Chapter 1

Configuring Channelized T3 Interfaces

Use the procedures described in this chapter to configure channelized T3 (CT3) interfaces on E-series routers.

This chapter contains the following sections:

Overview

Channelized T3 interfaces are supported by the modules described in this chapter. Configuration procedures for all channelized T3 physical interfaces are identical; however, the capabilities of the modules differ. Each port on a CT3 module offers a total bidirectional rate of 43.008 Mbps.

This section describes the features of channelized T3 interfaces. For information about configuring channelized T3 interfaces over SONET/SDH, see *Chapter 4, Configuring Channelized OCx/STMx Interfaces*.

MDL/FDL Support

Channelized T3 interfaces on some line modules support maintenance data link (MDL) messages at the T3 level and facilities data link (FDL) messages at the T1 level. For a list of the line modules that support MDL and FDL, see *ERX Module Guide*, *Appendix A*, *Module Protocol Support*.

You can use MDL and FDL messages to determine the status of a link and to display statistics for the remote end of a connection. MDL and FDL messages do not interfere with other data transmitted over the link.

MDL Standards

You can configure channelized T3 interfaces to send MDL messages that comply with ANSI T1.107a-1990 Standard for Telecommunications—Digital Hierarchy – Supplement to Formats Specification (August 1990). MDL messages identify a particular link by sharing common codes for data such as the equipment identifier, line identifier, frame identifier, and unit.

FDL Standards

Similarly, you can configure T1 channels to send FDL messages that comply with either or both of the following standards:

- ANSI T1.403-1989 Standard for Telecommunications—Network and Customer Installation Interfaces – DS1 Metallic Interface – Robbed-bit Signaling State Definitions (1989)

  FDL messages that comply with the ANSI standard identify a particular link by sharing common codes for data such as the equipment identifier, line identifier, frame identifier, and unit.

- AT&T Technical Reference 54016—Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format (September 1989)

  FDL messages that comply with the AT&T standard identify a particular link by sharing performance data and do not use common codes for data such as the equipment identifier, line identifier, frame identifier, and unit.

Timeout of Received MDL and FDL Messages

When a line module receives an MDL or FDL message string, it stores the strings for a period of 10 seconds after the last message was received. If the line module does not receive another message of any type containing the same string within 10 seconds, it erases the local copy of the message.

Most MDL and FDL message strings are common to all three types of messages that can be transmitted: path identifications, idle signals, and test signals. Certain message strings, however, are unique to a particular message type. Table 4 briefly describes each MDL/FDL message string and indicates (with a a) the types of messages in which it can be sent.

Table 4: MDL and FDL Message Strings and Message Types

Message String	Description	Path Message	Idle Signal Message	Test Signal Message
eic	Equipment identification code	a	a	a
fic	Frame identification code	a	a	a
generator	Generator number	–	–	a
lic	Line identification code	a	a	a

Table 4: MDL and FDL Message Strings and Message Types (continued)

Message String	Description	Path Message	Idle Signal Message	Test Signal Message
pfi	Facility identification code	a	–	–
port	Equipment port number	–	a	–
unit	Unit identification code	a	a	a

As long as another message of any type containing the same string is received within 10 seconds, the line module retains the local copy of the message string and resets the 10-second timer for that string.

For example, if a line module receives an MDL or FDL test signal message containing an eic string, and then receives an idle signal message within 10 seconds that also contains an eic string, it retains the local copy of the most recent eic string received and resets the 10-second timer for that message. However, if 10 seconds pass without the line module receiving a path identification, test signal, or idle signal message containing an eic string, the line module erases the local copy of the eic message string.

For message strings that are unique to a particular message type, the line module must receive another message of the same type containing this string in order to retain the local copy of the string and reset the timer. For example, if the line module receives a test signal message containing a generator string and does not receive another test signal message within 10 seconds, it will erase the local copy of the generator string.

Frequency of FDL Path Messages

E-series routers transmit FDL path identifier messages every second. This behavior complies with the ANSI T1.403 specification (see *References* on page 7 for more information) and is consistent with the MDL implementation for E-series routers.

Higher-Level Protocols

See *ERX Module Guide*, *Appendix A*, *Module Protocol Support* for information about the higher-level protocols that channelized T3 interfaces support.

Platform Considerations

You can configure channelized T3 interfaces on the following E-series routers:

- ERX-1440 router
- ERX-1410 router
- ERX-710 router
- ERX-705 router
- ERX-310 router

NOTE: The E120 router and the E320 router do not support configuration of channelized T3 interfaces.

For detailed information about the modules that support channelized T3 interfaces on ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the protocols and applications that channelized T3 modules support.

CT3/T3-F0 Line Modules and CT3/T3 12 I/O Modules

ERX-7xx models, ERX-14xx models, and the ERX-310 router support the CT3/T3-F0 line module and CT3/T3 12 I/O module. The CT3/T3-F0 line module and CT3/T3 12 I/O module support both channelized and unchannelized T3 operation. You can configure a mixture of channelized and unchannelized ports on these modules. For information about configuring unchannelized T3 ports, see *Chapter 2, Configuring T3 and E3 Interfaces*.

ERX-14xx models support up to 12 CT3/T3-F0 line modules and 12 CT3/T3 12 I/O modules, ERX-7xx models support up to 5 CT3/T3-F0 line modules and 5 CT3/T3 12 I/O modules, and the ERX-310 router supports up to two CT3/T3-F0 line modules and two CT3/T3 12 I/O modules. Each CT3/T3 12 I/O module has 12 physical T3 (DS3) ports. Each port uses two SMB connectors: one for the transmit (TX) connection and one for the receive (RX) connection.

CT3/T3-F0 line modules and CT3/T3 12 I/O modules support the following in channelized mode:

- 28 asynchronous T1 (DS1) channels per T3 port
- 24 DS0 channels (64-Kbps) per T1 interface
- 166 DS0 channels per T3 port

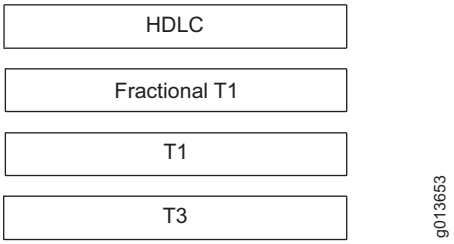
Exchanging Modules

If you replace a CT3/T3 line module and a CT3/T3 I/O module with a CT3/T3-F0 line module and a CT3/T3 12 I/O module or vice versa, you must erase the configuration of the existing modules. See **slot accept** in *JUNOSe System Basics Configuration Guide, Chapter 6, Managing Modules*.

Interface Stack

Figure 1 shows the stack for a channelized T3 interface. To configure a channelized T3 interface, configure a T3 controller, followed by a T1 channel, and then a fractional T1 channel. Finally, you must configure a High-Speed Data Link Control (HDLC) data channel on the interface.

Figure 1: Stack for Channelized T3 Interface



For more information about the layers in a channelized T3 interface, see *Numbering Scheme* on page 5.

NOTE: For a detailed description of interface types and specifiers, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*. For information about interfaces, see *JUNOSe System Basics Configuration Guide, Chapter 1, Planning Your Network*.

Numbering Scheme

This section describes how to identify each layer in a channelized T3 interface stack.

T3 Controllers

A T3 controller on a channelized T3 interface is identified using the *slot/port* format where:

- *slot*—Number of the slot in which the line module resides in the chassis.

  In ERX-7xx models, line module slots are numbered 2-6; slots 0 and 1 are reserved for SRP modules. In ERX-14xx models, line module slots are numbered 0–5 and 8–13; slots 6 and 7 are reserved for SRP modules. In an ERX-310 router, line module slots are numbered 0–2; slot 0 is reserved for the SRP module.

- *port*—Number of the port on the I/O module. On a CT3/T3 12 I/O module, ports are numbered 0–11.

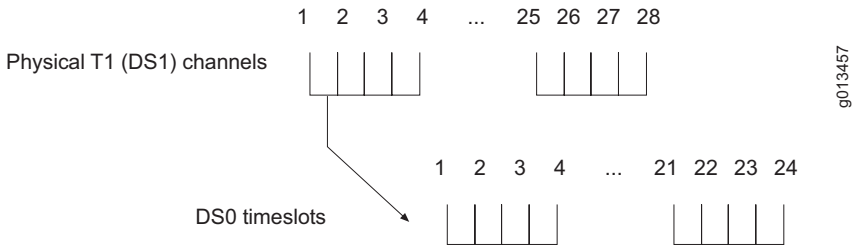
For information about installing line modules and I/O modules in ERX routers, see *ERX Hardware Guide, Chapter 4, Installing Modules*.

T1 Channels

A T3 line consists of 28 T1 channels (or data streams). A T1 channel is identified by its number in the range 1–28.

Each T1 channel is an aggregate of 24 DS0 timeslots, as shown in Figure 2. To configure an entire T1 line, assign 24 timeslots to each channel.

Figure 2: T1 Channels and DS0 Timeslots on a T3 Line



Fractional T1

Fractional T1 is a portion of a T1 line. To configure fractional T1 on a channelized T3 interface, you assign a range of DS0 timeslots to a T1 channel and *subchannel*. A subchannel is group of timeslots. Subchannel numbers range from 1–24 and do not necessarily correspond to DS0 timeslots. The subchannel number identifies a fractional T1 channel.

For example, you might make the assignments for subchannels 1–6 as listed in Table 5.

Table 5: Sample T1 Subchannel/Timeslot Assignments

Subchannel	DS0 Timeslot
1	1–4, 10, 22–24
2	5–6
3	7–9
4	11
5	12–15, 20–21
6	16–19

To configure the subchannels listed in Table 5, use the following command to specify the T3 controller in chassis slot 0, port 1.

```
host1(config)#controller t3 0/1
```

Then assign the timeslots to channel 1, subchannel 1.

```
host1(config-controll)#t1 1/1 timeslots 1-4,10,22-24
host1(config-controll)#t1 1/2 timeslots 5-6
host1(config-controll)#t1 1/3 timeslots 7-9
host1(config-controll)#t1 1/4 timeslots 11
host1(config-controll)#t1 1/5 timeslots 12-15,20-21
host1(config-controll)#t1 1/6 timeslots 16-19
```

HDLC Channels

To identify an HDLC channel or the complete channelized T3 interface, use the format *slot*/*port*:*T1 channel*/*subchannel*. Refer to the preceding sections for definitions of the variables.

References

For more information about channelized T3 interfaces, consult the following resources:

- RFC 1661—The Point-to-Point Protocol (PPP) (July 1994)
- RFC 2495—Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types (January 1999)
- RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999)
- ANSI T1.107a-1990 Standard for Telecommunications—Digital Hierarchy – Supplement to Formats Specification (August 1990)
- ANSI T1.403-1989 Standard for Telecommunications—Network and Customer Installation Interfaces – DS1 Metallic Interface – Robbed-bit Signaling State Definitions (1989)
- AT&T Technical Reference 54016—Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format (September 1989)

For more information about bit error rate test (BERT) patterns, see:

- ITU O.151—Error performance measuring equipment operating at the primary rate and above (October 1992)
- ITU O.153—Basic parameters for the measurement of error performance at bit rates below the primary rate (October 1992)
- T1M1.3 Working Group—A Technical Report on Test Patterns for DS1 Circuits (November 1993)
- ANSI T1.404-1994 Standard for Telecommunications—Network-to-Customer – DS3 Metallic Interface Specification (1994)

Before You Configure an Interface

Before you configure a channelized T3 interface, verify the following:

- You have installed the line module and the I/O module correctly.
- Each configured line module is able to transmit data to and receive data from your switch connections.

For more information about installing line modules and I/O modules, see the *ERX Hardware Guide*.

You should also have the following information available:

- Framing type, clock source, cable length, and the loopback method for each T3 controller
- Framing type and clock source for each T1 channel
- Timeslot mapping and line speed for each fractional T1 channel
- HDLC channel information, such as data inversion information, cyclic redundancy check (CRC) type, idle character, maximum transmission unit (MTU), and maximum receive unit (MRU)

Configuration Tasks

To configure a channelized T3 interface:

1. Configure a T3 controller.
2. (Optional) Configure MDL settings.
3. (Optional) Configure other settings for the interface.
4. Configure T1 channels and subchannels.
5. Configure HDLC channels.

Configuring a T3 Controller

To configure a T3 controller:

1. Access Controller Configuration mode by specifying the T3 controller.

   host1(config)#**controller t3 0/1**

2. Enable the T3 controller.

   T3 controllers are disabled by default.

   host1(config-controll)#**no shutdown**

controller t3

- Use to specify a T3 controller in *slot/port* format.
  - *slot*—Number of the slot in which the line module resides in the chassis
  - *port*—Number of the port on the I/O module
- Example

  host1(config)#**controller t3 0/1**

- There is no **no** version.

shutdown

- Use to disable a T3 controller.
- The T3 interface is disabled by default.
- Example

  host1(config-controll)#**no shutdown**

- Use the **no** version to restart a disabled interface.

Configuring MDL Messages

You can configure a channelized T3 interface to send MDL messages. MDL messages are supported only when T3 framing uses C-bit parity, the default setting.

To configure a channelized T3 interface to send MDL messages:

1. Specify a T3 interface.

   host1(config)#**controller t3 8/0**

2. (Optional) Configure the interface to operate in an MDL carrier environment.

   host1(config-controll)#**mdl carrier**

3. Specify the MDL messages.

   host1(config-controll)#**mdl string eic "ERX-1410"**
   host1(config-controll)#**mdl string fic "FG786"**
   host1(config-controll)#**mdl string lic "Bldg 10"**
   host1(config-controll)#**mdl string pfi "Site 25"**
   host1(config-controll)#**mdl string port 0800**
   host1(config-controll)#**mdl string unit 080001**

4. Enable transmission of MDL messages.

   host1(config-controll)#**mdl transmit path-id**
   host1(config-controll)#**mdl transmit idle-signal**
   host1(config-controll)#**mdl transmit test-signal**

mdl carrier

- Use to specify that an interface is used in the carrier environment.
- Example

  host1(config-controll)#**mdl carrier**

- Use the **no** version to restore the default situation, in which the interface does not operate in the carrier environment.

mdl string

- Use to specify an MDL message.
- Example

  host1(config-controll)#**mdl string port 0800**

- Use the **no** version to restore the default value to the specified MDL message or to all MDL messages.

mdl transmit

- Use to enable transmission of MDL messages.
- Specify the keyword **path-id** to transmit path identifications every second.
- Specify the keyword **idle-signal** to send idle signals every second.
- Specify the keyword **test-signal** to transmit test signals every second.
- Example

  host1(config-controll)#**mdl transmit test-signal**

- Use the **no** version to disable transmission of the specified MDL message or all MDL messages.

Other Optional Tasks

The following configuration tasks are optional when you configure a T3 controller:

- Specify a cable length.
- Change the clock source.
- Change the framing format.
- Enable or disable SNMP link status processing.
- Assign a text description or an alias to the interface.

cablelength

- Use to adjust the transmit power appropriate to the length of the T3 cable.
- Specify a cable length in the range 1–450 feet.
- The router supports two transmit powers, one for a cable length 1–225 feet and another for a cable length 226–450 feet. Therefore, it is not necessary for you to know the exact length of your cable. You only need to know if the cable length is greater than 225 feet. For example, if your cable size exceeds 225 feet, specify any number greater than 225 (and less than 451).
- Example

  host1(config-controll)#**cablelength 300**

- Use the **no** version to restore the default value, 0 feet.

clock source

- Use to configure the transmit clock source for a T3 controller.
- Configure one end of the line as **internal** and the other end as **line**.
- Specify the keyword **line** to use a transmit clock recovered from the line's receive data stream.
- Specify the keywords **internal module** to use the line module's internal clock as the transmit clock.
- Specify the keywords **internal chassis** to use the router's clock as the transmit clock.
- Example

  host1(config-controll)#**clock source internal module**

- Use the **no** version to revert to the default, **line**.

description

- Use to assign a text description or an alias to a channelized T3 interface.
- You can use this command to help you identify the interface and keep track of interface connections.
- The description or alias can be a maximum of 80 characters.
- Use the **show controllers t3 | t1** command to display the text description.
- Example

  host1(config-controll)#**description toronto ct3 interface**

- Use the **no** version to remove the text description or alias.

framing

- Use to configure the framing format for a T3 controller.
- Specify either **m23** or **c-bit** framing.
- Choose the framing format that is compatible with the framing format of the Telco network device at the other end of the line.
- Select **c-bit** framing if you intend to configure MDL messages.

- Example

  host1(config-controll)#**framing c-bit**

- Use the **no** version to restore the default value, **c-bit**.

snmp trap link-status

- Use to enable SNMP link status processing on a T3 controller.
- Example

  host1(config-controll)#**snmp trap link-status**

- Use the **no** version to disable SNMP link status processing.

Configuring T1 Channels

To configure T1 channels and subchannels:

1. From Global Configuration mode, specify the T3 controller in slot 0, port 1.

   host1(config)#**controller t3 0/1**

2. Assign a range of timeslots to a channel and subchannel.

   For example, assign the following range of timeslots: 1, 3–8, and 10 to channel 2, subchannel 1. Timeslots 2, 9, and 11–24 are available for other subchannels.

   host1(config-controll)#**t1 2/1 timeslots 1,3-8,10**

Optional Tasks

The T1 channel configuration commands enable you to specify options for a single channel, multiple individual channels, ranges of channels, or any combination of the three types of specifications. For example:

host1(config-controll)#**t1 2,4,6-15,20-25 clock source line**

The following configuration tasks are optional when you configure T1 channels:

- Disable T1 channels.
- Change the clock source.
- Assign a text description or an alias to the interface.
- Change the framing format.
- Enable or disable SNMP link status processing.
- Configure FDL messages.

controller t3

- Use to specify a T3 controller in *slot/port* format.
  - *slot*—Number of the slot in which the line module resides in the chassis
  - *port*—Number of the port on the I/O module
- Example

  host1(config)#**controller t3 0/1**

- There is no **no** version.

t1 clock source

- Use to configure the transmit clock source for T1 channels.
- The router supports **internal** and **line** clocking.
  - If you specify internal clocking, the interface transmits data using the line module or the chassis as the internal clock. You must specify one of the following for internal clocking:
    - **module**—Specifies internal clock is from the line module itself
    - **chassis**—Specifies internal clock is from the configured router clock
  - If you specify line clocking, the interface transmits data with a clock recovered from the line's receive data stream.
- Example

  host1(config-controll)#**t1 2,4-10 clock source line**

- Use the **no** version to restore the default value, **line**.

t1 description

- Use to assign a text description or an alias to T1 or fractional T1 channels on a CT3 module.
- You can use this command to help you identify the interface and keep track of interface connections.
- The description or alias can be a maximum of 80 characters.
- Use the **show controllers t3** | **t1** command to display the text description.
- Examples

  host1(config-controll)#**t1 2 description london t1 interface**
  host1(config-controll)#**t1 2/1 description london first ft1 interface**

- Use the **no** version to remove the text description or alias.

t1 framing

- Use to configure the framing format for T1 channels.
- You must specify either **esf** (extended superframe) or **sf** (superframe) framing.
- The framing format you choose must be compatible with the framing format at the other end of the line.

- Example

  host1(config-controll)#**t1 2 framing sf**

- Use the **no** version to restore the default value, **esf**.

t1 shutdown

- Use to disable T1 channels or a subchannel.
- To disable channels or a subchannel, specify one or more T1 channels or a subchannel in *channel* or *channel/subchannel* format.
  - *channel*—One or more T1 channels, or a range of channels in the range 1–28
  - *subchannel*—Subchannel from 1–24
- The T1 interface is enabled by default.
- Example

  host1(config-controll)#**t1 4-15,18,21,25-27 shutdown**

- Use the **no** version to restart a disabled interface.

t1 snmp trap link-status

- Use to enable SNMP link status processing on T1 channels.
- To enable or disable SNMP on an interface, specify T1 channels or subchannel in *channel* or *channel/subchannel* format.
  - *channel*—One or more T1 channels, or a range of channels in the range 1–28
  - *subchannel*—Subchannel from 1–24
- Example

  host1(config-controll)#**t1 2 snmp trap link-status**

- Use the **no** version to disable SNMP link status processing.

t1 timeslots

- Use to assign a range of DS0 timeslots to a subchannel as a single data stream.
- To configure a subchannel, specify a T1 channel in *channel/subchannel* format and a range of timeslots.
  - *channel*—T1 channel in the range 1–28
  - *subchannel*—Number from 1–24
  - dash—Represents a range of timeslots; a comma separates timeslots. For example, 1-10, 15-18 assigns timeslots 1–10 and 15–18.

- Example

  host1(config-controll)#**t1 2/1 timeslots 1,3-8,10**

- You can specify a line speed that applies to all DS0 timeslots assigned to a subchannel. The default line speed is 64 Kbps.
- Use the **no** version to delete the fractional T1 circuit.

Configuring FDL Messages

To configure T1 channels to send FDL messages:

1. Specify a T3 interface.

   host1(config)#**controller t3 8/0**

2. Specify the standard for transmission of FDL messages on both ends of the T1 connection.

   host1(config-controll)#**t1 1 fdl ansi**

3. (Optional) Configure one or more T1 channels to operate in an FDL carrier environment.

   host1(config-controll)#**t1 1 fdl carrier**

4. (ANSI signals) Specify the FDL messages.

   host1(config-controll)#**t1 1 fdl string eic "ERX-1410"**
   host1(config-controll)#**t1 1 fdl string fic "HY0019"**
   host1(config-controll)#**t1 1 fdl string lic "Bldg 10"**
   host1(config-controll)#**t1 1 fdl string unit 080001**
   host1(config-controll)#**t1 1 fdl string pfi "Site 25"**
   host1(config-controll)#**t1 1 fdl string port 0800**
   host1(config-controll)#**t1 1 fdl string generator "Test generator"**

5. Enable transmission of FDL messages.

   host1(config-controll)#**t1 1 fdl transmit path-id**

6. (Optional) Specify that the router should generate yellow alarms for the T1 channels.

   host1(config-controll)#**t1 1 yellow generate**

7. (Optional) Specify that the router should detect yellow alarms for the T1 channels.

   host1(config-controll)#**t1 1 yellow detect**

t1 fdl

- Use to specify the FDL standard for the channel.
- Specify one or more T1 channels or a range of channels in the range 1–28.
- Specify the keyword **ansi** to support the ANSI FDL standard (see *References* on page 7).
- Specify the keyword **att** to support the AT&T FDL standard (see *References* on page 7).
- Specify the keyword **all** to support both the ANSI and AT&T standards
- Specify the keyword **none** to remove the current FDL mode settings
- You can configure a different standard on each T1 channel.
- Example

  host1(config-controll)#**t1 14-20,24 fdl att**

- Use the **no** version to restore the default, none.

t1 fdl carrier

- Use to specify that T1 channels are used in the carrier environment.
- Example

  host1(config-controll)#**t1 6 fdl carrier**

- Use the **no** version to restore the default situation, in which the T1 channels do not operate in the carrier environment.

t1 fdl string

- Use to specify an FDL message as defined in the ANSI T1.403 specification.

NOTE: The router sends these FDL messages only if you have issued the **t1 fdl** command with the **ansi** or **all** keyword and then issued the **t1 fdl transmit** command.

- Example

  host1(config-controll)#**t1 6 fdl string eic "ERX-1440"**

- Use the **no** version to restore the default value to the specified FDL message or to all FDL messages.

t1 fdl transmit

- Use to configure the router to send the specified type of FDL message.
- By default, the router sends only FDL performance data messages.

NOTE: The router sends FDL messages specified with the **t1 fdl string** command only if you have issued the **t1 fdl** command with the **ansi** or **all** keyword. If you specified the **att** keyword with the **t1 fdl** command, the router sends only performance data.

- Specify the keyword **path-id** to transmit path identifications every second.
- Specify the keyword **idle-signal** to send idle signals every second.
- Specify the keyword **test-signal** to transmit test signals every second.
- Example

  host1(config-controll)#**t1 28 fdl transmit path-id**

- Use the **no** version to disable transmission of the specified FDL message or all FDL messages.

t1 yellow detect

- Use to detect yellow alarm for T1 channels.
- By default, T1 channels detect alarms.
- Example

  host1(config-controll)#**t1 6,10-14,19 yellow detect**

- Use the **no** version to disable detection of yellow alarms.

t1 yellow generate

- Use to generate a yellow alarm when a loss of frame or loss of signal condition is detected on T1 channels.
- By default, T1 channels generate alarms.
- Example

  host1(config-controll)#**t1 6,10-14,19 yellow generate**

- Use the **no** version to disable generation of yellow alarms.

Configuring an HDLC Channel

You must configure an HDLC channel for each group of fractional T1 lines and each full T1 line.

To configure an HDLC channel, specify a serial interface (for example, HDLC channel in slot 0, port 1, channel 1, subchannel 5).

host1(config)#**interface serial 0/1:1/5**

Optional Tasks

The following configuration tasks are optional when you configure an HDLC channel on a channelized T3 interface:

- Configure the CRC.
- Specify the HDLC idle character.
- Enable data inversion on the interface.
- Set the time interval for monitoring bit and packet rates.

- Set the MRU.
- Set the MTU.
- Assign a text description or an alias to the serial interface.

crc

- Use to configure the size of the CRC.
- The CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data.
- 16 and 32 indicate the number of bits per frame that are used to calculate the frame check sequence (FCS). Both the sender and receiver must use the same setting.
- Use a 32-bit CRC when transmitting long streams at fast rates and to provide better ongoing error detection.
- Example

  host1(config-if)#**crc 32**

- Use the **no** version to restore the default value, 16.

idle-character

- Use to configure the HDLC idle character.
- The idle character is sent between HDLC packets.
- Specify one of the following idle characters:
  - **flags—**Sets the idle character to 0x7E
  - **marks**—Sets the idle character to 0xFF
- Example

  host1(config-if)#**idle-character marks**

- Use the **no** version to restore the default value, 0x7E (flags).

interface serial

- Use to configure a serial interface in the *slot/port:channel/subchannel* format.
  - *slot*—Number of the slot in which the line module resides in the chassis
  - *port*—Number of the port on the I/O module
  - *channel*—T1 channel
  - *subchannel*—Subchannel in the range 1–24
- Example

  host1(config)#**interface serial 0/1:1/5**

- Use the **no** version to disable the interface.

invert data

- Use to enable data stream inversion for the interface.
- Enable data stream inversion only if it is turned on at the other end of the line.
- Example

  host1(config-if)#**invert data**

- Use the **no** version to disable data inversion.

load-interval

- Use to set the time interval at which the router calculates bit and packet rate counters.
- You can choose a multiple of 30 seconds, in the range 30–300 seconds.
- Example

  host1(config-if)#**load-interval 90**

- Use the **no** version to restore the default value, 300 seconds.

mru

- Use to configure the MRU size for the interface.
- Specify a value in the range 4–9996 bytes.
- You should coordinate this value with the network administrator on the other end of the line.
- If you configure a different MRU value in higher-level protocols, such as IP, the router uses the lower value. This can produce unexpected behavior in your network.
- Example

  host1(config-if)#**mru 1600**

- Use the **no** version to restore the default, 1600 bytes.

mtu

- Use to configure the MTU size for the interface.
- Specify a value in the range 4–9996 bytes.
- You should coordinate this value with the network administrator on the other end of the line.
- If you configure a different MTU value in higher-level protocols, such as IP, the router uses the lower value. This can produce unexpected behavior in your network.
- Example

  host1(config-if)#**mtu 1600**

- Use the **no** version to restore the default, 1600 bytes.

serial description

- Use to assign a text description or an alias to a serial HDLC interface.
- You can use this command to help you identify the interface and keep track of interface connections.
- The description or alias can be a maximum of 80 characters.
- Use the **show interfaces serial** command to display the text description.
- Example

  host1(config-if)#**serial description ottawa012 hdlc channel**

- Use the **no** version to remove the text description or alias.

Configuration Example

The following example illustrates how to configure the layers on a channelized T3 interface:

```
host1(config)#controller t3 0/1
host1(config-controll)#no shutdown
host1(config-controll)#framing c-bit
host1(config-controll)#clock source internal module
host1(config-controll)#cablelength 220
host1(config-controll)#t1 2 framing esf
lihost1(config-controll)#t1 2 clock source internal
host1(config-controll)#t1 2 loopback local
host1(config-controll)#t1 2/1 timeslots 1,3-8,10
host1(config-controll)#exit
host1(config)#interface serial 0/1:2/1
host1(config-if)#invert data
host1(config-controll)#exit
```

Testing Interfaces

If you want to run loopback tests or bit error rate tests on channelized T3 interfaces, you must enable testing at the T3 or T1 layer. See *Interface Stack* on page 5 for a description of the layers.

For a list of the modules that support bit error rate tests (BERTs) and remote loopback, see *ERX Module Guide*, *Appendix A*, *Module Protocol Support*.

NOTE: BERTs are supported on frame-based channelized T3 interfaces, with the exception of the CT3/T3 line module used with the 3-port CT3/T3 I/O module.

Testing at the T3 Layer

To enable testing at the T3 layer:

1. Change the clock source to internal.

   host1(config-controll)#**clock source internal module**

2. Configure one of the following tests:

   - Set the loopback to **local** to test the line without connecting to the network.

     host1(config-controll)#**loopback local**

   - Set the loopback to **network** to test the line connected to the network.

     host1(config-controll)#**loopback network line**

3. (Optional) Configure one of the following tests for remote loopback:

   - Set the loopback to **remote** to request that a remote device connected on a T3 interface enter into a loopback.

     host1(config-controll)#**loopback remote**

   - Configure the T3 interface to enable or disable the ability to enter into a loopback initiated by a remote device, as follows:

     - Issue the **equipment customer loopback** command to enable the router to enter into loopback when it receives an appropriate signal from the remote device.

       host1(config-controll)#**equipment customer loopback**

     - Issue the **equipment network loopback** command to disable the ability to enter into loopback initiated by a remote device.

       host1(config-controll)#**equipment network loopback**

4. Configure the line to run bit error rate tests.

   host1(config-controll)#**bert pattern 2^15 time 20**

bert

- Use to enable bit error rate tests using the specified pattern on a channelized T3 interface.
- Unlike other configuration commands, **bert** is not stored in NVRAM.
- Specify one of the following test patterns:
  - **0s**—Repetitive test pattern of all zeros, 00000...
  - **1s**—Repetitive test pattern of all ones, 11111...
  - **2^9**—Pseudorandom test pattern, 511 bits in length
  - **2^11**—Pseudorandom test pattern, 2047 bits in length

- **2^15**—Pseudorandom test pattern, 32,767 bits in length
- **2^20**—Pseudorandom test pattern, 1,048,575 bits in length
- **2^20-QRSS**—Pseudorandom QRSS test pattern, 1,048,575 bits in length
- **2^23**—Pseudorandom test pattern, 8,388,607 bits in length
- **alt-0-1**—Repetitive alternating test pattern of zeros and ones, 01010101...

- Specify the duration of the test in the range 1–1440 minutes.
- Example

  host1(config-controll)#**bert pattern 2^15 interval 20**

- Use the **no** version to stop the test that is running.

equipment loopback

- Use to enable or disable the router's ability to enter into a loopback initiated by a remote device connected on a channelized T3 interface.

NOTE: Remote loopback is available only on channelized T3 interfaces configured to use C-bit framing.

- Specify one of the following loopback options:
  - **customer**—Enables the router to enter into loopback when it receives an appropriate signal from the remote interface
  - **network**—Disables the router's ability to enter into loopback when it receives an appropriate signal from the remote interface
- Examples

  host1(config-controll)#**equipment customer loopback**
  host1(config-controll)#**equipment network loopback**

- Use the **no** version to disable the router's ability to be placed in loopback by the remote device.

loopback

- Use to configure a loopback.
- Specify one of the following loopback options.
  - **local**—Loops the data back toward the router; on supported line modules, also sends an alarm indication signal (AIS) out toward the network
  - **network**—Loops the data toward the network before the framer processes the data
  - **payload**—Loops the data toward the network after the framer processes the data

- **remote**—Sends a far end alarm code in the C-bit framing, as defined in ANSI T1.404, to notify the remote end to activate or (when you use the **no** version) deactivate the line loopback

NOTE: Remote loopback is available only on channelized T3 interfaces configured to use C-bit framing.

- Example

  host1(config-controll)#**loopback local**

- Use the **no** version to restore the default configuration, no loopback.

Testing at the T1 Layer

The T1 channel testing commands enable you to specify testing parameters for a single channel, multiple individual channels, ranges of channels, or any combination of the three types of specifications. For example:

host1(config-controll)#**t1 3,6-15,22,25-27 loopback local**

To enable testing at the T1 layer:

1. Configure one of the following loopback tests.

   - Set the loopback to **local** to test the line without connecting to the network.

     host1(config-controll)#**t1 2 loopback local**

   - Set the loopback to **network** to test the line connected to the network.

     host1(config-controll)#**t1 2 loopback network line**

   - Set the loopback to **remote-loopback** to enable acceptance of loopback commands issued from a remote router.

     host1(config-controll)#**t1 2 remote-loopback**

2. Configure the line to run bit error rate tests.

   host1(config-controll)#**t1 2 bert pattern 2^11 time 10 unframed**

t1 bert

- Use to enable bit error rate tests using the specified pattern on a T1 interface.
- Unlike other configuration commands, **bert** is not stored in NVRAM.
- Specify one of the following test patterns:

NOTE: The CT3/T3-F0 line module supports only the **2^11**, **2^15**, and **2^20-O153** options.

- **0s**—Repetitive test pattern of all zeros, 00000...
- **1s**—Repetitive test pattern of all ones, 11111...

- **2^11**—Pseudorandom test pattern, 2047 bits in length
- **2^15**—Pseudorandom test pattern, 32,767 bits in length
- **2^20-O153**—Pseudorandom test pattern, 1,048,575 bits in length
- **2^20-QRSS**—Pseudorandom QRSS test pattern, 1,048,575 bits in length
- **2^23**—Pseudorandom test pattern, 8,388,607 bits in length
- **alt-0-1**—Repetitive alternating test pattern of zeros and ones, 01010101...

NOTE: The BERT patterns supported when testing the T1 layer vary depending on the line module and I/O module assembly you are using.

- Specify the duration of the test in the range 1–1440 minutes.
- Optionally, specify the unframed keyword to overwrite the framing bits.
- Example

  host1(config-controll)#**t1 2 bert pattern 2^11 interval 10 unframed**

- Use the **no** version to stop the test that is running.

t1 loopback

- Use to configure a loopback.
- Specify one of the following options:

NOTE: The CT3/T3-F0 line module does not support the **remote line inband** option.

- **local**—Loops the router output data back toward the router at the T1 framer; on supported line modules, also sends an alarm indication signal (AIS) out toward the network
- **network { line | payload }**—Specify the **line** keyword to loop the data back toward the network before the T1 framer and automatically set a local loopback at the HDLC controllers. Specify the **payload** keyword to loop the payload data back toward the network at the T1 framer and automatically set a local loopback at the HDLC controllers.
- **remote line fdl ansi**—Sends a repeating 16-bit ESF data link code word (00001110 11111111) to the remote end requesting that it enter into a network line loopback. Specify the **ansi** keyword to enable the remote line facilities data link (FDL) ANSI bit loopback on the T1 channel, according to the ANSI T1.403 Specification.
- **remote line fdl bellcore**—Sends a repeating 16-bit ESF data link code word (00010010 11111111) to the remote end requesting that it enter into a network line loopback. Specify the **bellcore** keyword to enable the remote line facilities data link (FDL) Bellcore bit loopback on the T1 channel, per the Bellcore TR-TSY-000312 Specification.

- **remote line inband—**Sends a repeating 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback
- **remote payload** [**fdl**] [**ansi**]—Sends a repeating, 16-bit, ESF data link code word (00010100 11111111) to the remote end requesting that it enter into a network payload loopback. Enables the remote payload facilities data link (FDL) ANSI bit loopback on the T1 channel. You can optionally specify **fdl** and **ansi**.

- If you do not specify an option, the router will set a local loopback for the channel.
- Example

  host1(config-controll)#**t1 2 loopback local**

- Use the **no** version to deactivate loopback. If you specify the **remote** keyword, the **no** version sends the 16-bit ESF data link code word or inband pattern to deactivate the loopback at the remote end based on the last activate request sent to the remote end. If you do not specify the **remote** keyword, the **no** version clears the local loopback configuration.

t1 remote-loopback

- Use to enable the acceptance of loopback commands issued from a remote router.
- Example

  host1(config-controll)#**t1 2 remote-loopback**

- Use the **no** version to restore the factory default, which is to reject loopback commands issued from a remote router.

Monitoring Interfaces

From User Exec mode, use the following **show** commands to monitor and display the T3 interface, T1 interface, and HDLC serial data channel information:

- Monitor channelized T3 interfaces on a slot and port.

  host1#**show controllers t3 0/1**

- Monitor a T1 interface.

  host1#**show controllers t3 0/1:1**

- Monitor fractional T1 subchannels.

  host1#**show controllers t3 ft1**

- Monitor the state of the serial interface or a slot/port.

  host1#**show controllers t3 serial 0/1**

Setting a Baseline

You can set a statistics baseline for serial interfaces, subinterfaces, and/or circuits using the **baseline interface serial** command. Use the **delta** keyword with the **show** commands to display statistics with the baseline subtracted.

Displaying Counters and Time Intervals

Counters and time intervals are MIB statistics, which are defined in the following specifications:

- RFC 2495—Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types (January 1999)
- RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999)

The **show controllers t3** ***slot/port*** **all** command displays the following information:

- T3 current interval counters—Counters for the current interval
- T3 last interval counters—Counters for the previous interval
- T3 24-hour total counters—Cumulative counters for the last 24 hours or since the interface was started
- The last 24 hours of 15-minute reporting intervals (96 intervals)

The **show controllers t3** ***slot/port:*****channel all** command displays the following information:

- T1 current interval counters—Counters for the current interval
- T1 last interval counters—Counters for the previous interval
- T1 24-hour total counters—Cumulative counters for the last 24 hours or since the interface was started
- The last 24 hours of 15-minute reporting intervals (96 intervals)

Output Filtering

You can use the output filtering feature of the **show** command to include or exclude lines of output based on a text string you specify. See *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*, for details.

baseline interface serial

- Use to set a statistics baseline for serial interfaces.
- The router implements the baseline by reading and storing the statistics at the time the baseline is set and subtracting this baseline whenever baseline-relative statistics are retrieved.
- Use the optional **delta** keyword with the **show interfaces serial** commands to view the baseline statistics.

- Example

  host1#**baseline interface serial 2/0:1/1**

- There is no **no** version.

show controllers t3 | t1

- Use to display data and MIB statistics for a T3 interface or a T1 channel.
- Use the **brief** keyword to display the administrative and operational status of all configured T3 interfaces, or to display abbreviated information for the specified T3 interface.
- For definitions of the MIB statistics for a T3 interface, see RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999).
- For definitions of the MIB statistics for a T1 channel, see RFC 2495—Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types (January 1999).
- Field descriptions for T3 interface (T1 channel not specified)
  - Description—Text description or alias if configured for the interface
  - ifAdminStatus—One of the following administrative states of the interface:
    - ifAdminUp—Interface is administratively enabled
    - ifAdminDown—Interface is administratively disabled
    - ifAdminTesting—Interface is administratively configured in a testing state
  - snmp trap link-status—*S*tatus of SNMP trapping (enabled or disabled)
  - alarms detected—One of the following T3 alarms:
    - No alarm present—No alarms present on the line
    - Rcv RAI Failure—Remote device is sending a far end alarm failure
    - Xmt RAI Failure—Local device is sending a far end alarm failure
    - Rcv AIS—Remote device is sending an alarm indication signal (AIS)
    - Xmt AIS—Local device is sending an AIS
    - Rcv LOF—Loss of one or more frames from the remote end
    - Rcv LOS—Loss of signal at the local end
    - Undefined line status—Indicates that the line is in an undefined state

NOTE: The alarms detected field does not appear for interfaces that you disabled in the software.

  - framing—Type of framing format
  - line code—Type of line code format
  - clock source—Type of clock source
  - cable length—Cable length, in feet

- Loopback—State of loopback for the controller: enabled or disabled. If loopback is enabled, one of the following states is displayed:
  - Diagnostic—Loops the data back toward the router and sends an AIS toward the network
  - Payload—Loops the data toward the network after the framer has processed the data
  - Line—Loops the data toward the network before the data reaches the framer
- MDL Transmit Path—Status of path transmission: active or not active
- MDL Transmit Test-Signal—Status of test signal: active or not active
- MDL Transmit Idle-Signal—Status of idle signal: active or not active
- Equipment Identification Code—eic string for MDL
- Line Identification Code—lic string for MDL
- Frame Identification Code—fic string for MDL
- Unit Identification Code—unit string for MDL
- Facility Identification Code—pfi string for MDL
- Port Code—port string for MDL
- Generator Number—generator string for MDL
- BERT test—Number of current test and total number of tests
  - Test interval—Length of the BERT test
  - status—Sync (controller is synchronized with remote device) or NoSync (controller is not synchronized with remote device)
  - Sync count—Number of times the pattern detector synchronized with the incoming data pattern
  - Received bit count—Number of bits received
  - Error bit count—Number of bits with errors
- Number of valid intervals—Number of 15-minute intervals since the line module was last powered on or reset
- Time elapse in current interval—Reported in 15-second intervals
- P-bit errored seconds—Number of errored seconds encountered by a T3 in the current interval
- P-bit severely errored seconds—Number of severely errored seconds encountered by a T3 in the current interval
- Severely errored frame seconds—Number of severely errored framing seconds encountered by a T3 in the current interval
- Unavailable seconds—Number of unavailable seconds encountered by a T3 in the current interval
- Line code violations—Number of line code violations encountered by a T3 in the current interval
- P-bit coding violations—Number of coding violations encountered by a T3 in the current interval

- Line errored seconds—Number of line errored seconds encountered by a T3 in the current interval
- C-bit coding violations—Number of C-bit coding violations encountered by a T3 in the current interval
- C-bit errored seconds—Number of C-bit errored seconds encountered by a T3 in the current interval
- C-bit severely errored seconds—Number of C-bit severely errored seconds encountered by a T3 in the current interval

- Example 1—In this example, a T3 interface is specified.

```
host1#show controllers t3 2/0

DS3 2/0
Description: toronto ct3 interface
ifAdminStatus = ifAdminDown
snmp trap link-status = enabled
No alarms detected
Framing is C-BIT, Line Code is B3ZS, Clock Source is Line
Cable Length is 0 ft
Loopback Disabled
MDL Transmit Path is not active
MDL Transmit Test-Signal is active
MDL Transmit Idle-Signal is not active
Equipment Identification Code is ERX-1400
Line Identification Code is Bldg 10
Frame Identification Code is null string
Unit Identification Code is 080001
Facility Identification Code is Site 25
Port Code is Port 0800
Generator Number is null string
Number of valid interval - 96
Time elapse in current interval - 861
Ds3 Current Interval Counters
P-bit errored seconds          = 0
P-bit severely errored seconds = 0
Severely errored frame seconds = 0
Unavailable seconds            = 0
Line code violations           = 0
P-bit coding violations        = 0
Line errored seconds           = 0
C-bit coding violations        = 0
C-bit errored seconds          = 0
C-bit severely errored seconds = 0
Ds3 Last Interval Counters
P-bit errored seconds          = 0
P-bit severely errored seconds = 0
Severely errored frame seconds = 0
Unavailable seconds            = 0
Line code violations           = 0
P-bit coding violations        = 0
Line errored seconds           = 0
C-bit coding violations        = 0
C-bit errored seconds          = 0
C-bit severely errored seconds = 0
Ds3 24 Hour Total Counters
P-bit errored seconds          = 0
P-bit severely errored seconds = 0
Severely errored frame seconds = 0
Unavailable seconds            = 0
Line code violations           = 0
```

```
P-bit coding violations        = 0
Line errored seconds           = 0
C-bit coding violations        = 0
C-bit errored seconds          = 0
C-bit severely errored seconds = 0
```

- Example 2—In this example, the **brief** keyword is specified.

```
host1#show controllers t3 brief

Interfaces                  ifAdminStatus   OperationalStatus
5/0(channelized)               up              up
5/1(channelized)               up              up
5/2(channelized)               up              down
5/3(channelized)               down            down
5/4(channelized)               down            down
5/5(channelized)               down            down
5/6(channelized)               down            down
5/7(channelized)               down            down
5/8(channelized)               down            down
5/9(channelized)               down            down
5/10(channelized)              down            down
5/11(channelized)              down            down
3/0(channelized)               down            down
3/1(channelized)               down            down
3/2(channelized)               down            down
4/0:1/1(unchannelized)         up              down
4/2:1/1(channelized)           up              lowerLayerDown
```

- Field descriptions for a T1 channel
  - Description—Text description or alias if configured for the interface
  - ifOperStatus—Physical state of the interface:
    - ifOperDown—Interface is not functioning
    - ifOperLowerLayerDown—Lower layer in the interface stack is not functioning
    - ifOperNotPresent—Module has been removed from the chassis
    - ifOperTesting—Interface is being tested
    - ifOperUp—Interface is functioning
  - Yellow Alarm detection—Status of yellow alarm detection: active or not active
  - Yellow Alarm generation—Status of yellow alarm generation: active or not active
  - snmp trap link-status—Status of SNMP trapping (enabled or disabled)
  - Framing—Type of framing format
  - Clock source—Type of clock source
  - Loopback state—Type of loopback (if enabled) and status: enabled or disabled
  - Last remote loopback request sent—None or deactivate
  - FDL—Status of FDL: standard configured or not configured
  - FDL Transmit Path—Status of path transmission: active or not active

- FDL Transmit Idle-Signal—Status of idle signal: active or not active
- FDL Transmit Test-Signal—Status of test signal: active or not active
- Equipment Identification Code—eic string for FDL
- Line Identification Code—lic string for FDL
- Frame Identification Code—fic string for FDL
- Unit Identification Code—unit string for FDL
- Facility Identification Code—pfi string for FDL
- Port Code—port string for FDL
- Generator Number—generator string for FDL
- BERT test—Number of current test and total number of tests
  - Test interval—Length of the BERT test
  - status—Sync (controller is synchronized with remote device) or NoSync (controller is not synchronized with remote device)
  - Sync count—Number of times the pattern detector synchronized with the incoming data pattern
  - Received bit count—Number of bits received
  - Error bit count—Number of bits with errors
- Number of valid intervals—Number of 15-minute intervals since the line module was last powered on or reset
- Time elapse in current interval—Statistics are reported in 15-minute intervals
- Errored seconds—Number of errored seconds encountered by a T1 in the current interval
- Severely errored seconds—Number of severely errored seconds encountered by a T1 in the current interval
- Severely errored frame seconds—Number of severely errored framing seconds encountered by a T1 in the current interval
- Unavailable seconds—Number of unavailable seconds encountered by a T1 in the current interval
- Clock slip seconds—Number of clock slips encountered by a T1 in the current interval
- Path code violations—Number of coding violations encountered by a T1 in the current interval
- Line errored seconds—Number of line errored seconds encountered by a T1 in the current interval
- Bursty errored seconds—Number of bursty errored seconds encountered by a T1 in the current interval
- Degraded minutes—Number of minutes that a T1 line is degraded
- Line code violations—Number of line code violations encountered by a T1 in the current interval

- Example 1—In this example, a T1 channel and the **brief** keyword are specified.

```
host1#show controllers t1 2/0:1 brief

DS3 2/0:1
ifOperStatus = ifOperUp
Yellow Alarm detection is active
Yellow Alarm generation is active
snmp trap link-status = disabled
Framing is D4, Line Code is Ami, Clock Source is Internal - Module
Allocated Ds0 time slot map = 0x0
Loopback Enabled - Diagnostic
Last Remote Loopback Request Sent - Deactivate
FDL is not configured
FDL Transmit Path-Id is not active
FDL Transmit Test-Signal is not active
FDL Transmit Idle-Signal is not active
Equipment Identification Code is the null string
Line Identification Code is the null string
Frame Identification Code is the null string
Unit Identification Code is the null string
Facility Identification Code is the null string
Port Code is the null string
Generator Number is the null string
BERT test - 2 in 23
Test Interval 1 minute(s), Complete
Sync count = 1
Received bit count = 92148912
Error bit count = 17
Number of valid interval - 90
Time elapse in current interval - 580
```

- Example 2—In this example, the **brief** keyword is specified for all T1 channels.

```
host1#show controllers t1 brief

Interfaces                  ifAdminStatus   OperationalStatus
5/0:1(framed)                    up              lowerLayerDown
5/0:2(framed)                    up              lowerLayerDown
5/0:3(framed)                    up              lowerLayerDown
5/0:4(framed)                    up              lowerLayerDown
5/0:5(framed)                    up              lowerLayerDown
5/0:6(framed)                    up              lowerLayerDown
...
5/2:26(framed)                   up              lowerLayerDown
5/2:27(framed)                   up              lowerLayerDown
5/2:28(framed)                   up              lowerLayerDown
```

- Example 3—In this example, a T1 channel is specified.

```
host1#show controllers t1 1/0:1

DS1 1/0:1
Description: toronto t1 channel
ifOperStatus = ifOperUp
Yellow Alarm detection is active
Yellow Alarm generation is active
snmp trap link-status = disabled
Framing is D4, Line Code is Ami, Clock Source is Internal - Module
Allocated Ds0 time slot map = 0x0
Last Remote Loopback Request Sent - Deactivate
FDL is not configured
FDL Transmit Path-Id is not active
FDL Transmit Test-Signal is not active
```

```
FDL Transmit Idle-Signal is not active
Equipment Identification Code is the null string
Line Identification Code is the null string
Frame Identification Code is the null string
Unit Identification Code is the null string
Facility Identification Code is the null string
Port Code is the null string
Generator Number is the null string
BERT test - 2 in 23
Test Interval 1 minute(s), Complete
Sync count = 1
Received bit count = 92148912
Error bit count = 17
Number of valid interval - 90
Time elapse in current interval - 580

Ds1 Current Interval Counters
Errored seconds = 0
Severely errored second = 0
Severely errored frame seconds = 0
Unavailable seconds = 0
Clock slip seconds = 0
Path code violations = 0
Line errored seconds = 0
Bursty errored seconds = 0
Degraded minutes = 0
Line code violations = 0

Ds1 Last Interval Counters
Errored seconds = 0
Severely errored second = 0
Severely errored frame seconds = 0
Unavailable seconds = 0
Clock slip seconds = 0
Path code violations = 0
Line errored seconds = 0
Bursty errored seconds = 0
Degraded minutes = 0
Line code violations = 0

Ds1 24 Hour Total Counters
Errored seconds = 25
Severely errored second = 7
Severely errored frame seconds = 25
Unavailable seconds = 0
Clock slip seconds = 6
Path code violations = 18
Line errored seconds = 0
Bursty errored seconds = 0
Degraded minutes = 0
Line code violations = 0
```

show controllers t3 ft1

- Use to display information about the state of a fractional T1 subchannel.
- Field descriptions
  - Description—Text description or alias if configured for the interface
  - ifOperStatus—Physical status of the interface
    - ifOperUp—Interface is functioning

        - ifOperTesting—Interface is being tested
        - ifOperNotPresent—Module has been removed from the chassis
        - ifOperDown—Interface is not functioning
      - snmp trap link-status of SNMP trapping (enabled or disabled)
      - Ds0 time slot map—Fractional T1 subchannel
      - Ds0 mode—Base data rate: either Nx56 or Nx64
    - The **ft1** option displays the state of the serial interface.
    - The optional *slot* and *port* parameters display information about a specific slot and port.
    - Example

```
host1#show controllers t3 ft1

Ft1 Interface at 2/0:1/1
Description: toronto ft1 interface
ifOperStatus = ifOperLowerLayerDown
snmp trap link-status = disabled
Ds0 time slot map = 0x1
Ds0 mode = Nx64
```

show controllers t3 remote

- Use to display MIB statistics for the remote end of a channelized T3 interface configured for MDL or for the remote end of a T1 channel configured for FDL.
- Specify the **all** option to display detailed information for all 15-minute intervals.
- For definitions of the MIB statistics for a T3 interface, see RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999).
- For definitions of the MIB statistics for a T1 channel, see RFC 2495—Definitions of Managed Objects for the DS1, E1, DS2 and E2 Interface Types (January 1999).
- Field descriptions for a T3 interface
  - Far End MDL Carrier bit—Status of MDL configuration on remote device connected to T3 interface
    - set—MDL is configured for carrier mode
    - not set—MDL is not configured for carrier mode
  - Far End Equipment Identification Code—eic string sent by remote device for MDL
  - Far End Line Identification Code—lic string sent by remote device for MDL
  - Far End Frame Identification Code—fic string sent by remote device for MDL
  - Far End Unit Identification Code—unit string sent by remote device for MDL
  - Far End Facility Identification Code—pfi string sent by remote device for MDL

- Far End Generator Number—generator string sent by remote device for MDL
- Far End Port Number—port string sent by remote device for MDL
- Number of valid intervals—Number of 15-minute intervals since the line module was last powered on or reset
- Time elapse in current interval—Number of seconds that have passed in the 15-minute (900-second) interval
- C-bit errored seconds—Number of C-bit errored seconds encountered by a T3 in the current interval
- C-bit severely errored seconds—Number of C-bit severely errored seconds encountered by a T3 in the current interval
- C-bit coding violations—Number of C-bit coding violations encountered by a T3 in the current interval
- Unavailable seconds—Number of unavailable seconds encountered by a T3 in the current interval
- Invalid seconds—Number of seconds when statistics were not collected

- Example—In this example, a T3 interface is specified.

```
host1#show controllers t3 5/0 remote

Far End MDL Carrier bit is not set
Far End Equipment Identification Code is the null string
Far End Line Identification Code is the null string
Far End Frame Identification Code is the null string
Far End Unit Identification Code is the null string
Far End Facility Identification Code is the null string
Far End Generator Number is the null string
Far End Port Number is the null string

Number of valid interval - 3
Time elapse in current interval - 756

Ds3 Current Interval Counters
C-bit errored seconds          = 0
C-bit severely errored seconds = 0
C-bit coding violations        = 0
Unavailable seconds            = 0
Invalid seconds                = 0
Ds3 Last Interval Counters
C-bit errored seconds          = 0
C-bit severely errored seconds = 0
C-bit coding violations        = 0
Unavailable seconds            = 0
Invalid seconds                = 0

Ds3 24 Hour Total Counters
C-bit errored seconds          = 1
C-bit severely errored seconds = 1
C-bit coding violations        = 330
Unavailable seconds            = 0
Invalid seconds                = 0
```

- Field descriptions for a T1 channel
  - DS1—Identifier of T1 channel
  - Number of valid intervals—Number of 15-minute intervals since the line module was last powered on or reset
  - Time elapse in current interval—Number of seconds that have passed in the 15-minute (900-second) interval
  - Far End FDL Carrier bit—Status of FDL configuration on remote device connected to T1 channel
    - set—FDL is configured for carrier mode
    - not set—FDL is not configured for carrier mode
  - Far End Equipment Identification Code—eic string sent by remote device for FDL
  - Far End Line Identification Code—lic string sent by remote device for FDL
  - Far End Frame Identification Code—fic string sent by remote device for FDL
  - Far End Unit Identification Code—unit string sent by remote device for FDL
  - Far End Facility Identification Code—pfi string sent by remote device for FDL
  - Far End Generator Number—generator string sent by remote device for FDL
  - Far End Port Number—port string sent by remote device for FDL
  - Errored seconds—Number of errored seconds encountered by a T1 in the current interval
  - Severely errored seconds—Number of severely errored seconds encountered by a T1 in the current interval
  - Severely errored frame seconds—Number of severely errored framing seconds encountered by a T1 in the current interval
  - Unavailable seconds—Number of unavailable seconds encountered by a T1 in the current interval
  - Clock slip seconds—Number of clock slips encountered by a T1 in the current interval
  - Path code violations—Number of coding violations encountered by a T1 in the current interval
  - Line errored seconds—Number of line errored seconds encountered by a T1 in the current interval
  - Bursty errored seconds—Number of bursty errored seconds encountered by a T1 in the current interval
  - Degraded minutes—Number of minutes that a T1 line is degraded
- Example—In this example, a T1 channel is specified.

```
host1#show controllers t1 10/1:1 remote

DS1 10/1:1
Number of valid interval - 0
```

```
Time elapse in current interval - 0

Far End FDL Carrier bit is not set
Far End Equipment Identification Code is the null string
Far End Line Identification Code is the null string
Far End Frame Identification Code is the null string
Far End Unit Identification Code is the null string
Far End Facility Identification Code is the null string
Far End Port Number is the null string
Far End Generator Number is the null string

DS1 Current Interval Counters
Errored seconds                 = 0
Severely errored second         = 0
Severely errored frame seconds  = 0
Unavailable seconds             = 0
Clock slip seconds              = 0
Path code violations            = 0
Line errored seconds            = 0
Bursty errored seconds          = 0
Degraded minutes                = 0

DS1 24 Hour Total Counters
Errored seconds                 = 0
Severely errored second         = 0
Severely errored frame seconds  = 0
Unavailable seconds             = 0
Clock slip seconds              = 0
Path code violations            = 0
Line errored seconds            = 0
Bursty errored seconds          = 0
Degraded minutes                = 0
```

show controllers t3 serial

- Use to display the state of the serial interface.
- Field descriptions
  - Description—Text description or alias if configured for the interface
  - ifOperStatus—Physical status of the interface
    - ifOperUp—Interface is functioning
    - ifOperTesting—Interface is being tested
    - ifOperNotPresent—Module has been removed from the chassis
    - ifOperDown—Interface is not functioning
  - snmp trap link-status of SNMP trapping (enabled or disabled)
  - Crc type checking—Size of the cyclic redundancy check (CRC)
  - Hdlc mru—Current size of the maximum receive unit (MRU)
  - Hdlc mtu—Current size of the maximum transmission unit (MTU)
  - Hdlc interface speed—Current line speed of the interface
  - Ds0 time slot map—T1 subchannel
  - Invert data disabled—Status of the data inversion feature
- The optional *slot* and *port* parameters display information about a specific slot and port.

- Use the *slot/port:channel/subchannel* option to display information about a specific interface.
- Example

```
host1#show controllers t3 serial

Serial Interface at 2/0:1/1
ifOperStatus = ifOperLowerLayerDown
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 9996
Hdlc mtu = 9996
Hdlc interface speed = 64000
Ds0 time slot map = 0x1
Invert data disabled, Ds0 mode = Nx64

Serial Interface at 2/1:1/1
ifOperStatus = ifOperLowerLayerDown
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 9996
Hdlc mtu = 9996
Hdlc interface speed = 64000
Ds0 time slot map = 0x1
Invert data disabled, Ds0 mode = Nx64

Found 2 Serial Interfaces
```

show interfaces serial

- Use to display information about the serial interfaces you specify.
- Field descriptions
  - Fractional Interface—Location of a channelized T1 or E1 interface
  - Description—Text description or alias if configured for the interface
  - ifOperStatus—Administrative status of the interface
    - ifOperUp—Interface is functioning
    - ifOperTesting—Interface is being tested
    - ifOperNotPresent—Module has been removed from the chassis
    - ifOperDown—Interface is not functioning
    - ifOperLowerDown—Lower layer in the interface stack is not functioning
  - snmp trap link-status—Enabled or disabled
  - Encapsulation—Layer 2 encapsulation display; options include: ppp, frame-relay ietf, mlppp, mlframe-relay ietf, hdlc
  - Crc type checking—Size of the CRC
  - Hdlc mru—Current size of the MRU
  - Hdlc mtu—Current size of the MTU
  - Hdlc interface speed—Current line speed of the interface
  - Hdlc idle-character—Current idle character
  - Invert data disabled—Status of the data inversion feature

- Ds0 time slot map—Channelized T1 or E1 channel group
- Ds0 mode—Nx56 or Nx64
- 5 minute input rate—Data rates based on the traffic received in the last five minutes
- 5 minute output rate—Data rates based on the traffic sent in the last five minutes
- Interface statistics
  - Packets received—Number of packets received on the interface
  - Bytes received—Number of bytes received on the interface
  - Errored packets received—Number of packets with errors received on the interface
  - Packets sent—Number of packets sent on the interface
  - Bytes sent—Number of bytes sent on the interface
- Errored packets sent—Number of packets with errors sent from the interface
- Example

```
host1#show interfaces serial 0/1:2 brief

Serial Interface at 0/1:2
Description: ottawa012 hdlc channel
ifOperStatus = ifOperUp
snmp trap link-status = disabled
Encapsulation hdlc
Crc type checking - CRC16
Hdlc mru = 1600
Hdlc mtu = 1600
Hdlc interface speed = 768000
Hdlc idle-character marks
Invert data disabled
Ds0 time slot map = 0xfff
Ds0 mode = Nx64

Serial Interface at 13/0:2
Description: ottawa013 hdlc channel
ifOperStatus = ifOperUp
snmp trap link-status = disabled
Crc type checking - CRC16
Hdlc mru = 1600
Hdlc mtu = 1600
Hdlc interface speed = 768000
Invert data disabled
Ds0 time slot map = 0xfff000
Ds0 mode = Nx64

Found 2 Serial Interfaces
```