CHAPTER 6

Interface Commands

This chapter contains the commands used to configure nonprotocol-specific interface features. The commands are in alphabetical order. For hardware technical descriptions, and for information about installing the router interfaces, refer to the hardware installation and maintenance publication for your particular product.

For interface configuration tasks and examples, refer to the chapter entitled "Configuring Interfaces" in the *Router Products Configuration Guide*.

For a conversion table of the modular products and Cisco 7000 series processors, see the appendix entitled "Cisco 7000 Processors."

Note For information about the Channel Interface Processor (CIP), see the chapter entitled "IBM Channel Attach Commands." The CIP is described in a separate chapter because of the interrelationship of host system configuration values and router configuration values.

---

async default ip address

To assign the interface address that is used by the device connecting to the router via PPP or SLIP, unless you override the address at the command line, use the **async default ip address** interface configuration command. Use the **no** form of this command to remove the address from your configuration.

async default ip address *ip-address*
no async default ip address

Syntax Description

ip-address	Address of the client interface.

Default

No interface address is assigned.

Command Mode

Interface configuration

Example

The following example specifies address 182.32.7.51 on asynchronous interface 1:

```
interface async 1
async default ip address 182.32.7.51
```

Related Command

async dynamic address

async dynamic address

To specify an address on an asynchronous interface (rather than using the default address), use the **async dynamic address** interface configuration command. Use the **no** form of this command to disable dynamic addressing.

async dynamic address
no async dynamic address

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example shows dynamic addressing assigned to an interface:

```
interface async 1
async dynamic address
```

Related Commands

ppp
slip

async dynamic routing

To implement asynchronous routing on an interface, use the **async dynamic routing** interface configuration command. The **no** form of this command disables use of routing protocols; static routing will still be used.

async dynamic routing
no async dynamic routing

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example shows how to enable asynchronous routing on asynchronous interface 1. The **ip tcp header-compression passive** command enables Van Jacobson TCP header compression and prevents transmission of compressed packets until a compressed packet arrives from the asynchronous link.

```
interface async 1
async dynamic routing
async dynamic address
async default ip address 1.1.1.2
ip tcp header-compression passive
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

async dynamic address
ip tcp header-compression †

async mode dedicated

To place a line into network mode using SLIP or PPP encapsulation, use the **async mode dedicated** interface configuration command. The **no** form of this command returns the line to interactive mode.

async mode dedicated
no async mode

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

With dedicated asynchronous mode, the interface will use either SLIP or PPP encapsulation, depending on which **encapsulation** method is configured for the interface. An EXEC prompt does not appear, and the line is not available for normal interactive use.

If you configure a line for dedicated mode, you will not be able to use **async dynamic address**, because there is no user prompt. You must configure either **async default ip address** and **ip unnumbered** or **ip address**.

Example

The following example assigns an Internet address to an asynchronous line and places the line into network mode. Setting the stop bits to 1 enhances performance.

```
interface async 1
async default ip address 182.32.7.51
async mode dedicated
encapsulation slip
```

Related Command

async mode interactive

async mode interactive

To enable the **slip** and **ppp** EXEC commands, use the **async mode interactive** line configuration command. Use the **no** form of this command to prevent users from implementing SLIP and PPP at the EXEC level.

async mode interactive
no async mode

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Example

The following example enables the **ppp** and **slip** EXEC commands:

```
interface async 1
async mode interactive
```

Related Commands

async mode dedicated
ppp
slip

auto-polarity

To enable automatic receiver polarity reversal on a hub port connected to an Ethernet interface of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **auto-polarity** hub configuration command. To disable this feature, use the **no** form of this command.

auto-polarity
no auto-polarity

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Hub configuration

Usage Guidelines

This command applies to a port on an Ethernet hub only.

Example

The following example enables automatic receiver polarity reversal on hub 0, ports 1 through 3:

```
hub ethernet 0 1 3
auto-polarity
```

Related Command

hub

backup delay

To define how much time should elapse before a secondary line is set up or taken down after a primary line transition, use the **backup delay** interface configuration command. Use the **no backup delay** command to remove the definition.

backup delay {*enable-delay* | **never**} {*disable-delay* | **never**}
no backup delay {*enable-delay* | **never**} {*disable-delay* | **never**}

Syntax Description

enable-delay	Integer that specifies the delay in seconds after the primary line goes down before the secondary line is activated.
disable-delay	Integer that specifies the delay in seconds after the primary line goes up before the secondary line is deactivated.
never	Prevents the secondary line from being activated or deactivated.

Default

never

Command Mode

Interface configuration

Usage Guidelines

When a primary line goes down, the router delays the amount of seconds defined by the *enable-delay* argument before enabling the secondary line. If, after the delay period, the primary line is still down, the secondary line is activated.

When a primary line comes back up, the router will delay the amount of seconds defined by the *disable-delay* argument.

Note In cases where there are spurious signal disruptions that may appear as intermittent lost carrier signals, it is recommended that some delay be enabled before activating and deactivating a secondary.

Note The interval configured with the **backup delay** command does not affect the operation of the **backup load** command.

Examples

The following example sets a 10-second delay on deactivating the secondary line; however, the line is activated immediately:

```
interface serial 0
backup delay 0 10
```

The same example on the Cisco 7000 requires the following commands:

```
interface serial 1/1
backup delay 0 10
```

backup interface

To configure the serial interface as a secondary, or dial backup line, use the **backup interface** interface configuration command. Use the **no backup** command with the appropriate serial port designation to turn disable this feature.

backup interface *interface-name*
backup interface *interface-name slot/port* (for the Cisco 7000 series)
no backup interface *interface-name*

Syntax Description

interface-name	Serial port to be set as the secondary interface line.
slot	On the Cisco 7000 series, specifies the slot number.
port	On the Cisco 7000 series, specifies the port number.

Default

Disabled

Command Mode

Interface configuration

Examples

The following example sets serial 1 as the backup line to serial 0:

```
interface serial 0
backup interface serial 1
```

The following example on the Cisco 7000 sets serial 2 as the backup line to serial 1:

```
interface serial 1/1
backup interface serial 2/2
```

Related Command

down-when-looped

backup load

To set the traffic load thresholds for dial backup service, use the **backup load** interface configuration command. Use the **no backup load** command to remove the setting.

backup load {*enable-threshold* | **never**} {*disable-load* | **never**}
no backup load {*enable-threshold* | **never**} {*disable-load* | **never**}

Syntax Description

enable-threshold	Integer that specifies a percentage of the primary line's available bandwidth.
never	Specifies that the secondary line never be activated due to load.
disable-load	Integer that specifies a percentage of the primary line's available bandwidth.
never	Specifies that the secondary line never be deactivated due to load.

Default

Both arguments default to **never**.

Command Mode

Interface configuration

Usage Guidelines

When the transmitted or received load on the primary line is greater than the value assigned to the *enable-threshold* argument, the secondary line is enabled.

When the transmitted load on the primary line plus the transmitted load on the secondary line is less than the value entered for the *disable-load* argument, and the received load on the primary line plus the received load on the secondary line is less than the value entered for the *disable-load* argument, the secondary line is disabled.

If the **never** keyword is used instead of an *enable-threshold* value, the secondary line is never activated because of load. If the **never** keyword is used instead of a *disable-load* value, the secondary line is never deactivated because of load.

Examples

The following example sets the traffic load threshold to 60 percent on the primary line. When that load is exceeded, the secondary line is activated, and will not be deactivated until the combined load is less than 5 percent of the primary bandwidth.

```
interface serial 0
backup load 60 5
```

The same example on the Cisco 7000 requires the following commands:

```
interface serial 1/1
backup load 60 5
```

bandwidth

To set a bandwidth value for an interface, use the **bandwidth** interface configuration command. Use the **no bandwidth** command to restore the default values.

bandwidth *kilobits*
no bandwidth

Syntax Description

kilobits	Intended bandwidth in kilobits per second. For a full bandwidth DS3, enter the value **44736**.

Default

Default bandwidth values are set during startup and can be displayed with the EXEC command **show interfaces**.

Command Mode

Interface configuration

Usage Guidelines

The **bandwidth** command sets an informational parameter only; you cannot adjust the actual bandwidth of an interface with this command. For some media, such as Ethernet, the bandwidth is fixed; for other media, such as serial lines, you can change the actual bandwidth by adjusting hardware. For both classes of media, you can use the **bandwidth** configuration command to communicate the current bandwidth to the higher-level protocols.

Additionally, IGRP uses the minimum path bandwidth to determine a routing metric. The TCP protocol adjusts initial retransmission parameters based on the apparent bandwidth of the outgoing interface.

At higher bandwidths, the value you configure with the **bandwidth** command is not what is displayed by the **show interface** command. The value shown is that used in IGRP updates and also used in computing load.

Note This is a routing parameter only; it does not affect the physical interface.

Example

The following example sets the full bandwidth for DS3 transmissions:

```
interface serial 0
bandwidth 44736
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

vines metric †

channel-group

Use the **channel-group** controller configuration command to define the timeslots that belong to each T1 or E1 circuit.

channel-group *number* **timeslots** *range* [**speed** {**48** | **56** | **64**}]

Syntax Description

number	Channel-group number. When configuring a T1 data line, channel-group numbers can be a value from 0 to 23. When configuring an E1 data line, channel-group numbers can be a value from 0 to 30.
timeslots *range*	Timeslot or range of timeslots belonging to the channel group. The first timeslot is numbered 1. For a T1 controller, the timeslot range is from 1 to 24. For an E1 controller, the timeslot range is from 1 to 31.
speed {**48** | **56** | **64**}	(Optional) Specifies the line speed (in kilobits per second) of the T1 or E1 link.

Default

The default line speed when configuring a T1 controller is 56 kbps.

The default line speed when configuring an E1 controller is 64 kbps.

Command Mode

Controller configuration

Usage Guidelines

Use this command in configurations where the router is intended to communicate with a T1 or E1 fractional data line. The channel-group number may be arbitrarily assigned and must be unique for the controller. The timeslot range must match the timeslots assigned to the channel group. The service provider defines the timeslots that comprise a channel group.

Example

In the following example, three channel groups are defined. Channel-group 0 consists of a single timeslot, channel-group 8 consists of 7 timeslots and runs at a speed of 64 kbps per timeslot, and channel-group 12 consists of a single timeslot.

```
channel-group 0 timeslots 1
channel-group 8 timeslots 5,7,12-15,20 speed 64
channel-group 12 timeslots 2
```

Related Commands

linecode
framing

clear controller lex

To reboot the LAN Extender chassis and restart its operating software, use the **clear controller lex** privileged EXEC command.

clear controller lex *number* [**prom**]
clear controller lex *slot*/*port* [**prom**] (for the Cisco 7000 series)

Syntax Description

number	Number of the LAN Extender interface corresponding to the LAN Extender to be rebooted.
prom	(Optional) Forces a reload of the PROM image, regardless of any Flash image.
slot	On the Cisco 7000 series, specifies the backplane slot number. On the Cisco 7000, the value can be 0, 1, 2, 3, or 4. On the Cisco 7010, the value can be 0, 1, or 2.
port	On the Cisco 7000 series, specifies the port number of the interface. The value can be 0, 1, 2, or 3 for the serial interface.

Command Mode

Privileged EXEC

Usage Guidelines

The **clear controller lex** command halts operation of the LAN Extender and performs a cold restart.

Without the **prom** keyword, if an image exists in Flash memory, and that image has a newer software version than the PROM image, and that image has a valid checksum, then this command runs the Flash image. If any one of these three conditions is not met, this command reloads the PROM image.

With the **prom** keyword, this command reloads the PROM image, regardless of any Flash image.

Examples

The following example halts operation of the LAN Extender bound to LAN Extender interface 2 and causes the LAN Extender to perform a cold restart from Flash memory:

```
Router# clear controller lex 2
reload remote lex controller? [confirm] yes
```

The following example halts operation of the LAN Extender bound to LAN Extender interface 2 and causes the LAN Extender to perform a cold restart from PROM:

```
Router# clear controller lex 2 prom
reload remote lex controller? [confirm] yes
```

clear controller

Use the **clear controller** EXEC command to reset the T1 or E1 controller interface on the Cisco 7000 series or Cisco 4000 series routers.

clear controller {**t1** | **e1**}*slot/port* (Cisco 7000)
clear controller {**t1** | **e1**} *number* (Cisco 4000)

Syntax Description

slot	Backplane slot number; can be 0, 1, 2, 3, or 4. The slots are numbered from left to right.
port	Port number of the interface. It can be **0** or **1** depending on the type of controller, as follows: • MIP (MultiChannel Interface Processor) **0 or 1** Ports on each interface processor are numbered from the top down.
number	Network interface module (NIM) number, in the range 0 through 2.

Command Mode

EXEC

Example

The following example resets the T1 controller at slot 4, port 0 on a Cisco 7000 series router:

```
clear controller t1 4/0
```

The following example resets the E1 controller at NIM 0 on a Cisco 4000 series router:

```
clear controller e1 0
```

Related Command

controller e1
controller t1

clear counters

To clear the interface counters, use the **clear counters** EXEC command.

clear counters [*type number*] [**ethernet** | **serial**]
clear counters [*type slot*/*port*] [**ethernet** | **serial**] (for the Cisco 7000 series)

Syntax Description

type (Optional) Specifies the interface type; it is one of the keywords listed in Table 6-1.

number (Optional) Specifies the interface counter displayed with the **show interfaces** command.

ethernet (Optional) If the *type* is **lex**, you can clear the interface counters on the Ethernet interface.

serial (Optional) If the *type* is **lex**, you can clear the interface counters on the serial interface.

slot (Optional) On the Cisco 7000 series, specifies the backplane slot number. On the Cisco 7000, the value can be 0, 1, 2, 3, or 4. On the Cisco 7010, the value can be 0, 1, or 2.

port (Optional) On the Cisco 7000 series, specifies the port number of the interface. The value can be 0, 1, 2, or 3 for the serial interface.

Table 6-1 Clear Counters Interface Type Keywords

Keyword	Interface Type
async	Asynchronous interface
bri	Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI)
dialer	Dialer interface
ethernet	Ethernet interface
fddi	Fiber Distributed Data Interface (FDDI)
hssi	High-Speed Serial Interface (HSSI)
lex	LAN Extender interface
loopback	Loopback interface
null	Null interface
serial	Synchronous serial interface
tokenring	Token Ring interface
tunnel	Tunnel interface

Command Mode

EXEC

Usage Guidelines

This command clears all the current interface counters from the interface unless the optional arguments *type* and *number* are specified to clear only a specific interface type (serial, Ethernet, Token Ring, and so on).

Note This command will not clear counters retrieved using SNMP, but only those seen with the EXEC **show interface** command.

Examples

The following example illustrates how to clear all interface counters:

```
clear counters
```

The following example illustrates how to clear interface counters on the serial interface residing on a Cisco 1000 series LAN Extender:

```
clear counters lex 0 serial
```

Related Command

show interfaces

clear hub

To reset and reinitialize the hub hardware connected to an interface of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **clear hub** EXEC command.

clear hub ethernet *number*

Syntax Description

ethernet	Indicates the hub in front of an Ethernet interface.
number	Hub number to clear, starting with 0. Since there is currently only one hub, this number is 0.

Command Mode

EXEC

Example

The following example clears hub 0:

```
clear hub ethernet 0
```

Related Command

hub

clear hub counters

To set to zero the hub counters on an interface of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **clear hub counters** EXEC command.

clear hub counters [**ether** *number* [*port* [*end-port*]]]

Syntax Description

ether	(Optional) Indicates the hub in front of an Ethernet interface.
number	(Optional) Hub number for which to clear counters. Since there is currently only one hub, this number is 0. If you specify the keyword **ether**, you must specify the *number* .
port	(Optional) Port number on the hub. On the Cisco 2505, port numbers range from 1 through 8. On the Cisco 2507, port numbers range from 1 through 16. On the Cisco 2516, Ethernet ports number 1 to 14. If a second port number follows, then this port number indicates the beginning of a port range. If you do not specify a port number, counters for all ports are cleared.
end-port	(Optional) Ending port number of a range.

Command Mode

EXEC

Example

The following example clears the counters displayed in a **show hub** command for all ports on hub 0:

```
clear hub counters ether 0
```

Related Command

show hub

clear interface

To reset the hardware logic on an interface, use the **clear interface** EXEC command.

clear interface *type number*
clear interface *type slot*/*port* (on a Cisco 7000 series)
clear interface *type slot*/*port* [**:***channel-group*] (on a Cisco 7000 MIP T1 interface)

Syntax Description

type — Specifies the interface type; it is one of the keywords listed in Table 6-2.

number — Specifies the port, connector, or interface card number.

slot — On the Cisco 7000 series, specifies the backplane slot number. On the 7000, value can be 0, 1, 2, 3, or 4. On the 7010, value can be 0, 1, or 2.

port — On the Cisco 7000 series, specifies the port number of the interface and can be 0, 1, 2, 3, 4 or 5 depending on the type of interface, as follows:

- AIP (ATM Interface Processor) 0
- EIP (Ethernet Interface Processor) 0, 1, 2, 3, 4, or 5
- FIP (FDDI Interface Processor) 0
- HIP (HSSI Interface Processor) 0
- MIP (Multichannel Interface Processor) 0 or 1
- TRIP (Token Ring Interface Processor) 0, 1, 2, or 3

channel-group — (Optional) On the Cisco 7000 series supporting channelized T1, specifies the channel and can be between 0 and 23.

Table 6-2 Clear Interface Type Keywords

Keyword	Interface Type
async	Async interface
atm	Asynchronous Transfer Mode (ATM) interface
bri	Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI)
ethernet	Ethernet interface
fddi	Fiber Distributed Data Interface (FDDI)
hssi	High-Speed Serial Interface (HSSI)
loopback	Loopback interface
null	Null interface
serial	Synchronous serial interface
tokenring	Token Ring interface
tunnel	Tunnel interface

Command Mode

EXEC

Note Under normal circumstances, you do not need to clear the hardware logic on interfaces.

Example

The following example resets the interface logic on HSSI interface 1:

```
clear interface hssi 1
```

clear rif-cache

To clear entries from the Routing Information Field (RIF) cache, use the **clear rif-cache** EXEC command.

clear rif-cache

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Example

The following example illustrates how to clear the RIF cache:

```
clear rif-cache
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

multiring †

clock source (controller)

Use the **clock source** controller configuration command to set the T1-line clock-source for the MIP in the Cisco 7000 or for the NIM in the Cisco 4000.

clock source {**line** | **internal**}

Syntax Description

line	Specifies the T1 line as the clock source.
internal	Specifies the MIP (Cisco 7000) or the NIM (Cisco 4000) as the clock source.

Default

T1 line

Command Mode

Controller configuration

Usage Guidelines

This command is used in configurations where the interfaces are connected back-to-back, rather than to a T1 line, and one of the interfaces must provide a clocking signal. When the interface is connected to a channelized T1 line, this command need never be used.

Example

The following example enables internal clocking:

```
clock source internal
```

Related Commands

framing
linecode

clock source (interface)

To control which clock a G.703-E1 interface will use to clock its transmitted data from, use the **clock source** interface configuration command. The **no** form of this command restores the default value.

clock source {**line** | **internal**}
no clock source

Syntax Description

line	Specifies that the interface will clock its transmitted data from a clock recovered from the line's receive data stream (default).
internal	Specifies that the interface will clock its transmitted data from its internal clock.

Default

By default, the applique uses the line's receive data stream.

Command Mode

Interface configuration

Usage Guidelines

This command applies to a Cisco 4000 router or Cisco 7000 series router. A G.703-E1 interface can clock its transmitted data from either its internal clock or from a clock recovered from the line's receive data stream.

Example

The following example specifies the G.703-E1 interface to clock its transmitted data from its internal clock:

```
clock source internal
```

clock rate

To configure the clock rate for the hardware connections on the serial interface appliques, network interface modules (NIMs), and interface processors (IPs) to an acceptable bit rate, use the **clock rate** interface configuration command. Use the **no clock rate** command to remove the clock rate if you change the interface from a DCE to a DTE device.

clock rate *bps*
no clock rate

Syntax Description

bps	Desired clock rate in bits per second: 1200, 2400, 4800, 9600, 19200, 38400, 56000, 64000, 72000, 125000, 148000, 500000, 800000, 1000000, 1300000, 2000000, or 4000000.

Default

No clock rate is configured.

Command Mode

Interface configuration

Usage Guidelines

Be aware that the fastest speeds might not work if your cable is too long, and that speeds faster than 148,000 bits per second are too fast for RS-232 signaling. It is recommended that you only use the synchronous serial RS-232 signal at speeds up to 64,000 bits per second. To permit a faster speed, use an RS-449 or V.35 applique.

Example

The following example sets the clock rate on the first serial interface to 64,000 bits per second:

```
interface serial 0
clock rate 64000
```

cmt connect

To start the processes that perform the connection management (CMT) function and allow the ring on one fiber to be started, use the **cmt connect** EXEC command.

cmt connect [*interface-name* [**phy-a** | **phy-b**]]

Syntax Description

interface-name	(Optional) Specifies the FDDI interface.
phy-a	(Optional) Selects Physical Sublayer A.
phy-b	(Optional) Selects Physical Sublayer B.

Command Mode

EXEC

Usage Guidelines

In normal operation, the FDDI interface is operational once the interface is connected and configured. The **cmt connect** command allows the operator to start the processes that perform the CMT function.

The **cmt connect** command is not needed in the normal operation of FDDI; this command is used mainly in interoperability tests.

Examples

The following examples demonstrate use of the **cmt connect** command for starting the CMT processes on the FDDI ring.

The following command starts all FDDI interfaces:

```
cmt connect
```

The following command starts both fibers on the FDDI interface unit zero:

```
cmt connect fddi 0
```

The following command on the Cisco 7000 starts both fibers on the FDDI interface unit zero:

```
cmt connect fddi 1/0
```

The following command starts only Physical Sublayer A on the FDDI interface unit 0 (zero):

```
cmt connect fddi 0 phy-a
```

The following command on the Cisco 7000 starts only Physical Sublayer A on the FDDI interface unit 0 (zero):

```
cmt connect fddi 1/0 phy-a
```

cmt disconnect

To stop the processes that perform the connection management (CMT) function and allow the ring on one fiber to be stopped, use the **cmt disconnect** EXEC command.

cmt disconnect [*interface-name* [**phy-a** | **phy-b**]]

Syntax Description

interface-name	(Optional) Specifies the FDDI interface.
phy-a	(Optional) Selects Physical Sublayer A.
phy-b	(Optional) Selects Physical Sublayer B.

Command Mode

EXEC

Usage Guidelines

In normal operation, the FDDI interface is operational once the interface is connected and configured, and is turned off using the **shutdown** interface configuration command. The **cmt disconnect** command allows the operator to stop the processes that perform the CMT function and allow the ring on one fiber to be stopped.

The **cmt disconnect** command is not needed in the normal operation of FDDI; this command is used mainly in interoperability tests.

Examples

The following examples demonstrate use of the **cmt disconnect** command for stopping the CMT processes on the FDDI ring.

The following command stops all FDDI interfaces:

```
cmt disconnect
```

The following command stops both fibers on the FDDI interface unit zero:

```
cmt disconnect fddi 0
```

The following command on the Cisco 7000 stops both fibers on the FDDI interface unit zero:

```
cmt disconnect fddi 1/0
```

The following command stops only Physical Sublayer A on the FDDI interface unit 0 (zero). This command causes the FDDI media to go into a wrapped state so that the ring will be broken.

```
cmt disconnect fddi 0 phy-a
```

The following command on the Cisco 7000 stops only Physical Sublayer A on the FDDI interface unit 0 (zero). This command causes the FDDI media to go into a wrapped state so that the ring will be broken.

```
cmt disconnect fddi 1/0 phy-a
```

compress

To configure software compression for Link Access Procedure, Balanced (LAPB), Point-to-Point Protocol (PPP), and High-Level Data Link Control (HDLC) encapsulations, use the **compress** interface configuration command. To disable compression, use the **no** form of this command.

compress [**predictor** | **stac**]
no compress [**predictor** | **stac**]

Syntax Description

predictor	(Optional) Specifies that a predictor compression algorithm will be used on LAPB or PPP encapsulation.
stac	(Optional) Specifies that a Stacker (LZS) compression algorithm will be used on HDLC or PPP encapsulation.

Default

Compression is disabled.

Command Mode

Interface configuration

Usage Guidelines

You can configure point-to-point software compression for all LAPB, PPP, and HDLC encapsulations. Compression reduces the size of frames via lossless data compression. The compression algorithm used is a predictor algorithm (the RAND compression algorithm), which uses a compression dictionary to predict what the next character in the frame will be.

For HDLC encapsulations, you can specify a Stacker compression algorithm by using the **stac** keyword. LAPB encapsulation supports both predictor and Stacker compression algorithms.

Compression is performed in software and may significantly affect system performance. We recommend that you disable compression if CPU load exceeds 65 percent. To display the CPU load, use the **show process cpu** EXEC command.

Compression requires that both ends of the serial link be configured to use compression. You should never enable compression for connections to a public data network.

Note The best performance data compression algorithms adjust their compression methodology as they identify patterns in the data. To prevent data loss and support this adjustment process, the compression algorithm is run over LAPB to ensure that everything is sent in order, with no missing data and no duplicate data.

If the majority of your traffic is already compressed files, we recommend that you not use compression. If the files are already compressed, the additional processing time spent in attempting unsuccessfully to compress them again will slow system performance.

Table 6-3 provides general guidelines for deciding which compression type to select for LAPB encapsulations.

Table 6-3 Compression Guidelines for LAPB Encapsulations

Compression Type to Use	Situation
Predictor	The bottleneck is the load on the router.
Stacker	The bottleneck is line bandwidth.
None	Most files are already compressed.

Stacker compression for LAPB encapsulations reaches its performance ceiling on T1 lines; it is not recommended for faster lines because the added processing slows their performance. Stacker compression processing might be slower on other systems than on the Cisco 4500 routers.

When using predictor compression, you can adjust the MTU for the serial interface and the LAPB maximim bits per frame (N1) parameter, as shown in the first example, to avoid informational diagnostics regarding excessive MTU or N1 sizes. However, you should not change those parameters when you use Stacker compression.

Examples

The following example enables predictor compression on serial interface 0 for a LAPB link:

```
interface serial 0
encapsulation lapb
compress predictor
mtu 1509
lapb n1 12072
```

The following example enables Stacker compression on serial interface 0 for a LAPB link. This example does not set the MTU size and the maximum bits per frame (N1); we recommend that you do not change those LAPB parameters for Stacker compression:

```
interface serial 0
encapsulation lapb
compress predictor
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

encapsulation lapb
encapsulation x25
show compress
show processes †

controller

To configure a T1 or E1 controller and enter controller configuration mode, use the **controller** global configuration command.

controller [**t1** | **e1**] *slot*/*port* (on the Cisco 7000)

controller [t1 | e1] *number* (on the Cisco 4000)

Syntax Description

t1	T1 controller.
e1	E1 controller.
slot	Backplane slot number; can be 0, 1, 2, 3, or 4. On the Cisco 7010, the slot number can be 0, 1, or 2. The slots are numbered from left to right.
port	Port number of the interface. It can be **0** or **1** for the MIP (MultiChannel Interface Processor). Ports on each interface processor are numbered from the top down.
number	Network interface module (NIM) number, in the range 0 through 2.

Default

No T1 or E1 controller is configured.

Command Mode

Global configuration

Usage Guidelines

This command is used in configurations where the router is intended to communicate with a T1 or E1 fractional data line. Additional parameters for the T1 or E1 line must be configured for the controller before the T1 or E1 circuits can be configured by means of the **interface** global configuration command.

This command is used only on a Cisco 7000 or Cisco 4000 series router.

Example

In the following example, the MIP in slot 4, port 0 of a Cisco 7000 is configured as a T1 controller:

```
controller t1 4/0
```

In the following example, NIM 0 of a Cisco 4000 is configured as a T1 controller:

```
controller t1 0
```

Related Commands

channel-group
clear controller lex
clear controller t1
clock source (controller)
framing
linecode
show controllers e1
show controllers t1

copy flash lex

To download an executable image from Flash memory on the core router to the LAN Extender chassis, use the **copy flash lex** privileged EXEC command.

copy flash lex *number*

Syntax Description

number	Number of the LAN Extender interface to which to download an image from Flash memory.

Command Mode

Privileged EXEC

Usage Guidelines

If you attempt to download a version of the software older than what is currently running on the LAN Extender, a warning message is displayed.

Example

The following example illustrates how to copy the executable image *namexx* to the LAN Extender interface 0:

```
Router# copy flash lex 0
Name of file to copy? namexx
Address of remote host [255.255.255.255] <cr>
writing namexx !!!!!!!!!!!!!!!!!!!!!!!!copy complete
```

Related Command

copy tftp lex

copy tftp lex

To download an executable image from a TFTP server to the LAN Extender, use the **copy tftp lex** privileged EXEC command.

copy tftp lex *number*

Syntax Description

number	Number of the LAN Extender interface to which to download an image.

Command Mode

Privileged EXEC

Usage Guidelines

If you attempt to download a version of the software older than what is currently running on the LAN Extender, a warning message is displayed.

Example

The following example illustrates how to copy the file *namexx* from the TFTP server:

```
Router# copy tftp lex 0
Address or name of remote host (255.255.255.255]? 131.108.1.111
Name of file to copy? namexx
OK to overwrite software version 1.0 with 1.1 ?[confirm]
Loading namexx from 131.108.13.111!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 127825/131072 bytes]

Successful download to LAN Extender
```

crc

To set the length of the cyclic redundancy check (CRC) on a Fast Serial Interface Processor (FSIP) or HSSI Interface Processor (HIP) of the Cisco 7000 series only, use the **crc** interface configuration command. To set the CRC length to 16 bits, use the **no** form of this command.

crc *size*
no crc

Syntax Description

size	CRC size (16 or 32 bits).

Default

16 bits

Command Mode

Interface configuration

Usage Guidelines

All interfaces use a 16-bit cyclic redundancy check (CRC) by default, but also support a 32-bit CRC. CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. The designators 16 and 32 indicate the length (in bits) of the frame check sequence (FCS). A CRC of 32 bits provides more powerful error detection, but adds overhead. Both the sender and receiver must use the same setting.

CRC-16, the most widely used throughout the United States and Europe, is used extensively with wide-area networks (WANs). CRC-32 is specified by IEEE 802 and as an option by some point-to-point transmission standards. It is often used on SMDS networks and LANs.

Example

In the following example, the 32-bit CRC is enabled on serial interface 3/0:

```
interface serial 3/0
crc 32
```

crc4

To enable generation of the G.703-E1 CRC4, use the **crc4** interface configuration command. To disable this feature, use the **no** form of this command.

crc4
no crc4

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command applies to a Cisco 4000 router or Cisco 7000 series router. It is useful for checking data integrity while operating in framed mode. CRC4 provides additional protection for a frame alignment signal under noisy conditions. Refer to CCITT Recommendation G.704 for a definition of CRC4.

Example

The following example enables CRC4 generation on the G.703-E1 interface:

```
crc4
```

dce-terminal-timing enable

When running the line at high speeds and long distances, use the **dce-terminal-timing enable** interface configuration command to prevent phase shifting of the data with respect to the clock. If SCTE is not available from the DTE, use **no dce-terminal-timing-enable**, which causes the DCE to 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 keywords or arguments.

Default

DCE uses its own clock.

Command Mode

Interface configuration

Usage Guidelines

On the Cisco 4000 platform, 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.

Example

The following example prevents phase shifting of the data with respect to the clock:

```
interface serial 0
dce-terminal-timing enable
```

delay

To set a delay value for an interface, use the **delay** interface configuration command. Use the **no delay** command to restore the default delay value.

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.

Default

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

Command Mode

Interface configuration

Example

The following example sets a 30,000-microsecond delay on serial interface 3:

```
interface serial 3
delay 30000
```

Related Command

show interfaces

description (controller)

To add a description to a T1 controller interface on a Cisco 7000 series router, use the **description** controller configuration command. Use the **no description** command to remove the description.

description *string*
no description

Syntax Description

string	Comment or a description to help you remember what is attached to the interface

Default

No description is added.

Command Mode

Controller configuration

Usage Guidelines

The **description** command is meant solely as a comment to be put in the configuration to help you remember what certain T1 controllers are used for. The description affects the MIP interfaces only and appears in the output of the **show controllers t1** and **write terminal** EXEC commands.

Example

The following example shows how to add a description for a T1 controller on slot 4, port 1, channel group 0:

```
interface serial 4/1:0
description Fractional T1 line to Mountain View -- 128 Kb/s
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

show controllers t1
write terminal †

description (interface)

To add a description to an interface configuration, use the **description** interface configuration command. Use the **no description** command to remove the description.

description *string*
no description

Syntax Description

string	Comment or a description to help you remember what is attached to this interface.

Default

No description is added.

Command Mode

Interface configuration

Usage Guidelines

The **description** command is meant solely as a comment to be put in the configuration to help you remember what certain interfaces are used for. The description appears in the output of the following EXEC commands: **show configuration**, **show interfaces**, and **write terminal**.

Example

The following example describes a 3174 controller on serial interface 0:

```
interface serial 0
description 3174 Controller for test lab
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

show configuration †
show interfaces
write terminal †

down-when-looped

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

down-when-looped

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command is valid for HDLC or PPP encapsulation on serial and HSSI 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 only enabled 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.

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

Example

In the following example, interface serial 0 is configured for HDLC encapsulation. It is then configured to let the system know that it is down when in loopback mode.

```
interface serial0
encapsulation hdlc
down-when-looped
```

Related Commands

backup interface
loopback (interface)

dte-invert-txc

On the Cisco 4000 platform, you can specify the serial Network Interface 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. Use the **no** form of this command if the DCE accepts SCTE from the DTE.

dte-invert-txc
no dte-invert-txc

Syntax Description

This command has no arguments or keywords.

Default

Off

Command Mode

Interface configuration

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. This prevents phase shifting of the data with respect to the clock.

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

Example

The following example inverts the TXC on serial interface 0:

```
interface serial 0
dte-invert-txc
```

early-token-release

To enable *early token release*, use the **early-token-release** interface configuration command. Once enabled, use the no form of this command to disable this feature.

early-token-release
no early-token-release

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

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 CSC-C2CTR, CSC-R16 (or CSC-R16M), CSC-2R, and CSC-1R cards and the Token Ring Interface Processor (TRIP) on the Cisco 7000 all support early token release.

Examples

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

```
interface tokenring 1
early-token-release
```

On the Cisco 7000 series, to enable the use of early token release on your Token Ring interface processor in slot 4 on port 1, issue the following configuration commands:

```
interface tokenring 4/1
early-token-release
```

encapsulation

To set the encapsulation method used by the interface, use the **encapsulation** interface configuration command.

encapsulation *encapsulation-type*

Syntax Description

encapsulation-type	Encapsulation type. See Table 6-4 for a list of supported encapsulation types.

Default

The default depends on the type of interface. For example, a synchronous serial interface defaults to HDLC.

Command Mode

Interface configuration

Usage Guidelines

In order to use SLIP or PPP, the router 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.

Table 6-4 Encapsulation Types

Keyword	Encapsulation Type
atm-dxi	Asynchronous Transfer Mode-Data Exchange Interface.
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.
lapb	X.25 LAPB DTE operation (for serial interface).
ppp	Point-to-Point Protocol (PPP) (for serial interface).
sdlc	IBM serial SNA.
sdlc-primary	IBM serial SNA (for primary serial interface).
sdlc-secondary	IBM serial SNA (for secondary serial interface).
smds	Switched Multimegabit Data Services (SMDS) (for serial interface).
snap	IEEE 802.2 Ethernet media. This encapsulation is specified in RFC 1042 and allows Ethernet protocols to run on IEEE 802.2 media.
stun	Cisco Serial Tunnel (STUN) protocol functions (for serial interface).
x25	X.25 DTE operation (for serial interface).

Examples

The following example resets HDLC serial encapsulation on serial interface 1:

```
interface serial 1
encapsulation hdlc
```

The following example enables PPP encapsulation on serial interface 0:

```
interface serial 0
encapsulation ppp
```

Related Commands

keepalive
ppp
ppp authentication chap
slip

encapsulation atm-dxi

Use the **encapsulation atm-dxi** interface configuration command to enable ATM-DXI encapsulation. The **no encapsulation atm-dxi** command disables ATM-DXI.

encapsulation atm-dxi
no encapsulation atm-dxi

Syntax Description

This command has no arguments or keywords.

Default

HDLC

Command Mode

Interface configuration

Example

The following example configures ATM-DXI encapsulation on serial interface 1:

```
interface serial 1
encapsulation atm-dxi
```

Related Command

atm-dxi map

encapsulation lapb

To set the LAPB encapsulation method used by the interface, use the **encapsulation lapb** interface configuration command.

encapsulation lapb [**dte** | **dce**] [**multi** | *protocol*]

Syntax Description

dte	(Optional) DDN X.25 DTE operation (for serial interface).
dce	(Optional) DDN X.25 DCE operation (for serial interface).
multi	(Optional) Multi-protocol support.
protocol	(Optional) Protocol type. See Table 6-5 for a list of supported protocol types.

Default

DTE is the default operational type.

IP is the default protocol type.

Command Mode

Interface configuration

Usage Guidelines

In order to use a particular encapsulation, you must configure the router with that protocol type.

Table 6-5 Encapsulation LAPB Protocol Types

Keyword	Protocol Type
apollo	Apollo domain.
appletalk	AppleTalk.
clns	ISO CLNS.
decnet	DECnet.
ip	IP.
ipx	Novell IPX.
multi	Multiprotocol operation.
qllc	QLLC protocol.
snapshot	Snapshot routing support.
vines	Banyan VINES.
xns	Xerox Network Services.

Example

The following example enables LAPB encapsulation on serial interface 0, using a default IP routing protocol:

```
interface serial 0
encapsulation lapb
```

encapsulation x25

To set the X.25 encapsulation method used by the interface, use the **encapsulation x25** interface configuration command.

encapsulation x25 [**bfe** | **ddn** | **ietf**]
encapsulation x25 dce [**ddn** | **ietf**]
encapsulation x25 dte [**bfe** | **ddn** | **ietf**]

Syntax Description

dce	(Optional) DDN X.25 DCE operation (for serial interface).
dte	(Optional) DDN X.25 DTE operation (for serial interface).
bfe	(Optional) Blacker Front End attachment encapsulation.
ddn	(Optional) Defense Data Network attachment encapsulation.
ietf	(Optional) IETF RFC-1356 encapsulation.

Default

IETF RFC-1356 is the default encapsulation.

Command Mode

Interface configuration

Usage Guidelines

In order to use a particular encapsulation, you must configure the router with that protocol type.

Examples

The following example enables X.25 encapsulation on serial interface 0, using a default IETF encapsulation:

```
interface serial 0
encapsulation x25
```

The following example enables X.25 encapsulation on serial interface 0, using BFE encapsulation:

```
interface serial 0
encapsulation x25 dte bfe
```

fddi burst-count

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

fddi burst-count *number*
no fddi burst-count

Syntax Description

number	Number of preallocated buffers in the range from 1 to 10.

Default

3 buffers

Command Mode

Interface configuration

Usage Guidelines

This command applies to the FCI card only. The microcode software version should *not* be 128.45 or 128.43.

Example

The following example sets the number of buffers to 5:

```
interface fddi 0
fddi burst-count 5
```

fddi c-min

To set the C-Min timer on the PCM, use the **fddi c-min** interface configuration command. Use the **no** form of this command to revert to the default value.

fddi c-min *microseconds*
no fddi c-min

Syntax Description

microseconds	Sets the timer value in microseconds.

Default

1600 microseconds

Command Mode

Interface configuration

Usage Guidelines

This command applies to the processor 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.

Example

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

```
interface fddi 0
fddi c-min 2000
```

Related Commands

fddi tb-min
fddi tl-min-time
fddi t-out

fddi cmt-signal-bits

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

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 ten 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 6-6.
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 6-7.
bit 6—Media Access Control (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.

phy-b (Optional) Selects Physical Sublayer B.

Default

The default signal bits for the **phy-a** and **phy-b** keywords are as follows:

- **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 Mode

Interface configuration

Usage Guidelines

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

Note 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.

Use Table 6-6 and Table 6-7 to set the physical type and duration bits.

Table 6-6 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 6-7 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)

Example

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

```
interface fddi 0
fddi cmt-signal-bits 208
```

fddi duplicate-address-check

To turn on the duplicate address detection capability on the FDDI, use the **fddi duplicate-address-check** interface configuration command. Use the **no** form of this command to disable this feature.

fddi duplicate-address-check
no fddi duplicate-address-check

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command is used only to check duplicate addresses before and during ring initialization. Even without this command, the software checks for duplicate addresses after the ring is up and operational.

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

Example

The following example enables duplicate address checking on the FDDI:

```
interface fddi 0
fddi duplicate-address-check
```

fddi encapsulate

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

fddi encapsulate
no fddi encapsulate

Syntax Description

This command has no arguments or keywords.

Default

The FDDI interface by default uses the SNAP encapsulation format defined in RFC 1042. It is not necessary to define an encapsulation method for this interface when using the CSC-FCI interface card.

Command Mode

Interface configuration

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 command **fddi encapsulate** 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 b it-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 may be present in a multimedia bridged LAN and preventing 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. Further, 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.

Example

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

```
interface fddi 1
fddi encapsulate
```

fddi smt-frames

To enable the SMT frame processing capability on the FDDI, use the **fddi smt-frames** interface configuration command. Use the **no** form of this command to disable this feature, in which case the router will not generate or respond to SMT frames.

fddi smt-frames
no fddi smt-frames

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

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.

Example

The following example disables SMT frame processing:

```
interface fddi 0
no fddi smt-frames
```

fddi t-out

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

fddi t-out *milliseconds*
no fddi t-out

Syntax Description

milliseconds	Sets the timeout timer.

Default

100 milliseconds

Command Mode

Interface configuration

Usage Guidelines

This command applies to the processor 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.

Example

The following example sets the timeout timer to 200 milliseconds:

```
interface fddi 0
fddi t-out 200
```

Related Commands

fddi c-min
fddi tb-min
fddi tl-min-time

fddi tb-min

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

fddi tb-min *milliseconds*
no fddi tb-min

Syntax Description

milliseconds	Sets the TB-Min timer value in milliseconds.

Default

100 milliseconds

Command Mode

Interface configuration

Usage Guidelines

This command applies to the processor 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.

Example

The following example sets the TB-Min timer to 200 milliseconds:

```
interface fddi 0
fddi tb-min 200
```

Related Commands

fddi c-min
fddi tl-min-time
fddi t-out

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** interface configuration command.

fddi tl-min-time *microseconds*

Syntax Description

microseconds	Integer 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 the remote station can acquire the signal.

Default

30 microseconds

Command Mode

Interface configuration

Usage Guidelines

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

Examples

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

```
interface fddi 0
fddi tl-min-time 100
```

The following example changes the TL-Min time from 30 microseconds to 100 microseconds on a Cisco 7000:

```
interface fddi 3/0
fddi tl-min-time 100
```

Related Commands

fddi c-min
fddi tl-min-time
fddi t-out

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** interface configuration command.

fddi token-rotation-time *microseconds*

Syntax Description

microseconds	Integer that specifies the token rotation time (TRT).

Default

5000 microseconds

Command Mode

Interface configuration

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:

```
interface fddi 0
fddi token-rotation-time 24000
```

The following example sets the rotation time to 24,000 microseconds on a Cisco 7000:

```
interface fddi 3/0
fddi token-rotation-time 24000
```

fddi valid-transmission-time

To recover from a transient ring error, use the **fddi valid-transmission-time** interface configuration command.

fddi valid-transmission-time *microseconds*

Syntax Description

microseconds Integer that specifies the transmission valid timer (TVX) interval.

Default

2500 microseconds

Command Mode

Interface configuration

Examples

The following example changes the transmission timer interval to 3000 microseconds:

```
interface fddi 0
fddi valid-transmission-time 3000
```

The following example changes the transmission timer interval to 3000 microseconds on a Cisco 7000:

```
interface fddi 3/0
fddi valid-transmission-time 3000
```

framing

Use the **framing** controller configuration command to select the frame type for the T1 or E1 data line.

framing {**sf** | **esf**} (for T1 lines)
framing {**crc4** | **no-crc4**} [**australia**] (for E1 lines)

Syntax Description

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

Default

Super frame is the default on a T1 line.

CRC4 frame is the defalut on an E1 line.

Command Mode

Controller configuration

Usage Guidelines

Use this command in configurations where the router is intended to communicate with T1 or E1 fractional data line. The service provider determines which framing type, either **sf**, **esf**, or **crc4** is required for your T1/E1 circuit.

Example

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

```
framing esf
```

Related Commands

channel-group
linecode

hold-queue

To specify the hold-queue limit of an interface, use the **hold-queue** interface configuration command. Use the **no hold-queue** command with the appropriate keyword to restore the default values for an interface.

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

Syntax Description

length	Integer that specifies the maximum number of packets in the queue.
in	Specifies the input queue.
out	Specifies the output queue.

Default

The default input hold-queue limit is 75 packets. The default output hold-queue limit is 40 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 Mode

Interface configuration

Usage Guidelines

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 EXEC command **show interfaces**.

Note 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).

Example

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

```
interface serial 0
hold-queue 30 in
```

Related Command

show interfaces

hssi external-loop-request

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

hssi external-loop-request
no hssi external-loop-request

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

The HSA applique (on the HSSI) contains an LED that indicates the LA, LB, and LC signals 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 HSSI from the CSU/DSU.

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

Example

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

```
hssi external-loop-request
```

hssi internal-clock

To convert the HSSI interface into a 45 MHz clock master, use the **hssi internal-clock** interface configuration command. Use the **no** form of this command to disable the clock master mode.

hssi internal-clock
no hssi internal-clock

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

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.

Example

The following example converts the HSSI interface into a 45 MHz clock master:

```
hssi internal-clock
```

hub

To enable and configure a port on an Ethernet hub of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **hub** global configuration command.

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. Since there is currently only one hub, this number is 0.
port	Port number on the hub. On the Cisco 2505, port numbers range from 1 through 8. On the Cisco 2507, port numbers range 1 to 16. On the Cisco 2516, Ethernet ports number 1 to 14. If a second port number follows, then the first port number indicates the beginning of a port range.
end-port	(Optional) Last port number of a range.

Default

No hub ports are configured.

Command Mode

Global configuration

Examples

The following example enables port 1 on hub 0:

```
hub ethernet 0 1
no shutdown
```

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

```
hub ethernet 0 1 8
no shutdown
```

Related Command

shutdown

ignore-dcd

Use the **ignore-dcd** interface configuration command to configure the serial interface to monitor the DSR signal (instead of the DCD signal) as the line up/down indicator. Use the **no** form of this command to restore the default behavior.

ignore-dcd
no ignore-dcd

Syntax Description

This command has no arguments or keywords.

Default

The serial interface, operating in DTE mode, monitors the DCD signal as the line up/down indicator.

Command Mode

Interface configuration

Usage Guidelines

This command applies to Quad Serial NIM interfaces on the Cisco 4000 series and Hitachi-based serial interfaces on the Cisco 2500 series and Cisco 3000 series.

When the serial interface is operating in DTE mode, it monitors the Data Carrier Detect (DCD) signal as the line up/down indicator. By default, the attached DCE device sends the DCD signal. When the DTE interface detects the DCD signal, it changes the state of the interface to up.

In some configurations, such as an SDLC multidrop environment, the DCE device sends the Data Set Ready (DSR) signal instead of the DCD signal, which prevents the interface from coming up. Use this command to tell the interface to monitor the DSR signal instead of the DCD signal as the line up/down indicator.

Example

The following example configures serial interface 0 to monitor the DSR signal as the line up/down indicator:

```
interface serial 0
ignore-dcd
```

interface

To configure an interface type and enter interface configuration mode, use the **interface** global configuration command.

interface *type number*
interface *type slot*/*port* (for the Cisco 7000 series)
interface serial *slot*/*port*:*channel-group* (for channelized T1 or E1 on the Cisco 7000)
interface serial *number*:*channel-group* (for channelized T1 or E1 on the Cisco 4000)

To configure a subinterface, use the **interface** global configuration command.

interface *type number.subinterface-number* [**multipoint** | **point-to-point**]
interface *type slot*/*port.subinterface-number* [**multipoint** | **point-to-point**] (for the Cisco 7000 series)

Syntax Description

type	Type of interface to be configured. See Table 6-8.
number	Port, connector, or interface card number. On a Cisco 4000 series router, specifies the NIM number. The numbers are assigned at the factory at the time of installation or when added to a system, and can be displayed with the **show interfaces** command.
slot	On the Cisco 7000 series, specifies the backplane slot number. On the 7000, value can be **0**, **1**, **2**, **3**, or **4**. On the 7010, value can be **0**, **1**, or **2**. The slots are numbered from left to right.
/port	On the Cisco 7000 series, specifies the port number of the interface. It can be **0**, **1**, **2**, **3**, **4**, **5**, **6**, or **7** depending on the type of interface, as follows: • AIP (ATM Interface Processor) **0** • EIP (Ethernet Interface Processor) **0**, **1**, **2**, **3**, **4**, or **5** • FIP (FDDI Interface Processor) **0** • FSIP (Fast Serial Interface Processor) **0**, **1**, **2**, **3, 4, 5, 6, or 7** • HIP (HSSI Interface Processor) **0** • MIP (MultiChannel Interface Processor) **0** or **1** • TRIP (Token Ring Interface Processor) **0**, **1**, **2**, or **3** • Ports on each interface processor are numbered from the top down.
:*channel-group*	On the Cisco 7000 series on a MIP/CxCT1 card, specifies the T1 channel group number in the range of 0 to 23 defined with the **channel-group** controller configuration command.
.*subinterface-number*	Subinterface number in the range 1 to 4294967293. The number that precedes the period (.) must match the number this subinterface belongs to.
multipoint | **point-to-point**	(Optional) Specifies a multipoint or point-to-point subinterface. The default is **multipoint**.

Table 6-8 Interface Type Keywords

Keyword	Interface Type
async	Auxiliary port line used as an asynchronous interface.
atm	ATM interface.
bri	Integrated Services Digital Network (ISDN) Basic Rate Interface (BRI). This interface configuration is propagated to each of the B channels. B channels cannot be individually configured. The interface must be configured with dial-on-demand commands in order for calls to be placed on that interface.
dialer	Dialer interface.
ethernet	Ethernet IEEE 802.3 interface.
fddi	Fiber Distributed Data Interface (FDDI).
hssi	High-Speed Serial Interface (HSSI).
lex	LAN Extender (LEX) interface.
loopback	Software-only loopback interface that emulates an interface that is always up. It is a virtual interface supported on all platforms. The *interface-number* is the number of the loopback interface that you want to create or configure.There is no limit on the number of loopback interfaces you can create.
null	Null interface.
serial	Serial interface.
tokenring	Token Ring interface.
tunnel	Tunnel interface; a virtual interface. The *number* is the number of the tunnel interface that you want to create or configure. There is no limit on the number of tunnel interfaces you can create.

Default

The default mode for subinterfaces is **multipoint**.

Command Mode

Global configuration

Usage Guidelines

Subinterfaces can be configured to support partially meshed Frame Relay networks (refer to the chapter entitled “Configuring Interfaces” in the *Router Products Configuration Guide*).

There is no correlation between the number of the physical serial interface and the number of the logical LAN Extender interface. These interfaces can have the same or different numbers.

Examples

In the following example, serial interface 0 is configured with PPP encapsulation:

```
interface serial 0
encapsulation ppp
```

The following example enables loopback mode and assigns an IP network address and network mask to the interface. The loopback interface established here will always appear to be up:

```
interface loopback 0
ip address 131.108.1.1 255.255.255.0
```

The following example for the Cisco 7000 shows the interface configuration command for Ethernet port 4 on the EIP that is installed in (or recently removed from) slot 2:

```
interface ethernet 2/4
```

The following example begins configuration on the Token Ring interface processor in slot 1 on port 0 of a Cisco 7000:

```
interface tokenring 1/0
```

The following example shows how a partially meshed Frame Relay network can be configured. In this example, subinterface serial 0.1 is configured as a multipoint subinterface with three frame relay PVCs associated, and subinterface serial 0.2 is configured as a point-to-point subinterface.

```
interface serial 0
encapsulation frame-relay
interface serial 0.1 multipoint
ip address 131.108.10.1 255.255.255.0
frame-relay interface-dlci 42 broadcast
frame-relay interface-dlci 53 broadcast
interface serial 0.2 point-to-point
ip address 131.108.11.1 255.255.0
frame-relay interface-dlci 59 broadcast
```

The following example configures circuit 0 of a T1 link for Point-to-Point Protocol (PPP) encapsulation:

```
controller t1 4/1
circuit 0 1
interface serial 4/1:0
ip address 131.108.13.1 255.255.255.0
encapsulation ppp
```

The following example configures LAN Extender interface 0:

```
interface lex 0
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

circuit
controller
mac-address †
ppp
show interfaces
slip

invert-transmit-clock

Delays between the SCTE clock and data transmission indicate that the transmit clock signal might not be appropriate for the interface rate and length of cable being used. Different ends of the wire may have variances that differ slightly. To invert the clock signal to compensate for these factors, use the **invert-transmit-clock** interface configuration command. This command applies only to the Cisco 7000 series.

invert-transmit-clock
no invert-transmit-clock

Syntax Description

This command has no arguments or keywords.

Command Mode

Interface configuration

Example

In the following example, the clock signal on serial interface 3/0 is inverted.

```
interface serial 3/0
invert-transmit-clock
```

ip address-pool

To make temporary IP addresses available for dial-in asynchronous clients using Serial Line Internet Protocol (SLIP)/PPP, use the **ip address-pool** global configuration command. Use the **no** form of the command to disable IP address pooling on all interfaces.

ip address-pool dhcp-proxy-client
no ip address-pool dhcp-proxy-client

Syntax Description

This command has no arguments or keywords.

Default

IP address pooling is not enabled.

Command Mode

Global configuration

Usage Guidelines

The **ip address-pool** command allows you to use a router as the intermediary (a proxy-client) between a third-party Dynamic Host Configuration Protocol (DHCP) server and clients dialing in to the router on asynchronous interfaces. If this command is issued and no DHCP servers have been defined using the **ip dhcp server** command, the router will use the limited address of 255.255.255.255 to communicate with available DHCP servers on the network.

A DHCP server temporarily allocates network addresses to clients through the router on an as-needed basis. While the client is active, the address is automatically renewed in a minimum of 20-minute increments. When the user terminates the session, the interface connection is terminated so that network resources can be quickly reused.

In normal situations, if a SLIP/PPP session fails (for example if a modem line disconnects), the allocated address is temporarily reserved so that client can receive the same IP address when it dials back into the rotuer. This way, a session that was accidentally terminated can be resumed.

The **ip address-pool** command initializes proxy-client status to all interfaces on the router defined as asynchronous. To selectively disable proxy-client status on a single asynchronous interface, use the **no peer default ip address pool** interface command.

Example

The following example enables DHCP proxy-client status on all asynchronous interfaces on the router:

```
ip address-pool dhcp-proxy-client
```

Related Commands

ip dhcp-server
peer default ip address pool
show dhcp
interface async
encapsulation
ppp

ip dhcp-server

To specify which Dynamic Host Configuration Protocol (DHCP) servers to use on your network, specify the IP address of one or more DHCP servers available on the network by using the **ip dhcp-server** global configuration command. Use the **no** form of the command to remove a DHCP server's IP address.

ip dhcp-server [*ip-address* | *name*]
no ip dhcp-server [*ip-address* | *name*]

Syntax Description

ip-address	(Optional) IP address of a DHCP server. You can specify up to 10 servers on the network.
name	(Optional) Name of a DHCP server. You can specify up to 10 servers on the network.

Default

The IP limited broadcast address of 255.255.255.255 is used for transactions if no DHCP server is specified. Use of this address provides allows automatic detection of DHCP servers.

Command Mode

Global configuration

Usage Guidelines

By default, the DHCP proxy-client feature uses the IP address of 255.255.255.255 to discover and interact with DHCP servers. If you wish to specify which DHCP servers are used on your network, use the **ip dhcp-server** command to define up to four specific DHCP servers. To use the DHCP proxy-client feature, enable your router to be a proxy-client on asynchronous interfaces by using the **ip address-pool dhcp-proxy-client** command.

Note To facilitate transmission, configure intermediary routers to use an ip helper address whenever the DHCP server is not on the local LAN and the router is using broadcasts to interact with the DHCP server. See "Configuring IP" in the *Router Products Configuration Guide Addendum*..

Example

The following command specifies a DHCP server with the IP address of 129.12.13.81:

```
ip dhcp-server 129.12.13.81
```

Related Commands

ip address-pool dhcp-proxy-client
ip helper address
peer default ip address pool
show dhcp

keepalive

Use the **keepalive** interface configuration command to set the keepalive timer for a specific interface. The **no keepalive** command turns off keepalives entirely.

keepalive [*seconds*]
no keepalive [*seconds*]

Syntax Description

seconds	(Optional) Unsigned integer value greater than 0. The default is 10 seconds.

Default

Enabled and set to 10 seconds on most interfaces; disabled on aysnchronous interfaces.

Command Mode

Interface configuration

Usage Guidelines

Asynchronous interfaces do not send and do not expect keepalives from the remote end of a point-to-point connection. To enable keepalives on anynchronous interfaces, use the **keepalive** command and set a specific interval.

You can configure the keepalive interval, which is the frequency at which the router sends messages to itself (Ethernet and Token Ring) or to the other end (serial), to ensure a network interface is alive. The interval in previous software versions was 10 seconds; it is now adjustable in 1-second increments down to 1 second. An interface is declared down after three update intervals have passed without receiving a keepalive packet.

Setting the keepalive timer to a low value is very useful for rapidly detecting Ethernet interface failures (transceiver cable disconnecting, cable unterminated, and so on).

A typical serial line failure involves losing Carrier Detect (CD). Since this sort of failure is typically noticed within a few milliseconds, adjusting the keepalive timer for quicker routing recovery is generally not useful.

Note When adjusting the keepalive timer for a very low bandwidth serial interface, large datagrams can delay the smaller keepalive packets long enough to cause the line protocol to go down. You may need to experiment to determine the best value.

Example

The following example sets the keepalive interval to 3 seconds:

```
interface ethernet 0
keepalive 3
```

lex burned-in-address

To set the burned-in MAC address for a LAN Extender interface, use the **lex burned-in-address** interface configuration command. To clear the burned-in MAC address, use the **no** form of this command.

lex burned-in-address *ieee-address*
no lex burned-in-address

Syntax Description

ieee-address	48-bit IEEE MAC address written as a dotted triplet of four-digit hexadecimal numbers.

Default

No burned-in MAC address is set

Command Mode

Interface configuration

Usage Guidelines

Use this command only on a LAN Extender interface that is not currently active (not bound to a serial interface).

Example

The following example sets the burned-in MAC address on LAN Extender interface 0:

```
interface serial 4
encapsulation ppp
interface lex 0
lex burned-in-address 0000.0c00.0001
ip address 131.108.172.21 255.255.255.0
```

lex input-address-list

To assign an access list that filters on MAC addresses, use the **lex input-address-list** interface configuration command. To remove an access list from the interface, use the **no** form of this command.

lex input-address-list *access-list-number*
no lex input-address-list

Syntax Description

access-list-number	Number of the access list you assigned with the **access-list** global configuration command. It can be a number from 700 to 799.

Default

No access lists are preassigned to a LAN Extender interface.

Command Mode

Interface configuration

Usage Guidelines

Use the **lex input-address-list** command to filter the packets that are allowed to pass from the LAN Extender to the core router. The access list filters packets based on the source MAC address.

The LAN Extender interface does not process MAC-address masks. Therefore, you should omit the mask from the **access-list** commands.

For LAN Extender interfaces, an implicit permit everything entry is automatically defined at the end of an access list. Note that this behavior differs from other router access lists, which have an implicit deny everything entry at the end of each access list.

Example

The following example applies access list 710 to LAN Extender interface 0. This access list denies all packets from MAC address 0800.0214.2776 and permits all other packets.

```
access-list 710 deny 0800.0214.2776
interface lex 0
lex input-address-list 710
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

access-list †

lex input-type-list

To assign an access list that filters Ethernet packets by type code, use the **lex input-type-list** interface configuration command. To remove an access list from the interface, use the **no** form of this command.

lex input-type-list *access-list-number*
no lex input-type-list

Syntax Description

access-list-number	Number of the access list you assigned with the **access-list** global configuration command. It can be a number in the range 200 to 299.

Default

No access lists are preassigned to a LAN Extender interface.

Command Mode

Interface configuration

Usage Guidelines

Filtering is done on the LAN Extender chassis.

The LAN Extender interface does not process masks. Therefore, you should omit the mask from the **access-list** commands.

For LAN Extender interfaces, an implicit permit everything entry is automatically defined at the end of an access list. Note that this behavior differs from other router access lists, which have an implicit deny everything entry at the end of each access list.

Example

The following example applies access list 220 to LAN Extender interface 0. This access list denies all AppleTalk packets (packets with a type field of 0x809B) and permits all other packets.

```
access-list 220 deny 0x809B 0x0000
interface lex 0
lex input-type-list 220
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

access-list †

lex priority-group

To activate priority output queuing on the LAN Extender, use the **lex priority-group** interface configuration command. To disable priority output queuing, use the **no** form of this command.

lex priority-group *group*
no lex priority-group

Syntax Description

group	Number of the priority group. It can be a number in the range 1 to 10.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

To define queuing priorities, use the **priority-list protocol** global configuration command. Note that you can use only the following forms of this command:

priority-list *list* **protocol** *protocol* {**high** | **medium** | **normal** | **low**}

priority-list *list* **protocol bridge** {**high** | **medium** | **normal** | **low**} **list** *list-number*

If you specify a protocol that does not have an assigned Ethernet type code, such as **x25**, **stun**, or **pad**, it is ignored and will not participate in priority output queuing.

Example

The following example activates priority output queuing on LAN Extender interface 0:

```
priority-list 5 protocol bridge medium list 701
lex interface 0
lex priority-group 5
```

Related Command

A dagger (†) indicates that the command is documented in another chapter.

priority-list protocol †

lex retry-count

To define the number of times to resend commands to the LAN Extender chassis, use the **lex retry-count** interface configuration command. To return to the default value, use the **no** form of this command.

lex retry-count *number*
no lex retry-count [*number*]

Syntax Description

number	Number of times to retry sending commands to the LAN Extender. It can be a number in the range 0 to 100. The default is 10 times.

Default

10

Command Mode

Interface configuration

Usage Guidelines

After the core router has sent a command the specified number of times without receiving an acknowledgment from the LAN Extender, it stops sending the command altogether.

Example

The following example resends commands 20 times to the LAN Extender:

```
lex interface 0
lex retry-count 20
```

Related Command

lex timeout

lex timeout

To define the amount of time to wait for a response from the LAN Extender, use the **lex timeout** interface configuration command. To return to the default time, use the **no** form of this command.

lex timeout *milliseconds*
no lex timeout [*milliseconds*]

Syntax Description

milliseconds	Time, in milliseconds, to wait for a response from the LAN Extender before resending the command. It can be a number in the range 500 to 60000. The default is 2000 milliseconds (2 seconds).

Default

2000 milliseconds (2 seconds)

Command Mode

Interface configuration

Usage Guidelines

The **lex timeout** command defines the amount of time that the core router will wait to receive an acknowledgment after having sent a command to the LAN Extender.

Example

The following example causes unacknowledged packets to be resent at 4-second intervals:

```
lex interface 0
lex timeout 4000
```

Related Command

lex retry-count

linecode

Use the **linecode** controller configuration command to select the line-code type for the T1 or E1 line.

linecode {**ami** | **b8zs** | **hdb3**}

Syntax Description

ami	Specifies alternate mark inversion (AMI) as the line-code type. Valid for T1 or E1 controllers.
b8zs	Specifies B8ZS as the line-code type. Valid for T1 controller only.
hdb3	Specifies high-density bipolar 3 (hdb3) as the line-code type. Valid for E1 controller only.

Default

AMI is the default for T1 lines.

High-density bipolar 3 is the default for E1 lines.

Command Mode

Controller configuration

Usage Guidelines

Use this command in configurations where the router is intended to communicate with T1 fractional data line. The T1 service provider determines which line-code type, either **ami** or **b8zs**, is required for your T1 circuit. Likewise, the E1 service provider determines which line-code type, either **ami** or **hdb3**, is required for your E1 circuit

Example

The following example specifies B8ZS as the line-code type:

```
linecode b8zs
```

link-test

To re-enable the link-test function on a port on an Ethernet hub of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **link-test** hub configuration command. Disable this feature if a pre-10BaseT twisted-pair device not implementing link test is connected to the hub port with the **no** form of this command.

link-test
no link-test

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Hub configuration

Usage Guidelines

This command applies to a port on an Ethernet hub only. Disable this feature if a 10BaseT twisted-pair device at the other end of the hub does not implement the link test function.

Example

The following example disables the link test function on hub 0, ports 1 through 3:

```
hub ethernet 0 1 3
no link-test
```

Related Command

hub

local-lnm

To enable Lanoptics Hub Networking Management of a PCbus Token Ring interface, use the **local-lnm** interface configuration command. Use the **no** form of this command to disable Lanoptics Hub Networking Management.

local-lnm
no local-lnm

Syntax Description

This command has no arguments or keywords.

Default

Management is not enabled.

Command Mode

Interface configuration

Usage Guidelines

The Token Ring interface on the AccessPro PC card can be managed by a remote LAN manager over the PCbus interface. At present, the Lanoptics Hub Networking Management software running on an IBM compatible PC is supported.

Example

The following example enables Lanoptics Hub Networking Management:

```
local-lnm
```

loopback (controller)

To loop an entire E1 line (including all channel-groups defined on the controller) toward the line and back toward the router, use the **loopback** controller configuration command. To remove the loop, use the **no** form of this command.

loopback
no loopback

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Controller configuration

Usage Guidelines

This command is useful for testing the DCE device (CSU/DSU) itself.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the E1 line:

```
controller e1 0
loopback
```

loopback (interface)

To diagnose equipment malfunctions between interface and device, use the **loopback** interface configuration command. The **no loopback** command disables the test.

loopback
no loopback

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

On HSSI serial interface cards, the loopback function configures a two-way internal and external loop on the HSA applique of the specific interface.

On MCI and SCI serial interface cards, the loopback functions when a CSU/DSU or equivalent device is attached to the router. The **loopback** command loops the packets through the CSU/DSU to configure a CSU loop, when the device supports this feature.

On the MCI and MEC Ethernet cards, the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

On the CSC-FCI FDDI card, the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

On all Token Ring interface cards (except the 4-megabit CSC-R card), the interface receives back every packet it sends when the **loopback** command is enabled. Loopback operation has the additional effect of disconnecting network server functionality from the network.

Note Loopback does not work on an X.21 DTE because the X.21 interface definition does not include a loopback definition.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on Ethernet interface 4:

```
interface ethernet 4
loopback
```

Related Commands

down-when-looped
show interfaces loopback

loopback applique

To configure an internal loop on the HSSI applique, use the **loopback** interface configuration command. To remove the loop, use the **no** form of this command.

loopback applique
no loopback applique

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command loops the packets within the applique, thus providing a way to test for communication within the router. It is useful for sending pings to yourself to check functionality of the applique.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the HSSI applique:

```
interface serial 1
loopback applique
```

Related Command

show interfaces loopback

loopback dte

To loop packets to DTE internally within the CSU/DSU at the DTE interface, when the device supports this feature, use the **loopback** interface configuration command. To remove the loop, use the **no** form of this command.

loopback dte
no loopback dte

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command is useful for testing the DTE-to-DCE cable.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the DTE interface:

```
interface serial 1
loopback dte
```

Related Command

show interfaces loopback

loopback line

To loop packets completely through the CSU/DSU to configure the CSU loop, when the device supports this feature, use the **loopback line** interface configuration command. To remove the loop, use the **no** form of this command.

loopback line
no loopback line

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command is useful for testing the DCE device (CSU/DSU) itself.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the DCE device:

```
interface serial 1
loopback line
```

Related Command

show interfaces loopback

loopback local (controller)

To loop an entire T1 line (including all channel-groups defined on the controller) toward the line and back toward the router, use the **loopback local** controller configuration command. To remove the loop, use the **no** form of this command.

loopback local
no loopback local

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Controller configuration

Usage Guidelines

This command is useful for testing the DCE device (CSU/DSU) itself.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the T1 line:

```
controller t1 0
loopback local
```

loopback local (interface)

To loop a channelized T1 or channelized E1 channel-group, use the **loopback local** interface configuration command. To remove the loop, use the **no** form of this command.

loopback local
no loopback local

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command is useful to loop a single channel-group in a channelized environment without disrupting the other channel-groups.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures the loopback test on the T1 line:

```
interface serial 1/0:22
loopback local
```

Related Command

show interfaces loopback

loopback remote (controller)

To loop packets from a MIP through the CSU/DSU, over a dedicated T1 link, to the remote CSU at the single destination for this T1 link and back, use the **loopback remote** controller configuration command. To remove the loop, use the **no** form of this command.

loopback remote
no loopback remote

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Controller configuration

Usage Guidelines

This command applies only when the device supports the remote function. It is used for testing the data communication channels.

For MIP cards, this controller configuration command applies if *only one* destination exists at the remote end of the cloud, the entire T1 line is dedicated to it, and the device at the remote end is a CSU (not a CSU/DSU). This is an uncommon case; MIPs are not usually used in this way.

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures a remote loopback test:

```
interface serial 0
loopback remote
```

Related Command

show interfaces loopback

loopback remote (interface)

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

loopback remote
no loopback remote

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command applies only when the remote CSU/DSU device supports the function. It is used for testing the data communication channels. The loopback usually is performed at the line port, rather than the DTE port, of the remote CSU/DSU.

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

To show interfaces currently in loopback operation, use the **show interfaces loopback** EXEC command.

Example

The following example configures a remote loopback test:

```
interface serial 0
loopback remote
```

Related Command

show interfaces loopback

media-type

To specify the Ethernet Network Interface Module configuration on the Cisco 4000 series, use the **media-type** interface configuration command.

media-type [**aui** | **10baset**]
no media-type [**aui** | **10baset**]

Syntax Description

aui	(Optional) Selects a 15-pin physical connection.
10baset	(Optional) Selects an RJ45 10BaseT physical connection.

Default

AUI 15-pin physical connection

Command Mode

Interface configuration

Example

The following example selects an RJ45 10BaseT physical connection on Ethernet interface 1:

```
interface ethernet 1
media-type 10baset
```

mop enabled

To enable an interface to support the Maintenance Operation Protocol (MOP), use the **mop enabled** interface configuration command. To disable MOP on an interface, use the **no mop enabled** command.

mop enabled
no mop enabled

Syntax Description

This command has no arguments or keywords.

Default

Enabled on Ethernet interfaces and disabled on all other interfaces.

Command Mode

Interface configuration

Example

In the following example, MOP is enabled for serial interface 0:

```
interface serial 0
mop enabled
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

mop sysid
mop retransmit-timer †
mop retries †

mop sysid

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

mop sysid
no mop sysid

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

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

Example

In the following example, serial interface 0 is enabled to send MOP system identification messages:

```
interface serial 0
mop sysid
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

mop device-code †
mop enabled

mtu

To adjust the maximum packet size or maximum transmission unit (MTU) size, use the **mtu** interface configuration command. Use the **no mtu** command to restore the MTU value to its original default value.

mtu *bytes*
no mtu

Syntax Description

bytes	Desired size in bytes.

Default

Table 6-9 lists default MTU values according to media type.

Table 6-9 Default Media MTU Values

Media Type	Default MTU
Ethernet	1500
Serial	1500
Token Ring	4464
ATM	4470
FDDI	4470
HSSI (HSA)	4470

Command Mode

Interface configuration

Usage Guidelines

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

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

Example

The following example specifies an MTU of 1000 bytes:

```
interface serial 1
mtu 1000
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

encapsulation smds †
ip mtu †

nrzi-encoding

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

nrzi-encoding
no nrzi-encoding

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

All FSIP interface types support nonreturn to zero (NRZ) and nonreturn to zero inverted (NRZI) format. This is a line coding format that is required for serial connections in some environments. NRZ encoding is most common. NRZI encoding is used primarily with RS-232 connections in IBM environments.

Example

In the following example, serial interface 1 is configured for NRZI encoding:

```
interface serial 1
nrzi-encoding
```

peer default ip address pool

You can selectively disable DHCP proxy-client status on an individual asynchronous interface on a router by using the **no peer default ip address pool** interface configuration command. You can turn a single interface back on by issuing the standard command after it is turned off.

peer default ip address pool
no peer default ip address pool

Syntax Description

This command has no arguments or keywords.

Default

DHCP proxy-client status is not enabled until the **ip address-pool** command is issued, at which time the DHCP proxy-client feature is enabled on all asynchronous ports.

Command Mode

Interface configuration

Usage Guidelines

The **no peer default ip address pool** command turns off DHCP proxy-client status on individual asynchronous interfaces that are globally turned on with the **ip address-pool dhcp-proxy-client** command. If you have disabled DHCP on a given interface, you can re-enable DHCP on this interface by issuing the standard **peer default ip address pool** command. You cannot enable DHCP on any interface until the **ip address-pool dhcp-proxy-client** command is issued.

Example

The following command disables DHCP proxy-client status on the current asynchronous interface:

```
no peer default ip address pool
```

Related Commands

ip address-pool dhcp-proxy-client
ip dhcp-server
show dhcp
interface async
encapsulation
ppp

ppp authentication

To enable Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP), and to enable a TACACS+ authorization method on a serial interface, use the **ppp authentication** interface configuration command. Use the **no** form of the command to disable this authentication.

ppp authentication {**chap** | **pap**} [**if-needed**] [*listname*] [**callin**]
no ppp authentication

Caution If you use a *list-name* that has not been configured with the **aaa authentication ppp** command, you disable PPP on this line.

Syntax Description

chap	Enables CHAP on a serial interface.
pap	Enables PAP on a serial interface.
if-needed	(Optional) Used with TACACS and XTACACS. Do not perform CHAP or PAP authentication if the user has already provided authentication. This option is available only on asynchronous interfaces.
list-name	(Optional) Used with AAA/TACACS+. Specify the name of a list of TACACS+ methods of authentication to use. If no listname is specified, the system uses the default. Lists and default are created with the **aaa authentication ppp** command.
callin	Specifies authentication on incoming (received) calls only.

Default

PPP authentication is not enabled.

Command Mode

Interface configuration

Usage Guidelines

Once you have enabled CHAP or PAP, the local communication server requires a password from remote devices. If the remote device does not support CHAP or PAP, no traffic is passed to that device.

If you are using **autoselect** on a TTY line, you will probably want to use the **ppp authentication** command to turn on PPP authentication for the corresponding interface.

When you specify the **if-needed** option, PPP authentication is not required when the user has already provided authentication. This option is useful in conjunction with the **autoselect** command, but cannot be used with AAA/TACACS+.

The *list-nam*e keyword can be used only when AAA/TACACS+ has been initialized, and cannot be used with the **if-needed** argument.

Example

The following example enables CHAP on asynchronous interface 4, and uses the authentication list *MIS-access*:

```
interface async 4
encapsulation ppp
ppp authentication chap MIS-access
```

Related Commands

aaa authentication ppp
aaa new-model
autoselect
dialer map
encapsulation ppp
ppp use-tacacs
username password

ppp compress

To configure software compression for Point-to-Point Protocol (PPP) encapsulation, use the **ppp compress** interface configuration command. To disable compression, use the **no** form of this command.

ppp compress [**predictor** | **stac**]
no ppp compress [**predictor** | **stac**]

Syntax Description

predictor	(Optional) Specifies that a predictor compression algorithm will be used.
stac	(Optional) Specifies that a Stacker (LZS) compression algorithm will be used.

Default

PPP compression is disabled.

Command Mode

Interface configuration

Usage Guidelines

Compression reduces the size of frames via lossless data compression. The compression algorithm used is a predictor algorithm (the RAND compression algorithm), which uses a compression dictionary to predict what the next character in the frame will be.

PPP encapsulation supports both predictor and Stacker compression algorithms.

Compression is performed in software and may significantly affect system performance. We recommend that you disable compression if CPU load exceeds 65 percent. To display the CPU load, use the **show process cpu** EXEC command.

Compression requires that both ends of the point-to-point link be configured to use compression. You should never enable compression for connections to a public data network.

If the majority of your traffic is already compressed files, we recommend that you not use compression. If the files are already compressed, the additional processing time spent in attempting unsuccessfully to compress them again will slow system performance.

Examples

The following example enables predictor compression on serial interface 0:

```
interface serial 0
encapsulation ppp
ppp compress predictor
```

Related Commands

encapsulation ppp
show compress

ppp quality

To enable Link Quality Monitoring (LQM) on a serial interface, use the **ppp quality** interface configuration command. Use the **no** form of this command to disable LQM.

ppp quality *percentage*
no ppp quality

Syntax Description

percentage	Specifies the link quality threshold. Range is 1 to 100.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

The percentages are calculated for both incoming and outgoing directions. The outgoing quality is calculated by comparing the total number of packets and bytes sent to the total number of packets and bytes received by the peer. The incoming quality is calculated by comparing the total number of packets and bytes received to the total number of packets and bytes sent by the peer.

If the link quality percentage is not maintained, the link is deemed to be of poor quality and is taken down. The policy implements a time lag so that the link does not bounce up and down.

Example

The following example enables LQM on serial interface 4:

```
interface serial 4
encapsulation ppp
ppp quality 80
```

Related Commands

encapsulation ppp
keepalive

pri-group

To specify ISDN Primary Rate Interface (PRI) on a channelized T1 card on the Cisco 7000 series, use the **pri-group** controller configuration command. Use the **no pri-group** command to remove the ISDN PRI.

pri-group [**timeslots** *range*]
no pri-group

Syntax Description

timeslots *range*	(Optional) Specifies a single range of values from 1 to 23.

Default

Disabled

Command Mode

Controller configuration

Usage Guidelines

When you configure ISDN PRI, you must first specify an ISDN switch type for PRI and a T1 controller.

Example

The following example specifies ISDN PRI on T1 slot 1, port 0:

```
isdn switch-type primary-4ess
controllers t1 1/0
framing esf
linecode b8zs
pri-group timeslots 2-6
```

Related Commands

controller
framing
isdn switch-type
linecode

pulse-time

To enable pulsing DTR signal intervals on the serial interfaces, use the **pulse-time** interface configuration command. Use the **no pulse-time** command to restore the default interval.

pulse-time *seconds*
no pulse-time

Syntax Description

seconds	Integer that specifies the DTR signal interval in seconds.

Default

0 seconds

Command Mode

Interface configuration

Usage Guidelines

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

Example

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

```
interface serial 2
pulse-time 3
```

ring-speed

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

ring-speed *speed*

Syntax Description

speed	Integer that specifies the ring speed, either 4 for 4-Mbps or 16 for 16-Mbps operation.

Default

16-Mbps operation

Caution Configuring a ring speed that is wrong or incompatible with the connected Token Ring will cause the ring to beacon, which effectively takes the ring down and makes it nonoperational.

Command Mode

Interface configuration

Example

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

```
interface tokenring 0
ring-speed 4
```

show async status

To list the status of the asynchronous interface 1 associated with the router auxiliary port, use the **show async status** user EXEC command:

show async status

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Usage Guidelines

Shows all asynchronous sessions, whether they are using SLIP or PPP encapsulation.

Sample Display

The following is sample output from the **show async status** command:

```
Router> show async status

Async protocol statistics:
  Rcvd: 5448 packets, 7682760 bytes
        1 format errors, 0 checksum errors, 0 overrun, 0 no buffer
  Sent: 5455 packets, 7682676 bytes, 0 dropped


 Int           Local          Remote Qd InPack OutPac Inerr  Drops  MTU Qsz
   1     192.31.7.84         Dynamic  0      0      0     0      0 1500  10
```

Table 6-10 describes significant fields shown in the display.

Table 6-10 Show Async Status Field Descriptions

Field	Description
Rcvd:	Statistics on packets received.
5548 packets	Packets received.
7682760 bytes	Total number of bytes.
1 format errors	Packets with a bad IP header, even before the checksum is calculated.
0 checksum errors	Count of checksum errors.
0 overrun	Number of giants received.
0 no buffer	Number of packets received when no buffer was available.
Sent:	Statistics on packets sent.
5455 packets	Packets sent.
7682676 bytes	Total number of bytes.
0 dropped	Number of packets dropped.
Int	Interface number.

Field	Description
*	Line currently in use.
Local	Local IP address on the link.
Remote	Remote IP address on the link; “Dynamic” indicates that a remote address is allowed but has not been specified; “None” indicates that no remote address is assigned or being used.
Qd	Number of packets on hold queue (Qsz is max).
InPack	Number of packets received.
OutPac	Number of packets sent.
Inerr	Number of total input errors; sum of format errors, checksum errors, overruns and no buffers.
Drops	Number of packets received that would not fit on the hold queue.
MTU	Current maximum transmission unit size.
Qsz	Current output hold queue size.

Related Commands

async default ip address
async dynamic address
async dynamic routing
async mode dedicated
async mode interactive
interface async

show compress

To display compression statistics, use the **show compress** EXEC command.

show compress

Syntax Description

This command has no arguments or parameters.

Command Mode

EXEC

Sample Display

The following is sample output from the **show compress** command:

```
Router# show compress

Serial0
uncompressed bytes xmt/rcv 10710562/11376835
1  min avg ratio xmt/rcv 2.773/2.474
5  min avg ratio xmt/rcv 4.084/3.793
10 min avg ratio xmt/rcv 4.125/3.873
no bufs xmt 0 no bufs rcv 0
resets 0
```

Table 6-11 describes the fields shown in the display.

Table 6-11 Show Compress Field Descriptions

Field	Description
Serial0	Name and number of the interface.
uncompressed bytes xmt/rcv	Total number of uncompressed bytes sent and received.
1 min avg ratio xmt/rcv 5 min avg ratio xmt/rcv 10 min avg ratio xmt/rcv	Static compression ratio for bytes sent and received, averaged over 1, 5, and 10 minutes.
no bufs xmt	Number of times buffers were not available to compress data being sent.
no bufs rcv	Number of times buffers were not available to uncompress data being received.
resets	Number of resets.

Related Command

compress

show controllers cbus

Use the **show controllers cbus** privileged EXEC command on the AGS+ to display all information under the ciscoBus controller card. This command also shows the capabilities of the card and reports controller-related failures.

show controllers cbus

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Displays

The following is sample output from the **show controllers cbus** command:

```
Router# show controllers cbus

cBus 1, controller type 3.0, microcode version 2.0
  128 Kbytes of main memory, 32 Kbytes cache memory
  40 1520 byte buffers, 14 4484 byte buffers
  Restarts: 0 line down, 0 hung output, 0 controller error
 --More--
HSCI 1, controller type 10.0, microcode version 129.3
  Interface 6 - Hssi0, electrical interface is Hssi DTE
    5 buffer RX queue threshold, 7 buffer TX queue limit, buffer size 1520
    ift 0004, rql 2, tq 0000 0000, tql 7
    Transmitter delay is 0 microseconds
 MEC 3, controller type 5.1, microcode version 130.6
  Interface 18 - Ethernet2, station address 0000.0c02.a03c (bia 0000.0c02.a03c)
    10 buffer RX queue threshold, 7 buffer TX queue limit, buffer size 1520
    ift 0000, rql 10, tq 0000 0000, tql 7
    Transmitter delay is 0 microseconds
  Interface 19 - Ethernet3, station address 0000.0c02.a03d (bia 0000.0c02.a03d)
    10 buffer RX queue threshold, 7 buffer TX queue limit, buffer size 1520
    ift 0000, rql 10, tq 0000 0000, tql 7
    Transmitter delay is 0 microseconds
```

Table 6-12 describes the fields shown in the following lines of output from the display.

```
cBus 1, controller type 3.0, microcode version 2.0
  128 Kbytes of main memory, 32 Kbytes cache memory
  40 1520 byte buffers, 14 4484 byte buffers
  Restarts: 0 line down, 0 hung output, 0 controller error
```

Table 6-12 Show Controllers cBus Field Descriptions—Part 1

Field	Description
cBus 1	Card type and number (varies depending on card).
controller type 3.0	Version number of the card.
microcode version 2.0	Version number of the card's internal software (in read-only memory).

Field	Description
128 Kbytes of main memory	Amount of main memory on the card.
32 Kbytes cache memory	Amount of cache memory on the card.
40 1520 byte buffers	Number of buffers of this size on the card.
14 4484 byte buffers	Number of buffers of this size on the card.
Restarts 0 line down 0 hung output 0 controller error	Count of restarts due to the following conditions: Communication line down Output unable to transmit Internal error

Table 6-13 describes the fields shown in the following lines of output from the display:

```
HSCI 1, controller type 10.0, microcode version 129.3
  Interface 6 - Hssi0, electrical interface is Hssi DTE
    5 buffer RX queue threshold, 7 buffer TX queue limit, buffer size 1520
    ift 0004, rql 2, tq 0000 0000, tql 7
    Transmitter delay is 0 microseconds
```

Table 6-13 Show Controllers cBus Field Descriptions—Part 2

Field	Description
HSCI 1	Card type and number (varies depending on card).
controller type 10.0	Version number of the card.
microcode version 129.3	Version number of the card's internal software (in read-only memory).
Interface 6	Physical interface number.
Hssi 0	Logical name for this interface.
electrical interface is Hssi DTE	Self-explanatory.
5 buffer RX queue threshold	Maximum number of buffers allowed in the receive queue.
7 buffer TX queue limit	Maximum number of buffers allowed in the transmit queue.
buffer size 1520	Size of the buffers on this card (in bytes).
ift 0004	Interface type code. 0 = EIP 1 = FSIP 4 = HIP 5 = TRIP 6 = FIP 7 = AIP
rql 2	Receive queue limit. Current number of buffers allowed for the receive queue. It is used to limit the number of buffers used by a particular inbound interface. When equal to 0, all of that interface's receive buffers are in use.
tq 0000 0000	Transmit queue head and tail pointers.
tql 7	Transmit queue limit. Current number of buffers allowed for transmit queue. It limits the maximum cbus buffers allowed to sit on a particular interface's transmit queue.
Transmitter delay is 0 microseconds	Transmitter delay between the packets.

The **show controllers cbus** command displays the internal status of the SP and each cBus interface processor (IP), including the slot location, the card hardware version, and the currently-running microcode version. It also lists each interface (port) on each IP including the logical interface number, interface type, physical (slot/port) address, and hardware (station address) of each interface. The following display shows an AIP installed in IP slot 4, the running AIP microcode is Version 170.30, the PLIM type is 4B/5B, and the available bandwidth is 100 Mbps:

```
Router# show controllers cbus

Switch Processor 5, hardware version 11.1, microcode version 170.46
  Microcode loaded from system
  512 Kbytes of main memory, 128 Kbytes cache memory
  60 1520 byte buffers, 91 4496 byte buffers
  Restarts: 0 line down, 0 hung output, 0 controller error
 AIP 4, hardware version 1.0, microcode version 170.30
  Microcode loaded from system
  Interface 32 - ATM4/0, PLIM is 4B5B(100Mbps)
    15 buffer RX queue threshold, 36 buffer TX queue limit, buffer size 4496
    ift 0007, rql 12, tq 0000 0620, tql 36
    Transmitter delay is 0 microseconds
```

show controllers cxbus

Use the **show controllers cxbus** privileged EXEC command to display information about the Switch Processor (SP) CxBus controller on the Cisco 7000 series. This command displays information that is specific to the interface hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

show controllers cxbus

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

The following is sample output on the Cisco 7000 from the **show controllers cxbus** command:

```
Router# show controllers cxbus

Switch Processor 5, hardware version 11.1, microcode version 172.6
  Microcode loaded from system
  512 Kbytes of main memory, 128 Kbytes cache memory
  75 1520 byte buffers, 86 4484 byte buffers
  Restarts: 0 line down, 0 hung output, 0 controller error
 CIP 3, hardware version 1.1, microcode version 170.1
  Microcode loaded from system
  CPU utilization 7%, sram 145600/512K, dram 86688/2M
  Interface 24 - Channel 3/0
    43 buffer RX queue threshold, 61 buffer TX queue limit, buffer size 4484
    ift 0007, rql 32, tq 0000 0468, tql 61
    Transmitter delay is 0 microseconds
  Interface 25 - Channel 3/1
    43 buffer RX queue threshold, 61 buffer TX queue limit, buffer size 4484
    ift 0007, rql 34, tq 0000 0000, tql 61
    Transmitter delay is 0 microseconds
```

Table 6-14 describes the fields shown in the display.

Table 6-14 Show Controllers CxBus Field Descriptions

Field	Description
IP type, slot number	Unit type and slot number.
hardware version	Version number of the controller.
microcode version	Version number of the controller's internal software (in read-only memory).
Microcode loaded from	Source of microcode; can be system, ROM, or Flash.
main memory cache memory	Amount of main and cache memory on the processor.
byte system buffer	An extra buffer left over after carving the normal pools. It is used for host-generated traffic when available.

Restarts line down hung output controller error	Number of restarts due to the following conditions: Communication line down Output unable to transmit Internal error
CPU utilization	Measure of how busy the CPU is during a given time interval.
sram	The first value is the number of bytes of sram free (that is, not being used by code or data). The second value is the total bytes available of sram, and is expressed in terms of kilobytes or megabytes. The sram is the high-speed static RAM that is used for running the operational code.
dram	The first value is the number of bytes of dram free (that is, not being used by code or data). The second value is the total bytes available of dram, and is expressed in terms of kilobytes or megabytes. The dram is normal dynamic RAM that is used for packet buffers, data, and so on.
Interface number	Names of interfaces by CxBus interface type, slot, and port number.
RX buffers	Number of buffers for received packets.
TX queue limit	Maximum number of buffers in transmit queue.
ift	Interface type code. 0 = EIP 1 = FSIP 4 = HIP 5 = TRIP 6 = FIP 7 = AIP
rql	Receive queue limit. Current number of buffers allowed for the receive queue. It is used to limit the number of buffers used by a particular inbound interface. When equal to 0, all of that interface's receive buffers are in use.
tq	Transmit queue head and tail pointers.
tql	Transmit queue limit. Current number of buffers allowed for transmit queue. It limits the maximum cbus buffers allowed to sit on a particular interface's transmit queue.
Transmitter delay	Delay between outgoing frames.
Station address	The hardware address of the interface.

The following is sample output showing an interface port that has a G.703 cable attached:

```
Router# show controllers cxbus

FSIP 2, hardware version 1.0, microcode version 170.10
  Microcode loaded from flash xyzabc/fsip_q170-10
  Interface 16 - Serial2/0, electrical interface is G.703 Unbalanced
    10 buffer RX queue threshold, 15 buffer TX queue limit, buffer size 1520
    ift 0001, rql 9, tq 0000 0000, tql 15
    Transmitter delay is 0 microseconds
    Interface 17 - Serial2/1, electrical interface is G.703 Unbalanced
    11 buffer RX queue threshold, 14 buffer TX queue limit, buffer size 2104
    ift 0001, rql 10, tq 0000 0000, tql 14
    Transmitter delay is 0 microseconds
  Interface 18 - Serial2/2, electrical interface is G.703 Balanced
    10 buffer RX queue threshold, 15 buffer TX queue limit, buffer size 1520
    ift 0001, rql 9, tq 0000 0000, tql 15
    Transmitter delay is 0 microseconds
  Interface 19 - Serial2/3, electrical interface is G.703 Balanced
    10 buffer RX queue threshold, 15 buffer TX queue limit, buffer size 1520
```

```
ift 0001, rql 8, tq 0000 0428, tql 15
Transmitter delay is 0 microseconds
```

In output, “balanced” and “unbalanced” refer to the electrical signal levels at the connector resulting from different line termination schemes.

show controllers e1

Use the **show controllers e1** privileged EXEC command on the Cisco 7000 to display information about the E1 links supported by the MultiChannel Interface Processor (MIP).

show controllers e1 [*slot*/*port*]

Syntax Description

slot	Specifies the backplane slot number and can be 0, 1, 2, 3, or 4.
port	Specifies the port number of the controller and can be 0 or 1.

Command Mode

Privileged EXEC

Usage Guidelines

For the E1 interface on the Cisco 7000, the MIP can query the port adapters to determine their current status. Issue a **show controllers e1** command to display statistics about the E1 link.

If you specify a slot and port number, each 15-minute period will be displayed.

This command displays controller status that is specific to the controller hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

Sample Display

The following is sample output from the **show controllers e1** command on the Cisco 7000 series:

```
Router# show controllers e1

e1 0/0 is up.
  Applique type is Channelized E1 - unbalanced
  Framing is CRC4, Line Code is HDB3
  No alarms detected.
  Data in current interval (725 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

Table 6-15 describes the **show controllers e1** display fields.

Table 6-15 Show Controllers E1 Field Descriptions

Field	Description
e1 0/0 is up.	The E1 controller 0 in slot 0 is operating. The controller's state can be up, down, or administratively down. Loopback conditions are shown by (Locally looped) or (Remotely Looped).
Applique type	The applique type is shown and will indicate balanced or unbalanced.

Field	Description
Framing is	Shows the current framing type.
Linecode is	Shows the current linecode type.
No alarms detected.	Any alarms detected by the controller are displayed here. Possible alarms are as follows: • Transmitter is sending remote alarm. • Transmitter is sending AIS. • Receiver has loss of signal. • Receiver is getting AIS. • Receiver has loss of frame. • Receiver has remote alarm. • Receiver has no alarms.
Data in current interval (725 seconds elapsed)	Shows the current accumulation period, which rolls into the 24 hour accumulation every 15 minutes. Accumulation period is from 1 to 900 seconds. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer.
Line Code Violations	Indicates the occurrence of either a Bipolar Violation (BPV) or Excessive Zeroes (EXZ) error event.
Path Code Violations	Indicates a frame synchronization bit error in the D4 and E1-noCRC formats, or a CRC error in the ESF and E1-CRC formats.
Slip Secs	Indicates the replication or deletion of the payload bits of a DS1 frame. A slip might be performed when there is a difference between the timing of a synchronous receiving terminal and the received signal.
Fr Loss Secs	Indicates the number of seconds an Out Of Frame (OOF) error is detected.
Line Err Secs	Line Errored Seconds (LES) is a second in which one or more Line Code Violation errors are detected.
Degraded Mins	A Degraded Minute is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3.
Errored Secs	In ESF and E1 CRC links, an Errored Second is a second in which one of the following are detected: one or more Path Code Violations; one or more Out of Frame defects; one or more Controlled Slip events; a detected AIS defect. For SF and E1 no-CRC links, the presence of Bipolar Violations also triggers an Errored Second.
Bursty Err Secs	A second with fewer than 320 and more than 1 Path Coding Violation error, no Severely Errored Frame defects and no detected incoming AIS defects. Controlled slips are not included in this parameter.
Severely Err Secs	For ESF signals, a second with one of the following errors: 320 or more Path Code Violation errors; one or more Out of Frame defects; a detected AIS defect. For E1-CRC signals, a second with one of the following errors: 832 or more Path Code Violation errors; one or more Out of Frame defects. For E1-nonCRC signals, a second with 2048 Line Code Violations or more. For D4 signals, a count of 1-second intervals with Framing Errors, or an Out of Frame defect, or 1544 Line Code Violations.
Unavail Secs	A count of the total number of seconds on the interface.

show controllers ethernet

Use the **show controllers ethernet** EXEC command to display information on the Cisco 2500, 3000, or 4000.

show controllers ethernet *number*

Syntax Description

number	Interface number of the Ethernet interface.

Command Mode

EXEC

Sample Display

The following is sample output from the **show controllers ethernet** command on the Cisco 4000:

```
Router# show controllers ethernet 0

LANCE unit 0, NIM slot 1, NIM type code 4, NIM version 1
Media Type is 10BaseT, Link State is Up, Squelch is Normal
idb 0x4060, ds 0x5C80, regaddr = 0x8100000
IB at 0x600D7AC: mode=0x0000, mcfilter 0000/0001/0000/0040
station address 0000.0c03.a14f  default station address 0000.0c03.a14f
buffer size 1524
RX ring with 32 entries at 0xD7E8
Rxhead = 0x600D8A0 (12582935), Rxp = 0x5CF0(23)
00 pak=0x60336D0 ds=0x6033822 status=0x80 max_size=1524 pak_size=98
01 pak=0x60327C0 ds=0x6032912 status=0x80 max_size=1524 pak_size=98
02 pak=0x6036B88 ds=0x6036CDA status=0x80 max_size=1524 pak_size=98
03 pak=0x6041138 ds=0x604128A status=0x80 max_size=1524 pak_size=98
04 pak=0x603FAA0 ds=0x603FBF2 status=0x80 max_size=1524 pak_size=98
05 pak=0x600DC50 ds=0x600DDA2 status=0x80 max_size=1524 pak_size=98
06 pak=0x6023E48 ds=0x6023F9A status=0x80 max_size=1524 pak_size=1506
07 pak=0x600E3D8 ds=0x600E52A status=0x80 max_size=1524 pak_size=1506
08 pak=0x6020990 ds=0x6020AE2 status=0x80 max_size=1524 pak_size=386
09 pak=0x602D4E8 ds=0x602D63A status=0x80 max_size=1524 pak_size=98
10 pak=0x603A7C8 ds=0x603A91A status=0x80 max_size=1524 pak_size=98
11 pak=0x601D4D8 ds=0x601D62A status=0x80 max_size=1524 pak_size=98
12 pak=0x603BE60 ds=0x603BFB2 status=0x80 max_size=1524 pak_size=98
13 pak=0x60318B0 ds=0x6031A02 status=0x80 max_size=1524 pak_size=98
14 pak=0x601CD50 ds=0x601CEA2 status=0x80 max_size=1524 pak_size=98
15 pak=0x602C5D8 ds=0x602C72A status=0x80 max_size=1524 pak_size=98
16 pak=0x60245D0 ds=0x6024722 status=0x80 max_size=1524 pak_size=98
17 pak=0x6008328 ds=0x600847A status=0x80 max_size=1524 pak_size=98
18 pak=0x601EB70 ds=0x601ECC2 status=0x80 max_size=1524 pak_size=98
19 pak=0x602DC70 ds=0x602DDC2 status=0x80 max_size=1524 pak_size=98
20 pak=0x60163E0 ds=0x6016532 status=0x80 max_size=1524 pak_size=98
21 pak=0x602CD60 ds=0x602CEB2 status=0x80 max_size=1524 pak_size=98
22 pak=0x6037A98 ds=0x6037BEA status=0x80 max_size=1524 pak_size=98
23 pak=0x602BE50 ds=0x602BFA2 status=0x80 max_size=1524 pak_size=98
24 pak=0x6018988 ds=0x6018ADA status=0x80 max_size=1524 pak_size=98
25 pak=0x6033E58 ds=0x6033FAA status=0x80 max_size=1524 pak_size=98
26 pak=0x601BE40 ds=0x601BF92 status=0x80 max_size=1524 pak_size=98
27 pak=0x6026B78 ds=0x6026CCA status=0x80 max_size=1524 pak_size=98
28 pak=0x6024D58 ds=0x6024EAA status=0x80 max_size=1524 pak_size=74
29 pak=0x602AF40 ds=0x602B092 status=0x80 max_size=1524 pak_size=98
30 pak=0x601FA80 ds=0x601FBD2 status=0x80 max_size=1524 pak_size=98
```

```
31 pak=0x6038220 ds=0x6038372 status=0x80 max_size=1524 pak_size=98
TX ring with 8 entries at 0xDA20, tx_count = 0
tx_head = 0x600DA58 (12582919), head_txp = 0x5DC4 (7)
tx_tail = 0x600DA58 (12582919), tail_txp = 0x5DC4 (7)
00 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
01 pak=0x000000 ds=0x602126A status=0x03 status2=0x0000 pak_size=60
02 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
03 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
04 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
05 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
06 pak=0x000000 ds=0x600CF12 status=0x03 status2=0x0000 pak_size=118
07 pak=0x000000 ds=0x6003ED2 status=0x03 status2=0x0000 pak_size=126
0 missed datagrams, 0 overruns, 2 late collisions, 2 lost carrier events
0 transmitter underruns, 0 excessive collisions,  0 tdr, 0 babbles
0 memory errors, 0 spurious initialization done interrupts
0 no enp status, 0 buffer errors, 0 overflow errors
10 one_col, 10 more_col, 22 deferred, 0 tx_buff
0 throttled, 0 enabled
Lance csr0 = 0x73
```

show controllers fddi

Use the **show controllers fddi** user EXEC command to display all information under the FDDI controller card on the AGS+ or FDDI Interface Processor (FIP) on the Cisco 7000.

show controllers fddi

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Usage Guidelines

This command reflects the internal state of the chips and information the system uses for bridging and routing that is specific to the interface hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

Sample Display

The following is sample output from the **show controllers fddi** command on the Cisco 7000:

```
Router# show controllers fddi

Fddi2/0 - hardware version 2.2, microcode version 1.2
  Phy-A registers:
    cr0 4, cr1 0, cr2 0, status 3, cr3 0
  Phy-B registers:
    cr0 4, cr1 4, cr2 0, status 3, cr3 0
  FORMAC registers:
    irdtlb  71C2, irdtneg F85E, irdthtt F5D5, irdmir  FFFF0BDC
    irdtrth F85F, irdtmax FBC5, irdtvxt 5959, irdstmc 0810
    irdmode 6A20, irdimsk 0000, irdstat 8060, irdtpri 0000
  FIP registers
    ccb:   002C  cmd:   0006  fr:   000F  mdptr: 0000  mema: 0000
    icb:   00C0  arg:   0003  app:  0004  mdpg:  0000  af:   0603
    clm:   E002  bcn:   E016  clbn: 0198  rxoff: 002A  en:   0001
    clmbc: 8011  bcnbc: 8011  robn: 0004  park:  0000  fop:  8004

    txchn: 0000  pend:  0000  act:  0000  tail:  0000  cnt:  0000
    state: 0003  check: 0000  eof:  0000  tail:  0000  cnt:  0000
    rxchn: 0000  buf0:  0534  nxt0: 0570  eof:   0000  tail: 0000
    eofch: 0000  buf1:  051C  nxt1: 0528  pool:  0050  err:  005C

    head:  0984  cur:   0000  t0:   0030  t1:    0027  t2:   000F
    tail:  0984  cnt:   0001  t3:   0000  rxlft: 000B  used: 0000
    txq_s: 0018  txq_f: 0018  Aarm: 0000  Barm:  1388  fint: 8004

 Total LEM: phy-a 6, phy-b 13
```

The last line of output indicates how many times the specific PHY encountered an “UNKNOWN LINE STATE” event on the fiber.

show controllers lex

To show hardware and software information about the LAN Extender chassis, use the **show controllers lex** EXEC command.

show controllers lex [*number*]
show controllers lex [*slot*/*port*] (for the Cisco 7000 series)

Syntax Description

number	(Optional) Number of the LAN Extender interface about which to display information.
slot	(Optional) Specifies the backplane slot number on the Cisco 7000 series, and can be 0, 1, 2, 3, or 4.
port	(Optional) Specifies the port number of the controller and can be 0 or 1.

Command Mode

EXEC

Usage Guidelines

Use the **show controllers lex** command to display information about the hardware revision level, software version number, Flash memory size, serial number, and other information related to the configuration of the LAN Extender.

Sample Display

The following is sample output from the **show controllers lex** command:

```
Router# show controllers lex 0

Lex0:
FLEX Hardware revision 1
FLEX Software version 255.0
128K bytes of flash memory
Serial number is 123456789
Station address is 0000.4060.1100
```

The following is sample output from the **show controller**s **lex** command when the LAN Extender interface is not bound to a serial interface:

```
Router# show controller lex 1

Lex1 is not bound to a serial interface
```

Table 6-16 describes the fields shown in the output.

Table 6-16 Show Controllers Lex Field Description

Field	Description
Lex0:	Number of the LAN Extender interface

Field	Description
FLEX Hardware revision	Revision number of the Cisco 1000 series LAN Extender chassis
FLEX Software version	Revision number of the software running on the LAN Extender chassis
128K bytes of Flash memory	Amount of Flash memory in the LAN Extender
Serial number	Serial number of the LAN Extender chassis
Station address	MAC address of the LAN Extender chassis

show controllers mci

Use the **show controllers mci** privileged EXEC command to display all information under the Multiport Communications Interface card or the SCI. This command displays information the system uses for bridging and routing that is specific to the interface hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

show controllers mci

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show controllers mci** command:

```
Router# show controllers mci

MCI 0, controller type 1.1, microcode version 1.8
   128 Kbytes of main memory, 4 Kbytes cache memory
22 system TX buffers, largest buffer size 1520
   Restarts: 0 line down, 0 hung output, 0 controller error
Interface 0 is Ethernet0, station address 0000.0c00.d4a6
   15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
   Transmitter delay is 0 microseconds
Interface 1 is Serial0, electrical interface is V.35 DTE
   15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
   Transmitter delay is 0 microseconds
   High speed synchronous serial interface
Interface 2 is Ethernet1, station address aa00.0400.3be4
   15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
   Transmitter delay is 0 microseconds
Interface 3 is Serial1, electrical interface is V.35 DCE
   15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
   Transmitter delay is 0 microseconds
   High speed synchronous serial interface
```

Table 6-17 describes significant fields shown in the display.

Table 6-17 Show Controllers MCI Field Descriptions

Field	Description
MCI 0	Card type and unit number (varies depending on card).
controller type 1.1	Version number of the card.
microcode version 1.8	Version number of the card's internal software (in read-only memory).
128 Kbytes of main memory	Amount of main memory on the card.
4 Kbytes cache memory	Amount of cache memory on the card.
22 system TX buffers	Number of buffers that hold packets to be transmitted.

Field	Description
largest buffer size 1520	Largest size of these buffers (in bytes).
Restarts 0 line down 0 hung output 0 controller error	Count of restarts due to the following conditions: Communication line down Output unable to transmit Internal error
Interface 0 is Ethernet0	Names of interfaces, by number.
electrical interface is V.35 DTE	Line interface type for serial connections. If the jumper on the AGS+ applique enables NRZI mode, then this field will indicate V.35 NRZI DTE or DCE.
15 total RX buffers	Number of buffers for received packets.
11 buffer TX queue limit	Maximum number of buffers in transmit queue.
Transmitter delay is 0 microseconds	Delay between outgoing frames.
Station address 0000.0c00.d4a6	Hardware address of the interface.

Note The interface type is only queried at startup. If the hardware changes *subsequent* to initial startup, then the wrong type is reported. This has *no* adverse effect on the operation of the software. For instance, if a DCE cable is connected to a dual-mode V.35 applique after the unit has been booted, then the display presented for **show interfaces** incorrectly reports attachment to a DTE device although the software recognizes the DCE interface and behaves accordingly.

Related Command

tx-queue-limit

show controllers pcbus

To display all information about the ISA bus interface, use the **show controllers pcbus** privileged EXEC command.

show controllers pcbus

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Usage Guidelines

This command is valid on LanOptics' Branchcard or Stacknet 2000 products only.

Sample Display

The following is sample output from the **show controllers pcbus** command:

```
Router# show controllers pcbus

PCbus unit 0,  Name = PCbus0  Hardware is ISA PCbus shared RAM
IDB at 0x3719B0,  Interface driver data structure at 0x3735F8
Control/status register at 0x2110008,  Shared memory at 0xC000000
Shared memory is initialized

Shared memory interface control block :
Magic no = 0x41435A56 (valid)  Version = 1.0
Shared memory size = 64K bytes,  Interface is NOT shutdown
Interface state is up, line protocol is up

Tx buffer : (control block at 0xC000010)
Start offset = 0x30,  Size = 0x7FE8,  Overflows = 1
GET_ptr = 0x4F6C,  PUT_ptr = 0x4F6C,  WRAP_ptr = 0x3BB0

Rx buffer : (control block at 0xC000020)
Start offset = 0x8018,  Size 0x7FE8,  Overflows = 22250698
GET_ptr = 0x60,  PUT_ptr = 0x60,  WRAP_ptr = 0x7FD0

Interrupts received = 567
```

show controllers serial

Use the **show controllers serial** privileged EXEC command to display information that is specific to the interface hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

show controllers serial

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Sample Display

Sample output of the **show controllers serial** command on the Cisco 4000 follows:

```
Router# show controllers serial

MK5 unit 0, NIM slot 1, NIM type code 7, NIM version 1
idb = 0x6150, driver structure at 0x34A878, regaddr = 0x8100300
IB at 0x6045500: mode=0x0108, local_addr=0, remote_addr=0
N1=1524, N2=1, scaler=100, T1=1000, T3=2000, TP=1
buffer size 1524
DTE V.35 serial cable attached
RX ring with 32 entries at 0x45560 : RLEN=5, Rxhead 0
00 pak=0x6044D78  ds=0x6044ED4 status=80 max_size=1524 pak_size=0
01 pak=0x60445F0  ds=0x604474C status=80 max_size=1524 pak_size=0
02 pak=0x6043E68  ds=0x6043FC4 status=80 max_size=1524 pak_size=0
03 pak=0x60436E0  ds=0x604383C status=80 max_size=1524 pak_size=0
04 pak=0x6042F58  ds=0x60430B4 status=80 max_size=1524 pak_size=0
05 pak=0x60427D0  ds=0x604292C status=80 max_size=1524 pak_size=0
06 pak=0x6042048  ds=0x60421A4 status=80 max_size=1524 pak_size=0
07 pak=0x60418C0  ds=0x6041A1C status=80 max_size=1524 pak_size=0
08 pak=0x6041138  ds=0x6041294 status=80 max_size=1524 pak_size=0
09 pak=0x60409B0  ds=0x6040B0C status=80 max_size=1524 pak_size=0
10 pak=0x6040228  ds=0x6040384 status=80 max_size=1524 pak_size=0
11 pak=0x603FAA0  ds=0x603FBFC status=80 max_size=1524 pak_size=0
12 pak=0x603F318  ds=0x603F474 status=80 max_size=1524 pak_size=0
13 pak=0x603EB90  ds=0x603ECEC status=80 max_size=1524 pak_size=0
14 pak=0x603E408  ds=0x603E564 status=80 max_size=1524 pak_size=0
15 pak=0x603DC80  ds=0x603DDDC status=80 max_size=1524 pak_size=0
16 pak=0x603D4F8  ds=0x603D654 status=80 max_size=1524 pak_size=0
17 pak=0x603CD70  ds=0x603CECC status=80 max_size=1524 pak_size=0
18 pak=0x603C5E8  ds=0x603C744 status=80 max_size=1524 pak_size=0
19 pak=0x603BE60  ds=0x603BFBC status=80 max_size=1524 pak_size=0
20 pak=0x603B6D8  ds=0x603B834 status=80 max_size=1524 pak_size=0
21 pak=0x603AF50  ds=0x603B0AC status=80 max_size=1524 pak_size=0
22 pak=0x603A7C8  ds=0x603A924 status=80 max_size=1524 pak_size=0
23 pak=0x603A040  ds=0x603A19C status=80 max_size=1524 pak_size=0
24 pak=0x60398B8  ds=0x6039A14 status=80 max_size=1524 pak_size=0
25 pak=0x6039130  ds=0x603928C status=80 max_size=1524 pak_size=0
26 pak=0x60389A8  ds=0x6038B04 status=80 max_size=1524 pak_size=0
27 pak=0x6038220  ds=0x603837C status=80 max_size=1524 pak_size=0
28 pak=0x6037A98  ds=0x6037BF4 status=80 max_size=1524 pak_size=0
29 pak=0x6037310  ds=0x603746C status=80 max_size=1524 pak_size=0
30 pak=0x6036B88  ds=0x6036CE4 status=80 max_size=1524 pak_size=0
31 pak=0x6036400  ds=0x603655C status=80 max_size=1524 pak_size=0
```

```
TX ring with 8 entries at 0x45790 : TLEN=3, TWD=7
tx_count = 0, tx_head = 7, tx_tail = 7
00 pak=0x000000 ds=0x600D70C status=0x38 max_size=1524 pak_size=22
01 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
02 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
03 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
04 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
05 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
06 pak=0x000000 ds=0x600D70E status=0x38 max_size=1524 pak_size=2
07 pak=0x000000 ds=0x6000000 status=0x38 max_size=1524 pak_size=0
XID/Test TX desc at 0xFFFFFF, status=0x30, max_buffer_size=0, packet_size=0
XID/Test RX desc at 0xFFFFFF, status=0x0, max_buffer_size=0, packet_size=0
Status Buffer at 0x60459C8: rcv=0, tcv=0, local_state=0, remote_state=0
phase=0, tac=0, currd=0x00000, curxd=0x00000
bad_frames=0, frmrs=0, T1_timeouts=0, rej_rxs=0, runts=0
0 missed datagrams, 0 overruns, 0 bad frame addresses
0 bad datagram encapsulations, 0 user primitive errors
0 provider primitives lost, 0 unexpected provider primitives
0 spurious primitive interrupts, 0 memory errors, 0 tr
%LINEPROTO-5-UPDOWN: Linansmitter underruns
mk5025 registers: csr0 = 0x0E00, csr1 = 0x0302, csr2 = 0x0704
                  csr3 = 0x5500, csr4 = 0x0214, csr5 = 0x0008
```

show controllers t1

Use the **show controllers t1** privileged EXEC command on the Cisco 7000 to display information about the T1 links supported by the Multichannel Interface Processor (MIP).

show controllers t1 [*slot*/*port*]

Syntax Description

slot	Specifies the backplane slot number and can be 0, 1, 2, 3, or 4.
port	Specifies the port number of the controller and can be 0 or 1.

Command Mode

EXEC

Usage Guidelines

This command displays controller status that is specific to the controller hardware. The information displayed is generally useful for diagnostic tasks performed by technical support personnel only.

For the T1 interface on the Cisco 7000, the MIP can query the port adapters to determine their current status. Issue a **show controllers t1** command to display statistics about the T1 link.

If you specify a slot and port number, each 15 minute period will be displayed.

Sample Display

The following is sample output from the **show controllers t1** command on the Cisco 7000 series:

```
Router# show controllers t1

T1 0/0 is up.
  No alarms detected.
  Data in current interval (725 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 24 hours)
     0 Line Code Violations, 0 Path Code Violations,
     0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
     0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 0 Unavail Secs
```

Table 6-18 describes the **show controllers t1** display fields.

Table 6-18 Show Controllers T1 Field Descriptions

Field	Description
T1 0/0 is up.	The T1 controller 0 in slot 0 is operating. The controller's state can be up, down, administratively down. Loopback conditions are shown by (Locally looped) or (Remotely Looped).

Field	Description
No alarms detected.	Any alarms detected by the controller are displayed here. Possible alarms are as follows: Transmitter is sending remote alarm. Transmitter is sending AIS. Receiver has loss of signal. Receiver is getting AIS. Receiver has loss of frame. Receiver has remote alarm. Receiver has no alarms.
Data in current interval (725 seconds elapsed)	Shows the current accumulation period, which rolls into the 24 hour accumulation every 15 minutes. Accumulation period is from 1 to 900 seconds. The oldest 15 minute period falls off the back of the 24-hr accumulation buffer
Line Code Violations	Indicates the occurrence of either a Bipolar Violation (BPV) or Excessive Zeroes (EXZ) error event.
Path Code Violations	Indicates a frame synchronization bit error in the D4 and E1-noCRC formats, or a CRC error in the ESF and E1-CRC formats.
Slip Secs	Indicates the replication or deletion of the payload bits of a DS1 frame. A slip may be performed when there is a difference between the timing of a synchronous receiving terminal and the received signal.
Fr Loss Secs	Indicates the number of seconds an Out Of Frame (OOF) error is detected.
Line Err Secs	Line Errored Seconds (LES) is a second in which one or more Line Code Violation errors are detected.
Degraded Mins	A Degraded Minute is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3.
Errored Secs	In ESF and E1-CRC links, an Errored Second is a second in which one of the following are detected: one or more Path Code Violations; one or more Out of Frame defects; one or more Controlled Slip events; a detected AIS defect. For D4 and E1-noCRC links, the presence of Bipolar Violations also triggers an Errored Second.
Bursty Err Secs	A second with fewer than 320 and more than 1 Path Coding Violation error, no Severely Errored Frame defects and no detected incoming AIS defects. Controlled slips are not included in this parameter.
Severely Err Secs	For ESF signals, a second with one of the following errors: 320 or more Path Code Violation errors; one or more Out of Frame defects; a detected AIS defect. For E1-CRC signals, a second with one of the following errors: 832 or more Path Code Violation errors; one or more Out of Frame defects. For E1-nonCRC signals, a second with 2048 Line Code Violations or more. For D4 signals, a count of 1-second intervals with Framing Errors, or an Out of Frame defect, or 1544 Line Code Violations.
Unavail Secs	A count of the total number of seconds on the interface.

show controllers token

To display information about memory management, error counters, and the CSC-R, CSC-1R, CSC-2R, C2CTR, and CSC-R16 (or CSC-R16M) Token Ring interface cards or Token Ring Interface Processor (TRIP), in the case of the Cisco 7000 series, use the **show controllers token** privileged EXEC command.

show controllers token

Syntax Description

This command has no arguments or keywords.

Command Mode

Privileged EXEC

Usage Guidelines

Depending on the board being used, the output can vary. This command also displays information that is proprietary to Cisco Systems. Thus, the information that **show controllers token** displays is of primary use to Cisco technical personnel. Information that is useful to users can be obtained with the **show interfaces tokenring** command, described later in this chapter.

Sample Display

The following is sample output on the AGS+ from the **show controllers token** command:

```
Router# show controllers token

TR Unit 0 is board 0 - ring 0

 state 3, dev blk: 0x1D2EBC, mailbox: 0x2100010, sca: 0x2010000
   current address: 0000.3080.6f40, burned in address: 0000.3080.6f40
   current TX ptr: 0xBA8, current RX ptr: 0x800

   Last Ring Status: none

 Stats: soft:0/0, hard:0/0, sig loss:0/0
        tx beacon: 0/0, wire fault 0/0, recovery: 0/0
        only station: 0/0, remote removal: 0/0
   Bridge: local 3330, bnum 1, target 3583
     max_hops 7, target idb: 0x0, not local
   Interface failures: 0  -- Bkgnd Ints: 0
   TX shorts 0, TX giants 0

   Monitor state: (active)
     flags 0xC0, state 0x0, test 0x0, code 0x0, reason 0x0
 f/w ver: 1.0, chip f/w: '000000.ME31100', [bridge capable]
     SMT versions: 1.01 kernel, 4.02 fastmac
     ring mode: F00, internal enables:  SRB REM RPS CRS/NetMgr
     internal functional: 0000011A (0000011A), group: 00000000 (00000000)
     if_state: 1, ints: 0/0, ghosts: 0/0, bad_states: 0/0
     t2m fifo purges: 0/0
     t2m fifo current: 0, t2m fifo max: 0/0, proto_errs: 0/0
     ring: 3330, bridge num: 1, target: 3583, max hops: 7
Packet counts:
       receive total:  298/6197, small: 298/6197, large 0/0
               runts: 0/0, giants: 0/0
```

```
              local: 298/6197, bridged: 0/0, promis: 0/0
            bad rif: 0/0, multiframe: 0/0
       ring num mismatch 0/0, spanning violations 0
       transmit total: 1/25, small: 1/25, large 0/0
              runs: 0/0, giants: 0/0, errors 0/0
bad fs: 0/0, bad ac: 0
congested: 0/0, not present: 0/0
     Unexpected interrupts: 0/0,  last unexp. int: 0

     Internal controller counts:
   line errors: 0/0,  internal errors: 0/0
   burst errors: 0/0,  ari/fci errors: 0/0
   abort errors: 0/0, lost frame: 0/0
   copy errors: 0/0, rcvr congestion: 0/0
   token errors: 0/0, frequency errors: 0/0
   dma bus errors: -/-, dma parity errors: -/-
     Internal controller smt state:
   Adapter MAC:     0000.3080.6f40, Physical drop:     00000000
   NAUN Address:    0000.a6e0.11a6, NAUN drop:         00000000
   Last source:     0000.a6e0.11a6, Last poll:         0000.3080.6f40
   Last MVID:       0006,           Last attn code:    0006
   Txmit priority:  0006,           Auth Class:        7FFF
   Monitor Error:   0000,           Interface Errors:  FFFF
   Correlator:      0000,           Soft Error Timer:  00C8
   Local Ring:      0000,           Ring Status:       0000
   Beacon rcv type: 0000,           Beacon txmit type: 0000
   Beacon type:     0000,           Beacon NAUN:       0000.a6e0.11a6
```

Table 6-19 describes the fields shown in the following line of sample output:

```
TR Unit 0 is board 0 - ring 0
```

Table 6-19 Show Controllers Token Field Descriptions—Part 1

Field	Description
TR Unit 0	Unit number assigned to the Token Ring interface associated with this output.
is board 0	Board number assigned to the Token Ring controller board associated with this interface.
ring 0	Number of the Token Ring associated with this board.

In the following output line, state 3 indicates the state of the board. The rest of this output line displays memory mapping that is of primary use to Cisco engineers.

```
state 3, dev blk: 0x1D2EBC, mailbox: 0x2100010, sca: 0x2010000
```

The following line also appears in **show interface token** output as the address and burned in address, respectively:

```
current address: 0000.3080.6f40, burned in address: 0000.3080.6f40
```

The following line of output displays buffer management pointers that change by board:

```
current TX ptr: 0xBA8, current RX ptr: 0x800
```

The following line of output indicates the ring status from the controller chip set. This information is used by LAN Network Manager:

```
Last Ring Status: none
```

The following lines of output show Token Ring statistics. See the Token Ring specification for more information.

```
Stats: soft:0/0, hard:0/0, sig loss:0/0
       tx beacon: 0/0, wire fault 0/0, recovery: 0/0
       only station: 0/0, remote removal: 0/0
```

The following line of output indicates that Token Ring communication has been enabled on the interface. If this line of output appears, the message "Source Route Bridge capable" should appear in the **show interfaces tokenring** display.

```
Bridge: local 3330, bnum 1, target 3583
```

Table 6-20 describes the fields shown in this line of sample output:

```
max_hops 7, target idb: 0x0, not local
```

Table 6-20 Show Controllers Token Field Descriptions—Part 2

Field	Description
max_hops 7	Maximum number of bridges.
target idb: 0x0	Destination interface definition.
not local	Indicates whether the interface has been defined as a local or remote bridge.

The following line of output is specific to the hardware:

```
Interface failures: 0  -- Bkgnd Ints: 0
```

In the following line of output, TX shorts are the number of packets the interface transmits that are discarded because they are smaller than the medium's minimum packet size. TX giants are the number of packets the interface transmits that are discarded because they exceed the medium's maximum packet size.

```
TX shorts 0, TX giants 0
```

The following line of output indicates the state of the controller. Possible values include active, failure, inactive, and reset:

```
Monitor state: (active)
```

The following line of output displays detailed information relating to the monitor state shown in the previous line of output. This information relates to the firmware on the controller. This information is relevant to Cisco engineers only if the monitor state is something other than active.

```
flags 0xC0, state 0x0, test 0x0, code 0x0, reason 0x0
```

Table 6-21 describes the fields in the following line of output:

```
f/w ver: 1.0 expr 0, chip f/w: '000000.ME31100', [bridge capable]
```

Table 6-21 Show Controllers Token Field Descriptions—Part 3

Field	Description
f/w ver: 1.0	Version of the Cisco firmware on the board.

Field	Description
chip f/w: '000000.ME31100'	Firmware on the chip set.
[bridge capable]	Interface has not been configured for bridging, but that it has that capability.

The following line of output displays the version numbers for the kernel and the accelerator microcode of the Madge firmware on the board; this firmware is the LLC interface to the chip set:

```
SMT versions: 1.01 kernel, 4.02 fastmac
```

The following line of output displays LAN Network Manager information that relates to ring status:

```
ring mode: F00, internal enables:  SRB REM RPS CRS/NetMgr
```

The following line of output corresponds to the functional address and the group address shown in **show interfaces tokenring** output:

```
internal functional: 0000011A (0000011A), group: 00000000 (00000000)
```

The following line of output displays interface board state information that is proprietary to Cisco Systems:

```
if_state: 1, ints: 0/0, ghosts: 0/0, bad_states: 0/0
```

The following output lines display information that is proprietary to Cisco Systems. Cisco engineers use this information for debugging purposes.

```
t2m fifo purges: 0/0
t2m fifo current: 0, t2m fifo max: 0/0, proto_errs: 0/0
```

Each of the fields in the following line of output maps to a field in the **show source bridge** display, as follows: ring maps to srn; bridge num maps to bn; target maps to trn; and max hops maps to max:

```
ring: 3330, bridge num: 1, target: 3583, max hops: 7
```

In the following lines of output, the number preceding the slash (/) indicates the count since the value was last displayed; the number following the slash (/) indicates count since the system was last booted:

```
Packet counts:
       receive total:  298/6197, small: 298/6197, large 0/0
```

In the following line of output, the number preceding the slash (/) indicates the count since the value was last displayed; the number following the slash (/) indicates count since the system was last booted. The runts and giants values that appear here correspond to the runts and giants values that appear in **show interfaces tokenring** output.

```
                runts: 0/0, giants: 0/0
```

The following lines of output are receiver-specific information that Cisco engineers can use for debugging purposes:

```
                local: 298/6197, bridged: 0/0, promis: 0/0
              bad rif: 0/0, multiframe: 0/0
        ring num mismatch 0/0, spanning violations 0
        transmit total: 1/25, small: 1/25, large 0/0
                 runts: 0/0, giants: 0/0, errors 0/0
```

The following output lines include very specific statistics that are not relevant in most cases, but exist for historical purposes. In particular, the internal errors, burst errors, ari/fci, abort errors, copy errors, frequency errors, dma bus errors, and dma parity errors fields are not relevant.

```
     Internal controller counts:
line errors: 0/0,  internal errors: 0/0
burst errors: 0/0,  ari/fci errors: 0/0
abort errors: 0/0, lost frame: 0/0
copy errors: 0/0, rcvr congestion: 0/0
token errors: 0/0, frequency errors: 0/0
dma bus errors: -/-, dma parity errors: -/-
```

The following lines of output are low-level Token Ring interface statistics relating to the state and status of the Token Ring with respect to all other Token Rings on the line:

```
  Internal controller smt state:
Adapter MAC:     0000.3080.6f40, Physical drop:     00000000
NAUN Address:    0000.a6e0.11a6, NAUN drop:         00000000
Last source:     0000.a6e0.11a6, Last poll:         0000.3080.6f40
Last MVID:       0006,           Last attn code:    0006
Txmit priority:  0006,           Auth Class:        7FFF
Monitor Error:   0000,           Interface Errors:  FFFF
Correlator:      0000,           Soft Error Timer:  00C8
Local Ring:      0000,           Ring Status:       0000
Beacon rcv type: 0000,           Beacon txmit type: 0000
```

Sample Display

Sample output for the **show controllers token** command on the Cisco 7000 follows:

```
Router> show controllers token
Tokenring4/0: state administratively down
  current address: 0000.3040.8b4a, burned in address: 0000.3040.8b4a
  Last Ring Status: none
    Stats: soft: 0/0, hard: 0/0, sig loss: 0/0
           tx beacon: 0/0, wire fault 0/0, recovery: 0/0
           only station: 0/0, remote removal: 0/0
  Monitor state: (active), chip f/w: '000000........', [bridge capable]
    ring mode: 0”
    internal functional: 00000000 (00000000), group: 00000000 (00000000)
    internal addrs: SRB: 0000, ARB: 0000, EXB 0000, MFB: 0000
                    Rev: 0000, Adapter: 0000, Parms 0000
    Microcode counters:
      MAC giants 0/0, MAC ignored 0/0
      Input runts 0/0, giants 0/0, overrun 0/0
      Input ignored 0/0, parity 0/0, RFED 0/0
      Input REDI 0/0, null rcp 0/0, recovered rcp 0/0
      Input implicit abort 0/0, explicit abort 0/0
      Output underrun 0/0, tx parity 0/0, null tcp 0/0
      Output SFED 0/0, SEDI 0/0, abort 0/0
      Output False Token 0/0, PTT Expired 0/0
    Internal controller counts:
      line errors: 0/0,  internal errors: 0/0
      burst errors: 0/0,  ari/fci errors: 0/0
      abort errors: 0/0, lost frame: 0/0
      copy errors: 0/0, rcvr congestion: 0/0
      token errors: 0/0, frequency errors: 0/0
    Internal controller smt state:
      Adapter MAC:     0000.0000.0000, Physical drop:     00000000
      NAUN Address:    0000.0000.0000, NAUN drop:         00000000
      Last source:     0000.0000.0000, Last poll:         0000.0000.0000
      Last MVID:       0000,           Last attn code:    0000
      Txmit priority:  0000,           Auth Class:        0000
      Monitor Error:   0000,           Interface Errors:  0000
      Correlator:      0000,           Soft Error Timer:  0000
      Local Ring:      0000,           Ring Status:       0000
      Beacon rcv type: 0000,           Beacon txmit type: 0000
      Beacon type:     0000,           Beacon NAUN:       0000.0000.0000
```

```
        Beacon drop:     00000000,       Reserved:         0000
        Reserved2:       0000
```

Table 6-22 describes key **show controllers token** display fields.

Table 6-22 Show Controllers Token Field Descriptions

Field	Description
Tokenring4/0	Interface processor type, slot, and port.
Last Ring Status	Last abnormal ring condition. Can be any of the following: Signal Loss HW Removal Remote Removal Counter Overflow Only station Ring Recovery

show hub

To display information about the hub (repeater) on an Ethernet interface of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **show hub** EXEC command.

show hub [**ether** *number* [*port* [*end-port*]]]

Syntax Description

ether	(Optional) Indicates that this is an Ethernet hub.
number	(Optional) Hub number, starting with 0. Since there is currently only one hub, this number is 0.
port	(Optional) Port number on the hub. On the Cisco 2505, port numbers range from 1 through 8. On the Cisco 2507, port numbers range from 1 through 16. On the Cisco 2516, Ethernet ports number 1 to 14. If a second port number follows, then this port number indicates the beginning of a port range.
end-port	(Optional) Ending port number of a range.

Command Mode

EXEC

Usage Guidelines

If you do not specify a port or port range for the **show hub** command, the command displays all ports (for example, ports 1 through 16 on a Cisco 2507) by default. Therefore, the commands **show hub**, **show hub ethernet 0**, and **show hub ethernet 0 1 16** all produce the same result.

If no ports are specified, the command displays some additional data about the internal port. The internal port is the hub's connection to Ethernet interface 0 inside the box. Ethernet interface 0 still exists; physical access to the interface is via the hub.

Sample Displays

The following is sample output from the **show hub** command for hub 0, port 2 only:

```
Router# show hub ethernet 0 2

Port 2 of 16 is administratively down, link state is down
  0 packets input, 0 bytes
  0 errors with 0 collisions
     (0 FCS, 0 alignment, 0 too long,
      0 short, 0 runts, 0 late,
      0 very long, 0 rate mismatches)
  0 auto partitions, last source address (none)
  Last clearing of "show hub" counters never

Repeater information (Connected to Ethernet0)
  2792429 bytes seen with 18 collisions, 1 hub resets
  Version/device ID 0/1 (0/1)
  Last clearing of "show hub" counters never
```

The following is sample output from the **show hub** command for hub 0, all ports:

```
Router# show hub ethernet 0

Port 1 of 16 is administratively down, link state is up
  2458 packets input, 181443 bytes
  3 errors with 18 collisions
     (0 FCS, 0 alignment, 0 too long,
      0 short, 3 runts, 0 late,
      0 very long, 0 rate mismatches)
  0 auto partitions, last source address was 0000.0cff.e257
  Last clearing of “show hub” counters never
.
.
.
Port 16 of 16 is down, link state is down
  0 packets input, 0 bytes
  0 errors with 0 collisions
     (0 FCS, 0 alignment, 0 too long,
      0 short, 0 runts, 0 late,
      0 very long, 0 rate mismatches)
  0 auto partitions, last source address (none)
  Last clearing of “show hub” counters never

Repeater information (Connected to Ethernet0)
  2792429 bytes seen with 18 collisions, 1 hub resets
  Version/device ID 0/1 (0/1)
  Last clearing of “show hub” counters never

Internal Port (Connected to Ethernet0)
  36792 packets input, 4349525 bytes
  0 errors with 14 collisions
     (0 FCS, 0 alignment, 0 too long,
      0 short, 0 runts, 0 late,
      0 very long, 0 rate mismatches)
  0 auto partitions, last source address (none)
  Last clearing of “show hub” counters never
```

Table 6-23 describes significant fields show in the display.

Table 6-23 Show Hub Field Descriptions

Field	Description
Port ... of ... is administratively down	Port number out of total ports; indicates whether the interface hardware is currently active, or down due to the following: • The link-state test failed. • The MAC address mismatched when source address configured. • It has been taken down by an administrator.
link state is up	Indicates whether port has been disabled by the link-test function. If the link-test function is disabled by the user, nothing will be shown here.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.

Field	Description
errors	Sum of FCS, alignment, too long, short, runts, very long, and rate mismatches.
collisions	Number of messages retransmitted due to Ethernet collisions.
FCS	Counter for the number of frames detected on the port with an invalid frame check sequence.
alignment	Counter for the number of frames of valid length (64 bytes to 1518 bytes) that have been detected on the port with an FCS error and a framing error.
too long	Counter for the number of frames that exceed the maximum valid packet length of 1518 bytes.
short	Counter for the number of instances when activity is detected with duration less than 74-82 bit times.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size. For example, any Ethernet packet that is less than 64 bytes is considered a runt.
late	Counter for the number of instances when a collision is detected after 480-565 bit times in the frame.
very long	Counter for the number of times the transmitter is active in excess of 4 ms to 7.5 ms.
rate mismatches	Counter for the number of occurrences when the frequency, or data rate of incoming signal is noticably different from the local transmit frequency.
auto partitions	Counter for the number of instances where the repeater has partitioned the port from the network.
last source address	Source address of last packet received by this port. Indicates "none" if no packets have been received since power on or a hub reset.
Last clearing of "show hub" counters	Elapsed time since **clear hub counters** command. Indicates "never" if counters have never been cleared.
Repeater information (Connected to Ethernet0)	Indicates that the following information is about the hub connected to the Ethernet interface shown.
... bytes seen with ... collisions, ... hub resets	Hub resets is the number of times the hub has been reset by network management software or by the **clear hub** command.
Version/device ID 0/1 (0/1)	Hub hardware version. IMR+ version device of daughter board.
Internal Port (Connected to Ethernet0)	Set of counters for the internal AUI port connected to the Ethernet interface.

Related Command

hub

show interfaces

Use the **show interfaces** EXEC command to display statistics for all interfaces configured on the router. The resulting output varies, depending on the network for which an interface has been configured.

show interfaces [*type* {*unit*}] [*first*] [*last*] [**accounting**]
show interfaces [*type slot*/*port*] [**accounting**] (for the Cisco 7000 series)

Syntax Description

type unit	(Optional) Specify that information for a particular interface controller be displayed. Allowed values for type include **async**, **bri0**, **ethernet**, **fddi**, **hssi**, **loopback**, **null**, **serial**, **tokenring**, and **tunnel**. For the Cisco 7000 series, *type* can be **atm**, **ethernet**, **fddi**, **serial**, or **tokenring**. The argument *unit* must match a port number on the selected interface controller.
first last	(Optional) The Cisco 2500 and 3000 support the ISDN Basic Rate Interface (BRI). The argument *first* can be either 1 or 2. The argument *last* can only be 2, indicating B channels 1 and 2. D-channel information is obtained by using the command without the optional arguments.
accounting	(Optional) Displays the number of packets of each protocol type that has been sent through the interface. You can show these numbers for all interfaces, or you can specify a specific *type* and *unit*.
slot	Specifies the backplane slot number and can be 0, 1, 2, 3, or 4.
port	Specifies the port number of the interface and can be 0, 1, 2, 3, 4, or 5 depending on the type of interface, as follows: • AIP (ATM Interface Processor) 0 • EIP (Ethernet Interface Processor) 0, 1, 2, 3, 4, or 5 • FIP (FDDI Interface Processor) 0 • FSIP (Fast Serial Interface Processor) 0, 1, 2, 3, 4, 5, 6, or 7 • HIP (HSSI Interface Processor) 0 • TRIP (Token Ring Interface Processor) 0, 1, 2, or 3

Command Mode

EXEC

Usage Guidelines

The **show interfaces** command displays statistics for the network interfaces. The resulting display on the Cisco 7000 series will show the interface processors in slot order. If you add interface processors after booting the system, they will appear at the end of the list, in the order in which they were inserted.

If you use the **show interfaces** command on the Cisco 7000 series without the *slot/port* arguments, information for all interface types will be shown. For example, if you type **show interfaces ethernet** you will receive information for all ethernet, serial, Token Ring, and FDDI interfaces. Only by adding the *type slot/port* argument can you specify a particular interface.

If you enter a **show interfaces** command for an interface type that has been removed from the router, interface statistics will be displayed accompanied by the following text: "Hardware has been removed."

You will use the **show interfaces** command frequently while configuring and monitoring routers. The various forms of the **show interfaces** commands are described in detail in the sections immediately following this command.

Sample Display

The following is sample output from the **show interfaces** command. Because your display will depend on the type and number of interface cards in your router, only a portion of the display is shown.

```
Router# show interfaces
Ethernet 0 is up, line protocol is up
  Hardware is MCI Ethernet, address is 0000.0c00.750c (bia 0000.0c00.750c)
  Internet address is 131.108.28.8, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 10000 Kbit, DLY 100000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input 0:00:00, output 0:00:00, output hang never
  Last clearing of "show interface" counters 0:00:00
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 2000 bits/sec, 4 packets/sec
     1127576 packets input, 447251251 bytes, 0 no buffer
     Received 354125 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     5332142 packets output, 496316039 bytes, 0 underruns
     0 output errors, 432 collisions, 0 interface resets, 0 restarts
---More---
```

Sample Display Including Custom Queueing Output

When custom queueing is enabled the **show interfaces** command includes the current status of the custom output queues:

```
Last clearing of "show interface" counters 0:00:06
Input queue: 0/75/0 (size/max/drops); Total output drops: 21
Output queues: (queue #: size/max/drops)
   0: 14/20/14 1: 0/20/6 2: 0/20/0 3: 0/20/0 4: 0/20/0 5: 0/20/0
   6: 0/20/0 7: 0/20/0 8: 0/20/0 9: 0/20/0 10: 0/20/0
```

The drops accounted in the (custom) output queues result from bandwidth limitation for the associated traffic that leads to queue length overflow. Total output drops include drops on all custom queues as well as the system queue.

Sample Display with Accounting Option

To display the number of packets of each protocol type that have been sent through all configured interfaces, use the **show interfaces accounting** EXEC command. When you use the **accounting** option, only the accounting statistics are displayed.

Note Except for protocols that are encapsulated inside other protocols, such as IP over X.25, the accounting option also shows the total of all bytes sent and received, including the MAC header. For example, it totals the size of the Ethernet packet or the size of a packet that includes HDLC encapsulation.

Table 6-24 lists the protocols for which per-packet accounting information is kept.

Table 6-24 Per-Packet Counted Protocols

Protocol	Notes
Apollo	No note.
AppleTalk	No note.
ARP	For IP, Apollo, Frame Relay, SMDS.
CLNS	No note.
DEC MOP	The routers use MOP packets to advertise their existence to DEC machines that use the MOP protocol. A router periodically broadcasts MOP packets to identify itself as a MOP host. This results in MOP packets being counted, even when DECnet is not being actively used.
DECnet	No note.
HP Probe	No note.
IP	No note.
LAN Manager	LAN Network Manager and IBM Network Manager.
Novell	No note.
Serial Tunnel	SDLC.
Spanning Tree	No note.
SR Bridge	No note.
Transparent Bridge	No note.
VINES	No note.
XNS	No note.

Sample Display

The following is sample output from the **show interfaces accounting** command:

```
Router# show interfaces accounting

Interface TokenRing0 is disabled

Ethernet0
                Protocol    Pkts In   Chars In   Pkts Out  Chars Out
                      IP     873171  735923409      34624    9644258
                  Novell     163849   12361626      57143    4272468
                 DEC MOP          0          0          1         77
                     ARP      69618    4177080       1529      91740
Interface Serial0 is disabled

Ethernet1
                Protocol    Pkts In   Chars In   Pkts Out  Chars Out
```

```
                      IP          0          0         37      11845
                  Novell          0          0       4591     275460
                 DEC MOP          0          0          1         77
                     ARP          0          0          7        420

Interface Serial1 is disabled
Interface Ethernet2 is disabled
Interface Serial2 is disabled
Interface Ethernet3 is disabled
Interface Serial3 is disabled
Interface Ethernet4 is disabled
Interface Ethernet5 is disabled
Interface Ethernet6 is disabled
Interface Ethernet7 is disabled
Interface Ethernet8 is disabled
Interface Ethernet9 is disabled

Fddi0
                Protocol    Pkts In   Chars In   Pkts Out  Chars Out
                  Novell          0          0        183      11163
                     ARP          1         49          0          0
```

When the output indicates an interface is “disabled,” the router has received excessive errors (over 5000 in a keepalive period).

show interfaces async

Use the **show interfaces async** privileged EXEC command to display information about the serial interface.

show interfaces async[*unit*] [**accounting**]

Syntax Description

unit	(Optional) Must be 1.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show interfaces async** command:

```
Router# show interfaces async 1

Async 1 is up, line protocol is up
   Hardware is Async Serial
Internet address is 1.0.0.1, subnet mask is 255.0.0.0
MTU 1500 bytes, BW 9 Kbit, DLY 100000 usec, rely 255/255, load 56/255
Encapsulation SLIP, keepalive set (0 sec)
Last input 0:00:03, output 0:00:03, output hang never
Last clearing of “show interface” counters never
Output queue 0/3, 2 drops; input queue 0/0, 0 drops
Five minute input rate 0 bits/sec, 1 packets/sec
Five minute output rate 2000 bits/sec, 1 packets/sec
273 packets input, 13925 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
221 packets output, 41376 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets, 0 restarts
0 carrier transitions
```

Table 6-25 describes the fields shown in the display.

Table 6-25 Show Interfaces Async Field Descriptions

Field	Description
Async... is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) and if it has been taken down by an administrator.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol think the line is usable (that is, whether keepalives are successful).
Hardware is	Hardware type.
Internet address is	Internet address and subnet mask, followed by packet size.

Field	Description
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes. The calculation uses the value from the **bandwidth** interface configuration command.
Encapsulation	Encapsulation method assigned to interface.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	The time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.

Field	Description
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum may not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRC's is usually the result of collisions or a station transmitting bad data. On a serial link, CRC's usually indicate noise, gain hits or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be incremented.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. Indicates modem or line problems if the carrier detect line is changing state often.
Protocol	Protocol that is operating on the interface.
Pkts In	Number of packets received for that protocol.
Chars In	Number of characters received for that protocol.

Field	Description
Pkts Out	Number of packets transmitted for that protocol.
Chars Out	Number of characters transmitted for that protocol.

Sample Display with Accounting Option

The following is a sample display from the **show interfaces async accounting** command:

```
Router# show interfaces async 0 accounting

Async 0
   Protocol  Pkts In   Chars In  Pkts Out   Chars Out
   IP        7344      4787842   1803       1535774
   DEC MOP   0         0         127        9779
   ARP       7         420       39         2340
```

The **show line** and **show slip** commands can also be useful in monitoring asynchronous interfaces.

show interfaces atm

Use the **show interfaces atm** privileged EXEC command to display information about the ATM interface.

show interfaces atm [*slot*/*port*]

Syntax Description

slot/*port*	(Optional) Slot on the Cisco 7000 can be 0, 1, 2, 3, or 4. On the Cisco 7010, slot can be 0, 1, or 2. Port must be 0.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show interfaces atm** command:

```
Router# show interfaces atm4/0

ATM4/0 is up, line protocol is up
  Hardware is cxBus ATM
  Internet address is 131.108.97.165, subnet mask is 255.255.255.0
  MTU 4470 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ATM, loopback not set, keepalive set (10 sec)
  Encapsulation(s): AAL5, PVC mode
  256 TX buffers, 256 RX buffers, 1024 Maximum VCs, 1 Current VCs
  Signalling vc = 1, vpi = 0, vci = 5
  ATM NSAP address: BC.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.13
  Last input 0:00:05, output 0:00:05, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     144 packets input, 3148 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     154 packets output, 4228 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets, 0 restarts
```

Table 6-26 describes the fields shown in the display.

Table 6-26 Show Interfaces ATM Field Descriptions

Field	Description
ATM... is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) and if it has been taken down by an administrator.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol think the line is usable (that is, whether keepalives are successful).
Hardware is	Hardware type.
Internet address is	Internet address and subnet mask.

Field	Description
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes. The calculation uses the value from the **bandwidth** interface configuration command.
Encapsulation	Encapsulation method assigned to interface.
Encapsulation(s)	AAL5, PVC or SVC mode.
TX buffers	Number of buffers configured with the **atm txbuff** command.
RX buffers	Number of buffers configured with the **atm rxbuff** command.
Maximum VCs	Maximum number of virtual circuits.
Current VCs	Current number of virtual circuits.
Signaling VC	Number of the signaling PVC.
vpi	Virtual path identifier number.
vci	Virtual channel identifier number.
ATM NSAP address	NSAP address of the ATM interface.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	The time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.

Field	Description
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum may not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRC's is usually the result of collisions or a station transmitting bad data. On a serial link, CRC's usually indicate noise, gain hits or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be incremented.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.

Field	Description
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.

show interfaces ethernet

Use the **show interfaces ethernet** privileged EXEC command to display information about an Ethernet interface on the router.

show interfaces ethernet *unit* [**accounting**]
show interfaces ethernet [*slot/port*] [**accounting**] (for the Cisco 7000 series)

Syntax Description

unit	Must match a port number on the selected interface.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
slot	(Optional) On the Cisco 7000 series, slot location of the interface processor.
port	(Optional) On the Cisco 7000 series, port number on interface.

Command Mode

Privileged EXEC

Usage Guidelines

If you do not provide values for the argument *unit* (or *slot* and *port* on the Cisco 7000 series), the command will display statistics for all network interfaces. The optional keyword **accounting** displays the number of packets of each protocol type that have been sent through the interface.

Sample Display

The following is sample output from the **show interfaces** command for the Ethernet 0 interface:

```
Router# show interfaces ethernet 0

Ethernet 0 is up, line protocol is up
   Hardware is MCI Ethernet, address is aa00.0400.0134 (bia 0000.0c00.4369)
   Internet address is 131.108.1.1, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
   Encapsulation ARPA, loopback not set, keepalive set (10 sec)
   ARP type: ARPA, PROBE, ARP Timeout 4:00:00
   Last input 0:00:00, output 0:00:00, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 2 drops
   Five minute input rate 61000 bits/sec, 4 packets/sec
   Five minute output rate 1000 bits/sec, 2 packets/sec
       2295197 packets input, 305539992 bytes, 0 no buffer
       Received 1925500 broadcasts, 0 runts, 0 giants
       3 input errors, 3 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       0 input packets with dribble condition detected
       3594664 packets output, 436549843 bytes, 0 underruns
       8 output errors, 1790 collisions, 10 interface resets, 0 restarts
       0 output buffer failures, 0 output buffers swapped out
```

Table 6-27 describes significant fields shown in the display.

Table 6-27 Show Interfaces Ethernet Field Descriptions

Field	Description
Ethernet ... is up ...is administratively down	Indicates whether the interface hardware is currently active and if it has been taken down by an administrator. “Disabled” indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol believe the interface is usable (that is, whether keepalives are successful) or if it has been taken down by an administrator.
Hardware	Hardware type (for example, MCI Ethernet, SCI, cBus Ethernet) and address.
Internet address	Internet address followed by subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
ARP type:	Type of Address Resolution Protocol assigned.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by the interface. Useful for knowing when a dead interface failed.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.

Field	Description
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic it sends and receives (rather than all network traffic). The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received ... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size. For instance, any Ethernet packet that is less than 64 bytes is considered a runt.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size. For example, any Ethernet packet that is greater than 1,518 bytes is considered a giant.
input error	Includes runts, giants, no buffer, CRC, frame, overrun, and ignored counts. Other input-related errors can also cause the input errors count to be increased, and some datagrams may have more than one error; therefore, this sum may not balance with the sum of enumerated input error counts.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a LAN, this is usually the result of collisions or a malfunctioning Ethernet device.
overrun	Number of times the receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
input packets with dribble condition detected	Dribble bit error indicates that a frame is slightly too long. This frame error counter is incremented just for informational purposes; the router accepts the frame.
packets output	Total number of messages transmitted by the system.

Field	Description
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This is usually the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times a Type 2 Ethernet controller was restarted because of errors.
output buffer failures	Number of times that a packet was not output from the output hold queue because of a shortage of MEMD shared memory,
output buffers swapped out	Number of packets stored in main memory when the output queue is full; swapping buffers to main memory prevents packets from being dropped when output is congested. The number is high when traffic is bursty.

Sample Display on Cisco 7000

The following sample output illustrates the **show interfaces ethernet** command on the Cisco 7000:

```
Router> show interfaces ethernet 4/2

Ethernet4/2 is up, line protocol is up
  Hardware is cxBus Ethernet, address is 0000.0c02.d0ce (bia 0000.0c02.d0ce)
  Internet address is 131.108.7.1, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input 0:00:00, output 0:00:09, output hang never
  Last clearing of "show interface" counters 0:56:40
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 3000 bits/sec, 4 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     4961 packets input, 715381 bytes, 0 no buffer
     Received 2014 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     567 packets output, 224914 bytes, 0 underruns
     0 output errors, 168 collisions, 0 interface resets, 0 restarts
```

Sample Display with Accounting Option

The following is sample output from the **show interfaces ethernet** command with the **accounting** option on the Cisco 7000:

```
Router# show interfaces ethernet 4/2 accounting

Ethernet4/2
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

show interfaces fastethernet

To display information about the FastEthernet interfaces, use the **show interface fastethernet** EXEC command.

show interfaces fastethernet [*number*] (Cisco 4500 series and Cisco 4700 series)
show interfaces fastethernet [*slot*/*port*] (Cisco 7000 series and Cisco 7200 series)
show interfaces fastethernet [*slot*/*port-adapter*/*port*] (Cisco 7500 series with a VIP card)

Syntax Description

number	(Optional) Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 router, specifies the NIM or NPM number. The numbers are assigned at the factory at the time of installation or when added to a system.
slot	(Optional) On the Cisco 7000 series, slot location of the FEIP. On the Cisco 7200, slot 0 is the Fast Ethernet port on the I/O controller.
port	(Optional) On the Cisco 7000 family, port number on the interface.
port-adapter	(Optional) On the Cisco 7000 and Cisco 7500 series, port bay on a VIP card. The value can be 0 or 1.

Command Mode

EXEC

Sample Display

The following is a sample display for the show interface fastethernet on a Cisco 4500 router:

```
c4500-1# show interfaces fastethernet 0

FastEthernet0 is up, line protocol is up
  Hardware is DEC21140, address is 0000.0c0c.1111 (bia 0002.eaa3.5a60)
  Internet address is 11.0.0.1 255.0.0.0
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive not set, hdx, 100BaseTX
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input never, output 0:00:16, output hang 0:28:01
  Last clearing of “show interface” counters 0:20:05
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 1786161921 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     67 packets output, 8151 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets, 0 restarts
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

The following shows information specific to the first FEIP port in slot 0 on a Cisco 7000 router:

```
Router# show interface fastethernet 0/1
FastEthernet0/1 is administratively down, line protocol is down
  Hardware is cxBus FastEthernet, address is 0000.0c35.dc16 (bia 0000.0c35.dc16)
  Internet address is 1.1.0.64 255.255.0.0
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive not set, half-duplex, RJ45 (or MII)
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input never, output 2:03:52, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 1 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 watchdog, 0 multicast
     0 input packets with dribble condition detected
     5 packets output, 805 bytes, 0 underruns
     0 output errors, 0 collisions, 4 interface resets, 0 restarts
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Table 1 describes the fields in these displays.

Table 1 Show Interfaces FastEthernet Field Descriptions

Field	Description
FastEthernet0 is ... is up ...is administratively down	Indicates whether the interface hardware is currently active and if it has been taken down by an administrator.
line protocol is	Indicates whether the software processes that handle the line protocol consider the line usable or if it has been taken down by an administrator.
Hardware	Hardware type (for example, MCI Ethernet, SCI, cBus Ethernet) and address.
Internet address	Internet address followed by subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
ARP type:	Type of Address Resolution Protocol assigned.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.

Table 1 Show Interfaces FastEthernet Field Descriptions (Continued)

Field	Description
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by the interface. Useful for knowing when a dead interface failed.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. If the interface is not in promiscuous mode, it senses network traffic it sends and receives (rather than all network traffic). The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received ... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size. For instance, any Ethernet packet that is less than 64 bytes is considered a runt.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size. For example, any Ethernet packet that is greater than 1,518 bytes is considered a giant.
input errors	Includes runts, giants, no buffer, CRC, frame, overrun, and ignored counts. Other input-related errors can also cause the input errors count to be increased, and some datagrams may have more than one error; therefore, this sum may not balance with the sum of enumerated input error counts.

Table 1 Show Interfaces FastEthernet Field Descriptions (Continued)

Field	Description
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a LAN, this is usually the result of collisions or a malfunctioning Ethernet device.
overrun	Number of times the receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Number of packets whose receipt was aborted.
watchdog	Number of times watchdog receive timer expired. It happens when receiving a packet with length greater than 2048.
multicast	Number of multicast packets received.
input packets with dribble condition detected	Dribble bit error indicates that a frame is slightly too long. This frame error counter is incremented just for informational purposes; the router accepts the frame.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This is usually the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times a Type 2 Ethernet controller was restarted because of errors.

Table 1 Show Interfaces FastEthernet Field Descriptions (Continued)

Field	Description
babbles	The transmit jabber timer expired.
late collision	Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble.
deferred	Deferred indicates that the chip had to defer while ready to transmit a frame because the carrier was asserted.
lost carrier	Number of times the carrier was lost during transmission.
no carrier	Number of times the carrier was not present during the transmission.
output buffer failures	Number of times that a packet was not output from the output hold queue because of a shortage of MEMD shared memory,
output buffers swapped out	Number of packets stored in main memory when the output queue is full; swapping buffers to main memory prevents packets from being dropped when output is congested. The number is high when traffic is bursty.

show interfaces fddi

Use the **show interfaces fddi** EXEC command to display information about the FDDI interface.

show interfaces fddi *unit* [**accounting**]
show interfaces fddi [*slot*/*port*] [**accounting**] (for the Cisco 7000 series)

Syntax Description

unit	Must match a port number on the selected interface.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
slot	(Optional) On the Cisco 7000 series, slot location of the interface processor.
port	(Optional) On the Cisco 7000 series, port number on interface.

Command Mode

EXEC

Sample Displays

The following is a sample partial display of FDDI-specific data from the **show interfaces fddi** command:

```
Router> show interfaces fddi 0

Fddi0 is up, line protocol is up
  Hardware is cBus Fddi, address is 0000.0c06.8de8 (bia 0000.0c06.8de8)
  Internet address is 131.108.33.9, subnet mask is 255.255.255.0
  MTU 4470 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation SNAP, loopback not set, keepalive not set
  ARP type: SNAP, ARP Timeout 4:00:00
  Phy-A state is  active, neighbor is   B, cmt signal bits 008/20C, status ILS
  Phy-B state is connect, neighbor is unk, cmt signal bits 20C/000, status QLS
  ECM is insert, CFM is c_wrap_a, RMT is ring_op
  token rotation 5000 usec, ring operational 1d01
  Upstream neighbor 0000.0c06.8b7d, downstream neighbor 0000.0c06.8b7d
  Last input 0:00:08, output 0:00:08, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 5000 bits/sec, 1 packets/sec
  Five minute output rate 76000 bits/sec, 51 packets/sec
     852914 packets input, 205752094 bytes, 0 no buffer
     Received 126752 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     8213126 packets output, 616453062 bytes, 0 underruns
     0 output errors, 0 collisions, 4 interface resets, 0 restarts
     5 transitions, 0 traces
```

The following is a sample partial display of FDDI-specific data from the **show interfaces fddi** command on a Cisco 7000:

```
Router> show interfaces fddi 3/0

Fddi3/0 is up, line protocol is up
  Hardware is cxBus Fddi, address is 0000.0c02.adf1 (bia 0000.0c02.adf1)
  Internet address is 131.108.33.14, subnet mask is 255.255.255.0
  MTU 4470 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation SNAP, loopback not set, keepalive not set
  ARP type: SNAP, ARP Timeout 4:00:00
  Phy-A state is  active, neighbor is   B, cmt signal bits 008/20C, status ILS
  Phy-B state is  active, neighbor is   A, cmt signal bits 20C/008, status ILS
  ECM is in, CFM is thru, RMT is ring_op
  Token rotation 5000 usec, ring operational 21:32:34
  Upstream neighbor 0000.0c02.ba83, downstream neighbor 0000.0c02.ba83
  Last input 0:00:05, output 0:00:00, output hang never
  Last clearing of "show interface" counters 0:59:10
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 69000 bits/sec, 44 packets/sec
  Five minute output rate 0 bits/sec, 1 packets/sec
     113157 packets input, 21622582 bytes, 0 no buffer
     Received 276 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     4740 packets output, 487346 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets, 0 restarts
     0 transitions, 2 traces, 3 claims, 2 beacons
```

The following is an example that includes the **accounting** option. When you use the **accounting** option, only the accounting statistics are displayed.

```
Router> show interfaces fddi 3/0 accounting

Fddi3/0
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

Table 6-28 describes the **show interfaces fddi** display fields.

Table 6-28 Show Interfaces FDDI Field Descriptions

Field	Description
Fddi is {up |down} ...is administratively down	Gives the interface processor unit number and tells whether the interface hardware is currently active and can transmit and receive or if it has been taken down by an administrator. "Disabled" indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.
line protocol is {up | down | administratively down}	Indicates whether the interface hardware is currently active and can transmit and receive or if it has been taken down by an administrator.
Hardware	Provides the hardware type, followed by the hardware address.
Internet address	IP address, followed by subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.

DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether or not loopback is set.
keepalive	Indicates whether or not keepalives are set.
ARP type:	Type of Address Resolution Protocol assigned.
Phy-{A | B}	Lists the state the Physical A or Physical B connection is in; one of: off, active, trace, connect, next, signal, join, verify, or break.
neighbor	State of the neighbor: • A—Indicates that the CMT process has established a connection with its neighbor. The bits received during the CMT signaling process indicate that the neighbor is a Physical A type dual-attachment station or concentrator that attaches to the primary ring IN and the secondary ring OUT when attaching to the dual ring. • S—Indicates that the CMT process has established a connection with its neighbor and that the bits received during the CMT signaling process indicate that the neighbor is one Physical type in a single-attached station (SAS). •B—Indicates that the CMT process has established a connection with its neighbor and that the bits received during the CMT signaling process indicate that the neighbor is a Physical B dual-attached station or concentrator that attaches to the secondary ring IN and the primary ring OUT when attaching to the dual ring. • M—Indicates that the CMT process has established a connection with its neighbor and that the bits received during the CMT signaling process indicate that the router's neighbor is a Physical M-type concentrator that serves as a Master to a connected station or concentrator. • unk—Indicates that the network server has not completed the CMT process, and as a result, does not know about its neighbor. See the section "Setting Bit Control" for an explanation of the bit patterns.
cmt signal bits	Shows the transmitted/received CMT bits. The transmitted bits are 0x008 for a Physical A type and 0x20C for Physical B type. The number after the slash (/) is the received signal bits. If the connection is not active, the received bits are zero (0); see the line beginning Phy-B earlier in this display.

status	Status value displayed is the actual status on the fiber. The FDDI standard defines the following values: • LSU—Line State Unknown, the criteria for entering or remaining in any other line state have not been met. • NLS—Noise Line State is entered upon the occurrence of 16 potential noise events without satisfying the criteria for entry into another line state. • MLS—Master Line State is entered upon the reception of eight or nine consecutive HQ or QH symbol pairs. • ILS—Idle Line State is entered upon receipt of four or five idle symbols. • HLS—Halt Line State is entered upon the receipt of 16 or 17 consecutive H symbols. • QLS—Quiet Line State is entered upon the receipt of 16 or 17 consecutive Q symbols or when carrier detect goes low. • ALS—Active Line State is entered upon receipt of a JK symbol pair when carrier detect is high. • OVUF—Elasticity buffer Overflow/Underflow. The normal states for a connected Physical type are ILS or ALS. If the report displays the QLS status, this indicates that the fiber is disconnected from Physical B, or that it is not connected to another Physical type, or that the other station is not running.
Off	Indicates that the CMT is not running on the Physical Sublayer. The state will be off if the interface has been shutdown or if the **cmt disconnect** command has been issued for Physical A or Physical B.
Brk	Break State is the entry point in the start of a PCM connection.
Tra	Trace State localizes a stuck beacon condition.
Con	Connect State is used to synchronize the ends of the connection for the signaling sequence.
Nxt	Next State separates the signaling performed in the Signal State and transmits Protocol Data Units (PDUs) while MAC Local Loop is performed.
Sig	Signal State is entered from the Next State when a bit is ready to be transmitted.
Join	Join State is the first of three states in a unique sequence of transmitted symbol streams received as line states—the Halt Line State, Master Line State, and Idle Line State, or HLS-MLS-ILS—that leads to an active connection.
Vfy	Verify State is the second state in the path to the Active State and will not be reached by a connection that is not synchronized.
Act	Active State indicates that the CMT process has established communications with its physical neighbor. The transition states are defined in the X3T9.5 specification. You are referred to the specification for details about these states.

ECM is ...	ECM is the SMT entity coordination management, which overlooks the operation of CFM and PCM. The ECM state can be one of the following: • out—The router is isolated from the network. • in—The router is actively connected to the network. This is the normal state for a connected router. • trace—The router is trying to localize a stuck beacon condition. • leave—The router is allowing time for all the connections to break before leaving the network. • path_test—The router is testing its internal paths. • insert—The router is allowing time for the optical bypass to insert. • check—The router is making sure optical bypasses switched correctly. • deinsert—The router is allowing time for the optical bypass to deinsert.
CFM is ...	Contains information about the current state of the MAC connection. The Configuration Management (CFM) state can be one of the following: • isolated—The MAC is not attached to any Physical type. • _wrap_a—The MAC is attached to Physical A. Data is received on Physical A and transmitted on Physical A. • wrap b—The MAC is attached to Physical B. Data is received on Physical B and transmitted on Physical B. • wrap_s—The MAC is attached to Physical S. Data is received on Physical S and transmitted on Physical S. This is the normal mode for a single attachment station (SAS). • thru—The MAC is attached to Physical A and B. Data is received on Physical A and transmitted on Physical B. This is the normal mode for a dual attachment station (DAS) with one MAC. The ring has been operational for 1 minute and 42 seconds.
RMT is ...	RMT (Ring Management) is the SMT MAC-related state machine. The RMT state can be one of the following: • isolated—The MAC is not trying to participate in the ring. This is the initial state. • non_op—The MAC is participating in ring recovery and ring is not operational. • ring_op—The MAC is participating in an operational ring. This is the normal state while the MAC is connected to the ring. • detect—The ring has been nonoperational for longer than normal. Duplicate address conditions are being checked. • non_op_dup—Indications have been received that the address of the MAC is a duplicate of another MAC on the ring. Ring is not operational. • ring_op_dup—Indications have been received that the address of the MAC is a duplicate of another MAC on the ring. Ring is operational in this state. • directed—The MAC is sending beacon frames notifying the ring of the stuck condition. • trace—Trace has been initiated by this MAC and the RMT state machine is waiting for its completion before starting an internal path test.

token rotation	Token rotation value is the default or configured rotation value as determined by the**fddi token-rotation-time** command. This value is used by all stations on the ring. The default is 5000 microseconds.
ring operational	When the ring is operational, the displayed value will be the negotiated token rotation time of all stations on the ring. Operational times are displayed by the number of hours:minutes:seconds the ring has been up. If the ring is not operational, the message "ring not operational" is displayed.
Upstream | downstream neighbor	Displays the canonical MAC address of outgoing upstream and downstream neighbors. If the address is unknown, the value will be the FDDI unknown address (0x00 00 f8 00 00 00).
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five-minute input rate Five-minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The five-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.

giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data.
frame	Number of packets received incorrectly that have a CRC error and a noninteger number of octets. On a LAN, this is usually the result of collisions or a malfunctioning Ethernet device. On an FDDI LAN, this also may be the result of a failing fiber (cracks) or a hardware malfunction.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of transmit aborts (when the router cannot feed the transmitter fast enough).
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, because some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Because an FDDI ring cannot have collisions, this statistic is always zero.
interface resets	Number of times an interface has been reset. The interface may be reset by the administrator or automatically when an internal error occurs.
restarts	Should always be zero for FDDI interfaces.
transitions	The number of times the ring made a transition from ring operational to ring nonoperational, or vice versa. A large number of transitions indicates a problem with the ring or the interface.
traces	Trace count applies to both the FCI, FCIT, and FIP. Indicates the number of times this interface started a trace.
claims	Pertains to FCIT and FIP only. Indicates the number of times this interface has been in claim state.
beacons	Pertains to FCIT and FIP only. Indicates the number of times the interface has been in beacon state.
Protocol	Protocol that is operating on the interface.
Pkts In	Number of packets received for that protocol.
Chars In	Number of characters received for that protocol.

Pkts Out	Number of packets transmitted for that protocol.
Chars Out	Number of characters transmitted for that protocol.

show interfaces hssi

Use the **show interfaces hssi** privileged EXEC command to display information about the HSSI interface.

show interfaces hssi *unit* [**accounting**]
show interfaces hssi [*slot*/*port*] [**accounting**] (for the Cisco 7000 series)

Syntax Description

unit	Must match a port number on the selected interface.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
slot	(Optional) On the Cisco 7000 series, slot location of the interface processor.
port	(Optional) On the Cisco 7000 series, port number on interface.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show interfaces hssi** command when HSSI is enabled:

```
Router# show interfaces hssi 0

HSSI 0 is up, line protocol is up
Hardware is cBus HSSI
Internet address is 150.136.67.190, subnet mask is 255.255.255.0
MTU 4470 bytes, BW 45045 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set, keepalive set (10 sec)
Last input 0:00:03, output 0:00:00, output hang never
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
Five minute input rate 0 bits/sec, 0 packets/sec
Five 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 parity, 0 rx disabled
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
17 packets output, 994 bytes, 0 underruns
0 output errors, 0 applique, 4 interface resets, 0 restarts
2 carrier transitions
```

Table 6-29 describes significant fields shown in the display.

Table 6-29 Show Interfaces HSSI Field Descriptions

Field	Description
HSSI is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) and if it has been taken down by an administrator. "Disabled" indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol considers the line usable (that is, whether keepalives are successful).
Hardware	Specifies the hardware type.
Internet address	Lists the Internet address followed by subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set and type of loopback test.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops Input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes.
packets input	Total number of error-free packets received by the system.

Field	Description
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
parity	Report of the parity errors on the HSSI.
rx disabled	Indicates the HSSI could not find a free buffer on the ciscoBus controller to reserve for use for the HSSI receiver. When this happens, the HSSI shuts down its receiver and waits until a buffer is available. Data is not lost unless a packet comes in and overflows the HSSI FIFO. Usually, the receive disables are frequent but do not last for long, and the number of dropped packets is less than the count in the "rx disabled" field. A receive disabled condition can happen in systems that are under heavy traffic load and that have shorter packets. In this situation, the number of buffers available on the ciscoBus controller is at a premium. One way to alleviate this problem is to reduce the mtu on the HSSI interface from 4500 (FDDI size) to 1500 (Ethernet size). Doing so allows the software to take the fixed memory of the ciscoBus controller and divide it into a larger number of smaller buffers, rather than a small number of large buffers. Receive disables are not errors, so they are not included in any error counts.
input errors	Sum of all errors that prevented the receipt of datagrams on the interface being examined. This may not balance with the sum of the enumerated output errors, because some datagrams may have more than one error and others may have errors that do not fall into any of the specifically tabulated categories.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link. CRC errors are also reported when a far-end abort occurs, and when the idle flag pattern is corrupted. This makes it possible to get CRC errors even when there is no data traffic.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.

Field	Description
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Number of packets whose receipt was aborted.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end router's receiver can handle. This may never happen (be reported) on some interfaces.
congestion drop	Number of messages discarded because the output queue on an interface grew too long. This can happen on a slow, congested serial link.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
applique	Indicates an unrecoverable error has occurred on the HSA applique. The system then invokes an interface reset.
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. Indicates modem or line problems if the carrier detect line is changing state often.
Protocol	Protocol that is operating on the interface.
Pkts In	Number of packets received for that protocol.
Chars In	Number of characters received for that protocol.
Pkts Out	Number of packets transmitted for that protocol.
Chars Out	Number of characters transmitted for that protocol.

The following is an example of the **show interfaces hssi** command on a Cisco 7000:

```
Router# show in hssi 1/0
```

```
Hssi1/0 is up, line protocol is up
  Hardware is cxBus HSSI
  Internet address is 131.108.38.14, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 45045 Kbit, DLY 1000000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 0:00:00, output 0:00:08, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 1000 bits/sec, 2 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     630573548 packets input, 2077237628 bytes, 0 no buffer
     Received 2832063 broadcasts, 0 runts, 0 giants
              0 parity, 1970 rx disabled
     113 input errors, 20 CRC, 93 frame, 0 overrun, 0 ignored, 0 abort
     629721628 packets output, 1934313295 bytes, 0 underruns
     0 output errors, 0 applique, 62 interface resets, 0 restarts
     309 carrier transitions
```

The following is an example of the **show interfaces hssi** command with the **accounting** option on a Cisco 7000:

```
Router# show interfaces hssi 1/0 accounting

HIP1/0
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

show interfaces lex

To display statistics about a LAN Extender interface, use the **show interface lex** EXEC command.

show interfaces lex *number* [**ethernet** | **serial**]

Syntax Description

number	Number of the LAN Extender interface that resides on the core router about which to display statistics.
ethernet	(Optional) Displays statistics about the Ethernet interface that resides on the LAN Extender chassis.
serial	(Optional) Displays statistics about the serial interface that resides on the LAN Extender chassis.

Command Mode

EXEC

Usage Guidelines

To display statistics about the LAN Extender interface on the core router, use the **show interfaces lex** command without any keywords.

Administratively, the physical serial interface that connects the core router to the LAN Extender is completely hidden. The **show interfaces serial** command will show only that the serial interface is present. However, it will not report any statistics about the traffic passing over the physical line. All statistics are report by the **show interfaces lex** command.

Sample Displays

The following is sample output from the **show interfaces lex** command, showing the LAN Extender interface on the host router. Note the "Bound to ..." field, which is displayed only on a LAN Extender interface.

```
Router# show interfaces lex 0

Lex0 is up, line protocol is up
  Hardware is Lan Extender, address is 0204.0301.1526 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 10000 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set
  ARP type: ARPA, ARP Timeout 4:00:00
  Bound to Serial3
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 1000 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     1022 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     2070 packets output, 23663 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets, 0 restarts
```

The following is sample output from the **show interfaces lex** command when you specify the **ethernet** keyword:

```
Router# show interfaces lex 0 ethernet

Lex0-Ethernet0 is up, line protocol is up
  Hardware is LAN-Extender, address is 0000.0c01.1526 (bia 0000.0c01.1526)
  Last input 6w3d, output 6w3d
  Last clearing of "show interface" counters 0:02:30
  Output queue 40/50, 60 drops; input queue 10/40, 2 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     3916 packets input, 960303 bytes, 3 no buffer
     Received 2 broadcasts, 3 runts, 3 giants
     2 input errors, 1 CRC, 1 frame, 1 overrun, 3 ignored, 2 abort
     2500 packets output, 128288 bytes, 1 underruns
     1 output errors, 1 collisions, 0 interface resets, 0 restarts
```

The following is sample output from the **show interfaces lex** command when you specify the **serial** keyword:

```
Router# show interfaces lex 0 serial

Lex0-Serial0 is up, line protocol is up
  Hardware is LAN-Extender
  Last input 6w3d, output 6w3d
  Last clearing of "show interface" counters 0:03:05
  Input queue: 5/15/4 (size/max/drops); Total output drops: 450
  Output queue: high 25/35/90, medium 70/80/180, normal 40/50/120, low 10/20/60
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     1939 packets input, 30998 bytes, 6 no buffer
     Received 4 broadcasts, 6 runts, 6 giants
     4 input errors, 2 CRC, 2 frame, 2 overrun, 6 ignored, 4 abort
     1939 packets output, 219535 bytes, 2 underruns
     2 output errors, 2 collisions, 0 interface resets, 0 restarts
     2 carrier transitions
```

Table 6-30 describes the fields shown in these displays.

Table 6-30 Show Interfaces Lex Field Descriptions

Field	Description
Lex0 is up, line protocol is up	Indicates whether the logical LAN Extender interface on the core router is currently active (that is, whether carrier detect is present) and whether it has been taken down by an administrator.
Lex0-Ethernet0 is up, line protocol is up Lex0-Serial0 is up, line protocol is up	Indicates whether the physical Ethernet and serial interfaces on the LAN Extender chassis are currently active (that is, whether carrier detect is present) and if it has been taken down by an administrator.
Hardware is LAN-Extender	Hardware type of the interfaces on the LAN Extender.
address is...	Logical MAC address of the interface.
bia	Burned-in MAC address of the interface. The LAN Extender interface does not have a burned in address; hence it appears as all zeroes.
MTU	Maximum transmission unit size of the interface.

Field	Description
BW	Value of the bandwidth parameter that has been configured for the interface (in kilobits per second). The bandwidth parameter is used to compute IGRP metrics only. If the interface is attached to a serial line with a line speed that does not match the default (1536 or 1544 for T1 and 56 for a standard synchronous serial line), use the **bandwidth** command to specify the correct line speed for this serial line.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
ARP type	Type of Address Resolution Protocol assigned.
ARP Timeout	Number of hours, minutes, and seconds an ARP cache entry will stay in the cache.
Bound to ...	Number of the serial interface to which the logical LAN Extender interface is bound.
Last input	Number of hours, minutes, and seconds (or never) since the last packet was successfully received by an interface. This is useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds (or never) since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing of "show interface" counters	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 231ms (and less than 232ms) ago
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.

Field	Description
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received ... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
input packets with dribble condition detected	Does not apply to a LAN Extender interface.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This might never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this might not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This usually is the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). Some collisions are normal. However, if your collision rate climbs to around 4 or 5%, you should consider verifying that there is no faulty equipment on the segment and/or moving some existing stations to a new segment. A packet that collides is counted only once in output packets.

Field	Description
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds' time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.

show interfaces loopback

Use the **show interfaces loopback** privileged EXEC command to display information about the loopback interface.

show interfaces loopback [*unit*] [**accounting**]

Syntax Description

unit	(Optional) Must match a port number on the selected interface.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.

Command Mode

Privileged EXEC

Sample Displays

The following is sample output from the **show interfaces loopback** command:

```
Router# show interfaces loopback 0

Loopback0 is up, line protocol is up
  Hardware is Loopback
  MTU 1500 bytes, BW 1 Kbit, DLY 50 usec, rely 255/255, load 1/255
  Encapsulation UNKNOWN, loopback not set, keepalive set (10 sec)
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/0, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five 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 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 restarts
```

The following is sample output when the **accounting** keyword is included:

```
Router# show interfaces loopback 0 accounting

Loopback0
                Protocol    Pkts In   Chars In   Pkts Out  Chars Out
No traffic sent or received on this interface.
```

Table 6-31 describes significant fields shown in the displays.

Table 6-31 Show Interfaces Loopback Descriptions

Field	Description
Loopback is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) and if it has been taken down by an administrator. “Disabled” indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.

Field	Description
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol considers the line usable (that is, whether keepalives are successful).
Hardware	Hardware is Loopback.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set and type of loopback test.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops Input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.

Field	Description
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Sum of all errors that prevented the receipt of datagrams on the interface being examined. This may not balance with the sum of the enumerated output errors, because some datagrams may have more than one error and others may have errors that do not fall into any of the specifically tabulated categories.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of collisions or a station transmitting bad data. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link. CRC errors are also reported when a far-end abort occurs, and when the idle flag pattern is corrupted. This makes it possible to get CRC errors even when there is no data traffic.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Number of packets whose receipt was aborted.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end router's receiver can handle. This may never happen (be reported) on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	A loopback interface does not have collisions.

Field	Description
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.
Protocol	Protocol that is operating on the interface.
Pkts In	Number of packets received for that protocol.
Chars In	Number of characters received for that protocol.
Pkts Out	Number of packets transmitted for that protocol.
Chars Out	Number of characters transmitted for that protocol.

show interfaces serial

Use the **show interfaces serial** privileged EXEC command to display information about a serial interface.

show interfaces serial [*number*] [**accounting**]
show interfaces serial [*slot*/*port*] [**accounting**] (for the Cisco 7000 series)

Syntax Description

number	(Optional) Must match the interface port number.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
slot	(Optional) On the Cisco 7000 series, slot location of the interface processor.
port	(Optional) On the Cisco 7000 series, port number on interface.

Command Mode

Privileged EXEC

Sample Display

The following is sample output from the **show interfaces** command for a synchronous serial interface:

```
Router# show interfaces serial

Serial 0 is up, line protocol is up
   Hardware is MCI Serial
   Internet address is 150.136.190.203, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation HDLC, loopback not set, keepalive set (10 sec)
   Last input 0:00:07, output 0:00:00, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 0 packets/sec
   Five minute output rate 0 bits/sec, 0 packets/sec
       16263 packets input, 1347238 bytes, 0 no buffer
       Received 13983 broadcasts, 0 runts, 0 giants
       2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
1 carrier transitions

     22146 packets output, 2383680 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets, 0 restarts
```

Table 6-32 describes significant fields shown in the display.

Table 6-32 Show Interfaces Serial Field Descriptions

Field	Description
Serial ... is {up | down} ...is administratively down	Indicates whether the interface hardware is currently active (whether carrier detect is present) and if it has been taken down by an administrator. "Disabled" indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.
line protocol is {up | down}	Indicates whether the software processes that handle the line protocol consider the line usable (that is, whether keepalives are successful) or if it has been taken down by an administrator.
Hardware is	Specifies the hardware type.
Internet address is	Specifies the Internet address and subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW 1544 Kbit	Indicates the value of the bandwidth parameter that has been configured for the interface (in kilobits per second). The bandwidth parameter is used to compute IGRP metrics only. If the interface is attached to a serial line with a line speed that does not match the default (1536 or 1544 for T1 and 56 for a standard synchronous serial line), use the **bandwidth** command to specify the correct line speed for this serial line.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.

Field	Description
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
Received ... broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input error	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum may not balance with the other counts.
CRC	Cyclic redundancy checksum generated by the originating station or far-end device does not match the checksum calculated from the data received. On a serial link, CRCs usually indicate noise, gain hits, or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the transmitter has been running faster than the router can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This usually is the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). Some collisions are normal. However, if your collision rate climbs to around 4 or 5%, you should consider verifying that there is no faulty equipment on the segment and/or moving some existing stations to a new segment. A packet that collides is counted only once in output packets.

Field	Description
interface resets	Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds' time. On a serial line, this can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a serial interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.
carrier transitions	Number of times the carrier detect signal of a serial interface has changed state. For example, if data carrier detect (DCD) goes down and comes up, the carrier transition counter will increment two times. Indicates modem or line problems if the carrier detect line is changing state often.
alarm indications, remote alarms, rx LOF, rx LOS	Number of CSU/DSU alarms, and number of occurrences of receive loss of frame and receive loss of signal.
BER inactive, NELR inactive, FELR inactive	Status of G.703-E1 counters for bit error rate (BER) alarm, near-end loop remote (NELR), and far-end loop remote (FELR). Note that you cannot set the NELR or FELR.

The following is sample output of the **show interfaces serial** command for the HDLC synchronous serial interface on a Cisco 7000:

```
Router# show interfaces serial 1/0

Serial1/0 is up, line protocol is up
  Hardware is cxBus Serial
  Internet address is 150.136.190.203, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 0:00:07, output 0:00:00, output hang never
  Last clearing of "show interface" counters 2w4d
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     16263 packets input, 1347238 bytes, 0 no buffer
     Received 13983 broadcasts, 0 runts, 0 giants
     2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
     22146 packets output, 2383680 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets, 0 restarts
     1 carrier transitions
```

The following is sample output of the **show interfaces serial** command for a G.703 interface on which framing is enabled:

```
Router# show interfaces serial 2/3

Serial2/3 is up, line protocol is up
  Hardware is cxBus Serial
  Internet address is 5.4.4.1, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 0:00:21, output 0:00:21, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five minute output rate 0 bits/sec, 0 packets/sec
     53 packets input, 7810 bytes, 0 no buffer
```

```
Received 53 broadcasts, 0 runts, 0 giants
2 input errors, 2 CRC, 0 frame, 0 overrun, 0 ignored, 2 abort
56 packets output, 8218 bytes, 0 underruns
0 output errors, 0 collisions, 2 interface resets, 0 restarts
1 carrier transitions
2 alarm indications, 333 remote alarms, 332 rx LOF, 0 rx LOS
RTS up, CTS up, DTR up, DCD up, DSR up
BER inactive, NELR inactive, FELR inactive
```

Table 6-32 describes significant fields shown in the display.

Sample Display with Frame Relay Encapsulation

When using the Frame Relay encapsulation, use the **show interfaces** command to display information on the multicast DLCI, the DLCI of the interface, and the LMI DLCI used for the local management interface.

The multicast DLCI and the local DLCI can be set using the **frame-relay multicast-dlci** and the **frame-relay local-dlci** configuration commands, or provided through the local management interface. The status information is taken from the LMI, when active.

The following is sample output from the **show interfaces serial** command when using Frame Relay encapsulation:

```
Router# show interfaces serial

Serial 2 is up, line protocol is up
   Hardware type is MCI Serial
   Internet address is 131.108.122.1, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation FRAME-RELAY, loopback not set, keepalive set (10 sec)
   multicast DLCI 1022,  status defined, active
   source DLCI    20, status defined, active
   LMI DLCI 1023, LMI sent 10, LMI stat recvd 10, LMI upd recvd 2
   Last input 7:21:29, output 0:00:37, output hang never
   Output queue 0/100, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 0 packets/sec
   Five minute output rate 0 bits/sec, 0 packets/sec
       47 packets input, 2656 bytes, 0 no buffer
       Received 5 broadcasts, 0 runts, 0 giants
       5 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 57 abort
       518 packets output, 391205 bytes
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
       1 carrier transitions
```

In this display, the multicast DLCI has been changed to 1022 with the **frame-relay multicast-dlci** interface configuration command.

The display shows the statistics for the LMI are the number of status inquiry messages sent (LMI sent), the number of status messages received (LMI recvd), and the number of status updates received (upd recvd). See the *Frame Relay Interface* specification for additional explanations of this output.

Sample Display with ANSI LMI

For a serial interface with the ANSI LMI enabled, use the **show interfaces** command to determine the LMI type implemented.

The following is a sample display from the **show interfaces** output for a serial interface with the ANSI LMI enabled:

```
Router# show interfaces serial

Serial 1 is up, line protocol is up
   Hardware is MCI Serial
   Internet address is 131.108.121.1, subnet mask is 255.255.255.0
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation FRAME-RELAY, loopback not set, keepalive set
   LMI DLCI    0, LMI sent 10, LMI stat recvd 10
   LMI type is ANSI Annex D
   Last input 0:00:00, output 0:00:00, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 1 packets/sec
   Five minute output rate 1000 bits/sec, 1 packets/sec
       261 packets input, 13212 bytes, 0 no buffer
       Received 33 broadcasts, 0 runts, 0 giants
       0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       238 packets output, 14751 bytes, 0 underruns
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
```

Notice that the **show interfaces** output for a serial interface with ANSI LMI shown in this display is very similar to that for encapsulation set to Frame Relay, as shown in the previous display. Table 6-33 describes the few differences that exist.

Table 6-33 Show Interfaces Serial Field Description with ANSI LMI

Field	Description
LMI DLCI 0	Identifies the DLCI used by the LMI for this interface. Default: 1023.
LMI sent 10	Number of LMI packets the router sent.
LMI type is ANSI Annex D	Indicates that the interface is configured for the ANSI-adopted Frame Relay specification T1.617 Annex D.

Sample Display with LAPB Encapsulation

Use the **show interfaces** command to display operation statistics for an interface using LAPB encapsulation.

The following is sample output from the **show interfaces** command for a serial interface using LAPB encapsulation:

```
Router# show interfaces

LAPB state is DISCONNECT, T1 3000, N1 12000, N2 20, K7, TH 3000
Window is closed
IFRAMEs 12/28 RNRs 0/1 REJs 13/1 SABMs 1/13 FRMRs 3/0 DISCs 0/11
```

Table 6-34 shows the fields relevant to all LAPB connections.

Table 6-34 Show Interfaces Serial Field Descriptions when LAPB Is Enabled

Parameter	Description
LAPB state is DISCONNECT	State of the LAPB protocol.
T1 3000, N1 12000, ...	Current parameter settings.
Window is closed	Indicates that no more frames can be transmitted until some outstanding frames have been acknowledged.

Parameter	Description
IFRAMEs 12/28 RNRs 0/1 ...	Count of the different types of frames in the form of sent/received.

Show Interfaces Serial with PPP

An interface configured for synchronous PPP encapsulation differs from the standard **show interface serial** output. An interface configured for PPP might include the following information.

```
lcp state = OPEN
ncp ipcp state = OPEN   ncp osicp state = NOT NEGOTIATED
ncp ipxcp state = NOT NEGOTIATED   ncp xnscp state = NOT NEGOTIATED
ncp vinescp state = NOT NEGOTIATED   ncp deccp state = NOT NEGOTIATED
ncp bridgecp state = NOT NEGOTIATED   ncp atalkcp state = NOT NEGOTIATED
```

Table 6-35 show the fields relevant to PPP connections.

Table 6-35 Show Interfaces Serial Field Descriptions with PPP Encapsulation

Field	Description
lcp state	Link Control Protocol
ncp ipcp state	Network Control Protocol Internet Protocol Control Protocol
ncp osicp state	Network Control Protocol OSI (CLNS) Control Protocol
ncp ipxcp state	Network Control Protocol IPX (Novell) Control Protocol
ncp xnscp state	Network Control Protocol XNS Control Protocol
ncp vinescp state	Network Control Protocol VINES Control Protocol
ncp deccp state	Network Control Protocol DECnet Control Protocol
ncp bridgecp state	Network Control Protocol Bridging Control Protocol
ncp atalkcp state	Network Control Protocol AppleTalk Control Protocol

Sample Display with SDLC Connections

Use the **show interfaces** command to display the SDLC information for a given SDLC interface. The following is sample output from the **show interfaces** command for an SDLC primary interface supporting the SDLLC function.

```
Router# show interfaces

Serial 0 is up, line protocol is up
Hardware is MCI Serial
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation SDLC-PRIMARY, loopback not set
    Timers (msec): poll pause 100 fair poll 500. Poll limit 1
    [T1 3000, N1 12016, N2 20, K 7] timer: 56608 Last polled device: none
    SDLLC [ma: 0000.0C01.14--, ring: 7 bridge: 1, target ring: 10
              largest token ring frame 2052]
SDLC addr C1 state is CONNECT
     VS 6, VR 3, RCNT 0, Remote VR 6, Current retransmit count 0
     Hold queue: 0/12 IFRAMEs 77/22 RNRs 0/0 SNRMs 1/0 DISCs 0/0
     Poll: clear, Poll count: 0, chain: p: C1 n: C1
     SDLLC [largest SDLC frame: 265, XID: disabled]
 Last input 00:00:02, output 00:00:01, output hang never
 Output queue 0/40, 0 drops; input queue 0/75, 0 drops
```

```
Five minute input rate 517 bits/sec, 30 packets/sec
Five minute output rate 672 bits/sec, 20 packets/sec
    357 packets input, 28382 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    926 packets output, 77274 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets, 0 restarts
    2 carrier transitions
```

Table 6-36 shows the fields relevant to all SDLC connections.

Table 6-36 Show Interfaces Serial Field Descriptions when SDLC Is Enabled

Parameter	Description
Timers (msec): poll pause, fair poll, Poll limit	Current values of these timers, as described in the configuration section, for this interface.
T1, N1, N2, K	Values for these parameters, as described in the configuration section, for this interface.

Table 6-37 shows other data given for each SDLC secondary configured to be attached to this interface.

Table 6-37 SDLC Secondary Descriptions

SDLC Secondary	Description
addr	Address of this secondary.
state is	Current state of this connection, which is one of the following:
DISCONNECT	No communication is being attempted to this secondary.
CONNECT	A normal connect state exists between this router and this secondary.
DISCSENT	This router has sent a disconnect request to this secondary and is awaiting its response.
SNRMSENT	This router has sent a connect request (SNRM) to this secondary and is awaiting its response.
THEMBUSY	This secondary has told this router that it is temporarily unable to receive any more information frames.
USBUSY	This router has told this secondary that it is temporarily unable to receive any more information frames.
BOTHBUSY	Both sides have told each other that they are temporarily unable to receive any more information frames.
ERROR	This router has detected an error and is waiting for a response from the secondary acknowledging this.
VS	Sequence number of the next information frame this station sends.
VR	Sequence number of the next information frame from this secondary that this station expects to receive.
Remote VR	Last frame transmitted by this station that has been acknowledged by the other station.
Current retransmit count:	Number of times the current I-frame or sequence of I-frames has been retransmitted.
Hold Queue	Number of frames in hold queue/Maximum size of hold queue.

SDLC Secondary	Description
IFRAMEs, RNRs, SNRMs, DISCs	Sent/received count for these frames.
Poll	"Set" if this router has a poll outstanding to the secondary; "clear" if it does not.
Poll Count	Number of polls in a row that have been given to this secondary at this time.
Chain	Shows the previous (p) and next (n) secondary address on this interface in the *round robin loop* of polled devices.

Sample Display with SDLLC

Use the **show interfaces serial** command to display the SDLLC statistics for SDLLC configured interfaces.

The following is sample output from the **show interfaces serial** command for an a serial interface configured for SDLLC:

```
Router# show interfaces serial

Serial 0 is up, line protocol is up
   Hardware is MCI Serial
   MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
   Encapsulation SDLC-PRIMARY, loopback not set
       Timers (msec): poll pause 100 fair poll 500. Poll limit 1
       [T1 3000, N1 12016, N2 20, K 7] timer: 56608 Last polled device: none
       SDLLC [ma: 0000.0C01.14--, ring: 7 bridge: 1, target ring: 10
              largest token ring frame 2052]
   SDLC addr C1 state is CONNECT
       VS 6, VR 3, RCNT 0, Remote VR 6, Current retransmit count 0
       Hold queue: 0/12 IFRAMEs 77/22 RNRs 0/0 SNRMs 1/0 DISCs 0/0
       Poll: clear, Poll count: 0, chain: p: C1 n: C1
       SDLLC [largest SDLC frame: 265, XID: disabled]
   Last input 00:00:02, output 00:00:01, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 517 bits/sec, 30 packets/sec
   Five minute output rate 672 bits/sec, 20 packets/sec
       357 packets input, 28382 bytes, 0 no buffer
       Received 0 broadcasts, 0 runts, 0 giants
       0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
       926 packets output, 77274 bytes, 0 underruns
       0 output errors, 0 collisions, 0 interface resets, 0 restarts
       6608 Last polled device: none
       SDLLC [ma: 0000.0C01.14--, ring: 7 brid2 carrier transitions
```

Most of the output shown in the display is generic to all SDLC encapsulated interfaces and is described in the "LLC2 and SDLC Commands" chapter. Table 6-38 shows the parameters specific to SDLLC.

Table 6-38 SDLLC Parameters

Parameter	Description
SDLLC ma	Lists the MAC address configured for this interface. The last byte is shown as "--" to indicate that it is filled in with the SDLC address of the connection.
ring, bridge, target ring	Lists the parameters as configured by the **sdllc traddr** command.

Parameter	Description
largest token ring frame	Shows the largest Token Ring frame that is accepted on the LLC2 side of the connection.
largest SDLC frame	Shows the largest SDLC frame that is accepted and will be generated on the SDLC side of the connection.
XID	Enabled or disabled: Shows whether XID processing is enabled on the SDLC side of the connection. If enabled, it will show the XID value for this address.

Sample Display with Accounting Option

The following example illustrates the **show interfaces serial** command with the **accounting** option on a Cisco 7000:

```
Router# show interfaces serial 1/0 accounting

Serial1/0
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

show interfaces tokenring

Use the **show interfaces tokenring** privileged EXEC command to display information about the Token Ring interface and the state of source route bridging.

show interfaces tokenring *unit* [**accounting**]
show interfaces tokenring *slot*/*port* [**accounting**] (for the Cisco 7000 series)

Syntax Description

unit	Must match the interface port line number.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.
slot	On the Cisco 7000 series, optional slot location of the interface processor. On the 7000, value can be 0, 1, 2, 3, or 4. On the 7010, value can be 0, 1, or 2.
port	On the Cisco 7000 series, optional port number on interface. Value can be 0, 1, 2, or 3.

Command Mode

Privileged EXEC

Usage Guidelines

If you do not provide values for the parameters *slot* and *port*, the command will display statistics for all the network interfaces. The optional keyword **accounting** displays the number of packets of each protocol type that have been sent through the interface.

Sample Display

The following is sample output from the **show interfaces tokenring** command:

```
Router# show interfaces tokenring

TokenRing 0 is up, line protocol is up
Hardware is 16/4 Token Ring, address is 5500.2000.dc27 (bia 0000.3000.072b)
   Internet address is 150.136.230.203, subnet mask is 255.255.255.0
   MTU 8136 bytes, BW 16000 Kbit, DLY 630 usec, rely 255/255, load 1/255
   Encapsulation SNAP, loopback not set, keepalive set (10 sec)
   ARP type: SNAP, ARP Timeout 4:00:00
   Ring speed: 16 Mbps
   Single ring node, Source Route Bridge capable
   Group Address: 0x00000000, Functional Address: 0x60840000
   Last input 0:00:01, output 0:00:01, output hang never
   Output queue 0/40, 0 drops; input queue 0/75, 0 drops
   Five minute input rate 0 bits/sec, 0 packets/sec
   Five minute output rate 0 bits/sec, 0 packets/sec
   16339 packets input, 1496515 bytes, 0 no buffer
        Received 9895 broadcasts, 0 runts, 0 giants
        0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     32648 packets output, 9738303 bytes, 0 underruns
0 output errors, 0 collisions, 2 interface resets, 0 restarts
     5 transitions
```

Table 6-39 describes significant fields shown in the display.

Table 6-39 Show Interfaces Tokenring Field Descriptions

Field	Description
Token Ring is up | down	Interface is either currently active and inserted into ring (up) or inactive and not inserted (down). On the Cisco 7000 series, gives the interface processor type, slot number, and port number. "Disabled" indicates the router has received over 5000 errors in a keepalive interval, which is 10 seconds by default.
Token Ring is Reset	Hardware error has occurred.
Token Ring is Initializing	Hardware is up, in the process of inserting the ring.
Token Ring is Administratively Down	Hardware has been taken down by an administrator.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol believe the interface is usable (that is, whether keepalives are successful).
Hardware	Hardware type. "Hardware is Token Ring" indicates that the board is a CSC-R board. "Hardware is 16/4 Token Ring" indicates that the board is a CSC-R16 board. Also shows the address of the interface.
Internet address	Lists the Internet address followed by subnet mask.
MTU	Maximum Transmission Unit of the interface.
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method assigned to interface.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
ARP type:	Type of Address Resolution Protocol assigned.
Ring speed:	Speed of Token Ring—4 or 16 Mbps.
{Single ring/multiring node}	Indicates whether a node is enabled to collect and use source routing information (RIF) for routable Token Ring protocols.
Group Address:	Interface's group address, if any. The group address is a multicast address; any number of interfaces on the ring may share the same group address. Each interface may have at most one group address.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.

Field	Description
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops Input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of a station transmitting bad data.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets.

Field	Description
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end router's receiver can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Since a Token Ring cannot have collisions, this statistic is nonzero only if an unusual event occurred when frames were being queued or dequeued by the system software.
interface resets	Number of times an interface has been reset. The interface may be reset by the administrator or automatically when an internal error occurs.
Restarts	Should always be zero for Token Ring interfaces.
transitions	Number of times the ring made a transition from up to down, or vice versa. A large number of transitions indicates a problem with the ring or the interface.

The following is sample output from the **show interfaces tokenring** command on a Cisco 7000:

```
Router# show interfaces tokenring 2/0

TokenRing2/0 is administratively down, line protocol is down
  Hardware is cxBus Token Ring, address is 0000.3040.8b4a (bia 0000.3040.8b4a)
  MTU 8136 bytes, BW 16000 Kbit, DLY 630 usec, rely 255/255, load 1/255
  Encapsulation SNAP, loopback not set, keepalive set (10 sec)
  ARP type: SNAP, ARP Timeout 4:00:00
  Ring speed: 0 Mbps
  Single ring node, Source Route Transparent Bridge capable
  Ethernet Transit OUI: 0x0000F8
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five 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 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets, 0 restarts
     1 transitions
```

The following example on the Cisco 70000 includes the **accounting** option.When you use the accounting option, only the accounting statistics are displayed.

```
Router# show interfaces tokenring 2/0 accounting

TokenRing2/0
       Protocol    Pkts In   Chars In   Pkts Out  Chars Out
             IP       7344    4787842       1803    1535774
      Appletalk      33345    4797459      12781    1089695
        DEC MOP          0          0        127       9779
            ARP          7        420         39       2340
```

show interfaces tunnel

To list tunnel interface information, use the **show interfaces tunnel** privileged EXEC command.

show interfaces tunnel *unit* [**accounting**]

Syntax Description

unit	Must match the interface port line number.
accounting	(Optional) Displays the number of packets of each protocol type that have been sent through the interface.

Command Mode

EXEC

Sample Display

The following is sample output from the **show interface tunnel** command:

```
Router# show interfaces tunnel 4

Tunnel4 is up, line protocol is down
  Hardware is Routing Tunnel
  MTU 1500 bytes, BW 9 Kbit, DLY 500000 usec, rely 255/255, load 1/255
  Encapsulation TUNNEL, loopback not set, keepalive set (10 sec)
  Tunnel source 0.0.0.0, destination 0.0.0.0
  Tunnel protocol/transport GRE/IP, key disabled, sequencing disabled
  Last input never, output never, output hang never
  Last clearing of “show interface” counters never
  Output queue 0/0, 0 drops; input queue 0/75, 0 drops
  Five minute input rate 0 bits/sec, 0 packets/sec
  Five 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 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 restarts
```

Table 6-40 describes significant fields shown in the display.

Table 6-40 Show Interfaces Tunnel Field Descriptions

Field	Description
Tunnel is up | down	Interface is currently active and inserted into ring (up) or inactive and not inserted (down). On the Cisco 7000 series, gives the interface processor type, slot number, and port number.
line protocol is {up | down | administratively down}	Shows line protocol up if a valid route is available to the tunnel destination. Shows line protocol down if no route is available, or if the route would be recursive.
Hardware	Specifies the hardware type.
MTU	Maximum Transmission Unit of the interface.

Field	Description
BW	Bandwidth of the interface in kilobits per second.
DLY	Delay of the interface in microseconds.
rely	Reliability of the interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over 5 minutes.
load	Load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.
Encapsulation	Encapsulation method is always TUNNEL for tunnels.
loopback	Indicates whether loopback is set or not.
keepalive	Indicates whether keepalives are set or not.
Tunnel source	IP address used as the source address for packets in the tunnel.
destination	IP address of the host destination.
Tunnel protocol	Tunnel transport protocol (the protocol the tunnel is using). This is based on the **tunnel mode** command, which defaults to GRE.
key	ID key for the tunnel interface, unless disabled.
sequencing	Indicates whether the tunnel interface drops datagrams that arrive out of order. Can be disabled.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by an interface. Useful for knowing when a dead interface failed.
Last output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface.
output hang	Number of hours, minutes, and seconds (or never) since the interface was last reset because of a transmission that took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops Input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last 5 minutes. The 5-minute input and output rates should be used only as an approximation of traffic per second during a given 5-minute period. These rates are exponentially weighted averages with a time constant of 5 minutes. A period of four time constants must pass before the average will be within two percent of the instantaneous rate of a uniform stream of traffic over that period.
packets input	Total number of error-free packets received by the system.
bytes input	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.

Field	Description
no buffers	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
CRC	Cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRCs is usually the result of a station transmitting bad data.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be increased.
abort	Illegal sequence of one bits on a serial interface. This usually indicates a clocking problem between the serial interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes output	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end router's receiver can handle. This may never be reported on some interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the interface being examined. Note that this may not balance with the sum of the enumerated output errors, as some datagrams may have more than one error, and others may have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of messages retransmitted due to an Ethernet collision. This usually is the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). Some collisions are normal. However, if your collision rate climbs to around 4 or 5%, you should consider verifying that there is no faulty equipment on the segment and/or moving some existing stations to a new segment. A packet that collides is counted only once in output packets.

Field	Description
interface resets	Number of times an interface has been reset. The interface may be reset by the administrator or automatically when an internal error occurs.
Restarts	Number of times the controller was restarted because of errors.

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

show interfaces
show ip route †
show route †

show interfaces vty

Use the **show interfaces vty** EXEC command to display information about virtual asynchronous interfaces.

show interfaces vty *number*

Syntax Description

number	Number of the virtual terminal (VTY) that has been configured for asynchronous protocol features (vty-async).

Command Mode

EXEC

Sample Display

The following is sample output from the **show interfaces vty** command:

```
Router# show interfaces vty 17

VTY-Async17 is up, line protocol is up
  Hardware is Virtual Async Serial
  Interface is unnumbered.  Using address of Ethernet0 (171.69.60.44)
MTU 1500 bytes, BW 9 Kbit, DLY 100000 usec, rely 255/255, load 1/255
  Encapsulation SLIP, loopback not set
  DTR is pulsed for 5 seconds on reset
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/10, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 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 restarts
     0 carrier transitions
```

Table 6-41 describes the fields shown in the sample display.

Table 6-41 Show Interfaces VTY Field Descriptions

Field	Description
Async... is {up | down | administratively down}	Indicates whether the interface is currently active (whether carrier detect is present) and if it has been taken down by an administrator.
line protocol is {up | down | administratively down}	Indicates whether the software processes that handle the line protocol think the line is usable (that is, whether keepalives are successful).
Hardware is	Hardware type.
Internet address | unnumbered	IP address, or IP unnumbered for the line. If unnumbered, the output lists the interface and IP address to which the line is assigned (Ethernet0 at 171.69.60.44 in this example).
MTU	Maximum transmission unit of the vty-async interface.

Field	Description
BW	Bandwidth of the vty-async interface in kilobits per second.
DLY	Delay of the vty-async interface in microseconds.
rely	Reliability of the vty-async interface as a fraction of 255 (255/255 is 100% reliability), calculated as an exponential average over five minutes.
load	Load on the vty-async interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over five minutes. The calculation uses the value from the **bandwidth** interface configuration command.
Encapsulation	Encapsulation method assigned to the vty-async interface.
loopback	Test in which signals are sent and then directed back toward the source at some point along the communication path. Used to test network interface usability.
DTR	Data Terminal Ready. An RS232-C circuit that is activated to let the DCE know when the DTE is ready to send and receive data.
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by a vty-async interface. Useful for knowing when a dead interface failed.
output	The number of hours, minutes, and seconds since the last packet was successfully transmitted by a vty-async interface.
output hang	Number of hours, minutes, and seconds (or never) since the vty-async interface was last reset because of a transmission that took too long. When the number of hours in any of the "last" fields exceeds 24 hours, the number of days and hours is printed. If that field overflows, asterisks are printed.
Last clearing	The time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) shown in this report were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. *** indicates the elapsed time is too large to be displayed. 0:00:00 indicates the counters were cleared more than 2^{31}ms (and less than 2^{32}ms) ago.
Output queue, drops input queue, drops	Number of packets in output and input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped due to a full queue.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last five minutes.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error free packets received by the system.
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no input buffer events.
broadcasts	Total number of broadcast or multicast packets received by the vty-async interface.
runts	Number of packets that are discarded because they are smaller than the medium's minimum packet size.

Field	Description
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Total number of no buffer, runts, giants, CRCs, frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	The cyclic redundancy checksum generated by the originating LAN station or far end device does not match the checksum calculated from the data received. On a LAN, this usually indicates noise or transmission problems on the LAN interface or the LAN bus itself. A high number of CRC's is usually the result of collisions or a station transmitting bad data. On a serial link, CRC's usually indicate noise, gain hits or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the vty-async interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be incremented.
abort	Illegal sequence of one bits on a vty-async interface. This usually indicates a clocking problem between the vty-async interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end communication server's receiver can handle. This might never be reported on some vty-async interfaces.
output errors	Sum of all errors that prevented the final transmission of datagrams out of the vty-async interface being examined. Note that this might not balance with the sum of the enumerated output errors, as some datagrams might have more than one error, and others might have errors that do not fall into any of the specifically tabulated categories.
collisions	Number of packets colliding.
interface resets	Number of times a vty-async interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. This can be caused by a malfunctioning modem that is not supplying the transmit clock signal, or by a cable problem. If the system notices that the carrier detect line of a vty-async interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when a vty-async interface is looped back or shut down.
restarts	Number of times the controller was restarted because of errors.

Field	Description
carrier transitions	Number of times the carrier detect signal of a vty-async interface has changed state. Indicates modem or line problems if the carrier detect line is changing state often.

show ip interface

To list a summary of an interface's IP information and status, use the **show ip interface** privileged EXEC command.

show ip interface [**brief**] [*type*] [*number*]

Syntax Description

brief	(Optional) Displays a brief summary of IP status and configuration.
type	(Optional) Specifies that information be displayed about that interface type only. The possible value depends on the type of interfaces the system has. For example, it could be **ethernet**, **null**, **serial**, **tokenring**, etc.
number	(Optional) Interface number.

Command Mode

Privileged EXEC

Sample Displays

The following is sample output from the **show ip interface** command:

```
Router# show ip interface

Ethernet0 is administratively down, line protocol is down
  Internet address is 1.0.46.10, subnet mask is 255.0.0.0
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is enabled
  Multicast groups joined: 224.0.0.1 224.0.0.2
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP is enabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP fast switching on the same interface is disabled
  IP SSE switching is disabled
  Router Discovery is disabled
  IP accounting is disabled
  TCP/IP header compression is disabled
  Probe proxy name replies are disabled
  Gateway Discovery is disabled
PCbus0 is administratively down, line protocol is down
  Internet address is 198.135.1.43, subnet mask is 255.255.255.0
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is enabled
  Multicast groups joined: 224.0.0.1 224.0.0.2
```

```
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP is enabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP fast switching on the same interface is disabled
  IP SSE switching is disabled
  Router Discovery is disabled
  IP accounting is disabled
  TCP/IP header compression is disabled
  Probe proxy name replies are disabled
  Gateway Discovery is disabled
Serial0 is administratively down, line protocol is down
  Internet address is 198.135.2.49, subnet mask is 255.255.255.0
  Broadcast address is 255.255.255.255
  Address determined by setup command
  MTU is 1500 bytes
  Helper address is not set
  Directed broadcast forwarding is enabled
  Multicast groups joined: 224.0.0.1 224.0.0.2
  Outgoing access list is not set
  Inbound  access list is not set
  Proxy ARP is enabled
  Security level is default
  Split horizon is enabled
  ICMP redirects are always sent
  ICMP unreachables are always sent
  ICMP mask replies are never sent
  IP fast switching is enabled
  IP fast switching on the same interface is disabled
  IP SSE switching is disabled
  Router Discovery is disabled
  IP accounting is disabled
  TCP/IP header compression is disabled
  Probe proxy name replies are disabled
  Gateway Discovery is disabled
```

The following is sample output from the **show ip interface brief** command:

```
Router# show ip interface brief

Interface    IP-Address      OK?  Method     Status                 Protocol
Ethernet0    1.0.46.10       YES  manual     administratively down  down
PCbus0       198.135.1.43    YES  manual     administratively down  down
Serial0      198.135.2.49    YES  manual     administratively down  down
```

The following is sample output from the **show ip interface brief pcbus 0** command:

```
Router# show ip interface brief pcbus 0

Interface    IP-Address      OK?  Method     Status                 Protocol
PCbus0       198.135.1.43    YES  manual     administratively down  down
```

Related Command

show interfaces

show rif

Use the **show rif** EXEC command to display the current contents of the RIF cache.

show rif

Syntax Description

This command has no arguments or keywords.

Command Mode

EXEC

Sample Display

The following is sample output from the **show rif** command:

```
Router# show rif

Codes: * interface, - static, + remote
Hardware Addr  How   Idle (min)  Routing Information Field
5C02.0001.4322 rg5           -   0630.0053.00B0
5A00.0000.2333 TR0           3   08B0.0101.2201.0FF0
5B01.0000.4444 -             -   -
0000.1403.4800 TR1           0   -
0000.2805.4C00 TR0           *   -
0000.2807.4C00 TR1           *   -
0000.28A8.4800 TR0           0   -
0077.2201.0001 rg5          10   0830.0052.2201.0FF0
```

In the display, entries marked with an asterisk (*) are the router/bridge's interface addresses. Entries marked with a dash (–) are static entries. Entries with a number are cached entries. If the RIF timeout is set to something other than the default of 15 minutes, the timeout is displayed at the top of the display.

Table 6-42 describes significant fields shown in the display.

Table 6-42 Show RIF Cache Display Field Descriptions

Field	Description
Hardware Addr	Lists the MAC-level addresses.
How	Describes how the RIF has been learned. Possible values include a ring group (rg), or interface (TR).
Idle (min)	Indicates how long, in minutes, since the last response was received directly from this node.
Routing Information Field	Lists the RIF.

shutdown

To disable an interface, use the **shutdown** interface configuration command. To restart a disabled interface, use the **no shutdown** command.

shutdown
no shutdown

Syntax Description

This command has no arguments or keywords.

Default

Enabled

Command Mode

Interface configuration

Usage Guidelines

The **shutdown** command disables all functions on the specified interface. On serial interfaces, this command causes the DTR signal to be dropped. On Token Ring interfaces, this command causes the interface to be deinserted from the ring. On FDDI interfaces, this command causes the optical bypass switch, if present, to go into bypass mode.

This command also marks the interface as unavailable. To check whether an interface is disabled, use the EXEC command **show interfaces**. An interface that has been shut down is shown as administratively down in the display from this command.

Examples

The following example turns off Ethernet interface 0:

```
interface ethernet 0
shutdown
```

The following example turns the interface back on:

```
interface ethernet 0
no shutdown
```

Related Command

show interfaces

shutdown (hub configuration)

To shut down a port on an Ethernet hub of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **shutdown** hub configuration command. To restart the disabled hub, use the **no** form of this command.

shutdown
no shutdown

Syntax Description

This command has no arguments or keywords.

Command Mode

Hub configuration

Example

The following example shuts down hub 0, ports 1 through 3:

```
hub ethernet 0 1 3
shutdown
```

Related Command

hub

smt-queue-threshold

To set the maximum number of unprocessed FDDI station management (SMT) frames that will be held for processing, use the **smt-queue-threshold** global configuration command. Use the **no smt-queue-threshold** command to restore the queue to the default.

smt-queue-threshold *number*
no smt-queue-threshold

Syntax Description

number Number of buffers used to store unprocessed SMT messages that are to be queued for processing. Acceptable values are positive integers.

Default

The default threshold value is equal to the number of FDDI interfaces installed in the router.

Command Mode

Global configuration

Usage Guidelines

This command helps ensure that the routers keep track of FDDI *upstream* and *downstream* neighbors, particularly when a router includes more than one FDDI interface.

In FDDI, upstream and downstream neighbors are determined by transmitting and receiving SMT Neighbor Information Frames (NIFs). The router can appear to lose track of neighbors when it receives an SMT frame and the queue currently contains an unprocessed frame. This occurs because the router discards incoming SMT frames if the queue is full. Discarding SMT NIF frames can cause the router to lose its upstream or downstream neighbor.

Note Use this command carefully, because the SMT buffer is charged to the inbound interface (input hold queue) until the frame is completely processed by the system. Setting this value to a high limit can impact buffer usage and the ability of the router to receive routable packets or routing updates.

Example

The following example specifies that the SMT queue can hold ten messages. As SMT frames are processed by the system, the queue is decreased by one:

```
smt-queue-threshold 10
```

source-address

To configure source address control on a port on an Ethernet hub of a Cisco 2505, Cisco 2507, or Cisco 2516, use the **source-address** hub configuration command. To remove a previously defined source address, use the **no** form of this command.

source-address [*mac-address*]
no source-address

Syntax Description

mac-address	(Optional) MAC address in the packets that the hub will allow to access the network.

Default

Disabled

Command Mode

Hub configuration

Usage Guidelines

If you omit the MAC address, the hub uses the value in the last source address register, and if the address register is invalid, it will remember the first MAC address it receives on the previously specified port, and allow only packets from that MAC address onto that port.

Examples

The following example configures the hub to allow only packets from MAC address 1111.2222.3333 on port 2 of hub 0:

```
hub ethernet 0 2
source-address 1111.2222.3333
```

The following example configures the hub use the value of the last source address register. If the address register is invalid, it will remember the first MAC address it receives on port 2, and allow only packets from the learned MAC address on port 2:

```
hub ethernet 0 2
source-address
```

Related Command

hub

squelch

To extend the Ethernet twisted-pair 10BaseT capability beyond the standard 100 meters on the Cisco 4000 platform, use the **squelch** interface configuration command. To restore the default, use the **no** form of this command.

squelch {**normal** | **reduced**}
no squelch {**normal** | **reduced**}

Syntax Description

normal Allows normal capability.

reduced Allows extended 10BaseT capability.

Default

Normal range

Command Mode

Interface configuration

Example

The following example extends the twisted-pair 10BaseT capability on the cable attached to Ethernet interface 2:

```
interface ethernet 2
squelch reduced
```

timeslot

To enable framed mode on a G.703-E1 interface, use the **timeslot** interface configuration command. To restore the default, use the **no** form of this command or set the start slot to 0.

timeslot *start-slot* **–** *stop-slot*
no timeslot

Syntax Description

start-slot	The first subframe in the major frame. Range is 1 to 31 and must be less than or equal to *stop-slot*.
stop-slot	The last subframe in the major frame. Range is 1 to 31 and must be greater than or equal to *start-slot*.

Default

A G.703-E1 interface is configured for unframed mode.

Command Mode

Interface configuration

Usage Guidelines

This command applies to a Cisco 4000 router or Cisco 7000 series router. G.703-E1 interfaces have two modes of operation, framed and unframed. When in framed mode, the range from *start-slot* to *stop-slot* gives the number of 64-Kbps slots in use. There are 32 64-Kbps slots available.

Example

The following example enables framed mode on a G.703-E1 interface:

```
timeslot 1-3
```

Related Command

ts16

transmit-clock-internal

When a DTE does not return a transmit clock, use the **transmit-clock-internal** interface command to enable the internally generated clock on a serial interface on a Cisco 7000. Use the **no** form of this command to disable the feature.

transmit-clock-internal
no transmit-clock-internal

Syntax Description

This command has no keywords or arguments.

Default

Disabled

Command Mode

Interface configuration

Example

In the following example, the internally generated clock is enabled on serial interface 3/0:

```
interface serial 3/0
transmit-clock-internal
```

transmitter-delay

To specify a minimum dead-time after transmitting a packet, use the **transmitter-delay** interface configuration command. The **no transmitter-delay** command restores the default.

transmitter-delay {*microseconds* | *hdlc-flags*}
no transmitter-delay

Syntax Description

microseconds	Approximate number of microseconds of minimum delay after transmitting a packet on the MCI and SCI interface cards.
hdlc-flags	Minimum number of HDLC flags to be sent between each packet on the HIP, HSCI, FSIP, or HSSI. The valid range on the HSSI is 2 to 128000.

Default

0 microseconds

Command Mode

Interface configuration

Usage Guidelines

This command is especially useful for serial interfaces that can send back-to-back data packets over serial interfaces faster than some hosts can receive them.

The transmitter delay feature is implemented for the following Token Ring cards: CSC-R16, CSC-R16M, CSC-1R, CSC-2R, and CSC-CTR. For the first four cards, the command syntax is the same as the existing command and specifies the number of milliseconds to delay between sending frames that are generated by the router. Transmitter delay for the CSC-CTR uses the same syntax, but specifies a relative time interval to delay between transmission of all frames.

Example

The following example specifies a delay of 300 microseconds on serial interface 0:

```
interface serial 0
transmitter-delay 300
```

ts16

To control the use of time slot 16 for data on a G.703-E1 interface, use the **ts16** interface configuration command. To restore the default, use the **no** form of this command.

ts16
no ts16

Syntax Description

This command has no arguments or keywords.

Default

Time slot 16 is used for signaling.

Command Mode

Interface configuration

Usage Guidelines

This command applies to a Cisco 4000 router or Cisco 7000 series router. By default, time slot 16 is used for signaling. Use this command to configure time slot 16 to be used for data. When in framed mode, in order to get all possible subframes or timeslots, you must use the **ts16** command.

Example

The following example configures time slot 16 to be used for data on a G.703-E1 interface:

```
ts16
```

Related Command

timeslot

tunnel checksum

To enable encapsulator-to-decapsulator checksumming of packets on a tunnel interface, use the **tunnel checksum** interface configuration command. To disable checksumming, use the **no** form of this command.

tunnel checksum
no tunnel checksum

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command currently applies to generic route encapsulation (GRE) only. Some passenger protocols rely on media checksums to provide data integrity. By default, the tunnel does not guarantee packet integrity. By enabling end-to-end checksums, the routers will drop corrupted packets.

Example

In the following example, all protocols will have encapsulator-to-decapsulator checksumming of packets on the tunnel interface:

```
tunnel checksum
```

tunnel destination

To specify a tunnel interface's destination, use the **tunnel destination** interface configuration command. To remove the destination, use the **no** form of this command.

tunnel destination {*hostname* | *ip-address*}
no tunnel destination

Syntax Description

hostname	Name of the host destination
ip-address	IP address of the host destination expressed in decimal in four-part, dotted notation

Default

No tunnel interface destination is specified.

Command Mode

Interface configuration

Usage Guidelines

You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and source packets off of the loopback interface.

Examples

The following example enables Cayman tunneling:

```
interface tunnel0
tunnel source ethernet0
tunnel destination 131.108.164.19
tunnel mode cayman
```

The following example enables GRE tunneling:

```
interface tunnel0
appletalk cable-range 4160-4160 4160.19
appletalk zone Engineering
tunnel source ethernet0
tunnel destination 131.108.164.19
tunnel mode gre ip
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

appletalk cable-range†
appletalk zone†
tunnel mode
tunnel source

tunnel key

To enable an ID key for a tunnel interface, use the **tunnel key** interface configuration command. To remove the ID key, use the **no** form of this command.

tunnel key *key-number*
no tunnel key

Syntax Description

key-number	Integer from 0 to 4294967295

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command currently applies to generic route encapsulation (GRE) only. Tunnel ID keys can be used as a form of *weak* security to prevent misconfiguration or injection of packets from a foreign source.

Note When using GRE, the ID key is carried in each packet. We do *not* recommend relying on this key for security purposes.

Example

In the following example, the tunnel key is set to 3:

```
tunnel key 3
```

tunnel mode

To set the encapsulation mode for the tunnel interface, use the **tunnel mode** interface configuration command. To set to the default, use the **no** form of this command.

tunnel mode {**aurp** | **cayman** | **dvmrp** | **eon** | **gre ip** | **nos**}
no tunnel mode

Syntax Description

aurp	AppleTalk Update Routing Protocol (AURP).
cayman	Cayman TunnelTalk AppleTalk encapsulation.
dvmrp	Distance Vector Multicast Routing Protocol .
eon	EON compatible CLNS tunnel.
gre ip	Generic route encapsulation (GRE) protocol over IP.
nos	KA9Q/NOS compatible IP over IP.

Default

GRE tunneling

Command Mode

Interface configuration

Usage Guidelines

You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and source packets off of the loopback interface.

Cayman tunneling implements tunneling as designed by Cayman Systems. This enables our routers to interoperate with Cayman GatorBoxes. With Cayman tunneling, you can establish tunnels between two routers or between our router and a GatorBox. When using Cayman tunneling, you must not configure the tunnel with an AppleTalk network address. This means that there is no way to ping the other end of the tunnel.

Use DVMRP when a router connects to a mrouted router to run DVMRP over a tunnel. It is required to configure Protocol-Independent Multicast (PIM) and an IP address on a DVMRP tunnel.

Generic route encapsulation (GRE) tunneling can be done between our routers only. When using GRE tunneling for AppleTalk, you configure the tunnel with an AppleTalk network address. This means that you can ping the other end of the tunnel.

Examples

The following example enables Cayman tunneling:

```
interface tunnel 0
tunnel source ethernet 0
tunnel destination 131.108.164.19
```

```
tunnel mode cayman
```

The following example enables GRE tunneling:

```
interface tunnel 0
appletalk cable-range 4160-4160 4160.19
appletalk zone Engineering
tunnel source ethernet0
tunnel destination 131.108.164.19
tunnel mode gre ip
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

appletalk cable-range†
appletalk zone†
tunnel destination
tunnel source

tunnel sequence-datagrams

To configure a tunnel interface to drop datagrams that arrive out of order, use the **tunnel sequence-datagrams** interface configuration command. To disable this function, use the **no** form of this command.

tunnel sequence-datagrams
no tunnel sequence-datagrams

Syntax Description

This command has no arguments or keywords.

Default

Disabled

Command Mode

Interface configuration

Usage Guidelines

This command currently applies to generic route encapsulation (GRE) only. This command is useful when carrying passenger protocols that behave poorly when they receive packets out of order (for example, LLC2-based protocols).

Example

In the following example, the tunnel is configured to drop datagrams that arrive out of order:

```
tunnel sequence-datagrams
```

tunnel source

To set a tunnel interface's source address, use the **tunnel source** interface configuring command. To remove the source address, use the **no** form of this command.

tunnel source {*ip-address* | *type number*}
no tunnel source

Syntax Description

ip-address	IP address to use as the source address for packets in the tunnel.
type	All interface types.
number	Specifies the port, connector, or interface card number. The numbers are assigned at the factory at the time of installation or when added to a system, and can be displayed with the **show interfaces** command.

Default

No tunnel interface's source address is set.

Command Mode

Interface configuration

Usage Guidelines

You cannot have two tunnels using the same encapsulation mode with exactly the same source and destination address. The workaround is to create a loopback interface and source packets off of the loopback interface.

When using tunnels to Cayman boxes, you must set the **tunnel source** to an explicit IP address on the same subnet as the Cayman box, not the tunnel itself.

Examples

The following example enables Cayman tunneling:

```
interface tunnel0
tunnel source ethernet0
tunnel destination 131.108.164.19
tunnel mode cayman
```

The following example enables GRE tunneling:

```
interface tunnel0
appletalk cable-range 4160-4160 4160.19
appletalk zone Engineering
tunnel source ethernet0
tunnel destination 131.108.164.19
tunnel mode gre ip
```

Related Commands

A dagger (†) indicates that the command is documented in another chapter.

appletalk cable-range†
appletalk zone†
tunnel destination

tx-queue-limit

To control the number of transmit buffers available to a specified interface on the MCI and SCI cards, use the **tx-queue-limit** interface configuration command.

tx-queue-limit *number*

Syntax Description

number	Maximum number of transmit buffers that the specified interface can subscribe.

Default

Defaults depend on the total transmit buffer pool size and the traffic patterns of all the interfaces on the card. Defaults and specified limits are displayed with the **show controllers mci** EXEC command.

Command Mode

Interface configuration

Usage Guidelines

This command should be used only under the guidance of a technical support representative.

Example

The following example sets the maximum number of transmit buffers on the interface to 5:

```
interface ethernet 0
tx-queue-limit 5
```

Related Command

show controllers mci