

# t1

To create a logical T1 controller from each of the specified time slots of the T3 line, use the **t1** command in controller configuration mode. To delete the defined logical controller, use the **no** form of this command.

**t1** *ds1* **controller**

**no t1** *ds1* **controller**

## Syntax Description

*ds1* Time slot within the T3 line. The valid time-slot range is from 1 to 28.

## Defaults

No default behavior or values.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3AA      | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

The purpose of this command is to convert the collection of the 28 T1 controllers comprising the T3 controller into individual T1 controllers that the system can use. In other words, the Cisco AS5800 access server cannot pass data until a T1 controller is configured (using the **controller** command), and you cannot configure a T1 controller until it has been created using the **t1** command.

## Examples

The following example shows how to configure a logical T1 controller at T1 time slot 1 for the T3 controller located in shelf 1, slot 4, port 0. Note that you have to enter the command from controller configuration mode.

```
Router(config)# controller t3 1/4/0
Router(config-controller)# t1 1 controller
Router(config-controller)# end
```

## Related Commands

| Command              | Description   |
|----------------------|---|
| <b>controller</b>    | Configures a T1 and other types of controller and enters controller configuration mode. |
| <b>controller t3</b> | Configures a T3 controller.   |

# t1 bert

To enable or disable a bit error rate tester (BERT) test pattern for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 bert** command in controller configuration mode. To disable a BERT test pattern, use the **no** form of this command.

```
t1 channel bert pattern {0s | 1s | 2^15 | 2^20 | 2^23} interval minutes [unframed]
```

```
no t1 channel bert pattern {0s | 1s | 2^15 | 2^20 | 2^23} interval minutes [unframed]
```

## Syntax Description

|                         |   |
|-------------------------|---|
| <i>channel</i>          | Number between 1 and 28 that indicates the T1 channel.  |
| <b>pattern</b>          | Specifies the length of the repeating BERT test pattern.  |
| <b>0s</b>               | 0s—Repeating pattern of zeros (...000...).  |
| <b>1s</b>               | 1s—Repeating pattern of ones (...111...).   |
| <b>2^15</b>             | 2 <sup>15</sup> —Pseudorandom repeating pattern that is 32,767 bits in length.                    |
| <b>2^20</b>             | 2 <sup>20</sup> —Pseudorandom repeating pattern that is 1,048,575 bits in length.                 |
| <b>2^23</b>             | 2 <sup>23</sup> —Pseudorandom repeating pattern that is 8,388,607 bits in length.                 |
| <b>interval minutes</b> | Specifies the duration of the BERT test, in minutes. The interval can be a value from 1 to 14400. |
| <b>unframed</b>         | (Optional) Specifies T1 unframed BERT.  |

## Defaults

No BERT test is performed.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2S       | The <b>unframed</b> keyword was added to this command.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

The BERT test patterns from the CT3IP are framed test patterns (that is, the test patterns are inserted into the payload of the framed T1 signal).

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

- Type of test pattern selected
- Status of the test
- Interval selected

- Time remaining on the BERT test
- Total bit errors
- Total bits received

When the T1 channel has a BERT test running, the line state is DOWN. Also, when the BERT test is running and the Status field is Not Sync, the information in the total bit errors field is not valid. When the BERT test is done, the Status field is not relevant.

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

**Note**

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

**Examples**

The following example shows how to run a BERT test pattern of all zeros for 30 minutes on T1 channel 6 on the CT3IP in slot 9:

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

**Related Commands**

| Command                    | Description  |
|----------------------------|--|
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller. |

# t1 clock source

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

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

| Syntax Description | channel         | Number between 1 and 28 that indicates the T1 channel.                 |
|--------------------|-----------------|--|
|                    | <b>internal</b> | Specifies that the internal clock source is used. This is the default. |
|                    | <b>line</b>     | Specifies that the network clock source is used.                       |

**Defaults** Internal

**Command Modes** Controller configuration

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 11.3        | This command was introduced.  |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                 | 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

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

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



**Note**

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

This command does not have a **no** form.

**Examples** The following example shows how to set the clock source to line T1 6 and T1 8 on the CT3IP:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 clock source line
Router(config-controller)# t1 8 clock source line
```

---

**Related Commands**

| <b>Command</b>              | <b>Description</b>  |
|-----------------------------|---|
| <b>clock source (CT3IP)</b> | Specifies where the clock source is obtained for use by the CT3IP in Cisco 7500 series routers. |

---

# t1 external

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

```
t1 external channel [cablelength feet] [linecode [ami | b8zs]]
```

```
no t1 external channel
```

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

## Defaults

No external T1 is specified.  
The default cable length is 133 feet.  
The default line coding is B8ZS.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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

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

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

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

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

**Note**

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

**Note**

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

**Examples**

The following example shows how to configure T1 1 on the CT3IP as an external port using AMI line coding and a cable length of 300 feet:

```
Router(config)# controllers t3 9/0/0
Router(config-controller)# t1 external 1 cablelength 300 linecode ami
```

**Related Commands**

| Command                    | Description  |
|----------------------------|--|
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller. |

# t1 fdl ansi

To enable the 1-second transmission of the remote performance reports via the Facility Data Link (FDL) per ANSI T1.403 for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 fdl ansi** command in controller configuration mode. To disable the performance report, use the **no** form of this command.

**t1 channel fdl ansi**

**no t1 channel fdl ansi**

|                           |                |  |
|---------------------------|----------------|--|
| <b>Syntax Description</b> | <i>channel</i> | Number between 1 and 28 that indicates the T1 channel. |
|---------------------------|----------------|--|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                          |
|----------------------|--------------------------|
| <b>Command Modes</b> | Controller configuration |
|----------------------|--------------------------|

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>   |
|------------------------|----------------|---|
|                        | 11.3           | This command was introduced.  |
|                        | 12.2(33)SRA    | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                        | 12.2SX         | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

|                         |  |
|-------------------------|--|
| <b>Usage Guidelines</b> | The <b>t1 fdl ansi</b> command can be used only if the T1 framing type is Extended Super Frame (ESF). To display the remote performance report information, use the <b>show controllers t3 remote performance</b> command. |
|-------------------------|--|



**Note**

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

|                 |   |
|-----------------|---|
| <b>Examples</b> | The following example shows how to generate the performance reports for T1 channel 8 on the CT3IP:<br><pre>Router(config)# controller t3 9/0/0 Router(config-controller)# t1 8 fdl ansi</pre> |
|-----------------|---|

| <b>Related Commands</b> | <b>Command</b>             | <b>Description</b>   |
|-------------------------|----------------------------|--|
|                         | <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller. |

# t1 framing

To specify the type of framing used by T1 channels, use the **t1 framing** command in controller configuration mode.

## Cisco 7500 Series Routers with Channelized T3 Interface Processor

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

## Channelized T3 Shared Port Adapters

```
t1 channel framing {esf | sf [hdlc-idle {0x7e | 0xff}] [mode {j1}]}
```

```
no t1 channel framing {esf | sf [hdlc-idle {0x7e | 0xff}] [mode {j1}]}
```

| Syntax Description             |   |
|--------------------------------|---|
| <i>channel</i>                 | Number indicating the T1 channel. <ul style="list-style-type: none"> <li>On the CT3IP—1 to 28</li> <li>On the 2-Port and 4-Port Channelized T3 SPA—0 to 23</li> </ul> |
| <i>esf</i>                     | Specifies that Extended Super Frame (ESF) is used as the T1 framing type. This is the default for the CT3IP.  |
| <i>sf</i>                      | Specifies that Super Frame (SF) is used as the T1 framing type. This is the default for the 2-Port and 4-Port Channelized T3 SPA.                                     |
| <b>hdlc-idle</b> {0x7e   0xff} | (Optional) Sets the idle pattern for the T1 interface to either <b>0x7e</b> (the default) or <b>0xff</b> .  |
| <b>mode</b> {j1}               | (Optional) Specifies the JT-G704 Japanese frame type. The <b>mode</b> keyword is not supported on Cisco 7304 routers with the 2-Port and 4-Port Channelized T3 SPA.   |

## Defaults

*esf* (for C3TIP)

*sf* (for 2-Port and 4-Port Channelized T3 SPA)

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.0(14)S   | This command was integrated into Cisco IOS Release 12.0(14)S. The <b>hdlc-idle</b> keyword option was added.  |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.   |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3 to support SPAs on the Cisco 7304 series routers.   |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7600 series router and Catalyst 6500 series switch. The <b>mode</b> keyword option was added. |

| Release     | Modification  |
|-------------|---|
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S to support SPAs on the Cisco 12000 series routers. |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |

### Usage Guidelines

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



#### Note

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

To return to the default mode, use the **no** form of this command. This command does not have a **no** form on the Cisco 7500 series router with the CT3IP.

The **mode** keyword is not supported on Cisco 7304 routers with the 2-Port and 4-Port Channelized T3 SPA.

### Examples

The following example shows how to set the framing for the T1 6 and T1 8 on the CT3IP to Super Frame:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 framing sf
Router(config-controller)# t1 8 framing sf
```

### Related Commands

| Command                | Description   |
|------------------------|---|
| <b>controller</b>      | Configures a T1, E1, or T3 controller and enters controller configuration mode. |
| <b>show controller</b> | Displays controller configuration.  |

# t1 linecode

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

**t1** *channel* **linecode** [**ami** | **b8zs**]

## Syntax Description

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

## Defaults

B8ZS

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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

### AMI Line Coding

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

### B8ZS Line Coding

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



### Note

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

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**Examples**

The following example shows how to set the line coding for T1 channel 16 on the CT3IP to AMI:

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# t1 16 linecode ami  
Router(config-controller)# exit  
Router(config)# interface serial 9/0/0:16  
Router(config-if)# invert data
```

---

**Related Commands**

| Command                            | Description  |
|------------------------------------|--|
| <b>invert data</b>                 | Inverts the data stream.   |
| <b>loopback remote (interface)</b> | Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back. |

# t1 logging-events

To print typical T1 controller Up and Down messages on a channelized T3 port adapter in T3 controller, use the **t1 logging-events** command configuration mode. To disable printing of the T1 controller Up and Down messages, use the **no** form of this command.

**t1** {*t1*} **logging-events** [**detail**]

[**no**] **t1** {*t1*} **logging-events**

## Syntax Description

|               |   |
|---------------|---|
| <i>t1</i>     | Number between 1 and 28 that represents the T1 channel for the Channelized T3 Interface Processor (CT3IP) on Cisco 7500 series and Cisco 7200 series routers. |
| <b>detail</b> | (Optional) Enables printing the reason code when a T1 controller of a T3 controller changes from the Up state to the Down state.                              |

## Defaults

The **t1 logging-events** command is the default.

## Command Modes

T3 controller configuration mode.

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 12.2(19c) | This command was introduced. |

## Usage Guidelines

This command refers to the T1 controller as part of a T3 controller.

The **no t1 logging-events** command disables printing of the controller Up and Down messages. These messages will appear neither on the console nor in the logs.

## Examples

The following example uses the **t1 logging-events** command to print normal controller Up and Down messages, without indicating the reason code for a changed state. The T1 1 controller is part of the T3 controller with a bay/port of 4/1.

```
Router(config-controller)# t1 1 logging-events
```

```
*Jun 20 00:29:39: %CONTROLLER-5-UPDOWN: Controller T3 4/1 T1 1, changed state to UP
*Jun 20 00:30:09: %CONTROLLER-5-UPDOWN: Controller T3 4/1 T1 1, changed state to DOWN
```

The following example uses the **t1 logging-events detail** command to show the Out-of-Frame (OOF) reason code when the T1 1 controller of a T3 controller with a bay/port of 4/1 changes from an Up state to a Down state:

```
Router(config-controller)# t1 1 logging-events detail
```

```
*Jun 19 17:47:50: %CONTROLLER-5-DOWNDDETAIL: Controller T3 4/1 T1 1, changed state to down
due to OOF
```

**Related Commands**

| <b>Command</b>        | <b>Description</b>   |
|-----------------------|--|
| <b>logging-events</b> | <b>Prints typical T3 controller Up and Down messages on a channelized T3 port adapter.</b> |

# t1 span

To enable link noise monitoring on a clear channel T1 link on Cisco 10000 series routers, use the **t1 span** command in controller configuration mode. To disable link noise monitoring, use the **no** form of this command.

```
t1 channel span {minor-warn | remove | major-warn}[duration seconds | lcv threshold [pcv threshold] [set | clear]]
```

```
no t1 channel span {minor-warn | remove | major-warn}[duration seconds | lcv threshold [pcv threshold] [set | clear]]
```

## Syntax Description

|                         |   |
|-------------------------|---|
| <i>channel</i>          | Number that indicates the T1 channel. The range is from 1 to 28.  |
| <b>minor-warn</b>       | Enables minor warning messages for noisy T1 links.  |
| <b>major-warn</b>       | Enables major warning messages for noisy T1 links.  |
| <b>remove</b>           | Enables removal of noisy T1 links from a multilink bundle.  |
| <i>lcv threshold</i>    | Specifies the line code violation (LCV) threshold value in bit error per second. The valid range on a T1 link is 5 to 1544 seconds. The valid range on an E1 link is 7 to 2048 seconds. <ul style="list-style-type: none"> <li>The default LCV value for minor-warn on a T1 link is 154 seconds and on E1 link is 205 seconds.</li> <li>The default LCV value for major-warn or removal on a TI link is 1544 seconds and on E1 link is 2048 seconds.</li> </ul>   |
| <i>duration seconds</i> | Specifies the number of consecutive seconds that a threshold is exceeded or improved for a condition to occur. The valid range on a T1/E1 link is 4 to 600 seconds. The default value for T1 and E1 links is 10 seconds.  |
| <i>pcv threshold</i>    | Specifies the number of timeslots in error per second. The valid range on a T1 link is 3 to 320 seconds and on an E1 link is 8 to 832 seconds. <p><b>Note</b> A T1 link has 24 timeslots and an E1 link has 32 timeslots.</p> <ul style="list-style-type: none"> <li>The default path code violation (PCV) value for minor-warn on a T1 link is 145 seconds and on E1 link is 205 seconds.</li> <li>The default PCV value for major-warn or removal on a TI link is 320 seconds and on E1 link is 832 seconds.</li> </ul> |
| <b>set</b>              | (Optional) Specifies the set condition. Set is used as the default when no conditions are given.  |
| <b>clear</b>            | (Optional) Specifies the clear condition.   |

## Command Default

Link Noise Monitoring on any T1 or E1 link is disabled by default. If enabled without specifying any thresholds, the default values are used as mentioned in the Syntax Description.

## Command Modes

Controller configuration (config-controller)

**Command History**

| Release     | Modification                 |
|-------------|------------------------------|
| 12.2(33)XNE | This command was introduced. |

**Usage Guidelines**

Note the following when configuring link noise monitoring on T1 and E1 links:

- The **major-warn** and **remove** keywords cannot be used at the same time; disable one to use the other.
- If the **warn** and **remove** keywords are specified without any other options, the LCV and PCV thresholds and duration defaults are used to determine set (**set**) and clear (**clear**) conditions.
- If the **span** command is issued with the **set** keyword and the command is not issued again with the **clear** keyword, or vice versa, the values configured for the threshold and duration is used for both keywords.
- If the **span** command is issued without the **set** or **clear** keywords specified, **set** is the default keyword.
- The **set** and **clear** keywords can be specified only if the threshold values for the LCV and/or duration is specified.
- The threshold for a clear condition must be less than the threshold for a set condition.
- The threshold for a warn event must be less than the threshold for a remove event.
- The duration is calculated in seconds and is the number of consecutive seconds by which either of the thresholds (exceed or improve) must be surpassed for a condition to occur.
- For events, the BER on a line should be greater than or equal to ( $\geq$ ) the thresholds for exceed condition. For improve condition, BER has to be less than ( $<$ ) the threshold.
- If the PCV threshold is not configured (using the **pcv** keyword and value), this threshold is calculated by the linear extrapolation of the Gaussian probability that is representative of most noise environments based on the configured LCV threshold. If the LCV threshold is specified, it is not mandatory to specify the PCV threshold.

**Examples**

The following example shows how to generate an exceed event for a minor warning, if the number of LCVs on the T1 line remain above or equal to 20, or the number of PCVs remains above or equal to 10 for 10 continuous seconds.

```
Router(config-controller)# t1 1 span minor-warn lcv 20 pcv 10 duration 10 set
```

The following example shows how to generate an improve event for a minor warning, if the number of LCVs on the T1 line remain below 15 or the number of PCVs remain below 8 for 20 continuous seconds.

```
Router(config-controller)# t1 1 span minor-warn lcv 15 pcv 8 duration 20 clear
```

The following example shows the same threshold value being used by the **set** and **clear** conditions, when both keywords are not specified. In this example, the threshold value is 80 for both conditions.

```
Router(config-controller)# t1 1 span major-warn lcv 150 pcv 100 duration 80
Router(config-controller)# end
Router# show running-config | section controller sonet 7/0/0
```

```
controller SONET 7/0/0
 framing SONET
 path 1 controller t3
 clock source internal
 controller T3 7/0/0.1
```

```
t1 1 channel-group 0 timeslots 1-24
t1 1 span minor-warn lcv 150 pcv 100 duration 80 set
t1 1 span minor-warn lcv 150 pcv 100 duration 80 clear
```

The following example shows how the threshold value specified for the clear condition is used by the set condition when set condition is not specified. In this example, the threshold value of 100 specified for the clear condition is used for the set condition.

```
Router(config-controller)# t1 1 span major-warn lcv 100 pcv 70 duration 100 clear
Router(config-controller)# end
Router# show running-config | section controller sonet 7/0/0
controller SONET 7/0/0
  framing SONET
  path 1 controller t3
  clock source internal
controller T3 7/0/0.1
t1 1 channel-group 0 timeslots 1-24
  t1 1 span minor-warn lcv 100 pcv 70 duration 100 set
  t1 1 span minor-warn lcv 100 pcv 70 duration 100 clear
```

The following is a sample output showing the details of the calculated PCV threshold value. The calculated PCV value is 141:

```
Router# debug c10k lnm
Router(config-controller)# t1 1 span major-warn lcv 150
Router(config-controller)# end
*Sep 10 20:34:43.923: T1 extrapolation: pcv_delta=130 lcv_delta=139 factor=140
pcv_const=14
  computed pcv_threshold = 141
*Sep 10 20:34:43.923: CMD for minor-warn set
*Sep 10 20:34:43.923: clear taking set thresholds
*Sep 10 20:34:43.923: T3 7/0/0.1#1 setting values to be sent to LC for WARN ENABLE 3
*Sep 10 20:34:43.923:
  3, 150, 150, 141, 141, 10, 10, 0, 0, 0, 0, 0, 0
Router# show running-config | section controller sonet 7/0/0
controller SONET 7/0/0
  framing SONET
  path 1 controller t3
  clock source internal
controller T3 7/0/0.1
t1 1 channel-group 0 timeslots 1-24
  t1 1 span minor-warn lcv 150 pcv 141 duration 10 set
  t1 1 span minor-warn lcv 150 pcv 141 duration 10 clear
```

## Related Commands

| Command                    | Description  |
|----------------------------|--|
| <b>t1 clock source</b>     | Specifies where the clock source is obtained for use by each T1 channel on the channelized T3 interface. |
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller.                               |
| <b>t1 span syslog</b>      | Generates syslog messages for spans that are enabled with the link noise monitoring feature.             |

# t1 span syslog

To generate syslog messages for all the spans on which the link noise monitoring feature is enabled, use the **t1 span syslog** command in controller configuration mode. To disable the generation of syslog messages, use the **no** form of this command.

**t1 channel span syslog**

**no t1 channel span syslog**

| Syntax Description |   |
|--------------------|---|
| <i>channel</i>     | Number that indicates the T1 channel. The range is from 1 to 28.                                |
| <b>syslog</b>      | Generates syslog messages for T1 links that are enabled with the Link Noise Monitoring feature. |

**Command Default** Syslog messages are disabled by default.

**Command Modes** Controller configuration (config-controller)

| Command History | Release     | Modification                 |
|-----------------|-------------|------------------------------|
|                 | 12.2(33)XNE | This command was introduced. |

**Usage Guidelines**

The Cisco 10000 series router is a scalable platform and supports up to 4000 T1 links on one chassis. When enabled, syslog messages are generated for all T1 links on which link noise monitoring is configured. A syslog event is reported as a message. The syslog report stores the last five events.

When an 'exceed' event is reported, a syslog message is generated. Such syslog messages from all links clog up the logging buffer. When enabling syslog messages, a message prompts you to confirm whether to generate syslog messages or not.

To view the events for a line card, use the **show controller type number lnm event** command in the privileged EXEC mode. To view the events for a SPA, use the **show platform spa slot/subslot lnm event** command.

**Examples** The following example shows the message displayed when the minor warning threshold has exceeded:

```
LN3-3- MINWARNEXCEED: Interface Serial7/0/0.1/1:0, noise exceeded above minor warning threshold
```

The following example shows the sample output of the **show controller** command, when executed for a specified T1 channel:

```
Router# show controllers t3 7/0/0.1 /5 lnm

Channel      Monitoring type                Thresholds (lcv/pcv/duration)
-----
5           minor-warn (syslog disabled)   Set(154 /145 /10 ) Clear(154 /145 /10 )
```

Router#

The following example shows the sample output of the last five stored messages:

Router# **show controller t3 7/0/0.1 lnm events**

```

Channel          Last five events
-----
1      MINWARNEXCEED : Noise exceeded minor-warn thresholds at Jun 11 1995 13:42:01
      MAJWARNEXCEED : Noise exceeded major-warn thresholds at Jun 11 1995 13:42:01
      MINWARNIMPROVE: Noise improved minor-warn thresholds at Jun 11 1995 13:42:01
      MAJWARNIMPROVE: Noise improved major-warn thresholds at Jun 11 1995 13:42:01
2      Channel not configured for E1/T1
3      Channel not configured for E1/T1
4      No events
5      Channel not configured for E1/T1

```

#### Related Commands

| Command                    | Description  |
|----------------------------|--|
| <b>t1 clock source</b>     | Specifies where the clock source is obtained for use by each T1 channel on the channelized T3 interface. |
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller.                               |
| <b>t1 span</b>             | Enables link noise monitoring on T1 links.   |

# t1 test

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

```
t1 test channel [cablelength feet] [linecode {ami | b8zs}]
```

```
no t1 test channel
```

## Syntax Description

|                              |   |
|------------------------------|---|
| <i>channel</i>               | Number between 1 and 28 that indicates the T1 channel.  |
| <i>cablelength feet</i>      | (Optional) Specifies the cable length, in feet, from the T1 channel to the external CSU or Multi-Channel Interface Processor (MIP). Values are from 0 to 655. Default is 133. |
| <i>linecode {ami   b8zs}</i> | (Optional) Specifies the line coding format used by the T1 channel. Values are alternate mark inversion (AMI) or bipolar 8 zero suppression (B8ZS). Default is B8ZS.          |

## Defaults

No test port is configured.  
The default cable length is 133 feet.  
The default line coding is B8ZS.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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

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

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

- LOS—Loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port.

- AIS—Alarm indication signal indicates that the port is receiving an all-ones signal.
- OK—A valid signal is being received and the signal is not an all-ones signal.

**Note**

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

**Note**

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

**Examples**

The following example shows how to configure T1 6 on the CT3IP as a test port using the default cable length and line coding:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 test 6
```

**Related Commands**

| Command                    | Description  |
|----------------------------|--|
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller.   |
| <b>t1 external</b>         | Specifies that a T1 channel on the CT3IP in Cisco 7500 series routers is used as an external port so the T1 channel can be further multiplexed on the MIP or other multiplexing equipment. |

# t1 timeslot

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

```
t1 channel timeslot range [speed {56 | 64}]
```

```
no t1 channel timeslot
```

## Syntax Description

|                        |   |
|------------------------|---|
| <i>channel</i>         | Number between 1 and 28 that indicates the T1 channel.  |
| <i>range</i>           | Specifies the time slots assigned to the T1 channel. The range can be from 1 to 24. A dash represents a range of time slots, and a comma separates time slots. For example, 1-10,15-18 assigns time slots 1 through 10 and 15 through 18. |
| <b>speed {56   64}</b> | (Optional) Specifies the data rate for the T1 channel, in kbps. Values are 56 or 64. The default is 64. The 56-kbps speed is valid only for T1 channels 21 through 28.  |

## Defaults

No time slots are specified for the T1 channel.  
The default data rate is 64 kbps.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

You must specify the time slots used by each T1 channel.



### Note

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

## Examples

The following example shows how to assign time slots 1 through 24 to T1 1 for full T1 bandwidth usage:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 1 timeslot 1-24
```

The following example shows how to assign time slots 21 to 23 and 26 to 28 and a data rate of 56 kbps to T1 6 for fractional T1 bandwidth usage:

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# t1 6 timeslot 21-23,26-28 speed 56
```

# t1 yellow

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

```
t1 channel yellow {detection | generation}
```

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

## Syntax Description

|                   |   |
|-------------------|---|
| <i>channel</i>    | Number between 1 and 28 that indicates the T1 channel.                      |
| <b>detection</b>  | Detects yellow alarms. This is the default, along with <b>generation</b> .  |
| <b>generation</b> | Generates yellow alarms. This is the default, along with <b>detection</b> . |

## Defaults

Yellow alarms are detected and generated on the T1 channel.

## Command Modes

Controller configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 11.3        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

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



### Note

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

## Examples

The following example shows how to disable the yellow alarm detection on T1 channel 6 on the CT3IP:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 framing sf
Router(config-controller)# no t1 6 yellow detection
```

# tcam priority

To prioritize the interfaces for forwarding to software in the event of Ternary Content Addressable Memory (TCAM) entry or label exhaustion, use the **tcam priority** command in interface configuration mode. To revert to the default setting, use the **no** form of this command.

**tcam priority [high | low]**

**no tcam priority**

| Syntax Description | high | Sets priority to high. |
|--------------------|------|------------------------|
|                    | low  | Sets priority to low.  |

**Defaults** normal

**Command Modes** Interface configuration

| Command History | Release      | Modification  |
|-----------------|--------------|---|
|                 | 12.2(14)SX   | This command was introduced on the Supervisor Engine 720.                                 |
|                 | 12.2(17d)SXB | Support for this command on the Supervisor Engine 2 was extended to Release 12.2(17d)SXB. |
|                 | 12.2(33)SRA  | This command was integrated into Cisco IOS Release 12.2(33)SRA.                           |

## Usage Guidelines

The interfaces are chosen in this order:

1. Low-priority interfaces without Vlan Access Control Lists (VACLs) and without multicast
2. Low-priority interfaces without VACLs and approved by multicast
3. Low-priority interfaces with VACLs and approved by multicast
4. Low-priority interfaces (not approved by multicast)
5. Normal-priority interfaces without VACLs and without multicast
6. Normal-priority interfaces without VACLs and approved by multicast
7. Normal-priority interfaces with VACLs and approved by multicast
8. Normal-priority interfaces (not approved by multicast)
9. High-priority interfaces without VACLs and without multicast
10. High-priority interfaces without VACLs and approved by multicast
11. High-priority interfaces with VACLs and approved by multicast
12. High-priority interfaces (not approved by multicast)

---

**Examples**

This example shows how to set the priority:

```
Router(config-if)# tcam priority low
```

---

**Related Commands**

| <b>Command</b>             | <b>Description</b>                                   |
|----------------------------|--|
| <b>show tcam interface</b> | Displays information about the interface-based TCAM. |

---

# termination

To configure the termination mode of the controller, use the **termination** command in the controller configuration mode.

**termination** [**co** | **cpe**]

## Syntax Description

|            |  |
|------------|--|
| <b>co</b>  | Set the line termination for the interface as CO (network) |
| <b>cpe</b> | Termination cpe (customer)                                 |

## Command Default

The command default termination mode is CPE.

## Command Modes

Controller configuration mode (config-controller)

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 15.1(1)T | This command was introduced. |

## Examples

The following example shows the line termination set to “co”:

```
Router(config-controller)# termination co
```

## Related Commands

| Command                 | Description   |
|-------------------------|---|
| <b>controller shdsl</b> | Configures a controller for single-pair high-bit-rate digital subscriber line (SHDSL) mode. |

# test aim eeprom

To test the data compression Advanced Interface Module (AIM) after it is installed in the Cisco 2600 series router, use the **test aim eeprom** command in privileged EXEC mode.

## test aim eeprom

**Syntax Description** This command has no arguments or keywords.

**Defaults** No tests are performed on the data compression AIM card.

**Command Modes** Privileged EXEC

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 12.0(2)T    | This command was introduced.  |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                 | 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

**Usage Guidelines** This command does not have a **no** form.



### Caution

Using this command can erase all locations in EEPROM memory.

This command is the AIM counterpart of the **test pas eeprom** command, which performs similar tasks for port modules.

[Table 1](#) shows the questions asked of the user when the **test aim eeprom** command is entered, and the recommended user responses.

**Table 1** Questions and Responses for test aim eeprom Command

| Questions                   | Responses  |
|-----------------------------|--|
| AIM Slot [0]:               | User responds by entering the slot number of the AIM whose EEPROM is to be modified. If the user presses ENTER, the default slot 0 is used.  |
| Use NMC93C46 ID EEPROM [y]: | User responds with “y” if the AIM contains an NMC93C46 type EEPROM and “n” if the AIM contains an X2444 EEPROM. The compression Advanced Interface Module (CAIM) contains a NMC93C46 EEPROM, and this is the default if the user just pressed ENTER. |

**Table 1** Questions and Responses for test aim eeprom Command (continued)

| Questions                                       | Responses  |
|---|--|
| AIM Slot %d eeprom (? for help)[%c]             | General command prompt for the <b>test aim eeprom</b> command dialog. The AIM slot number chosen is displayed, and the default command is the last command entered.  |
| Address within slot %d eeprom, [0x%02x]         | Enter the desired address within the EEPROM to modify. The default is the next address beyond the byte last modified. If the user wishes to enter a hexadecimal number, it must be preceded by “0x”.   |
| Read or Write access to slot %d at 0x%02x [%c]? | Respond with a W to write to the addressed byte or with an R to read from the addressed byte. The default value is selected by just pressing Enter and is the same as the value specified in the last primitive access.  |
| Write data (hex 8 bits) [%02x]?:                | If you respond to prompt B with “W”, then prompt C is issued, requesting the user to enter the data to write to the addressed byte. The user enters the desired value. Note that if the user desires to enter a hex value, the hex value entered must be preceded by “0x”. Otherwise, the value entered is assumed to be in decimal radix. |

There is a danger that you can erase all bytes in the entire EEPROM. Though it is good to have a diagnostic tool that allows you to read and write data, there is a danger that lost data will make the Advanced Interface Module (AIM) card fail.

During your session with the test dialog, you have access to the following commands:

|                      |  |
|----------------------|--|
| <b>H</b> or <b>h</b> | Displays a summary of the available commands.  |
| <b>d</b>             | Dump EEPROM contents—Displays the contents of the EEPROM in hex.   |
| <b>e</b>             | Erase EEPROM—Erases the entire EEPROM (all bytes set to 0xff).   |
| <b>p</b>             | Primitive access—Erases the EEPROM.  |
| <b>q</b>             | Exit EEPROM test—Causes the <b>test aim eeprom</b> command dialog to exit to the command line interface (CLI). |
| <b>z</b>             | Zero EEPROM—Zeros the entire EEPROM.   |

**Examples**

The following example displays the **test aim eeprom** command user dialog:

```
Router# test aim eeprom

AIM Slot [0]: 0
Use NMC93C46 ID EEPROM [y]: y
AIM Slot 0 eeprom (? for help)[?]: ?
  d - dump eeprom contents
  e - erase all locations (to 1)
  p - primitive access
  q - exit eeprom test
  z - zero eeprom

'c' rules of radix type-in and display apply.

AIM Slot 0 eeprom (? for help)[?]:
```

# test cable-diagnostics

To test the condition of 10-Gigabit Ethernet links or copper cables on 48-port 10/100/1000 BASE-T modules, use the **test cable-diagnostics** command in privileged EXEC mode.

**test cable-diagnostics tdr interface type number**

| Syntax Description | Parameter             | Description  |
|--------------------|-----------------------|--|
|                    | <b>tdr</b>            | Activates the TDR test for copper cables on 48-port 10/100/1000 BASE-T modules.    |
|                    | <b>interface type</b> | Specifies the interface type; see the “Usage Guidelines” section for valid values. |
|                    | <b>number</b>         | Module and port number.  |

**Defaults** This command has no default settings.

**Command Modes** Privileged EXEC

| Command History | Release      | Modification  |
|-----------------|--------------|---|
|                 | 12.2(17a)SX  | Support for this command was introduced on the Cisco 7600 series routers.   |
|                 | 12.2(17b)SXA | This command was changed to provide support for the 4-port 10GBASE-E serial 10-Gigabit Ethernet module (WS-X6704-10GE). |
|                 | 12.2(17d)SXB | Support for this command on the Supervisor Engine 2 was extended to Release 12.2(17d)SXB.                               |
|                 | 12.2(33)SRA  | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |

**Usage Guidelines** Cable diagnostics can help you detect whether your cable has connectivity problems.

The TDR test guidelines are as follows:

- TDR can test cables up to a maximum length of 115 meters.
- The TDR test is supported on Cisco 7600 series routers running Release 12.2(17a)SX and later releases on specific modules. See the Release Notes for Cisco IOS Release 12.2SX on the Catalyst 6500 and Cisco 7600 Supervisor Engine 720, Supervisor Engine 32, and Supervisor Engine 2 for the list of the modules that support TDR.
- The valid values for **interface type** are **fastethernet** and **gigabitethernet**.
- Do not start the test at the same time on both ends of the cable. Starting the test at both ends of the cable at the same time can lead to false test results.
- Do not change the port configuration during any cable diagnostics test. This action may result in incorrect test results.

- The interface must be up before running the TDR test. If the port is down, the **test cable-diagnostics tdr** command is rejected and the following message is displayed:

```
Router# test cable-diagnostics tdr interface gigabitethernet2/12
% Interface Gi2/12 is administratively down
% Use 'no shutdown' to enable interface before TDR test start.
```

- If the port speed is 1000 and the link is up, do not disable the auto-MDIX feature.
- For fixed 10/100 ports, before running the TDR test, disable auto-MDIX on both sides of the cable. Failure to do so can lead to misleading results.
- For all other conditions, you must disable the auto-MDIX feature on both ends of the cable (use the **no mdix auto** command). Failure to disable auto-MDIX will interfere with the TDR test and generate false results.
- If a link partner has auto-MDIX enabled, this action will interfere with the TDR-cable diagnostics test and test results will be misleading. The workaround is to disable auto-MDIX on the link partner.
- If you change the port speed from 1000 to 10/100, enter the **no mdix auto** command before running the TDR test. Note that entering the **speed 1000** command enables auto-MDIX regardless of whether the **no mdix auto** command has been run.

### Examples

This example shows how to run the TDR-cable diagnostics:

```
Router # test cable-diagnostics tdr interface gigabitethernet2/1
TDR test started on interface Gi2/1
A TDR test can take a few seconds to run on an interface
Use 'show cable-diagnostics tdr' to read the TDR results.
```

### Related Commands

| Command                            | Description  |
|------------------------------------|--|
| <b>clear cable-diagnostics tdr</b> | Clears a specific interface or clears all interfaces that support TDR. |
| <b>show cable-diagnostics tdr</b>  | Displays the test results for the TDR cable diagnostics.               |

# test interface fastethernet

To test the Fast Ethernet interface by causing the interface to ping itself, use the **test interface fastethernet** command in user EXEC or privileged EXEC mode.

**test interface fastethernet** *number*

|                           |               |   |
|---------------------------|---------------|---|
| <b>Syntax Description</b> | <i>number</i> | Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 series router, specifies the network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system and are displayed with the <b>show interfaces</b> command. |
|---------------------------|---------------|---|

|                      |                              |
|----------------------|------------------------------|
| <b>Command Modes</b> | User EXEC<br>Privileged EXEC |
|----------------------|------------------------------|

|                        |                |   |
|------------------------|----------------|---|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>   |
|                        | 11.2           | This command was introduced.  |
|                        | 12.2(33)SRA    | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                        | 12.2SX         | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

|                         |  |
|-------------------------|--|
| <b>Usage Guidelines</b> | This command sends pings from the specified interface to itself. Unlike the <b>ping</b> command, the <b>test interface fastethernet</b> command does not require the use of an IP address. |
|-------------------------|--|

|                 |   |
|-----------------|---|
| <b>Examples</b> | The following example shows how to test a Fast Ethernet interface on a Cisco 4500 router:<br>Router# <b>test interface fastethernet 0</b> |
|-----------------|---|

|                         |                          |  |
|-------------------------|--------------------------|--|
| <b>Related Commands</b> | <b>Command</b>           | <b>Description</b>   |
|                         | <b>ping (privileged)</b> | Diagnoses basic network connectivity on AppleTalk, CLNS, DECnet, IP, or Novell IPX networks. |
|                         | <b>ping (user)</b>       | Provides simple ping diagnostics of network connectivity.                                    |
|                         | <b>show interfaces</b>   | Displays information about interfaces.   |

# test platform police get

To get the IPv6 internal police rate, use the **test platform police get** command in privileged EXEC mode.

**test platform police get**

**Syntax Description** This command has no arguments or keywords.

**Command Default** 0 (No rate has been applied.)

**Command Modes** Privileged EXEC (#)

| Command History | Release      | Modification  |
|-----------------|--------------|---|
|                 | 12.2(33)SRD1 | The command was introduced on the Cisco 7600 series routers for the ES+ line cards, the SIP-400, and the 7600-ES+ITU-2TG and 7600-ES+ITU-4TG. |

**Usage Guidelines** Use this command under the **exec** command of the line card console. It is not visible from the route processor (RP) console.

**Examples** The following example shows how to get the IPv6 internal police rate:

```
Router> enable
Router# test platform police get
IPv6 with HBH header is policed at 100000 kbps
```

| Related Commands | Command                         | Description                         |
|------------------|---------------------------------|-------------------------------------|
|                  | <b>test platform police set</b> | Sets the IPv6 internal police rate. |

# test platform police set

To set the IPv6 internal police rate, use the **test platform police set** command in privileged EXEC mode. This command does not have a **no** form.

**test platform police set** *rate*



**Note** If you have set a rate limit and wish to cancel it, you will need to use this command to set the rate to 0.

|                           |             |  |
|---------------------------|-------------|--|
| <b>Syntax Description</b> | <i>rate</i> | <p>Specifies the internal police rate. The range is from 0 to 100000 kbps.</p> <ul style="list-style-type: none"> <li>For the SIP-400, you can configure a rate up to, and including 25600 packets per second (PPS).</li> <li>For the ES+ line cards and the 7600-ES+ITU-2TG and 7600-ES+ITU-4TG line cards, you can configure rates of: <ul style="list-style-type: none"> <li>16 Kbps to 2 Mbps; granularity of 16 kbps</li> <li>2 Mbps to 100 Mbps; granularity of 64 kbps</li> </ul> </li> </ul> |
|---------------------------|-------------|--|

**Command Default** For ES40 line cards, the default police rate is 12.8 Mbps.  
For the SIP-400, the default police rate is 21.36 kpps.

**Command Modes** Privileged EXEC (#)

| Command History | Release      | Modification  |
|-----------------|--------------|---|
|                 | 12.2(33)SRD1 | The command was introduced on the Cisco 7600 series routers for the ES+ line cards, the SIP-400, and the 7600-ES+ITU-2TG and 7600-ES+ITU-4TG. |

**Usage Guidelines** Use this command under the EXEC command of the line card console. It is not visible from the route processor (RP) console.

For both the ES+ line cards and the SIP-400, setting the police rate to 0 turns off the policing.

For both the ES+ line cards and the SIP-400, when the policer is set from the the line card console, the setting remains effective even if the line card is moved to another chassis running the Cisco IOS Release 12.2(33)SRD1 (or later) image.

For the SIP-400, IPv6 HBH packets will continue to go through the QoS policing configured on the line card. For ES+ line cards, IPv6 HBH packets will bypass any QoS configured on the line card.

**Examples** The following examples shows how to set the IPv6 with HBH header to be policed at 100000 kbps:

```
Router> enable
```

```
Router# test platform police set 10000
```

**Related Commands**

| <b>Command</b>                        | <b>Description</b>                  |
|---------------------------------------|-------------------------------------|
| <code>test platform police get</code> | Gets the IPv6 internal police rate. |

# test platform police ipv6 disable

To disable the IPv6 internal policer, use the **test platform police ipv6 disable** command in privileged EXEC mode.

**test platform police ipv6 disable**

**Syntax Description** This command has no arguments or keywords.

**Command Default** 0 (No rate has been applied)

**Command Modes** Privileged EXEC (#)

| Command History | Release   | Modification  |
|-----------------|-----------|---|
|                 | 15.1(3)S1 | The command was introduced on the Cisco 7600 series routers for the ES+ line cards, the SIP-400, and the 7600-ES+ITU-2TG and 7600-ES+ITU-4TG. |

**Usage Guidelines** Use this command under the **exec** command of the line card console. It is not visible from the route processor (RP) console.

**Examples** This example shows how to disable the IPv6 internal police rate:

```
Router (config)# test platform police ipv6 disable
```

| Related Commands | Command                              | Description                         |
|------------------|--------------------------------------|-------------------------------------|
|                  | <b>test platform police ipv6 set</b> | Sets the IPv6 internal police rate. |
|                  | <b>test platform police ipv6 get</b> | Gets the IPv6 internal police rate. |

# test satellite satellite mfg link

To force the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT) to show that the backbone link to the hub is up, even when the link is actually down, use the **test satellite satellite mfg link** command in privileged EXEC mode.

```
test satellite satellite slot/unit mfg link { force | normal }
```

## Syntax Description

|               |   |
|---------------|---|
| <i>slot</i>   | Router chassis slot in which the network module is installed.       |
| <i>unit</i>   | Interface number. For NM-1VSAT-GILAT network modules, always use 0. |
| <b>force</b>  | Forces the satellite link to appear to be UP.                       |
| <b>normal</b> | Allows the satellite link to display the actual status, UP or DOWN. |

## Defaults

The actual status (UP or DOWN) of the satellite link is displayed.

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 12.3(14)T | This command was introduced. |

## Usage Guidelines

Use the **test satellite satellite mfg link** command only when instructed by your satellite service provider or a technical support representative.

## Examples

The following example shows how to force the NM-1VSAT-GILAT network module to show that the backbone link to the hub is up, even if the link is actually down:

```
Router# test satellite satellite 1/0 mfg link force
```

The following example shows how to allow the NM-1VSAT-GILAT network module to show the actual status (UP or DOWN) of the satellite link:

```
Router# test satellite satellite 1/0 mfg link normal
```

# test satellite satellite reset

To reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **test satellite satellite reset** command in privileged EXEC mode.

**test satellite satellite *slot* *unit* reset [hard]**

| Syntax Description | slot | Router chassis slot in which the network module is installed.       |
|--------------------|------|---|
|                    | unit | Interface number. For NM-1VSAT-GILAT network modules, always use 0. |
|                    | hard | Hardware reset. Not available on all routers.                       |

**Defaults** Without the **hard** keyword, the command initiates a software reset.

**Command Modes** Privileged EXEC

| Command History | Release   | Modification                 |
|-----------------|-----------|------------------------------|
|                 | 12.3(14)T | This command was introduced. |

**Usage Guidelines** Use the **test satellite satellite reset** command only when instructed by your satellite service provider or a technical support representative. You will lose satellite network connectivity while the NM-1VSAT-GILAT network module resets.

We recommend that you first try a software reset. The hardware reset option is not available on all routers.

**Examples** The following example shows how to initiate a software reset of the NM-1VSAT-GILAT network module:

```
Router# test satellite satellite 1/0 reset
```

The following example shows how to initiate a hardware reset of the NM-1VSAT-GILAT network module:

```
Router# test satellite satellite 1/0 reset hard
```

# test service-module

To perform self-tests on an integrated CSU/DSU serial interface module, such as a 4-wire, 56/64 kbps CSU/DSU, use the **test service-module** command in privileged EXEC mode.

**test service-module** *interface-type interface-number*

## Syntax Description

|                         |                   |
|-------------------------|-------------------|
| <i>interface-type</i>   | Interface type.   |
| <i>interface-number</i> | Interface number. |

## Command Modes

Privileged EXEC

## Command History

| Release     | Modification  |
|-------------|---|
| 11.2        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

The following tests are performed on the CSU/DSU:

- ROM checksum test
- RAM test
- EEPROM checksum test
- Flash checksum test
- DTE loopback with an internal pattern test

These self-tests are also performed at power on.

This command cannot be used if a DTE loopback, line loopback, or remote loopback is in progress.

Data transmission is interrupted for 5 seconds when you issue this command. To view the output of the most recent self-tests, use the **show service-module** command.

This command does not have a **no** form.

## Examples

The following example shows how to perform a self-test on serial interface 0:

```
Router# test service-module serial 0

SERVICE_MODULE(0): Performing service-module self test
SERVICE_MODULE(0): self test finished: Passed
```

**Related Commands**

| <b>Command</b>                     | <b>Description</b>   |
|------------------------------------|--|
| <b>channelized</b>                 | Clears the interface counters.                             |
| <b>clear service-module serial</b> | Resets an integrated CSU/DSU.                              |
| <b>show service-module serial</b>  | Displays the performance report for an integrated CSU/DSU. |

# test trunk

To configure the test port on a trunk card, use the **test trunk** command in privileged EXEC mode.

```
test trunk stm1 {drop | monitor} {tx | rx} {on | off} e1 controller
```

| Syntax Description | stm1              | Specifies the test port on an STM-1 trunk card. This keyword is supported only on the Cisco AS5850 platform.                                   |
|--------------------|-------------------|--|
|                    | <b>drop</b>       | Specifies drop mode where the existing signal is dropped and the signal from the test port is sent to the controller.                          |
|                    | <b>monitor</b>    | Specifies monitor mode where the signal from the specified E1 controller is monitored via the test port. The original signal is not disturbed. |
|                    | <b>tx</b>         | Specifies that signal is sent on the transmit line.  |
|                    | <b>rx</b>         | Specifies that signal is sent on the receive line.   |
|                    | <b>on</b>         | Switches the test port on.   |
|                    | <b>off</b>        | Switches the test port off.  |
|                    | <b>e1</b>         | Specifies that an E1 controller is to be used for testing.   |
|                    | <i>controller</i> | Slot and port numbers to identify the E1 controller.   |

## Defaults

The test port is disabled.

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                        |
|-----------|-------------------------------------|
| 11.0      | This command was introduced.        |
| 12.2(15)T | The <b>stm-1</b> keyword was added. |

## Usage Guidelines

If a controller does not go up, or there are a large number of errors associated with a specific E1 controller, you might be able to determine whether the problem is in the server card or in an external line by using the test port. The test port is located on the front panel of the SDH/STM-1 trunk card.

This command does not have a **no** form because the command itself switches the test port on or off.

To use this command, one E1 controller is selected and the transmit and receive lines can be put into drop or monitor mode. Both drop and monitor modes can be used at the same time on either the transmit or receive lines, but both transmit and receive lines cannot be used in drop or monitor mode at the same time.

## Examples

The following example shows how to configure a test port to use drop mode on the receive line of an E1 controller in the second path of an STM-1 trunk card in slot 2 of a Cisco AS5850 chassis:

```
Router# test trunk stm-1 drop rx on E1 2/0.2/1/2
```

# timeslot

To enable framed mode on a serial interface on a G.703 E1 port adapter, an FSIP, or an E1-G.703/G.704 serial port adapter, use the **timeslot** command in interface configuration mode. To restore the interface to unframed mode, use the **no** form of this command or set the start slot to 0.

**timeslot** *start-slot stop-slot*

**no timeslot**

## Syntax Description

|                   |   |
|-------------------|---|
| <i>start-slot</i> | First subframe in the major frame. Valid range is from 1 to 31 and must be less than or equal to the <i>stop-slot</i> value.    |
| <i>stop-slot</i>  | Last subframe in the major frame. Valid range is from 1 to 31 and must be greater than or equal to the <i>start-slot</i> value. |

## Defaults

The default G.703 E1 interface is not configured for framed mode.

## Command Modes

Interface configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 10.3        | This command was introduced.  |
| 11.1 CA     | This command was modified to include the E1-G.703/G.704 serial port adapter and Cisco 7200 series routers.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

Framed mode allows you to specify a bandwidth for the interface by designating some of the 32 time slots for data and reserving the others for framing (timing). Unframed mode, also known as clear channel, does not reserve any time slots for framing.

This command applies to Cisco 4000, 7000, 7200, and 7500 series routers. G.703 E1 interfaces have two modes of operation, framed and unframed. When in framed mode, the range from *start-slot* to *stop-slot* gives the number of 64-kbps slots in use. There are thirty-two 64-kbps slots available.

In framed mode, timeslot 16 is not used for data. To use timeslot 16 for data, use the **ts16** interface configuration command.

## Examples

The following example shows how to enable framed mode on a serial interface on a G.703 E1 port adapter or an E1-G.703/G.704 port adapter:

```
Router(config)# interface serial 3/0
Router(config-if)# timeslot 1-3
```

| Related Commands | Command              | Description  |
|------------------|----------------------|--|
|                  | <a href="#">ts16</a> | Controls the use of timeslot 16 for data on a G.703 E1 interface or on an E1-G703/G.704 serial port adapter. |

# tod

To configure the time of day message format used by the 1PPS interface use the **tod** command in global configuration mode. To remove a time of day configuration, use the **no** form of this command.

```
tod slot/bay {iso8601 | ubx | nmea | cisco | ntp} [delay delay-amount]
```

```
no tod slot/bay {iso8601 | ubx | nmea | cisco | ntp} [delay delay-amount]
```

## Syntax Description

|                     |  |
|---------------------|--|
| <i>slot</i>         | Slot of the 1PPS interface.  |
| <i>bay</i>          | Bay of the 1PPS interface.   |
| <b>iso8601</b>      | Specifies ISO 8601 time of day format.   |
| <b>ubx</b>          | Specifies UBX time of day format.  |
| <b>nmea</b>         | Specifies NMEA time of day format.   |
| <b>cisco</b>        | Specifies Cisco time of day format.  |
| <b>ntp</b>          | Specifies NTP time of day format.  |
| <b>delay</b>        | (Optional) Specifies a delay between the 1PPS message and the time of day message.                                 |
| <i>delay-amount</i> | Amount of delay between the 1PPS message and the time of day message, in milliseconds. The range is from 1 to 999. |

## Command Default

No default behavior or values.

## Command Modes

Global configuration (config)

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 15.0(1)S | This command was introduced. |

## Usage Guidelines

This command applies only to platforms that have 1PPS ports.

## Examples

The following example shows how to configure a PTP announcement interval:

```
Router# configure terminal
Router(config)# ptp clock ordinary domain 0
Router(config)# tod 3/0 ntp
Router(config)# exit
```

| Related Commands | Command       | Description  |
|------------------|---------------|--|
|                  | <b>input</b>  | Enables PTP input clocking using the 1.544 Mhz, 2.048 Mhz, or 10 Mhz timing interface or phase using the 1PPS or RS-422 interface. |
|                  | <b>output</b> | Enables output of time of day messages using the 1PPS interface.   |

# transceiver type all

To enter in to transceiver type configuration mode (which in turn facilitates you to enable the monitoring of all transceivers), use the **transceiver type all** command in global configuration mode. This command does not have the **no** form.

## transceiver type all

**Syntax Description** This command has no arguments or keywords.

**Command Default** Transceiver type configuration is disabled.

**Command Modes** Global configuration (config)

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 12.2(18)SXE | This command was introduced.  |
|                 | 12.2(33)SXH | This command was modified. The <b>interval</b> keyword was removed. |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.     |

**Usage Guidelines** You can enter the transceiver type configuration mode using the **transceiver type all** command. You can then monitor the transceiver types and also set the monitoring interval using the **monitoring** command.

**Examples** This example shows how to enter in to transceiver type configuration mode and then enable the monitoring for all transceiver types:

```
Router(config)# transceiver type all
Router(config-xcvr-type)# monitoring interval 500
```

| Related Commands | Command  | Description  |
|------------------|--|--|
|                  | <b>monitoring</b>                                    | Enables to monitor the transceiver types and also set the monitoring interval. |
|                  | <b>snmp-server enable traps transceiver type all</b> | Enables all supported SNMP transceiver traps for all transceiver types.        |

# transmit-buffers backing-store

To buffer short-term traffic bursts that exceed the bandwidth of the output interface, use the **transmit-buffers backing-store** command in interface configuration mode. To disable this function, use the **no** form of this command.

**transmit-buffers backing-store**

**no transmit-buffers backing-store**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is off, unless weighted fair queuing is enabled on the interface. If weighted fair queuing is enabled on the interface, the **transmit-buffers backing-store** command is enabled by default.

## Command Modes

Interface configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 10.3        | This command was introduced on the Cisco 7500 series router.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

If the **transmit-buffers backing-store** command is enabled and a full hardware transmit queue is encountered, packets are swapped out of the original memory device (MEMD) into a system buffer in DRAM. If the **transmit-buffers backing-store** command is *not* enabled and the output hold queue is full, packets are dropped instead of being copied if a full hardware transmit queue is encountered. In both cases, the original MEMD buffer is freed so that it can be reused for other input packets.

To preserve packet order, the router checks the output hold queue and outputs previously queued packets first.

## Examples

The following example shows how to enable the **transmit-buffers backing-store** command on a FDDI interface:

```
Router(config)# interface fddi 3/0
Router(config-if)# transmit-buffers backing-store
```

## Related Commands

| Command                 | Description                   |
|-------------------------|-------------------------------|
| <b>fair-queue (WFQ)</b> | Enables WFQ for an interface. |

# transmit-clock-internal

To enable the internally generated clock on a serial interface on a Cisco 7200 series or Cisco 7500 series router when a DTE does not return a transmit clock, use the **transmit-clock-internal** command in interface configuration mode. To disable the internally generated clock, use the **no** form of this command.

**transmit-clock-internal**

**no transmit-clock-internal**

**Syntax Description** This command has no arguments or keywords.

**Defaults** The internally generated clock is disabled.

**Command Modes** Interface configuration

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 10.0        | This command was introduced.  |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                 | 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

**Examples** The following example shows how to enable the internally generated clock on serial interface 3/0 on a Cisco 7200 series or Cisco 7500 series router:

```
Router(config)# interface serial 3/0
Router(config-if)# transmit-clock-internal
```

# transmit-interface

To assign a transmit interface to a receive-only interface, use the **transmit-interface** command in interface configuration mode. To return to normal duplex Ethernet interfaces, use the **no** form of this command.

**transmit-interface** *type number*

**no transmit-interface**

| Syntax Description |               |   |
|--------------------|---------------|---|
|                    | <i>type</i>   | Transmit interface type to be linked with the (current) receive-only interface.   |
|                    | <i>number</i> | Transmit interface number to be linked with the (current) receive-only interface. |

**Defaults** Disabled

**Command Modes** Interface configuration

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 10.0        | This command was introduced.  |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                 | 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

**Usage Guidelines** Receive-only interfaces are used commonly with microwave Ethernet links.

**Examples** The following example specifies Ethernet interface 0 as a simplex Ethernet interface:

```
interface ethernet 1
 ip address 128.9.1.2
 transmit-interface ethernet 0
```

# transmitter-delay

To specify a minimum dead-time after transmitting a packet, use the **transmitter-delay** command in interface configuration mode. To restore the default, use the **no** form of this command.

**transmitter-delay** *delay*

**no transmitter-delay**

## Syntax Description

|              |  |
|--------------|--|
| <i>delay</i> | On the FSIP, high-speed serial interface (HSSI, and) on the IGS router, the minimum number of High-Level Data Link Control (HDLC) flags to be sent between successive packets. On all other serial interfaces and routers, approximate number of microseconds of minimum delay after transmitting a packet. The valid range is from 0 to 131071. Default is 0. |
|--------------|--|

## Defaults

0 flags or microseconds

## Command Modes

Interface configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 10.0        | This command was introduced.  |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

This command is especially useful for serial interfaces that can send back-to-back data packets over serial interfaces faster than some hosts can receive them.

The transmitter delay feature is implemented for the following Token Ring cards: CSC-R16, CSC-R16M, CSC-1R, CSC-2R, and CSC-CTR. For the first four cards, the command syntax is the same as the existing command and specifies the number of microseconds to delay between sending frames that are generated by the router. Transmitter delay for the CSC-CTR uses the same syntax, but specifies a relative time interval to delay between transmission of all frames.

## Examples

The following example shows how to specify a delay of 300 microseconds on serial interface 0:

```
Router(config)# interface serial 0
Router(config-if)# transmitter-delay 300
```

# transport-mode

To configure a transport mode, use the **transport-mode** command in interface configuration mode. To return to the default state, use the **no** form of this command.

**transport-mode** {lan | wan | otn bit-transparent {opu1e | opu2e}}

**no transport-mode** {lan | wan | otn bit-transparent {opu1e | opu2e}}

| Syntax Description |   |
|--------------------|---|
| <b>lan</b>         | 10GBASE-R LAN pass-through mode (10.3125 Gb/s)  |
| <b>wan</b>         | 10GBASE-W WAN (SONET/SDH) mode (9.95328 Gb/s)   |
| <b>otn</b>         | Optical Transport Network (G.709). The following modes are supported under interface OTN: <ul style="list-style-type: none"> <li>• <b>bit-transparent</b>—XAUI transparently mapped into OTU-2 (11.096 or 11.049 Gb/s)               <ul style="list-style-type: none"> <li>– <b>opu1e</b>—Over OPU1e (11.0491 Gb/s)</li> <li>– <b>opu2e</b>—Over OPU2e (11.0957 Gb/s)</li> </ul> </li> </ul> |

**Command Default** LAN

**Command Modes** Interface configuration (config-if)

| Command History | Release      | Modification   |
|-----------------|--------------|--|
|                 | 12.2(33)SRD1 | This command was introduced on the Cisco 7600 series router. |

**Examples** The following example shows how to configure a LAN transport mode:

```
Router(config-if)# transport-mode lan
```

| Related Commands | Command                     | Description  |
|------------------|-----------------------------|--|
|                  | <b>controller dwdm</b>      | Configures a DWDM controller.                      |
|                  | <b>g709 fec</b>             | Configures the FEC for the DWDM controller.        |
|                  | <b>g709 odu threshold</b>   | Configures thresholds for selected ODU BER alarms. |
|                  | <b>g709 otu threshold</b>   | Configures thresholds for selected OTU BER alarms. |
|                  | <b>no g709 odu report</b>   | Disables the logging of selected ODU alarms.       |
|                  | <b>no g709 otu report</b>   | Disables the logging of selected OTU alarms.       |
|                  | <b>show controller dwdm</b> | Displays ITU-T G.709 alarms, alerts, and counters. |

# transport ipv4

To specify IPv4 transport source mode and the transport source interface, use the **transport ipv4** command in L3 VPN encapsulation configuration mode. To remove the transport source, use the **no** form of this command.

**transport ipv4** [**source** *interface-type interface-number*]

**no transport** [**ipv4**]

## Syntax Description

|                         |   |
|-------------------------|---|
| <b>source</b>           | Specifies the IPv4 transport source.    |
| <i>interface-type</i>   | (Optional) The source interface type.   |
| <i>interface-number</i> | (Optional) The source interface number. |

## Command Default

The IPV4 transport source mode and interface are not defined.

## Command Modes

L3VPN Encapsulation Configuration (config-l3vpn-encap-ip)

## Command History

| Release     | Modification                 |
|-------------|------------------------------|
| 12.2(33)SRE | This command was introduced. |

## Usage Guidelines

The **transport ipv4** command specifies IPv4 transport source mode and defines the transport source interface while configuring the L3VPN encapsulation profile. When you use this command, make sure that the specified source address is used as the nexthop in BGP updates advertised by the PE.

## Examples

The following example shows how to specify IPv4 transport source mode and the transport source interface:

```
Router(config-l3vpn-encap-ip)# transport ipv4 source loopback 0
```

## Related Commands

| Command                            | Description  |
|------------------------------------|--|
| <b>l3vpn encapsulation ip</b>      | Configures the L3VPN encapsulation profile.                      |
| <b>protocol gre</b>                | Specifies GRE as the tunnel mode and sets the GRE key.           |
| <b>show l3vpn encapsulation ip</b> | Displays the profile health and the underlying tunnel interface. |

## transport ipv4 (PTP)

To specify the IP version, transmission mode, and interface that a Precision Time Protocol clock port uses to exchange timing packets, use the **transport ipv4** command in PTP clock port configuration mode. To remove a transport configuration, use the **no** form of this command.

```
transport ipv4 { unicast | multicast | multicast-mix } interface interface-type interface-number
[negotiation]
```

```
no transport ipv4 { unicast | multicast | multicast-mix } interface interface-type interface-number
[negotiation]
```

### Syntax Description

|                         |   |
|-------------------------|---|
| <b>unicast</b>          | Configures the clock port to exchange timing packets in unicast mode.   |
| <b>multicast</b>        | Configures the clock port to exchange timing packets in multicast mode.   |
| <b>multicast-mix</b>    | Configures the clock port to exchange timing packets in multicast-unicast communication mode. In multicast-unicast mode, the clock port sends initial Announce and Sync messages as multicast; if a slave device responds with a unicast message, the clock port sends the Delay-Resp message as unicast. |
| <b>interface</b>        | Specifies an interface on the device.   |
| <i>interface-type</i>   | The type of the interface.  |
| <i>interface-number</i> | The number of the interface.  |
| <b>negotiation</b>      | (Optional) Enables dynamic discovery of slave devices and their preferred format for sync interval and announce interval messages.  |

### Command Default

The IP version, transmission mode, and interface are not specified for exchanging timing packets.

### Command Modes

PTP clock port configuration (config-ptp-port)

### Command History

| Release  | Modification                 |
|----------|------------------------------|
| 15.0(1)S | This command was introduced. |

### Usage Guidelines

You can configure different transport values for each PTP clock port.

### Examples

The following example shows how to use the **transport ipv4** command:

```
Router# configure terminal
Router(config)# ptp clock ordinary domain 0
Router(config-ptp-clk)# clock-port masterport master
Router(config-ptp-port)# transport ipv4 unicast interface top5/2/2
Router(config-ptp-port)# end
```

## ■ transport ipv4 (PTP)

---

**Related Commands**

| <b>Command</b>    | <b>Description</b>                      |
|-------------------|---|
| <b>clock-port</b> | Specifies the mode of a PTP clock port. |

---

# ts16

To control the use of time slot 16 for data on a G.703 E1 interface or on an E1-G.703/G.704 serial port adapter, use the **ts16** command in interface configuration mode. To restore the default, use the **no** form of this command.

**ts16**

**no ts16**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Time slot 16 is used for signaling.

## Command Modes

Interface configuration

## Command History

| Release     | Modification  |
|-------------|---|
| 10.3        | This command was introduced.  |
| 11.1CA      | This command was implemented on the E1-G.703/G.704 serial port adapter and Cisco 7200 series routers.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

This command applies to Cisco 4000, 7000, 7200, and 7500 series routers. By default, time slot 16 is used for signaling. Use this command to configure time slot 16 to be used for data. When in framed mode, in order to get all possible subframes or time slots, you must use the **ts16** command.

## Examples

The following example shows how to configure time slot 16 to be used for data on a G.703 E1 interface or an E1-G.703/G.704 serial port adapter:

```
Router(config-if)# ts16
```

## Related Commands

| Command                  | Description   |
|--------------------------|---|
| <a href="#">timeslot</a> | Enables framed mode serial interface on a G.703 E1 port adapter, an FSIP, or an E1-G.703/G.704 serial port adapter. |

# ttb

To send a trace trail buffer in E3 g832 framing mode, use the **ttb** command in interface configuration mode. To disable the trace, use the **no** form of this command.

**ttb** {**country** | **rnode** | **serial** | **snode** | **soperator** | **x**} *line*

**no ttb** {**country** | **rnode** | **serial** | **snode** | **soperator** | **x**} *line*

## Syntax Description

|                              |                             |
|------------------------------|-----------------------------|
| <b>country</b> <i>line</i>   | Two-character country code. |
| <b>rnode</b> <i>line</i>     | Receive node code.          |
| <b>serial</b> <i>line</i>    | M.1400 Serial               |
| <b>snode</b> <i>line</i>     | Sending Town/Node ID code.  |
| <b>soperator</b> <i>line</i> | Sending Operator code.      |
| <b>x</b> <i>line</i>         | XO                          |

## Defaults

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release     | Modification   |
|-------------|--|
| 12.2S       | This command was introduced.   |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3 to support SPAs on the Cisco 7304 routers.   |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7600 series routers and Catalyst 6500 series switches. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S to support SPAs on the Cisco 12000 series routers.                                    |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.  |

## Usage Guidelines

Use the **ttb** command to attach a header that contains fields to send to a remote device.

## Examples

The following example starts a TTB message on the first port on slot 5.

```
Router# configure terminal
Router(config)# int serial 5/0/0
Router(config-if)# ttb country us
Router(config-if)# ttb snode 123
Router(config-if)# ttb rnode rn
Router(config-if)# ttb x 9
Router(config-if)# ttb serial 432
```

| <b>Related Commands</b> | <b>Command</b>                | <b>Description</b>              |
|-------------------------|-------------------------------|---------------------------------|
|                         | <b>show controller serial</b> | Displays controller statistics. |

# tug-2 e1

To create E1 controllers for a specified path under the Tributary Unit group type 2 (TUG-2), use the **tug-2 e1** command in controller configuration mode.

**tug-2** *tug-2-number* **e1** *e1-number*

## Syntax Description

|                     |   |
|---------------------|---|
| <i>tug-2-number</i> | Number, or range of numbers, from 1 to 7. To specify a range of TUG-2 numbers use a dash between the values, for example 1-5. An individual TUG-2 can be specified using a comma between values, for example 2,4. Default is 1. |
| <i>e1-number</i>    | Number, or range of numbers, from 1 to 3. To specify a range of E1 numbers use a dash between the values, for example 1-3. An individual E1 can be specified using a comma between values, for example 2,3.                     |

## Defaults

Default *tug-2-number* value for STM-1 card is 1.

## Command Modes

Controller configuration

## Command History

| Release   | Modification  |
|-----------|---|
| 12.0(14)S | This command was introduced.                                  |
| 12.2(15)T | This command was integrated into Cisco IOS Release 12.2(15)T. |

## Usage Guidelines

Use the **tug-2 e1** command to create an E1 controller with the following name format:

*slot/port.path/tug-2-number/e1-number*

Up to 21 controllers can be created for one path. Only one path can be selected at a time.

## Examples

The following example shows how to configure 15 E1 controllers on the second path of an STM-1 in physical slot number 2 of a Cisco AS5850 chassis:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-4
Router(config-ctrlr-tug3)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 5 e1 3
```

## Related Commands

| Command                      | Description                                   |
|------------------------------|---|
| <b>show controller sonet</b> | Displays information about SONET controllers. |

## tug-2 e1 bert pattern

To send a BER test pattern on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 bert pattern** command in configuration controller tug3 mode.

To send a BER test pattern on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 bert pattern** command in configuration controller au3 mode.

To stop the BER test, use the **no** form of this command.

```
tug-2 tug-2 number e1 e1-number [bert pattern pattern interval time]
```

```
[no] tug-2 tug-2 number e1 e1-number [bert pattern pattern interval time]
```

### Syntax Description

|                     |   |
|---------------------|---|
| <i>tug-2 number</i> | A number in the range of 1 to 7.  |
| <i>e1-number</i>    | A number in the range of 1 to 3.  |
| <i>pattern</i>      | <ul style="list-style-type: none"> <li>2<sup>11</sup>, pseudorandom test pattern (2048 bits long).</li> <li>2<sup>15</sup>, pseudorandom O.151 test pattern (32,768 bits long).</li> <li>2<sup>20</sup>-O153, 2<sup>20</sup>-1 O.153 test pattern.</li> <li>2<sup>20</sup>-QRSS, pseudorandom QRSS O.151 test pattern (1,048,575 bits long).</li> </ul> |
| <i>time</i>         | An interval in the range of 1 to 14,400 minutes.  |

### Defaults

No BER test is configured.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | Support for this command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.         |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

Use the **tug-2 e1 bert pattern** command in configuration controller tug3 command mode to send a BERT test on an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 bert pattern** command in configuration controller au3 command mode to send a BERT test on an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

To view the test results of a BER test pattern, use the **show controller sonet** command.

### Examples

The following example sends a BER 2<sup>11</sup> pseudorandom pattern through E1 line 1, that has been mapped to a TUG-3 on a Cisco 7500 series router, for five minutes:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 bert pattern 2^11 interval 5
```

The following example sends a BER 2<sup>15</sup> pseudorandom pattern through E1 line 1, that has been mapped to an AU-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch, for ten minutes:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 bert pattern 2^15 interval 10
```

### Related Commands

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |

## tug-2 e1 channel-group timeslots

To create a logical channel group on an E1 line that has been mapped to a TUG-3 or AU-3, use the **tug-2 e1 channel-group timeslots** command in the appropriate configuration mode. To remove a logical channel group, use **no** the form of this command.

```
tug-2 tug-2-number e1 e1-number [[channel-group channel-group-number] [timeslots
list-of-timeslots]]
```

```
no tug-2 tug-2-number e1 e1-number [[channel-group channel-group-number] [timeslots
list-of-timeslots]]
```

### Syntax Description

|                             |   |
|-----------------------------|---|
| <i>tug-2-number</i>         | A number in the range of 1 to 7.  |
| <i>e1-number</i>            | A number in the range of 1 to 3.  |
| <b>channel-group</b>        | Defines a logical channel group to be a channelized E1 line.                              |
| <i>channel-group-number</i> | (Optional) A number in the range of 0 to 30.  |
| <b>timeslots</b>            | (Optional) Creates the time slots that make up the E1 line.                               |
| <i>list-of-timeslots</i>    | (Optional) A number in the range of 1 to 31 or a combination of subranges within 1 to 31. |

### Defaults

No channel groups are configured on an E1 line.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | Support for this command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.         |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

This command is supported on the C 10000 router. It is used with the Cisco channelized STM-1 card. Use the **tug-2 e1 channel-group timeslots** command in configuration controller tug3 command mode to configure a logical channel group on an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 channel-group timeslots** command in configuration controller au3 command mode to configure a logical channel group on an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

### Examples

The following example configures logical channel group 15 on E1 1, that is mapped to a TUG-3, and assigns channelized time slots 1 to 5 and 20 to 23 on a Cisco 7500 series router:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 channel group 15 timeslots 1-5, 20-23
```

The following example configures logical channel group 10 on E1 1, that is mapped to an AU-3, and assigns channelized time slots 1 to 5 and 20 to 23 on a Cisco 7200 VXR router or a Catalyst 6000 family switch:

```
Router(config)# controller sonet 2/0
Router(config-controller)# framing sdh
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 channel group 10 timeslots 1-5, 20-23
```

### Related Commands

| Command                  | Description  |
|--------------------------|--|
| <b>aug mapping</b>       | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>              | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>        | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |
| <b>tug-2 e1 unframed</b> | Creates an unframed (clear channel) logical channel group on an E1 line.           |
| <b>tug-2 e1 framing</b>  | Specifies the type of framing used by the E1 lines.                                |

## tug-2 e1 clock source

To set the clock source on an E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 clock source** command in the appropriate configuration mode.

```
tug-2 tug-2-number e1 e1-number clock source {internal | line}
```

### Syntax Description

|                     |  |
|---------------------|--|
| <i>tug-2-number</i> | A number in the range of 1 to 7.               |
| <i>e1-number</i>    | A number in the range of 1 to 3.               |
| <b>internal</b>     | Specifies the PA-MC-STM-1 as the clock source. |
| <b>line</b>         | Specifies the E1 line as the clock source.     |

### Defaults

Clock source is configured from the E1 line.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

Use the **tug-2 e1 clock source** command in configuration controller tug3 command mode to configure the clock source of an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command. Use the **tug-2 e1 clock source** command in configuration controller au3 command mode to configure the clock source of an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

### Examples

The following example configures E1 line 1, that has been mapped to an AU-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch, to be the clock source:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 clock source line
```

The following example configures E1 line 1, that has been mapped to a TUG-3 on a Cisco 7500 series router to use the PA-MC-STM-1, as the clock source:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 clock source internal
```

#### Related Commands

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |

## tug-2 e1 framing

To set the type of framing used by an E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 framing** command in appropriate configuration mode. To disable the framing mode, use the **no** form of this command.

```
tug-2 tug-2-number e1 e1-number framing {crc4 | no-crc4}
```

```
no tug-2 tug-2-number e1 e1-number framing {crc4 | no-crc4}
```

### Syntax Description

|                     |  |
|---------------------|--|
| <i>tug-2-number</i> | A number in the range of 1 to 7.                 |
| <i>e1-number</i>    | A number in the range of 1 to 3.                 |
| <b>crc4</b>         | Specifies 4-bit cyclic redundancy check framing. |
| <b>no-crc4</b>      | Specifies basic framing.                         |

### Defaults

Framing format is crc4.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

Use the **tug-2 e1 framing** command in configuration controller tug3 command mode to configure the type of framing used by an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 framing** command in configuration controller au3 command mode to configure the type of framing used by an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

**Examples**

The following example configures E1 line 1, that has been mapped to a TUG-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch, to use crc4 framing:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 framing crc4
```

The following example configures E1 line 1, that has been mapped to an AU-3 on a Cisco 7500 series router, to use basic framing:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 framing no-crc4
```

**Related Commands**

| Command                  | Description  |
|--------------------------|--|
| <b>aug mapping</b>       | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>              | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>        | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |
| <b>tug-2 e1 unframed</b> | Creates an unframed (clear channel) logical channel group on an E1 line.           |

## tug-2 e1 loopback

To specify a loopback on an E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 loopback** command in appropriate configuration mode. To disable the loopback, use the **no** form of this command.

```
tug-2 tug-2-number e1 e1-number loopback {local | network {line | payload}}
```

```
[no] tug-2 tug-2-number e1 e1-number loopback {local | network {line | payload}}
```

### Syntax Description

|                                 |  |
|---------------------------------|--|
| <i>tug-2-number</i>             | A number in the range of 1 to 7.   |
| <i>e1-number</i>                | A number in the range of 1 to 3.   |
| <b>local</b>                    | Loops transmitted E1 output back to the router via the internal E1 framer.   |
| <b>network {line   payload}</b> | Sets the loopback toward the network before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ). |

### Defaults

No loopbacks are set on an E1 line.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

Use the **tug-2 e1 loopback** command in configuration controller tug3 command mode to specify a loopback for an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 loopback** command in configuration controller au3 command mode to specify a loopback for an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

**Examples**

The following example sets E1 line 1, that has been mapped to an AU-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch, into network line loopback:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 loopback network line
```

The following example sets E1 line 1, that has been mapped to a TUG-3 on a Cisco 7500 series router, into local loopback:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 loopback local
```

**Related Commands**

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |

## tug-2 e1 national bits

To set the national reserved bits on an E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 national bits** command in appropriate configuration mode.

```
tug-2 tug-2-number e1 e1-number national bits pattern
```

| Syntax Description  |  |   |
|---------------------|--|---|
| <i>tug-2 -umber</i> |  | A number in the range of 1 to 7.  |
| <i>e1-number</i>    |  | A number in the range of 1 to 3.  |
| <i>pattern</i>      |  | The national reserved bit pattern is a hexadecimal value in the range 0x0 to 0x1F (hexadecimal) or 0 to 31 (decimal). |

| Defaults |      |
|----------|------|
|          | 0x1F |

| Command Modes |   |
|---------------|---|
|               | Configuration controller tug3 (for an E1 line mapped to a TUG-3)<br>Configuration controller au3 (for an E1 line mapped to an AU-3) |

| Command History | Release     | Modification  |
|-----------------|-------------|---|
|                 | 12.0(14)S   | This command was introduced.  |
|                 | 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
|                 | 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
|                 | 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
|                 | 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
|                 | 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

| Usage Guidelines |   |
|------------------|---|
|                  | Use the <b>tug-2 e1 national bits</b> command in configuration controller tug3 command mode to configure the national reserved bits for an E1 line that has been mapped to a TUG-3 via the <b>aug mapping au-4</b> command. |

Use the **tug-2 e1 national bits** command in configuration controller au3 command mode to configure the national reserved bits for an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

| Examples |   |
|----------|---|
|          | The following example configures the national reserved bits for E1 line 1, that has been mapped to a TUG-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch, into a 0x0 hexadecimal pattern: |

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-4
```

```
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 national bits 0x0
```

The following example configures the national reserved bits for E1 line 1, that has been mapped to an AU-3 on a Cisco 7500 series router, into decimal pattern 0:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 national bits 0
```

#### Related Commands

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |

# tug-2 e1 shutdown

To shut down an individual E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 shutdown** command in appropriate configuration mode. To enable an individual E1 line, use the **no** form of this command.

**tug-2** *tug-2-number* **e1** *e1-number* **shutdown**

**[no]** **tug-2** *tug-2 number* **e1** *e1-number* **shutdown**

## Syntax Description

|                     |                                  |
|---------------------|----------------------------------|
| <i>tug-2-number</i> | A number in the range of 1 to 7. |
| <i>e1-number</i>    | A number in the range of 1 to 3. |

## Defaults

E1 lines are not shut down.

## Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

## Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

## Usage Guidelines

Use the **tug-2 e1 shutdown** command in configuration controller tug3 command mode to shut down an individual E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 shutdown** command in configuration controller au3 command mode to shut down an individual E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

## Examples

The following example shuts down E1 line 1 that has been mapped to an AU-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 shutdown
```

The following example shuts down E1 line 1, that has been mapped to a TUG-3 on a Cisco 7500 series router:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 shutdown
```

#### Related Commands

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |

## tug-2 e1 unframed

To create an E1 unframed (clear channel) logical channel group on an E1 line that has been mapped to a TUG-3 or an AU-3, use the **tug-2 e1 unframed** command in appropriate configuration mode. To remove a logical channel group, use the **no** form of this command.

**tug-2** *tug-2-number* **e1** *e1-number* **unframed**

**[no]** **tug-2** *tug-2-number* **e1** *e1-number* **unframed**

### Syntax Description

|                     |                                  |
|---------------------|----------------------------------|
| <i>tug-2 -umber</i> | A number in the range of 1 to 7. |
| <i>e1-number</i>    | A number in the range of 1 to 3. |

### Defaults

No default behavior or values.

### Command Modes

Configuration controller tug3 (for an E1 line mapped to a TUG-3)  
Configuration controller au3 (for an E1 line mapped to an AU-3)

### Command History

| Release     | Modification  |
|-------------|---|
| 12.0(14)S   | This command was introduced.  |
| 12.1(7)E    | This command was integrated into Cisco IOS Release 12.1(7)E. Support for this command was added for Cisco 7200 VXR routers and Catalyst 6000 family switches.                     |
| 12.2(8)T    | This command was integrated into Cisco IOS Release 12.2(8)T.  |
| 12.2(14)S   | This command was integrated into Cisco IOS Release 12.2(14)S.   |
| 12.2(33)SRA | This command was integrated into Cisco IOS Release 12.2(33)SRA.   |
| 12.2SX      | This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware. |

### Usage Guidelines

Use the **tug-2 e1 unframed** command in configuration controller tug3 command mode to create an unframed (clear channel) logical channel group on an E1 line that has been mapped to a TUG-3 via the **aug mapping au-4** command.

Use the **tug-2 e1 unframed** command in configuration controller au3 command mode to create an unframed (clear channel) logical channel group on an E1 line that has been mapped to an AU-3 via the **aug mapping au-3** command.

The channel group number for unframed E1 lines is always 0.

**Examples**

The following example configures an unframed logical channel group on E1 line 1 that has been mapped to a TUG-3 on a Cisco 7200 VXR router or a Catalyst 6000 family switch:

```
Router(config)# controller sonet 2/0
Router(config-controller)# aug mapping au-4
Router(config-controller)# au-4 1 tug-3 2
Router(config-ctrlr-tug3)# tug-2 4 e1 1 unframed
```

The following example configures an unframed logical channel group on E1 line 1 that has been mapped to an AU-3 on a Cisco 7500 series router:

```
Router(config)# controller sonet 2/0/0
Router(config-controller)# aug mapping au-3
Router(config-controller)# au-3 1
Router(config-ctrlr-au3)# tug-2 4 e1 1 unframed
```

**Related Commands**

| Command            | Description  |
|--------------------|--|
| <b>aug mapping</b> | Configures the AUG mapping mode of the PA-MC-STM-1.                                |
| <b>au-3</b>        | Configures a particular AU-3 of an E1 line that has been mapped to an AU-3.        |
| <b>au-4 tug-3</b>  | Specifies the AU-4 and TUG-3 number of an E1 line that has been mapped to an AU-4. |