3 card, complete these steps:

1. Enter the **enable** command.

   Enter your password. You are in privileged EXEC mode when the prompt changes to `AS5800#`.

   ```
   AS5800> enable
   Password: password
   AS5800#
   ```

2. Enter into global configuration mode by entering the **configure terminal** command. This

example uses the terminal configuration option. You are in global configuration mode when the prompt changes to `AS5800(config)#`.

```
AS5800# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
AS5800(config)#
```

3. Enter **interface loopback 0** to create interface loopback 0, which is the logical IP subnet that contains all dial-in user addresses. You are in interface mode when the prompt changes to `AS5800(config-if)#`.

```
AS5800(config)# interface loopback 0
%LINEPROTO-5-UPDOWN: Line protocol on Interface Loopback0,
changed state to up
```

4. Set the normal data path back to its source (either *local* or *network*).

```
AS5800(config-if)# loopback local
```

5. Use the **no shutdown** command to enable the interface. To deactivate any command functionality, type **no** before the command.

```
AS5800(config-if)# no shutdown
```

6. Enter controller configuration mode to configure your T3 controller port. The only legal port value is 0.

```
AS5800(config)# controller t3 shelf/slot/0
```

7. Enter an optional text description for the T3 controller.

```
AS5800(config-controller)# t3 description ascii-string
```

8. Enter the controller **cablelength** value, from **0** to **450** (feet).

```
AS5800(config-controller)# cablelength 200
```

9. Enter the type of T3 framing used. *C-bit* specifies C-bit parity framing. *M23* (default) specifies M23 multiplexer framing.

```
AS5800(config-controller)# framing c-bit
```

10. Create a logical T1 controller from each of the specified T3 line time slots. The entry ds1 is a time slot within the T3 line with a value from **1** to **28**.

```
AS5800(config-controller)# t1 ds1 controller
```

11. Enter controller configuration mode to configure your T3 controller port. T1-num is a T1 timeslot within the T3 line with a value from **1** to **28**.

```
AS5800(config)# controller t1 shelf/slot/port:t1-num
```

12. Configure the clock source as an internal clock (internal) or a recovered clock (line).

```
AS5800(config-controller)# clock source line
```

13. Configure clock priority, which is a value from **1** to **50**.

    Select an *external* reference clock or a *trunk card* to select a clocking source.

    If you use an external reference clock, no other CLI is needed. If you use a trunk card, select a dial shelf slot from **0** to **5**.

    Select the T3 port number, which has a value of **0**.

```
AS5800(config)# dial-tdm-clock priority {1-50}
{external | trunk-slot} {0-5} ds3-port 0 port {1-28}
```

14. Save your changes when ready.

```
AS5800# copy running-config startup-config
```

Verification

To verify your software configuration, you can enter **show** commands to display clock (**show dial-shelf clock**) and controller (**show controller t3**) settings. To enter **show** commands, you must be in privileged EXEC mode. Here are some examples:

```
AS5800# show dial-shelf clock
Primary Clock:
--------------
Slot 12:
System primary is 1/1/0:2 of priority 213
TDM Bus Master Clock Generator State = NORMAL
Backup clocks:
Source Slot Port DS3-Port Priority Status State
-------------------------------------------------------------
Trunk 0 1 0 206 Bad Default
Trunk 0 2 0 212 Bad Default
Trunk 1 4 0 225 Good Default
Status of trunk clocks:
-----------------------
Ds3 2 2 2 2 2 2 2 2 2 1 1 1 1 1 1 1 1 1 1
Slot Port Type 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1 0 9 8 7 6 5 4 3 2 1
0 0 T3 G G G G G G G G G G G G G G G G G G G G G G G G G G G G
1 0 T3 B B B B B B B B B B B B B B B B B B G G G G G G G G
AS5800# show controller t3
T3 1/0/0 is up.
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 Line.
Data in current interval (751 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 16 15 minute intervals):
34989 Line Code Violations, 16414 P-bit Coding Violation,
49331 C-bit Coding Violation, 0 P-bit Err Secs,
```

```
0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
12 Unavailable Secs, 0 Line Errored Secs,
10 C-bit Errored Secs, 10 C-bit Severely Errored Secs
T3 1/1/0 is up.
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 Line.
Data in current interval (751 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 16 15 minute intervals):
42579 Line Code Violations, 16421 P-bit Coding Violation,
49208 C-bit Coding Violation, 0 P-bit Err Secs,
0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
2 Unavailable Secs, 0 Line Errored Secs,
10 C-bit Errored Secs, 10 C-bit Severely Errored Secs
```

A typical T3 controller configuration in a running-configuration file appears like this:

```
T3 controller configuration:
----------------------------
controller T3 1/0/0
framing m23
clock source line
cablelength 224
t1 1 controller
t1 2 controller
t1 3 controller
t1 4 controller
t1 5 controller
t1 6 controller
t1 7 controller
t1 8 controller
t1 9 controller
t1 10 controller
t1 11 controller
t1 12 controller
t1 13 controller
t1 14 controller
t1 15 controller
t1 16 controller
t1 17 controller
t1 18 controller
t1 19 controller
t1 20 controller
t1 21 controller
t1 22 controller
t1 23 controller
t1 24 controller
t1 25 controller
t1 26 controller
t1 27 controller
t1 28 controller
```

A typical T1 controller configuration appears like this:

```
T1 controller configuration:
----------------------------
controller T1 1/0/0:1
```

```
framing esf
pri-group timeslots 1-24
controller T1 1/0/0:2
channel-group 0 timeslots 1-24
.
.
.
controller T1 1/1/0:28
cas-group 0 timeslots 1-24
```

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828 router and G.shdsl link up-down Problem - Dec 12, 2004 Soho 97 fixed IP routing - Dec 11, 2004 ISDN PRI AS5350 one timeslot stuck in restart - Dec 11, 2004 828 G.SHDSL back-to-back configuration - Dec 11, 2004 Monitoring dialup users to a syslog server - Dec 10, 2004

Related Information

- **Overview: PA-MC-T3 Port Adapter Installation and Configuration**
- **Card Removal and Insertion**
- **Cisco AS5800 Universal Access Server Hardware Installation Guide**
- **Technical Support - Cisco Systems**