Cisco Remote Connection Management Feature Module

Feature Overview

Cisco Remote Connection Management uses Cisco IOS software commands to configure the local (near-end) digital signal level 3 (DS3) port to match the configuration settings on a remote (far-end) DS3 port to achieve network connectivity and pass data traffic.

Cisco Remote Connection Management (CRCM) is supported on line cards that transmit to DS3 ports. For example, CRCM is supported on the following two types of line cards:

- Channelized OC-12 to DS3 line card provides a local Synchronous Optical Network (SONET) OC-12 interface to the Gigabit Switch Router (GSR) that is connected to a remote (far-end) DS3 port.

- 6DS3-SMB or 12DS3-SMB line card provides copper DS3 interfaces through sub-miniature bayonet coupling (SMB) connectors to the GSR that is connected to a remote DS3 port.

Both line cards are compatible with any Cisco 12000 series router that operates with the Cisco IOS Release 11.2(18)GS4 or a later 11.2(18)GS4 release.

Both line cards support third-party data service unit (DSU) vendors, Digital-Link, Kentrox, and Larscom. The DSU vendors enable connections between a local line card that is installed in a GSR and a remote DS3 port.

Cisco Remote Connection Management is useful because you can independently configure each local line card interface or serial port interface to achieve network connectivity.

Note   The examples in this publication refer to the 6DS3-SMB or 12DS3-SMB line cards. However, the Channelized OC-12 to DS3 line card also supports the Cisco Remote Connection Management feature.

Benefits

You can use Cisco Remote Connection Management to:

- Configure a line card port interface or a line card serial port interface.

- Establish direct communication between the local and remote DS3 ports using the default DSU, **cisco**.

Restrictions

The following restrictions apply to Cisco Remote Connection Management:

- Cisco Remote Connection Management only works with Channelized OC-12 to DS3, 6DS3-SMB, and 12DS3-SMB line cards that use Cisco IOS Release 11.2(18)GS4 or later.

- Cisco Remote Connection Management uses two Cisco-proprietary DS3 C-bit parity Far-End Alarm and Control (FEAC) messages that are not used in the American National Standards Institute (ANSI) standard. Table 1 describes the commands that generate the FEAC messages.

Table 1   Far-end Alarm and Control Messages

Confirmation Message	FEAC Code	Default Value	Commands
DEFAULT_SUBRATE_CONFIG	0x0CFF	fullrate	Router (config-if)# **dsu remote fullrate**
REMOVE_DEFAULT_SUBRATE_CONFIG	0x08FF	user-configured	Router (config-if)# **dsu remote fullrate**

Note   You can use Cisco Remote Connection Management only if (1) both ends of the DS3 line are configured for C-bit parity mode, and (2) the FEAC message from the DS3 payload source terminal to the DS3 payload sink terminal is delivered unaltered.

Related Documents

- *Channelized OC-12 to DS3 Line Card Installation and Configuration*

- *6DS3-SMB or 12DS3-SMB Line Card Installation and Configuration*

- *Release Notes for Cisco 12000 Series, Cisco IOS 11.2GS*

- *Cisco 7000 Family and 12000 Series - Release Notes for Release 12.0 S*

- *Cisco 12000 series Router Installation and Configuration Guide*

- The following configuration and command reference publications apply to your particular system configuration:

    — *Cisco IOS Software Command Summary*

    — *Cisco Management Information Base (MIB) User Quick Reference*

Supported Platforms

Cisco Remote Connection Management is supported on the following Cisco 12000 series Gigabit Switch Router (GSR) platforms:

- 12016

- 12012

- 12008

Prerequisites

Cisco Remote Connection Management works only when you set the DSU bandwidth to subrate, and the local (near-end) port is configured with the default DSU, **cisco**.

Supported Standards, MIBs, and RFCs

The American National Standards Institute (ANSI) standard TI-107 describes the standard Far-End Alarm and Control (FEAC) codes in the following requests for comments (RFCs):

- RFC 1407: DS3/E3 MIB

- RFC 1619: IP over SONET

- RFC 1661: PPP Protocol

- RFC 1662: PPP in HDLC-like Framing

Note For descriptions of supported MIBs and how to use them, see Cisco's MIB web site on Cisco Connection Online (CCO) at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

Implementation

The following sections describe implementation for each line card that supports Cisco Remote Connection Management.

Channelized OC-12 to DS3 Line Card

The channelized OC-12 to DS3 line card (OC12-DS3) supports twelve (12) independent DS3 streams multiplexed over a single OC-12 SONET port. The port is labeled Tx on the left and Rx on the right. You can use either one duplex fiber cable or two simplex fiber cables to connect the port to other devices. You can configure and monitor the DS3 streams on a per channel basis.

Receive (Rx) Side

The line card has one OC-12 port that provides a duplex SC single-mode intermediate-reach SONET connection.

Transmit (Tx) Side

The line card interfaces through an Add/Drop Multiplexer (ADM) and transmits up to 12 channels of DS3 multiplexed over a single 622-Mbps OC-12 port.

6DS3-SMB or 12DS3-SMB Line Card

The 6DS3-SMB and 12DS3-SMB line cards consist of high-density DS3 service through six T3 or twelve T3 interfaces. A single port consists of one coaxial connector for receiving (Rx) and one coaxial connector for transmitting (Tx). The serial ports on the 6-port line card are numbered 0-5. The serial ports on the 12-port line card are numbered 0-11. A single serial port can be configured independently of other serial ports on the line card.

Note You can configure the 6DS3-SMB or 12DS3-SMB line card serial port interfaces in any sequence.

Receive (Rx) Side

When the receive (Rx) side of a serial port on the 6DS3-SMB or 12DS3-SMB line card receives data, it starts clock discovery, checks the data or errors, selects a best-fit length buffer for storing the packet, and writes it to a buffer in the Receive Buffer Memory that is partitioned into buffers of varying length.

The buffers are maintained on queues that include:

- Free queues for buffers not currently in use.

- Raw queue is a memory buffer where packets sit until they are processed by the L3 Switch Processor, before they can be transmitted to the interface.

- Output queues of packets that are ready to be sent to the appropriate interface.

Transmit (Tx) Side

When a serial port on the 6DS3-SMB or 12DS3-SMB line card transmits (Tx) side received data, it writes to a partitioned buffer in Transmit Buffer Memory. It tries to match the partitioned buffer lengths used for the Receive Buffer Memory to ensure that the "best fit" decision can be re-used when the packet is received from the switch fabric.

The buffers are maintained on queues that include:

- Free queues for buffers not currently in use.

- Raw queue is a memory buffer where packets sit until they are processed by the L3 Switch Processor, before they can be transmitted to the interface.

- Output queues of packets that are ready to be sent to the appropriate interface.

Configuration Tasks

To configure a line card interface or serial port, perform the following tasks.

- Locate an Interface (Optional)
- Configure an Interface (Required)
- Establish Network Connectivity (Required)
- Use Cisco Remote Connection Management Commands (Optional)
- Test Network Connectivity (Optional)

Locate an Interface

To locate a local (near-end) line card or serial port interface, perform the following configuration tasks, starting in privileged EXEC mode.

Step	Command	Purpose

1	`Local-Router# show diag 2`
	`SLOT 2  (RP/LC 2 ):6 Port Packet over DS3`
	`Local-Router#`
		Enter the **show diag** *slot* privileged EXEC command to locate a line card in a router. The **show diag** output example shows a 6DS3-SMB line card in slot 2.

2	`Local-Router# show diag summary`
	`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`
	`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`
	`Local-Router#`
		Enter the **show diag summary** privileged EXEC command to list all line cards in the router.
		The **show diag summary** command output example shows a channelized OC12 to DS3 line card in slot 1, a 6DS3-SMB line card in slot 2, and a 12DS3-SMB line card in slot 6.

Configure an Interface

This section describes the procedures for configuring a local line card interface or serial port interface. You can configure serial 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 your system requirements.

Use the following procedures to configure a line card interface or serial port interface, beginning in privileged EXEC mode.

1	`Local-Router# configure terminal` `Local-Router(config)#`	Enter the **configure terminal** privileged EXEC command to enter global configuration mode.
2	`Local-Router(config)# interface 6/0` `Local-Router(config-if)#`	Enter the **interface** *slot*/*port* global configuration command to configure a line card interface.
3	`Local-Router(config)# interface serial 6/0` `Local-Router(config-if)#`	Enter the **interface serial** *slot*/*port* global configuration command. The prompt changes to interface configuration mode.
4	`Local-Router(config-if)# ip address 1.1.1.11 255.0.0.0` `Local-Router#`	Assign an IP address and subnet mask to the port interface with the **ip address** interface configuration command:

5	`Local-Router(config-if)# ` **`framing c-bit`** `Local-Router(config-if)#`	Specify DS3 framing by entering the **framing** interface configuration command:
6	`Local-Router(config-if)# ` **`transmitter-delay 0`** `Local-Router>(config-if)#`	Use the **transmitter-delay** interface configuration command and specify the number of transmitting delay gap characters that will be sent between packets. The following command selects **0** gap characters.
7	`Local-Router>(config-if)# ` **`scramble`** `Local-Router>(config-if)#`	Enable DS3 payload scrambling by entering the **scramble** interface configuration command.
8	`Local-Router>(config-if)# ` **`no keepalive`** `Local-Router>(config-if)#`	Enter the **no keepalive** interface configuration command to turn off keepalive messages. Although some encapsulations benefit from keepalive processing (e.g., HDLC), the Cisco 12000 series routers do not require keepalive messages.
9	`Local-Router>(config-if)# ` **`no shutdown`** `Local-Router>(config-if)#`	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.
10	`Local-Router(config-if)#` `Local-Router(config-if)#`	Add any other required configuration commands for your system configuration.
11	`Local-Router(config-if)# ` **`exit`** `Local-Router(config)# ` **`exit`** `Local-Router#`	Type **exit** until you return to privileged EXEC mode.
12	`Local-Router# ` **`copy running-config startup-config`** `Local-Router#`	Write the new configuration to memory by entering the **copy running-config startup-config** privileged EXEC command. The system displays an OK message when the configuration has been stored.

Establish Network Connectivity

Use the **telnet** *ip address* command to connect the local (near-end) port to the remote (far-end) port using an intervening third-party DSU. Complete the procedure in this section starting in privileged EXEC mode.

1	`Local-Router# ` **`telnet 1.1.1.11 255.0.0.0`** `Remote-Router>`	Use the **telnet** *ip address* command to enable communication between the local (near-end) port and the remote (far-end) port

If you can use **telnet** to establish a connection with the remote router and send traffic, this indicates that all the local (near-end) port and the remote (far-end) port configuration settings match.

If you can not establish a connection using the **telnet** command, it indicates that the DSU and other configuration settings do not match between the local (near-end) interface and remote (far-end) interfaces. For example, the local (near-end) port DSU may be set to **kentrox**, and the remote (far-end) port DSU may be set to the **larscom**. The following sections explain how to use Cisco Remote Connection Management commands to change the DSU and other configuration settings on the local (near-end) port to match the remote (far-end) port.

Connect to the Remote Port

The line cards support the concept of subrates, where each channel can be configured to allow full DS3 bandwidth transmission (**fullrate**) or fractional DS3 bandwidth transmission (**subrate**). Both ends of a connection must agree on the bandwidth settings to communicate over the DS3 payload path. In cases where they do not agree, Cisco Remote Connection Management allows you to temporarily force the local (near-end) DS3 port to a known state (where the default configuration settings are; **cisco** DSU, **subrate** DS3 bandwidth transmission, and **no scramble** DS3 payload). Then you can review the remote (far-end) DS3 port settings by using a **telnet** command line interface (CLI) session. Cisco Remote Connection Management supports both initiation of requests for remote (far-end) DS3 channel reset and response to incoming requests for a local (near-end) DS3 channel reset.

The procedures in this section explain how to remove a third-party DSU, and change the local (near-end) configuration settings beginning in privileged EXEC mode.

1	`Local-Router# ` **`configure terminal`** `Local-Router(config)#`	Enter the **configure terminal** privileged EXEC command to enter global configuration mode.
2	`Local-Router(config)# ` **`interface serial 2/0`** `Local-Router(config-if)#`	Enter the **interface serial** *slot*/*port* global configuration command. The prompt changes to interface configuration mode.
3	`Local-Router(config-if)# ` **`dsu mode cisco`** `Local-Router(config-if)#`	Enter the **dsu mode cisco** interface configuration command.
4	`Local-Router(config-if)# ` **`dsu remote subrate`** `Local-Router(config-if)#`	Enter the **dsu remote subrate** interface configuration command to set the local DSU bandwidth to subrate.
5	`Local-Router(config-if)# ` **`exit`** `Local-Router>`	Type **exit** to return to user EXEC mode.

6	Local-Router> **telnet 1.1.1.11 255.0.0.0** Remote-Router>	Enter the **telnet** *ipaddress* of the remote (far-end) DS3 port to establish a direct connection.
7	Remote-Router# **show controllers serial 2/0** Remote-Router#	Enter the **show controller serial** *slot/port* privileged EXEC command. Write down the remote far-end interface configuration settings.
8	Remote-Router# **exit** Local-Router> **enable** Local-Router#	Type **exit** to end the **telnet** session and return to the local (near-end) interface in user EXEC mode. Type **enable** to enter privileged EXEC mode.

> **Note**   When you change the DS3 subrate parameter value, it changes the local (near-end) line card interface. Other parameter value changes affect individual DS3 serial ports on the 6DS3-SMB or 12DS3-SMB line card.

Use Cisco Remote Connection Management Commands

After you verify the remote (far end) interface settings through a direct connection, use Cisco Remote Connection Management IOS software commands to make additional configuration changes on the local (near-end) interface to match it. Complete the configuration tasks in this section, beginning in privileged EXEC mode:

Step	Command	Purpose
1	Local-Router# **configure terminal** Local-Router(config)#	Enter the **configure terminal** privileged EXEC command to enter global configuration mode.
2	Local-Router(config)# **interface serial 6/0** Local-Router(config-if)#	Enter the **interface serial** *slot/port* global configuration command. The prompt changes to interface configuration mode.
3	Local-Router(config-if)# **dsu bandwidth 44210**	Enter the **dsu bandwidth** *bps* interface configuration command to change the local (near-end) bandwidth.
4	Local-Router(config-if)# **dsu remote accept** %GRP_DS3-5-FAREND: Interface Serial 2/0 accepted far end request of type (dsu fullrate) Local-Router(config-if)#	Enter the **dsu remote accept** interface configuration command so the local (near-end) interface will accept incoming requests from the remote (far-end) port.
5	Local-Router(config-if)# **clock source line** Local-Router(config-if)#	Enter **clock source** interface configuration command for the local near-end interface. Set the remote (far-end) clock source to a setting that is the opposite of the near-end clock source.
6	Local-Router(config-if)# **exit** Local-Router(config)# **exit** Local-Router#	Type **exit** until you return to privileged EXEC mode.
7	Local-Router# **copy running-config startup-config**	Enter the **copy running-config startup-config** EXEC command to write the local (near-end) configuration settings to memory.

After you make the additional configuration changes, use **telnet** to establish a connection and test network connectivity between the local (near-end) interface and the remote (far-end) interface by using the methods in "Test Network Connectivity" section on page 9.

Test Network Connectivity

To test data traffic in a direct configuration without an intervening DSU between the local (near-end) port and the remote (far-end) DS3 port, you can:

- Verify Clocking Modes

- Specify DS3 Port Loopback Modes

- Test DS3 Port Bit Error Rates

Verify Clocking Modes

Clocking mode synchronization can affect the success or failure of network connectivity. To troubleshoot network connectivity, check your clock mode configuration according to the line card type. The internal clock source setting transmits using a locally generated clock, while the line clock source setting (loop timing) uses the recovered receive clock.

Line Card Interface Clocking Modes

If the local (near-end) of a connection is in line clocking mode, then the remote (far-end) must be in internal clocking mode, or in the opposite order.

If both the local (near-end) and remote (far-end) line cards are in internal clocking mode, this configuration works, but is not recommended for some line cards, such as Add/Drop Multiplexers (ADMs). In internal clocking mode, each end of the connection receives data at a frequency that is not exactly matched to its own transmit frequency.

Note If both the local (near-end) and remote (far-end) line cards are in line clocking mode, each end (local or remote) recovers a clock-based on what it receives from its remote end and uses that clock to transmit back to the remote end. This configuration creates a big loop with each end trying unsuccessfully to match the clock of the remote end because there is no fixed frequency source in the loop.

Specify Serial Port Interface Clocking Modes

Each local (near-end) and remote (far-end) DS3 serial port recovers a clock from the received data using a phase locked loop (PLL). Each PLL tries to track the data it receives to recover a clock. You can connect the two PLLs in a loop because both ends are in line clocking mode. There is no fixed clock frequency in this loop. Having no fixed frequency may actually work if each end agrees on a common clock frequency.

Caution There is always a time delay from one end to the other consisting of cables and bits of circuitry. This delay causes each end to be late in adjusting its clock to match the frequency of what the other end is sending, so the frequency keeps shifting as each end tries to match the other, but never quite makes it. This may result in a severe jitter. If this dual-line-clocking configuration works, it is by chance. This configuration is not recommended.

Specify DS3 Port Loopback Modes

To test the flow of data traffic, enter one of the three loopback paths that the DS3 controller supports:

- Diagnostic or local loopback mode—Tests line card operation without using a cable connection, allowing the card running diagnostics to send data to itself over a single channel.

- Network—The two network loopback modes, **network loopback line** and **network loopback payload**, loop data from the receive path to the transmit path at the QJET location on the line card. All received data is returned to the remote end over a single channel. The default clock source is **line**.

- Remote—The **loopback remote** command causes the local end to send a FEAC message to the remote end to change to network loopback mode so that it will echo the data that was sent. The loopback remote mode verifies that the remote clock source is set as **internal**. Use the **no** form of this command to restore the default value, **no loopback**, and to send a FEAC message to the remote end requesting that it exit network loopback mode.

On the 6DS3-SMB or 12DS3-SMB line card, each loopback path exists for the local (near-end) ports. All loopback configuration on the 6DS3-SMB or 12DS3-SMB line card is done in the QJET, a quad DS3 framer that provides DS3 payload and limited bit error rate test (BERT) functionality.

Figure 1 shows the data flow for three loopback configuration paths, including the default value, **no loopback**.

Figure 1   DS3 Loopback Paths
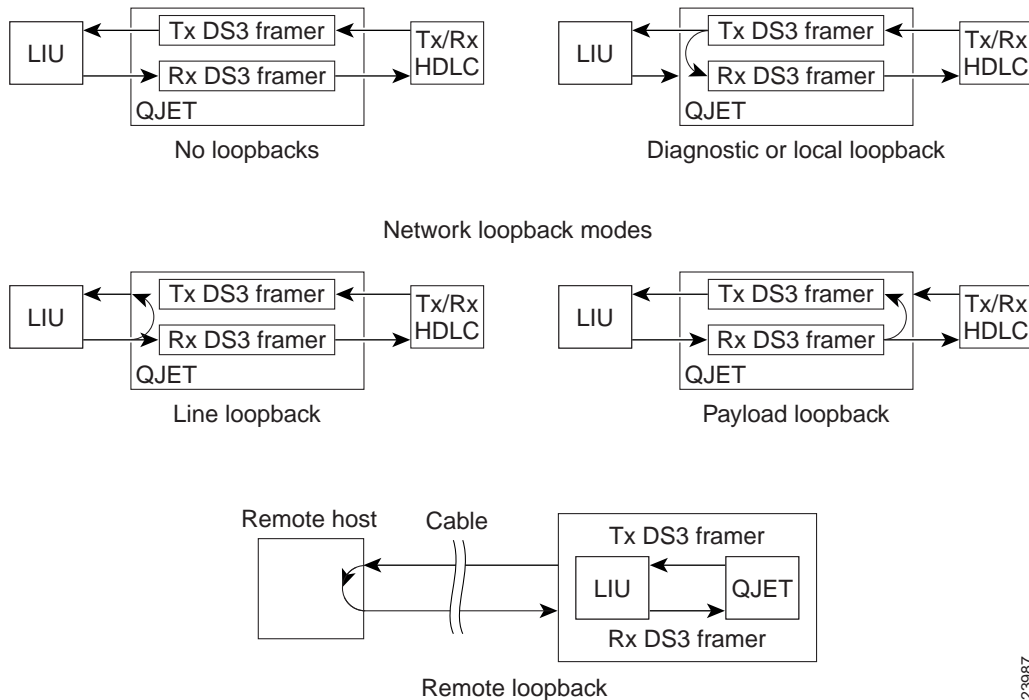
To test data traffic, use one of the **loopback** interface configuration commands shown in Table 2. Perform the configuration task in this section, beginning in privileged EXEC mode.

Table 2   DS3 Supported Loopback Modes

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

Step	Command	Purpose
1	Router# **configure terminal** Router(config)#	Enter **configure terminal** to enter global configuration mode.
2	Router(config)# **interface serial 6/0** Router(config-if)#	Enter the **interface serial** *slot*/*port* global configuration command. The prompt changes to interface configuration mode.
3	Router(config-if)# **clock source internal** Router(config-if)#	Enter the **clock source internal** interface configuration command that is specific to the loopback local mode.
4	Router(config-if)# **loopback local** Router(config-if)#	Enter the **loopback local** interface configuration command.

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.

Test DS3 Port Bit Error Rates

A Bit Error Rate Test (BERT) checks communication between the local and the remote DS3 ports. You can set the local interface to BER test mode while the remaining interfaces continue to transmit and receive normal traffic.

If traffic is not being transmitted or received, create a back-to-back loopback BERT test and send out a predictable stream to ensure that you receive the same data that was transmitted. To determine if the remote interface returns the bert pattern unchanged, the system administrator for the remote router must manually set the remote interface to **loopback network line.** Then you can enter a **bert pattern** interface configuration command at specified time intervals on the local interface.

The following example shows the output from a back-to-back loopback BERT test. The router types are a Cisco 12012 series GSR 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]
```

Enter Test Intervals Range

Table 3 lists DS3-supported BERT patterns. Test intervals range between 1 to 1140 minutes in length. The command examples show how to invoke an ongoing BERT pattern that will run during user-specified intervals. For example, entering the **bert pattern 2^23 interval 10** interface configuration command invokes a 2^23 BER test at ten minute intervals. The **no bert pattern** interface configuration command will terminate an ongoing BER test and return the local and remote interfaces to their default values. You can enter a BER test pattern beginning in privileged EXEC mode.

Table 3   DS3-Supported BERT Patterns

BERT Pattern	To Invoke	Command Examples
2^15	A pseudo-random repeating pattern that is 32767 bits long	`Router (config-if)#` **`bert pattern 2^15 interval 10`**
2^20	A pseudo-random repeating pattern that is 1048575 bits long	`Router (config-if)#` **`bert pattern 2^20 interval 10`**
qrss 2^20	A quasi-random signal source	`Router (config-if)#` **`bert pattern qrss 2^20`**
2^23	A pseudo-random repeating pattern that is 8388607 bits long	`Router (config-if)#` **`bert pattern 2^23 interval 10`**

Enter Errors in BERT Tests

To insert intentional errors into the BER test stream, use the **bert errors** *no-of-errors* interface configuration command, where the *no-of-errors* default is **1** and the range is 1 to 255, inclusive. Follow the configuration task in this section to insert 5 errors into the current BER test stream that is running the pseudo-random pattern 2^23 that repeats on the first DS3 channel for 10 minutes, beginning in privileged EXEC mode:

Step	Command	Purpose
1	`Router(config-if)#` **`bert pattern 2^23 interval 10`** `Router(config-if)#`	To enter a BERT on serial interface 6/0 that will sends a pseudo-random repeating pattern for ten minutes, enter the **bert pattern 2^23 interval 10** interface configuration command.
2	`Router(config-if)#` **`bert errors 5`**	Enter the **bert errors** interface configuration command and specify the number of errors you want to enter in the current BER test stream.

| Step	Command	Purpose

3	```Router(config-if)# exit```
	 ```Router(config)# exit```
	 ```Router#```
		Type **exit** to return to privileged EXEC mode.

4	```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#```
		Enter the **show controller serial** *6/0* **bert** EXEC command to verify that a BERT is enabled with a pattern of 2^23 and an interval of 10 minutes.

23Configuration Examples

The following configuration examples show how each line card that supports Cisco Remote Connection Management is connected.

Channelized OC-12 to DS3 Line Card Configuration Example

The configuration example in Figure 2 consists of a Cisco 12000 series router, a Cisco 7200 series router, and a Cisco 7500 series router connected to the packet over E3/T3 (POET) port adapter, and a third-party T3 DSU, such as Digital Link, Larscom, or Kentrox.

Figure 2 **Channelized OC12 to DS3 Configuration**
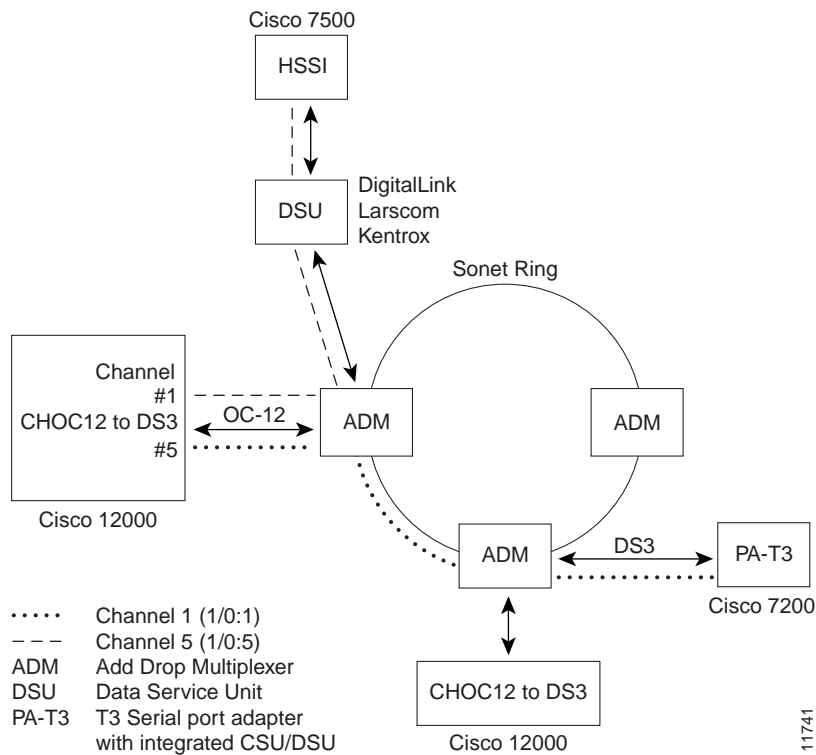
6DS3-SMB or 12DS3-SMB Line Card Configuration Example

This configuration example shows a direct connection between the local (near-end) and remote (far-end) interfaces. Figure 3 shows a local (near-end) line card, installed in a Cisco GSR and a remote (far-end) Cisco 7200 series router, using the default DSU mode, **cisco**.

Figure 3   Cisco Remote Connection Management Configuration
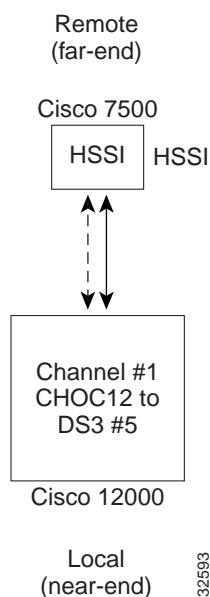
Use Cisco Remote Connection Management commands to configure the local (near-end) router to match the configuration on the remote (far-end) router. When you configure the local (near-end) line card, be sure to set the CRC to **16** or **32**, and verify that the encapsulation type on the local (near-end) matches the remote (far-end). The clock source on the default DSU mode, **cisco** is always set to **internal**. The clock source on the local (near-end) line card is **line** by default. You can not change the Cisco 7500 series HSSI router configuration.

```
Local-Router# show controller serial 8/5

Interface Serial8/5 (DS3 port 5)
hwidb = 0x613C26A0
ssb = 0x6188C658, ds = 0x6188C518
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
  Clock source is line, Cable length is 50
  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 HDLC
  Idle character is flags, Invert data is disabled
  Remote fullrate has no request outstanding
  Remote accept is enabled, MTU is 4470
No alarms detected.
Local-Router#

Hssi3/0 is up, line protocol is up
  Hardware is cxBus HSSI
  Internet address is 17.1.1.2/16
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
RSP7500-1#
```

Command Reference

This section documents the Cisco Remote Connection Management feature commands. All other commands used with this feature are documented in the *Cisco IOS Release 12.0 Command Summary*:

- **dsu bandwidth**
- **dsu mode**
- **dsu remote accept**
- **dsu remote**
- **show controllers serial**
- **show controller serial detail**
- **show diag**
- **show diag summary**
- **show interface**
- **show interface serial**

dsu bandwidth

To set the DSU bandwidth range, use the **dsu bandwidth** interface configuration command. Use the **no** form of this command to return to the default value.

> **dsu bandwidth** *range*
> **no dsu bandwidth** *range*

Syntax Description

range	A value from 0 to 44210 bps.

Default

44210 bps

Command Modes

Interface configuration

Command History

Release	Modification
11.2(11)GS	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

The local and remote DSU bandwidth configuration settings must match to enable network connectivity. When connected to an external DSU, the only data transmission rates allowed are those that are configurable on DSUs in the network. A zero range value will not allow data to pass. Refer to the DSU proprietary documentation for details.

Example

The following example shows how to set the bandwidth range to 44210 bps:

```
Router# configure terminal
Router(config)# interface 2/0
Router(config-if)# dsu bandwidth 44210
Router(config-if)#
```

Related Commands

Command	Description
dsu mode	A data service unit (DSU) is used to make the connection between a 6DS3-SMB or 12DS3-SMB line card installed in a local GSR and a remote device.

dsu mode

To configure the DSU mode on the Cisco 12000 series router and another device, use the **dsu mode** interface configuration command. Use the default DSU mode, **cisco**, to return to the default value.

dsu mode [**digital-link** | **kentrox** | **larscom** | **cisco**]
dsu mode cisco

Syntax Description

digital-link	Selects an X43 self-synchronous scrambler mode compatible with digital link DSU.
kentrox	Selects an X20 self-synchronous scrambler mode compatible with kentrox DSU.
larscom	Selects an X43 self-synchronous scrambler mode compatible with larscom DSU.
cisco	Selects an X43 self-synchronous scrambler compatible with cisco DSU.

Default

cisco

Command Modes

Interface configuration

Command History

Release	Modification
11.2(11)GS	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

A DSU mode must always be present in a DS3 interface configuration between two ports. Each line card interface or serial port interface can be configured to support third-party DSU modes, or the default mode, **cisco**. DSU mode is characterized primarily by the bandwidth control (subrate) and payload scrambling. The default DSU mode, **cisco**, has a default **line** clock source setting. The internal clock source setting transmits using a locally generated clock, while the line clock source setting (loop timing) uses the recovered receive clock. When you use a third-party DSU mode, if the local (near-end) of a connection is in line clocking mode, then the remote (far-end) must be in internal clocking mode, or in the opposite order. Clocking mode synchronization can affect the success or failure of network connectivity. To troubleshoot network connectivity, check your clock mode configuration according to the line card type.

Example

The following example sets the DSU mode to **kentrox**:

```
Router# configure terminal
Router(config)# interface serial 2/0
Router(config-if)# dsu mode kentrox
Router(config-if)# clock source line
```

Related Commands

Command	Description
clock source line	Specifies that the interface will clock it's transmitted data from a clock recovered from the line's receive data stream.

dsu remote accept

To set the local (near-end) DS3 port to accept the incoming remote requests, use the **dsu remote accept** global configuration command. Use the no form of this command to refuse incoming remote requests.

dsu remote accept
no dsu remote accept

Syntax Description

accept	Accept far-end requests to change configuration settings.

Defaults

This command has no default.

Command Modes

Global configuration

Command History

Release	Modification
11.2(11)GS	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

This command ensures that the local (near-end) will accept all requests from the remote (far-end).

Example

The following example shows how to configure the local (near-end) DS3 port to accept a remote configuration setting request by entering the **dsu remote accept** interface configuration command:

```
Router# configure terminal
Router(config)# interface serial 2/0
Router(config-if)# dsu remote accept
Router(config-if)#
```

Related Commands

Command	Description
None	

dsu remote

To set the local (near-end) DSU bandwidth, use the **dsu remote fullrate** interface configuration command. Use the **no** form of this command to return to the default value.

> **dsu remote** [**fullrate** | **subrate**]
> **dsu remote subrate**

Syntax Description

fullrate	Sets the sending and receiving rate to a full speed of 44210 bps.
subrate	Sets the sending and receiving rate to a fractional DS3 bandwidth transmission.

Default

subrate

Command Modes

Interface configuration

Command History

Release	Modification
11.2(11)GS	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

This command provides the lowest to highest speeds for sending and receiving data between the local (near-end) and remote (far-end) DS3 ports.

Example

The following example shows how to enter a local (near-end) DS3 port request to set the DSU bandwidth to **fullrate**:

```
Router# configure terminal
Router(config)# interface serial 2/0
Router(config-if)# dsu remote fullrate
Router(config-if)#
```

Related Command

Command	Description
dsu bandwidth	The DSU bandwidth range is from 0 to 44210 bps. It is the difference between the highest and lowest frequencies available for network signals.

show controllers serial

To show information that is specific to a 6DS3-SMB or 12DS3-SMB line card serial port, use the **show controllers serial** EXEC command.

show controllers serial *slot*/*port*

Syntax Description

slot/*port*	Router slot number and a port on the line card.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

Be sure to specify the router slot number and serial port number when using this command. The serial ports on the 6DS3-SMB line card are numbered 0-5. The serial ports on the 12DS3-SMB line card are numbered 0-11. A single serial port consists of one coaxial connector for receiving (Rx) and one coaxial connector for transmitting (Tx).

Example

The following example shows how to verify the controller configuration settings on the 0 DS3 serial port on a line card in slot 2:

```
Local-Router# show controller serial 2/0
DS3 port 2/0, interface Serial2/0
 cdb = 0x60B01EB8, base_hwidb = 0x6098AE20, hwidb = 0x6098BFE0
 ssb = 0x60B196CC, ds = 0x60B16448
 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 HDLC
  Idle character is flags, Invert data is disabled
  Remote fullrate has no request outstanding <<<<<----see fullrate request
  Remote accept is enabled, MTU is 4470 <<<<<----see remote accept
MIB information:
  Data in current interval (17 seconds elapsed):
   0 Line Code Violations, 0 P-bit Coding Violations
   0 C-bit Coding Violations
   0 P-bit Err Secs, 0 P-bit Sev Err Secs
   0 Sev Err Framing Secs, 0 Unavailable Secs
   0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Sev Err Secs
  No alarms detected.
Local-Router#
```

Related Commands

Command	Description
show controller serial detail	Displays a log message that records the number of requests that were made to a serial port.

show controller serial detail

To display information that is specific to the serial port interface hardware, use the **show controller serial detail** EXEC command.

show controller serial *slot*/*port* **detail**

Syntax Description

slot/*port*	Router slot number and a port on the line card.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

This command output displays a log message that records the number of requests that were made to a serial port on the 6DS3-SMB or 12DS3-SMB line card.

Example

The following example shows how to use the **show controller serial** *slot*/*port* **detail** command to verify configuration on the local near-end DS3 serial port:

```
Local-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
Local-Router#
```

(Remainder of displayed text omitted from example).

Related Commands

Command	Description
show interface serial *slot*/*port*	Verifies the configuration on a DS3 serial port interface.

show diag

To identify that a router recognizes a line card in a slot, use the **show diag** EXEC command.

show diag *slot*

Syntax Description

slot	Router slot number.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

Be sure to specify the router slot number when using this command.

Example

The following example shows how to enter the **show diag** command to verify that the router recognizes the line card in a slot:

```
Router# show diag 2
SLOT 2  (RP/LC 2 ):6 Port Packet over DS3
```

Related Commands

Command	Description
show diag summary	Displays a list of all types of line cards that are installed in the router.

show diag summary

To identify the types of line cards in all router slots, use the **show diag summary** EXEC command.

show diag summary

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

There is no need to specify the router slot number or port number when using this command.

Example

The following example shows how to use the **show diag summary** EXEC command to list all of the line cards that are installed in router slots:

```
Router# show diag summary
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
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
Router#
```

Related Command

Command	Description
show diag	Identifies a line card in a router slot.

show interface

To display information about a line card interface, use the **show interface** *slot*/*port* EXEC command.

show interface *slot*/*port*

Syntax Description

slot/*port*	Router slot number and a port on the line card.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

Be sure to specify the router slot number where the line card is installed.

Example

The following example shows how to obtain information about the 6DS3-SMB or 12DS3-SMB line card interface in slot 6:

```
Router# show interface 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#
```

Related Commands

Command	Description
show interfaces serial *slot*/*port*	Displays information about a serial port on the 6DS3-SMB or 12DS3-SMB line card.

show interface serial

Use the **show interfaces serial** *slot*/*port* EXEC command to display information about a serial interface.

> **show interfaces serial** *slot*/*port*

Syntax Description

slot/*port*	Router slot number and a port on the line card.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2(11)GS	This command was introduced.
12.0(5)S	This command was introduced in Cisco IOS Release 12.0S.

Usage Guidelines

Be sure to specify the router slot number and serial port number when using this command. The serial ports on the 6DS3-SMB line card are numbered 0-5. The serial ports on the 12DS3-SMB line card are numbered 0-11.

Example

The following example shows how to verify the configuration settings for the 0 DS3 serial port on the line card in slot 2:

```
Router# show interfaces serial 2/0
Serial2/0 is up, line protocol is up
Hardware is Interface Serial2/0 (DS3 port 0)
Internet address is 1.1.5.1/24
MTU 4470 bytes, BW 44210 Kbit, DLY 200 usec, rely 255/255, load 1/255
Encapsulation HDLC, crc 16, loopback not set
Keepalive set (10 sec)
Last input never, output 00:00:05, output hang never
Last clearing of show interface counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
0 packets input, 0 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 parity
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
2 packets output, 356 bytes, 0 underruns
0 output errors, 0 applique, 3 interface resets
0 output buffer failures, 0 output buffers swapped out
1 carrier transitions
Router#
```

Related Command

Command	Description
show interface	Displays information about a line card interface.

Glossary

Add/Drop Multiplexer (**ADM**)—A multiplexer capable of extracting and inserting lower-rate signals from or to a higher-rate multiplexed signal without completely demultiplexing the signal.

Bayonet coupling connector (**BNC**)—A standard cable connector, commonly used in T3 applications.

Digital signal level 3 (**DS3**)—Framing specification used for transmitting digital signals at 44.736 Mbps on a T3 facility.

Data service unit (**DSU**)—Device used in digital transmission that adapts the physical interface on a data terminal equipment (DTE) device to a transmission facility such as T3 or E3. The DSU is also responsible for such functions as signal timing. Often referred to, together with CSU, as DSU/ CSU.

Far-End Alarm and Control (**FEAC**)—A DS3 low-speed subchannel.

Frame check sequence (**FCS**)— Extra characters added to a frame for error control purposes. used in HDLC, Frame Relay, and other data link layer protocols.

High-level Data Link Control (**HDLC**)—Bit-oriented, synchronous data link layer protocol developed by International Organization for Standardization (ISO). Derived from Synchronous Data Link Control (SDLC), HDLC is a specific data encapsulation method on synchronous serial links using frame characters and checksums.

Management Information Base (**MIB**)—The set of attributes an SNMP-based management station can query or set in an SNMP agent resident in a network device.

Packet-Over E3/T3 (**POET**)—port adapter.

Sub-miniature bayonet (**SMB**)—coupling connectors.