**loopback remote (interface)**

To loop packets through a CSU/DSU, over a DS-3 link or a channelized T1 link, to the remote CSU/DSU and back, use the `loopback remote` command in interface configuration mode. To remove the loopback, use the `no` form of this command.

**FT1/T1 CSU/DSU Modules**

```
loopback remote {full | payload | smart-jack} [0in1 | 1in1 | 1in2 | 1in5 | 1in8 | 3in24 | qrw | user-pattern 24bit-binary-value]

no loopback remote {full | payload | smart-jack}
```

**2- and 4-Wire, 56/64-kbps CSU/DSU Modules**

```
loopback remote [2047 | 511 | stress-pattern pattern-number]

no loopback remote
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>full</td>
<td>Transmits a full-bandwidth line loopback request to a remote device, which is used for testing.</td>
</tr>
<tr>
<td>payload</td>
<td>Transmits a payload line loopback request to a remote device, which is used for testing the line and remote DSU.</td>
</tr>
<tr>
<td>smart-jack</td>
<td>Transmits a loopback request to the remote smart-jack, which some service providers attach on the line before the customer premises equipment (CPE). You cannot put the local smart jack into loopback.</td>
</tr>
<tr>
<td>0in1</td>
<td>(Optional) Transmits an all-zeros test pattern used for verifying B8ZS line encoding. The remote end may report a loss of signal when using alternate mark inversion (AMI) line coding.</td>
</tr>
<tr>
<td>1in1</td>
<td>(Optional) Transmits an all-ones test pattern used for signal power measurements.</td>
</tr>
<tr>
<td>1in2</td>
<td>(Optional) Transmits an alternating ones and zeroes test pattern used for testing bridge taps.</td>
</tr>
<tr>
<td>1in5</td>
<td>(Optional) Transmits the industry standard test-pattern loopback request.</td>
</tr>
<tr>
<td>1in8</td>
<td>(Optional) Transmits a test pattern used for stressing timing recovery of repeaters.</td>
</tr>
<tr>
<td>3in24</td>
<td>(Optional) Transmits a test pattern used for testing the ones density tolerance on AMI lines.</td>
</tr>
<tr>
<td>qrw</td>
<td>(Optional) Transmits a quasi-random word test pattern, which is a random signal that simulates user data.</td>
</tr>
<tr>
<td>user-pattern 24bit-binary-value</td>
<td>(Optional) Transmits a test pattern that you define. Enter a binary string up to 24 bits long. For the fixed patterns such 0in1 and 1in1, the T1 framing bits are jammed on top of the test pattern; for the user-pattern, the pattern is simply repeated in the time slots.</td>
</tr>
</tbody>
</table>
loopback remote (interface)

2047
(Optional) Transmits a pseudorandom test pattern that repeats after 2047 bits.

511
(Optional) Transmits a pseudorandom test pattern that repeats after 511 bits.

stress-pattern
(pattern-number)
(Optional) Transmits a DDS stress pattern available only on the 4-wire 56/64-kbps CSU/DSU module. You may enter a stress pattern from 1 to 4. A 1 pattern sends 100 bytes of all 1s and then 100 bytes of all 0s to test the stress clocking of the network. A 2 pattern sends 100 bytes of a 0x7e pattern and then 100 bytes of all 0s. A 3 pattern sends continuous bytes of a 0x46 pattern. A 4 pattern sends continuous bytes of 0x02 pattern.

Defaults
Disabled

Command Modes
Interface configuration

Command History
Release Modification
11.0 This command was introduced.

Usage Guidelines
This command applies only when the remote CSU/DSU device is configured for this function. It is used for testing the data communication channels along with or without remote CSU/DSU circuitry. The loopback is usually performed at the line port, rather than the DTE port, of the remote CSU/DSU.

For a multiport interface processor connected to a network via a channelized T1 link, the loopback remote interface configuration command applies if the remote interface is served by a DDS line (56 kbps or 64 kbps) and the device at the remote end is a CSU/DSU. In addition, the CSU/DSU at the remote end must react to latched DDS CSU loopback codes. Destinations that are served by other types of lines or that have CSU/DSUs that do not react to latched DDS CSU codes cannot participate in an interface remote loopback. Latched DDS CSU loopback code requirements are described in AT&T specification TR-TSY-000476, “OTGR Network Maintenance Access and Testing.”

For the integrated FT1/T1 CSU/DSU module, the loopback remote full command sends the loopup code to the remote CSU/DSU. The remote CSU/DSU performs a full-bandwidth loopback through the CSU portion of the module. The loopback remote payload command sends the loopup code on the configured time slots, while maintaining the D4-Extended Superframe. The remote CSU/DSU performs the equivalent of a loopback line payload request. The remote CSU/DSU loops back only those time slots that are configured on the remote end. This loopback reframes the data link, regenerates the signal, and corrects bipolar violations and extended super frame CRC errors. The loopback remote smart-jack command sends a loopup code to the remote smart jack. You cannot put the local smart jack into loopback.

Failure to loopup or initiate a remote loopback request could be caused by enabling the no service-module t1 remote-loopback command or having an alternate remote-loopback code configured on the remote end. When the loopback is terminated, the result of the pattern test is displayed.

For the 2- and 4-wire, 56/64-kbps CSU/DSU module, an active connection is required before a loopup can be initiated while in switched mode. When transmitting V.54 loopbacks, the remote device is commanded into loopback using V.54 messages. Failure to loopup or initiate a remote loopback request could be caused by enabling the no service-module 56k remote-loopback command.
To show interfaces that are currently in loopback operation, use the `show interfaces loopback` command in EXEC mode.

**Examples**

The following example configures a remote loopback test:

```
Router(config)# interface serial 0
Router(config-if)# loopback remote
```

The following example configures the remote device into full-bandwidth line loopback while specifying the `qrw` test pattern over the T1 CSU/DSU module on a Cisco 2524 or Cisco 2525 router:

```
Router(config)# interface serial 0
Router(config-if)# loopback remote full qrw
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0, changed state to down
%LINK-3-UPDOWN: Interface Serial0, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 0 - Remote unit placed in loopback
```

The following example transmits a remote loopback stress pattern over the 4-wire, 56/64-kbps CSU/DSU module, which tests the stress clocking of the network:

```
Router(config-if)# loopback remote stress-pattern 1
```

```
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1, changed state to down
%LINK-3-UPDOWN: Interface Serial1, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 1 - Remote unit placed in loopback
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>clear service-module serial</code></td>
<td>Resets an integrated CSU/DSU.</td>
</tr>
<tr>
<td><code>loopback dte</code></td>
<td>Loops packets back to the DTE device from the CSU/DSU.</td>
</tr>
<tr>
<td><code>loopback line</code></td>
<td>Loops packets completely through the CSU/DSU to configure the CSU loop.</td>
</tr>
<tr>
<td><code>service-module 56k remote-loopback</code></td>
<td>Enables the acceptance of a remote loopback request on a serial interface on a 2- or 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td><code>service-module t1 remote-loopback</code></td>
<td>Specifies whether the fractional T1/T1 CSU/DSU module enters loopback mode when it receives a loopback code on the line.</td>
</tr>
<tr>
<td><code>show interfaces loopback</code></td>
<td>Displays information about the loopback interface.</td>
</tr>
<tr>
<td><code>show service-module serial</code></td>
<td>Displays the performance report for an integrated CSU/DSU.</td>
</tr>
</tbody>
</table>
To configure the Maintenance Data Link (MDL) message defined in the ANSI T1.107a-1990 specification for the CT3 in a Cisco AS5800 universal access server, or for the CT3IP in Cisco 7500 series routers, use the `mdl` command in interface configuration mode. To remove the message, use the `no` form of this command.

```
mdl {transmit {path | idle-signal | test-signal} | string {eic | lic | fic | unit | pfi | port | generator} string}
no mdl {transmit {path | idle-signal | test-signal} | string {eic | lic | fic | unit | pfi | port | generator} string}
```

**Syntax Description**

- `transmit path` Enables transmission of the MDL Path message.
- `transmit idle-signal` Enables transmission of the MDL Idle Signal message.
- `transmit test-signal` Enables transmission of the MDL Test Signal message.
- `string eic string` Specifies the Equipment Identification Code; can be up to 10 characters.
- `string lic string` Specifies the Location Identification Code; can be up to 11 characters.
- `string fic string` Specifies the Frame Identification Code; can be up to 10 characters.
- `string unit string` Specifies the Unit Identification Code; can be up to 6 characters.
- `string pfi string` Specifies the Facility Identification Code sent in the MDL Path message; can be up to 38 characters.
- `string port string` Specifies the Port number string sent in the MDL Idle Signal message; can be up to 38 characters.
- `string generator string` Specifies the Generator number string sent in the MDL Test Signal message; can be up to 38 characters.

**Defaults**

No MDL message is configured.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Use the `show controllers t3` command to display MDL information (received strings). MDL information is displayed only when framing is set to C-bit.

**Note**

MDL is supported only when the DS3 framing is C-bit parity.
Examples

The following examples show several of the `mdl` commands for the CT3IP in slot 9:

```plaintext
Router(config)# controller t3 9/0/0
Router(config-controller)# mdl string eic Router A
Router(config-controller)# mdl string lic Test Network
Router(config-controller)# mdl string fic Building B
Router(config-controller)# mdl string unit ABC
```

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>show controllers t3</code></td>
<td>Displays information about the CT3IP on Cisco 7500 series routers.</td>
</tr>
</tbody>
</table>
media-type

To specify the physical connection on an interface, use the `media-type` command in interface configuration mode. To restore the default value, use the `no` form of this command.

```
media-type {aui | 10baset | 100baset | mii}
```

```
o media-type {aui | 10baset | 100baset | mii}
```

### Syntax Description

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>aui</code></td>
<td>Selects an AUI 15-pin physical connection. This is the default on Cisco 4000 series routers.</td>
</tr>
<tr>
<td><code>10baset</code></td>
<td>Selects an R-J45 10BASE-T physical connection.</td>
</tr>
<tr>
<td><code>100baset</code></td>
<td>Specifies an RJ-45 100BASE-T physical connection. This is the default on Cisco 7000 series and Cisco 7200 series routers.</td>
</tr>
<tr>
<td><code>mii</code></td>
<td>Specifies a media-independent interface.</td>
</tr>
</tbody>
</table>

### Defaults

An AUI 15-pin physical connection is the default setting on Cisco 4000 series routers.

100BASE-T physical connection is the default setting on Cisco 7000 series and Cisco 7200 series routers.

### Command Modes

Interface configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### Usage Guidelines

To specify the physical connection on an interface, use the following interface configuration:

- Ethernet network interface module configuration on Cisco 4000 series routers
- Fast Ethernet Interface Processor (FEIP) on Cisco 7000 series, 7200 series, and 7500 series routers
- Full-duplex or half-duplex mode on a serial interface

### Examples

The following example selects an RJ-45 10BASE-T physical connection on Ethernet interface 1:

```
Router(config)# interface ethernet 1
Router(config-if)# media-type 10baset
```

The following example specifies a media-independent interface physical connection to Fast Ethernet slot 0, port 1 on the Cisco 7000 or 7200 series:

```
Router(config)# interface fastethernet 0/1
Router(config-if)# media-type mii
```
The following example specifies a media-independent interface physical connection to Fast Ethernet slot 0, port adapter 1, port 1 on the Cisco 7500 series:

Router(config)# interface fastethernet 0/1/1
Router(config-if)# media-type mii
media-type half-duplex

The media-type half-duplex command is replaced by the half-duplex command. See the description of the half-duplex command in this chapter for more information.
modem dtr-delay

To control the time that a data terminal ready (DTR) signal is held down when a line clears, use the modem dtr-delay command in line configuration mode. To restore the default hold down time, use the no form of this command.

```
modem dtr-delay seconds

no modem dtr-delay seconds
```

Syntax Description

seconds Number of seconds. The default is 5.

Defaults

The default DTR signal hold down time is 5 seconds.

Command Modes

Line configuration

Command History

Release Modification
12.1 This command was introduced.

Usage Guidelines

Use this command to reduce the time that a DTR signal is held down after an asynchronous line clears and before the DTR signal is raised again to accept new calls. Incoming calls may be rejected in heavily loaded systems even when modems are unused because the default DTR hold down interval may be too long. The modem dtr-delay command is designed for lines used for an unframed asynchronous session such as Telnet. Lines used for a framed asynchronous session such as PPP should use the pulse-time interface command.

Examples

The following example shows how to specify a DTR hold down interval of 2 seconds:

```
Router(config)# line 7
Router(config-line)# modem dtr-delay 2
```

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulse-time</td>
<td>Enables pulsing DTR signal intervals on serial interfaces.</td>
</tr>
</tbody>
</table>
mop enabled

To enable an interface to support the Maintenance Operation Protocol (MOP), use the `mop enabled` command in interface configuration mode. To disable MOP on an interface, use the `no` form of this command.

```
mop enabled
no mop enabled
```

**Syntax Description**
This command has no arguments or keywords.

**Defaults**
Enabled on Ethernet interfaces and disabled on all other interfaces.

**Command Modes**
Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Examples**
The following example enables MOP for serial interface 0:

```
Router(config)# interface serial 0
Router(config-if)# mop enable
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mop retransmit-timer</td>
<td>Configures the length of time that the Cisco IOS software waits before sending boot requests again to a MOP server.</td>
</tr>
<tr>
<td>mop retries</td>
<td>Configures the number of times the Cisco IOS software will send boot requests again to a MOP server.</td>
</tr>
<tr>
<td>mop sysid</td>
<td>Enables an interface to send out periodic MOP system identification messages.</td>
</tr>
</tbody>
</table>
mop sysid

To enable an interface to send out periodic Maintenance Operation Protocol (MOP) system identification messages, use the `mop sysid` command in interface configuration mode. To disable MOP message support on an interface, use the `no` form of this command.

```
mop sysid

no mop sysid
```

**Syntax Description**
This command has no arguments or keywords.

**Defaults**
Enabled

**Command Modes**
Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**
You can still run MOP without having the background system ID messages sent. This command lets you use the MOP remote console, but does not generate messages used by the configurator.

**Examples**
The following example enables serial interface 0 to send MOP system identification messages:

```
Router(config)# interface serial 0
Router(config-if)# mop sysid
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mop device-code</td>
<td>Identifies the type of device sending MOP sysid messages and request program messages.</td>
</tr>
<tr>
<td>mop enabled</td>
<td>Enables an interface to support the MOP.</td>
</tr>
</tbody>
</table>
To adjust the maximum packet size or maximum transmission unit (MTU) size, use the `mtu` command in interface configuration mode. To restore the MTU value to its original default value, use the `no` form of this command.

```
mtu bytes
no mtu
```

**Syntax Description**

```
bytes Desired size in bytes.
```

**Defaults**

Table 13 lists default MTU values according to media type.

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Default MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet</td>
<td>1500</td>
</tr>
<tr>
<td>Serial</td>
<td>1500</td>
</tr>
<tr>
<td>Token Ring</td>
<td>4464</td>
</tr>
<tr>
<td>ATM</td>
<td>4470</td>
</tr>
<tr>
<td>FDDI</td>
<td>4470</td>
</tr>
<tr>
<td>HSSI (HSA)</td>
<td>4470</td>
</tr>
</tbody>
</table>

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Each interface has a default maximum packet size or MTU size. This number generally defaults to the largest size possible for that interface type. On serial interfaces, the MTU size varies, but cannot be set smaller than 64 bytes.

**Caution**

Changing an MTU size on a Cisco 7500 series router results in the recarving of buffers and resetting of all interfaces. The following message is displayed:

```
%RSP-3-Restart:cbus complex.
```
Protocol-Specific Versions of mtu Command

Changing the MTU value with the mtu interface configuration command can affect values for the protocol-specific versions of the command (the ip mtu command, for example). If the value specified with the ip mtu interface configuration command is the same as the value specified with the mtu interface configuration command, and you change the value for the mtu interface configuration command, the ip mtu value automatically matches the new mtu interface configuration command value. However, changing the values for the ip mtu configuration commands has no effect on the value for the mtu interface configuration command.

ATM and LANE Interfaces

ATM interfaces are not bound by what is configured on the major interface. By default, MTU on a subinterface is equal to the default MTU (4490); if a client is configured the default is 1500. MTU can be changed on subinterfaces, but it may result in recarving of buffers to accommodate the new maximum MTU on the interface.

Examples

The following example specifies an MTU of 1000 bytes:

```
Router(config)# interface serial 1
Router(config-if)# mtu 1000
```

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>encapsulation smds</td>
<td>Enables SMDS service on the desired interface.</td>
</tr>
<tr>
<td>ip mtu</td>
<td>Sets the MTU size of IP packets sent on an interface.</td>
</tr>
</tbody>
</table>
**national bit**

To set the E3 national bit in the G.751 frame used by the PA-E3 port adapter, use the `national bit` command in interface configuration mode. To return to the default E3 national bit, use the `no` form of this command.

```
national bit {0 | 1}
no national bit
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

**Defaults**

0 national bit

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CA</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

The `national bit` command sets bit 12 in the E3 frame.

To verify the national bit configured on the interface, use the `show controllers serial` EXEC command.

**Examples**

The following example sets the national bit to 1 on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:

```
Router(config)# interface serial 1/0/0
Router(config-if)# national bit 1
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>national bit</code></td>
<td>Sets the E3 international bit in the G.751 frame used by the PA-E3 port adapter.</td>
</tr>
<tr>
<td><code>show controllers serial</code></td>
<td>Displays information that is specific to the interface hardware.</td>
</tr>
</tbody>
</table>
national reserve

To set the E1 national bit, enter the `national reserve` command in interface configuration mode. To return to the default E1 national bit, use the `no` form of this command.

```
national reserve <0-1><0-1><0-1><0-1><0-1><0-1>
no national reserve
```

**Syntax Description**
This command has no arguments or keywords.

**Defaults**
```
111111
```

**Command Modes**
Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0(5)XE</td>
<td>This command was introduced.</td>
</tr>
<tr>
<td>12.0(7)XE1</td>
<td>Support for Cisco 7100 series routers was added.</td>
</tr>
<tr>
<td>12.1(5)T</td>
<td>This command was integrated into Cisco IOS Release 12.1(5)T.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**
This command applies only for E1. This command not only sets the national reserve bits but also sets the international bit as well. The far left digit represents the international bit. All six digits must be present for the pattern to be valid.

**Examples**
On Cisco 7100 series routers, the following example sets the national bit on interface 1 on the port adapter in slot 0 to no scrambling:

```
interface atm1/0
national reserve 011011
```
negotiation

To configure speed, duplex, and flow control on the Gigabit Ethernet port of the Cisco 7200-I/O-GE+E, use the negotiation command in interface configuration mode. To disable automatic negotiation, use the no negotiation auto command.

```
negotiation {forced | auto}

no negotiation auto
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>forced</td>
<td>Disables flow control and configures the Gigabit Ethernet interface in 1000/full-duplex mode.</td>
</tr>
<tr>
<td>auto</td>
<td>Enables the autonegotiation protocol to configure the speed, duplex, and automatic flow-control of the Gigabit Ethernet interface.</td>
</tr>
</tbody>
</table>

**Defaults**

Negotiation auto

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CC</td>
<td>This command was introduced.</td>
</tr>
<tr>
<td>12.0(7)S, 12.0(6)T</td>
<td>The forced keyword was added.</td>
</tr>
<tr>
<td>12.1(3a)E</td>
<td>Support for the Cisco 7200-I/O-GE+E controller was introduced.</td>
</tr>
<tr>
<td>12.1(5)T</td>
<td>This command was integrated into Cisco IOS Release 12.1(5)T.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

The negotiation command is applicable only to the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E. The negotiation auto command is used instead of the duplex and speed commands (which are used on Ethernet and Fast Ethernet interfaces) to automatically configure the duplex and speed settings of the interfaces. The negotiation forced command is used to configure the Gigabit Ethernet interface to be 1000/full-duplex only and to disable flow control. The Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E is restricted to 1000 Mbps/full duplex only. Autonegotiation negotiates only to these values.

**Examples**

The following example configures the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E to autonegotiate:

```
configure terminal
interface gigabitethernet 0/0
negotiation auto
```
## Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>show interfaces</code></td>
<td>Checks the status and configuration settings of the Gigabit Ethernet</td>
</tr>
<tr>
<td><code>gigabitethernet</code></td>
<td>interface of the Cisco 7200-I/O-GE+E.</td>
</tr>
</tbody>
</table>
nrzi-encoding

To enable nonreturn-to-zero inverted (NRZI) line-coding format, use the **nrzi-encoding** command in interface configuration mode. To disable this capability, use the **no** form of this command.

```
 nrzi-encoding [mark]
 no nrzi-encoding
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mark</td>
<td>(Optional) Specifies that NRZI mark encoding is required on the PA-8T and PA-4T+ synchronous serial port adapters on Cisco 7200 and 7500 series routers. If mark is not specified, NRZI space encoding is used.</td>
</tr>
</tbody>
</table>

**Defaults**

Disabled

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
<tr>
<td>11.3</td>
<td>The <strong>mark</strong> keyword was added for the Cisco 7200 series routers and Cisco 7500 series routers.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

All FSIP, PA-8T, and PA-4T+ interface types support nonreturn-to-zero (NRZ) and NRZI format. This is a line-coding format that is required for serial connections in some environments. NRZ encoding is most common. NRZI encoding is used primarily with EIA/TIA-232 connections in IBM environments.

**Examples**

The following example configures serial interface 1 for NRZI encoding:

```
Router(config)# interface serial 1
Router(config-if)# nrzi-encoding
```

The following example configures serial interface 3/1/0 for NRZI mark encoding:

```
Router(config)# interface serial 3/1/0
Router(config-if)# nrzi-encoding mark
```
physical-layer

To specify the mode of a slow-speed serial interface on a router as either synchronous or asynchronous, use the `physical-layer` command in interface configuration mode. To return the interface to the default mode of synchronous, use the `no` form of this command.

```
physical-layer { sync | async }

no physical-layer
```

### Syntax Description

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sync</code></td>
<td>Places the interface in synchronous mode. This is the default.</td>
</tr>
<tr>
<td><code>async</code></td>
<td>Places the interface in asynchronous mode.</td>
</tr>
</tbody>
</table>

### Defaults

Synchronous mode

### Command Modes

Interface configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### Usage Guidelines

This command applies only to low-speed serial interfaces available on Cisco 2520 through 2523 series routers.

If you specify the `no physical-layer` command, you return the interface to its default mode (synchronous).

In synchronous mode, low-speed serial interfaces support all interface configuration commands available for high-speed serial interfaces, except the following two commands:

- `half-duplex timer cts-delay`
- `half-duplex timer rts-timeout`

When placed in asynchronous mode, low-speed serial interfaces support all commands available for standard asynchronous interfaces.

When you enter this command, it does not appear in the output of `more system:running-config` and `more nvram:startup-config` commands because the command is a physical-layer command.

### Examples

This example changes a low-speed serial interface from synchronous to asynchronous mode:

```
Router(config)# interface serial 2
Router(config-if)# physical-layer async
```
<table>
<thead>
<tr>
<th>Related Commands</th>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>more</td>
<td>Displays a specified file.</td>
</tr>
</tbody>
</table>
port

To enable an interface on a PA-4R-DTR port adapter to operate as a concentrator port, use the `port` command in interface configuration mode. To restore the default station mode, use the `no` form of this command.

```
port
no port
```

**Syntax Description**

This command has no arguments or keywords.

**Defaults**

Station mode

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3(3)T</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

By default, the interfaces of the PA-4R-DTR operate as Token Ring stations. Station mode is the typical operating mode. Use this command to enable an interface to operate as a concentrator port.

**Examples**

The following example configures the PA-4R-DTR ports to operate in concentrator mode on a Cisco 7000 series router:

```
Router(config-if)# port
```
pos ais-shut

To send the line alarm indication signal (LAIS) when the Packet-Over-SONET (POS) interface is placed in any administrative shut down state, use the `pos ais-shut` command in interface configuration mode.

```
pos ais-shut
```

**Syntax Description**

This command has no keywords or arguments.

**Defaults**

No LAIS is sent.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CC</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

In Automatic Protection Switching (APS) environments, LAIS can be used to force a protection switch. This command forces an APS switch when the interface is placed in administrative shut down state.

For more information on APS, refer to the “Configuring Serial Interfaces” chapter in the *Cisco IOS Interface Configuration Guide*.

This command does not have a `no` form.

**Examples**

The following example forces the alarm indication on POS OC-3 interface 0 in slot 3:

```
Router(config)# interface pos 3/0
Router(config-if)# shutdown
Router(config-if)# pos ais-shut
```
pos flag

To set the SONET overhead bytes in the frame header to meet a specific standards requirement or to ensure interoperability with the equipment of another vendor, use the pos flag command in interface configuration mode. To remove the setting of the SONET overhead bytes, use the no form of this command.

```plaintext
pos flag {c2 | j0 | s1s0} value
no pos flag {c2 | j0 | s1s0} value
```

### Syntax Description

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>c2 value</td>
<td>Path signal identifier used to identify the payload content type. The default value is 0xCF.</td>
<td></td>
</tr>
<tr>
<td>j0 value</td>
<td>Section trace byte (formerly the C1 byte). For interoperability with Synchronous Digital Hierarchy (SDH) equipment in Japan, use the value 0x1. The byte value can be 0 to 255.</td>
<td></td>
</tr>
</tbody>
</table>
| s1s0 value         | S1 and S0 bits (bits 5 and 6 of the H1 #1 payload pointer byte). Use the following values to tell the SONET transmission equipment the SS bit:  
  - For OC-3c, use 0 (this is the default).  
  - For AU-4 container in SDH, use 2.  
  The S1 and S0 bits can be 0 to 3. Values 1 and 3 are undefined. The default value is 0. |

### Defaults

The default c2 value is 0xCF, and the default s1s0 value is 0.

### Command Modes

Interface configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2 GS</td>
<td>This command was introduced to support the Cisco 12000 series Gigabit Switch Routers.</td>
</tr>
</tbody>
</table>

### Usage Guidelines

Use the following values to tell the SONET transmission equipment the payload type:

- For PPP, or High-Level Data Link Control (HDLC) when required, use 0xCF (this is the default).
- For ATM, use 0x13.
- For other equipment, use any nonzero value.
- The byte value can be 0 to 255.

### Examples

The following example sets the path signal identifier used to identify the payload content type to ATM on the pos interface in slot 9:
Router(config)# interface pos 9/0
Router(config-if)# pos flag c2 0x13
Router(config-if)# end
Router#
pos framing

To specify the framing used on the POS (Packet-over-SONET) interface, use the `pos framing` command in interface configuration mode. To return to the default SONET STS-3c framing mode, use the `no` form of this command.

`pos framing {sdh | sonet}

no pos framing`

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sdh</td>
<td>Selects SDH STM-1 framing. This framing mode is typically used in Europe.</td>
</tr>
<tr>
<td>sonet</td>
<td>Selects SONET STS-3c framing. This is the default.</td>
</tr>
</tbody>
</table>

**Defaults**

SONET STS-3c framing

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
<tr>
<td>11.3</td>
<td>This command was modified to change the <code>pos framing-sdh</code> command to <code>pos framing-sdh</code>.</td>
</tr>
<tr>
<td>11.2 GS</td>
<td>The command syntax was changed from <code>pos framing-sdh</code> to <code>pos framing</code>. The <code>sonet</code> keyword was added.</td>
</tr>
</tbody>
</table>

**Examples**

The following example configures the interface for SDH STM-1 framing:

```
Router(config)# interface pos 3/0
Router(config-if)# pos framing sdh
Router(config-if)# no shutdown
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock source (interface)</td>
<td>Controls the clock used by a G.703-E1 interface.</td>
</tr>
<tr>
<td>interface</td>
<td>Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.</td>
</tr>
<tr>
<td>pos internal-clock</td>
<td>The <code>clock source</code> interface command replaces this command.</td>
</tr>
</tbody>
</table>
pos framing-sdh

The `pos framing-sdh` command is replaced by the `pos framing` command. See the description of the `pos framing` command in this chapter for more information.
The **pos internal-clock** command is replaced by the **clock source (interface)** command. See the description of the **clock source (interface)** command in this chapter for information on transmit clock source.
**POS Report**

To permit selected SONET alarms to be logged to the console for a POS (Packet-Over-SONET) interface, use the `pos report` command in interface configuration mode. To disable logging of select SONET alarms, use the `no` form of this command.

```
pos report {b1-tca | b2-tca | b3-tca | lais | lrdi | pais | plop | prdi | rdool | sd-ber | sf-ber | slof | slos}
no pos report {b1-tca | b2-tca | b3-tca | lais | lrdi | pais | plop | prdi | rdool | sd-ber | sf-ber | slof | slos}
```

### Syntax Description

- **b1-tca**: Reports B1 bit-error rate (BER) threshold crossing alarm (TCA) errors.
- **b2-tca**: Reports B2 BER crossing TCA errors.
- **b3-tca**: Reports B3 BER crossing TCA errors.
- **lais**: Reports line alarm indication signal errors.
- **lrdi**: Reports line remote defect indication errors.
- **pais**: Reports path alarm indication signal errors.
- **plop**: Reports path loss of pointer errors.
- **prdi**: Reports path remote defect indication errors.
- **rdoool**: Reports receive data out of lock errors.
- **sd-ber**: Reports signal degradation BER errors.
- **sf-ber**: Reports signal failure BER errors.
- **slof**: Reports section loss of frame errors.
- **slos**: Reports section loss of signal errors.

### Defaults

The following alarms are reported by default:

- `b1-tca`
- `b2-tca`
- `b3-tca`
- `plop`
- `slof`
- `slos`

### Command Modes

**Interface configuration**

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CC</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>
Usage Guidelines

Reporting an alarm means that the alarm can be logged to the console. Just because an alarm is permitted to be logged does not guarantee that it is logged. SONET alarm hierarchy rules dictate that only the most severe alarm of an alarm group is reported. Whether an alarm is reported or not, you can view the current state of a defect by checking the “Active Defects” line from the `show controllers pos` command output. A defect is a problem indication that is a candidate for an alarm.

For B1, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B1 byte of the following frame. Differences indicate that section level bit errors have occurred.

For B2, the bit interleaved parity error report is calculated by comparing the BIP-8/24 code with the BIP-8 code extracted from the B2 byte of the following frame. Differences indicate that line level bit errors have occurred.

For B3, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B3 byte of the following frame. Differences indicate that path level bit errors have occurred.

PAIS is sent by line terminating equipment (LTE) to alert the downstream path terminating equipment (PTE) that it has detected a defect on its incoming line signal.

PLOP is reported as a result of an invalid pointer (H1, H2) or an excess number of new data flag (NDF) enabled indications.

SLOF is detected when a severely error framing (SEF) defect on the incoming SONET signal persists for 3 milliseconds.

SLOS is detected when an all-zeros pattern on the incoming SONET signal lasts 19 plus or minus 3 microseconds or longer. This defect might also be reported if the received signal level drops below the specified threshold.

To determine the alarms that are reported on the interface, use the `show controllers pos` command.

Examples

The following example enables reporting of SD-BER and LAIS alarms on the interface:

```
Router(config)# interface pos 3/0/0
Router(config-if)# pos report sd-ber
Router(config-if)# pos report lais
Router(config-if)# end
Router#`

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>interface</code></td>
<td>Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.</td>
</tr>
<tr>
<td><code>show controllers pos</code></td>
<td>Displays information about the POS controllers.</td>
</tr>
</tbody>
</table>
**pos scramble-atm**

To enable SONET payload scrambling on a POS (Packet-Over-SONET) interface, use the **pos scramble-atm** command in interface configuration mode. To disable scrambling, use the **no** form of this command.

```
pos scramble-atm
no pos scramble-atm
```

**Syntax Description**

This command has no arguments or keywords.

**Defaults**

Scrambling is disabled

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CA</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

SONET payload scrambling applies a self-synchronous scrambler \(x^{43}+1\) to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density. Both ends of the connection must use the same scrambling algorithm. When enabling POS scrambling on a VIP2 POSIP on the Cisco 7500 series router that has a hardware revision of 1.5 or higher, you can specify CRC 16 only (that is, CRC 32 is currently not supported).

To determine the hardware revision of the POSIP, use the `show diag` command.

To determine whether scrambling is enabled on the interface, use the `show interface pos` command or the `more nvram:startup-config` command.

**Note**

SONET payload scrambling is enabled with the **pos scramble-atm** command. SONET payload scrambling applies a self-synchronous scrambler \(x^{43}+1\) to the Synchronous Payload Envelope (SPE) of the interface to ensure sufficient bit transition density. Both sides of the connection must be configured using the **pos scramble-atm** command. Currently, when connecting to a Cisco 7500 series router and using the **pos scramble-atm** command, you must specify the **crc 16** command rather than the **crc 32** command.

**Examples**

The following example enables scrambling on the interface:

```
Router(config)# interface pos 3/0
Router(config-if)# pos scramble-atm
Router(config-if)# no shutdown
Router(config-if)# end
Router#
```
## Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>crc</td>
<td>Sets the length of the CRC on an FSIP or HIP of the Cisco 7500 series routers or on a 4-port serial adapter of the Cisco 7200 series routers.</td>
</tr>
<tr>
<td>interface</td>
<td>Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode.</td>
</tr>
<tr>
<td>more</td>
<td>Displays a specified file.</td>
</tr>
<tr>
<td>show diag</td>
<td>Displays hardware information for the router</td>
</tr>
<tr>
<td>show interfaces pos</td>
<td>Displays information about the Packet OC-3 interface in Cisco 7500 series routers.</td>
</tr>
</tbody>
</table>
pos threshold

To set the bit-error rate (BER) threshold values of the specified alarms for a POS (Packet-Over-SONET) interface, use the **pos threshold** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
pos threshold { b1-tca | b2-tca | b3-tca | sd-ber | sf-ber } rate
no pos threshold { b1-tca | b2-tca | b3-tca | sd-ber | sf-ber } rate
```

**Syntax Description**

- **b1-tca**: B1 BER threshold crossing alarm. The default is 6.
- **b2-tca**: B2 BER threshold crossing alarm. The default is 6.
- **b3-tca**: B3 BER threshold crossing alarm. The default is 6.
- **sd-ber**: Signal degrade BER threshold. The default is 6.
- **sf-ber**: Signal failure BER threshold. The default is 3 (10e-3).
- **rate**: Bit-error rate from 3 to 9 (10^-n).

**Defaults**

The default **rate** is 6 for **b1-tca**, **b2-tca**, **b3-tca**, and **sd-ber**.

The default **rate** is 3 (10e-3) for **sf-ber**.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CC</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

For B1, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B1 byte of the following frame. Differences indicate that section level bit errors have occurred.

For B2, the bit interleaved parity error report is calculated by comparing the BIP-8/24 code with the BIP-8 code extracted from the B2 byte of the following frame. Differences indicate that line level bit errors have occurred.

For B3, the bit interleaved parity error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B3 byte of the following frame. Differences indicate that path level bit errors have occurred.

SF-BER and SD-BER are sourced from B2 BIP-8 error counts (as is B2-TCA). However, SF-BER and SD-BER feed into the automatic protection switching (APS) machine and can lead to a protection switch (if APS is configured).

B1-TCA, B2-TCA, and B3-TCA do nothing more than print a log message to the console (if reports for them are enabled).

To determine the BER thresholds configured on the interface, use the **show controllers pos** command.
Examples

The following example configures thresholds on the interface:

Router(config)# interface pos 3/0/0
Router(config-if)# pos threshold sd-ber 8
Router(config-if)# pos threshold sf-ber 4
Router(config-if)# pos threshold bl_tca 4
Router(config-if)# end
Router#

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>interface</td>
<td>Defines the IP addresses of the server, configures an interface type, and</td>
</tr>
<tr>
<td></td>
<td>enters interface configuration mode.</td>
</tr>
<tr>
<td>pos report</td>
<td>Permits selected SONET alarms to be logged to the console for a POS</td>
</tr>
<tr>
<td></td>
<td>interface.</td>
</tr>
<tr>
<td>show controllers pos</td>
<td>Displays information about the POS controllers.</td>
</tr>
</tbody>
</table>
posi framing-sdh

The posi framing-sdh command is replaced by the pos framing command. See the description of the pos framing command for more information.
To specify ISDN PRI on a channelized E1 or T1 card on a Cisco 7500 series router, use the \texttt{pri-group} command in controller configuration mode. To remove the ISDN PRI, use the \texttt{no} form of this command.

\begin{verbatim}
   pri-group [timeslots range]
   no pri-group
\end{verbatim}

\begin{table}[h]
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{Syntax Description} & \texttt{timeslots range} (Optional) Specifies a single range of values from 1 to 23. \\
\hline
\textbf{Defaults} & Disabled \\
\hline
\textbf{Command Modes} & Controller configuration \\
\hline
\textbf{Command History} & \\
Release  & Modification \\
11.0 & This command was introduced. \\
\hline
\textbf{Usage Guidelines} & When you configure ISDN PRI, you must first specify an ISDN switch type for PRI and an E1 or T1 controller. \\
\hline
\textbf{Examples} & The following example specifies ISDN PRI on T1 slot 1, port 0: \\
\begin{verbatim}
   Router# isdn switch-type primary-4ess
   Router(config)# controllers t1 1/0
   Router(config-controller)# framing esf
   Router(config-controller)# linecode b8zs
   Router(config-controller)# pri-group timeslots 2-6
\end{verbatim} \\
\hline
\textbf{Related Commands} & \\
\begin{tabular}{|l|l|}
\hline
\textbf{Command} & \textbf{Description} \\
controller & Configures a T1 or E1 controller and enters controller configuration mode. \\
\hline
\texttt{interface serial} & Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling). \\
\hline
\texttt{isdn switch-type (PRI)} & Specifies the central office switch type on the ISDN PRI interface. \\
\hline
\end{tabular}
\end{tabular}
\end{table}
**pulse-time**

To enable pulsing data terminal ready (DTR) signal intervals on the serial interfaces, use the `pulse-time` command in interface configuration mode. To restore the default interval, use the `no` form of this command.

```
pulse-time [msec] seconds
no pulse-time
```

**Syntax Description**

- **msec** *(Optional)* Specifies the use of milliseconds for the DTR signal interval.
- **seconds** Integer that specifies the DTR signal interval in seconds. If the `msec` keyword is configured the DTR signal interval is specified in milliseconds. The default is 0.

**Defaults**

0 seconds

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
<tr>
<td>12.1(5)T</td>
<td>The optional <code>msec</code> keyword was added to configure the DTR signal interval in milliseconds.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

When the serial line protocol goes down (for example, because of loss of synchronization), the interface hardware is reset and the DTR signal is held inactive for at least the specified interval. This function is useful for handling encrypting or other similar devices that use the toggling of the DTR signal to resynchronize.

Use the optional `msec` keyword to specify the DTR signal interval in milliseconds. A signal interval set to milliseconds is recommended on high-speed serial interfaces (HSSI).

**Examples**

The following example enables DTR pulse signals for 3 seconds on serial interface 2:

```
Router(config)# interface serial 2
Router(config-if)# pulse-time 3
```

The following example enables DTR pulse signals for 150 milliseconds on HSSI interface 2/1/0:

```
Router(config)# interface hssi 2/1/0
Router(config-if)# pulse-time msec 150
```
ring-speed

To set the ring speed for the CSC-1R and CSC-2R Token Ring interfaces, use the `ring-speed` command in interface configuration mode.

```
ring-speed speed
```

**Syntax Description**

表

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>speed</td>
<td>Integer that specifies the ring speed, either 4 for 4-Mbps operation or 16 for 16-Mbps operation. The default is 16.</td>
</tr>
</tbody>
</table>

**Defaults**

16-Mbps operation

**Caution**

Configuring a ring speed that is wrong or incompatible with the connected Token Ring causes the ring to beacon, which makes the ring nonoperational.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.0</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

This command does not have a `no` form.

**Examples**

The following example sets a Token Ring interface ring speed to 4 Mbps:

```
Router(config)# interface tokenring 0
Router(config-if)# ring-speed 4
```
**scramble**

To enable scrambling of the payload on the PA-E3 and PA-T3 port adapters, use the `scramble` command in interface configuration mode. To disable scrambling, use the `no` form of this command.

```
scramble
no scramble
```

**Syntax Description**

This command has no arguments or keywords.

**Defaults**

Scrambling is disabled.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1 CA</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

E3/T3 scrambling is used to assist clock recovery on the receiving end.

Scrambling can prevent some bit patterns from being mistakenly interpreted as alarms by switches placed between the DSUs.

The local interface configuration must match the remote interface configuration. For example, if you enable scrambling on the local port, you must also do the same on the remote port.

To verify that scrambling is configured on the interface, use the `show controllers serial` EXEC command.

**Examples**

The following example enables scrambling on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:

```
Router(config)# interface serial 1/0/0
Router(config-if)# scramble
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>show controllers serial</code></td>
<td>Displays information that is specific to the interface hardware.</td>
</tr>
</tbody>
</table>
The `sdlc cts-delay` command is replaced by the `half-duplex timer` command. See the description of the `half-duplex timer` command in this chapter for more information.
The `sdlc hdx` command is replaced by the `half-duplex` command. See the description of the `half-duplex` command in this chapter for more information.
**sdlc rts-delay**

The **sdlc rts-delay** command is replaced by the **half-duplex timer** command. See the description of the **half-duplex timer** command in this chapter for more information.
To set the amount of time that the router waits before trying to bring up a serial interface when it goes down, use the `serial restart-delay` command in interface configuration mode. To restore the default, use the `no` form of the command.

```
serial restart-delay count

no serial restart-delay
```

**Syntax Description**

<table>
<thead>
<tr>
<th><code>count</code></th>
<th>Value from 0 to 900 in seconds. This is the frequency at which the hardware is reset.</th>
</tr>
</thead>
</table>

**Defaults**

0 is the default value.

**Command Modes**

Interface configuration

**Command History**

- **Release**: 11.2 P
  - **Modification**: This command was introduced.
- **Release**: 12.0(5)XK and 12.0(7)T
  - **Modification**: Support was added for the Cisco MC3810.

**Usage Guidelines**

The router resets the hardware each time the serial restart timer expires. This command is often used with the dial backup feature and with the `pulse-time` command, which sets the amount of time to wait before redialing when a DTR dialed device fails to connect.

When the `count` value is set to the default of 0, the hardware is not reset when it goes down. In this way, if the interface is used to answer a call, it does not cause DTR to drop, which can cause a communications device to disconnect.

**Examples**

This examples shows the restart delay on serial interface 0 set to 0:

```
interface Serial0
serial restart-delay 0
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>pulse-time</code></td>
<td>Enables pulsing DTR signal intervals on the serial interfaces.</td>
</tr>
<tr>
<td><code>show interfaces serial</code></td>
<td>Displays information about a serial interface.</td>
</tr>
</tbody>
</table>
service-module 56k clock rate

To configure the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module, use the service-module 56k clock rate command in interface configuration mode. To enable a network line speed of 56 kbps, which is the default, use the no form of this command.

```
interface serial 0
service-module 56k clock rate speed
```

```
no service-module 56k clock rate speed
```

### Syntax Description

<table>
<thead>
<tr>
<th>speed</th>
<th>Network line speed in kbps. The default speed is 56 kbps. Choose from one of the following optional speeds:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>2400 kbps</td>
</tr>
<tr>
<td>4.8</td>
<td>4800 kbps</td>
</tr>
<tr>
<td>9.6</td>
<td>9600 kbps</td>
</tr>
<tr>
<td>19.2</td>
<td>19200 kbps</td>
</tr>
<tr>
<td>38.4</td>
<td>38400 kbps</td>
</tr>
<tr>
<td>56</td>
<td>56000 kbps</td>
</tr>
<tr>
<td>64</td>
<td>64000 kbps</td>
</tr>
<tr>
<td>auto</td>
<td>Automatic line speed mode. Configure this option if your line speed is constantly changing.</td>
</tr>
</tbody>
</table>

### Defaults

56 kbps

### Command Modes

Interface configuration

### Command History

- **Release**
  - 11.2

- **Modification**
  - This command was introduced.

### Usage Guidelines

The 56-kbps line speed is available in switched mode, which is enabled using the service-module 56k network-type interface configuration command on the 4-wire CSU/DSU. If you have a 2-wire CSU/DSU module, the default is automatically set to switched mode.

The 64-kbps line speed cannot be used with back-to-back digital data service (DDS) lines. The subrate line speeds are determined by the service provider.

The auto keyword enables the CSU/DSU to decipher current line speed from the sealing current running on the network. Use the auto keyword only when transmitting over telco DDS lines and the clocking source is taken from the line.
Examples

The following example displays two routers connected in back-to-back DDS mode. However, notice that at first the configuration fails because the `auto` option is used. Later in the example the correct matching configuration is issued, which is 38.4 kbps.

Router1(config)# interface serial 0
Router1(config-if)# service-module 56k clock source internal
Router1(config-if)# service-module 56k clock rate 38.4

Router2(config-if)# service-module 56k clock rate auto
a1# ping 10.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
......
Success rate is 0 percent (0/5)

Router2(config-if)# service-module 56k clock rate 38.4

Router1# ping 10.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/54/56 ms

When transferring from DDS mode to switched mode, you must set the correct clock rate, as shown in the following example:

Router2(config-if)# service-module 56k network-type dds
Router2(config-if)# service-module 56k clock rate 38.4
Router2(config-if)# service-module 56k network-type switched
% Have to use 56k or auto clock rate for switched mode
% Service module configuration command failed: WRONG FORMAT.

Router2(config-if)# service-module 56k clock rate auto
% WARNING - auto rate will not work in back-to-back DDS.
Router2(config-if)# service-module 56k network-type switched

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service-module 56k clock</td>
<td>sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>source</td>
<td></td>
</tr>
<tr>
<td>service-module 56k network</td>
<td>sends packets in switched dial-up mode or DDS mode using a serial interface on a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>type switched</td>
<td></td>
</tr>
</tbody>
</table>
service-module 56k clock source

To set up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module, use the `service-module 56k clock source` command in interface configuration mode. To specify that the clocking come from line, use the `no` form of this command.

```
  service-module 56k clock source {line | internal}
```

```
  no service-module 56k clock source {line | internal}
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>line</td>
<td>Uses the clocking provided by the active line coming in to the router. This is the default.</td>
</tr>
<tr>
<td>internal</td>
<td>Uses the internal clocking provided by the hardware module.</td>
</tr>
</tbody>
</table>

**Defaults**

Line clock

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.1</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

In most applications, the CSU/DSU should be configured with the `clock source line` command. For back-to-back configurations, configure one CSU/DSU with the `clock source internal` command and the other with `clock source line` command.

**Examples**

The following example configures internal clocking and transmission speed at 38.4 kbps.

```
Router(config)# interface serial 0
Router(config-if)# service-module 56k clock source internal
Router(config-if)# service-module 56k clock rate 38.4
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>clock source (interface)</code></td>
<td>Controls the clock used by a G.703-E1 interface.</td>
</tr>
<tr>
<td><code>service-module 56k clock rate</code></td>
<td>Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
</tbody>
</table>
service-module 56k data-coding

To prevent application data from replicating loopback codes when operating at 64 kbps on a 4-wire CSU/DSU, use the service-module 56k data-coding command in interface configuration mode. To enable normal transmission, use the no form of this command.

```
no service-module 56k data-coding {normal | scrambled}
```

### Syntax Description

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>normal</td>
<td>Specifies normal transmission of data. This is the default.</td>
</tr>
<tr>
<td>scrambled</td>
<td>Scrambles bit codes or user data before transmission. All control codes such as out-of-service and out-of-frame are avoided.</td>
</tr>
</tbody>
</table>

### Defaults

Normal data transmission

### Command Modes

Interface configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### Usage Guidelines

Enable the scrambled configuration only in 64-kbps digital data service (DDS) mode. If the network type is set to switched, the configuration is refused.

If you transmit scrambled bit codes, both CSU/DSUs must have this command configured for successful communication.

### Examples

The following example scrambles bit codes or user data before transmission:

```
Router(config)# interface serial 0
Router(config-if)# service-module 56k clock rate 64
Router(config-if)# service-module 56k data-coding scrambled
```

### Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service-module 56k clock rate</td>
<td>Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
</tbody>
</table>
service-module 56k network-type

To transmit packets in switched dial-up mode or digital data service (DDS) mode using a serial interface on a 4-wire, 56/64-kbps CSU/DSU module, use the service-module 56k network-type command in interface configuration mode. To transmit from a dedicated leased line in DDS mode, use the no form of this command.

```
service-module 56k network-type { dds | switched }
no service-module 56k network-type { dds | switched }
```

**Syntax Description**

- **dds**: Transmits packets in DDS mode or through a dedicated leased line. The default is DDS enabled for the 4-wire CSU/DSU.
- **switched**: Transmits packets in switched dial-up mode. On a 2-wire, switched 56-kbps CSU/DSU module, this is the default and only setting.

**Defaults**

- DDS is enabled for the 4-wire CSU/DSU.
- Switched is enabled for the 2-wire CSU/DSU.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

In switched mode, you need additional dialer configuration commands to configure dial-out numbers. Before you enable the service-module 56k network-type switched command, both CSU/DSUs must use a clock source coming from the line and have the clock rate configured to auto or 56 kbps. If the clock rate is not set correctly, this command will not be accepted.

The 2-wire and 4-wire, 56/64-kbps CSU/DSU modules use V.25 bis dial commands to interface with the router. Therefore, the interface must be configured using the dialer in-band command. Data terminal ready (DTR) dial is not supported.

**Note**

Any loopbacks in progress are terminated when switching between modes.

**Examples**

The following example configures transmission in switched dial-up mode:

```
Router(config)# interface serial 0
Router(config-if)# service-module 56k clock rate auto
Router(config-if)# service-module 56k network-type switched
Router(config-if)# dialer in-band
Router(config-if)# dialer string 5551111
Router(config-if)# dialer-group 1
```
### Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dialer in-band</td>
<td>Specifies that DDR is to be supported.</td>
</tr>
<tr>
<td>service-module 56k clock rate</td>
<td>Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>service-module 56k clock source</td>
<td>Sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>service-module 56k switched-carrier</td>
<td>Selects a service provider to use with a 2- or 4-wire, 56/64-kbps dial-up serial line.</td>
</tr>
</tbody>
</table>
service-module 56k remote-loopback

To enable the acceptance of a remote loopback request on a serial interface on a 2- or 4-wire, 56/64-kbps CSU/DSU module, use the `service-module 56k remote-loopback` command in interface configuration mode. To disable the module from entering loopback, use the `no` form of this command.

```
no service-module 56k remote-loopback
```

**Syntax Description**
This command has no arguments or keywords.

**Defaults**
Enabled

**Command Modes**
Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**
The `no service-module 56k remote-loopback` command prevents the local CSU/DSU from being placed into loopback by remote devices on the line. The line provider is still able to put the module into loopback by reversing sealing current. Unlike the T1 module, the 2- or 4-wire, 56/64-kbps CSU/DSU module can still initiate remote loopbacks with the `no` form of this command configured.

**Examples**
The following example enables transmitting and receiving remote loopbacks:

```
Router(config)## interface serial 0
Router(config-if)## service-module 56k remote-loopback
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>loopback remote (interface)</code></td>
<td>Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back.</td>
</tr>
</tbody>
</table>
service-module 56k switched-carrier

To select a service provider to use with a 2- or 4-wire, 56/64-kbps dial-up serial line, use the service-module 56k switched-carrier command in interface configuration mode. To enable the default service provider, use the no form of this command.

```
service-module 56k switched-carrier {att | sprint | other}
no service-module 56k switched-carrier {att | sprint | other}
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>att</td>
<td>AT&amp;T or other digital network service provider. This is the default on the 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>sprint</td>
<td>Sprint or other service provider whose network requires echo cancelers. This is the default on the 2-wire, switched 56-kbps CSU/DSU module.</td>
</tr>
<tr>
<td>other</td>
<td>Any other service provider.</td>
</tr>
</tbody>
</table>

**Defaults**

ATT is enabled on the 4-wire, 56/64-kbps CSU/DSU module.

Sprint is enabled on the 2-wire, switched 56-kbps CSU/DSU module.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

On a Sprint network, echo-canceler tones are sent during call setup to prevent the echo cancelers from damaging digital data. The transmission of echo-canceler tones may increase call setup times by 8 seconds on the 4-wire module. Having echo cancellation enabled does not affect data traffic.

This configuration command is ignored if the network type is DDS.

**Examples**

The following example configures AT&T as a service provider:

```
Router(config)# interface serial 0
Router(config-if)# service-module 56k network-type switched
Router(config-if)# service-module 56k switched-carrier att
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service-module 56k network-type</td>
<td>Sends packets in switched dial-up mode or DDS mode using a serial interface on a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
</tbody>
</table>
## service-module t1 clock source

To specify the clock source for the fractional T1/T1 CSU/DSU module, use the `service-module t1 clock source` command in interface configuration mode. To return to the default line clock, use the `no` form of this command.

```
service-module t1 clock source {internal | line}
```

```
no service-module t1 clock source {internal | line}
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>internal</th>
<th>Specifies the CSU/DSU internal clock.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>line</td>
<td>Specifies the line clock. This is the default.</td>
</tr>
</tbody>
</table>

### Defaults

Line clock

### Command Modes

Interface configuration

### Command History

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

### Examples

The following example sets an internal clock source on serial line 0:

```
Router(config)# interface serial 0
Router(config-if)# service-module t1 clock source line
```

### Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>service-module 56k clock source</strong></td>
<td>Sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module.</td>
</tr>
</tbody>
</table>
service-module t1 data-coding

To guarantee the ones density requirement on an alternate mark inversion (AMI) line using the fractional T1/T1 module, use the `service-module t1 data-coding` command in interface configuration mode. To enable normal data transmission, use the `no` form of this command.

```
service-module t1 data-coding {inverted | normal}

no service-module t1 data-coding {inverted | normal}
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>inverted</td>
<td>Inverts bit codes by changing all 1 bits to 0 bits and all 0 bits to 1 bits.</td>
</tr>
<tr>
<td>normal</td>
<td>Requests that no bit codes be inverted before transmission. This is the default.</td>
</tr>
</tbody>
</table>

**Defaults**

Normal transmission

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Data inversion is used to guarantee the ones density requirement on an AMI line when using bit-oriented protocols such as High-Level Data Link Control (HDLC), PPP, X.25, and Frame Relay. If the time slot speed is set to 56 kbps, this command is rejected because line density is guaranteed when transmitting at 56 kbps. Use this command with the 64-kbps line speed.

If you transmit inverted bit codes, both CSU/DSUs must have this command configured for successful communication.

**Examples**

The following example inverts bit codes using a time slot speed of 64 kbps:

```
Router(config)# interface serial 0
Router(config-if)# service-module t1 timeslots all speed 64
Router(config-if)# service-module t1 data-coding inverted
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>service-module t1 linecode</code></td>
<td>Selects the linecode for the fractional T1/T1 module.</td>
</tr>
<tr>
<td><code>service-module t1 timeslots</code></td>
<td>Defines time slots that constitute a fractional T1/T1 (FT1/T1) channel.</td>
</tr>
</tbody>
</table>
service-module t1 fdl

To set the FDL parameter to either ATT or ANSI, use the `service-module t1 fdl` command in interface configuration mode. To ignore the FDL parameter, use the `no` form of this command.

```
  service-module t1 fdl {ansi | att}

  no service-module t1 fdl
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ansi</td>
<td>Sets the FDL parameter to ANSI.</td>
</tr>
<tr>
<td>att</td>
<td>Sets the FDL parameter to ATT.</td>
</tr>
</tbody>
</table>

**Defaults**

Determined by the telephone company.

**Command Modes**

Interface configuration mode

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2 P</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

The default is `no service-module t1 fdl`. The `ansi` or `att` options are determined by your service provider or telephone company.
service-module t1 framing

To select the frame type for a line using the fractional T1/T1 (FT1/T1) module, use the `service-module t1 framing` command in interface configuration mode. To revert to the default, Extended Super Frame, use the `no` form of this command.

```
service-module t1 framing {esf | sf}

no service-module t1 framing {esf | sf}
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th>esf</th>
<th>Specifies Extended Super Frame as the T1 frame type. This is the default.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>sf</td>
<td>Specifies D4 Super Frame as the T1 frame type.</td>
</tr>
</tbody>
</table>

**Defaults**

Extended Super Frame (ESF)

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Use this command in configurations in which the router communicates with FT1/T1 data lines. The service provider determines which framing type, either `esf` or `sf`, is required for your circuit.

**Examples**

The following example enables Super Frame as the FT1/T1 frame type:

```
Router(config-if)# service-module t1 framing sf
```
service-module t1 lbo

To configure the CSU line-build-out (LBO) on a fractional T1/T1 CSU/DSU module, use the `service-module t1 lbo` command in interface configuration mode. To disable line-build-out, use the `no` form of this command.

```
service-module t1 lbo { -15 db | -7.5 db | none }

no service-module t1 lbo { -15 db | -7.5 db | none }
```

<table>
<thead>
<tr>
<th>Syntax Description</th>
<th><code>-15 db</code></th>
<th>Decreases outgoing signal strength by 15 dB.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><code>-7.5 db</code></td>
<td>Decreases outgoing signal strength by 7.5 dB.</td>
</tr>
<tr>
<td></td>
<td><code>none</code></td>
<td>Transmits packets without decreasing outgoing signal strength.</td>
</tr>
</tbody>
</table>

**Defaults**

Disabled

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Use this command to decrease the outgoing signal strength to an optimum value for a fractional T1 line receiver. The ideal signal strength should be -15 dB to -22 dB, which is calculated by adding the phone company loss, cable length loss, and line build out.

You may use this command in back-to-back configurations, but it is not needed on most actual T1 lines.

**Examples**

The following example sets the LBO to -7.5 dB:

```
Router(config)# interface serial 0
Router(config-if)# service-module t1 lbo -7.5 db
```
service-module t1 linecode

To select the line code for the fractional T1/T1 module, use the `service-module t1 linecode` command in interface configuration mode. To select the default, the B8ZS line code, use the `no` form of this command.

```
service-module t1 linecode { ami | b8zs }
no service-module t1 linecode { ami | b8zs }
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ami</td>
<td>Specifies alternate mark inversion (AMI) as the line code.</td>
</tr>
<tr>
<td>b8zs</td>
<td>Specifies binary 8 zero substitution (B8ZS) as the line code. This is the default.</td>
</tr>
</tbody>
</table>

**Defaults**
The default line code is B8ZS.

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Configuring B8ZS is a method of ensuring the ones density requirement on a T1 line by substituting intentional bipolar violations in bit positions four and seven for a sequence of eight zero bits. When the CSU/DSU is configured for AMI, you must guarantee the ones density requirement in your router configuration using the `service-module t1 data-coding inverted` command or the `service-module t1 time slots speed 56` command.

Your T1 service provider determines which line code, either `ami` or `b8zs`, is required for your T1 circuit.

**Examples**
The following example specifies AMI as the line code:

```
Router(config)# interface serial 0
Router(config-if)# service-module t1 linecode ami
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service-module t1 data-coding</td>
<td>Guarantees the ones density requirement on an AMI line using the fractional T1/T1 module.</td>
</tr>
<tr>
<td>service-module t1 timeslots</td>
<td>Defines time slots that constitute a fractional T1/T1 (FT1/T1) channel.</td>
</tr>
</tbody>
</table>
service-module t1 remote-alarm-enable

To generate remote alarms (yellow alarms) at the local CSU/DSU or detect remote alarms sent from the remote CSU/DSU, use the service-module t1 remote-alarm-enable command in interface configuration mode. To disable remote alarms, use the no form of this command.

```
  service-module t1 remote-alarm-enable

  no service-module t1 remote-alarm-enable
```

**Syntax Description**

This command has no arguments or keywords.

**Defaults**

Remote alarms are disabled

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1.2</td>
<td>This command was introduced.</td>
</tr>
</tbody>
</table>

**Usage Guidelines**

Remote alarms are transmitted by the CSU/DSU when it detects an alarm condition, such as a red alarm (loss of frame) or blue alarm (unframed ones). The receiving CSU/DSU then knows that there is an error condition on the line.

With D4 Super Frame configured, a remote alarm condition is transmitted by setting the bit 2 of each time slot to zero. For received user data that has the bit 2 of each time slot set to zero, the CSU/DSU interprets the data as a remote alarm and interrupts data transmission, which explains why remote alarms are disabled by default. With Extended Super Frame configured, the remote alarm condition is signalled out of band in the facilities data link.

You can see if the FT1/T1 CSU/DSU is receiving a remote alarm (yellow alarm) by issuing the show service-module command.

**Examples**

The following example enables remote alarm generation and detection:
```
Router(config)# interface serial 0
Router(config-if)# service-module t1 remote-alarm-enable
```

**Related Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>service-module t1 framing</td>
<td>Selects the frame type for a line using the fractional T1/T1 (FT1/T1) module.</td>
</tr>
</tbody>
</table>
service-module t1 remote-loopback

To specify if the fractional T1/T1 CSU/DSU module enters loopback mode when it receives a loopback code on the line, use the `service-module t1 remote-loopback` command in interface configuration mode. To disable remote loopbacks, use the `no` form of this command.

```
service-module t1 remote-loopback {full | payload} [alternate | v54]

no service-module t1 remote-loopback {full | payload}
```

**Syntax Description**

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>full</td>
<td>Configures the remote loopback code used to transmit or accept CSU loopback requests. This is the default, along with <code>payload</code>.</td>
</tr>
<tr>
<td>payload</td>
<td>Configures the loopback code used by the local CSU/DSU to generate or detect payload-loopback commands. This is the default, along with <code>full</code>.</td>
</tr>
<tr>
<td>alternate</td>
<td>(Optional) Transmits a remote CSU/DSU loopback request using a 4-in-5 pattern for loopup and a 2-in-3 pattern for loopdown. This is an inverted version of the standard loopcode request.</td>
</tr>
<tr>
<td>v54</td>
<td>(Optional) Industry standard loopback code. Use this configuration for CSU/DSUs that may not support the Accunet loopup standards. This keyword is used only with a <code>payload</code> request, not a <code>full</code> request.</td>
</tr>
</tbody>
</table>

**Note**

By entering the `service-module t1 remote-loopback` command without specifying any keywords, you enable the standard-loopup codes, which use a 1-in-5 pattern for loopup and a 1-in-3 pattern for loopdown.

**Defaults**

Full and payload loopbacks with standard-loopup codes

**Command Modes**

Interface configuration

**Command History**

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
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<tbody>
<tr>
<td>11.2</td>
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</tbody>
</table>

**Usage Guidelines**

You can simultaneously configure the `full` and `payload` loopback points. However, only one loopback code can be configured at a time. For example, if you configure the `service-module t1 remote-loopback payload alternate` command, a `payload v54` request cannot be transmitted or accepted.

The `no` form of this command disables loopback requests. For example, the `no service-module t1 remote-loopback full` command ignores all full-bandwidth loopback transmissions and requests.

Configuring the `no` form of this command may not prevent telco line providers from looping your router in esf mode, because fractional T1/T1 lines use facilities data link messages to initiate loopbacks.

If you enable the `service-module t1 remote-loopback` command, the `loopback remote` commands on the FT1/T1 CSU/DSU module will not be successful.
Examples

The following example displays two routers connected back-to-back through a fractional T1/T1 line:

Router# no service-module t1 remote-loopback full
Router# service-module t1 remote-loopback payload alternate

Router# loopback remote full
%SERVICE_MODULE-5-LOOPUPFAILED: Unit 0 - Lookup of remote unit failed

Router# service-module t1 remote-loopback payload v54
Router# loopback remote payload
%SERVICE_MODULE-5-LOOPUPFAILED: Unit 0 - Lookup of remote unit failed

Router# service-module t1 remote-loopback payload alternate
Router# loopback remote payload
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 0 - Remote unit placed in loopback

Related Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>loopback remote (interface)</td>
<td>Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back.</td>
</tr>
</tbody>
</table>