Configuring Clear Channel T3/E3 Controllers and Channelized T3 and T1/E1 Controllers

This module describes the configuration of clear channel T3/E3 controllers .

You must configure the T3/E3 controller before you can configure an associated serial interface.

Feature History for Configuring T3/E3 Controller Interfaces

Release	Modification
Release 3.4.1	This feature was introduced on the Cisco CRS-1 Router for the 4-Port Clear Channel T3/E3 SPA.

Prerequisites for Configuring T3/E3 Controllers

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Before configuring T3/E3 controllers, be sure that you have one of the following supported SPAs installed in the router:

- Cisco 2-Port and 4-Port Clear Channel T3/E3 SPA

Information About T3/E3 Controllers and Serial Interfaces

The 2-Port and 4-Port Clear Channel T3/E3 SPAs support clear channel services over serial lines only.

If a controller is not channelized, then it is a clear channel controller, and the full bandwidth of its associated serial line is dedicated to a single channel that carries serial services.

When a T3 controller is channelized, it is logically divided into smaller bandwidth T1 or E1 controllers, depending on which mode of channelization you select. The sum of the bandwidth of the serial interfaces on the T1 or E1 controllers cannot exceed the bandwidth of the T3 controller that contains those channelized T1 or E1 controllers.

When you channelize a T3 controller, each individual T1 or E1 controller is automatically further channelized into DS0 time slots. A single T1 controller carries 24 DS0 time slots, and a single E1 controller carries 31 DS0 time slots. Users can divide these DS0 time slots up into individual channel groups. Each channel group can support a single serial interface.

When a controller is channelized, and channel groups have been created, services are provisioned on the associated serial interfaces.

The channelization feature in this release allows the following types of channelization:

- A single T3 controller into 28 T1 controllers, for a total controller size of 44210 kbps.

- A single T3 controller into 21 E1 controllers, for a total controller size of 43008 kbps.

- A single T1 controller supports up to 1.536 MB.

- A single E1 controller supports up to 2.048 MB.

Note A single shared port adapter (SPA) can support up to 448 channel groups.

This section includes the following additional topics:

6 simultaneous BERT sessions among first three physical ports and 6 simultaneous BERT sessions on 4th port.

All interfaces configured on a SONET/SDH controller for the 1-Port Channelized OC-3/STM-1 SPA should be IC-SSO protected or none of them should be IC-SSO protected.

For detailed information about loopback support, see the "Loopback Support" section.

Configuration Overview

Configuring a channelized T3 controller and its associated serial interfaces is a 4-step process:

1. Configure the T3 controller, and set the mode for that controller to T1 or E1.

2. Configure the T1 or E1 controller.

3. Create channel groups and assign DS0 time slots to these channel groups as desired.

4. Configure the serial interfaces that are associated with the individual channel groups, as described in the Configuring Serial Interfaces module later in this document.

Default Configuration Values for T3 and E3 Controllers

This table describes the default configuration parameters that are present on the T3 and E3 controllers.

Note
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Table 1: T3 and E3 Controller Default Configuration Values

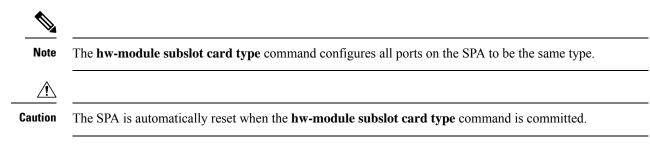| Parameter	Default Value	Configuration File Entry
Frame type for the data line	For T3: C-bit framing For E3: G.751	**framing** {**auto-detect** | **c-bit** | **m23**}
Clocking for individual T3/E3 links	**internal**	**clock source** {**internal** | **line**}
Cable length	224 feet	**cablelength** *feet*
Maintenance data link (MDL) messages (T3 only)	**disable**	**mdl transmit** {**idle-signal** | **path** | **test-signal**} {**disable** | **enable**}
National reserved bits for an E3 port (E3 only)	**enable**, and the bit pattern value is 1.	**national bits** {**disable** | **enable**}

Note When configuring clocking on a serial link, you must configure one end to be **internal**, and the other end to be **line**. If you configure **internal** clocking on both ends of a connection, framing slips occur. If you configure **line** clocking on both ends of a connection, the line does not come up.

How to Configure Clear Channel T3/E3 Controllers

The T3/E3 controllers are configured in the physical layer control element of the Cisco IOS XR software configuration space. This configuration is described in the following tasks:

Setting the Card Type

By default, the 2-Port and 4-Port Clear Channel T3/E3 SPAs boot in T3 mode. If you want to use the 2-Port or 4-Port Clear Channel T3/E3 SPA in E3 mode, you must change the default setting of the **hw-module subslot card type** command as described in this section.

Note The **hw-module subslot card type** command configures all ports on the SPA to be the same type.

Caution The SPA is automatically reset when the **hw-module subslot card type** command is committed.

Note   The **hw-module subslot card type** command applies to the 2-Port and 4-Port Clear Channel T3/E3 SPAs only. The 2-Port and 4-Port Channelized T3 SPA runs in T3 mode only.

Before you begin

If you have previously configured the interfaces on the 2-Port or 4-Port Clear Channel T3/E3 SPA and now you want to change the card type, you must delete any previously defined T3/E3 controller and serial interface configurations. Use the **no controller** [**e1** and **no interface serial** commands to revert the controller and interface configurations to their defaults.

Restrictions

This task is applicable to 2-Port and 4-Port Clear Channel T3/E3 SPAs only.

SUMMARY STEPS

1. **configure**
2. **hw-module subslot** *subslot-id* **cardtype** {**e1**}
3. **end** or **commit**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** RP/0/RP0/CPU0:router# configure	Enters global configuration mode.
Step 2	**hw-module subslot** *subslot-id* **cardtype** {**e1**} **Example:** RP/0/RP0/CPU0:router(config)# hw-module subslot 0/1/0 cardtype e3	Sets the serial mode for the SPA. • t3—Specifies T3 connectivity of 44,210 kbps through the network, using B3ZS coding. This is the default setting. • e3—Specifies a wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 34,010 kbps.
Step 3	**end** or **commit** **Example:** RP/0/RP0/CPU0:router(config)# end or RP/0/RP0/CPU0:router(config)# commit	Saves configuration changes. • When you issue the **end** command, the system prompts you to commit changes: ```Uncommitted changes found, commit them before exiting(yes/no/cancel)?[cancel]:``` - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.

Command or Action	Purpose
	- Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
	- Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
	• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Configuring a Clear Channel E3 Controller

Before you begin

You must first use the **hw-module subslot cardtype** command to set the card to support E3.

Restrictions

• If you configure an option that is not valid for your controller type, you receive an error when you commit the configuration.

• A single SPA cannot support a mixture of T3 and E3 interfaces.

• This task is applicable to 2-Port and 4-Port Clear Channel T3/E3 SPAs only.

SUMMARY STEPS

1. **configure**
2. **controller e3** *interface-path-id*
3. **mode serial**
4. **no shutdown**
5. **end** or **commit**
6. **show controllers e3** *interface-path-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**controller e3** *interface-path-id* **Example:**	Specifies the E3 controller name in the notation *rack/slot/module/port* and enters E3 configuration mode.

	Command or Action	Purpose
	RP/0/RP0/CPU0:router(config)# controller t3 0/1/0/0	
Step 3	**mode serial** **Example:** RP/0/RP0/CPU0:router(config-e3)# mode serial	Configures the mode of the port to be clear channel serial. **Note** • This step is required for the 2-Port and 4-Port Channelized T3 SPA only. The 2-Port and 4-Port Clear Channel T3/E3 SPA run in serial mode by default.
Step 4	**no shutdown** **Example:** RP/0/RP0/CPU0:router(config-e3)# no shutdown	Removes the shutdown configuration. • The removal of the shutdown configuration removes the forced administrative down on the controller, enabling the controller to move to an up or a down state.

Step 5	**end** or **commit**
	
	Example:
	
	RP/0/RP0/CPU0:router(config-e3)# end
	
	or
	
	RP/0/RP0/CPU0:router(config-e3)# commit
		Saves configuration changes.
		
		• When you issue the **end** command, the system prompts you to commit changes:
		
		`Uncommitted changes found, commit them before exiting(yes/no/cancel)?`
		`[cancel]:`
		
		- Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
		
		- Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
		
		- Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
		
		• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Step 6	**show controllers e3** *interface-path-id* **Example:** RP/0/RP0/CPU0:router# show controllers e3 0/1/0/0	(Optional) Displays information about the E3 controllers.

What to do next

• Modify the default configuration that is running on the E3 controller you just configured, as described in the "Modifying the Default E3 Controller Configuration" section later in this module.

- Configure a bit error rate test (BERT) on the controller to test its integrity, as described in the "Configuring BERT" section later in this module.

- Configure the associated serial interface, as described in the Configuring Serial Interfaces on the Cisco ASR 9000 Series Router module later in this document.

Modifying the Default E3 Controller Configuration

This task explains how to modify the default E3 controller configuration, which is described in the "Default Configuration Values for T3 and E3 Controllers" section earlier in this module.

SUMMARY STEPS

1. **configure**
2. **controller e3** *interface-path-id*
3. **clock source {internal | line}**
4. **cablelength** *feet*
5. **framing {g751 | g832}**
6. **national bits** {**disable** | **enable**}
7. **no shutdown**
8. **end** or **commit**
9. **show controllers e3** *interface-path-id*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**controller e3** *interface-path-id* **Example:** `RP/0/RP0/CPU0:router(config)# controller t3 0/1/0/0`	Specifies the E3 controller name in the notation *rack/slot/module/port* and enters E3 configuration mode.
Step 3	**clock source {internal	line}** **Example:** `RP/0/RP0/CPU0:router(config-e3)# clock source internal`	(Optional) Sets the clocking for individual E3 links. **Note** • The default clock source is **internal**. • When configuring clocking on a serial link, you must configure one end to be **internal**, and the other end to be **line**. If you configure **internal** clocking on both ends of a connection, framing slips occur. If you configure **line** clocking on both ends of a connection, the line does not come up.

	Command or Action	Purpose
Step 4	**cablelength** *feet* **Example:** RP/0/RP0/CPU0:router(config-e3)# cablelength 250	(Optional) Specifies the distance of the cable from the router to the network equipment. **Note** • The default cable length is 224 feet.
Step 5	**framing {g751 | g832}** **Example:** RP/0/RP0/CPU0:router(config-e3)# framing g832	(Optional) Selects the frame type for the E3 port. Possible E3 frame types are G.751 and G.832. **Note** • The default framing for E3 is G.751.
Step 6	**national bits** {**disable** | **enable**} **Example:** RP/0/RP0/CPU0:router(config-e3)# national bits enable	(Optional) Enables or disables the 0x1F national reserved bit pattern on the E3 port. **Note** • The E3 national bit is enabled by default, and the bit pattern value is 1.
Step 7	**no shutdown** **Example:** RP/0/RP0/CPU0:router(config-e3)# no shutdown	Removes the shutdown configuration. • The removal of the shutdown configuration removes the forced administrative down on the controller, enabling the controller to move to an up or a down state.

Step 8	**end** or **commit**
	
	Example:
	
	RP/0/RP0/CPU0:router(config-e3)# end
	
	or
	
	RP/0/RP0/CPU0:router(config-e3)# commit
		Saves configuration changes.
		
		• When you issue the **end** command, the system prompts you to commit changes:
		
		`Uncommitted changes found, commit them before exiting(yes/no/cancel)?`
		`[cancel]:`
		
		- Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
		
		- Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
		
		- Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
		
		• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Step 9	**show controllers e3** *interface-path-id* **Example:**	(Optional) Displays information about the E3 controllers.

Command or Action	Purpose
`RP/0/RP0/CPU0:router# show controllers e3 0/1/0/0`	

What to do next

- Modify the default configuration that is running on the T3 controller you just configured, as described in the "Modifying the Default T3 Controller Configuration" section later in this module.

- Configure BERT on the controller to test its integrity, as described in the "Configuring BERT" section later in this module.

- Configure the associated serial interface, as described in the *Configuring Serial Interfaces on the Cisco ASR 9000 Series Router* module later in this document.

Configuring a Clear Channel T3 Controller

Before you begin

You must use the **hw-module subslot cardtype** command to set the card to support T3, as described in the Setting the Card Type section on earlier in this module.

Restrictions

- This task is applicable to 2-Port and 4-Port Clear Channel T3/E3 SPAs only.

- If you configure an option that is not valid for your controller type, you receive an error when you commit the configuration.

- A single SPA cannot support a mixture of T3 and E3 interfaces.

SUMMARY STEPS

1. **configure**
2. **controller t3** *interface-path-id*
3. **mode serial**
4. **no shutdown**
5. **end** or **commit**
6. **show controllers t3** *interface-path-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.

	Command or Action	**Purpose**
Step 2	**controller t3** *interface-path-id* **Example:** RP/0/RP0/CPU0:router(config)# controller t3 0/1/0/0	Specifies the T3 controller name in the *rack/slot/module/port* notation and enters T3 configuration mode.
Step 3	**mode serial** **Example:** RP/0/RP0/CPU0:router(config-t3)# mode serial	Configures the mode of the port to be clear channel serial. **Note** • This step is required for the 2-Port and 4-Port Channelized T3 SPA only. The 2-Port and 4-Port Clear Channel T3/E3 SPA runs in serial mode by default.
Step 4	**no shutdown** **Example:** RP/0/RP0/CPU0:router(config-t3)# no shutdown	Removes the shutdown configuration. • The removal of the shutdown configuration removes the forced administrative down on the controller, enabling the controller to move to an up or a down state.

Step 5	**end** or **commit**
	
	Example:
	
	RP/0/RP0/CPU0:router(config-t3)# end
	or
	RP/0/RP0/CPU0:router(config-t3)# commit
		Saves configuration changes.
		
		• When you issue the **end** command, the system prompts you to commit changes:
		
		`Uncommitted changes found, commit them before exiting(yes/no/cancel)?`
		`[cancel]:`
		
		- Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
		
		- Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
		
		- Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
		
		• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Step 6	**show controllers t3** *interface-path-id* **Example:** RP/0/RP0/CPU0:router# show controllers t3 0/1/0/0	(Optional) Displays information about the T3 controllers.

What to do next

- Modify the default configuration that is running on the T3 controller you just configured, as described in the "Modifying the Default T3 Controller Configuration" section later in this module.

- Configure BERT on the controller to test its integrity, as described in the "Configuring BERT" section later in this module.

- Configure the associated serial interface, as described in the Configuring Serial Interfaces on the Cisco ASR 9000 Series Router module.

- When a T3 controller is in clear channel mode, it carries a single serial interface.

- The T3 controllers are configured in the T3 configuration mode.

Modifying the Default T3 Controller Configuration

This task explains how to modify the default T3 controller configuration, which is described in the Default Configuration Values for T3 and E3 Controllers section.

Before you begin

You must configure a clear channel controller, as described in one of the following sections:

- Configuring a Clear Channel T3 Controller

SUMMARY STEPS

1. **configure**
2. **controller T3** *interface-path-id*
3. **clock source {internal | line}**
4. **cablelength** *feet*
5. **framing** {**auto-detect** | **c-bit** | **m23**}
6. **mdl transmit** {**idle-signal** | **path** | **test-signal**} {**disable** | **enable**}
7. **mdl string** {**eic** | **fi** | **fic** | **gen-number** | **lic** | **port-number** | **unit**} *string*
8. **no shutdown**
9. **end** or **commit**
10. **show controllers t3** *interface-path-id*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**controller T3** *interface-path-id* **Example:**	Specifies the T3 controller name in the notation *rack/slot/module/port* and enters T3 configuration mode.

	Command or Action	**Purpose**
	`RP/0/RP0/CPU0:router(config)# controller t3 0/1/0/0`	
Step 3	**clock source {internal	line}** **Example:** `RP/0/RP0/CPU0:router(config-t3)# clock source internal`	(Optional) Sets the clocking for the T3 port. **Note** • The default clock source is **internal**. • When configuring clocking on a serial link, you must configure one end to be **internal**, and the other end to be **line**. If you configure **internal** clocking on both ends of a connection, framing slips occur. If you configure **line** clocking on both ends of a connection, the line does not come up.
Step 4	**cablelength** *feet* **Example:** `RP/0/RP0/CPU0:router(config-t3)# cablelength 250`	(Optional) Specifies the distance of the cable from the router to the network equipment. **Note** • The default cable length is 224 feet.
Step 5	**framing** {**auto-detect**	**c-bit**	**m23**} **Example:** `RP/0/RP0/CPU0:router(config-t3)# framing c-bit`	(Optional) Selects the frame type for the T3 port. **Note** • The default frame type for T3 is C-bit.
Step 6	**mdl transmit** {**idle-signal**	**path**	**test-signal**} {**disable**	**enable**} **Example:** `RP/0/RP0/CPU0:router(config-t3)# mdl transmit path enable`	(Optional) Enables Maintenance Data Link (MDL) messages on the T3 port. **Note** • MDL messages are supported only when the T3 framing is C-bit parity. • MDL message are disabled by default.
Step 7	**mdl string** {**eic**	**fi**	**fic**	**gen-number**	**lic**	**port-number**	**unit**} *string* **Example:** `RP/0/RP0/CPU0:router(config-t3)# mdl fi facility identification code`	(Optional) Specifies the values of the strings sent in the MDL messages.
Step 8	**no shutdown** **Example:** `RP/0/RP0/CPU0:router(config-t3)# no shutdown`	Removes the shutdown configuration. • The removal of the shutdown configuration removes the forced administrative down on the controller, enabling the controller to move to an up or a down state.
Step 9	**end** or **commit**	Saves configuration changes.

Command or Action	Purpose

Example:
 	
`RP/0/RP0/CPU0:router(config-t3)# end`
 	
or
 	
`RP/0/RP0/CPU0:router(config-t3)# commit`
	• When you issue the **end** command, the system prompts you to commit changes:
	
	`Uncommitted changes found, commit them before`
	`exiting(yes/no/cancel)?`
	`[cancel]:`
	
	- Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
	
	- Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
	
	- Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
	
	• Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

Step 10 **show controllers t3** *interface-path-id* **Example:** `RP/0/RP0/CPU0:router# show controllers t3 0/1/0/0`	(Optional) Displays information about the T3 controllers.

What to do next

• If you configured a clear channel T3 controller, perform the following tasks:

- Configure BERT on the controller to test its integrity, as described in the "Configuring BERT" section on page 474 later in this module.

- Configure the associated serial interface, as described in the *Configuring Serial Interfaces on the Cisco ASR 9000 Series Router* module.

Configuring BERT

Depending on your hardware support, BERT is supported on each of the T3/E3 . It is done only over an unframed T3/E3 signal and is run on only one port at a time. It is also supported on individual channel groups.

To view the BERT results, use the **show controllers t3** command in EXEC mode. The BERT results include the following information:

• Type of test pattern selected

• Status of the test

• Interval selected

- Time remaining on the BER test

- Total bit errors

- Total bits received

BERT is data intrusive. Regular data cannot flow on a line while the test is in progress. The line is put in an alarm state when BERT is in progress and restored to a normal state after BERT has been terminated.

Configuring BERT on T3/E3 Controllers

This task explains how to enable a bit error rate test (BERT) pattern on a T3/E3 line.

You must have configured a clear channel T3/E3 controller.

Restrictions

Valid patterns for all controllers and channel groups include: 0s, 1s, 2^15, 2^20, 2^20-QRSS, 2^23, and alt-0-1.

Additional valid patterns for T1 controllers include: 1in8, 3in24, 55Daly, and 55Octet. Additional valid patterns for channel groups include: 2^11 and 2^9.

Before you begin

You must have configured a clear channel T3/E3 controller.

SUMMARY STEPS

1.   **configure**
2.   **controller [t3 | e3]** *interface-path-id*
3.   **bert pattern** *pattern*
4.   **bert interval** *time*
5.   **bert error** [*number*]
6.   **end** or **commit**
7.   **exit**
8.   **exit**
9.   **bert [t3 | e3]** *interface-path-id* [**channel-group** *channel-group-number]* [**error**] **start**
10.   **bert [t3 | e3]** *interface-path-id* [**channel-group** *channel-group-number]* **stop**
11.   **show controllers** [**t3 | e3]** *interface-path-id*

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**controller [t3 | e3**] *interface-path-id* **Example:** RP/0/RP0/CPU0:router(config)# controller t3 0/1/0/0	Specifies the controller name and instance in the notation *rack/slot/module/por*t, and enters T3 or E3 controller configuration mode.
Step 3	**bert pattern** *pattern* **Example:** RP/0/RP0/CPU0:router(config-t3)# bert pattern 2^15	Enables a specific bit error rate test (BERT) pattern on a controller. **Note** You must use the **bert** command in EXEC mode to start the BER test.
Step 4	**bert interval** *time* **Example:** RP/0/RP0/CPU0:router(config-t3)# bert pattern 2^15	(Optional) Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1 line. The interval can be a value from 1 to 14400.
Step 5	**bert error** [*number*] **Example:** RP/0/RP0/CPU0:router(config-t3)# bert error 10	Specifies the number of BERT errors to introduce into the bit stream. Range is from 1 to 255.
Step 6	**end** or **commit** **Example:** RP/0/RP0/CPU0:router(config-t3)# end or RP/0/RP0/CPU0:router(config-t3)# commit	Saves configuration changes. • When you issue the **end** command, the system prompts you to commit changes: Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode. - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes. - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes. • Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.
Step 7	**exit** **Example:**	Exits T3/E3 or T1 controller configuration mode.

Command or Action	Purpose
`RP/0/RP0/CPU0:router(config-t3)# exit`	
Step 8 **exit** **Example:** `RP/0/RP0/CPU0:router(config)# exit`	Exits global configuration mode.

Step 9   **bert [t3 | e3]** *interface-path-id* [**channel-group** *channel-group-number]* [**error**] **start**
 	
Example:
 	
`RP/0/RP0/CPU0:router# bert t3 0/3/0/0 start`
`RP/0/RP0/CPU0:router# bert t3 0/3/0/0 error`
	Starts the configured BERT test on the specified T3/E3 or T1 controller.
	
	Note • You can include the optional **error** keyword to inject errors into the running BERT stream.

Step 10 **bert [t3 | e3]** *interface-path-id* [**channel-group** *channel-group-number]* **stop** **Example:** `RP/0/RP0/CPU0:router# bert t3 0/3/0/0 stop`	Stops the configured BERT test on the specified T3/E3 or T1 controller.
Step 11 **show controllers** [**t3 | e3**] *interface-path-id* **Example:** `RP/0/RP0/CPU0:router# show controllers t3 0/3/0/0`	Displays the results of the configured BERT. Configure the serial interfaces that are associate with the controllers you tested, as described in the Configuring Serial Interfaces on the Cisco ASR 9000 Series Router module.

What to do next

Configure the serial interfaces that are associate with the controllers you tested, as described in the *Configuring Serial Interfaces on the Cisco ASR 9000 Series Router* module.

Configuration Examples

This section contains the following examples:

Configuring a Clear Channel T3 Controller: Example

The following example shows configuration for a clear channel T3 controller:

```
RP/0/RP0/CPU0:router# configure
RP/0/RP0/CPU0:router(config)#controller T3 0/3/2/0
RP/0/RP0/CPU0:router(config-t3)#clock source internal
RP/0/RP0/CPU0:router(config-t3)#mode serial
RP/0/RP0/CPU0:router(config-t3)#cablelength 4
RP/0/RP0/CPU0:router(config-t3)#framing c-bit
RP/0/RP0/CPU0:router(config-t3)#commit
```

Configuring BERT on a T3 Controller: Example

The following example shows how to configure a BERT on a T3 controller, and then display the results of the BERT:

```
RP/0/RP0/CPU0:router# config
RP/0/RP0/CPU0:router(config)# controller t3 0/3/0/1
RP/0/RP0/CPU0:router(config-t3)# bert pattern 0s

Run bert from exec mode for the bert config to take effect

RP/0/RP0/CPU0:router(config-t3)#exit
RP/0/RP0/CPU0:router(config)# exit

Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]
RP/0/RP0/CPU0:router# bert t3 0/3/0/1 start


RP/0/RP0/CPU0:router# bert t3 0/3/0/1 stop


RP/0/RP0/CPU0:router# show controllers t3 0/3/0/1

  T30/3/0/1 is up
  No alarms detected.
  MDL transmission is disabled
    EIC: , LIC: , FIC: , UNIT:
     Path FI:
     Idle Signal PORT_NO:
     Test Signal GEN_NO:
  FEAC code received: No code is being received
  Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Internal
  Data in current interval (108 seconds elapsed):
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Data in Interval 1:
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Data in Interval 2:
     0 Line Code Violations, 0 P-bit Coding Violation
     0 C-bit Coding Violation, 0 P-bit Err Secs
     0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
     0 Unavailable Secs, 0 Line Errored Secs
     0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Data in Interval 3:
     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
```