data-protection

To enable data protection for a circuit emulation (CEM) channel, use the **data-protection** command in CEM configuration mode. To disable data protection, use the **no** form of this command.

data-protection

no data-protection

Syntax Description

This command has no arguments or keywords.

Defaults

Data protection is disabled.

Command Modes

CEM configuration

Command History

Release	Modification
12.3(7)T	This command was introduced.

Examples

The following example demonstrates how to enable data protection.

```
Router(config-cem)# data-protection
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
clear cem	Clears CEM channel statistics.
show cem	Displays CEM channel statistics.

data-strobe

To specify an input control lead to be monitored as an indicator of valid data, use the **data-strobe** command in CEM configuration mode. To disable the monitoring of an input control lead, use the **no** form of this command.

data-strobe *input-lead* {**on** | **off**}

no data-strobe

Syntax Description

input-lead	Specifies the input lead. The choice of leads depends on whether the port is DCE or DTE.
on	Enables packet creation when the lead is asserted.
off	Enables packet creation when the lead is deactivated.

Defaults

No input control lead is monitored.

Command Modes

CEM configuration

Command History

Release	Modification
12.3(7)T	This command was introduced.

Usage Guidelines

Any input control signal on a serial data port may be configured as a "data strobe" to indicate to the NM-CEM-4SER network module whether ingress data on the port should be encapsulated for transmission or ignored. If the **data strobe** command is specified with the **on** keyword, data packets are created and sent when the input lead is asserted. If the data strobe is off (either intentionally, or as a result of the failure of the customer premises equipment [CPE]), no data packets are created, and this results in preservation of bandwidth in the IP network.

This command applies only to serial ports.

Examples

The following example demonstrates how to specify that packets are to be created and sent to the far end only when the DTR input control lead is asserted.

```
Router(config-cem)# data-strobe dtr on
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
clear cem	Clears CEM channel statistics.
control-lead sampling rate	Configures the sampling rate of input control leads.

Command	Description
control-lead state	Specifies the state of an output control lead.
show cem	Displays CEM channel statistics.

dce-terminal-timing enable

To prevent phase shifting of the data with respect to the clock when running the line at high speeds and long distances, use the **dce-terminal-timing enable** command in interface configuration mode. If serial clock transmit external (SCTE) terminal timing is not available from the DTE, use the **no** form of this command; the DCE will use its own clock instead of SCTE from the DTE.

dce-terminal-timing enable

no dce-terminal-timing enable

Syntax Description

This command has no arguments or keywords.

Defaults

The DCE uses its own clock.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

On the Cisco 4000 router, you can specify the serial Network Interface Module timing signal configuration. When the board is operating as a DCE and the DTE provides terminal timing (SCTE or TT), the **dce-terminal-timing enable** command causes the DCE to use SCTE from the DTE.

Examples

The following example shows how to prevent phase shifting of the data with respect to the clock:

```
Router(config)# interface serial 0
Router(config-if)# dce-terminal-timing enable
```

default (CEM)

To reset channel options to their default values, use the **default** command in CEM configuration mode.

default {**data-protection** | **dejitter-buffer** | **idle-pattern** | **ip dscp** | **ip tos** | **ip precedence** | **payload-compression** | **payload-size** | **signaling**}

Syntax Description

data-protection	Resets data protection to its default value.
dejitter-buffer	Resets the dejitter buffer to its default value.
idle-pattern	Resets the idle pattern to its default value.
ip dscp	Resets the IP differentiated services code point (DSCP) field to its default value.
ip tos	Resets the IP type of service (ToS) field to its default value.
ip precedence	Resets the IP precedence field to its default value.
payload-compression	Resets payload compression to its default value.
payload-size	Resets payload size to its default value.
signaling	Resets signaling to its default value.

Defaults

The CEM channel options are set at their configured values.

Command Modes

CEM configuration

Command History

Release	Modification
12.3(7)T	This command was introduced for CEM configuration mode.

Examples

The following example demonstrates how to reset CEM channel data protection to its default value.

```
Router(config-cem)# default data-protection
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
clear cem	Clears CEM channel statistics.
data-protection	Enables data protection.
dejitter-buffer	Configures the dejitter buffer size.
idle-pattern	Defines the idle pattern that the channel transmits when it goes down.
payload-compression	Enables payload compression.
payload-size	Configures the payload size.
show cem	Displays CEM channel statistics.
signaling	Enables CAS signaling.

dejitter-buffer

To configure the size of the dejitter buffer, use the **dejitter-buffer** command in CEM configuration mode. To restore the dejitter buffer to its default size, use the **no** form of this command.

dejitter-buffer *size*

no dejitter-buffer

Syntax Description

size	Size, in milliseconds, of the dejitter buffer. The range is from 5 to 500. The default is 60.

Defaults

The dejitter buffer defaults to 60 milliseconds.

Command Modes

CEM configuration

Command History

Release	Modification
12.3(7)T	This command was introduced.

Examples

The following example shows how to set the dejitter buffer to 200 milliseconds.

```
Router(config-cem)# dejitter-buffer 200
```

Related Commands

Command	Description
cem	Enters circuit emulation configuration mode.
clear cem	Clears CEM channel statistics.
show cem	Displays CEM channel statistics.

delay (interface)

To set a delay value for an interface, use the **delay** command in interface configuration mode. To restore the default delay value, use the **no** form of this command.

delay *tens-of-microseconds*

no delay

Syntax Description

tens-of-microseconds	Integer that specifies the delay in tens of microseconds for an interface or network segment. To see the default delay, use the **show interfaces** command.

Defaults

Default delay values may be displayed with the **show interfaces** EXEC command.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Examples

The following example shows how to set a delay of 30,000 microseconds on serial interface 3:

```
Router(config)# interface serial 3
Router(config-if)# delay 3000
```

Related Commands

Command	Description
show interfaces	Displays the statistical information specific to a serial interface.

description (controller)

To add a description to an E1 or T1 controller or the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **description** command in controller configuration mode. To remove the description, use the **no** form of this command.

description *string*

no description

Syntax Description

string	Comment or description (up to 80 characters) to help you remember what is attached to an interface.

Defaults

No description is added.

Command Modes

Controller configuration

Command History

Release	Modification
10.3	This command was introduced.
11.3	This command was modified to include the CT3IP controller.

Usage Guidelines

The **description** command is meant solely as a comment to be put in the configuration to help you remember what certain controllers are used for. The description affects the CT3IP and Multichannel Interface Processor (MIP) interfaces only and appears in the output of the **show controller e1**, **show controller t1, show controller t3**, and **show running-config** EXEC commands.

Examples

The following example shows how to add a description for a 3174 controller:

```
Router(config)# controller t1
Router(config-controller)# description 3174 Controller for test lab
```

Related Commands

Command	Description
show controllers e1	Displays information about the E1 links supported by the NPM (Cisco 4000) or MIP (Cisco 7500 series).
show controllers t1	Displays information about the T1 links.
show controllers t3	Displays information about the CT3IP on Cisco 7500 series routers.

dot1q tunneling ethertype

To define the Ethertype field type used by peer devices when implementing Q-in-Q VLAN tagging, use the **dot1q tunneling ethertype** command in interface configuration mode. To remove the VLAN tag Ethertype, use the **no** form of this command.

dot1q tunneling ethertype *ethertype*

no dot1q tunneling ethertype *ethertype*

Syntax Description

ethertype	Type of Ethertype field. Valid values are either 0x8100 or 0x9100. Default is 0x8100.

Defaults

The Ethertype field used by peer devices when implementing Q-in-Q VLAN tagging is 0x8100.

Command Modes

Interface configuration

Command History

Release	Modification
12.3(7)T	This command was introduced.

Usage Guidelines

Use the **dot1q tunneling ethertype** command if the peer switching devices are using an Ethertype field value of 0x9100. All Cisco switching devices use the default Ethertype field value of 0x8100.

This command is used with the IEEE 802.1Q-in-Q VLAN Tag Termination feature in which double VLAN tagging is configured using the **encapsulation dot1q** command. 802.1q double tagging allows a service provider to use a single VLAN to support customers who have multiple VLANs.

Examples

The following example shows how to configure an Ethertype field as 0x9100:

```
Router(config)# interface gigabitethernet 1/0/0
Router(config-if)# dot1q tunneling ethertype 0x9100
```

Related Commands

Command	Description
encapsulation dot1q	Enables 802.1q encapsulation of traffic on a specified subinterface or range of subinterfaces.
interface	Configures an interface and enters interface configuration mode.

down-when-looped

To configure an interface to inform the system that it is down when loopback is detected, use the **down-when-looped** command in interface configuration mode.

down-when-looped

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command is valid for High-Level Data Link Control (HDLC) or PPP encapsulation on serial and High-Speed Serial Interface (HSSI) interfaces.

This command does not have a **no** form.

Backup Interfaces

When an interface has a backup interface configured, it is often desirable that the backup interface be enabled when the primary interface is either down or in loopback. By default, the backup is enabled only if the primary interface is down. By using the **down-when-looped** command, the backup interface will also be enabled if the primary interface is in loopback.

Testing an Interface with the Loopback Command

If testing an interface with the loopback command, or by placing the DCE into loopback, the **down-when-looped** command should not be configured; otherwise, packets will not be transmitted out the interface that is being tested.

Examples

The following example shows how to configure interface serial 0 for HDLC encapsulation. The interface is then configured to let the system know that it is down when in loopback mode.

```
Router(config)# interface serial0
Router(config-if)# encapsulation hdlc
Router(config-if)# down-when-looped
```

Related Commands

Command	Description
backup interface	Configures an interface as a secondary or dial backup interface.
loopback (E3 controller)	Diagnoses equipment malfunctions between an interface and a device.

ds0-group (J1 controller)

To configure channelized J1 time slots, use the **ds0-group** command in controller configuration mode. To remove the DS0 group, use the **no** form of this command.

ds0-group *ds0-group-no* **timeslots** *timeslot-list* **type** *external-signaling*

no ds0-group *ds0-group-no* **timeslots** *timeslot-list* **type** *external-signaling*

Syntax Description

ds0-group-no	Specifies the DS0 group number.
timeslots *timeslot-list*	Specifies the DS0 time slot range of values from 1 to 31 for J1 interfaces. Time slot 16 is reserved for signaling.
type *external-signaling*	Specifies that the signaling traffic comes from an outside source. The signaling method selection for type depends on the connection that you are making.

Defaults

No DS0 group is defined.

Command Modes

Controller configuration

Command History

Release	Modification
11.2	This command was originally the **cas-group** command.
12.0(1)T	The **cas-group** command was introduced for the Cisco 3600 series.
12.0(5)XE	The command was renamed **ds0-group** on the Cisco AS5300 and on the Cisco 2600 and Cisco 3600 series.
12.0(7)T	The command was integrated into the Cisco IOS Release 12.0(7)T.
12.2(8)T	The command was introduced as a J1 configuration command for the Cisco 2600 and Cisco 3600 series.

Usage Guidelines

The **ds0-group** command replaces the existing **cas-group** command. Making the command generic allows flexibility and scalability. It is not restricted to channel associated signaling (CAS) or channel bundling.

The **ds0-group** command automatically creates a logical voice port that is numbered as follows on Cisco 2600 and Cisco 3600 series routers: *slot*/*port*:*ds0-group-no*. Although only one voice port is created for each group, applicable calls are routed to any channel in the group.

Examples

The following example is sample output from the **show controllers j1** command on the Cisco 3660 series after channelized J1 time slots have been configured:

```
Router(config-controller)# ds0-group 1 timeslots 1-15,17-31 type e&m-wink-start
Router(config-controller)# end
Router# show controllers j1
```

```
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(1), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(2), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(3), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(4), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(5), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(6), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(7), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(8), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(9), cp
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(10), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(11), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(12), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(13), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(14), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(15), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(17), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(18), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(19), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(20), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(21), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(22), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(23), p
*Mar  1 03:12:26.259: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(24), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(25), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(26), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(27), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(28), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(29), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(30), p
*Mar  1 03:12:26.263: %LINK-3-UPDOWN: Interface recEive and transMit3/0:0(31), p
```

Related Commands

Command	Description
ds0 busyout	Busyouts one or more signal level 0s (DS0s).

dsl-mode shdsl symmetric annex

To specify the operating mode of the digital subscriber line (DSL) controller, use the **dsl-mode shdsl symmetric annex** command in controller configuration mode. To return the DSL to the default Annex A, use the **no** form of this command.

dsl-mode shdsl symmetric annex *mode*

Syntax Description

mode	Sets the DSL operating mode. The valid values are: • **a**: Supports Annex A of the G.991.2 standard for North America. This is the default. • **b**: Supports Annex B of the G.991.2 standard for Europe. • **a-b**: Supports Annex A or B. For CPE mode only. Not supported in CO mode. Selected when the line trains. • **a-b-anfp**: Supports Annex A or B–ANFP. For CPE mode only. Not supported in CO mode. Selected when the line trains. • **b-anfp**: Supports Annex B–ANFP.

Defaults

The annex defaults to A for North America.

Command Modes

Controller configuration

Command History

Release	Modification
12.3(4)XD	This command was introduced on Cisco 2600 series and Cisco 3700 series routers.
12.3(4)XG	This command was integrated into the Cisco IOS Release 12.3(4)XG on the Cisco 1700 series routers.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T on Cisco 2600 series, Cisco 3631, and Cisco 3700 series routers.
12.3(11)T	Support for the following additional annex parameters was integrated into Cisco IOS Release 12.3(11)T to support Cisco 1700, Cisco 1800, Cisco 2600, Cisco 2800, Cisco 3700, and Cisco 3800 series routers: • **b** • **a–b** • **a–b–anfp** • **b–anfp**

Usage Guidelines

This command is used to configure the DSL controller interface to operate in a specified DSL mode and to set regional operating parameters. The **shdsl** keyword is used to set the mode to SHDSL and configures multirate, high-speed DSL per ITU G.991.2. The **symmetric** keyword configures the controller to symmetric mode. The **annex** keyword configures the controller to use regional operating parameters. The regional operating parameters default to North America.

Examples

The following example displays the use of the **controller dsl 0/0** command to configure the controller in the router configured on the central office (CO) side. Use the **dsl-mode shdsl symmetric annex b** command to configure the controller for multirate, high-speed DSL with symmetric mode for European operating parameters.

```
Router# configure terminal

Router(config)# controller dsl 0/0
Router(config-controller)# line-term co
Router(config-controller)# dsl-mode shdsl symmetric annex b
Router(config-controller)# mode atm
Router(config-controller)#
00:22:07: %CONTROLLER-5-UPDOWN: Controller DSL 0/0, changed state to down

Router(config-controller)# line-mode 4-wire
00:23:25: %CONTROLLER-5-UPDOWN: Controller DSL 0/0, changed state to up
00:23:31: %LINK-3-UPDOWN: Interface ATM0/0, changed state to up
00:23:32: %LINEPROTO-5-UPDOWN: Line protocol on Interface ATM0/0, changed state to up
```

Related Commands

Command	Description
controller dsl	Configures the DSL controller.

dsu bandwidth

To specify the maximum allowable bandwidth used by a T3 or E3 controller or the PA-T3 and PA-E3 port adapters, use the **dsu bandwidth** command in interface configuration mode. To return to the default bandwidth, use the **no** form of this command.

dsu bandwidth *kbps*

no dsu bandwidth

Syntax Description

kbps	Maximum bandwidth, in kbps. Range is from 22 to 44736. Default values are as follows: • 34010 for E3 or PA-E3 • 44210 for T3 • 44736 for PA-T3

Defaults

34010 kbps for E3 or PA-E3
44210 kbps for T3
44736 kbps for PA-T3

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CA	This command was introduced.
12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

Usage Guidelines

The local interface configuration must match the remote interface configuration. For example, if you reduce the maximum bandwidth to 16000 on the local port, you must also do the same on the remote port.

The **dsu bandwidth** command reduces the bandwidth by padding the E3 and T3 frame.

To verify the data service unit (DSU) bandwidth configured on the interface, use the **show interfaces serial** EXEC command.

When G.751 framing is used, DSU bandwidth can be used to select a payload subrate from 34010 kbps down to 22 kbps. Before framing bypass can be used, a DSU bandwidth of 34010 kbps must be configured.

Even though software allows the user to configure a continuous range of bandwidths in subrate modes, vendors support bandwidths only in quantums (for example, in an E3 digital link, bandwidth must be in multiples of 358 kbps). Therefore, the software sets the user-configured bandwidth to the closest vendor-supported bandwidth. Use the **show interfaces serial** *slot*/*port* command to display the actual bandwidth that is configured.

The user-configured subrate mode, subrate bandwidth, actual subrate bandwidth configured, and scramble configuration are displayed near the end of the **show interfaces serial** command output.

The following table shows DSU modes and vendor-supported bandwidths.

Mode	DSU	Bandwidth Range	Bandwidth Multiples
0	Digital Link or Cisco	358–34010 kbps for E3	358 kbps
		300–44210 kbps for T3	300.746 kbps
1	ADC Kentrox T3/E3 IDSU	1000–34010 kbps for E3	500 kbps
		1500–44210 kbps for T3	500 kbps
2	Larscom Access T45	3100–44210 kbps	3158 kbps
3	Adtran T3SU 300	75–44210 kbps	75.186 kbps
4	Verilink HDM 2182	1500–44210 kbps	1579 kbps

Examples

The following example sets the maximum allowable DSU bandwidth to 16,000 kbps on interface 1/0/0:

```
Router(config)# interface serial 1/0/0
Router(config-if)# dsu bandwidth 16000
```

The following example shows the user-configured subrate bandwidth and the actual configured subrate bandwidth as displayed in the output of the **show interfaces serial** command:

```
Router# show interfaces serial

Serial1/0 is up, line protocol is up
  Hardware is DSXPNM Serial
  MTU 1500 bytes, BW 44210 Kbit, DLY 20000 usec,
     reliability 253/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  DTR is pulsed for 0 seconds on reset, Restart-Delay is 1637167 secs
  Last input 04:59:04, output 04:59:04, output hang never
  Last clearing of "show interface" counters 00:00:02
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:fifo
  Output queue :0/40 (size/max)
  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 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
 DSU mode 0, bandwidth 34010, real bandwidth 34010, scramble 0
```

Related Commands

Command	Description
show interfaces serial	Displays information that is specific to the interface hardware.

dsu mode

To specify the interoperability mode used by a T3 or E3 controller or the PA-T3 and PA-E3 port adapters, use the **dsu mode** command in interface configuration mode. To return to the default mode, use the **no** form of this command.

dsu mode {**0** | **1** | **2** | **3** | **4**}

no dsu mode

Syntax Description

0	Sets the interoperability mode to 0. This is the default. Specify mode 0 to connect an E3 controller to another E3 controller or to a Digital Link DSU (DL3100). Specify mode 0 to connect a PA-E3 port adapter to another PA-E3 port adapter or to a Digital Link DSU (DL3100). Use mode 0 to connect a PA-T3 port adapter to another PA-T3 port adapter or to a Digital Link DSU (DL3100).
1	Sets the interoperability mode to 1. Specify mode 1 to connect an E3 or T3 controller or a PA-E3 or PA-T3 port adapter to a Kentrox DSU.
2	Sets the interoperability mode to 2. Specify mode 2 to connect a T3 controller or a PA-T3 port adapter to a Larscom DSU.
3	Sets the interoperability mode to 3. Specify mode 3 to connect a T3 controller to an Adtran T3SU 300.
4	Sets the interoperability mode to 4. Specify mode 4 to connect a T3 controller to a Verilink HDM 2182.

Defaults

0

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CA	This command was introduced.
12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for E3 and T3 controllers: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

Usage Guidelines

Scrambling Support on T3 and E3 Serial Interfaces in DSU Mode 1

DSU mode 1 refers to Kentrox mode. If DSU mode is used on a T3 serial interface and the bandwidth is = > 35,000 bps, the scrambling option is not supported. Likewise, if DSU mode 1 is used for an E3 serial interface and the bandwidth is = > 24,510 bps, scrambling is not supported.

Match Local and Remote DSU Configurations

The local interface configuration must match the remote interface configuration. For example, if you define the data service unit (DSU) interoperability mode as 1 on the local port, you must also do the same on the remote port.

Know the DSU Type

You must know what type of DSU is connected to the remote port to determine if it interoperates with an E3 or T3 controller or a PA-E3 or PA-T3 port adapter. The **dsu mode** command enables and improves interoperability with other DSUs.

Verify DSU Mode

To verify the DSU mode configured on the interface, use the **show controllers serial** or **show interfaces serial** EXEC commands.

Examples

The following example sets the DSU mode to 1 on interface 1/0/0:

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

The following example shows the configuration for a serial interface configured in DSU mode 1. The bandwidth is set higher than that supported by the Kentrox firmware allows for scrambling. therefore, the scrambling option is not supported in this configuration.

```
Router(config)# interface serial 1/0/0
Router(config-if)# mtu 4474
Router(config-if)# ip address 216.186.93.114 255.255.255.252
Router(config-if)# ip mtu 4470
Router(config-if)# dsu mode 1
Router(config-if)# dsu bandwidth 44210
```

Related Commands

Command	Description
show controllers serial	Displays information that is specific to the serial controllers.
show interfaces serial	Displays information that is specific to the interface hardware.

dte-invert-txc

To invert the transmit external clock (TXC) signal received from the DCE when the device is operating as a DTE, use the **dte-invert-txc** command in interface configuration mode. If the DCE accepts serial clock transmit external (SCTE) signal when the device is operating as a DTE, use the **no** form of this command.

dte-invert-txc

no dte-invert-txc

Syntax Description

This command has no arguments or keywords.

Defaults

The TXC signal is not inverted.

Command Modes

Interface configuration

Command History

Release	Modification
9.1	This command was introduced.

Usage Guidelines

Use this command if the DCE cannot receive SCTE from the DTE, the data is running at high speeds, and the transmission line is long. The **dte-invert-txc** command prevents phase shifting of the data with respect to the clock.

On the Cisco 4000 series, you can specify the serial Network Processor Module timing signal configuration. When the board is operating as a DTE, the **dte-invert-txc** command inverts the TXC clock signal it gets from the DCE that the DTE uses to transmit data.

If the DCE accepts SCTE from the DTE, use **no dte-invert-txc**.

Examples

The following example inverts the TXC on serial interface 0:

```
Router(config)# interface serial 0
Router(config-if)# dte-invert-txc
```

duplex

To configure duplex operation on an interface, use the **duplex** command in interface configuration mode. To return the system to half-duplex mode, the system default, use the **no** form of this command.

duplex {**full** | **half** | **auto**}

no duplex

Syntax Description

full	Specifies full-duplex operation.
half	Specifies half-duplex operation. This is the default.
auto	Specifies the autonegotiation capability. The interface automatically operates at half or full duplex, depending on environmental factors, such as the type of media and the transmission speeds for the peer routers, hubs, and switches used in the network configuration.

Defaults

Half-duplex mode

Command Modes

Interface configuration

Command History

Release	Modification
11.2(10)P	This command was introduced.

Usage Guidelines

To use the autonegotiation capability (that is, detect speed and duplex modes automatically), you must set both speed and duplex to auto.

Table 7 describes the access server's performance for different combinations of the duplex and speed modes. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

Table 7 Relationship Between duplex and speed Commands

duplex Command	speed Command	Resulting System Action
duplex auto	**speed auto**	Autonegotiates both speed and duplex modes.
duplex auto	**speed 100** or **speed 10**	Autonegotiates both speed and duplex modes.
duplex half or **duplex full**	**speed auto**	Autonegotiates both speed and duplex modes.
duplex half	**speed 10**	Forces 10 Mbps and half duplex.
duplex full	**speed 10**	Forces 10 Mbps and full duplex.

Table 7 Relationship Between duplex and speed Commands (continued)

duplex Command	speed Command	Resulting System Action
duplex half	**speed 100**	Forces 100 Mbps and half duplex.
duplex full	**speed 100**	Forces 100 Mbps and full duplex.

For the Cisco AS5300, the **duplex** {**full** | **half** | **auto**} command syntax replaces the following two earlier duplex commands:

- **half-duplex**
- **full-duplex**

You will get the following error messages if you try to use these commands on a Cisco AS5300:

```
Router(config)# interface fastethernet 0
Router(config-if)# full-duplex
Please use duplex command to configure duplex mode
Router(config-if)#
Router(config-if)# half-duplex
Please use duplex command to configure duplex mode
```

Examples

The following example shows how to configure full- duplex operation on a Cisco AS5300:

```
Router(config)# interface fastethernet 0
Router(config-if)# duplex full
```

Related Commands

Command	Description
interface fastethernet	Selects a particular Fast Ethernet interface for configuration.
show controllers fastethernet	Displays information about initialization block information, transmit ring, receive ring, and errors for the Fast Ethernet controller chip on the Cisco 4500, Cisco 7200 series, or Cisco 7500 series routers.
speed	Configures the speed for a Fast Ethernet interface.

e2-clockrate

To configure serial interface 0 for E2 (8 MHz full duplex) and to shut down the other three serial interfaces (1 to 3), use the **e2-clockrate** command in interface configuration mode. To disable the full duplex E2, use the **no** form of this command.

e2-clockrate

no e2-clockrate

Syntax Description

This command has no arguments or keywords.

Defaults

All interfaces are running.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(2)XD	This command was introduced.
12.0(3)T	This command was integrated into Cisco IOS Release 12.0(3)T.

Usage Guidelines

The **e2-clockrate** command is an interface configuration command and is seen only with **interface serial0**. When this command is used, serial interface 0 supports speeds up to E2 (8 MHz full duplex) and the other three serial interfaces (1 to 3) are put in the "shutdown" state. Also, running this command displays the following warning message:

```
Serial interface 0 is configured to support E2 rates and serial ports "1-3" are moved to
shutdown state.
```

Examples

The following example shows sample display output for the **e2-clockrate** EXEC command.

```
Router(config-if)# e2-clockrate
Interface Serial 0 is configured to support clockrates up to E2 (8Mbps)
Interfaces serial 1-3 will not be operational
```

Related Commands

Command	Description
clock rate	Configures the clock rate for the hardware connections on serial interfaces such as NIMs and interface processors to an acceptable bit rate.

early-token-release

To enable early token release on Token Ring interfaces, use the **early-token-release** command in interface configuration mode. To disable this function, use the **no** form of this command.

early-token-release

no early-token-release

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Early token release is a method whereby the Token Ring interfaces can release the token back onto the ring immediately after transmitting, rather than waiting for the frame to return. This feature helps increase the total bandwidth of the Token Ring.

The Token Ring Interface Processor (TRIP) on the Cisco 7500 series routers and the Token Ring adapters on the Cisco 7200 series routers all support early token release.

Examples

The following example enables the use of early token release on Token Ring interface 1:

```
Router(config)# interface tokenring 1
Router(config-if)# early-token-release
```

The following example enables the use of early token release on the Token Ring interface processor in slot 4 on port 1 on the Cisco 7500 series routers:

```
Router(config)# interface tokenring 4/1
Router(config-if)# early-token-release
```

encapsulation

To set the encapsulation method used by the interface, use the **encapsulation** command in interface configuration mode. To remove the encapsulation, use the **no** form of this command.

encapsulation *encapsulation-type*

no encapsulation *encapsulation-type*

Syntax Description

encapsulation-type	Encapsulation type; one of the following keywords: • **atm-dxi**—ATM Mode-Data Exchange Interface. • **bstun**—Block Serial Tunnel. • **dot1q** *vlan-id* [**native**]—Enables IEEE 802.1q encapsulation of traffic on a specified subinterface in VLANs. The *vlan-id* argument is a virtual LAN identifier. The valid range is from 1 to 1000. The optional **native** keyword sets the PVID value of the port to the *vlan-id* value. • **frame-relay**—Frame Relay (for serial interface). • **hdlc**—High-Level Data Link Control (HDLC) protocol for serial interface. This encapsulation method provides the synchronous framing and error detection functions of HDLC without windowing or retransmission. This is the default for synchronous serial interfaces. • **isl** *vlan-id*—Inter-Switch Link (ISL) (for VLANs). • **lapb**—X.25 Link Access Procedure, Balanced. Data link layer protocol (LAPB) DTE operation (for serial interface). • **ppp**—PPP (for serial interface). • **sde** *said*—IEEE 802.10. The *said* argument is a security association identifier. This value is used as the VLAN identifier. The valid range is from 0 to 0xFFFFFFFE. • **sdlc**—IBM serial Systems Network Architecture (SNA). • **sdlc-primary**—IBM serial SNA (for primary serial interface). • **sdlc-secondary**—IBM serial SNA (for secondary serial interface). • **slip**—Specifies Serial Line Internet Protocol (SLIP) encapsulation for an interface configured for dedicated asynchronous mode or dial-on-demand routing (DDR). This is the default for asynchronous interfaces. • **smds**—Switched Multimegabit Data Services (SMDS) (for serial interface). • **ss7**—Sets the encapsulation type to SS7 and overrides the serial interface objects high-level data link control (HDLC) default.

Defaults

The default depends on the type of interface. For example, synchronous serial interfaces default to HDLC and asynchronous interfaces default to SLIP.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
10.3	The **sde** keyword was added to support IEEE 802.10
11.1	The **isl** keyword was added to support the Interswitch Link (ISL) Cisco protocol for interconnecting multiple switches and routers, and for defining virtual LAN (VLAN) topologies.
11.3(4)T	The **tr-isl trbrf-vla**n keyword was added to support TRISL, a Cisco proprietary protocol for interconnecting multiple routers and switches and maintaining VLAN information as traffic goes between switches.
12.0(1)T	The **dot1q** keyword was added to support IEEE 8021q standard for encapsulation of traffic on a specified subinterface in VLANs.
12.1(3)T	The **native** keyword was added.
12.2(11)T	This command was modified to include the **ss7** keyword in support of integrated signaling link terminal capabilities.
12.3(2)T	The **tr-isl trbrf-vla**n keyword was removed because support for the TRISL protocol is no longer available in Cisco IOS software.

Usage Guidelines

SLIP and PPP

To use SLIP or PPP, the router or access server must be configured with an IP routing protocol or with the **ip host-routing** command. This configuration is done automatically if you are using old-style **slip address** commands. However, you must configure it manually if you configure SLIP or PPP via the **interface async** command.

On lines configured for interactive use, encapsulation is selected by the user when they establish a connection with the **slip** or **ppp** EXEC command.

IP Control Protocol (IPCP) is the part of PPP that brings up and configures IP links. After devices at both ends of a connection communicate and bring up PPP, they bring up the control protocol for each network protocol that they intend to run over the PPP link such as IP or IPX. If you have problems passing IP packets and the **show interface** command shows that line is up, use the **negotiations** command to see if and where the negotiations are failing. You might have different versions of software running, or different versions of PPP, in which case you might need to upgrade your software or turn off PPP option negotiations. All IPCP options as listed in RFC 1332, *PPP Internet Protocol Control Protocol (IPCP)*, are supported on asynchronous lines. Only Option 2, TCP/IP header compression, is supported on synchronous interfaces.

PPP echo requests are used as keepalive packets to detect line failure. The **no keepalive** command can be used to disable echo requests. For more information about the **no keepalive** command, refer to the chapter "IP Services Commands" in the *Cisco IOS IP Command Reference, Volume 1 of 4: Addressing and Services* and to the chapter "Configuring IP Services" in the *Cisco IOS IP Configuration Guide*.

To use SLIP or PPP, the Cisco IOS software must be configured with an IP routing protocol or with the **ip host-routing** command. This configuration is done automatically if you are using old-style **slip address** commands. However, you must configure it manually if you configure SLIP or PPP via the **interface async** command.

Note Disable software flow control on SLIP and PPP lines before using the **encapsulation** command.

SS7

The SS7 encapsulation command is new with the Integrated SLT feature and is available only for interface serial objects created by the **channel-group** command. For network access server (NAS) platforms, the encapsulation for channel group serial interface objects defaults to HDLC. You must explicitly set the encapsulation type to SS7 to override this default.

When encapsulation is set to SS7, the encapsulation command for that object is no longer available. A serial SS7 link is deleted only when its associated dial feature card (DFC) card is removed. As with existing Cisco 26*xx*-based SLTs, you do not need to specify whether the SS7 link is to be used as an A-link or an F-link.

By itself this command does not select the correct encapsulation type. Therefore, once created, you must set the encapsulation type to the new SS7 value, as well as assign a session channel ID to the link at the serial interface command level. The configuration on a digital SS7 link can be saved **(no shutdow**n) only when its encapsulation is successfully set to SS7 and it has been assigned a channel identifier.

VLANs

Do not configure encapsulation on the native VLAN of an IEEE 802.1q trunk without the **native** keyword. (Always use the **native** keyword when the *vlan-id* is the ID of the IEEE 802.1q native VLAN.)

For detailed information on use of this command with VLANs, refer to the *Cisco IOS Switching Services Configuration Guide* and the *Cisco IOS Switching Services Command Reference*.

Examples

The following example shows how to reset HDLC serial encapsulation on serial interface 1:

```
Router(config)# interface serial 1
Router(config-if)# encapsulation hdlc
```

The following example shows how to enable PPP encapsulation on serial interface 0:

```
Router(config)# interface serial 0
Router(config-if)# encapsulation ppp
```

The following example shows how to configure async interface 1 for PPP encapsulation:

```
Router(config)# interface async 1
Router(config-if)# encapsulation ppp
```

To learn more about the virtual serial interface and check SS7 encapsulation, enter the **show interfaces serial** *slot*/*trunk*:*channel-group* command in privileged EXEC mode, as in the following example:

```
Router# show interfaces serial 7/3:1

Serial7/3:1 is up, line protocol is down
 Hardware is PowerQUICC Serial
 MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
  reliability 255/255, txload 4/255, rxload 1/255
 Encapsulation SS7 MTP2, loopback not set
 Keepalive set (10 sec)
 Last input never, output 00:00:00, output hang never
 Last clearing of "show interface" counters 03:53:40
 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 26000 bits/sec, 836 packets/sec
```

```
0 packets input, 0 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
11580159 packets output, 46320636 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 output buffer failures, 0 output buffers swapped out
2 carrier transitions
DCD=up DSR=down DTR=down RTS=down CTS=down
```

Related Commands

Command	Description
channel-group	Assigns a channel group and selects the DSO time slots desired for SS7 links.
encapsulation x25	Specifies operation of a serial interface as an X.25 device.
keepalive	Sets the keepalive timer for a specific interface.
ppp	Starts an asynchronous connection using PPP.
ppp authentication	Enables CHAP or PAP or both and specifies the order in which CHAP and PAP authentication are selected on the interface.
ppp bap call	Sets PPP BACP call parameters.
slip	Starts a serial connection to a remote host using SLIP.

end (satellite initial configuration)

To exit satellite initial configuration mode, save any new or changed parameters, and reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **end** command in satellite initial configuration mode.

end

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **end** command is identical to the **exit** command in satellite initial configuration mode.

When you enter the **exit** or **end** command to exit satellite initial configuration mode, the system automatically saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory and resets the NM-1VSAT-GILAT network module.

Examples

The following example shows what appears when you enter the **end** or **exit** command after changing one or more initial configuration parameters:

```
Router(sat-init-config)# end
Applying changed parameters to the satellite module.
Parameter update succeeded.  Module is now resetting.
Router#
```

The following example shows what appears when you enter the **end** or **exit** command when no parameters have been changed:

```
Router(sat-init-config)# end
Router#
```

Related Commands

Command	Description
apply	Saves new or changed satellite initial configuration parameters and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
exit (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

exit (satellite initial configuration)

To exit satellite initial configuration mode, save any new or changed parameters, and reset the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT), use the **exit** command in satellite initial configuration mode.

exit

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values

Command Modes

Satellite initial configuration

Command History

Release	Modification
12.3(14)T	This command was introduced.

Usage Guidelines

The **exit** command is identical to the **end** command in satellite initial configuration mode.

When you enter the **exit** or **end** command to exit satellite initial configuration mode, the system automatically saves any changed parameters to the NM-1VSAT-GILAT network module nonvolatile memory and resets the NM-1VSAT-GILAT network module.

Examples

The following example shows what appears when you enter the **exit** or **end** command after changing one or more initial configuration parameters:

```
Router(sat-init-config)# exit
Applying changed parameters to the satellite module.
Parameter update succeeded.  Module is now resetting.
Router#
```

The following example shows what appears when you enter the **exit** or **end** command when no parameters have been changed:

```
Router(sat-init-config)# exit
Router#
```

Related Commands

Command	Description
apply	Saves new or changed satellite initial configuration parameters and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).
end (satellite initial configuration)	Exits satellite initial configuration mode, saves any new or changed parameters, and resets the Cisco IP VSAT satellite WAN network module (NM-1VSAT-GILAT).

error throttling

To stop receiving error data packets on multiple channel groups configured on all interfaces on the T1 controller of a channelized T3 port adapter, use the **error throttling** command in T3 controller configuration mode. To continue receiving error data packets on all channels on the T1 controller, use the **no** form of this command.

error throttling

no error throttling

Syntax Description

This command has no arguments or keywords.

Defaults

The **error throttling** command is enabled by default.

Command Modes

T3 controller configuration

Command History

Release	Modification
12.2(19c)	This command was introduced.

Usage Guidelines

Use the **show controllers t3** command to display whether the current router configuration has error throttling enabled or disabled.

The **error throttling** command disables the T1 level clock in order to stop receiving error data packets on a T1 controller.

When a T1 has multiple channel groups configured over it, error throttling affects all the channels on a T1. If any single interface receives a burst of errors, over a short duration, such as 400 errors in 100 milliseconds, the T1 clock is turned off for a period of 100 milliseconds. The reason is that when there is a high rate of errors, the error rate is very likely to continue for a long duration of time. Using error throttling to stop receiving the error data packets reduces wasteful processing and discarding of error packets.

The **no error throttling** command allows all the error data packets to be processed, dropped, and accounted for on a T1 controller. When the error rate is high, the CPU can become overloaded.

When the **no error throttling** command is used to configure a T3 port, the configuration applies to all of the 28 associated T1 channels.

Examples

The following example enables error throttling by disabling the T1 clock in order to stop receiving error data packets on a T1 controller:

```
Router(config-controller)# error throttling
```

The following example uses the **show controllers t3** command to display partial output showing that error throttling is enabled on the T1 controller:

```
Router# show controllers t3 2/1/0

T3 2/1/0 is down.  Hardware is 2CT3 single wide port adapter
  CT3 H/W Version: 0.2.2, CT3 ROM Version: 1.0, CT3 F/W Version: 2.5.1
  FREEDM version: 1, reset 0 resurrect 0
  Applique type is Channelized T3
  Transmitter is sending remote alarm.
  Receiver has loss of signal.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Internal
  Rx-error throttling on T1's ENABLED
  .
  .
  .
```

Related Commands

Command	Description
show controllers t3	Displays whether the current router configuration has error throttling enabled or disabled.

fddi burst-count

To allow the FCI card to preallocate buffers to handle bursty FDDI traffic (for example, Network File System [NFS] bursty traffic), use the **fddi burst-count** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi burst-count *number*

no fddi burst-count

Syntax Description

number	Number of preallocated buffers in the range from 1 to 10. The default is 3.

Defaults

3 buffers

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command applies to the FCI card only.

Note The microcode software version should *not* be 128.45 or 128.43.

Examples

The following example sets the number of buffers to 5:

```
Router(config)# interface fddi 0
Router(config-if)# fddi burst-count 5
```

fddi c-min

To set the C-Min timer on the pulse code modulation (PCM), use the **fddi c-min** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi c-min *microseconds*

no fddi c-min

Syntax Description

microseconds	Sets the timer value, in microseconds. The default is 1600.

Defaults

1600 microseconds

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command applies to the processor connection management (CMT) only. You need extensive knowledge of the PCM state machine to tune this timer. Use this command when you run into PCM interoperability problems.

Examples

The following example sets the C-Min timer to 2000 microseconds:

```
Router(config)# interface fddi 0
Router(config-if)# fddi c-min 2000
```

Related Commands

Command	Description
fddi tb-min	Sets the TB-Min timer in the PCM.
fddi tl-min-time	Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification).
fddi t-out	Sets the t-out timer in the PCM.

fddi cmt-signal-bits

To control the information transmitted during the connection management (CMT) signaling phase, use the **fddi cmt-signal-bits** command in interface configuration mode.

fddi cmt-signal-bits *signal-bits* [**phy-a** | **phy-b**]

Syntax Description

signal-bits	A hexadecimal number preceded by 0x; for example, 0x208. The FDDI standard defines 10 bits of signaling information that must be transmitted, as follows: • bit 0—Escape bit. Reserved for future assignment by the FDDI standards committee. • bits 1 and 2—Physical type, as defined in Table 8. • bit 3—Physical compatibility. Set if topology rules include the connection of a physical-to-physical type at the end of the connection. • bits 4 and 5—Link confidence test duration; set as defined in Table 9. • bit 6—MAC available for link confidence test. • bit 7—Link confidence test failed. The setting of bit 7 indicates that the link confidence was failed by the Cisco end of the connection. • bit 8—MAC for local loop. • bit 9—MAC on physical output.
phy-a	(Optional) Selects Physical Sublayer A. The default is 0x008 (hexadecimal) or 00 0000 1000 (binary). Bits 1 and 2 are set to 00 to select Physical A. Bit 3 is set to 1 to indicate “accept any connection.”
phy-b	(Optional) Selects Physical Sublayer B. The default is 0x20c (hexadecimal) or 10 0000 1100 (binary). Bits 1 and 2 are set to 10 to select Physical B. Bit 3 is set to 1 to indicate “accept any connection.” Bit 9 is set to 1 to select MAC on output. The normal data flow on FDDI is input on Physical A and output on Physical B.

Defaults

- **phy-a** is set to 0x008 (hexadecimal) or 00 0000 1000 (binary). Bits 1 and 2 are set to 00 to select Physical A. Bit 3 is set to 1 to indicate “accept any connection.”
- **phy-b** is set to 0x20c (hexadecimal) or 10 0000 1100 (binary). Bits 1 and 2 are set to 10 to select Physical B. Bit 3 is set to 1 to indicate “accept any connection.” Bit 9 is set to 1 to select MAC on output. The normal data flow on FDDI is input on Physical A and output on Physical B.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

If neither the **phy-a** nor **phy-b** keyword is specified, the signal bits apply to both physical connections.

Caution Use of the **fddi cmt-signal-bits** configuration command is *not* recommended under normal operations. This command is used when debugging specific CMT implementation issues.

Table 8 lists the physical types.

Table 8 FDDI Physical Type Bit Specifications

Bit 2	Bit 1	Physical Type
0	0	Physical A
1	0	Physical B
0	1	Physical S
1	1	Physical M

Table 9 lists the duration bits.

Table 9 FDDI Link Confidence Test Duration Bit Specification

Bit 5	Bit 4	Test Duration
0	0	Short test (default 50 milliseconds)
1	0	Medium test (default 500 milliseconds)
0	1	Long test (default 5 seconds)
1	1	Extended test (default 50 seconds)

This command does not have a **no** form.

Examples

The following example sets the CMT signaling phase to signal bits 0x208 on both physical connections:

```
Router(config)# interface fddi 0
Router(config-if)# fddi cmt-signal-bits 0x208
```

fddi duplicate-address-check

To enable the duplicate address detection capability on the FDDI interface, use the **fddi duplicate-address-check** command in interface configuration mode. To disable this function, use the **no** form of this command.

fddi duplicate-address-check

no fddi duplicate-address-check

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

If you use this command, the Cisco IOS software will detect a duplicate address if multiple stations are sharing the same MAC address. If the software finds a duplicate address, it will shut down the interface.

Examples

The following example enables duplicate address checking on the FDDI interface:

```
Router(config)# interface fddi 0
Router(config-if)# fddi duplicate-address-check
```

fddi encapsulate

To specify encapsulating bridge mode on the CSC-C2/FCIT interface card, use the **fddi encapsulate** command in interface configuration mode. To turn off encapsulation bridging and return the FCIT interface to its translational, nonencapsulating mode, use the **no** form of this command.

fddi encapsulate

no fddi encapsulate

Syntax Description

This command has no arguments or keywords.

Defaults

By default, the FDDI interface uses the SNAP encapsulation format defined in RFC 1042, *Standard for the Transmission of IP Datagrams Over IEEE 802 Networks*. It is not necessary to define an encapsulation method for this interface when using the CSC-FCI interface card.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The **no fddi encapsulate** command applies only to CSC-C2/FCIT interfaces, because the CSC-FCI interfaces are always in encapsulating bridge mode. The CSC-C2/FCIT interface card fully supports transparent and translational bridging for the following configurations:

- FDDI to FDDI
- FDDI to Ethernet
- FDDI to Token Ring

The **fddi encapsulate** command puts the CSC-C2/FCIT interface into encapsulation mode when doing bridging. In transparent mode, the FCIT interface interoperates with earlier versions of the CSC-FCI encapsulating interfaces when performing bridging functions on the same ring.

Caution Bridging between dissimilar media presents several problems that can prevent communications from occurring. These problems include bit-order translation (or usage of MAC addresses as data), maximum transfer unit (MTU) differences, frame status differences, and multicast address usage. Some or all of these problems might be present in a multimedia bridged LAN and might prevent communication from taking place. These problems are most prevalent when bridging between Token Rings and Ethernets or between Token Rings and FDDI nets. This is because of the different way Token Ring is implemented by the end nodes.

The following protocols have problems when bridged between Token Ring and other media: Novell IPX, DECnet Phase IV, AppleTalk, VINES, XNS, and IP. Furthermore, the following protocols may have problems when bridged between FDDI and other media: Novell IPX and XNS. We recommend that these protocols be routed whenever possible.

Examples

The following example sets FDDI interface 1 on the CSC-C2/FCIT interface card to encapsulating bridge mode:

```
Router(config)# interface fddi 1
Router(config-if)# fddi encapsulate
```

fddi frames-per-token

To specify the maximum number of frames that the FDDI interface transmits per token capture, use the **fddi frames-per-token** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi frames-per-token *number*

no fddi frames-per-token

Syntax Description

number	Maximum number of frames to transmit per token capture. Valid values are from 1 to 10. The default is 3.

Defaults

3 frames

Command Modes

Interface configuration

Command History

Release	Modification
11.2 P	This command was introduced.

Usage Guidelines

Changing the value will increase or decrease the maximum number of frames that the FDDI interface can transmit when it receives a token. Increasing the value does not necessarily mean more frames will be transmitted on each token capture. This is heavily dependent on the traffic load of the specific interface.

When the interface captures a token, it transmits all of the frames that are queued in the interface's transmit ring, up to a maximum value specified by the **fddi frames-per-token** command.

If there are no frames ready for transmission, the token is passed on, and no frames are transmitted. If there are less than the **fddi frames-per-token** value in the transmit ring, all frames in the transmit ring are transmitted before the token is passed on. If there are more than the **fddi frames-per-token** value in the transmit ring, the specified value is transmitted before the token is passed on. The remaining frames in the transmit ring remain queued until the token is captured again.

Examples

The following example shows how to configure the FDDI interface to transmit four frames per token capture:

```
Router(config-if)# fddi frames-per-token 4
```

fddi smt-frames

To enable the Station Management (SMT) frame processing capability on the FDDI, use the **fddi smt-frames** command in interface configuration mode. To disable this function and prevent the Cisco IOS software from generating or responding to SMT frames, use the **no** form of this command.

fddi smt-frames

no fddi smt-frames

Syntax Description

This command has no arguments or keywords.

Defaults

Enabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use the **no** form of this command to turn off SMT frame processing for diagnosing purposes. Use the **fddi smt-frames** command to reenable the feature.

Examples

The following example disables SMT frame processing:

```
Router(config)# interface fddi 0
Router(config-if)# no fddi smt-frames
```

fddi tb-min

To set the TB-Min timer in the physical connection management (PCM), use the **fddi tb-min** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi tb-min *milliseconds*

no fddi tb-min

Syntax Description

milliseconds	Number, in milliseconds, that sets the TB-Min timer value. The range is from 0 to 65535. The default is 100.

Defaults

milliseconds: 100

Command Modes

Interface configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

This command applies to the processor connection management (CMT) only. Use this command when you run into PCM interoperability problems.

Note You need extensive knowledge of the PCM state machine to tune this timer.

Examples

The following example shows how to set the TB-Min timer to 200 ms:

```
Router(config)# interface fddi 0
Router(config-if)# fddi tb-min 200
```

Related Commands

Command	Description
fddi c-min	Sets the C-Min timer on the PCM.
fddi tl-min-time	Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification).
fddi t-out	Sets the t-out timer in the PCM.

fddi tl-min-time

To control the TL-Min time (the minimum time to transmit a Physical Sublayer, or PHY line state, before advancing to the next physical connection management [PCM] state, as defined by the X3T9.5 specification), use the **fddi tl-min-time** command in interface configuration mode.

fddi tl-min-time *microseconds*

Syntax Description

microseconds	Number, in microseconds, that specifies the time used during the connection management (CMT) phase to ensure that signals are maintained for at least the value of TL-Min so that the remote station can acquire the signal. The range is from 0 to 4294967295. The default is 30.

Defaults

microseconds: 30

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Interoperability tests have shown that some implementations of the FDDI standard need more than 30 microseconds to sense a signal.

This command does not have a **no** form.

Examples

The following example changes the TL-Min time from 30 microseconds to 100 microseconds:

```
Router(config)# interface fddi 0
Router(config-if)# fddi tl-min-time 100
```

The following example changes the TL-Min time from 30 microseconds to 100 microseconds on a Cisco 7500 series router:

```
Router(config)# interface fddi 3/0
Router(config-if)# fddi tl-min-time 100
```

Related Commands

Command	Description
fddi c-min	Sets the C-Min timer on the PCM.
fddi t-out	Sets the t-out timer in the PCM.

fddi token-rotation-time

To control ring scheduling during normal operation and to detect and recover from serious ring error situations, use the **fddi token-rotation-time** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi token-rotation-time *microseconds*

no fddi token-rotation-time

Syntax Description

microseconds	Number, in microseconds, that specifies the token rotation time (TRT). The range is from 4000 to 165000. The default is 5000.

Defaults

microseconds: 5000

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The FDDI standard restricts the allowed time to be greater than 4000 microseconds and less than 165,000 microseconds. As defined in the X3T9.5 specification, the value remaining in the TRT is loaded into the token holding timer (THT). Combining the values of these two timers provides the means to determine the amount of bandwidth available for subsequent transmissions.

Examples

The following example sets the rotation time to 24,000 microseconds:

```
Router(config)# interface fddi 0
Router(config-if)# fddi token-rotation-time 24000
```

The following example sets the rotation time to 24,000 microseconds on a Cisco 7500 series router:

```
Router(config)# interface fddi 3/0
Router(config-if)# fddi token-rotation-time 24000
```

fddi t-out

To set the timeout timer in the physical connection management (PCM), use the **fddi t-out** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi t-out *milliseconds*

no fddi t-out

Syntax Description

milliseconds	Number, in milliseconds, that sets the timeout timer. The range is from 0 to 65535. The default is 100.

Defaults

milliseconds: 100

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

This command applies to the processor connection management (CMT) only. Use this command when you run into PCM interoperability problems.

Note You need extensive knowledge of the PCM state machine to tune this timer.

Examples

The following example sets the timeout timer to 200 ms:

```
Router(config)# interface fddi 0
Router(config-if)# fddi t-out 200
```

Related Commands

Command	Description
fddi c-min	Sets the C-Min timer on the PCM.
fddi tb-min	Sets the TB-Min timer in the PCM.
fddi tl-min-time	Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification).

fddi valid-transmission-time

To change the transmission valid timer (TVX) interval, use the **fddi valid-transmission-time** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

fddi valid-transmission-time *microseconds*

no fddi valid-transmission-time

Syntax Description

microseconds	Number, in microseconds, that specifies the TVX interval. The range is from 2500 to 2147483647. The default is 2500.

Defaults

microseconds: 2500

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use this command to recover from a transient FDDI ring error by setting a longer transmission timer interval.

Examples

The following example shows how to change the transmission timer interval to 3000 microseconds:

```
Router(config)# interface fddi 0
Router(config-if)# fddi valid-transmission-time 3000
```

The following example shows how to change the transmission timer interval to 3000 microseconds on Cisco 7000 series routers or Cisco 7200 series routers:

```
Router(config)# interface fddi 3/0
Router(config-if)# fddi valid-transmission-time 3000
```

fdl

To set the Facility Data Link (FDL) exchange standard for CSU controllers or to set the FDL exchange standard for a T1 interface that uses the Extended Super Frame (ESF) framing format, use the **fdl** command in ATM interface configuration mode. To disable FDL support or to specify that there is no ESF FDL, use the **no** form of this command.

fdl {**att** | **ansi** | **all** | **none**}

no fdl {**att** | **ansi** | **all** | **none**}

Syntax Description

att	Selects AT&T technical reference 54016 for ESF FDL exchange support.
ansi	Selects ANSI T1.403 for ESF FDL exchange support.
all	Specifies support for both AT&T technical reference 54016 and ANSI T1.403 for ESF FDL exchange support.
none	Specifies that there is no support for ESF FDL exchange.

Defaults

ansi

Command Modes

ATM interface configuration

Command History

Release	Modification
11.3	This command was introduced.
12.0(5)T and 12.0(5)XK	The command was introduced as an ATM interface configuration command for the Cisco 2600 and Cisco 3600 series. The **none** keyword was added, and the **both** keyword was changed to **all**.

Usage Guidelines

This command is available for T1 links only and sets the standard that will be followed for FDL messaging through a 4-Kbps out-of-band channel that a service provider uses to check for errors on the facility. You must use the same FDL exchange standard as your service provider. If the setting is not correct, the link may fail to come up. You can have a different standard configured on each T1 interface.

Note When using a multiport T1 ATM IMA network module on a Cisco 2600 or Cisco 3600 series router, ESF framing and binary eight zero substitution (B8ZS) line encoding are supported. When using a multiport E1 ATM IMA network module on a Cisco 2600 or Cisco 3600 series router, CRC4 multiframe framing and HDB3 line encoding are supported. These are the parameters specified by the ATM Forum, and they cannot be changed.

Examples

The following example shows how to specify both ANSI and AT&T standards for FDL exchange on a Cisco 2600 or Cisco 3600 series router:

```
Router(config)# interface atm 0/2
Router(config-if)# fdl all
```

framing

To select the frame type for the T1 or E1 data line, use the **framing** command in controller configuration mode.

T1 Lines

framing {**sfadm** | **esfadm**}

E1 Lines

framing {**crc4adm** | **pcm30adm** | **clear e1**}

Syntax Description

sfadm	Specifies super frame for the T1 channel.
esfadm	Specifies extended super frame for the T1 channel.
crc4adm	Specifies CRC4 framing mode for the E1 channel.
pcm30adm	Specifies CRC4 disabled framing mode for the E1 channel.
clear e1	Specifies clear-e1 framing mode for the E1 channel.

Defaults

Extended super frame for a T1 line
CRC4 disabled framing for an E1 line

Command Modes

Controller configuration

Command History

Release	Modification
11.3	This command was introduced.
12.0(5)XE	The command was enhanced as an ATM interface configuration command.
12.0(7)XE1	This command was implemented on the Cisco 7100 series routers.
12.1(5)T	This command was integrated into Cisco IOS Release 12.1(5)T.

Usage Guidelines

Use this command in configurations in which the router or access server is intended to communicate with T1 or E1 fractional data lines. The service provided determines which framing type is required for your T1 or E1 circuit.

This command does not have a **no** form.

Examples

The following example selects extended super frame as the T1 frame type:

```
Router(config)# controller t1 4/0
Router(config-controller)# framing esfadm
```

Related Commands

Command	Description
lbo	Specifies the distance of the cable from the routers to the network equipment.
linecode	Selects the line code type for a T1 or E1 line.

framing (CEM)

To specify the framing format of a circuit emulation (CEM) T1 or E1 port, use the **framing** command in controller configuration mode. To reset the framing format of the port to its default value, use the **no** form of this command.

T1 Port

framing {**sf** | **esf** | **unframed**}

no framing

E1 Port

framing {**crc4** | **no-crc4** | **unframed**}

no framing

Syntax Description

sf	Specifies that the T1 port framing format is set to super frame (SF) format, also commonly known as D4 framing format.
esf	Specifies that the T1 port framing format is set to extended super frame (ESF) format.
crc4	Specifies that the E1 port framing format is set to the G.704 standard with the optional CRC4 mechanism defined in time slot 0 enabled.
no-crc4	Specifies that the E1 port framing format is set to the G.704 standard with the optional CRC4 mechanism defined in time slot 0 disabled.
unframed	Specifies that no framing structure is sought (on the ingress data stream) or imposed (on the egress data stream) on the T1 or E1 port.

Defaults

T1 lines default to **esf**.
E1 lines default to **crc4**.
The **unframed** option is automatically selected if an unframed CEM channel is created on the port using the **cem-group** command.

Command Modes

Controller configuration

Command History

Release	Modification
12.3(7)T	This command was introduced to support circuit emulation.

Usage Guidelines

Framing must be configured to match the framing format used by the attached equipment.

In order to change a line between unframed and any framed mode, you must first delete the CEM channels defined in the line.

Examples

The following example shows how to set the framing format of a CEM T1 port to be super frame format.

```
Router(config-controller)# framing sf
```

The following example shows how to set the framing format of a CEM E1 port to the G.704 standard with the optional CRC4 mechanism defined in time slot 0 disabled.

```
Router(config-controller)# framing no-crc4
```

Related Commands

Command	Description
cem-group	Creates CEM channels on T1 or E1 ports.

framing (E3 controller)

To specify the type of framing used by the E3 controller, use the **framing** command in controller configuration mode. To restore the default framing type, use the **no** form of this command.

framing {**bypass** | **g751**}

no framing

Syntax Description

bypass	Specifies that G.751 framing be bypassed.
g751	Specifies G.751 as the E3 framing type. This is the default.

Defaults

G.751 framing

Command Modes

Controller configuration

Command History

Release	Modification
11.1 CA	This command was introduced.
12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for E3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

Usage Guidelines

If you do not specify the **framing** command, the default, **g751**, is used by the E3 controller to automatically determine the framing type received from the far-end equipment.

Configure framing as G.751 when the E3 connection terminates remotely on a Digital Link or Kentrox data service unit (DSU), or when needing a subrate on an E3 connection between two T3 or E3 network modules.

Note The local interface configuration must match the remote interface, or DSU, configuration.

When G.751 framing is used, DSU bandwidth can be used to select a payload subrate from 34,010 kbps down to 22 kbps.

When framing bypass is used, DSU bandwidth of 34,010 kbps must be configured.

When G.751 framing is used, configuring the **scramble** command can prevent some payload data from being mistakenly interpreted as G.751 framing bits by switches placed between the DSUs. By default, the **no scramble** command is configured.

When framing bypass is used, the **no scramble** command must be configured.

When G.751 framing is used, bit 11 of the G.751 frame is reserved for national use and is set to 1 by default.

Configure national bit 1 only when required for interoperability with your telephone company.

Examples

The following example shows the framing for the E3 controller set to bypass:

```
Router(config)# controller e3 1/0
Router(config-controller)# framing bypass
```

Related Commands

Command	Description
scramble	Specifies the type of framing used by the T1 channels on the CT3IP in Cisco 7500 series routers.

framing (SONET)

To select the frame type of the frame received on an optical line, use the **framing** command in controller configuration mode.

framing {**sonet** | **sdh**}

Syntax Description

sonet	Specifies the framing type as SONET.
sdh	Specifies the framing type as SDH.

Defaults

SONET is the default for the PA-MC-STM-1 port adapter.
SDH is the default for the STM-1 trunk card.

Command Modes

Controller configuration

Command History

Release	Modification
12.0(14)S	This command was introduced.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T and support was added for the STM-1 trunk card on the Cisco AS5850 platform.

Usage Guidelines

Use this command to configure the framing type of the SONET controller. The PA-MC-STM-1port adapter supports both the SONET and SDH framing modes. The STM-1 trunk feature card on the Cisco AS5850 only supports SDH framing.

This command does not have a **no** form.

Examples

The following example shows how to configure the framing type on a SONET controller of an STM-1 card in physical slot number 2 on a Cisco AS5850:

```
Router(config)# controller sonet 2/0
Router(config-controller)# framing sdh
```

Related Commands

Command	Description
show controllers sonet	Displays information about SONET controllers.

framing (T1/E1 controller)

To select the frame type for the T1 or E1 data line, use the **framing** command in controller configuration mode.

T1 Lines

framing {**sf** | **esf**}

E1 Lines

framing {**crc4** | **no-crc4**} [**australia**]

Syntax Description

sf	Specifies super frame as the T1 frame type. This is the default.
esf	Specifies extended super frame as the T1 frame type.
crc4	Specifies CRC4 frame as the E1 frame type. This is the default for Australia.
no-crc4	Specifies no CRC4 frame as the E1 frame type.
australia	(Optional) Specifies the E1 frame type used in Australia.

Defaults

Super frame is the default on a T1 line.
CRC4 frame is the default on an E1 line.

Command Modes

Controller configuration

Usage Guidelines

Use this command in configurations in which the router or access server is intended to communicate with T1 or E1 fractional data lines. The service provider determines the framing type required for your T1/E1 circuit.

This command does not have a **no** form.

Examples

The following example selects extended super frame as the T1 frame type:

```
Router(config-controller)# framing esf
```

Related Commands

Command	Description
cablelength	Specifies the distance of the cable from the routers to the network equipment.
linecode	Selects the linecode type for T1 or E1 line.

framing (T3 controller)

To specify the type of framing used by the T3 controller or by the CT3IP port adapter in Cisco 7500 series routers, use the **framing** command in controller configuration mode. To restore the default framing type, use the **no** form of this command.

T3 Controllers

framing {**c-bit** | **m23**}

no framing

Cisco 7500 Series Routers with CT3IP Port Adapter

framing {**c-bit** | **m23** | **auto-detect**}

no framing

Syntax Description

c-bit	Specifies that C-bit framing is used as the T3 framing type. This is the default for most T3 controllers.
m23	Specifies that M23 framing is used as the T3 framing type.
auto-detect	Specifies that the CT3IP detects the framing type that it receives from the far-end equipment. This is the default for the CT3IP in a Cisco 7500 series router.

Defaults

c-bit for most T3 controllers
auto-detect for the CT3IP in a Cisco 7500 series router

Command Modes

Controller configuration

Command History

Release	Modification
11.1 CA	This command was introduced.
12.2(11)YT	This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for T3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.

Usage Guidelines

If you do not specify the **framing** command, the default **c-bit** is used by most T3 controllers to automatically determine the framing type received from the far-end equipment. If you do not specify the **framing** command on the CT3IP, the default **auto-detect** is used to automatically determine the framing type received from the far-end equipment.

Because the CT3IP supports the Application Identification Channel (AIC) signal, the setting for the framing might be overridden by the CT3IP firmware.

You can also set the framing for each T1 channel by using the **t1 framing** controller configuration command.

Examples

The following example sets the framing for the CT3IP to C-bit:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# framing c-bit
```

Related Commands

Command	Description
t1 framing	Specifies the type of framing used by the T1 channels on the CT3IP in Cisco 7500 series routers.

framing (T3/E3 interface)

To specify T3 or E3 line framing for a PA-T3 or PA-E3 port adapter, use the **framing** command in interface configuration mode. To return to the default C-bit framing or G.751 framing, use the **no** form of this command.

PA-T3

framing {**c-bit** | **m13** | **bypass**}

no framing

PA-E3

framing {**bypass** | **g751**}

no framing

Syntax Description

c-bit	Specifies that C-bit framing is used as the T3 framing type. This is the default for the PA-T3.
m13	Specifies m13 T3 framing.
bypass	Specifies bypass E3 framing.
g751	Specifies G.751 E3 framing. This is the default for the PA-E3.

Defaults

C-bit framing for PA-T3
G.751 framing for PA-E3

Command Modes

Interface configuration

Command History

Release	Modification
11.1 CA	This command was introduced.

Usage Guidelines

The default framing is described in the ITU-T Recommendation G.751.

Note The International Telecommunication Union Telecommunication Standardization Sector (ITU-T) carries out the functions of the former Consultative Committee for International Telegraph and Telephone (CCITT).

When the framing mode is **bypass**, the T3 frame data is not included in the T3 frame, just the data.

When the framing mode is **bypass**, the E3 frame data is not included in the E3 frame, just the data.

If you use the **bypass** keyword, scrambling must be set to the default (disabled), the DSU mode must be set to the default (0), and the DSU bandwidth must be set to the default (44736).

To verify the framing mode configured on the interface, use the **show controllers serial** command in EXEC mode.

Examples

The following example sets the framing mode to bypass on interface 1/0/0:

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

Related Commands

Command	Description
show controllers serial	Displays information that is specific to the interface hardware.

full-duplex

To specify full-duplex mode on full-duplex single-mode and multimode port adapters, use the **full-duplex** command in interface configuration mode. To restore the default half-duplex mode, use the **no** form of this command.

full-duplex

no full-duplex

Syntax Description

This command has no arguments or keywords.

Defaults

Half-duplex mode is the default mode on a Cisco 7500 series router, a Fast Ethernet Interface Processor (FEIP), and serial interfaces that are configured for bisynchronous tunneling.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
11.3	This command was modified to include information on FDDI full-duplex, single-mode, and multimode port adapters.

Usage Guidelines

Use this command if the equipment on the other end is capable of full-duplex mode.

This command specifies full-duplex mode on full-duplex single-mode and multimode port adapters available on the following networking devices:

- Cisco 7200 series routers
- Second-generation Versatile Interface Processors (VIP2s) in Cisco 7500 series routers
- FEIP port
- Serial interface port that uses bisynchronous tunneling

Refer to the *Cisco Product Catalog* for hardware compatibility information and for specific model numbers of port adapters.

To enable half-duplex mode, use the **no full-duplex** or **half-duplex** commands.

Note For the Cisco AS5300, the **duplex** {**full** | **half** | **auto**} command replaces the **full-duplex** and **half-duplex** commands. You will get the following error messages if you try to use the **full-duplex** and **half-duplex** commands on a Cisco AS5300:

```
Router(config)# interface fastethernet 0
Router(config-if)# full-duplex
Please use duplex command to configure duplex mode
```

```
Router(config-if)#
Router(config-if)# half-duplex
Please use duplex command to configure duplex mode
```

Support for This Command

Use the question mark (?) command to find out which port adapters support this command. If the interface does not support full-duplex, an informational message similar to the one shown below is displayed, and no changes are made to the interface. To determine if the interface supports full-duplex, use the **show interfaces** command. For example, the following message is displayed if the interface does not support full-duplex:

```
% interface does not support full-duplex.
```

Use on FDDI

Full-duplex on the FDDI full-duplex port adapters allows an FDDI ring with exactly two stations to transform the ring into a full-duplex, point-to-point topology. To operate in full-duplex mode, there must be only two stations on the ring, the two stations must be capable of operating in full-duplex mode, and both stations must complete a full-duplex autoconfiguration protocol. There is no FDDI token in full-duplex mode. Refer to the *Cisco Product Catalog* for specific model numbers of port adapters.

Full-duplex autoconfiguration protocol allows an FDDI station to dynamically and automatically operate in either half-duplex (or ring) or full-duplex mode, and ensures that the stations fall back to ring mode when a configuration change occurs, such as a third station joining the ring.

After booting up, the FDDI stations begin operation in half-duplex mode. While the station performs the full-duplex autoconfiguration protocol, the station continues to provide data-link services to its users. Under normal conditions, the transition between half-duplex mode and full-duplex mode is transparent to the data-link users. The data-link services provided by full-duplex mode are functionally the same as the services provided by half-duplex mode.

If you change the full-duplex configuration (for example from disabled to enabled) on supported interfaces, the interface resets.

Examples

The following example configures full-duplex mode on the Cisco 7200 series routers:

```
Router(config)# interface fastethernet 0/1
Router(config-if)# full-duplex
```

The following example specifies full-duplex binary synchronous communications (Bisync) mode:

```
Router(config)# interface serial 0
Router(config-if)# encapsulation bstun
Router(config-if)# full-duplex
```

The following example enables full-duplex mode on FDDI interface 0:

```
Router(config)# interface fddi 0/1/0
Router(config-if)# full-duplex
```

Related Commands

Command	Description
half-duplex	Specifies half-duplex mode on an SDLC interface or on the FDDI full-duplex, single-mode port adapter and FDDI full-duplex, multimode port adapter on the Cisco 7200 series and Cisco 7500 series routers.
interface	Configures an interface type and enters interface configuration mode.

Command	Description
interface fastethernet	Selects a particular Fast Ethernet interface for configuration.
interface serial	Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling).
show interfaces	Displays statistics for all interfaces configured on the router or access server.
show interfaces fddi	Displays information about the FDDI interface.

half-duplex

To specify half-duplex mode on an Synchronous Data Link Control (SDLC) interface or on the FDDI full-duplex, single-mode port adapter and FDDI full-duplex, multimode port adapter on the Cisco 7200 series and Cisco 7500 series routers, use the **half-duplex** command in interface configuration mode. To reset the interface to full-duplex mode, use the **no** form of this command.

half-duplex

no half-duplex

Syntax Description

This command has no arguments or keywords.

Defaults

Full-duplex mode is the default mode on an SDLC interface, the FDDI full-duplex, single-mode port adapter and FDDI full-duplex, multimode port adapter on the Cisco 7200 series and Cisco 7500 series routers.

Command Modes

Interface configuration

Command History

Release	Modification
11.1	This command was introduced.
11.3	This command was modified to include information on FDDI full-duplex, single-mode, and multimode port adapters.

Usage Guidelines

SDLC Interfaces

The **half-duplex** command is used to configure an SDLC interface for half-duplex mode and is used on a variety of port adapters. Use the question mark (?) command to find out which port adapters support this command.

Note The **half-duplex** command replaces the **sdlc hdx** and **media-type half-duplex** commands.

Note For the Cisco AS5300, the **duplex** {**full** | **half** | **auto**} command replaces the **full-duplex** and **half-duplex** commands. You will get the following error messages if you try to use the **full-duplex** and **half-duplex** commands on a Cisco AS5300:

```
Router(config)# interface fastethernet 0
Router(config-if)# full-duplex
Please use duplex command to configure duplex mode
Router(config-if)#
Router(config-if)# half-duplex
Please use duplex command to configure duplex mode
```

Enabling Full-Duplex Mode

To enable full-duplex mode, use the **no half-duplex** or **full-duplex** commands.

Note The **media-type half-duplex** command exists in Cisco IOS Release 11.0(5). As of Release 11.0(6), the keyword **half-duplex** was removed from the **media-type** command. In Release 11.0(6), the functionality for specifying half-duplex mode is provided by the **half-duplex** command.

Port Adapters

Refer to the *Cisco Product Catalog* for specific model numbers of port adapters.

Examples

The following example configures an SDLC interface for half-duplex mode:

```
Router(config-if)# encapsulation sdlc-primary
Router(config-if)# half-duplex
```

Related Commands

Command	Description
full-duplex	Specifies full-duplex mode on full-duplex single-mode and multimode port adapters.

half-duplex controlled-carrier

To place a low-speed serial interface in controlled-carrier mode, instead of constant-carrier mode, use the **half-duplex controlled-carrier** command in interface configuration mode. To return the interface to constant-carrier mode, use the **no** form of this command.

half-duplex controlled-carrier

no half-duplex controlled-carrier

Syntax Description

This command has no arguments or keywords.

Defaults

Constant-carrier mode, where Data Carrier Detect (DCD) is held constant and asserted by the DCE half-duplex interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.2	This command was introduced.

Usage Guidelines

This command applies only to low-speed serial DCE interfaces in half-duplex mode. Configure a serial interface for half-duplex mode by using the **half-duplex** command. Refer to the *Cisco Product Catalog* for specific model numbers of networking devices which support serial interfaces.

Controlled-carrier operation means that the DCE interface has DCD deasserted in the quiescent state. When the interface has something to transmit, it asserts DCD, waits a user-configured amount of time, then starts the transmission. When the interface has finished transmitting, it waits a user-configured amount of time and then deasserts DCD.

Examples

The following examples place the interface in controlled-carrier mode and then back into constant-carrier operation.

This example shows changing to controlled-carrier mode from the default of constant-carrier operation:

```
Router(config)# interface serial 2
Router(config-if)# half-duplex controlled-carrier
```

This example shows changing to constant-carrier operation from controlled-carrier mode:

```
Router(config)# interface serial 2
Router(config-if)# no half-duplex controlled-carrier
```

Related Commands

Command	Description
half-duplex	Specifies half-duplex mode on an SDLC interface or single-mode and multimode port adapters.
half-duplex timer	Tunes half-duplex timers.
physical-layer	Specifies the mode of a slow-speed serial interface on a router as either synchronous or asynchronous.

half-duplex timer

To tune half-duplex timers, use the **half-duplex timer** command in interface configuration mode. To return to the default parameter values, use the **no** form of this command.

half-duplex timer {**cts-delay** *value* | **cts-drop-timeout** *value* | **dcd-drop-delay** *value* | **dcd-txstart-delay** *value* | **rts-drop-delay** *value* | **rts-timeout** *value* | **transmit-delay** *value*}

no half-duplex timer {**cts-delay** *value* | **cts-drop-timeout** *value* | **dcd-drop-delay** *value* | **dcd-txstart-delay** *value* | **rts-drop-delay** *value* | **rts-timeout** *value* | **transmit-delay** *value*}

Syntax Description

cts-delay *value*	Specifies the delay introduced by the DCE interface from the time it detects the Request to Send (RTS) to the time it asserts Clear to Send (CTS) in response. The range is dependent on the serial interface hardware. The default **cts-delay** value is 0 ms.
cts-drop-timeout *value*	Determines the amount of time a DTE interface waits for CTS to be deasserted after it has deasserted RTS. If CTS is not deasserted during this time, an error counter is incremented to note this event. The range is from 0 to 1,140,000 ms (1140 seconds). The default **cts-drop-timeout** value is 250 ms.
dcd-drop-delay *value*	Applies to DCE half-duplex interfaces operating in controlled-carrier mode (see the **half-duplex controlled-carrier** command). This timer determines the delay between the end of transmission by the DCE and the deassertion of Data Carrier Detect (DCD). The range is from 0 to 4400 ms (4.4 seconds). The default **dcd-drop-delay** value is 100 ms.
dcd-txstart-delay *value*	Applies to DCE half-duplex interfaces operating in controlled-carrier mode. This timer determines the time delay between the assertion of DCD and the start of data transmission by the DCE interface. The range is from 0 to 1,140,000 ms (1140 seconds). The default **dcd-txstart-delay** value is 100 ms.
rts-drop-delay *value*	Specifies the time delay between the end of transmission by the DTE interface and deassertion of RTS. The range is from 0 to 1,140,000 ms (1140 seconds). The default **rts-drop-delay** value is 3 ms.
rts-timeout *value*	Determines the number of milliseconds the DTE waits for CTS to be asserted after the assertion of RTS before giving up on its transmission attempt. If CTS is not asserted in the specified amount of time, an error counter is incremented. The range is dependent on the serial interface hardware. The default **rts-timeout** value is 3 ms.
transmit-delay *value*	Specifies the number of milliseconds a half-duplex interface will delay the start of transmission. In the case of a DTE interface, this delay specifies how long the interface waits after something shows up in the transmit queue before asserting RTS. For a DCE interface, this dictates how long the interface waits after data is placed in the transmit queue before starting transmission. If the DCE interface is in controlled-carrier mode, this delay shows up as a delayed assertion of DCD. This timer enables the transmitter to be adjusted if the receiver is a little slow and is not able to keep up with the transmitter. The range is from 0 to 4400 ms (4.4 seconds). The default **transmit-delay** value is 0 ms.

Defaults

The default **cts-delay** value is 0 ms.
The default **cts-drop-timeout** value is 250 ms.
The default **dcd-drop-delay** value is 100 ms.
The default **dcd-txstart-delay** value is 100 ms.
The default **rts-drop-delay** value is 3 ms.
The default **rts-timeout** value is 3 ms.
The default **transmit-delay** value is 0 ms.

Command Modes

Interface configuration

Command History

Release	Modification
11.3	This command was introduced.

Usage Guidelines

Tuning Half-Duplex Timers

The **half-duplex timer** command is used to tune half-duplex timers. With these timer tuning commands you can adjust the timing of the half-duplex state machines to suit the particular needs of their half-duplex installation.

You can configure more than one option using this command, but each option must be specified as a separate command.

Note The **half-duplex timer cts-delay** command replaces the **sdlc cts-delay** command. The **half-duplex timer rts-timeout** command replaces the **sdlc rts-timeout** command.

Value Ranges

The range of values for the **cts-delay** and **rts-timeout** keywords are dependent on the serial interface hardware.

Examples

The following example set the cts-delay timer to 10 ms and the transmit-delay timer to 50 ms:

```
Router(config)# interface serial 2
Router(config-if)# half-duplex timer cts-delay 10
Router(config-if)# half-duplex timer transmit-delay 50
```

Related Commands

Command	Description
half-duplex controlled-carrier	Places a low-speed serial interface in controlled-carrier mode, instead of constant-carrier mode.
physical-layer	Specifies the mode of a slow-speed serial interface on a router as either synchronous or asynchronous.

hold-queue

To limit the size of the IP output queue on an interface, use the **hold-queue** command in interface configuration mode. To restore the default values, use the **no** form of this command.

hold-queue *length* {**in** | **out**}

no hold-queue {**in** | **out**}

Syntax Description

length	Integer that specifies the maximum number of packets in the queue. The range of valid values is from 0 to 65535.
in	Specifies the input queue. The default is 75 packets. For asynchronous interfaces, the default is 10 packets.
out	Specifies the output queue. The default is 40 packets. For asynchronous interfaces, the default is 10 packets.

Defaults

The default input hold-queue limit is 75 packets.
The default output hold-queue limit is 40 packets.
For asynchronous interfaces the default is 10 packets.
These limits prevent a malfunctioning interface from consuming an excessive amount of memory. There is no fixed upper limit to a queue size.

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.
11.1	The **no hold-queue** command was added.

Usage Guidelines

Back-to-Back Routing Updates

The default of 10 packets allows the Cisco IOS software to queue a number of back-to-back routing updates. This is the default for asynchronous interfaces only; other media types have different defaults.

Hold Queues and Priority Queueing

The hold queue stores packets received from the network that are waiting to be sent to the client. It is recommended that the queue size not exceed ten packets on asynchronous interfaces. For most other interfaces, queue length should not exceed 100.

The input hold queue prevents a single interface from flooding the network server with too many input packets. Further input packets are discarded if the interface has too many input packets outstanding in the system.

If priority output queueing is being used, the length of the four output queues is set using the **priority-list** global configuration command. The **hold-queue** command cannot be used to set an output hold queue length in this situation.

For slow links, use a small output hold-queue limit. This approach prevents storing packets at a rate that exceeds the transmission capability of the link. For fast links, use a large output hold-queue limit. A fast link may be busy for a short time (and thus require the hold queue), but can empty the output hold queue quickly when capacity returns.

To display the current hold queue setting and the number of packets discarded because of hold queue overflows, use the **show interfaces** command in EXEC mode.

Caution Increasing the hold queue can have detrimental effects on network routing and response times. For protocols that use seq/ack packets to determine round trip times, do not increase the output queue. Dropping packets instead informs hosts to slow down transmissions to match available bandwidth. This is generally better than having duplicate copies of the same packet within the network (which can happen with large hold queues).

Examples

The following example shows how to set a small input queue on a slow serial line:

```
Router(config)# interface serial 0
Router(config-if)# hold-queue 30 in
```

Related Commands

Command	Description
priority-list	Assigns a priority queue for those packets that do not match any other rule in the priority list.
show interfaces	Displays statistics for all interfaces configured on the router or access server.

hssi external-loop-request

To allow the router to support a CSU/DSU that uses the loopback circuit (LC) signal to request a loopback from the router, use the **hssi external-loop-request** command in interface configuration mode. To disable this function, use the **no** form of this command.

hssi external-loop-request

no hssi external-loop-request

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

The HSA applique on the High-Speed Serial Interface (HSSI) contains an LED that indicates the loopback circuit A (LA), loopback circuit B (LB), and LC signals that are transiting through the devices. The CSU/DSU uses the LC signal to request a loopback from the router. The CSU/DSU may want to do this so that its own network management diagnostics can independently check the integrity of the connection between the CSU/DSU and the router.

Use this command to enable a two-way, internal, and external loopback request on the HSSI from the CSU/DSU.

Caution If your CSU/DSU does not support this function, it should not be enabled on the router. Not enabling this function prevents spurious line noise from accidentally tripping the external loopback request line, which would interrupt the normal data flow.

Examples

The following example enables a CSU/DSU to use the LC signal to request a loopback from the router:

```
Router(config-if)# hssi external-loop-request
```

hssi internal-clock

To convert the High-Speed Serial Interface (HSSI) into a clock master, use the **hssi internal-clock** command in interface configuration mode. To disable the clock master mode, use the **no** form of this command.

hssi internal-clock

no hssi internal-clock

Syntax Description

This command has no arguments or keywords.

Defaults

Disabled

Command Modes

Interface configuration

Command History

Release	Modification
10.0	This command was introduced.

Usage Guidelines

Use this command in conjunction with the HSSI null-modem cable to connect two Cisco routers together with HSSI. You must configure this command at both ends of the link, not just one.

Note HSSI network module provides full-duplex connectivity at SONET OC-1/STS-1 (51.840 Mhz), T3 (44.736 MHZ), and E3 (34.368 MHz) rates in conformance with the EIA/TIA-612 and EIA/TIA-613 specifications. The actual rate of the interface depends on the external data service unit (DSU) and the type of service to which it is connected.

Examples

The following example shows how to convert the HSSI interface into a clock master:

```
Router(config-if)# hssi internal-clock
```

hub

To enable and configure a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router, use the **hub** command in global configuration mode.

hub ethernet *number port* [*end-port*]

Syntax Description

ethernet	Indicates that the hub is in front of an Ethernet interface.
number	Hub number, starting with 0. Because there is only one hub, this number is 0.
port	Port number on the hub. On the Cisco 2505 router, port numbers range from 1 to 8. On the Cisco 2507 router, port numbers range from 1 to 16. If a second port number follows, then this port number indicates the beginning of a port range.
end-port	(Optional) Last port number of a range.

Defaults

No hub ports are configured.

Command Modes

Global configuration

Command History

Release	Modification
10.3	This command was introduced.

Usage Guidelines

This command does not have a **no** form.

Examples

The following example enables port 1 on hub 0:

```
Router# hub ethernet 0 1
Router(config-hub)# no shutdown
```

The following example enables ports 1 through 8 on hub 0:

```
Router# hub ethernet 0 1 8
Router(config-hub)# no shutdown
```

Related Commands

Command	Description
shutdown (hub)	Shuts down a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router.

hw-module main-cpu qa error-recovery

To enable the recovery mechanism for a QA error condition on a Cisco 7500 series router, use the **hw-module main-cpu qa error-recovery** command in global configuration mode. To disable the recovery mechanism for a QA error condition, use the **no** form of this command.

hw-module main-cpu qa error-recovery

no hw-module main-cpu qa error-recovery

Syntax Description

This command has no arguments or keywords.

Defaults

In Cisco IOS Release 12.0(24)S1, the recovery mechanism for a QA error condition is disabled; in all other releases, it is enabled.

Command Modes

Global configuration

Command History

Release	Modification
12.1(19)E	This command was introduced.
12.0(24)S1	This command was integrated into Cisco IOS Release 12.0(24)S1.
12.2(15)T5	This command was integrated into Cisco IOS Release 12.2(15)T5.
12.2(18)S	This command was integrated into Cisco IOS Release 12.2(18)S.
12.0(26)S	This command was integrated into Cisco IOS Release 12.0(26)S.
12.3(6)	This command was integrated into Cisco IOS Release 12.3(6).

Usage Guidelines

QA errors are sometimes seen in heavy traffic situations and may indicate a hardware failure or a software bug. In the case of a hardware failure, a Versatile Interface Processor (VIP) or a Route Switch Processor (RSP) must be replaced. It is possible, however, to recover from a QA error and not see another error for months. When the same buffer header is present in two different queues, the QA ASIC goes into an error condition and triggers a QA error interrupt. The QA error interrupt causes the RSP to dump the QA diagnostics and perform a cbus complex during which all the line cards are reloaded. Although the duplicate buffer header condition does not always indicate a hardware failure, the downtime of up to 300 seconds creates a real problem in the network.

The **hw-module main-cpu qa error-recovery** command has been created to enable a recovery mechanism for a QA error by allowing the router to remove the duplicate buffer header from the queue that shows the problem and requeue the buffer header. By using the QA error recovery, the downtime is reduced to less than one second under lab conditions. Three QA errors caused by buffer headers are permitted before the router performs a cbus complex and reloads all the line cards.

After three QA errors caused by duplicate queued buffer headers occur, the cbus complex is initiated and the line cards reload. Other QA errors, such as a null buffer header on any queue, can occur. Recovery is not possible in these cases, and the QA error triggers a cbus complex and subsequent line-card reloads. The QA error condition is specific to the Cisco 7500 series routers.

Examples

The following example shows how to enable the QA error recovery mechanism when a Cisco IOS Release 12.0(24)S1 image is used on a Cisco 7500 series router. In all other supported releases, the QA error recovery mechanism is enabled by default.

```
Router(config)# hw-module main-cpu qa error-recovery
```

Related Commands

Command	Description
show controllers cbus	Displays information about the cBus controller card.

hw-module sec-cpu reset

To reset and reload the standby Route Switch Processor (RSP) with the specified Cisco IOS image and to execute the image, use the **hw-module sec-cpu reset** command in privileged EXEC mode.

hw-module sec-cpu reset

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(16)ST	This command was introduced.
12.0(19)ST1	This command was enabled in privileged EXEC mode.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.

Usage Guidelines

Before using this command, you must use the **hw-module slot image** global configuration command to specify a high availability Cisco IOS image to run on the standby RSP. After the high availability image is loaded in the active RSP, use the **hw-module sec-cpu reset** command to reset and reload the standby RSP with the specified Cisco IOS image and to execute the image. To load the standby RSP with the default micro-IOS software contained in the active RSP image instead of a high availability Cisco IOS image, use the **no** form of the **hw-module slot image** command followed by the **hw-module sec-cpu reset** command.

Examples

The following example shows a Cisco 7513 router with the standby RSP loaded in slot 7. The standby RSP is reset and reloaded with the rsp-pv-mz high availability Cisco IOS image. Both RSPs have slot 0 flash memory cards.

```
Router(config)# hw-module slot 7 image slot0:rsp-pv-mz
Router(config)# end
Router# hw-module sec-cpu reset
```

Related Commands

Command	Description
hw-module slot image	Specifies a high availability Cisco IOS image to run on an active or standby RSP.

hw-module slot

To enable the router shelf to restart a stopped Dial Shelf Controller (DSC) card, to stop a DSC card, or to cause a shutdown, reset, or reload of any specified dial shelf feature board, use the **hw-module slot** command in privileged EXEC mode.

hw-module slot *shelf-id/slot-number* {**reload** | **reset** | **shutdown** | **start** | **stop**}

Syntax Description

shelf-id	Number of the dial shelf. The default number for the dial shelf is 1.
/slot-number	Number of the slot in the shelf where the target feature board or DSC is installed. If the **start** or **stop** keyword is used, the slot number must be either 12 or 13, because these keywords apply only to DSCs.
reload	Enables a remote reload of an individual feature board without having to use manual online insertion and removal (OIR).
reset	Resets a feature board.
shutdown	Shuts down a feature board.
start	Restarts the specified DSC.
stop	Stops the specified DSC.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3(6)AA	The **hw-module** command was introduced.
12.1	• The **hw-module** command was expanded to become the **hw-module slot** command. • The **reload** keyword was added to enable a remote reload of a feature board.
12.3(2)T	The **reset** and **shutdown** keywords were added.

Usage Guidelines

The **stop** form of this command is issued from the router shelf console instead of by pressing the attention (ATTN) button on the target DSC. Confirmation of when the start or stop took place is displayed. Warnings are issued and confirmation input is required if a **stop** command will result in a loss of service when backup functionality is not available.

When a DSC card is stopped, removed, and then reinstalled, there is no need to restart the card (whether the card is the original or a replacement) because a freshly installed card reboots as the backup DSC automatically. However, if a DSC is stopped, either by using the ATTN button or by issuing the **hw-module slot stop** command, it must be restarted by using the **start** form of the same command, or the DSC must be removed and reinstalled in order to reboot.

Press the ATTN button on the DSCs to shut down a card manually before removing the card. This is equivalent to issuing a **hw-module slot** command for that card at the router command prompt. Use the ATTN button to shut down the card before it is swapped out or tested in place, or to restart it, if the card has not been removed after having been shut down.

Tip The **hw-module slot** *shelf-id/slot-number* **reload** form of this command is useful for simulating an OIR event in the case of a feature board failure when physical access to the feature board card is restricted.

Entering the **hw-module slot** *shelf-id/slot-number* **reload** command initiates the feature board reload process through power cycling. The **hw-module slot** *shelf-id/slot-number* **reload** command cannot be used to reload DSCs.

Use the **reset** form of this command to reset the specified feature card and drop all active calls.

Use the **shutdown** form of this command to shut down the specified feature card and drop all active calls.

Examples

The following example shows how to stop the DSC in slot 13 and start the other DSC in slot 12 (which was previously stopped):

```
Router# hw-module slot 1/13 stop
Router# hw-module slot 1/12 start
```

The following example shows how to reload the dial shelf feature board in slot 6:

```
Router# hw-module slot 1/6 reload
```

The following example shows how to reset the card in slot 3:

```
Router# hw-module slot 1/3 reset
```

The following example shows how to shut down the PRE card located in slot 3:

```
Router# hw-module slot 1/3 shutdown
```

Related Commands

Command	Description
debug redundancy	Displays information used for troubleshooting dual (redundant) DSC cards.
show redundancy	Displays current or historical status and related information on dual (redundant) DSC cards.

hw-module slot image

To specify a high availability Cisco IOS image to run on an active or standby Route Switch Processor (RSP), use the **hw-module slot image** command in global configuration mode. To remove a high availability Cisco IOS image from the running configuration, use the **no** form of this command.

hw-module slot *slot-number* **image** *file-spec*

no hw-module slot *slot-number* **image** *file-spec*

Syntax Description

slot-number	Specifies the number of the RSP slot.
file-spec	Specifies the flash memory card location to load the image into and the name of the image.

Defaults

No high availability Cisco IOS images are specified to run on the active or standby RSPs.

Command Modes

Global configuration

Command History

Release	Modification
12.0(16)ST	This command was introduced.
12.3(7)T	This command was integrated into Cisco IOS Release 12.3(7)T.

Examples

The following example shows a Cisco 7513 router with the active RSP loaded in slot 6 and the standby RSP loaded in slot 7. The rsp-pv-mz high availability Cisco IOS image is specified to run on both the active and the standby RSP. Both RSPs have slot 0 flash memory cards.

```
Router(config)# hw-module slot 6 image slot0:rsp-pv-mz
Router(config)# hw-module slot 7 image slot0:rsp-pv-mz
```

Related Commands

Command	Description
hw-module sec-cpu reset	Resets and reloads the standby RSP with the specified Cisco IOS image and executes the image.
mode (HSA redundancy)	Configures the redundancy mode.
redundancy	Enters redundancy configuration mode.