Chapter 2

Configuring T3 and E3 Interfaces

Use the procedures described in this chapter to configure T3 and E3 interfaces on E-series routers.

This chapter contains the following sections:

Overview

Unchannelized T3 (DS3) and E3 interfaces are supported by the modules described in this chapter.

Throughout this chapter, interfaces on modules that provide ATM support are called T3/E3 ATM interfaces. Similarly, interfaces on modules that provide frame (HDLC) support are called T3/E3 frame interfaces.

This section describes the features of unchannelized T3/E3 interfaces. For information about configuring unchannelized T3 (DS3) interfaces over SONET/SDH, see *Chapter 4, Configuring Channelized OCx/STMx Interfaces*.

MDL Support

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

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

MDL Standards

You can configure 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.

Timeout of Received MDL Messages

When a line module receives an MDL 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 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 6 briefly describes each MDL message string and indicates (with a a) the types of messages in which it can be sent.

Table 6: MDL 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
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 test signal message containing an eic string, and then receives a 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.

Higher-Level Protocols

See *ERX Module Guide*, *Appendix A*, *Module Protocol Support* for information about the higher-level protocols that T3 and E3 interfaces support.

Platform Considerations

You can configure unchannelized T3 and unchannelized E3 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 unchannelized T3/E3 interfaces.

For detailed information about the modules that support unchannelized T3/E3 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 unchannelized T3/E3 modules support.

COCX-F3 Line Modules and Associated I/O Modules

ERX-7xx models, ERX-14xx models, and the ERX-310 router support the COCX-F3 line modules and associated I/O modules.

ERX-14xx models support up to twelve COCX-F3 line modules and twelve corresponding I/O modules, ERX-7xx models support up to five of these line modules and five corresponding I/O modules, and the ERX-310 router supports up to two of these line modules and two corresponding I/O modules. There are twelve physical T3/E3 (DS3) ports per I/O module. Each port uses two SMB connectors: one for the transmit (TX) connection and one for the receive (RX) connection.

COCX-F3 line modules and associated I/O modules support the following:

- Clocking
- Redundancy
- Frame Relay logical interface support
- Unique IP interface support for each PPP or Frame Relay PVC interface
- HDLC
- Fractional T3 (T3 only)
- Line speeds of 45 Mbps (T3) and 34 Mbps (E3)

OCx/STMx/DS3-ATM Line Modules and 4xDs3 ATM I/O Modules

ERX-7xx models, ERX-14xx models, and the ERX-310 router support the OCx/STMx/DS3-ATM line modules and 4xDS3 ATM I/O modules.

ERX-14xx models support up to twelve OCx/STMx/DS3-ATM line modules and twelve 4xDS3 ATM I/O modules, the ERX-7xx models support up to five of these line modules and five corresponding I/O modules, and the ERX-310 router supports up to two of these line modules and two corresponding I/O modules. There are four physical T3 (DS3) ports per I/O module. Each port uses two BNC connectors: one for the transmit (TX) connection and one for the receive (RX) connection.

OCx/STMx/DS3-ATM line modules pair with 4xDS3 ATM I/O modules to support the following:

- Clocking
- Redundancy
- Frame Relay logical interface support
- Unique IP interface support for each PPP or Frame Relay PVC interface
- Line speeds of 45 Mbps

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 modules and CT3/T3 12 I/O modules.

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. To configure these modules to support unchannelized T3 operation, issue the **no channelized** command. (See *Configuration Tasks* on page 47.) For information about configuring channelized T3 ports, see *Chapter 1, Configuring Channelized T3 Interfaces*.

ERX-14xx models support up to twelve CT3/T3-F0 line modules and twelve CT3/T3 12 I/O modules, ERX-7xx models support up to five of these line modules and five corresponding I/O modules, and the ERX-310 router supports up to two of these line modules and two corresponding I/O modules. There are twelve physical T3 (DS3) ports per I/O module. 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 I/O modules to support the following:

- Clocking
- Redundancy
- Frame Relay logical interface support
- Unique IP interface support for each PPP or Frame Relay PVC interface
- Line speeds of 45 Mbps

Interface Stack

Figure 3 on page 45 shows the stack for T3 ATM interfaces. Figure 4 on page 45 shows the stack for T3 frame and E3 frame interfaces.

To configure a T3 ATM interface, first configure a T3 controller. To configure ATM parameters, see *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM.*

To configure a T3 frame or E3 frame interface, first configure a T3 or E3 controller, and then configure a High-Speed Data Link Control (HDLC) data channel on the controller.

Figure 3: Stack for T3 ATM Interfaces

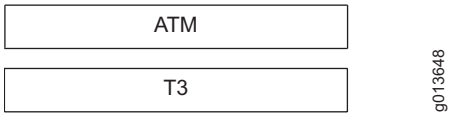
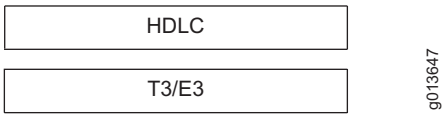


Figure 4: Stack for T3 Frame and E3 Frame Interfaces



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 T3 and E3 interfaces.

A T3/E3 controller on an ATM or frame 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 the ERX-310 router, the 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 the CT3/T3 12 I/O and E3-12 FRAME I/O modules, 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*.

References

For more information about T3 and E3 interfaces, consult the following resources:

- RFC 1661—The Point-to-Point Protocol (PPP) (July 1994)

- RFC 2364—PPP over AAL5 (July 1998)

- RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999)

- RFC 2516—Method for Transmitting PPP over Ethernet (PPPoE) (February 1998)

- RFC 2684—Multiprotocol Encapsulation over ATM Adaptation Layer 5 (September 1999)

- ANSI T1.107a-1990 Standard for Telecommunications—Digital Hierarchy – Supplement to Formats Specification (August 1990)

For more information about bit error 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)

- ANSI T1.404-1994 Standard for Telecommunications—Network-to-Customer – DS3 Metallic Interface Specification (1994)

Before You Configure an Interface

Before you configure a T3 or an E3 interface, verify that you have installed the line modules and I/O modules correctly.

You need the following information for each T3 controller:

- Framing type
- Clock source
- Cable length

You also need HDLC channel information, such as data inversion information, for interfaces that support HDLC.

Configuration Tasks

Configure a T3 interface by entering Global Configuration mode and performing the following tasks:

1. Configure a T3 controller.
2. (Optional) Configure MDL settings.
3. (Optional) Configure other settings for the interface.
4. Configure HDLC channels for T3 frame and E3 frame controllers.
5. (Optional) Configure fractional T3 for T3 frame controllers.
6. Use the appropriate **show** commands to verify your configuration.

E3 interface configuration tasks are identical to T3 interface configuration tasks, except that the CLI commands contain **e3** instead of **t3.**

For example, you configure an E3 controller with the **controller e3** command instead of the **controller t3** command.

Configuring a T3 or an E3 Controller

To configure a T3 or an E3 controller:

1. Select the T3 or E3 controller from Global Configuration mode.

   host1(config)#**controller t3 3/2**

2. Enable the T3 or E3 controller.

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

3. (CT3/T3-F0 line module only) Enable unchannelized operation for this controller.

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

channelized

- Use to enable channelized T3 operation on an interface of a CT3/T3-F0 line module.
- Example

  host1(config-controll)#**channelized**

- Use the **no** version to enable unchannelized T3 operation on an interface for a CT3/T3-F0 line module.

controller e3

- Use to specify an E3 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 e3 3/2**

- There is no **no** version.

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 or an E3 controller.
- The T3 or E3 interface is disabled by default.
- Example

  host1(config-controll)#**shutdown**

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

Configuring MDL Messages

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

To configure a 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**

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.

Optional Tasks

The following configuration tasks are optional for T3 and E3 interfaces:

- Specify the cable length (T3 only).
- Change the clock source.
- Change the framing format.
- Enable cell scrambling (ATM interfaces only).
- Assign a text description or an alias to the interface.

cablelength

- Use to adjust the transmit power appropriate to the length of a T3 cable.
- Specify a cable length in the range 1–450 feet.
- The router supports two transmit powers, one for a cable length between 1–225 feet and another for a cable length between 226–450 feet. Therefore, it is not necessary to know the exact size of your cable. You only need to know if the cable size 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, 0 feet.

clock source

- Use to configure the transmit clock source for a T3 or E3 line.
- Use a transmit clock on the line's receive data stream, except in rare cases such as back-to-back router tests. When performing back-to-back router tests, configure one end of the line as **internal** and the other end as **line**.
- Specify the keyword **line** to use a transmit clock on the line's receive data stream.
- Specify the keywords **internal module** to use the line module's internal clock.
- Specify the keywords **internal chassis** to use the router's 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 T3 or E3 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** or **show controllers e3** command to display the text description.
- Example

  host1(config-controll)#**description westford t3 interface**

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

ds3-scramble

- Use to enable cell scrambling in a T3 ATM interface.
- Example

  host1(config-controll)#**ds3-scramble**

- Use the **no** version to turn off cell scrambling on the interface.

e3-scramble

- Use to enable cell scrambling in an E3 ATM interface.
- Example

  host1(config-controll)#**e3-scramble**

- Use the **no** version to turn off cell scrambling on the interface.

framing

- Use to configure the framing format for a T3 or E3 line.
- For a T3 line, you must specify one of the following:
  - T3 FRAME—**c-bit** or **m23** (the default is **c-bit**)
  - T3 ATM—**cbitadm**, **cbitplcp**, **m23adm**, or **M23plcp** (the default is **cbitplcp**)
- For an E3 line, you must specify one of the following:
  - E3 FRAME—**g751** or **g832** (the default is **g751**)
- Choose a framing format that is compatible with the framing format of the network device at the other end of the line.
- Example

  host1(config-controll)#**framing m23**

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

Configuring Fractional T3

You can configure fractional T3 on T3 frame interfaces. E3 frame interfaces do not support fractional E3.

Fractional T3 is a portion of a T3 transmission service and provides a set of lines with a speed that is greater than T1 (1.544 Mbps), but less than T3 (44.736 Mbps).

To configure fractional T3:

1. Set the DSU mode for the lines.
2. Set the speed of the fractional T3 lines.
3. Enable scrambling of the payload.

CAUTION: Complete all three steps at the same time. Otherwise, the interface might drop packets unexpectedly.

dsu bandwidth

- Use to set the speed for the fractional T3 lines.
- If you issue this command, be sure to issue the **dsu mode** and **scramble** commands. Otherwise, the interface might drop packets unexpectedly.
- The router offers a set of speeds in increments that depend on the DSU mode you specify. The actual speed of the fractional T3 lines will be the value closest to the fractional bandwidth you specify.
- Example

  host1(config-controll)#**dsu bandwidth 10000**

- Use the **no** version to clear the bandwidth.
- If you issue the **no** version, be sure to issue the **no dsu mode** and **no scramble** commands. Otherwise, the interface might drop packets unexpectedly.

dsu mode

- Use to set the DSU mode for the lines.
- Specify 0 for Digital Link mode or 2 for Larscom mode.
- If you issue this command, be sure to issue the **dsu bandwidth** and **scramble** commands. Otherwise, the interface might drop packets unexpectedly.
- Example

  host1(config-controll)#**dsu mode 0**

- Use the **no** version to clear the DSU mode.
- If you issue the **no** version, be sure to issue the **no dsu bandwidth** and **no scramble** commands. Otherwise, the interface might drop packets unexpectedly.

scramble

- Use to enable cell scrambling on a T3 frame interface.
- If you issue this command, be sure to issue the **dsu mode** and **dsu bandwidth** commands. Otherwise, the interface might drop packets unexpectedly.
- Example

  host1(config-controll)#**scramble**

- Use the **no** version to turn off cell scrambling on the interface.
- If you issue the **no** version, be sure to issue the **no dsu mode** and **no dsu bandwidth** commands. Otherwise, the interface might drop packets unexpectedly.

Configuring an HDLC Channel

You must configure an HDLC channel for each T3 frame or E3 frame controller.

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

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

Optional Tasks

The following configuration tasks are optional when you configure an HDLC channel on a T3/E3 frame interface:

- Configure the cyclic redundancy check (CRC).
- Configure the HDLC idle character.
- Enable data inversion on the interface.
- Set the time interval for monitoring bit and packet rates.
- Set the maximum receive unit (MRU).
- Set the maximum transmit unit (MTU).
- Assign a text description or an alias to the serial interface.

crc

- Use to configure the size of the CRC.
- Specify the number of bits per frame (16 or 32) that are used to calculate the frame check sequence (FCS). Both the sender and receiver must use the same setting.
- The CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data.
- A 32-bit CRC should be used to protect longer streams at faster rates and, therefore, 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* 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)#**interface serial 3/0**

- 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 the feature.

load-interval

- Use to set the time interval at which the router calculates bit and packet rate counters.
- 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.
- Coordinate this value with the network administrator on the other end of the line.
- If you set this parameter to a different value for another protocol, such as IP, the router uses the lower value. This could produce unexpected behavior in your network.
- Example

  host1(config-if)#**mru 1500**

- 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.
- Coordinate this value with the network administrator on the other end of the line.
- If you set this parameter to a different value for another protocol, such as IP, the router uses the lower value. This could produce unexpected behavior in your network.
- Example

  host1(config-if)#**mtu 1500**

- 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 boston09 hdlc channel**

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

Configuration Examples

To configure a T3 interface, start at the Global Configuration mode, and issue the following commands:

```
host1(config)#controller t3 0/1
host1(config-controll)#no shutdwon
host1(config-controll)#framing c-bit
```

```
host1(config-controll)#clock source internal module
host1(config-controll)#cablelength 220
host1#exit
```

To configure an E3 interface, use the **controller e3** command in place of the **controller t3** command.

To configure HDLC channels on a T3 serial interface, issue the following commands:

```
host1(config)#controller t3 10/0
host1(config-controll)#exit
host1(config)#interface serial 10/0
host1(config-subif)#encapsulation ppp
host1(config-subif)#ip address 192.32.10.2 255.255.255.0
```

To configure fractional T3 on an interface, issue the following commands:

```
host1(config)#controller t3 10/0
host1(config-controll)#dsu mode 0
host1(config-controll)#dsu bandwidth 10000
host1(config-controll)#scramble
```

Testing Interfaces

Testing interfaces allows you to troubleshoot problems and to check the quality of links at various layers in the interface stack. The router supports the following test options:

- Transmission of BERT patterns to remote devices
- Local loopback—Loops the data back toward the router; on supported line modules, also sends an alarm indication signal (AIS) out toward the network
- Network loopback—Loops the data toward the network before the data reaches the frame
- Payload loopback—Loops the data toward the network after the framer processes the data
- Remote loopback—Provides the ability to:
  - Request that remote devices enter into loopback
  - Be placed in loopback by remote devices

Sending BERT Patterns

The router can send BERT patterns from different layers in the interface stack on frame-based T3 interfaces.

For a list of the modules that support bit error rate tests, see *ERX Module Guide*, *Appendix A*, *Module Protocol Support*.

To send BERT patterns:

1. Select a controller.

   host1(config)#**controller t3 3/2**

2. Configure a specific layer in the interface to generate BERT patterns.

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

   For information about BERT patterns, see *References* on page 46.

bert

- Use to enable bit error rate tests using the specified pattern on a 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 2^11 interval 10**

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

Enabling Local, Network, and Payload Loopback

To enable local, network, or payload loopback testing of a T3 or E3 line, use the **clock source** and **loopback** commands from Controller Configuration mode.

1. Change the clock source to internal.

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

2. Specify a loopback.

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

Enabling Remote Loopback

You can enable remote loopback capability on frame-based T3 interfaces configured to use C-bit framing. Remote loopback is *not* supported on E3 ATM, E3 FRAME, and T3 ATM interfaces.

For a list of the modules that support remote loopback, see *ERX Module Guide*, *Appendix A*, *Module Protocol Support*.

To enable remote loopback:

1. Change the clock source to internal.

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

2. Ensure that the line is configured to use C-bit framing, which is the default for frame-based T3 interfaces.

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

3. Configure one of the following loopback tests:

   - 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**

equipment loopback

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

NOTE: Remote loopback is available only on frame-based 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 frame-based 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.

Monitoring Interfaces

From User Exec mode, use the following **show** commands to monitor and display the T3 or E3 interface information:

host1#**show controllers t3 0/1**
host1#**show controllers e3 3/2**

Setting a Baseline

You can set a statistics baseline for serial interfaces 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 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 interface information:

- Status information
- T3 current interval counters—Displays the counters for the current interval
- T3 last interval counters—Displays the counters for the previous interval
- T3 24-hour total counters—Displays the 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 e3** ***slot/port*** **all** command displays identical information for an E3 controller (except where noted).

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*.

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 then 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**

- There is no **no** version.

show controllers e3
show controllers t3

- Use to display the parameters and MIB statistics on an interface.
- Use the **brief** keyword to display the administrative and operational status of all configured T3 or E3 interfaces, or to display abbreviated information for the specified T3 or E3 interface.
- For definitions of the MIB statistics, see RFC 2496—Definitions of Managed Objects for the DS3/E3 Interface Types (January 1999)

- Field descriptions
  - 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—Status of SNMP trapping (enabled or disabled)
  - alarms detected—One of the following T3 alarms (not applicable for E3):
    - 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

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 (this field is not present for E3 controllers)
  - Loopback—State of loopback for the controller: enabled or disabled. If loopback is enabled, one of the following states is displayed:
    - Diagnostic—Data loops back toward the router and sends an alarm AIS toward the network
    - Payload—Data loops toward the network after the framer has processed the data
    - Line—Data loops toward the network before the data reaches the framer
  - loopback state—State of loopback for the controller: enabled or disabled
  - DSU mode—Mode of the fractional T3 lines: Digital Link mode or Larscom mode
  - DSU bandwidth—Speed of the fractional T3 lines
  - DSU scramble—Status of scrambling for fractional T3: on or off
  - MDL Transmit Path—Indicates whether the transmission is active or not active (T3 only)

- MDL Transmit Test-Signal—Indicates if the transmission is active or not active (T3 only)
- MDL Transmit Idle-Signal—Indicates if the transmission is active or not active (T3 only)
- Equipment Identification Code—eic string for MDL (T3 only)
- Line Identification Code—lic string for MDL (T3 only)
- Frame Identification Code—fic string for MDL (T3 only)
- Facility Identification Code—fic string for MDL (T3 only)
- Equipment Port—port string for MDL (T3 only)
- Unit Identification Code—unit string for MDL (T3 only)
- Facility Identification Code—pfi string for MDL (T3 only)
- Port Code—port string for MDL (T3 only)
- Generator Number—generator string for MDL (T3 only)
- BERT test—Number of current test and total number of tests (T3 only)
  - 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 T3 or E3 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
- Errored seconds—Number of errored seconds encountered by an E3 (not applicable for T3) in the current interval (this field is not present for T3 controllers)
- P-bit errored seconds—Number of errored seconds encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)
- Severely errored seconds—Number of severely errored seconds encountered by an E3 (not applicable for T3) in the current interval (this field is not present for T3 controllers)
- P-bit severely errored seconds—Number of severely errored seconds encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)
- Severely errored frame seconds—Number of severely errored framing seconds encountered by a T3 or E3 in the current interval
- Unavailable seconds—Number of unavailable seconds encountered by a T3 or E3 in the current interval

- Line code violations—Number of line code violations encountered by a T3 or E3 in the current interval
- P-bit coding violations—Number of coding violations encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)
- Coding violations—Number of coding violations encountered by an E3 (not applicable for T3) in the current interval (this field is not present for T3 controllers)
- Line errored seconds—Number of line errored seconds encountered by a T3 or E3 in the current interval
- C-bit coding violations—Number of C-bit coding violations encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)
- C-bit errored seconds—Number of C-bit errored seconds encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)
- C-bit severely errored seconds—Number of C-bit severely errored seconds encountered by a T3 (not applicable for E3) in the current interval (this field is not present for E3 controllers)

- Example 1

```
host1#show controllers t3 2/0

DS3 2/0
Description: boston09 hdlc channel
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
DSU Mode is Larscom
DSU Bandwidth is 4000
DSU Scrambler is off
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
```

show controllers t3 remote

- Use to display MIB statistics for the remote end of a T3 interface configured for MDL.
- 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).

- Field descriptions
  - 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—This example specifies a T3 interface.

```
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
```