



# Configuring Clear Channel T3/E3 Controllers and Channelized T3 Controllers on Cisco IOS XR Software

This module describes the configuration of clear channel T3/E3 controllers and channelized T3 controllers on routers supporting Cisco IOS XR software. 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 3.3.0 | <p>This feature was introduced on the Cisco XR 12000 Series Router.</p> <p>Support was added on the Cisco XR 12000 Series Router for the following SIPS:</p> <ul style="list-style-type: none"><li>• Cisco XR 12000 SIP-401</li><li>• Cisco XR 12000 SIP-501</li><li>• Cisco XR 12000 SIP-601</li></ul> <p>Support was added on the Cisco XR 12000 Series Router for the following SPAs:</p> <ul style="list-style-type: none"><li>• 2-Port and 4-Port Channelized T3 SPA</li><li>• 2-Port Clear Channel T3/E3 SPA</li></ul> |
| Release 3.4.0 | No modifications.  |
| Release 3.4.1 | This feature was introduced on the Cisco CRS-1 for the 4-Port Clear Channel T3/E3 SPA.   |

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## Prerequisites for Configuring T3/E3 Controllers

Before configuring T3/E3 controllers, be sure that the following tasks and conditions are met:

- You must be in a user group associated with a task group that includes the proper task IDs for T3/E3 commands. Task IDs for commands are listed in *Cisco IOS XR Interface and Hardware Component Command Reference*.
- If you are configuring a channelized T3 controller, you must be in a user group associated with a task group that includes the proper task IDs for T1/E1 commands. Task IDs for commands are listed in *Cisco IOS XR Interface and Hardware Component Command Reference*.
- Your hardware must support T3/E3 controllers and serial interfaces. The following hardware supports T3/E3 controllers and serial interfaces in Cisco IOS XR Software Release 3.3:
  - 2-Port and 4-Port Clear Channel T3/E3 SPAs
  - 2-Port and 4-Port Channelized T3 SPAs

**Note**

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The 2-Port and 4-Port Channelized T3 SPAs can run in clear channel mode, or they can be channelized into 28 T1 or 21 E1 controllers.

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## 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. The 2-Port and 4-Port Channelized T3 SPAs supports clear channel services and channelized serial lines.

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.

**Note**

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In this release, only T3-to-T1/E1 channelization is supported.

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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 34010 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.

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

- Step 1** Configure the T3 controller, and set the mode for that controller to T1 or E1.
- Step 2** Configure the T1 or E1 controller.
- Step 3** Create channel groups and assign DS0 time slots to these channel groups as desired.
- Step 4** Configure the serial interfaces that are associated with the individual channel groups, as described in the *Configuring Serial Interfaces on Cisco IOS XR Software* module later in this document.

## Default Configuration Values for T3 and E3 Controllers

Table 3 describes the default configuration parameters that are present on the T3 and E3 controllers.

**Table 3** T3 and E3 Controller Default Configuration Values

| Parameter  | Default Value                                   | Configuration File Entry  |
|--|---|---|
| Frame type for the data line                       | For T3: C-bit framing<br>For E3: G.751          | <b>framing</b> {c-bit   m23}  |
| Clocking for individual T3/E3 links                | <b>internal</b>                                 | <b>clock source</b> {internal   line}                                     |
| Cable length                                       | 224 feet  | <b>cablelength</b> feet   |
| Maintenance data link (MDL) messages<br>(T1 only)  | <b>disable</b>                                  | <b>mdl transmit</b> {idle-signal   path   test-signal} {enable   disable} |
| National reserved bits for an E3 port<br>(E3 only) | <b>enable</b> , and the bit pattern value is 1. | <b>national bits</b> {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.

## Default Configuration Values for T1 Controllers

Table 4 describes the default configuration parameters that are present on the T1 controllers.

**Table 4** T1 Controller Default Configuration Values

| Parameter  | Default Value   | Configuration File Entry                                  |
|--|---|---|
| Frame type for the data line   | Extended superframe (esf)                                   | <b>framing {sf   esf}</b>                                 |
| Detection and generation of T1 yellow alarms.  | Yellow alarms are detected and generated on the T1 channel. | <b>yellow {detection   generation} {disable   enable}</b> |
| Clocking for individual T1 links   | <b>internal</b>   | <b>clock source {internal   line}</b>                     |
| Transmission of ANSI T1.403 once-per-second remote performance reports through Facility Data Link (FDL) for a T1 channel | <b>enable</b>   | <b>fdl ansi {enable   disable}</b>                        |



### 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.

## Default Configuration Values for E1 Controllers

Table 5 describes the default configuration parameters that are present on the E1 controllers.

**Table 5** E1 Controller Default Configuration Values

| Parameter                             | Default Value  | Configuration File Entry                 |
|---------------------------------------|--|--|
| Frame type for the data line          | Framing with CRC-4 error monitoring capabilities (crc).    | <b>framing {crc   no-crc   unframed}</b> |
| Clocking for individual T1 links      | internal   | <b>clock source {internal   line}</b>    |
| National reserved bits for an E1 port | 0 (which corresponds to <i>0x1f</i> in hexadecimal format) | <b>national bits bits</b>                |



### 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 and Channelized T1/E1 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 for the Clear Channel SPAs, page 37](#)
- [Configuring a Clear Channel T3 Controller, page 38](#)
- [Configuring a Clear Channel E3 Controller, page 41](#)
- [Configuring a Channelized T3-to-T1 Controller, page 44](#)
- [Configuring a Channelized T3-to-E1 Controller, page 50](#)
- [Configuring BERT, page 56](#)

## Setting the Card Type for the Clear Channel SPAs

By default, the 2-Port and 4-Port Clear Channel T3/E3 SPAs boot in T3 mode. If you want to use the card in E3 mode you must set the card type to be E3, as described in this procedure that follows.

**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**

You must set the card type on the 2-Port and 4-Port Clear Channel T3/E3 SPA only; the 2-Port and 4-Port Channelized T3 SPA runs in T3 mode only.

## Prerequisites

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 [t3|e3]** 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 {t3 | e3}**
3. **end**  
or  
**commit**

## DETAILED STEPS

|        | Command or Action   | Purpose   |
|--------|---|---|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure  | Enters global configuration mode.   |
| Step 2 | <b>hw-module subslot <i>subslot-id</i> cardtype {t3   e3}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# hw-module subslot 0/1/0 cardtype e3 | Sets the serial mode for the SPA. <ul style="list-style-type: none"> <li>• <b>t3</b>—Specifies T3 connectivity of 44,210 kbps through the network, using B3ZS coding. This is the default setting.</li> <li>• <b>e3</b>—Specifies a wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 34,010 kbps.</li> </ul>   |
| Step 3 | <b>end</b><br>or<br><b>commit</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# end<br>or<br>RP/0/0/CPU0:router(config)# commit                 | Saves configuration changes. <ul style="list-style-type: none"> <li>• When you issue the <b>end</b> command, the system prompts you to commit changes:<br/><br/>Uncommitted changes found, commit them before exiting (yes/no/cancel)?<br/>[cancel]: <ul style="list-style-type: none"> <li>– Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>– Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>– Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>• Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## Configuring a Clear Channel T3 Controller

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

The T3 controllers are configured using the T3 configuration mode.

**Note**

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

## Prerequisites

You must first use the **hw-module subslot cardtype** command to set the card to support T3.

**Note**

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

## Restrictions

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

## SUMMARY STEPS

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

## DETAILED STEPS

|        | Command or Action   | Purpose   |
|--------|---|---|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure  | Enters global configuration mode.   |
| Step 2 | <b>controller t3</b> <i>instance</i><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t3<br>0/1/0/0 | Specifies the T3 controller name in the <i>rack/slot/module/port</i> notation and enters T3 configuration mode. |

|        | Command or Action  | Purpose   |
|--------|--|---|
| Step 3 | <p><code>mode serial</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# mode serial</p>  | <p>Configures the mode of the port to be clear channel serial.</p> <p><b>Note</b> 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.</p>   |
| Step 4 | <p><code>clock source {internal   line}</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# clock source internal</p>   | <p>(Optional) Configure the clocking for individual T3 links.</p> <p><b>Note</b> The default clock source is <b>internal</b>.</p> <p><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b>, and the other end to be <b>line</b>. If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up.</p> |
| Step 5 | <p><code>cablelength feet</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# cablelength 250</p>   | <p>(Optional) Specifies the distance of the cable from the router to the network equipment.</p> <p><b>Note</b> The default cable length is 224 feet.</p>  |
| Step 6 | <p><code>framing {c-bit   m23}</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# framing c-bit</p>  | <p>(Optional) Selects the frame type for the T3 line. Possible T3 frame types are C-bit and M23.</p> <p><b>Note</b> The default frame type for T3 is C-bit.</p>   |
| Step 7 | <p><code>mdl transmit {idle-signal   path   test-signal} {enable   disable}</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3e3)# mdl transmit path enable</p>                    | <p>(Optional) Enables Maintenance Data Link (MDL) messages.</p> <p><b>Note</b> MDL messages are supported only when the T3 framing is C-bit parity.</p> <p><b>Note</b> MDL messages are disabled by default.</p>  |
| Step 8 | <p><code>mdl string {eic   fi   fic   gen-number   lic   port-number   unit} string</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3e3)# mdl fi facility identification code</p> | <p>(Optional) Specifies the values of the strings sent in the MDL messages.</p>   |
| Step 9 | <p><code>no shutdown</code></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# no shutdown</p>  | <p>Removes the shutdown configuration.</p> <ul style="list-style-type: none"> <li>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.</li> </ul>  |

|         | Command or Action  | Purpose  |
|---------|--|--|
| Step 10 | <pre>end or commit</pre> <p><b>Example:</b></p> <pre>RP/0/0/CPU0:router(config-t3)# end or RP/0/0/CPU0:router(config-t3)# commit</pre> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 11 | <pre>show controllers t3 instance</pre> <p><b>Example:</b></p> <pre>RP/0/0/CPU0:router# show controllers t3 0/1/0/0</pre>              | (Optional) Displays information about the T3 controllers.  |

## What to Do Next

- 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 Cisco IOS XR Software](#) module later in this document.

## Configuring a Clear Channel E3 Controller

When an E3 controller is in clear channel mode, it carries a single serial interface.

The E3 controllers are configured using the E3 configuration mode.



### Note

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

## Prerequisites

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

**Note**

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

**SUMMARY STEPS**

1. **configure**
2. **controller e3** *instance*
3. **mode serial**
4. **clock source** { **internal** | **line** }
5. **cablelength** *feet*
6. **framing** { **g751** | **g832** }
7. **national bits** { **disable** | **enable** }
8. **no shutdown**
9. **end**  
or  
**commit**
10. **show controllers t3** *instance*

**DETAILED STEPS**

|               | <b>Command or Action</b>  | <b>Purpose</b>   |
|---------------|---|--|
| <b>Step 1</b> | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure  | Enters global configuration mode.  |
| <b>Step 2</b> | <b>controller e3</b> <i>instance</i><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t3<br>0/1/0/0                     | Specifies the E3 controller name in the notation <i>rack/slot/module/port</i> and enters E3 configuration mode.  |
| <b>Step 3</b> | <b>mode serial</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-e3)# mode serial   | Configures the mode of the port to be clear channel serial.<br><b>Note</b> 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.   |
| <b>Step 4</b> | <b>clock source</b> { <b>internal</b>   <b>line</b> }<br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-e3)# clock source<br>internal | (Optional) Sets the clocking for individual E3 links.<br><b>Note</b> The default clock source is <b>internal</b> .<br><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b> , and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |

|         | Command or Action  | Purpose   |
|---------|--|---|
| Step 5  | <p><b>cablelength</b> <i>feet</i></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-e3)# cablelength 250</p>   | <p>(Optional) Specifies the distance of the cable from the router to the network equipment.</p> <p><b>Note</b> The default cable length is 224 feet.</p>  |
| Step 6  | <p><b>framing</b> {<b>g751</b>   <b>g832</b>}</p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-e3)# framing g832</p>  | <p>(Optional) Selects the frame type for the E3 port. Possible E3 frame types are G.751 and G.832.</p> <p><b>Note</b> The default framing for E3 is G.751.</p>  |
| Step 7  | <p><b>national bits</b> {<b>disable</b>   <b>enable</b>}</p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-e3)# national bits enable</p>   | <p>(Optional) Enables or disables the 0x1F national reserved bit pattern on the E3 port.</p> <p><b>Note</b> The E3 national bit is enabled by default, and the bit pattern value is 1.</p>  |
| Step 8  | <p><b>no shutdown</b></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-e3)# no shutdown</p>   | <p>Removes the shutdown configuration.</p> <ul style="list-style-type: none"> <li>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.</li> </ul>  |
| Step 9  | <p><b>end</b><br/>                     OR<br/> <b>commit</b></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-e3)# end<br/>                     OR<br/>                     RP/0/0/CPU0:router(config-e3)# commit</p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/>                     Uncommitted changes found, commit them before exiting (yes/no/cancel)?<br/>                     [cancel]:                     <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 10 | <p><b>show controllers e3</b> <i>instance</i></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router# show controllers e3 0/1/0/0</p>  | <p>(Optional) Displays information about the E3 controllers.</p>  |

## What to Do Next

- 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 Cisco IOS XR Software](#) module later in this document.

## Configuring a Channelized T3-to-T1 Controller

The 2-Port and 4-Port Channelized T3 SPAs support channelization to T1 and DS0.



### Note

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

### SUMMARY STEPS

1. **configure**
2. **controller t3** *instance*
3. **mode t1**
4. **clock source** {**internal** | **line**}
5. **cablelength** *feet*
6. **framing** {**c-bit** | **m23**}
7. **mdl transmit** {**idle-signal** | **path** | **test-signal**} {**enable** | **disable**}
8. **mdl string** {**eic** | **fi** | **fic** | **gen-number** | **lic** | **port-number** | **unit**} *string*
9. **no shutdown**
10. **end**  
or  
**commit**
11. **exit**
12. **exit**
13. **show controllers t1** *instance*
14. **configure**
15. **controller t1** *instance*
16. **framing** {**sf** | **esf**}
17. **yellow** {**detection** | **generation**} {**disable** | **enable**}
18. **clock source** {**internal** | **line**}
19. **fdl ansi** {**enable** | **disable**}
20. **no shutdown**
21. **channel-group** *channel-group-number*
22. **timeslots** *range*
23. **speed** *kbps*
24. **exit**
25. Repeat Step 21 through Step 24 to assign time slots to a channel group. Each controller can contain up to 24 time slots.

- 26. **exit**
- 27. Repeat Step 14 through Step 26 to assign more channel groups to a controller.
- 28. **end**  
or  
**commit**

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure   | Enters global configuration mode.  |
| Step 2 | <b>controller T3 instance</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t3<br>0/1/0/0   | Specifies the T3 controller name in the notation <i>rack/slot/module/port</i> and enters T3 configuration mode.  |
| Step 3 | <b>mode t1</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# mode t1  | Sets the mode of the channelized controllers to be T1, and creates 28 T1 controllers.  |
| Step 4 | <b>clock source {internal   line}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# clock source<br>internal  | (Optional) Sets the clocking for the T3 port.<br><b>Note</b> The default clock source is <b>internal</b> .<br><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b> , and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |
| Step 5 | <b>cablelength feet</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# cablelength 250   | (Optional) Specifies the distance of the cable from the router to the network equipment.<br><b>Note</b> The default cable length is 224 feet.  |
| Step 6 | <b>framing {c-bit   m23}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# framing c-bit  | (Optional) Selects the frame type for the T3 port.<br><b>Note</b> The default frame type for T3 is C-bit.  |
| Step 7 | <b>mdl transmit {idle-signal   path   test-signal} {enable   disable}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# mdl transmit<br>path enable | (Optional) Enables Maintenance Data Link (MDL) messages on the T3 port.<br><b>Note</b> MDL messages are supported only when the T3 framing is C-bit parity.<br><b>Note</b> MDL message are disabled by default.  |

|         | Command or Action   | Purpose   |
|---------|---|---|
| Step 8  | <pre>mdl string {eic   fi   fic   gen-number   lic   port-number   unit} string</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# mdl fi facility<br/>identification code</p> | (Optional) Specifies the values of the strings sent in the MDL messages.  |
| Step 9  | <pre>no shutdown</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# no shutdown</p>  | <p>Removes the shutdown configuration.</p> <ul style="list-style-type: none"> <li>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.</li> </ul>  |
| Step 10 | <pre>end OR commit</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# end<br/>OR<br/>RP/0/0/CPU0:router(config-t3)# commit</p>   | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 11 | <pre>exit</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-t3)# exit</p>  | Exits T3 configuration mode.  |
| Step 12 | <pre>exit</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config)# exit</p>   | Exits global configuration mode.  |
| Step 13 | <pre>show controllers t1 instance</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router# show controllers t3 0/1/0/0</p>  | (Optional) Displays information about the T1 controllers you created in Step 3.   |
| Step 14 | <pre>configure</pre> <p><b>Example:</b><br/>RP/0/0/CPU0:router# configure</p>   | Enters global configuration mode.   |

|         | Command or Action   | Purpose  |
|---------|---|--|
| Step 15 | <code>controller t1 instance</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t1<br>0/3/0/0/0                                  | Enters T1 configuration mode.  |
| Step 16 | <code>framing {sf   esf}</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1)# framing esf  | (Optional) Selects the frame type for the T1 data line: <ul style="list-style-type: none"> <li>• <b>sf</b>—Superframe</li> <li>• <b>esf</b>—Extended super frame</li> </ul> <b>Note</b> The default frame type for T1 is Extended superframe ( <b>esf</b> ).   |
| Step 17 | <code>yellow {detection   generation} {disable   enable}</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1e1)# yellow<br>detection enable | (Optional) Enables or disables the detection and generation of T1 yellow alarms.<br><br><b>Note</b> Yellow alarms are detected and generated on the T1 channel by default.   |
| Step 18 | <code>clock source {internal   line}</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1e1)# clock source<br>internal                       | (Optional) Sets the clocking for individual T1 links.<br><br><b>Note</b> The default clock source is <b>internal</b> .<br><br><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b> , and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |
| Step 19 | <code>fdl ansi {enable   disable}</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1e1)# fdl ansi<br>enable                                | (Optional) Enables the transmission of ANSI T1.403 once-per-second remote performance reports through Facility Data Link (FDL).<br><br><b>Note</b> FDL ansi is enabled by default.   |
| Step 20 | <code>no shutdown</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1e1)# no shutdown   | Removes the shutdown configuration. <ul style="list-style-type: none"> <li>• 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.</li> </ul>  |
| Step 21 | <code>channel-group channel-group-number</code><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t1)# channel-group 0                              | Creates a T1 channel group and enters channel group configuration mode for that channel group.   |

|         | Command or Action  | Purpose  |
|---------|--|--|
| Step 22 | <p><b>timeslots</b> <i>range</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> timeslots 7-12</p>  | <p>Associates one or more DS0 time slots to a channel group and creates an associated serial subinterface on that channel group.</p> <ul style="list-style-type: none"> <li>• Range is from 1 to 24 time slots.</li> <li>• You can assign all 24 time slots to a single channel group, or you can divide the time slots among several channel groups.</li> </ul> <p><b>Note</b> Each individual T1 controller supports a total of 24 DS0 time slots.</p> |
| Step 23 | <p><b>speed</b> <i>kbps</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1e1-channel_group)#<br/> speed 64</p>   | <p>(Optional) Specifies the speed of the DS0s in kilobits per second. Valid values are 56 and 64.</p> <p><b>Note</b> The default speed is 64 kbps.</p>   |
| Step 24 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> exit</p>  | <p>Exits channel group configuration mode.</p>   |
| Step 25 | <p><b>channel-group</b> <i>channel-group-number</i><br/> <b>timeslots</b> <i>range</i><br/> <b>speed</b> <i>kbps</i><br/> <b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1)# channel-group 2<br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> timeslots 13-18<br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> exit<br/> RP/0/0/CPU0:router(config-t1)# channel-group 3<br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> timeslots 19-24<br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> exit</p> | <p>Repeat Step 21 through Step 24 to create new channel groups and assign DS0 time slots to them.</p>  |
| Step 26 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1)#</p>  | <p>Exits T1 configuration mode and enters global configuration mode.</p>   |

|                | Command or Action  | Purpose   |
|----------------|--|---|
| <b>Step 27</b> | <pre> <b>configure</b> <b>controller t1</b> <i>instance</i> <b>framing</b> {<i>sf</i>   <b>esf</b>} <b>yellow</b> {<i>detection</i>   <b>generation</b>} {<i>disable</i>   <b>enable</b>} <b>clock source</b> {<i>internal</i>   <b>line</b>} <b>fdl ansi</b> {<i>enable</i>   <b>disable</b>} <b>no shutdown</b> <b>channel-group</b> <i>channel-group-number</i> <b>timeslots</b> <i>range</i> <b>speed</b> <i>kbps</i> <b>exit</b> <b>exit</b>  <b>Example:</b> RP/0/0/CPU0:router(config)# controller t1 0/3/0/0/2 RP/0/0/CPU0:router(config-t1)# channel-group 0 RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1-12 RP/0/0/CPU0:router(config-t1-channel_group)# exit RP/0/0/CPU0:router(config-t1)# channel-group 1 RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 13-24 RP/0/0/CPU0:router(config-t1-channel_group)# exit RP/0/0/CPU0:router(config-t1)# exit </pre> | <p>Repeat Step 14 through Step 26 to configure additional T1 controllers as desired.</p>  |
| <b>Step 28</b> | <pre> <b>end</b> OR <b>commit</b>  <b>Example:</b> RP/0/0/CPU0:router(config-t3)# end OR RP/0/0/CPU0:router(config-t3)# commit </pre>  | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes: <pre> Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]: </pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## What to Do Next

- 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 Cisco IOS XR Software](#) module later in this document.

## Configuring a Channelized T3-to-E1 Controller

The 2-Port and 4-Port Channelized T3 SPAs support channelization to E1 and DS0.



### Note

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

## SUMMARY STEPS

1. **configure**
2. **controller t3** *instance*
3. **mode e1**
4. **clock source** {**internal** | **line**}
5. **cablelength** *feet*
6. **framing** {**c-bit** | **m23**}
7. **no shutdown**
8. **end**  
or  
**commit**
9. **exit**
10. **exit**
11. **show controllers e1** *instance*
12. **configure**
13. **controller e1** *instance*
14. **clock source** {**internal** | **line**}
15. **framing** {**crc** | **no-crc** | **unframed**}
16. **national bits** *bits*
17. **no shutdown**
18. **channel-group** *channel-group-number*
19. **timeslots** *range*
20. **speed** *kbps*
21. **exit**
22. Repeat Step 18 through Step 21 to assign time slots to a channel group. Each controller can contain up to 24 time slots.

- 23. **exit**
- 24. Repeat Step 12 through Step 21 to assign a channel group to a controller.
- 25. **end**  
or  
**commit**

|        | Command or Action   | Purpose  |
|--------|---|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure  | Enters global configuration mode.  |
| Step 2 | <b>controller t3 instance</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t3<br>0/1/0/0            | Specifies the T3 controller name in the notation <i>rack/slot/module/port</i> and enters T3 configuration mode.  |
| Step 3 | <b>mode e1</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# mode t1   | Sets the mode of the channelized controllers to be E1, and creates 21 E1 controllers.  |
| Step 4 | <b>clock source {internal   line}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# clock source<br>internal | (Optional) Sets the clocking for individual E3 links.<br><b>Note</b> The default clock source is <b>internal</b> .<br><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b> , and the other end to be <b>line</b> . If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up. |
| Step 5 | <b>cablelength feet</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# cablelength 250                        | (Optional) Specifies the distance of the cable from the router to the network equipment.<br><b>Note</b> The default cable length is 224 feet.  |
| Step 6 | <b>framing {c-bit   m23}</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# framing c-bit                     | (Optional) Selects the frame type for the T3 port.<br><b>Note</b> The default frame type for T3 is C-bit.  |
| Step 7 | <b>no shutdown</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config-t3)# no shutdown                                 | Removes the shutdown configuration.<br><ul style="list-style-type: none"><li>• 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.</li></ul>   |

|         | Command or Action   | Purpose  |
|---------|---|--|
| Step 8  | <pre>end OR commit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t3)# end<br/> OR<br/> RP/0/0/CPU0:router(config-t3)# commit </p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/> <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 9  | <pre>exit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-e3)# exit </p>  | Exits E3 configuration mode and enters global configuration mode.  |
| Step 10 | <pre>exit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config)# exit </p>   | Exits global configuration mode and enters EXEC mode.  |
| Step 11 | <pre>show controllers e1 instance</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router# show controllers e1 0/1/0/0 </p>                        | (Optional) Displays information about the E1 controllers.  |
| Step 12 | <pre>configure</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router# configure </p>   | Enters global configuration mode.  |
| Step 13 | <pre>controller e1 instance</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config)# controller e1<br/> 0/3/0/0/0 </p>                     | Enters E1 configuration mode.  |

|         | Command or Action   | Purpose  |
|---------|---|--|
| Step 14 | <p><b>clock source</b> {<b>internal</b>   <b>line</b>}</p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1)# clock source internal</p>      | <p>(Optional) Sets the clocking for individual E1 links.</p> <p><b>Note</b> The default clock source is <b>internal</b>.</p> <p><b>Note</b> When configuring clocking on a serial link, you must configure one end to be <b>internal</b>, and the other end to be <b>line</b>. If you configure <b>internal</b> clocking on both ends of a connection, framing slips occur. If you configure <b>line</b> clocking on both ends of a connection, the line does not come up.</p> |
| Step 15 | <p><b>framing</b> {<b>crc</b>   <b>no-crc</b>   <b>unframed</b>}</p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1)# framing unframed</p> | <p>(Optional) Selects the frame type for the E1 data line. The following frame types are valid for E1:</p> <ul style="list-style-type: none"> <li>• <b>crc</b>—framing with CRC-4 error monitoring capabilities</li> <li>• <b>no-crc</b>—framing without CRC</li> <li>• <b>unframed</b>—unframed E1</li> </ul> <p><b>Note</b> The default frame type for E1 is <b>crc</b>.</p>   |
| Step 16 | <p><b>national bits</b> <i>bits</i></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1)# national bits 10</p>                              | <p>(Optional) Specifies the national reserved bits for an E1 port. Range is from 0 to 31.</p> <p><b>Note</b> The default bit pattern is 0, which corresponds to the hexadecimal value <i>0x1f</i>.</p>   |
| Step 17 | <p><b>no shutdown</b></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1)# no shutdown</p>   | <p>Removes the shutdown configuration.</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>   |
| Step 18 | <p><b>channel-group</b> <i>channel-group-number</i></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1)# channel-group 0</p>               | <p>Creates an E1 channel group and enters channel group configuration mode for that channel group.</p>   |
| Step 19 | <p><b>timeslots</b> <i>range</i></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1-channel_group)# timeslots 1-16</p>                     | <p>Associates one or more time slots to a channel group and creates an associated serial subinterface on that channel group.</p> <ul style="list-style-type: none"> <li>• Range is from 1 to 31 time slots.</li> <li>• You can assign all 31 time slots to a single channel group, or you can divide the time slots among several channel groups.</li> </ul> <p><b>Note</b> Each E1 controller supports a total of 31 DS0 time slots.</p>                                      |
| Step 20 | <p><b>speed</b> <i>kbps</i></p> <p><b>Example:</b><br/>RP/0/0/CPU0:router(config-e1-channel_group)# speed 100</p>                               | <p>(Optional) Specifies the speed of the DS0s in kilobits per second. Valid values are 56 and 64.</p> <p><b>Note</b> The default speed is 64 kbps.</p>   |

|         | Command or Action   | Purpose  |
|---------|---|--|
| Step 21 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-e1-channel_group)#<br/> exit</p>   | Exits channel group configuration mode   |
| Step 22 | <p><b>channel-group</b> <i>channel-group-number</i><br/> <b>timeslots</b> <i>range</i><br/> <b>speed</b> <i>kbps</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-e1)# channel-group 1<br/> RP/0/0/CPU0:router(config-e1-channel_group)#<br/> timeslots 17-31<br/> RP/0/0/CPU0:router(config-e1-channel_group)#<br/> speed 100<br/> RP/0/0/CPU0:router(config-e1-channel_group)#<br/> exit</p> | Repeat Step 18 through Step 21 to create new channel groups and assign DS0 time slots to them. |
| Step 23 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-e1)# exit</p>  | Exits E1 configuration mode  |

|                       | Command or Action  | Purpose  |
|-----------------------|--|--|
| <p><b>Step 24</b></p> | <pre> <b>configure</b> <b>controller e1</b> <i>instance</i> <b>framing</b> {<b>crc</b>   <b>no-crc</b>   <b>unframed</b>} <b>clock source</b> {<b>internal</b>   <b>line</b>} <b>national bits</b> <i>bits</i> <b>no shutdown</b> <b>channel-group</b> <i>channel-group-number</i> <b>timeslots</b> <i>range</i> <b>speed</b> <i>kbps</i>  <b>Example:</b> RP/0/0/CPU0:router# configure RP/0/0/CPU0:router(config)# controller e1 0/3/0/0/0 RP/0/0/CPU0:router(config-e1)# framing unframed RP/0/0/CPU0:router(config-e1)# clock source internal RP/0/0/CPU0:router(config-e1)# national bits 10 RP/0/0/CPU0:router(config-e1)# no shutdown RP/0/0/CPU0:router(config-e1)# channel-group 1 RP/0/0/CPU0:router(config-e1-channel_group)# timeslots 17-31 RP/0/0/CPU0:router(config-e1-channel_group)# speed 100 RP/0/0/CPU0:router(config-e1-channel_group)# exit                     </pre> | <p>Repeat Step 12 through Step 23 to configure additional E1 controllers as desired.</p>   |
| <p><b>Step 25</b></p> | <pre> <b>end</b> or <b>commit</b>  <b>Example:</b> RP/0/0/CPU0:router(config-e3)# end or RP/0/0/CPU0:router(config-e3)# commit                     </pre>  | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>• When you issue the <b>end</b> command, the system prompts you to commit changes:                     <pre> Uncommitted changes found, commit them before exiting (yes/no/cancel)? [cancel]:                     </pre> <ul style="list-style-type: none"> <li>– Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>– Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>– Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>• Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |

## What to Do Next

- 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 Cisco IOS XR Software](#) module later in this document.

## Configuring BERT

Bit error rate testing (BERT) is supported on each of the T3/E3 or T1/E1 controllers, and on the DS0 channel groups. It is done only over an unframed T3/E3 or T1/E1 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 t1** or **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 and T1/E1 Controllers

This task explains how to enable a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line or an individual channel group.

## Prerequisites

You must have configured a clear channel T3/E3 controller, or a channelized T3-to-T1/E1 controller.

## SUMMARY STEPS

1. **configure**
2. **controller** [**t3** | **e3** | **t1** | **e1**] *instance*
3. **bert pattern** *pattern*
4. **bert interval** *time*
5. **bert error** [*number*]
6. **end**  
or  
**commit**
7. **exit**

8. `exit`
9. `bert [t3 | e3 | t1 | e1] instance [channel-group channel-group-number] [error] start`
10. `bert [t3 | e3 | t1 | e1] instance [channel-group channel-group-number] stop`
11. `show controllers [t3 | e3 | t1 | e1] instance`

**DETAILED STEPS**

|               | <b>Command or Action</b>   | <b>Purpose</b>  |
|---------------|--|---|
| <b>Step 1</b> | <p><code>configure</code></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router# configure</p>  | Enters global configuration mode.   |
| <b>Step 2</b> | <p><code>controller [t3   e3   t1   e1] instance</code></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config)# controller t3<br/>                     0/1/0/0</p> | Specifies the controller name and instance in the notation <i>rack/slot/module/port</i> , and enters T3, E3, T1, or E1 controller configuration mode.   |
| <b>Step 3</b> | <p><code>bert pattern pattern</code></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-t3)# bert pattern<br/>                     2^15</p>                     | <p>Enables a specific bit error rate test (BERT) pattern on a controller. Valid patterns include: <b>0s</b>, <b>1s</b>, <b>2^15</b>, <b>2^20</b>, <b>2^20-QRSS</b>, <b>2^23</b>, <b>alt-0-1</b>, and <b>none</b>.</p> <p><b>Note</b> You must use the <b>bert</b> command in EXEC mode to start the BER test.</p> |
| <b>Step 4</b> | <p><code>bert interval time</code></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-t3)# bert pattern<br/>                     2^15</p>                       | (Optional) Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line. The interval can be a value from 1 to 14400.  |
| <b>Step 5</b> | <p><code>bert error [number]</code></p> <p><b>Example:</b><br/>                     RP/0/0/CPU0:router(config-t3)# bert error 10</p>   | Specifies the number of BERT errors to introduce into the bit stream. Range is from 1 to 255.   |

|         | Command or Action   | Purpose  |
|---------|---|--|
| Step 6  | <pre>end OR commit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t3)# end<br/> OR<br/> RP/0/0/CPU0:router(config-t3)# commit</p>                                  | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/> <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 7  | <pre>exit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t3)# exit</p>   | Exits T3/E3 or T1/E1 controller configuration mode.  |
| Step 8  | <pre>exit</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config)# exit</p>  | Exits global configuration mode.   |
| Step 9  | <pre>bert [t3   e3   t1   e1] instance [channel-group channel-group-number] [error] start</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router# bert t3 0/3/0/0 error start</p> | <p>Starts the configured BERT test on the specified T3/E3 or T1/E1 controller.</p> <p><b>Note</b> For T3/E3 controllers, you can include the optional <b>error</b> keyword to inject errors into the running BERT stream. The <b>error</b> keyword is not available on T1/E1 interfaces.</p>   |
| Step 10 | <pre>bert [t3   e3   t1   e1] instance [channel-group channel-group-number] stop</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router# bert t3 0/3/0/0 stop</p>                 | Stops the configured BERT test on the specified T3/E3 or T1/E1 controller.   |
| Step 11 | <pre>show controllers [t3   e3   t1   e1] instance</pre> <p><b>Example:</b><br/> RP/0/0/CPU0:router# show controllers t3 0/3/0/0</p>  | Displays the results of the configured BERT.   |

## What to Do Next

Configure the serial interfaces that are associate with the controllers you tested, as described in the *Configuring Serial Interfaces on Cisco IOS XR Software* module later in this document.

## Configuring BERT on a DS0 Channel Group

This task explains how to enable a bit error rate test (BERT) pattern on a an individual DS0 channel group.

## Prerequisites

You must have configured a clear channel T3/E3 controller, or a channelized T3-to-T1/E1 controller.

## SUMMARY STEPS

1. **configure**
2. **controller** [t1| e1] *instance*
3. **channel-group** *channel-group-number*
4. **bert pattern** *pattern*
5. **bert interval** *time*
6. **end**  
or  
**commit**
7. **exit**
8. **exit**
9. **exit**
10. **bert** [t1| e1] *instance start*
11. **bert** [t1| e1] *instance stop*
12. **show controllers** [t1| e1] *instance*

## DETAILED STEPS

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 1 | <b>configure</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# configure   | Enters global configuration mode.  |
| Step 2 | <b>controller</b> [t1   e1] <i>instance</i><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# controller t3<br>0/1/0/0 | Specifies the controller name and instance in the notation <i>rack/slot/module/port</i> , and enters T1 or E1 controller configuration mode. |

|        | Command or Action  | Purpose  |
|--------|--|--|
| Step 3 | <p><b>channel-group</b> <i>channel-group-number</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1)# channel-group 1<br/> RP/0/0/CPU0:router(config-t1-channel_group)#</p>                 | Enters channel group configuration mode for a specific channel group. Replace <i>channel-group-number</i> with the number that identifies the channel group on which you want to configure a BERT.   |
| Step 4 | <p><b>bert pattern</b> <i>pattern</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> bert pattern 2^15</p>  | <p>Enables a specific bit error rate test (BERT) pattern on a T3 line. Valid patterns include: <b>0s</b>, <b>1s</b>, <b>2^15</b>, <b>2^20</b>, <b>2^20-QRSS</b>, <b>2^23</b>, <b>alt-0-1</b>, and <b>none</b>.</p> <p><b>Note</b> You must use the <b>bert</b> command in EXEC mode to start the BER test.</p>   |
| Step 5 | <p><b>bert interval</b> <i>time</i></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> bert pattern 2^15</p>  | (Optional) Specifies the duration of a bit error rate test (BERT) pattern on a T3/E3 or T1/E1 line. The interval can be a value from 1 to 14400.   |
| Step 6 | <p><b>end</b><br/> OR<br/> <b>commit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> end<br/> OR<br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> commit</p> | <p>Saves configuration changes.</p> <ul style="list-style-type: none"> <li>When you issue the <b>end</b> command, the system prompts you to commit changes:<br/> <pre>Uncommitted changes found, commit them before exiting(yes/no/cancel)? [cancel]:</pre> <ul style="list-style-type: none"> <li>Entering <b>yes</b> saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.</li> <li>Entering <b>no</b> exits the configuration session and returns the router to EXEC mode without committing the configuration changes.</li> <li>Entering <b>cancel</b> leaves the router in the current configuration session without exiting or committing the configuration changes.</li> </ul> </li> <li>Use the <b>commit</b> command to save the configuration changes to the running configuration file and remain within the configuration session.</li> </ul> |
| Step 7 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1-channel_group)#<br/> exit</p>  | Exits channel group configuration mode.  |
| Step 8 | <p><b>exit</b></p> <p><b>Example:</b><br/> RP/0/0/CPU0:router(config-t1)# exit</p>   | Exits T1 or E1 configuration mode.   |

|         | Command or Action  | Purpose   |
|---------|--|---|
| Step 9  | <b>exit</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router(config)# exit   | Exits global configuration mode.                                |
| Step 10 | <b>bert [t1   e1] instance channel-group<br/>channel-group-number start</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# bert t1 0/3/0/0/0 error<br>start | Starts the configured BERT test on the specified channel group. |
| Step 11 | <b>bert [t1   e1] instance channel-group<br/>channel-group-number stop</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# bert t1 0/3/0/0/0 stop            | Stops the configured BERT test on the specified channel group.  |
| Step 12 | <b>show controllers [t1   e3] instance</b><br><br><b>Example:</b><br>RP/0/0/CPU0:router# show controllers t3 0/3/0/0                                       | Displays the results of the configured BERT.                    |

## What to Do Next

Configure the serial interfaces that are associate with the controllers you tested, as described in the [Configuring Serial Interfaces on Cisco IOS XR Software](#) module later in this document.

## Examples

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

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

The following example shows how to configure a T3 controller that has been channelized 28 T1 controllers:

```
RP/0/0/CPU0:router# configure
RP/0/0/CPU0:router(config)# controller T3 0/3/0/0
RP/0/0/CPU0:router(config-t3)# mode t1
RP/0/0/CPU0:router(config-t3)# framing m23
RP/0/0/CPU0:router(config-t3)# cablelength 11
RP/0/0/CPU0:router(config-t3)# clock source line
RP/0/0/CPU0:router(config-t3)#commit
RP/0/0/CPU0:router(config-t3)#exit
RP/0/0/CPU0:router(config)# exit
RP/0/0/CPU0:router#show controllers T1 ?
```

```

0/3/0/0/0   T1 Interface Instance
0/3/0/0/1   T1 Interface Instance
0/3/0/0/10  T1 Interface Instance
0/3/0/0/11  T1 Interface Instance
0/3/0/0/12  T1 Interface Instance
0/3/0/0/13  T1 Interface Instance
0/3/0/0/14  T1 Interface Instance
0/3/0/0/15  T1 Interface Instance
0/3/0/0/16  T1 Interface Instance
0/3/0/0/17  T1 Interface Instance
0/3/0/0/18  T1 Interface Instance
0/3/0/0/19  T1 Interface Instance
0/3/0/0/2   T1 Interface Instance
0/3/0/0/20  T1 Interface Instance
0/3/0/0/21  T1 Interface Instance
0/3/0/0/22  T1 Interface Instance
0/3/0/0/23  T1 Interface Instance
0/3/0/0/24  T1 Interface Instance
0/3/0/0/25  T1 Interface Instance
0/3/0/0/26  T1 Interface Instance
0/3/0/0/27  T1 Interface Instance
0/3/0/0/3   T1 Interface Instance
0/3/0/0/4   T1 Interface Instance
0/3/0/0/5   T1 Interface Instance
--More--
RP/0/0/CPU0:router(config)#
RP/0/0/CPU0:router(config)# controller t1 0/3/0/0/0
RP/0/0/CPU0:router(config-t1)# channel-group 0
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1-24
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# exit
RP/0/0/CPU0:router(config)# controller t1 0/3/0/0/1
RP/0/0/CPU0:router(config-t1)# channel-group 0
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1-24
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# exit
RP/0/0/CPU0:router(config)# controller t1 0/3/0/0/2
RP/0/0/CPU0:router(config-t1)# channel-group 0
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1-12
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# channel-group 1
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 13-24
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# exit
RP/0/0/CPU0:router(config)# controller t1 0/3/0/0/3
RP/0/0/CPU0:router(config-t1)# channel-group 0
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 1-6
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# channel-group 1
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 7-12
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# channel-group 2
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 13-18
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1)# channel-group 3
RP/0/0/CPU0:router(config-t1-channel_group)# timeslots 19-24
RP/0/0/CPU0:router(config-t1-channel_group)# exit
RP/0/0/CPU0:router(config-t1-channel_group)#commit

```

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

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

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

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

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

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

RP/0/0/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
```

## Additional References

The following sections provide references related to T3/E3 and T1/E1 controllers.

### Related Documents

| Related Topic  | Document Title  |
|--|---|
| Cisco IOS XR master command reference  | <i>Cisco IOS XR Master Commands List, Release 3.2</i>   |
| Cisco IOS XR interface configuration commands  | <i>Cisco IOS XR Interface and Hardware Component Command Reference</i>  |
| Initial system bootup and configuration information for a router using Cisco IOS XR software   | <i>Cisco IOS XR Getting Started Guide</i>   |
| Cisco IOS XR AAA services configuration information  | <i>Cisco IOS XR System Security Configuration Guide</i> and <i>Cisco IOS XR System Security Command Reference</i> |
| Information about configuring interfaces and other components on the Cisco CRS-1 from a remote Craft Works Interface (CWI) client management application | <i>Cisco CRS-1 Series Carrier Routing System Craft Works Interface Configuration Guide</i>                        |

### Standards

| Standards   | Title |
|---|-------|
| No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature. | —     |

### MIBs

| MIBs | MIBs Link  |
|------|--|
| —    | To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu:<br><a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a> |

## RFCs

| RFCs  | Title |
|---|-------|
| No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature. | —     |

## Technical Assistance

| Description   | Link  |
|---|---|
| The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content. | <a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a> |

■ **Additional References**