



Cisco IOS Software Configuration for the 6-Port and 12-Port DS3 Line Card

This document describes the software configuration procedure for the 6-port and 12-port DS3 line cards on the Cisco 12000 Series Router. These line cards are sometimes referred to as the 6DS3-SMB and 12DS3-SMB line cards.

Feature History for the 6-Port and 12-Port DS3 Line Card

Release	Modification
12.0(5)S	This feature was introduced.
12.0(8)S	B release of these line cards 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 DS3 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 DS3 line cards.



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Information About the 6-Port and 12-Port DS3 Line Cards

The 6-port and 12-port DS3 line cards consist of high-density DS3 service through six T3 or twelve T3 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 DS3 Line Cards

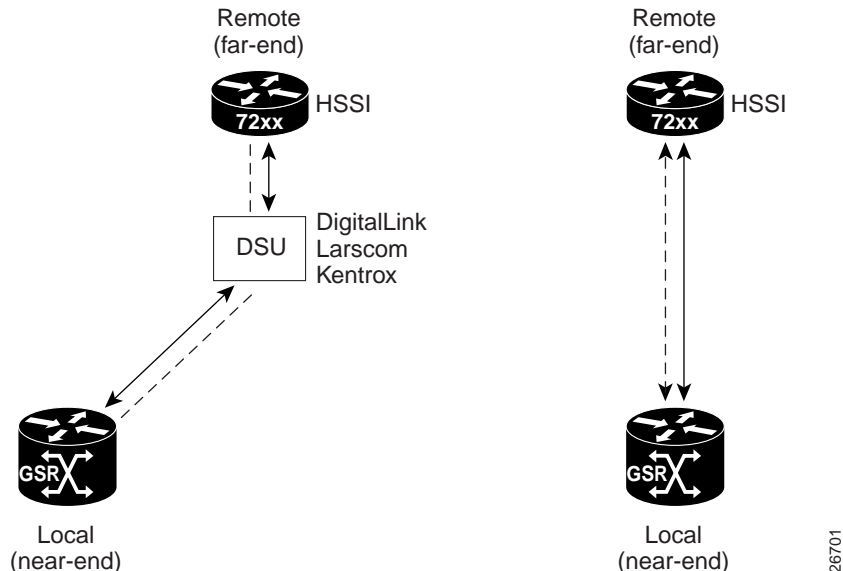
The following sections provide procedures and examples that describe how to configure and verify 6-port and 12-port DS3 line card configuration:

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Configuration Scenarios for the 6-Port and 12-Port DS3 Line Cards

You can configure the 6-port or 12-port DS3 line card in a router with another device by using a data service unit (DSU) that supports any of the three third-party DSU vendors: Digital-Link, Kentrox, and Larscom. If you use a DSU to make the connection between the Cisco 12000 Series Router and another device, you must set the DSU mode on the local DS3 port configuration to match the DSU mode on the remote DS3 port configuration. Therefore, if the remote DS3 port uses the Kentrox vendor, it sends a request to the local DS3 port to change the DSU mode to Kentrox. The left configuration example in [Figure 1](#) shows the 6-port or 12-port DS3 line card in a Cisco 12000 Series 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 router and another device, the local DS3 port configuration and the remote DS3 port are both set 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 DS3 Configuration Example

Configuring 6-Port and 12-Port DS3 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 DS3 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 DS3
Router#
```

(Remainder of displayed text omitted from example.)

If you know that there is more than one 6-port or 12-port DS3 line card installed in the router, use the **show diag summary EXEC** command to see the types of line cards that are installed in all the router slots. The following output shows a 6-port DS3 line card in slot 2 and a 12-port DS3 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 DS3 Single Mode
SLOT 2 (RP/LC 2 ):6 Port Packet over DS3 <<<<<---see DS3 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 DS3 <<<<<---see DS3 line card
Router#
```

If you want to address a specific 6-port or 12-port DS3 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 DS3 or 12-port DS3 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 DS3 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 DS3 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 DS3 line card interface, perform the following:

- 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 DS3 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 DS3 Line Card Serial Interface Default Values

Parameter	Configuration Command	Default Value
BERT ¹ interval	interval {1-1440}	none
BERT number of errors	range 1 to 255 inclusive	1
BERT pattern	bert pattern {2^15 2^20 qrss 2^23 0s 1s}	[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 larscom]	cisco
DSU subrate bandwidth	[no] dsu bandwidth <i>kbps</i>	44210
Encapsulation	encapsulation [hdlc ppp frame-relay]	hdlc
Far-end DSU bandwidth	[no] dsu remote fullrate	subrate
Framing mode	[no] framing [c-bit m13]	c-bit
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 remote]	no loopback
Maximum transmission unit	[no] mtu <i>bytes</i>	4470 bytes
Payload scrambling	[no] scramble	no scramble

Table 1 6-Port and 12-Port DS3 Line Card Serial Interface Default Values (continued)

Parameter	Configuration Command	Default Value
Remote requests	[no] dsu remote accept	accept
Transmitter delay	[no] transmitter-delay # of idle characters	0–255

1. BERT=bit error rate test

Configuring DS3 Serial Interfaces

This section explains basic configuration information to enable each 6-port or 12-port DS3 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 DS3 line card in slot 6, which makes the serial interface *slot/port* 6/0.

Step 1 Type **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 Specify DS3 framing by entering the **framing** interface configuration command:

```
Router(config-if)# framing c-bit
```

Step 5 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 6 Enable DS3 payload scrambling by entering the **scramble** interface configuration command:

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

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 may be required for your system configuration to enable routing protocols and to modify the 6-port or 12-port DS3 line card interface characteristics.
- Step 10** When you have entered all the configuration commands that complete the configuration, type **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 has been stored.

After you have completed 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 see the status of the 6-port or 12-port DS3 line card you configured in the [“Configuring DS3 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 (DS3 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, Framing is c-bit <<<<<----see loopback and framing settings
  Clock source is line, Cable length is 50 <<<<<--see clock source and cable length
  DSU mode is cisco, DSU bandwidth limit is 44210 <<<<<--see DSU mode and bandwidth
  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
  Remote fullrate has no request outstanding <<<<--see far-end DSU bandwidth
 Remote accept is enabled, MTU is 4470 <<<<<----see Remote accept
Router#
```

(Remainder of displayed text 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 version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command for a Cisco 12000 Series Router:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-M), Version 12.0(5)S
```

```
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Fri 16-April-99 09:21
Image text-base: 0x60010900, data-base: 0x6061E000
Router#
```

(Remainder of displayed text 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 DS3 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
Router#
```

(Remainder of displayed text 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 DS3 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
Router#
```

(Remainder of displayed text omitted from example.)

Customizing the 6-Port and 12-Port DS3 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 DS3 line cards support third-party data service units (DSUs), Internet Service Provider (ISP)-provided DS3 lines, and so on. You can change the configuration parameter default values in the 6-port or 12-port DS3 line card port interfaces to match the remote DSUs on your network. [Table 2](#) shows the configuration parameters.

Table 2 6DS3-SMB or 12DS3-SMB Line Card Serial Interface DSU Modes

Parameter	Configuration Command	Default Value	Command
DSU mode	[no] dsu mode [cisco digital-link kentrox larscom]	cisco	Router(config-if)# dsu mode cisco
DSU subrate bandwidth	[no] dsu bandwidth kbps	44210	Router(config-if)# dsu bandwidth 44210
Far-end DSU bandwidth	[no] dsu remote fullrate	subrate	Router(config-if)# dsu remote fullrate
Payload scrambling	[no] scramble	no scramble	Router(config-if)# scramble

Table 2 6DS3-SMB or 12DS3-SMB Line Card Serial Interface DSU Modes (continued)

Parameter	Configuration Command	Default Value	Command
Remote requests	[no] dsu remote accept	accept	Router(config-if)# dsu remote accept
Cyclic redundancy check	crc [16 32]	16	Router(config-if)# crc 16

**Note**

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

Verifying Local and Remote DS3 Port Settings

You can use **telnet** to determine the DSU mode settings on the remote DS3 port. Once you verify the remote DS3 port settings, you can negotiate changing configuration parameters so that DSU mode settings are the same on both the local and remote DS3 ports. You can set the DSU bandwidth to accept or reject the incoming remote requests from the local DS3 port by entering the **dsu remote accept** interface configuration command.

Selecting a DSU Mode

The DSU mode supports three third-party DSU vendors—Digital-Link, Kentrox, and Larscom—and the default DSU mode, Cisco. If you use a DSU to make the connection between the Cisco 12000 Series Router and another device, the local DS3 port configuration must match the remote DS3 port configuration. Therefore, if the remote DS3 port uses the Kentrox vendor, a request is sent to the local DS3 port to change the DSU mode to Kentrox, by manually entering the **dsu mode** configuration command and specifying the Kentrox DSU, or by using the Cisco Remote Connection Management (CRCM) feature to remotely configure the remote DS3 port. If you make a direct connection between a Cisco 12000 Series Router and another device, you can use the Cisco DSU mode. See [Figure 1](#) for configuration examples.

Setting the Sending and Receiving Rate

The local and remote DS3 ports must also agree on whether to use a subrate or fullrate sending and receiving rate, because the speed of the sending and receiving rate is regulated by the DSU mode. If the sending and receiving rates do not match, they will not work. Subrates are specific to DSU modes and must be configured appropriately. The subrate sending and receiving rate is slower and less expensive than the faster, more expensive, fullrate. You can synchronize the local and remote DS3 ports sending and receiving rates by entering the **dsu remote** interface configuration command.

Configuring the DSU Bandwidth Range

The DSU bandwidth range is from 0 to 44210 kbps. 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.

Enabling Payload Scrambling

Payload (data) scrambling converts the data received by the local or remote DS3 ports from any of the three supported third-party DSU vendor modes (Digital-Link, Kentrox, and Larscom) as well as the default, Cisco mode. To enable payload scrambling on the local and remote DS3 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 DS3 ports.

Configuring Cyclic Redundancy Checks

The 6-port and 12-port DS3 line cards use a 16-bit Cyclic Redundancy Check 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-bit or 32-bit CRC on a local interface, ensure that the remote device is also configured for a 16-bit or 32-bit CRC.

Configuring the Clock Source

Configuration of clock source can be performed either on one or both the local and remote DS3 ports. Therefore, if you enter the **clock source internal** command for the local DS3 port, you can select either **clock source line** or **clock source internal** for the remote DS3 port

Verifying Customized Configuration

To display controller information about local and remote DS3 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 DS3 details** command:

```
Router# show controllers serial 2/0 details
Interface Serial2/0 (DS3 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, Framing is c-bit
DSU mode is cisco, DSU bandwidth limit is 44210
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
Incoming far end requests:
 0 Total requests
 0 Loopback requests, 0 No loopback requests
 0 Full rate requests, 0 No full rate requests
```

```
0 Rejected requests, 0 Unknown requests
```

(Remainder of displayed text omitted from example.)

Specifying DS3 Port Loopback Modes

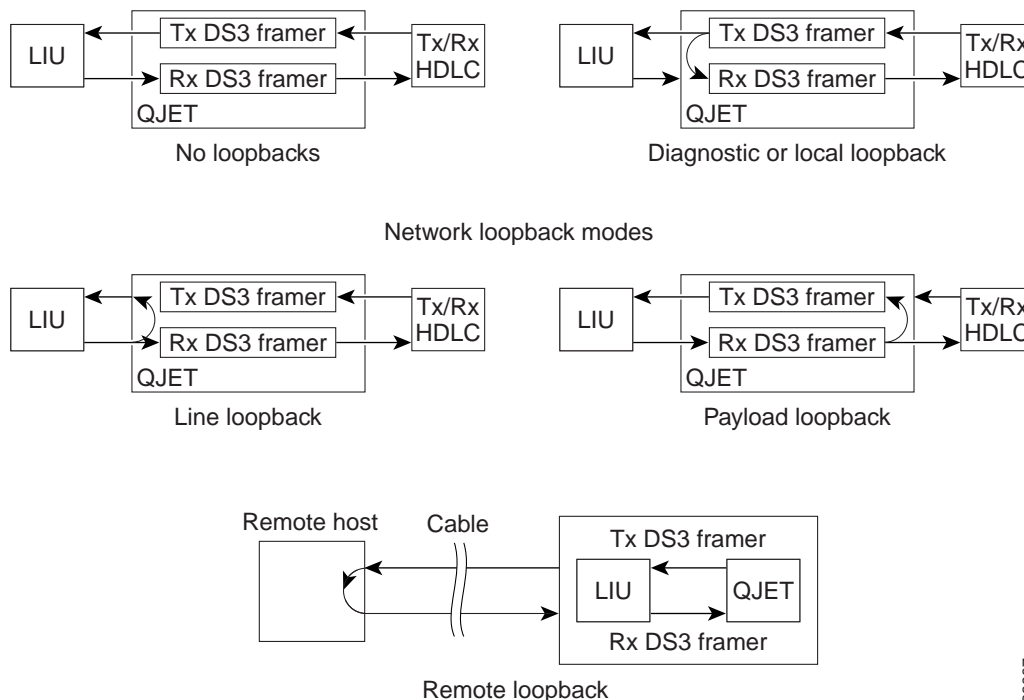
You can test the flow of data traffic by entering one of the three loopback paths that the DS3 controller supports. Specify the loopback mode by entering one of the **loopback** interface configuration commands shown in Table 3. Use the **no** form of this command to restore the default value, **no loopback**, which represents the normal operation between the local end (TX) and the remote end (RX).

Table 3 DS3 Supported Loopback Modes

Loopback Modes	Configuration Mode	Command
Remote loopback	loopback remote	Router(config-if)# loopback remote
Diagnostic or local loopback	loopback local	Router(config-if)# Router(config-if)# loopback local
Network Line Loopback	loopback network line	Router(config-if)# loopback network line
Network Payload loopback	loopback network payload	Router(config-if)# loopback network payload
Default value	default value	Router(config-if)# no loopback

Each loopback path exists for each of the 6-port or 12-port DS3 line card ports. All loopback configuration is done in the QJET, a quad DS3 framer that provides DS3 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 DS3 Loopback Paths



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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.

- Before you can 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 DS3 framer to test the status of an external communications line.

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

```
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 DS3 framing.

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 bit error rate (BER) testing is running. This will lead to an erroneously high BER.

- Remote—In this loopback mode, the local end sends a FEAC message to the remote end to set up a loopback that will echo the data that was sent. The FEAC message is requesting that the far end change to network loopback mode. If you choose the loopback remote mode, verify that the remote clock source is set as internal.

- 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 remote, enter the **loopback remote** interface configuration command, as shown in the following example:

```
Router(config-if)# loopback remote
```

Use the **no** form of this command to restore the default value, **no loopback**, and to send a far end alarm and control (FEAC) message to the far end requesting that it exit network loopback mode.

Configuring DS3 Port BER Testing

You can set one local DS3 serial port to bit error rate test (BERT) mode while the remaining local serial ports continue to transmit and receive normal traffic. A BERT checks communication between the local and the remote DS3 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 DS3 serial port returns the BERT pattern unchanged, the system administrator for the remote router must manually set the remote DS3 serial port to **loopback network line**, while you enter a **bert pattern** interface configuration command at specified time intervals on the local DS3 serial port.

The following example shows the output from a back-to-back loopback BER test. The router types are a Cisco 12012 Internet Router on the local (near) end, and a Cisco 12008 Series 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 and 1140 minutes long. The **no bert pattern** interface configuration command terminates an ongoing BER test and returns the local and remote DS3 serial ports to the default value.

Table 4 DS3-Supported BERT Patterns

BERT Pattern	To Invoke	Command
2 ¹⁵	A pseudorandom repeating pattern that is 32767 bits long	Router (config-if)# bert pattern 2¹⁵ interval 10
2 ²⁰	A pseudorandom repeating pattern that is 1048575 bits long	Router (config-if)# bert pattern 2²⁰ interval 10
qrss 2 ²⁰	A quasirandom signal source	Router (config-if)# bert pattern qrss ^
2 ²³	A pseudorandom repeating pattern that is 8388607 bits long	Router (config-if)# bert pattern 2²³ interval 10

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 2²³ and repeat on the first DS3 channel for 10 minutes:

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)# bert pattern 223 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 BER test stream that is running the pseudorandom pattern 2²³ that repeats on the first DS3 channel for 10 minutes:

```
Router# configure terminal
Router(config)# interface serial 6/0
Router(config-if)# bert pattern 223 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 DS3 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 may be displayed as up or down. Table 5 lists **show** commands for BERT.

Table 5 *show Commands for BERT Configuration*

Show Commands	Explanation
show controller serial <i>n/port</i>	Shows the current controller status, where <i>n</i> is the slot number.
show controller serial 6/0 bert	Shows the fields of a BER 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 (DS3 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 6DS3-SMB or 12DS3-SMB line card are framed test patterns; therefore, they are inserted into the payload of a framed T3 signal.

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

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

```
Interface Serial6/0 (DS3 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 DS3 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 BER test:

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

```
Interface Serial6/0 (DS3 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*

BERT Information	Explanation
State: enabled (not synchronized)	BERT test is active, but the hardware has not currently synchronized. Errors are counted only when the hardware has synchronized.
State: enabled (synchronized)	BERT test is active, and the hardware has synchronized. Any errors encountered are counted.
State: disabled (not synchronized, failed)	BERT 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)	BERT test is finished because the interval expired.
State: disabled (synchronized, aborted)	BERT test is finished as a result of a user request (for example, no bert)
Pattern	Can be any one of the supported BERT patterns.
Interval	Can be any value from 1 to 1440 (units are in 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, 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, the number of errors encountered during the current sync period. If it is not currently synchronized but was synchronized earlier, 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 DS3 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"> • <i>Software Configuration Guide for the Cisco 12000 Series Internet Router</i> • <i>Cisco IOS Configuration Fundamentals Configuration Guide</i> • <i>Cisco IOS Release 12.0S Release Notes for Cisco 12000 Series Internet Routers</i>

Technical Assistance

Description	Link
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