



Cisco IOS Software Configuration for the 6-Port and 12-Port E3 Line Card

This document describes the software configuration procedure for the 6-port and 12-port E3 line cards on the Cisco 12000 Series Router. These line cards are sometimes referred to as the 6E3-SMB and 12E3-SMB line cards.

Feature History for the 6-Port and 12-Port E3 Line Cards

Release	Modification
12.0(15)S	This feature was introduced.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for the 6-Port and 12-Port E3 Line Cards

The Cisco 12000 Series Router must have at least one clock and scheduler card (CSC) installed that provides a one-quarter bandwidth to support the requirements of the 6-port and 12-port E3 line cards.



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Information About the 6-Port and 12-Port E3 Line Cards

The 6-port and 12-port E3 line cards consist of high-density E3 service through six or twelve E3 interfaces.

The 6-port line card is a partially depopulated version of the 12-port line card. The 6-port line card consists of a total of 12 connectors, numbered 0 to 5. The 12-port line card consists of a total of 24 connectors, numbered 0 to 11. A single port consists of one coaxial connector for receiving (RX) and one coaxial connector for transmitting (TX).

How to Configure the 6-Port and 12-Port E3 Line Cards

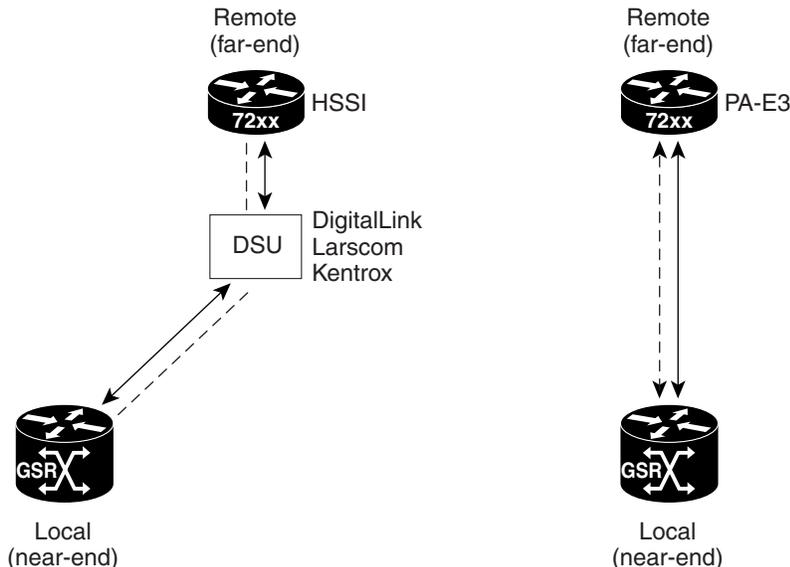
The following sections provide procedures and examples that describe how to configure and verify 6-port and 12-port E3 line card configuration:

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Configuration Scenario for 6-Port and 12-Port E3 Line Cards

You can configure the 6-port and 12-port E3 line cards in a Cisco 12000 Series Router with another device by using a data service unit (DSU) that supports either of the two third-party DSU vendors: Digital-Link and Kentrox. If you use a DSU to make the connection between the router and another device, you must set the DSU mode on the local E3 port configuration to match the DSU mode on the remote E3 port configuration. The configuration example on the left in [Figure 1](#) shows the 6-port or 12-port E3 line card in a router connected to a Cisco 7200 Router with a high-speed serial interface (HSSI) port through an external DSU.

If you make a direct connection between a Cisco 12000 Series Router and another device, you must set the local E3 port and the remote E3 port to the Cisco DSU mode, because there is no intervening third-party DSU. The configuration example on the right in [Figure 1](#) shows the Cisco DSU mode.

Figure 1 6-Port and 12-Port E3 Configuration Example

Configuring 6-Port and 12-Port E3 Line Card Interfaces

This section provides basic information to configure an interface and to specify IP routing. You can also enter other configuration commands and options, depending on the requirements of your system. To configure the 6-port and 12-port E3 line card interfaces, you must identify the router slot where the line card is installed (for example, slot 7). Use the **show diag EXEC** command to verify that the system recognizes the line card.

```
Router# show diag 2
SLOT 2 (RP/LC 2 ):6 Port Packet over E3
Router#
```

(Remainder of displayed text is omitted from example.)

If you know that there is more than one 6-port or 12-port E3 line card installed in the router, use the **show diag summary EXEC** command to display the types of line cards that are installed in all the router slots. The following output shows a 6-port E3 line card in slot 2 and a 12-port E3 line card in slot 6.

```
Router# show diag summ
SLOT 0 (RP/LC 0 ):1 Port Packet Over SONET OC-12c/STM-4c Single Mode
SLOT 1 (RP/LC 1 ):1 port SONET OC12 channelized to E3 Single Mode
SLOT 2 (RP/LC 2 ):6 Port Packet over E3 <<<<<----see E3 line card
SLOT 4 (RP/LC 4 ):4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 6 (RP/LC 6 ):12 Port Packet over E3 <<<<<----see E3 line card
Router#
```

If you want to address a specific 6-port or 12-port E3 line card interface, refer to interface slot 2 or interface slot 6, as shown in the previous output example.

If you want to address a specific port on the 6-port or 12-port E3 line card, refer to the router slot number and one of the serial interface port numbers.

Based on the previous output example:

- To address the 6-port E3 line card, which has six ports, in slot 2, the valid port numbers are 0 through 5, inclusive. The serial interface *slot/port* configuration format range is 2/0 through 2/5.
- To address the 12-port E3 line card, which has twelve ports, in slot 6, the valid port numbers are 0 through 11, inclusive. The serial interface *slot/port* configuration format range is 6/0 through 6/11.

To configure a 6-port or 12-port E3 line card interface, follow these steps:

- Step 1** Use the **enable** command to enter privileged EXEC mode. The system prompts you for a password if one is set.
- ```
Router> enablepassword
Router#
```
- Step 2** Enter configuration commands, one per line. Press **Return** after each configuration step unless otherwise noted.
- Step 3** Exit the privileged EXEC mode at any time and return to the Cisco IOS operation mode you want by entering **end** or **Ctrl-z** at the prompt:
- ```
Router# end
Router>
```

Table 1 shows default values for the E3 serial interface configuration of an enabled line card. For more information, see the configuration examples in this section.

Table 1 6-Port and 12-Port E3 Line Card Serial Interface Default Values

Parameter	Configuration Command	Default Value
BERT ¹ errors	range 1 to 255 inclusive	1
BERT pattern interval	bert pattern {0s 1s 2 ¹⁵ 2 ²⁰ 2 ²³ qrss} interval <i>interval_value</i>	[no] bert
Clock source	clock source [internal line]	line
Cyclic redundancy check	crc [16 32]	16
DSU mode	[no] dsu mode [cisco digital-link kentrox]	cisco
DSU subrate bandwidth	[no] dsu bandwidth <i>kbps</i>	34010
Encapsulation	encapsulation [hdlc ppp frame-relay]	hdlc
Idle character mode	[no] idle-character [flags marks]	flags
Invert data	[no] invert data	no invert data
Keepalive	[no] keepalive	keepalive 10
Loopback mode	[no] loopback [local network line network payload]	no loopback
Maximum transmission unit	[no] mtu <i>bytes</i>	4470 bytes
National bit	[no] national bit 1	0
Payload scrambling	[no] scramble	no scramble
Transmitter delay	[no] transmitter-delay <i>delay value</i>	0–255

1. BERT=bit error rate test

Configuring E3 Serial Interfaces

This section explains basic configuration information to enable each 6-port or 12-port E3 line card port as an interface and to specify IP routing. You can configure the ports in any sequence. Therefore, the IP addresses assigned to each port do not have to be numbered in sequential order. You can also enter other configuration commands and options, depending on the requirements of your system.

Use the following procedures to configure the port 0 interface on the 12-port E3 line card in slot 6, which makes the serial interface *slot/port 6/0*.

-
- Step 1** Enter **configure terminal** to enter global configuration mode and specify that the console terminal will be the source of the configuration commands:
- ```
Router# configure terminal
Router(config)#
```
- Step 2** Select the line card interface you want to configure by entering the **interface serial** global configuration command and specifying the slot and port:
- ```
Router(config)# interface serial 6/0
```
- Step 3** Assign an IP address and subnet mask to the port interface with the **ip address** interface configuration command:
- ```
Router(config-if)# ip address 1.1.1.11 255.0.0.0
```
- Step 4** Use the **transmitter-delay** interface configuration command to specify the number of transmitting delay gap characters that will be sent between packets. The following command selects 0 gap characters:
- ```
Router(config-if)# transmitter-delay 0
```
- Step 5** Enable E3 payload scrambling by entering the **scramble** interface configuration command:
- ```
Router(config-if)# scramble
```
- Step 6** Enable scrambling before the data has gone through subrate processing by using the **before subrate processing** option with the **scramble** command. This configuration is necessary when connecting to Cisco 7200 Router E3 port adapters.
- ```
Router(config-if)# scramble before subrate
```
- Step 7** Enter the **no keepalive** interface configuration command to turn off keepalive messages:
- ```
Router(config-if)# no keepalive
```
- Although some encapsulations benefit from keepalive processing (for example, HDLC), the Cisco 12000 Series Routers do not require keepalive messages.
- Step 8** Enter the **no shutdown** interface configuration command to change the shutdown state to up. The **no shutdown** command sends an **enable** command to the line card.
- ```
Router(config-if)# no shutdown
```
- Step 9** Add any other configuration commands that might be required for your system configuration to enable routing protocols and to modify the 6-port or 12-port E3 line card interface characteristics.
- Step 10** After you enter all the configuration commands that complete the configuration, enter **end** until you return to privileged EXEC mode.
- Step 11** Write the new configuration to memory in privileged EXEC mode:
- ```
Router# copy running-config startup-config
```

The system displays an OK message when the configuration is stored.

After you complete the configuration, you can check it using show commands. Use the **show controller EXEC** command for each interface to verify the port interface status. (See the [“Using show Commands to Check System Status”](#) section on page 6.)

## Using show Commands to Check System Status

Each line card in a Cisco 12000 Series Router maintains information about its configuration, traffic, errors, and so on. You can access this information by using the **show** commands. Following are descriptions and examples of the **show** commands.

To display the status of the line card you configured in the [“Configuring E3 Serial Interfaces”](#) section on page 5, enter the **show controller serial EXEC** command.

- The **show controllers serial** commands are line-card specific and are executed from the line card only. Arrows show the current controller-configurable parameter settings from [Table 1](#) in the following command output:

```
Router# show controller serial 6/0

Interface Serial6/0 (E3 port 0)
 hwidb = 0x611BF9A0
 ssb = 0x61642218, ds = 0x61642120
 Line state is administratively down
 rxLOS inactive, rxLOF inactive, rxAIS inactive <<<<----see Alarm status
 txAIS inactive, txRAI inactive, txRAI inactive <<<<----see Alarm status
 Current configurable parameter settings:
 Loopback is none
 Clock source is line <<<<--see clock source
 DSU mode is cisco <<<<--see DSU mode
 National bit is 1 <<<<--see National bit
 Payload scrambling is disabled, CRC is 16 <<<<----see scrambling
 Bert pattern is disabled, Bert interval is 0 <<<<----see BERT pattern status
 Transmitter delay is 0, Encapsulation is HDLC <<<<----see Transmitter delay
 Idle character is flags, Invert data is disabled
 MTU is 4470
Router#
```

(Remainder of displayed text is omitted from example.)

- Use the **show version** command to display the configuration of the system hardware (the number of each line card type installed), the Cisco IOS software release, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command for a router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-M), Version 12.0(15)S
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled 07-Dec-2000 09:21
Image text-base: 0x60010900, data-base: 0x6061E000
```

(Remainder of displayed text is omitted from example.)

- The **show interfaces** command displays information about the system interfaces. Following is a sample of the **show interface serial slot/port** command for port 0 of a line card installed in slot 6:

```
Router# show interfaces serial 6/0
Serial6/0 is up, line protocol is up
 Hardware is E3 line card
 Internet address is 1.1.1.11/24
```

```
MTU 4470 bytes, BW 44210 Kbit, DLY 200 usec, rely 255/255, load 1/255
```

(Remainder of displayed text is omitted from example.)

- Use the **show protocols** command to display the global (system-wide) and interface-specific status of any configured Level 3 protocol. The following example shows a 12-port E3 line card. The protocol is up on ports 0 through 3:

```
Router# show protocols
Global values:
 Internet Protocol routing is enabled
 Internet address is 1.1.11.1/16
 Serial6/0 is up, line protocol is up
 Serial6/1 is up, line protocol is up
 Serial6/2 is up, line protocol is up
 Serial6/3 is up, line protocol is up
 Serial6/11 is up, line protocol is up
 Internet address is 1.1.11.1/16
```

(Remainder of displayed text is omitted from example.)

## Customizing the 6-Port and 12-Port E3 Line Card Configuration

There are two sides to the network, a local network side and a remote customer side, or near and far ends. The 6-port and 12-port E3 line cards support third-party data service units (DSUs), Internet Service Provider (ISP)-provided E3 lines, and so on. You can change the configuration parameter default values in the 6-port or 12-port E3 line card port interfaces to match the remote DSUs on your network. [Table 2](#) shows the configuration parameters.

**Table 2** 6-Port and 12-Port E3 Line Card Serial Interface DSU Modes

| Parameter               | Configuration Command                                 | Default Value  | Command                                       |
|-------------------------|-------------------------------------------------------|----------------|-----------------------------------------------|
| DSU mode                | <b>[no] dsu mode [cisco   digital-link   kentrox]</b> | cisco          | Router(config-if)# <b>dsu mode cisco</b>      |
| DSU subrate bandwidth   | <b>[no] dsu bandwidth <i>kbps</i></b>                 | 34010          | Router(config-if)# <b>dsu bandwidth 34010</b> |
| National bit            | <b>[no] national bit 1</b>                            | 0              | Router(config-if)# <b>national bit 1</b>      |
| Payload scrambling      | <b>[no] scramble</b>                                  | no<br>scramble | Router(config-if)# <b>scramble</b>            |
| Cyclic redundancy check | <b>crc [16   32]</b>                                  | 16             | Router(config-if)# <b>crc 16</b>              |



**Note**

The local port and the remote port must have matching configurations.

### Selecting a DSU Mode

The DSU mode supports two third-party DSU vendors—Digital-Link and Kentrox—and the default DSU mode, Cisco. If you use a DSU to make the connection between a router and another device, the local E3 port configuration must match the remote E3 port configuration. Therefore, if the remote E3 port uses the Kentrox vendor, you must manually enter the **dsu mode** configuration command and specify the Kentrox DSU, or use the Cisco Remote Connection Management (CRCM) feature to

remotely configure the remote E3 port. If you make a direct connection between a Cisco 12000 Series Router and another device, you can use the Cisco DSU mode. (For configuration examples, see [Figure 1](#).)

## Configuring the DSU Bandwidth Range

The DSU bandwidth range is from 22 to 34010 kbps and the default is 34010. The local port and the remote port must have matching configurations. Therefore, if you reduce the effective bandwidth to 3000 on the local port, you must do the same on the remote port by entering the **dsu bandwidth** interface configuration command.

## National Bit

The national bit allows you to set the international bit in the G.751 frame. In interface configuration mode, you can define the bit in the G.751 frame (national bit) by entering the **national bit 1** configuration command. To return to the default national bit (0), use the **no** form of this command.

## Enabling Payload Scrambling

Payload (data) scrambling converts the data received by the local or remote E3 ports from either of the two supported third-party DSU vendor modes (Digital-Link and Kentrox) as well as the default, Cisco mode. To enable payload scrambling on the local and remote E3 ports, you must enter the **scramble** interface configuration command. If you do not enter the **scramble** command, payload scrambling remains disabled by default on the local and remote E3 ports.

In order to connect to a Cisco 7200 Router E3 port adaptor when subrate and scrambling are enabled in digital-link mode, you must use the **before subrate processing** option with the **scramble** command. The **before subrate processing** option performs scrambling before the data has gone through subrate processing.

## Configuring Cyclic Redundancy Checks

The 6-port and 12-port E3 line cards use a 16-bit Cyclic Redundancy Check (CRC) by default, but also support a 32-bit CRC to detect errors in transmitted data. You can set the CRC by entering the **crc** command. The router that sends the data divides the bits in the frame message by a predetermined number to calculate a frame check sequence (FCS). Before sending the data, the router appends the FCS value to ensure that the frame message contents are exactly divisible by a predetermined number. The router that receives the data divides the frame message by the same predetermined number and calculates the FCS. If the result is not 0, the router that receives the data assumes that a transmission error occurred and sends a request to the router to resend the data.



### Note

When enabling a 16- or 32-bit CRC on a local interface, ensure that the remote device is also configured for a 16- or 32-bit CRC.

## Configuring the Clock Source

The only exception for matching local and remote E3 port configurations is that the clock sources must be set opposite each other. Therefore, if you enter the **clock source internal** command for the local E3 port, you must enter **clock source line** for the remote E3 port.

## Verifying Customized Configuration

To display controller information about local and remote E3 ports and the requests sent between them, use the **show controllers serial *slot/port* details** command or the **show controllers serial *slot/port* all** command. The following shows output from the **show controllers E3 details** command:

```
Router# show controllers serial 2/0 details
Interface Serial2/0 (E3 port 0)
 hwidb = 0x61179020
 ssb = 0x615E8D54, ds = 0x615E5430
 Line state is up
 rxLOS inactive, rxLOF inactive, rxAIS inactive
 txAIS inactive, rxRAI inactive, txRAI inactive
 Current configurable parameter settings:
 Loopback is none
 Clock source is line
 DSU mode is cisco, DSU bandwidth limit is 34010
 National bit is 1
 Payload scrambling is disabled, CRC is 16
 Bert pattern is disabled, Bert interval is 0
 Transmitter delay is 0, Encapsulation is PPP
 Idle character is flags, Invert data is disabled
 Remote fullrate has no request outstanding
 Remote accept is enabled, MTU is 4470
Router#
```

(Remainder of displayed text is omitted from example.)

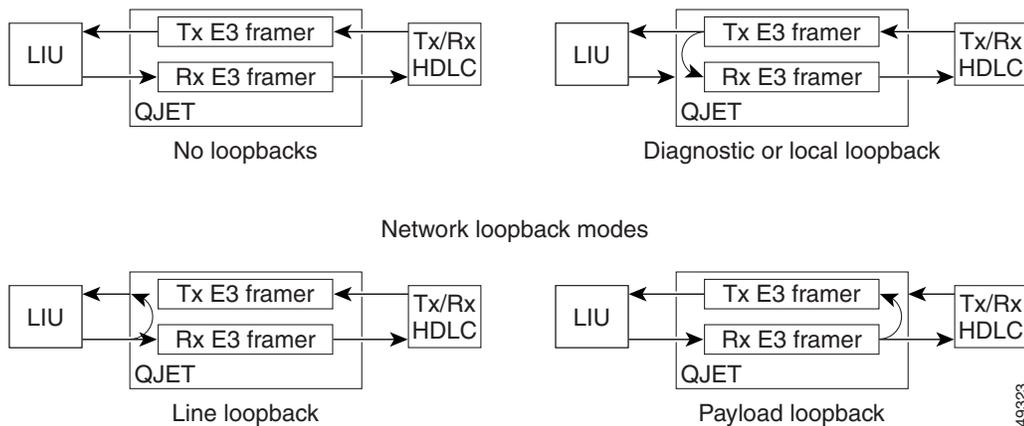
## Specifying E3 Port Loopback Modes

You can test the flow of data traffic by entering one of the three loopback paths that the E3 controller supports. Specify the loopback mode by entering one of the **loopback** interface configuration commands shown in [Table 3](#). Use the **no** form of this command to restore the default value, **no loopback**, which represents the normal operation between the local end (TX) and the remote end (RX).

**Table 3** E3 Supported Loopback Modes

| Loopback Modes               | Configuration Mode              | Command                                                     |
|------------------------------|---------------------------------|-------------------------------------------------------------|
| Diagnostic or local loopback | <b>loopback local</b>           | Router(config-if)# Router(config-if)# <b>loopback local</b> |
| Network Line loopback        | <b>loopback network line</b>    | Router(config-if)# <b>loopback network line</b>             |
| Network Payload loopback     | <b>loopback network payload</b> | Router(config-if)# <b>loopback network payload</b>          |
| Default value                | <b>default value</b>            | Router(config-if)# <b>no loopback</b>                       |

Each loopback path exists for each of the 6-port and 12-port E3 line card ports. All loopback configuration is done in the QJET, a quad E3 framer that provides E3 payload and limited bit error rate test (BERT) functionality. [Figure 2](#) shows the data flow for three loopback configuration paths, including no loopback.

**Figure 2 E3 Loopback Paths**

This section explains how to use loopback commands to test data traffic:

- **Diagnostic or local**—In this loopback mode, the local end (TX) and remote end (RX) ports create a diagnostic loopback that tests line card operation without using a cable connection, allowing the card running diagnostics to send data to itself over a single channel.
  - To set the loopback mode to local, specify the serial interface *slot/port*, as shown in the following example:
 

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)#
```
  - To set the loopback mode to local, enter the **loopback local** interface configuration command, as shown in the following example:
 

```
Router(config-if)# loopback local
```
  - If you choose the loopback local mode, you must configure the clock source as internal, as shown in the following example:
 

```
Router# configure terminal
Router(config-if)# clock source internal
```
- **Network**—Network loopback has two modes that are discussed in this section, **network loopback line** and **network loopback payload**. In either network loopback mode, data is looped from the receive path to the transmit path at the QJET location on the line card. All received data is returned to the far end over a single channel.
  - To set the loopback mode to network, specify the serial interface slot/port, as shown in the following example:
 

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)#
```
  - **Payload loopback mode**—The received payload is extracted and sent through the local E3 framer to test the status of an external communications line.
 

```
Router(config-if)# loopback network payload
```
  - **Loopback line mode**—In this loopback mode, the local end sends what it received from the remote end back to the remote end to test the status of an external communications line. No attempt is made to find E3 framing.

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To set the loopback mode to network, enter the **loopback network line** interface configuration command, as shown in the following example:

```
Router(config-if)# loopback network line
```

- If you choose the loopback network line mode or the loopback network payload mode, be sure the default clock source is *line*. You can also configure the clock source as shown in the following example:

```
Router# configure terminal
Router(config-if)# clock source line
```



#### Note

When using loopback network commands, be sure to enter the **no keep** command to turn keepalives off. Otherwise, the line will keep trying to come up, causing the port to reset, thereby causing a loss of pattern synchronization if BER testing is running. This will lead to an erroneously high BER.

## Configuring E3 Port BER Testing

You can set one local E3 serial port to BERT mode while the remaining local serial ports continue to transmit and receive normal traffic. A BER tester checks communication between the local and the remote E3 ports. If traffic is not being transmitted or received, create a back-to-back loopback BER test and send out a predictable stream to ensure that you receive the same data that was transmitted. To determine if the remote E3 serial port returns the BERT pattern unchanged, the system administrator for the remote router must manually set the remote E3 serial port to **loopback network line**, while you enter a **bert pattern** interface configuration command at specified time intervals on the local E3 serial port.

The following example shows the output from a back-to-back loopback BER test. The router types are a Cisco 12012 Router on the local (near) end, and a Cisco 12008 Router on the remote (far) end. Keepalive is disabled, while the loopback network line test runs between both routers. Clock source is set to **internal** on the local serial port 8, in slot 1 with IP address 10.0.0.2. Clock source is set to **line** on the remote serial port 5, in slot 1 with IP address 11.0.0.1. A BERT pattern is entered between local serial port 8/1 and remote serial port 5/1:

```
clock source internal-----clock source line
no keepalive-----loopback network line-----no keepalive
Router:[gsr-1]-----[mfr-1]
[BERT Pattern]
Serial8/1-----Serial5/1
[11.0.0.2]-----[11.0.0.1]

Router(config)# interface serial 6/0
Router(config-if)# bert pattern 2^23 interval 10
Router(config-if)#
```

[Table 4](#) lists the BERT patterns, explains how to invoke them, and specifies test intervals between 1 to 1440 minutes long. The **no bert pattern** interface configuration command terminates an ongoing BER test and returns the local and remote E3 serial ports to the default value.

**Table 4** E3-Supported BERT Patterns

| BERT Pattern | To Invoke           | Command                                                |
|--------------|---------------------|--------------------------------------------------------|
| 0s           | All 0s test pattern | Router (config-if)# <b>bert pattern 0s interval 10</b> |
| 1s           | All 1s test pattern | Router (config-if)# <b>bert pattern 1s interval 10</b> |

**Table 4** E3-Supported BERT Patterns (continued)

| BERT Pattern         | To Invoke                                                | Command                                                            |
|----------------------|----------------------------------------------------------|--------------------------------------------------------------------|
| 2 <sup>15</sup>      | Pseudorandom repeating pattern that is 32767 bits long   | Router (config-if)# <b>bert pattern 2<sup>15</sup> interval 10</b> |
| 2 <sup>20</sup>      | Pseudorandom repeating pattern that is 1048575 bits long | Router (config-if)# <b>bert pattern 2<sup>20</sup> interval 10</b> |
| 2 <sup>23</sup>      | Pseudorandom repeating pattern that is 8388607 bits long | Router (config-if)# <b>bert pattern 2<sup>23</sup> interval 10</b> |
| qrss 2 <sup>20</sup> | Quasirandom signal source                                | Router (config-if)# <b>bert pattern qrss interval 10</b>           |

## Checking Bit Errors Using a BERT

Following is an example of the **bert pattern** command and specified time intervals that will cause the BERT to send the pseudorandom pattern 2<sup>23</sup> and repeat on the first E3 channel for 10 minutes:

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)# bert pattern 2^23 interval 10
Router(config-if)# end
Router(config)# end
Router#
```

## Entering Errors in BER Tests

To insert intentional errors into the BER test stream, use the following command syntax: **bert errors** [*no-of-errors*], where the *no-of-errors* default is 1 and the range is 1 to 255, inclusive. The following example shows the command used to insert five errors into the current BERT test stream that is running the pseudorandom pattern 2<sup>23</sup> that repeats on the first E3 channel for 10 minutes:

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)# bert pattern 2^23 interval 10
Router(config-if)# bert errors 5
Router(config-if)# end
Router(config)# end
Router#
```

## Using show Commands to Verify BERT Configuration

When the E3 serial port is running a BERT, the serial port state is down, and only BERT data is passed. However, when using **show** commands, the line card state might be displayed as up or down. [Table 5](#) lists **show** commands for BERT.

**Table 5** show Commands for BERT Configuration

| show Commands                          | Explanation                                                             |
|----------------------------------------|-------------------------------------------------------------------------|
| <b>show controller serial n/port</b>   | Shows the current controller status, where <i>n</i> is the slot number. |
| <b>show controller serial 6/0 bert</b> | Shows the fields of a BERT test that is still in progress.              |

The following output indicates that BERT is enabled with a pattern of 2^23 and an interval of 10 minutes:

```
Router# show controller serial 6/0 bert

Interface Serial6/0 (E3 port 1)
BERT information:
 State :enabled (sync'd)
 Pattern :2^23
 Interval :10 minutes
 Time remaining :00:09:44
 Total errors :0
 Time this sync :00:00:10
 Errors this sync :0
 Sync count :1
Router#
```

**Note**

The bit error test patterns from the serial ports on a 6-port or 12-port E3 line card are framed test patterns; therefore, they are inserted into the payload of a framed E3 signal.

The following example shows the information of a BERT test that is still in progress:

```
Router# show controller serial 6/0 bert

Interface Serial6/0 (E3 port 1)
BERT information:
 State :enabled (sync'd)
 Pattern :2^23
 Interval :10 minutes
 Time remaining :00:01:44
 Total errors :0
 Time this sync :00:08:10
 Errors this sync :0
 Sync count :1
Router#
```

**Note**

When the E3 is running a BERT, the total bit errors value is not valid if the Status field is Not Sync.

The following is an example of a screen display from a completed BERT test:

```
Router# show controller serial 6/0 bert

Interface Serial6/0 (E3 port 1)
BERT information:
 State :disabled (sync'd, completed)
 Pattern :2^23
 Interval :10 minutes
 Time remaining :00:00:00
 Total errors :0
 Time this sync :00:09:54
 Errors this sync :0
 Sync count :1
Router#
```

Table 6 provides explanations of the BERT display fields in the previous examples.

**Table 6** BERT Test Display Fields

| <b>BERT Information</b>                    | <b>Description</b>                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| State: enabled (not synchronized)          | BER test is active, but the hardware is not currently synchronized. Errors are counted only when the hardware is synchronized.                                                                                                                                                                                                |
| State: enabled (synchronized)              | BER test is active, and the hardware is synchronized. Any errors encountered are counted.                                                                                                                                                                                                                                     |
| State: disabled (not synchronized, failed) | BER test is finished and the test resulted in failure, either because the hardware never synchronized or the physical layer interface module (PLIM) declared the test a failure.                                                                                                                                              |
| State: disabled (synchronized, completed)  | BER test is finished because the interval expired.                                                                                                                                                                                                                                                                            |
| State: disabled (synchronized, aborted)    | BER test is finished as a result of a user request (for example, <b>no bert</b> ).                                                                                                                                                                                                                                            |
| Pattern                                    | Can be any one of the supported BERT patterns.                                                                                                                                                                                                                                                                                |
| Interval                                   | Can be any value from 1 to 1440 (minutes).                                                                                                                                                                                                                                                                                    |
| Time remaining                             | Can be any value from 1 second to the interval provided, formatted as <i>hh:mm:ss</i> .                                                                                                                                                                                                                                       |
| Total errors                               | The total number of errors encountered while the hardware is synchronized.                                                                                                                                                                                                                                                    |
| Time this synchronization                  | If the hardware is currently synchronized, indicates the amount of time since synchronization began, formatted as <i>hh:mm:ss</i> . If it is not currently synchronized but was synchronized earlier, indicates the amount of time that the last or most recent synchronization period lasted, formatted as <i>hh:mm:ss</i> . |
| Errors this synchronization                | If the hardware is currently synchronized, indicates the number of errors encountered during the current sync period. If it is not currently synchronized but was synchronized earlier, indicates the number of errors encountered during the last or most recent synchronization period.                                     |
| Synchronization count                      | The number of times synchronization was achieved.                                                                                                                                                                                                                                                                             |

# Additional References

The following sections provide references related to the 6-port and 12-port E3 line cards.

## Related Documents

| Related Topic                   | Document Title                                                                                                                                                                                                                                                                                                |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hardware installation           | <i>Channelized and Electrical Interface Line Card Installation and Configuration</i>                                                                                                                                                                                                                          |
| Software configuration commands | <ul style="list-style-type: none"> <li>• <i>Software Configuration Guide for the Cisco 12000 Series Internet Router</i></li> <li>• <i>Cisco IOS Configuration Fundamentals Configuration Guide</i></li> <li>• <i>Cisco IOS Release 12.0S Release Notes for Cisco 12000 Series Internet Routers</i></li> </ul> |

## Technical Assistance

| Description                                                                                                                                                                                                                                                              | Link                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content. | <a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a> |

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■ Additional References