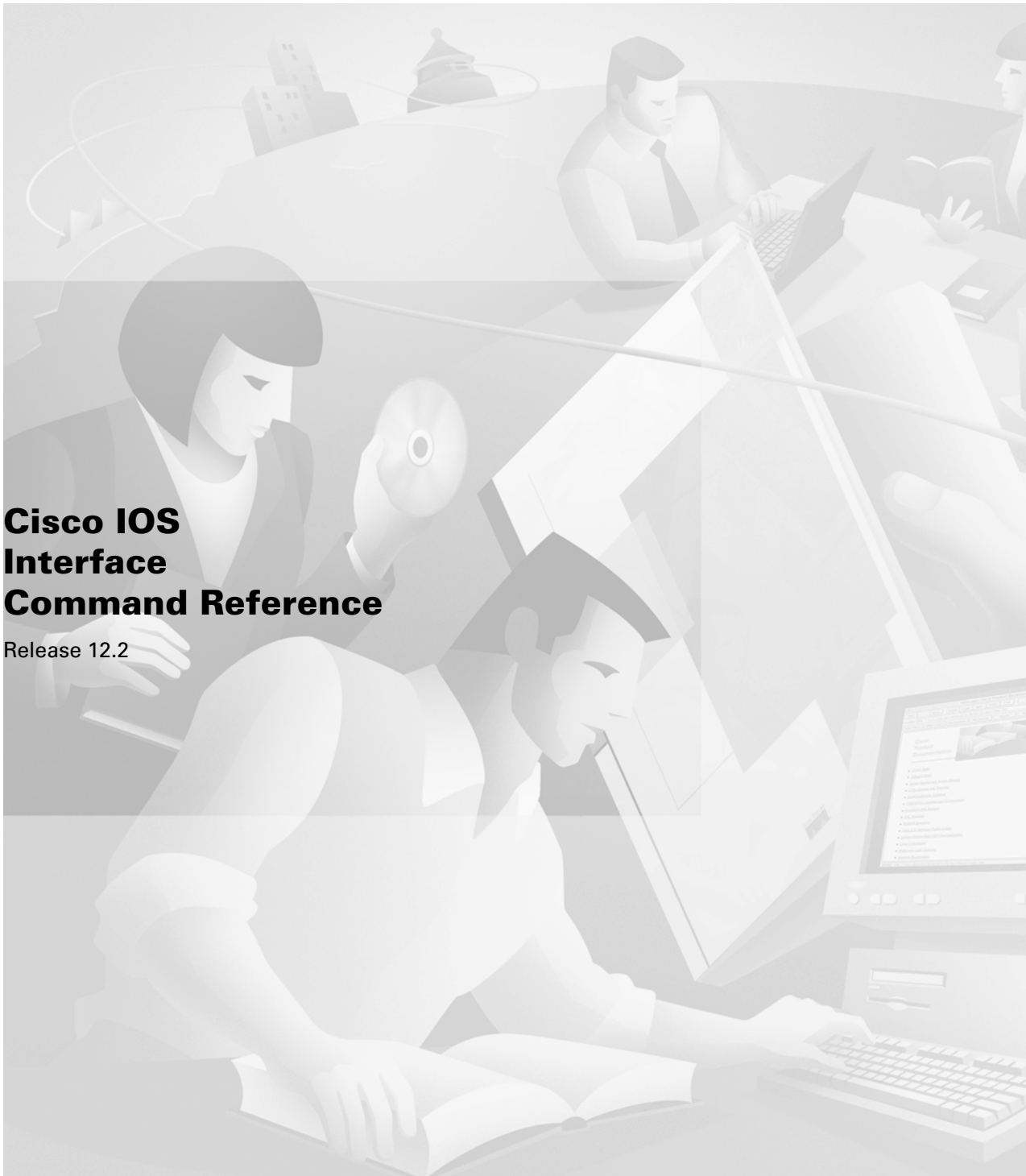




# **Cisco IOS Interface Command Reference**

Release 12.2

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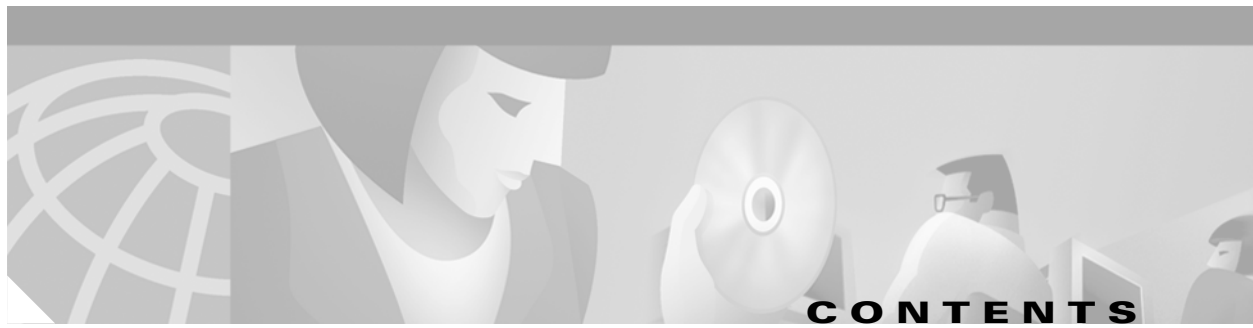
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**Using Cisco IOS Software** xv

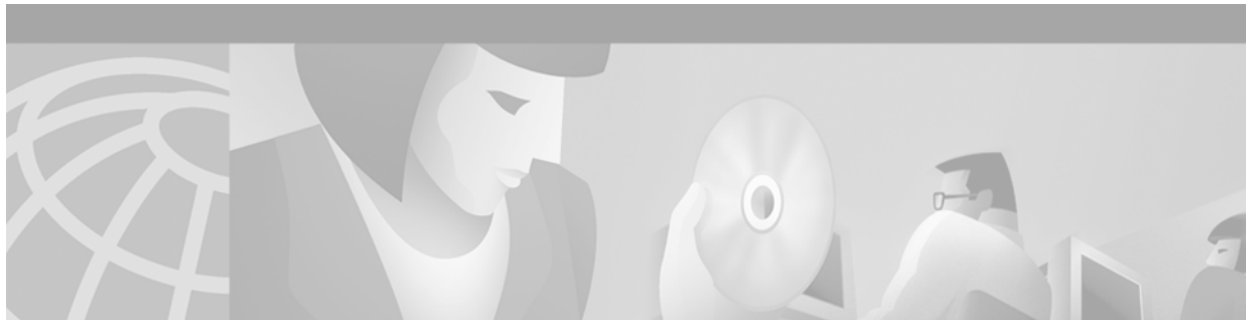
**Interface Commands** IR-1

**Dial Shelf Management Commands** IR-567

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# About Cisco IOS Software Documentation

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This chapter discusses the objectives, audience, organization, and conventions of Cisco IOS software documentation. It also provides sources for obtaining documentation from Cisco Systems.

## Documentation Objectives

Cisco IOS software documentation describes the tasks and commands necessary to configure and maintain Cisco networking devices.

## Audience

The Cisco IOS software documentation set is intended primarily for users who configure and maintain Cisco networking devices (such as routers and switches) but who may not be familiar with the tasks, the relationship between tasks, or the Cisco IOS software commands necessary to perform particular tasks. The Cisco IOS software documentation set is also intended for those users experienced with Cisco IOS software who need to know about new features, new configuration options, and new software characteristics in the current Cisco IOS software release.

## Documentation Organization

The Cisco IOS software documentation set consists of documentation modules and master indexes. In addition to the main documentation set, there are supporting documents and resources.

## Documentation Modules

The Cisco IOS documentation modules consist of configuration guides and corresponding command reference publications. Chapters in a configuration guide describe protocols, configuration tasks, and Cisco IOS software functionality and contain comprehensive configuration examples. Chapters in a command reference publication provide complete Cisco IOS command syntax information. Use each configuration guide in conjunction with its corresponding command reference publication.

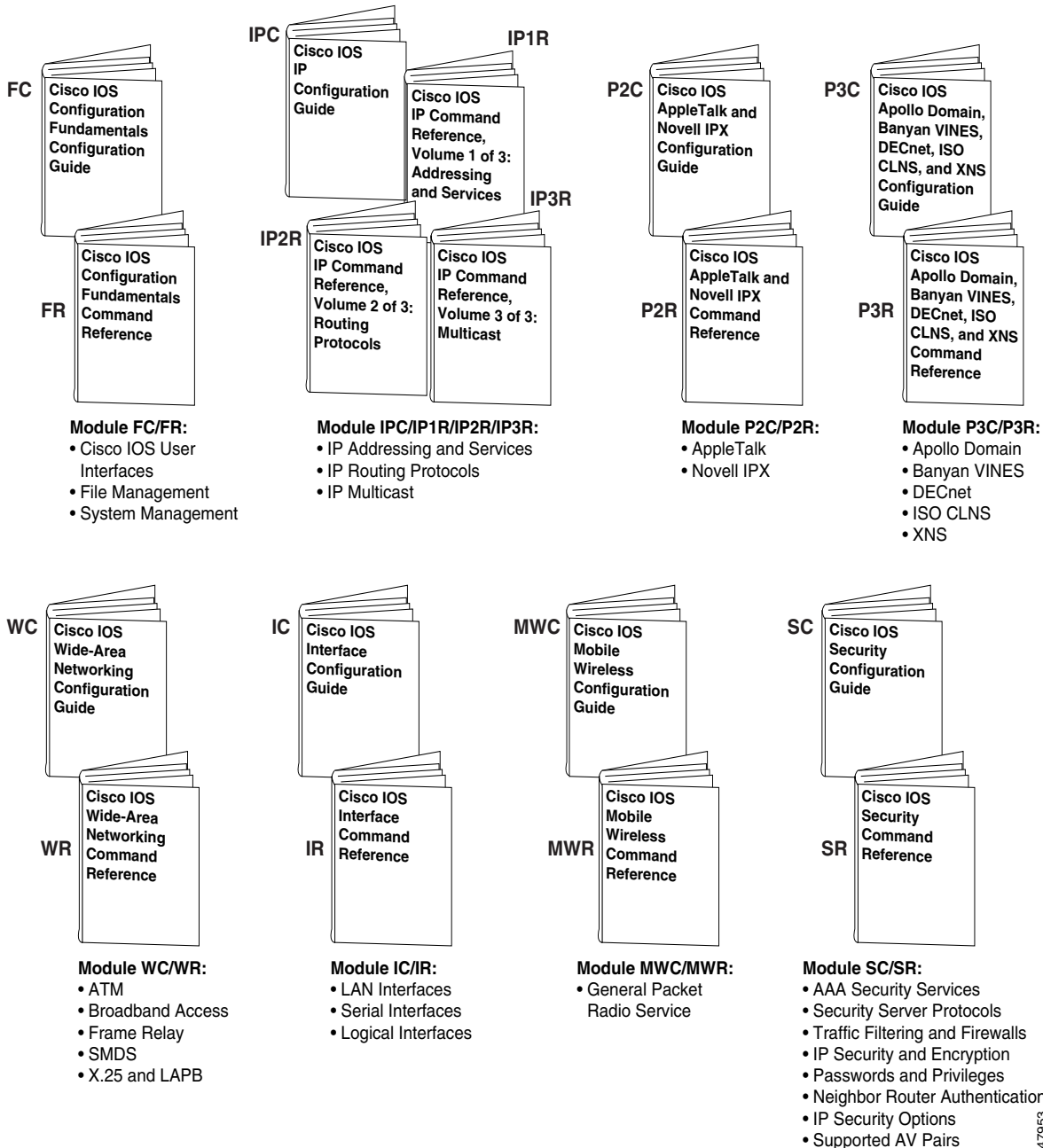
Figure 1 shows the Cisco IOS software documentation modules.



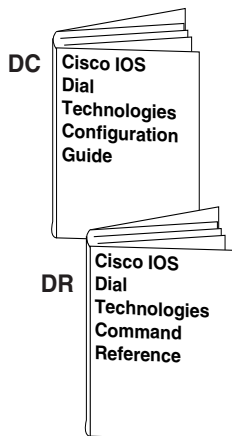
#### Note

The abbreviations (for example, FC and FR) next to the book icons are page designators, which are defined in a key in the index of each document to help you with navigation. The bullets under each module list the major technology areas discussed in the corresponding books.

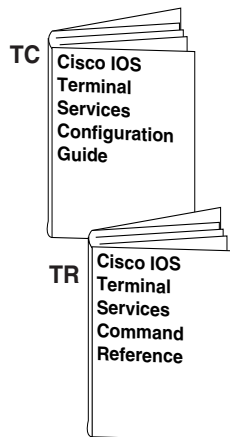
**Figure 1 Cisco IOS Software Documentation Modules**



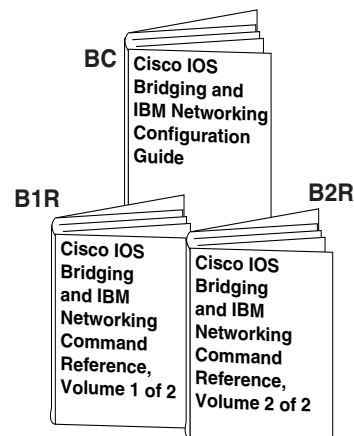
47953

**Module DC/DR:**

- Preparing for Dial Access
- Modem and Dial Shelf Configuration and Management
- ISDN Configuration
- Signalling Configuration
- Dial-on-Demand Routing Configuration
- Dial-Backup Configuration
- Dial-Related Addressing Services
- Virtual Templates, Profiles, and Networks
- PPP Configuration
- Callback and Bandwidth Allocation Configuration
- Dial Access Specialized Features
- Dial Access Scenarios

**Module TC/TR:**

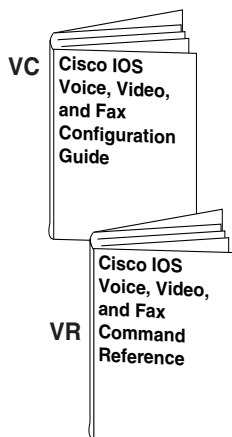
- ARA
- LAT
- NAS1
- Telnet
- TN3270
- XRemote
- X.28 PAD
- Protocol Translation

**Module BC/B1R:**

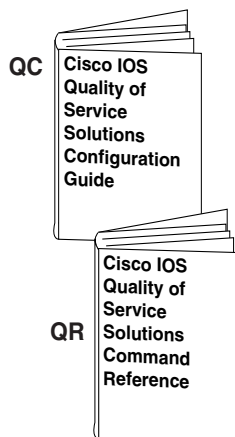
- Transparent Bridging
- SRB
- Token Ring Inter-Switch Link
- Token Ring Route Switch Module
- RSRB
- DLSw+
- Serial Tunnel and Block Serial Tunnel
- LLC2 and SDLC
- IBM Network Media Translation
- SNA Frame Relay Access
- NCIA Client/Server
- Airline Product Set

**Module BC/B2R:**

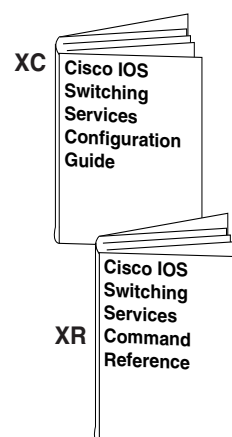
- DSPU and SNA Service Point
- SNA Switching Services
- Cisco Transaction Connection
- Cisco Mainframe Channel Connection
- CLAW and TCP/IP Offload
- CSNA, CMPC, and CMPC+
- TN3270 Server

**Module VC/VR:**

- Voice over IP
- Call Control Signalling
- Voice over Frame Relay
- Voice over ATM
- Telephony Applications
- Trunk Management
- Fax, Video, and Modem Support

**Module QC/QR:**

- Packet Classification
- Congestion Management
- Congestion Avoidance
- Policing and Shaping
- Signalling
- Link Efficiency Mechanisms

**Module XC/XR:**

- Cisco IOS Switching Paths
- NetFlow Switching
- Multiprotocol Label Switching
- Multilayer Switching
- Multicast Distributed Switching
- Virtual LANs
- LAN Emulation

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## Master Indexes

Two master indexes provide indexing information for the Cisco IOS software documentation set: an index for the configuration guides and an index for the command references. Individual books also contain a book-specific index.

The master indexes provide a quick way for you to find a command when you know the command name but not which module contains the command. When you use the online master indexes, you can click the page number for an index entry and go to that page in the online document.

## Supporting Documents and Resources

The following documents and resources support the Cisco IOS software documentation set:

- *Cisco IOS Command Summary* (two volumes)—This publication explains the function and syntax of the Cisco IOS software commands. For more information about defaults and usage guidelines, refer to the Cisco IOS command reference publications.
- *Cisco IOS System Error Messages*—This publication lists and describes Cisco IOS system error messages. Not all system error messages indicate problems with your system. Some are purely informational, and others may help diagnose problems with communications lines, internal hardware, or the system software.
- *Cisco IOS Debug Command Reference*—This publication contains an alphabetical listing of the **debug** commands and their descriptions. Documentation for each command includes a brief description of its use, command syntax, usage guidelines, and sample output.
- *Dictionary of Internetworking Terms and Acronyms*—This Cisco publication compiles and defines the terms and acronyms used in the internetworking industry.
- New feature documentation—The Cisco IOS software documentation set documents the mainline release of Cisco IOS software (for example, Cisco IOS Release 12.2). New software features are introduced in early deployment releases (for example, the Cisco IOS “T” release train for 12.2, 12.2(x)T). Documentation for these new features can be found in standalone documents called “feature modules.” Feature module documentation describes new Cisco IOS software and hardware networking functionality and is available on Cisco.com and the Documentation CD-ROM.
- Release notes—This documentation describes system requirements, provides information about new and changed features, and includes other useful information about specific software releases. See the “Using Software Release Notes” section on page xi for more information.
- Caveats documentation—This documentation provides information about Cisco IOS software defects in specific software releases.
- RFCs—Requests For Comments (RFCs) are standards documents maintained by the Internet Engineering Task Force (IETF). Cisco IOS software documentation references supported RFCs when applicable. The full text of referenced RFCs may be obtained on the World Wide Web at: <http://www.rfc-editor.org/>.
- MIBs—Management Information Bases (MIBs) are used for network monitoring. For lists of supported MIBs by platform and release, and to download MIB files, see the Cisco MIB website on Cisco.com at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.



# Document Conventions

Within Cisco IOS software documentation, the term *router* is generally used to refer to a variety of Cisco products (for example, routers, access servers, and switches). Routers, access servers, and other networking devices that support Cisco IOS software are shown interchangeably within examples. These products are used only for illustrative purposes; that is, an example that shows one product does not necessarily indicate that other products are not supported.

The Cisco IOS documentation set uses the following conventions:

| Convention              | Description                                                                                                                                                                                                                  |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>^</b> or <b>Ctrl</b> | The ^ and Ctrl symbols represent the Control key. For example, the key combination ^D or Ctrl-D means hold down the Control key while you press the D key. Keys are indicated in capital letters but are not case sensitive. |
| <i>string</i>           | A string is a nonquoted set of characters shown in italics. For example, when setting an SNMP community string to public, do not use quotation marks around the string or the string will include the quotation marks.       |

Command syntax descriptions use the following conventions:

| Convention      | Description                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------------------|
| <b>boldface</b> | Boldface text indicates commands and keywords that you enter literally as shown.                          |
| <i>italics</i>  | Italic text indicates arguments for which you supply values.                                              |
| [x]             | Square brackets enclose an optional element (keyword or argument).                                        |
|                 | A vertical line indicates a choice within an optional or required set of keywords or arguments.           |
| [x   y]         | Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice. |
| {x   y}         | Braces enclosing keywords or arguments separated by a vertical line indicate a required choice.           |

Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. For example:

| Convention  | Description                                                                                              |
|-------------|----------------------------------------------------------------------------------------------------------|
| [x {y   z}] | Braces and a vertical line within square brackets indicate a required choice within an optional element. |

Examples use the following conventions:

| Convention                          | Description                                                                       |
|-------------------------------------|-----------------------------------------------------------------------------------|
| <code>screen</code>                 | Examples of information displayed on the screen are set in Courier font.          |
| <b><code>boldface screen</code></b> | Examples of text that you must enter are set in Courier bold font.                |
| < >                                 | Angle brackets enclose text that is not printed to the screen, such as passwords. |

| Convention | Description                                                                                                                                                        |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| !          | An exclamation point at the beginning of a line indicates a comment line. (Exclamation points are also displayed by the Cisco IOS software for certain processes.) |
| [ ]        | Square brackets enclose default responses to system prompts.                                                                                                       |

The following conventions are used to attract the attention of the reader:



#### Caution

Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



#### Note

Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.



#### Timesaver

Means the *described action saves time*. You can save time by performing the action described in the paragraph.

## Identifying Platform Support for Cisco IOS Software Features

Cisco IOS software is packaged in feature sets consisting of software images intended for specific routing and switching platforms. The feature sets available for a specific hardware platform depend on which Cisco IOS software images are included in a release. Information in the following sections will help you identify the set of software images available in a specific release or to determine if a feature is available in a given Cisco IOS software image:

- Using Feature Navigator
- Using Software Release Notes

## Using Feature Navigator

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a particular set of features and which features are supported in a particular Cisco IOS software release or for a particular hardware platform.

To access Feature Navigator, you must have an account on Cisco.com. If you do not have an account on Cisco.com, go to <http://www.cisco.com/register> and follow the directions to establish an account. If you have forgotten or lost your account information, send an e-mail message to the Contact Database Administration group at [cdbadmin@cisco.com](mailto:cdbadmin@cisco.com).

To use Feature Navigator, you must have a JavaScript-enabled web browser such as Netscape 3.0 or later, or Internet Explorer 4.0 or later. Internet Explorer 4.0 always has JavaScript enabled. To enable JavaScript for Netscape 3.x or Netscape 4.x, follow the instructions provided with the web browser. For JavaScript support and enabling instructions for other browsers, contact the browser vendor.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. To access Feature Navigator, go to <http://www.cisco.com/go/fn>.

## Using Software Release Notes

Cisco IOS software releases include release notes that provide the following information:

- Platform support information
- Memory recommendations
- Microcode support information
- Feature set tables
- Feature descriptions
- Open and resolved severity 1 and 2 caveats for all platforms

Release notes are intended to be release-specific for the most current release, and the information provided in these documents may not be cumulative in providing information about features that first appeared in previous releases.

## Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

### World Wide Web

To access the most current Cisco documentation on the World Wide Web at the following website:

<http://www.cisco.com>.

Translated documentation is available at the following website:

[http://www.cisco.com/public/countries\\_languages.html](http://www.cisco.com/public/countries_languages.html)

### Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

### Ordering Documentation

Cisco documentation can be ordered in the following ways:

- Registered Cisco Direct Customers can order Cisco product documentation from the Networking Products Marketplace:

[http://www.cisco.com/cgi-bin/order/order\\_root.pl](http://www.cisco.com/cgi-bin/order/order_root.pl)

- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

<http://www.cisco.com/go/subscription>

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, in North America, by calling 800 553-NETS(6387).

## Documentation Feedback

If you are reading Cisco product documentation on the World Wide Web, you can submit technical comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco.

You can e-mail your comments to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

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Document Resource Connection  
170 West Tasman Drive  
San Jose, CA 95134-9883

We appreciate your comments.

## Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools. For Cisco.com registered users, additional troubleshooting tools are available from the TAC website.

### Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

Cisco.com provides a broad range of features and services to help customers and partners streamline business processes and improve productivity. Through Cisco.com, you can find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online technical support, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on Cisco.com to obtain additional personalized information and services. Registered users can order products, check on the status of an order, access technical support, and view benefits specific to their relationships with Cisco.

To access Cisco.com, go to the following website:

<http://www.cisco.com>

## Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

### Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

<http://www.cisco.com/tac>

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

<http://www.cisco.com/register/>

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

<http://www.cisco.com/tac/caseopen>

### Contacting TAC by Telephone

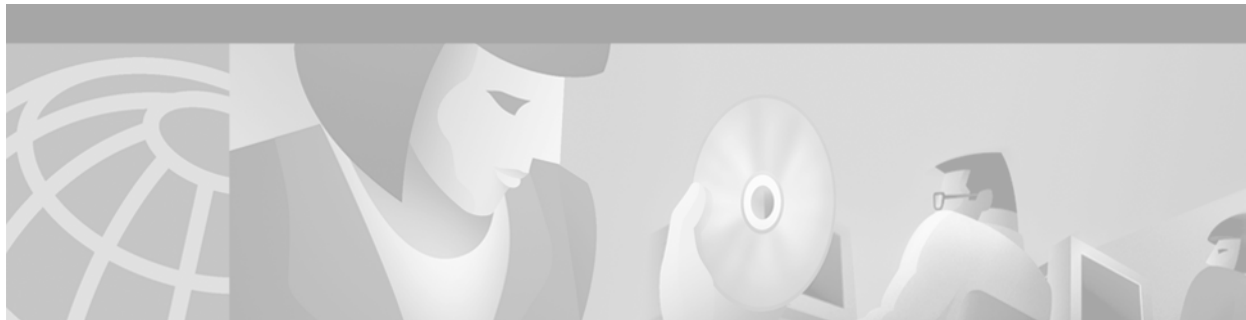
If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.





## Using Cisco IOS Software

---

This chapter provides helpful tips for understanding and configuring Cisco IOS software using the command-line interface (CLI). It contains the following sections:

- Understanding Command Modes
- Getting Help
- Using the no and default Forms of Commands
- Saving Configuration Changes
- Filtering Output from the show and more Commands
- Identifying Supported Platforms

For an overview of Cisco IOS software configuration, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*.

For information on the conventions used in the Cisco IOS software documentation set, see the chapter “About Cisco IOS Software Documentation” located at the beginning of this book.

## Understanding Command Modes

You use the CLI to access Cisco IOS software. Because the CLI is divided into many different modes, the commands available to you at any given time depend on the mode you are currently in. Entering a question mark (?) at the CLI prompt allows you to obtain a list of commands available for each command mode.

When you log in to the CLI, you are in user EXEC mode. User EXEC mode contains only a limited subset of commands. To have access to all commands, you must enter privileged EXEC mode, normally by using a password. From privileged EXEC mode you can issue any EXEC command—user or privileged mode—or you can enter global configuration mode. Most EXEC commands are one-time commands. For example, **show** commands show important status information, and **clear** commands clear counters or interfaces. The EXEC commands are not saved when the software reboots.

Configuration modes allow you to make changes to the running configuration. If you later save the running configuration to the startup configuration, these changed commands are stored when the software is rebooted. To enter specific configuration modes, you must start at global configuration mode. From global configuration mode, you can enter interface configuration mode and a variety of other modes, such as protocol-specific modes.

ROM monitor mode is a separate mode used when the Cisco IOS software cannot load properly. If a valid software image is not found when the software boots or if the configuration file is corrupted at startup, the software might enter ROM monitor mode.

Table 1 describes how to access and exit various common command modes of the Cisco IOS software. It also shows examples of the prompts displayed for each mode.

**Table 1 Accessing and Exiting Command Modes**

| Command Mode            | Access Method                                                                                                                                      | Prompt             | Exit Method                                                                                                                                                     |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| User EXEC               | Log in.                                                                                                                                            | Router>            | Use the <b>logout</b> command.                                                                                                                                  |
| Privileged EXEC         | From user EXEC mode, use the <b>enable</b> EXEC command.                                                                                           | Router#            | To return to user EXEC mode, use the <b>disable</b> command.                                                                                                    |
| Global configuration    | From privileged EXEC mode, use the <b>configure terminal</b> privileged EXEC command.                                                              | Router(config)#    | To return to privileged EXEC mode from global configuration mode, use the <b>exit</b> or <b>end</b> command, or press <b>Ctrl-Z</b> .                           |
| Interface configuration | From global configuration mode, specify an interface using an <b>interface</b> command.                                                            | Router(config-if)# | To return to global configuration mode, use the <b>exit</b> command.<br>To return to privileged EXEC mode, use the <b>end</b> command, or press <b>Ctrl-Z</b> . |
| ROM monitor             | From privileged EXEC mode, use the <b>reload</b> EXEC command. Press the <b>Break</b> key during the first 60 seconds while the system is booting. | >                  | To exit ROM monitor mode, use the <b>continue</b> command.                                                                                                      |

For more information on command modes, refer to the “Using the Command-Line Interface” chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide*.

## Getting Help

Entering a question mark (?) at the CLI prompt displays a list of commands available for each command mode. You can also get a list of keywords and arguments associated with any command by using the context-sensitive help feature.

To get help specific to a command mode, a command, a keyword, or an argument, use one of the following commands:

| Command                                | Purpose                                                                                                                  |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>help</b>                            | Provides a brief description of the help system in any command mode.                                                     |
| <i>abbreviated-command-entry?</i>      | Provides a list of commands that begin with a particular character string. (No space between command and question mark.) |
| <i>abbreviated-command-entry</i> <Tab> | Completes a partial command name.                                                                                        |
| <b>?</b>                               | Lists all commands available for a particular command mode.                                                              |
| <i>command ?</i>                       | Lists the keywords or arguments that you must enter next on the command line. (Space between command and question mark.) |



## Example: How to Find Command Options

This section provides an example of how to display syntax for a command. The syntax can consist of optional or required keywords and arguments. To display keywords and arguments for a command, enter a question mark (?) at the configuration prompt or after entering part of a command followed by a space. The Cisco IOS software displays a list and brief description of available keywords and arguments. For example, if you were in global configuration mode and wanted to see all the keywords or arguments for the **arap** command, you would type **arap ?**.

The <cr> symbol in command help output stands for “carriage return.” On older keyboards, the carriage return key is the Return key. On most modern keyboards, the carriage return key is the Enter key. The <cr> symbol at the end of command help output indicates that you have the option to press **Enter** to complete the command and that the arguments and keywords in the list preceding the <cr> symbol are optional. The <cr> symbol by itself indicates that no more arguments or keywords are available and that you must press **Enter** to complete the command.

Table 2 shows examples of how you can use the question mark (?) to assist you in entering commands. The table steps you through configuring an IP address on a serial interface on a Cisco 7206 router that is running Cisco IOS Release 12.0(3).

**Table 2**     *How to Find Command Options*

| Command                                                                                                                                                                                                                                                                                            | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router> <b>enable</b><br>Password: <password><br>Router#                                                                                                                                                                                                                                           | Enter the <b>enable</b> command and password to access privileged EXEC commands. You are in privileged EXEC mode when the prompt changes to Router#.                                                                                                                                                                                                                                                                                                   |
| Router# <b>configure terminal</b><br>Enter configuration commands, one per line. End with CNTL/Z.<br>Router(config)#                                                                                                                                                                               | Enter the <b>configure terminal</b> privileged EXEC command to enter global configuration mode. You are in global configuration mode when the prompt changes to Router(config)#.                                                                                                                                                                                                                                                                       |
| Router(config)# <b>interface serial ?</b><br><0-6>        Serial interface number<br>Router(config)# <b>interface serial 4 ?</b><br>/<br>Router(config)# <b>interface serial 4/ ?</b><br><0-3>        Serial interface number<br>Router(config)# <b>interface serial 4/0</b><br>Router(config-if)# | Enter interface configuration mode by specifying the serial interface that you want to configure using the <b>interface serial</b> global configuration command.<br><br>Enter ? to display what you must enter next on the command line. In this example, you must enter the serial interface slot number and port number, separated by a forward slash.<br><br>You are in interface configuration mode when the prompt changes to Router(config-if)#. |

**Table 2**    *How to Find Command Options (continued)*

| Command                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Comment                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>Router(config-if)# ? Interface configuration commands: . . . ip                Interface Internet Protocol config commands keepalive         Enable keepalive lan-name          LAN Name command llc2              LLC2 Interface Subcommands load-interval     Specify interval for load calculation for an                   interface locaddr-priority  Assign a priority group logging           Configure logging for interface loopback          Configure internal loopback on an interface mac-address       Manually set interface MAC address mls               mls router sub/interface commands mpoa              MPOA interface configuration commands mtu               Set the interface Maximum Transmission Unit (MTU) netbios           Use a defined NETBIOS access list or enable                   name-caching no                Negate a command or set its defaults nrzi-encoding     Enable use of NRZI encoding ntp               Configure NTP . . . Router(config-if)#</pre> | <p>Enter ? to display a list of all the interface configuration commands available for the serial interface. This example shows only some of the available interface configuration commands.</p>                                                                           |
| <pre>Router(config-if)# ip ? Interface IP configuration subcommands: access-group      Specify access control for packets accounting        Enable IP accounting on this interface address           Set the IP address of an interface authentication    authentication subcommands bandwidth-percent Set EIGRP bandwidth limit broadcast-address Set the broadcast address of an interface cgmp              Enable/disable CGMP directed-broadcast Enable forwarding of directed broadcasts dvmrp             DVMRP interface commands hello-interval    Configures IP-EIGRP hello interval helper-address     Specify a destination address for UDP broadcasts hold-time         Configures IP-EIGRP hold time . . . Router(config-if)# ip</pre>                                                                                                                                                                                                                                                          | <p>Enter the command that you want to configure for the interface. This example uses the <b>ip</b> command.</p> <p>Enter ? to display what you must enter next on the command line. This example shows only some of the available interface IP configuration commands.</p> |

**Table 2**     *How to Find Command Options (continued)*

| Command                                                                                                                                                                                                             | Comment                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router(config-if)# <b>ip address ?</b><br>A.B.C.D                      IP address<br>negotiated                      IP Address negotiated over PPP<br>Router(config-if)# <b>ip address</b>                         | <p>Enter the command that you want to configure for the interface. This example uses the <b>ip address</b> command.</p> <p>Enter <b>?</b> to display what you must enter next on the command line. In this example, you must enter an IP address or the <b>negotiated</b> keyword.</p> <p>A carriage return (&lt;cr&gt;) is not displayed; therefore, you must enter additional keywords or arguments to complete the command.</p> |
| Router(config-if)# <b>ip address 172.16.0.1 ?</b><br>A.B.C.D                      IP subnet mask<br>Router(config-if)# <b>ip address 172.16.0.1</b>                                                                 | <p>Enter the keyword or argument you want to use. This example uses the 172.16.0.1 IP address.</p> <p>Enter <b>?</b> to display what you must enter next on the command line. In this example, you must enter an IP subnet mask.</p> <p>A &lt;cr&gt; is not displayed; therefore, you must enter additional keywords or arguments to complete the command.</p>                                                                     |
| Router(config-if)# <b>ip address 172.16.0.1 255.255.255.0 ?</b><br>secondary                      Make this IP address a secondary address<br><cr><br>Router(config-if)# <b>ip address 172.16.0.1 255.255.255.0</b> | <p>Enter the IP subnet mask. This example uses the 255.255.255.0 IP subnet mask.</p> <p>Enter <b>?</b> to display what you must enter next on the command line. In this example, you can enter the <b>secondary</b> keyword, or you can press <b>Enter</b>.</p> <p>A &lt;cr&gt; is displayed; you can press <b>Enter</b> to complete the command, or you can enter another keyword.</p>                                            |
| Router(config-if)# <b>ip address 172.16.0.1 255.255.255.0</b><br>Router(config-if)#                                                                                                                                 | <p>In this example, Enter is pressed to complete the command.</p>                                                                                                                                                                                                                                                                                                                                                                  |

## Using the no and default Forms of Commands

Almost every configuration command has a **no** form. In general, use the **no** form to disable a function. Use the command without the **no** keyword to reenable a disabled function or to enable a function that is disabled by default. For example, IP routing is enabled by default. To disable IP routing, use the **no ip routing** command; to reenable IP routing, use the **ip routing** command. The Cisco IOS software command reference publications provide the complete syntax for the configuration commands and describe what the **no** form of a command does.

Configuration commands also can have a **default** form, which returns the command settings to the default values. Most commands are disabled by default, so in such cases using the **default** form has the same result as using the **no** form of the command. However, some commands are enabled by default and

have variables set to certain default values. In these cases, the **default** form of the command enables the command and sets the variables to their default values. The Cisco IOS software command reference publications describe the effect of the **default** form of a command if the command functions differently than the **no** form.

## Saving Configuration Changes

Use the **copy system:running-config nvram:startup-config** command to save your configuration changes to the startup configuration so that the changes will not be lost if the software reloads or a power outage occurs. For example:

```
Router# copy system:running-config nvram:startup-config
Building configuration...
```

It might take a minute or two to save the configuration. After the configuration has been saved, the following output appears:

```
[OK]
Router#
```

On most platforms, this task saves the configuration to NVRAM. On the Class A Flash file system platforms, this task saves the configuration to the location specified by the CONFIG\_FILE environment variable. The CONFIG\_FILE variable defaults to NVRAM.

## Filtering Output from the show and more Commands

In Cisco IOS Release 12.0(1)T and later releases, you can search and filter the output of **show** and **more** commands. This functionality is useful if you need to sort through large amounts of output or if you want to exclude output that you need not see.

To use this functionality, enter a **show** or **more** command followed by the “pipe” character (|); one of the keywords **begin**, **include**, or **exclude**; and a regular expression on which you want to search or filter (the expression is case-sensitive):

```
command | {begin | include | exclude} regular-expression
```

The output matches certain lines of information in the configuration file. The following example illustrates how to use output modifiers with the **show interface** command when you want the output to include only lines in which the expression “protocol” appears:

```
Router# show interface | include protocol

FastEthernet0/0 is up, line protocol is up
Serial4/0 is up, line protocol is up
Serial4/1 is up, line protocol is up
Serial4/2 is administratively down, line protocol is down
Serial4/3 is administratively down, line protocol is down
```

For more information on the search and filter functionality, refer to the “Using the Command-Line Interface” chapter in the *Cisco IOS Configuration Fundamentals Configuration Guide*.

# Identifying Supported Platforms

Cisco IOS software is packaged in feature sets consisting of software images that support specific platforms. The feature sets available for a specific platform depend on which Cisco IOS software images are included in a release. To identify the set of software images available in a specific release or to find out if a feature is available in a given Cisco IOS software image, see the following sections:

- Using Feature Navigator
- Using Software Release Notes

## Using Feature Navigator

Feature Navigator is a web-based tool that enables you to quickly determine which Cisco IOS software images support a particular set of features and which features are supported in a particular Cisco IOS image.

Feature Navigator is available 24 hours a day, 7 days a week. To access Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, e-mail the Contact Database Administration group at [cdbadmin@cisco.com](mailto:cdbadmin@cisco.com). If you do not have an account on Cisco.com, go to <http://www.cisco.com/register> and follow the directions to establish an account.

To use Feature Navigator, you must have a JavaScript-enabled web browser such as Netscape 3.0 or later, or Internet Explorer 4.0 or later. Internet Explorer 4.0 always has JavaScript enabled. To enable JavaScript for Netscape 3.x or Netscape 4.x, follow the instructions provided with the web browser. For JavaScript support and enabling instructions for other browsers, check with the browser vendor.

Feature Navigator is updated when major Cisco IOS software releases and technology releases occur. You can access Feature Navigator at the following URL:

<http://www.cisco.com/go/fn>

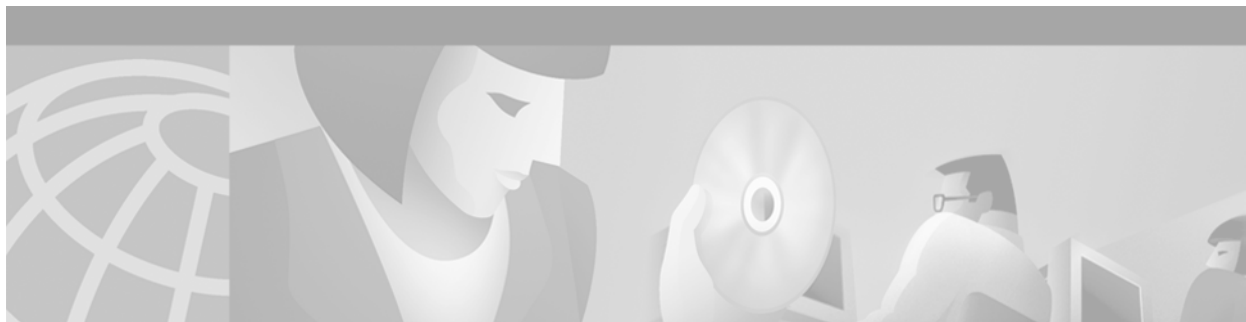
## Using Software Release Notes

Cisco IOS software releases include release notes that provide the following information:

- Platform support information
- Memory recommendations
- Microcode support information
- Feature set tables
- Feature descriptions
- Open and resolved severity 1 and 2 caveats for all platforms

Release notes are intended to be release-specific for the most current release, and the information provided in these documents may not be cumulative in providing information about features that first appeared in previous releases.





# Interface Commands

---

This book describes the basic commands that can be used on different types of interfaces. These commands correspond to the interface configuration tasks included in the Cisco IOS configuration guides. Refer to the configuration guide indicated here for configuration guidelines:

| For information about this type of interface . . . | Refer to this publication . . .                                                                                                           |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| General interface                                  | “Interface Configuration Overview” chapter in the <i>Cisco IOS Interface Configuration Guide</i>                                          |
| LAN interface                                      | “Configuring LAN Interfaces” chapter in the <i>Cisco IOS Interface Configuration Guide</i>                                                |
| Serial interface                                   | “Configuring Serial Interfaces” chapter in the <i>Cisco IOS Interface Configuration Guide</i>                                             |
| Logical interface                                  | “Configuring Logical Interfaces” chapter in the <i>Cisco IOS Interface Configuration Guide</i>                                            |
| Cisco Mainframe Channel Connection (CMCC) adapters | “Configuring Cisco Mainframe Channel Connection Adapters” chapter in the <i>Cisco IOS Bridging and IBM Networking Configuration Guide</i> |
| Dialer interface and virtual-access interface      | <i>Cisco IOS Dial Services Configuration Guide</i> and <i>Cisco IOS Dial Technologies Command Reference</i>                               |
| ISDN PRI interface                                 | <i>Cisco IOS Dial Technologies Configuration Guide</i> and <i>Cisco IOS Dial Technologies Command Reference</i>                           |

Other interface commands, specific to a particular technology area, are described in the technology specific configuration guides. For example, for hardware technical descriptions, and for information about installing the router or access server interfaces, refer to the hardware installation and maintenance publication for your particular product.

# aps authenticate

To enable authentication and specify the string that must be present to accept any packet on the out-of-band (OOB) communications channel on a packet-over-SONET (POS) interface, use the **aps authenticate** command in interface configuration mode. To disable authentication, use the **no** form of this command.

**aps authenticate** *string*

**no aps authenticate**

| Syntax Description | <i>string</i> | Text that must be present to accept the packet on a protected or working interface. A maximum of eight alphanumeric characters are accepted. |
|--------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|--------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|

| Defaults | Authentication is disabled. |
|----------|-----------------------------|
|----------|-----------------------------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CC | This command was introduced. |

| Usage Guidelines | Use the <b>aps authenticate</b> command to ensure that only valid packets are accepted on the OOB communications channel. |
|------------------|---------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------|

The **aps authenticate** command must be configured on both the working and protect interfaces.

| Examples | The following example enables authentication on POS interface 0 in slot 4: |
|----------|----------------------------------------------------------------------------|
|----------|----------------------------------------------------------------------------|

```
Router# configure terminal
Router(config)# interface pos 4/0/0
Router(config-if)# aps working 1
Router(config-if)# aps authenticate sanjose
Router(config-if)# exit
Router(config)# exit
Router#
```

| Related Commands | Command                     | Description                                        |
|------------------|-----------------------------|----------------------------------------------------|
|                  | <a href="#">aps protect</a> | Enables a POS interface as a protect interface.    |
|                  | <a href="#">aps working</a> | Configures a POS interface as a working interface. |



# aps force

To manually switch the specified circuit to a protect interface, unless a request of equal or higher priority is in effect, use the **aps force** command in interface configuration mode. To cancel the switch, use the **no** form of this command.

**aps force** *circuit-number*

**no aps force** *circuit-number*

## Syntax Description

|                       |                                                           |
|-----------------------|-----------------------------------------------------------|
| <i>circuit-number</i> | Number of the circuit to switch to the protect interface. |
|-----------------------|-----------------------------------------------------------|

## Defaults

No circuit is switched.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps force** command to manually switch the interface to a protect interface when you are not using the **aps revert** command. For example, if you need to change the fiber connection, you can manually force the working interface to switch to the protect interface.

In a one-plus-one (1+1) configuration only, you can use the **aps force 0** command to force traffic from the protect interface back onto the working interface.

The **aps force** command has a higher priority than any of the signal failures or the **aps manual** command.

The **aps force** command is configured only on protect interfaces.

## Examples

The following example forces the circuit on POS interface 0 in slot 3 (a protect interface) back onto a working interface:

```
Router# configure terminal
Router(config)# interface pos 3/0/0
Router(config-if)# aps protect 10/30/1/1
Router(config-if)# aps force 1
Router(config-if)# exit
Router(config)# exit
Router#
```

**Related Commands**

| Command                     | Description                                         |
|-----------------------------|-----------------------------------------------------|
| <a href="#">aps manual</a>  | Manually switches a circuit to a protect interface. |
| <a href="#">aps protect</a> | Enables a POS interface as a protect interface.     |
| <a href="#">aps working</a> | Configures a POS interface as a working interface.  |

# aps group

To allow more than one protect and working interface to be supported on a router, use the **aps group** command in interface configuration mode. To remove a group, use the **no** form of this command.

**aps group** *group-number*

**no aps group** *group-number*

## Syntax Description

|                     |                      |
|---------------------|----------------------|
| <i>group-number</i> | Number of the group. |
|---------------------|----------------------|

## Defaults

No groups exist.



### Note

0 is a valid group number.  
The default *group-number* is 0.  
The **aps group 0** command does not imply that no groups exist.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps group** command to specify more than one working and protect interfaces on a router, for example, working channel for group 0 and protect channel for group 1 on one router, and working channel for group 1 and protect channel for group 0 on another router.

The **aps group** command must be configured on both the protect and working interfaces.

## Examples

The following example configures two working/protect interface pairs. Working interface (3/0/0) is configured in group 10 (the protect interface for this working interface is configured on another router), and protect interface (2/0/1) is configured in group 20:

```
Router# configure terminal
Router(config)# interface ethernet 0/0
Router(config-if)# ip address 10.7.7.6 255.255.255.0
Router(config-if)# exit
Router(config)# interface pos 3/0/0
Router(config-if)# aps group 10
Router(config-if)# aps working 1
Router(config-if)# exit
Router(config)# interface pos 2/0/1
Router(config-if)# aps group 20
Router(config-if)# aps protect 1 10.7.7.7
Router(config-if)# end
```

On the second router, protect interface (4/0/0) is configured in group 10, and working interface (5/0/0) is configured in group 20 (the protect interface for this working interface is configured on another router):

```
Router(config)# interface ethernet 0/0
Router(config-if)# ip address 7.7.7.7 255.255.255.0
Router(config-if)# exit
Router(config)# interface pos 4/0/0
Router(config-if)# aps group 10
Router(config-if)# aps protect 1 7.7.7.6
Router(config-if)# exit
Router(config)# interface pos 5/0/0
Router(config-if)# aps group 20
Router(config-if)# aps working 1
Router(config-if)# exit
Router(config)# end
Router#
```

**Related Commands**

| Command                     | Description                                        |
|-----------------------------|----------------------------------------------------|
| <a href="#">aps protect</a> | Enables a POS interface as a protect interface.    |
| <a href="#">aps working</a> | Configures a POS interface as a working interface. |

# aps lockdown

To prevent a working interface from switching to a protect interface, use the **aps lockdown** command in interface configuration mode. To remove the lockdown, use the **no** form of this command.

**aps lockdown** *circuit-number*

**no aps lockdown** *circuit-number*

|                    |                                                                                                                                                                                                                                                                                                                                                                         |                                                    |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Syntax Description | <i>circuit-number</i>                                                                                                                                                                                                                                                                                                                                                   | Number of the circuit to lock out.                 |
| Defaults           | No lockdown exists.                                                                                                                                                                                                                                                                                                                                                     |                                                    |
| Command Modes      | Interface configuration                                                                                                                                                                                                                                                                                                                                                 |                                                    |
| Command History    | Release                                                                                                                                                                                                                                                                                                                                                                 | Modification                                       |
|                    | 11.1 CC                                                                                                                                                                                                                                                                                                                                                                 | This command was introduced.                       |
| Usage Guidelines   | The <b>aps lockdown</b> command is configured only on protect interfaces.                                                                                                                                                                                                                                                                                               |                                                    |
| Examples           | <p>This example locks out POS interface 3/0/0 (that is, prevents the circuit from switching to a protect interface in the event that the working circuit becomes unavailable):</p> <pre>Router# configure terminal Router(config)# interface pos 3/0/0 Router(config-if)# aps protect 1 10.7.7.7 Router(config-if)# aps lockdown 1 Router(config-if)# end Router#</pre> |                                                    |
| Related Commands   | Command                                                                                                                                                                                                                                                                                                                                                                 | Description                                        |
|                    | <a href="#">aps protect</a>                                                                                                                                                                                                                                                                                                                                             | Enables a POS interface as a protect interface.    |
|                    | <a href="#">aps working</a>                                                                                                                                                                                                                                                                                                                                             | Configures a POS interface as a working interface. |

# aps manual

To manually switch a circuit to a protect interface, use the **aps manual** command in interface configuration mode. To cancel the switch, use the **no** form of this command.

**aps manual** *circuit-number*

**no aps manual** *circuit-number*

| Syntax Description | <i>circuit-number</i> | Number of the circuit to switch to a protect interface. |
|--------------------|-----------------------|---------------------------------------------------------|
|--------------------|-----------------------|---------------------------------------------------------|

| Defaults | No circuit is switched. |
|----------|-------------------------|
|----------|-------------------------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CC | This command was introduced. |

| Usage Guidelines | Use the <b>aps manual</b> command to manually switch the interface to a protect interface. For example, you can use this feature when you need to perform maintenance on the working channel. If a protection switch is already up, you can also use the <b>aps manual</b> command to revert the communication link back to the working interface before the wait to restore (WTR) time has expired. The WTR time period is set by the <b>aps revert</b> command. |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

In a one-plus-one (1+1) configuration only, you can use the **aps manual 0** command to force traffic from the protect interface back onto the working interface.

The **aps manual** command is a lower priority than any of the signal failures or the **aps force** command.

| Examples | The following example forces the circuit on POS interface 0 in slot 3 (a working interface) back onto the protect interface: |
|----------|------------------------------------------------------------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------------------------------------------------------------|

```
Router# configure terminal
Router(config)# interface pos 3/0/0
Router(config-if)# aps working 1
Router(config-if)# aps manual 1
Router(config-if)# end
Router#
```

| Related Commands | Command                     | Description                                                                                                                |
|------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">aps force</a>   | Manually switches the specified circuit to a protect interface, unless a request of equal or higher priority is in effect. |
|                  | <a href="#">aps protect</a> | Enables a POS interface as a protect interface.                                                                            |

| Command                     | Description                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps revert</a>  | Enables automatic switchover from the protect interface to the working interface after the working interface becomes available. |
| <a href="#">aps working</a> | Configures a POS interface as a working interface.                                                                              |

# aps protect

To enable a POS interface as a protect interface, use the **aps protect** command in interface configuration mode. To remove the POS interface as a protect interface, use the **no** form of this command.

**aps protect** *circuit-number ip-address*

**no aps protect** *circuit-number ip-address*

## Syntax Description

|                       |                                                              |
|-----------------------|--------------------------------------------------------------|
| <i>circuit-number</i> | Number of the circuit to enable as a protect interface.      |
| <i>ip-address</i>     | IP address of the router that has the working POS interface. |

## Defaults

No circuit is protected.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps protect** command to configure the POS interface used by a working interface if the working interface becomes unavailable because of a router failure, degradation or loss of channel signal, or manual intervention.



### Caution

Configure the working interface before configuring the protect interface to keep the protect interface from becoming the active circuit and disabling the working circuit when it is finally discovered.

## Examples

The following example configures circuit 1 on POS interface 5/0/0 as a protect interface for the working interface on the router with the IP address of 10.7.7.7. For information on how to configure the working interface, refer to the **aps working** command.

```
Router# configure terminal
Router(config)# interface pos 5/0/0
Router(config-if)# aps protect 1 10.7.7.7
Router(config-if)# end
Router#
```

## Related Commands

| Command                     | Description                                        |
|-----------------------------|----------------------------------------------------|
| <a href="#">aps working</a> | Configures a POS interface as a working interface. |



# aps revert

To enable automatic switchover from the protect interface to the working interface after the working interface becomes available, use the **aps revert** command in interface configuration mode. To disable automatic switchover, use the **no** form of this command.

**aps revert** *minutes*

**no aps revert**

## Syntax Description

|                |                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------|
| <i>minutes</i> | Number of minutes until the circuit is switched back to the working interface after the working interface is available. |
|----------------|-------------------------------------------------------------------------------------------------------------------------|

## Defaults

Automatic switchover is disabled.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps revert** command to return the circuit to the working interface when it becomes available. The **aps revert** command is configured only on protect interfaces.

## Examples

The following example enables circuit 1 on POS interface 5/0/0 to revert to the working interface after the working interface has been available for 3 minutes:

```
Router# configure terminal
Router(config)# interface pos 5/0/0
Router(config-if)# aps protect 1 10.7.7.7
Router(config-if)# aps revert 3
Router(config-if)# end
Router#
```

## Related Commands

| Command                     | Description                                     |
|-----------------------------|-------------------------------------------------|
| <a href="#">aps protect</a> | Enables a POS interface as a protect interface. |

# aps timers

To change the time between hello packets and the time before the protect interface process declares a working interface router to be down, use the **aps timers** command in interface configuration mode. To return to the default timers, use the **no** form of this command.

**aps timers** *seconds1 seconds2*

**no aps timers**

## Syntax Description

|                 |                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------|
| <i>seconds1</i> | Number of seconds to wait before sending a hello packet (hello timer).                                                  |
| <i>seconds2</i> | Number of seconds to wait to receive a response from a hello packet before the interface is declared down (hold timer). |

## Defaults

Hello time is 1 second, and hold time is 3 seconds.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps timers** command to control the time between an automatic switchover from the protect interface to the working interface after the working interface becomes available.

Normally, the hold time is greater than or equal to three times the hello time.

The **aps timers** command is configured only on protect interfaces.

## Examples

The following example specifies a hello time of 2 seconds and a hold time of 6 seconds on circuit 1 on POS interface 5/0/0:

```
Router# configure terminal
Router(config)# interface pos 5/0/0
Router(config-if)# aps working 1
Router(config-if)# aps timers 2 6
Router(config-if)# end
Router#
```

# aps unidirectional

To configure a protect interface for unidirectional mode, use the **aps unidirectional** command in interface configuration mode. To return to the default, bidirectional mode, use the **no** form of this command.

**aps unidirectional**

**no aps unidirectional**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Bidirectional mode

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

Use the **aps unidirectional** command when you must interoperate with SONET network equipment, Add Drop Multiplexor(s) (ADMs) that supports unidirectional mode.



### Note

We recommend bidirectional mode when it is supported by the interconnecting SONET equipment. When the protect interface is configured as unidirectional, the working and protect interfaces must cooperate to switch the transmit and receive SONET channel in a bidirectional fashion. This happens automatically when the SONET network equipment is in bidirectional mode.

The **aps unidirectional** command is configured only on protect interfaces.

## Examples

The following example configures POS interface 3/0/0 for unidirectional mode:

```
Router# configure terminal
Router(config)# interface pos 3/0/0
Router(config-if)# aps unidirectional
Router(config-if)# aps protect 1 7.7.7.7
Router(config-if)# end
Router#
```

# aps working

To configure a Packet over SONET (POS) interface as a working interface, use the **aps working** command in interface configuration mode. To remove the protect option from the POS interface, use the **no** form of this command.

**aps working** *circuit-number*

**no aps working** *circuit-number*

## Syntax Description

|                       |                                                        |
|-----------------------|--------------------------------------------------------|
| <i>circuit-number</i> | Circuit number associated with this working interface. |
|-----------------------|--------------------------------------------------------|

## Defaults

No circuit is configured as working.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

When a working interface becomes unavailable because of a router failure, degradation or loss of channel signal, or manual intervention, the circuit is switched to the protect interface to maintain the connection.

To enable the circuit on the protect interface to switch back to the working interface after the working interface becomes available again, use the **aps revert** command in interface configuration mode.



### Caution

Configure the working interface before configuring the protect interface to keep the protect interface from becoming the active circuit and disabling the working circuit when it is finally discovered.

## Examples

The following example configures POS interface 0 in slot 4 as a working interface. For information on how to configure the protect interface, refer to the **aps protect** command.

```
Router# configure terminal
Router(config)# interface pos 4/0/0
Router(config-if)# aps working 1
Router(config-if)# end
Router#
```

## Related Commands

| Command                     | Description                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">aps protect</a> | Enables a POS interface as a protect interface.                                                                                 |
| <a href="#">aps revert</a>  | Enables automatic switchover from the protect interface to the working interface after the working interface becomes available. |

# atm sonet

To set the mode of operation and thus control the type of the ATM cell used for cell-rate decoupling on the SONET physical layer interface module (PLIM), use the **atm sonet** command in interface configuration mode. To restore the default Synchronous Transport Signal level 12, concatenated (STS-12c) operation, use the **no** form of this command.

**atm sonet [stm-4]**

**no atm sonet [stm-4]**

| Syntax Description | <b>stm-4</b> (Optional) Synchronous Digital Hierarchy/Synchronous Transport Signal level 4 (SDH/STM-4) operation (ITU-T specification). |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|

| Defaults | STS-12c |
|----------|---------|
|----------|---------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                        |
|-----------------|---------|-------------------------------------|
|                 | 11.1 CC | This command was introduced.        |
|                 | 11.2 GS | The <b>stm-4</b> keyword was added. |

| Usage Guidelines | Use STM-4 in applications in which SDH framing is required.<br>Use the default (STS-12c) in applications in which the ATM switch requires “unassigned cells” for rate adaptation. An unassigned cell contains 32 zeros. |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Examples | The following example sets the mode of operation to SONET STM-4 on ATM interface 3/0:<br><pre>Router(config)# <b>interface atm 3/0</b> Router(config-if)# <b>atm sonet stm-4</b> Router(config-if)# <b>end</b> Router#</pre> |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# auto-polarity

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

**auto-polarity**

**no auto-polarity**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |         |
|-----------------|---------|
| <b>Defaults</b> | Enabled |
|-----------------|---------|

|                      |                   |
|----------------------|-------------------|
| <b>Command Modes</b> | Hub configuration |
|----------------------|-------------------|

| <b>Command History</b> | Release | Modification                 |
|------------------------|---------|------------------------------|
|                        | 10.3    | This command was introduced. |

|                         |                                                         |
|-------------------------|---------------------------------------------------------|
| <b>Usage Guidelines</b> | This command applies to a port on an Ethernet hub only. |
|-------------------------|---------------------------------------------------------|

|                 |                                                                                                 |
|-----------------|-------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example enables automatic receiver polarity reversal on hub 0, ports 1 through 3: |
|-----------------|-------------------------------------------------------------------------------------------------|

```
Router(config)# hub ethernet 0 1 3
Router(config-hub)# auto-polarity
```

| <b>Related Commands</b> | Command             | Description                                                                            |
|-------------------------|---------------------|----------------------------------------------------------------------------------------|
|                         | <a href="#">hub</a> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |

# bandwidth (interface)

To set and communicate the current bandwidth value for an interface to higher-level protocols, use the **bandwidth** command in interface configuration mode. To restore the default values, use the **no** form of this command.

**bandwidth** *kilobits*

**no bandwidth**

## Syntax Description

|                 |                                                                                              |
|-----------------|----------------------------------------------------------------------------------------------|
| <i>kilobits</i> | Intended bandwidth, in kilobits per second. For a full bandwidth DS3, enter the value 44736. |
|-----------------|----------------------------------------------------------------------------------------------|

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines



### Note

The **bandwidth** command sets an informational parameter to communicate only the current bandwidth to the higher-level protocols; 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.

Interior Gateway Routing Protocol (IGRP) uses the minimum path bandwidth to determine a routing metric. The TCP protocol adjusts initial retransmission parameters on the basis of 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.

## Examples

The following example sets the full bandwidth for DS3 transmissions:

**bandwidth (interface)**

```
Router(config)# interface serial 0  
Router(config-if)# bandwidth 44736
```

**Related Commands**

| Command               | Description                                                      |
|-----------------------|------------------------------------------------------------------|
| <b>show interface</b> | Displays statistics for all interfaces configured on the router. |



# bert abort

To end a bit error rate testing session, use the **bert abort** command in privileged EXEC mode.

## bert abort

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                                                               |
|------------------------|----------------|---------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                           |
|                        | 12.0(2)XD      | This command was introduced.                                  |
|                        | 12.0(3)T       | This command was integtraed into Cisco IOS Release 12.0(3) T. |

|                         |                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>Use the <b>bert abort</b> command to cancel bit error rate testing on each port of the Cisco AS5300 router.</p> <p>The bit error rate test (BERT) feature enables you to test the quality of the connected PRI links by direct comparison of a pseudorandom or repetitive test pattern with an identical locally generated test pattern.</p> |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                                                                      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>This sample display shows output for the <b>bert abort</b> command when no bit error rate test is running:</p> <pre>Router# bert abort Router# 17:53:33: There is no BERT Test running ....</pre> |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |                                                                                                                                                                                                                                                                                                          |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>This sample display shows output from the <b>bert abort</b> command when a bit error rate test is running:</p> <pre>Router# bert abort Do you really want to abort the current BERT [confirm] Y  17:56:56: %BERT-6-BERT_RESULTS: Controller T1 0 Profile default : The Test was aborted by User</pre> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                         |                                 |                                                     |
|-------------------------|---------------------------------|-----------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                  | <b>Description</b>                                  |
|                         | <a href="#">bert controller</a> | Starts a bit error rate test for a particular port. |
|                         | <a href="#">bert pattern</a>    | Sets up various bit error rate testing profiles.    |

# bert controller

To start a bit error rate test for a particular port, use the **bert controller** command in privileged EXEC mode.

**bert controller** [*type-controller*] {[*last-controller*] | **profile** [*number* | **default**]}

## Syntax Description

|                        |                                                                             |
|------------------------|-----------------------------------------------------------------------------|
| <i>type-controller</i> | (Optional) Use either T1 or E1 depending on the type of facility.           |
| <i>last-controller</i> | (Optional) Last controller number. The valid range is 0 to 7.               |
| <b>profile</b>         | Sets the profile numbers for the bit error rate test. The default is 0.     |
| <i>number</i>          | (Optional) Numbers of the test profiles to use. The valid range is 0 to 15. |
| <b>default</b>         | (Optional) Executes the default bit error rate test (0).                    |

## Defaults

The default **profile** number is 0.

## Command Modes

Privileged EXEC

## Command History

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

## Usage Guidelines

Use the **bert controller** command to start a bit error rate test for a particular port on a Cisco AS5300 router.

### Quality Testing

The bit error rate test (BERT) feature enables you to test the quality of the connected PRI links by direct comparison of a pseudo-random or repetitive test pattern with an identical locally generated test pattern.

### E1 Controllers

The E1 controller cannot be set in loopback mode from the AS5300. For the bert controller command to work correctly with the E1 controller, the controller must be configured as a channel-group or CAS and the line must be configured as a remote loop from the switch side of the link.

## Examples

This sample display shows output from the **bert controller** command:

```
Router# bert controller T1 0 profile 0
Press <Return> to start the BERT [confirm] Y

17:55:34: %BERT-6-BERT_START: Starting BERT on Interface 0 with Profile default
Data in current interval (10 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

Table 3 describes the significant fields shown in the sample display for the **bert controller** command.

**Table 3** *bert controller Field Descriptions*

| Field                    | Description                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data in Current Interval | Shows the current accumulation period, which rolls into the 24 hour accumulation every 15 minutes. The 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     | For alternate mark inversion (AMI)-coded signals, a line code violation is a bipolar violation (BPV) occurrence. Indicates the occurrence of either a BPV or excessive zeros (EXZ) error event.                                                                                                                                                             |
| Path Code Violations     | When super frame (SF) (D4) framing is used, a path code violation is a framing error. When Extended Superframe (ESF) framing is used, a path code violation is a CRC-6 error. Indicates a frame-synchronization bit error in the D4 and E1-non-CRC 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 indicated when there is a difference between the timing of a synchronous receiving terminal and the received signal.                                                                                                                                                |
| Fr Loss Secs             | Seconds during which the framing pattern has been lost. Indicates the number of seconds an Out-of-Frame error is detected.                                                                                                                                                                                                                                  |
| Line Err Secs            | A line error second (LES) is a second in which one or more line code violation (LCV or CV-L) errors are detected.                                                                                                                                                                                                                                           |
| Degraded Mins            | Degraded minute is one in which the estimated error rate exceeds $1^{-6}$ but does not exceed $1^{-3}$ .                                                                                                                                                                                                                                                    |
| 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 alarm indication signal defect.<br><br>For D4 and E1-noCRC links, the presence of bipolar violations also triggers an errored second. |
| Bursty Err Secs          | Second with fewer than 320 and more than 1 path coding violation error, no severely errored frame defects, and no detected incoming alarm indication signals (AIS) defects. Controlled slips are not included in this parameter.                                                                                                                            |

**Table 3**     *bert controller Field Descriptions (continued)*

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Severely Err Secs | <p>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.</p> <p>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.</p> <p>For E1-non-CRC signals, a second with 2048 or more line code violations.</p> <p>For D4 signals, a count of 1-second intervals with framing errors, or an Out-of-Frame defect, or 1544 line code violations.</p> |
| Unavail Secs      | Count for every second in which an unavailable signal state occurs. This term is used by new standards in place of failed seconds (FS).                                                                                                                                                                                                                                                                                                                                                                                                |

**Related Commands**

| Command                      | Description                                      |
|------------------------------|--------------------------------------------------|
| <a href="#">bert abort</a>   | Aborts a bit error rate testing session.         |
| <a href="#">bert pattern</a> | Sets up various bit error rate testing profiles. |

# bert pattern

To enable a bit error rate (BER) test pattern on a T1 or E1 line, use the **bert pattern** command in controller configuration mode. To disable a BER test pattern, use the **no** form of this command.

**bert pattern** {**2^23** | **2^20** | **2^20-QRSS** | **2^15** | **2^11** | **1s** | **0s** | **alt-0-1**} **interval** *time*

**no bert pattern** {**2^23** | **2^20** | **2^20-QRSS** | **2^15** | **2^11** | **1s** | **0s** | **alt-0-1**} **interval** *time*

## Syntax Description

|                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| { <b>2^23</b>   <b>2^20-QRSS</b>   <b>2^15</b>   <b>2^11</b>   <b>1s</b>   <b>0s</b>   <b>alt-0-1</b> } | <p>Specifies the length of the repeating BER test pattern. Values are:</p> <ul style="list-style-type: none"> <li><b>2^23</b>—Pseudorandom 0.151 test pattern that is 8,388,607 bits in length.</li> <li><b>2^20</b>—Pseudo-random 0.153 test pattern that is 1,048,575 bits in length.</li> <li><b>2^20-QRSS</b>—Pseudorandom quasi-random signal sequence (QRSS) 0.151 test pattern that is 1,048,575 bits in length.</li> <li><b>2^15</b>—Pseudorandom 0.151 test pattern that is 32,768 bits in length.</li> <li><b>2^11</b>—Pseudorandom test pattern that is 2,048 bits in length.</li> <li><b>1s</b>—Repeating pattern of ones (...111...).</li> <li><b>0s</b>—Repeating pattern of zeros (...000...).</li> <li><b>alt-0-1</b>—Repeating pattern of alternating zeros and ones (...01010...).</li> </ul> |
| <b>interval</b> <i>time</i>                                                                             | Specifies the duration of the BER test. The interval can be a value from 1 to 1440 minutes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Defaults

Disabled

## Command Modes

Controller configuration

## Command History

| Release    | Modification                                                        |
|------------|---------------------------------------------------------------------|
| 11.1CC     | The command was introduced.                                         |
| 12.0(5)XE  | The command was enhanced as an ATM interface configuration command. |
| 12.0(7)XE1 | Support for Cisco 7100 series routers was added.                    |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T.        |

## Usage Guidelines

BER testing is supported on each of the T1 or E1 links and is done only over an unframed T1 or E1 signal, run on only one port at a time.

To view the BER test results, use the **show controllers atm EXEC** command. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BER test
- Total bit errors
- Total bits received

When the T1 or E1 line has a BER test running, the line state is **DOWN** and the status field shows the current/last result of the test.

The **bert pattern** command is not written to NVRAM. This command is only used to test the T1 or E1 line for a short predefined interval and to avoid accidentally saving the command, which could cause the interface not to come up the next time the router reboots.

### Examples

In the following example on a Cisco 7200 series router, a BER test pattern of all zeros is run for 30 minutes on T1 line 0 on the port adapter in slot 9:

```
interface atm 9/0
 bert pattern 0s interval 30
```

### Related Commands

| Command                                                   | Description                                                                                        |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>show controllers atm <i>slot/port</i></b>              | Displays information about T1/E1 links in Cisco 7100 series routers and Cisco 7200 series routers. |
| <b>show controllers atm <i>slot/port-adapter/port</i></b> | Displays information about the T1/E1 links in Cisco 7500 series routers.                           |

# bert profile

To set up various bit error rate testing profiles, use the **bert profile** command in privileged EXEC mode. To disable the particular bit error rate test (BERT) profile indicated by profile number, use the **no** form of this command.

**bert profile** *number pattern pattern threshold threshold error-injection err\_inj duration time*

**no bert profile** *number pattern pattern threshold threshold error-injection err\_inj duration time*

## Syntax Description

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>          | BERT profile number. The valid range is 1 to 15. This is the number assigned to a particular set of parameters. If no such profile of the same number exists in the system, a new profile is created with that number; otherwise, an existing set of parameters with that profile number is overwritten by the new profile.                                                                                                                                                    |
| <b>pattern</b>         | Pattern that BERT will generate on the line.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <i>pattern</i>         | 0s—repetitive pattern, all zeroes<br>1_in_16— <i>n</i> repetitive pattern, 1 in 16<br>1s— <i>n</i> repetitive pattern, all ones<br>211-O.152— <i>n</i> pseudo-random pattern, $2^{11}$ -1 O.152<br>215-O.15— <i>n</i> pseudo-random pattern, $2^{15}$ -1 O.151<br>220-O.151QRSS— <i>n</i> pseudo-random pattern, $2^{20}$ -1 O.151 QRSS (This is the default)<br>220-O.153— <i>n</i> pseudo-random pattern, $2^{20}$ -1 O.153<br>3_in_24— <i>n</i> repetitive pattern, 3 in 24 |
| <b>threshold</b>       | Test failure (error) threshold that determines if the BERT on this line passed.                                                                                                                                                                                                                                                                                                                                                                                                |
| <i>threshold</i>       | 10^-2—bit error rate of $10^{-2}$<br>10^-3—bit error rate of $10^{-3}$<br>10^-4—bit error rate of $10^{-4}$<br>10^-5—bit error rate of $10^{-5}$<br>10^-6—bit error rate of $10^{-6}$ (This is the default)<br>10^-7—bit error rate of $10^{-7}$<br>10^-8—bit error rate of $10^{-8}$                                                                                                                                                                                          |
| <b>error-injection</b> | Error injection rate for bit errors injected into the BERT pattern generated by the chip. The default is none.                                                                                                                                                                                                                                                                                                                                                                 |
| <i>err_inj</i>         | 10^-1—Error injection of $10^{-1}$<br>10^-2—Error injection of $10^{-2}$<br>10^-3—Error injection of $10^{-3}$<br>10^-4—Error injection of $10^{-4}$<br>10^-5—Error injection of $10^{-5}$<br>10^-6—Error injection of $10^{-6}$<br>10^-7—Error injection of $10^{-7}$<br>none—No error injection in the data pattern.                                                                                                                                                         |
| <b>duration</b>        | Duration, in minutes, for which BERT is to be executed.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <i>time</i>            | Duration of BERT, in minutes. The valid range is 1 to 1440. The default is 10.                                                                                                                                                                                                                                                                                                                                                                                                 |

## Defaults

The default profile created internally by the system has parameters that cannot be changed. This profile has been defined so that you can execute BERT on a line without having to configure a new profile. The default profile is displayed when the running configuration is displayed and is not stored in non-volatile random access memory (NVRAM):

```
bert profile default pattern 220-0151QRSS threshold 10^-6 error-injection none duration 10
```

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                                              |
|-----------|-----------------------------------------------------------|
| 12.0(2)XD | This command was introduced.                              |
| 12.0(3)T  | This command was implemented in Cisco IOS Release 12.0 T. |

## Usage Guidelines

Use the **bert profile** command to set up bit error rate testing profiles for the Cisco AS5300 router.

The bit error rate test (BERT) feature enables you to test the quality of the connected PRI links by direct comparison of a pseudorandom or repetitive test pattern with an identical locally generated test pattern. A BERT profile is a set of parameters related to a BERT test and is stored as part of the configuration in the NVRAM. You can define up to 15 BERT profiles on the system. By setting up the BERT profiles in this way, you do not have to enter the parameters each time you want to run a BERT—just select the number of the BERT profile you want to run.

## Examples

The following example shows a configured BERT profile number 1 to have a 0s test pattern, with a  $10^{-2}$  threshold, no error injection, and a duration of 125 minutes:

```
Router(config)# bert ?
    profile  Profile Number for this BERT configuration
Router(config)# bert profile ?
    <1-15>  BERT Profile Number
Router(config)# bert profile 1 pattern 0s threshold 10^-2 error-injection none duration 125
```

## Related Commands

| Command                         | Description                                         |
|---------------------------------|-----------------------------------------------------|
| <a href="#">bert abort</a>      | Aborts a bit error rate testing session.            |
| <a href="#">bert controller</a> | Starts a bit error rate test for a particular port. |



# cablelength

To specify the distance of the cable from the routers to the network equipment, use the **cablelength** command in controller configuration mode. To restore the default cable length, use the **no** form of this command.

**cablelength** *feet*

**no cablelength**

## Syntax Description

|             |                                                                                                                                                                                                                                 |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>feet</i> | Number of feet in the range of 0 to 450. The default values are: <ul style="list-style-type: none"><li>• 224 feet for Channelized T3 Interface Processor (CT3IP)</li><li>• 49 feet for PA-T3 and PA-2T3 port adapters</li></ul> |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

224 feet for CT3IP interface processor  
49 feet for PA-T3 and PA-2T3 port adapters

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

The default cable length of 224 feet is used by the CT3IP interface processor.  
The default cable length of 49 feet is used by the PA-T3 and PA-2T3port adapters.



### Note

Although you can specify a cable length from 0 to 450 feet, the hardware only recognizes two ranges: 0 to 49 and 50 to 450. For example, entering 35 feet uses the 0 to 49 range. If you later change the cable length to 40 feet, there is no change because 40 is within the 0 to 49 range. However, if you change the cable length to 50, the 50 to 450 range is used. The actual number you enter is stored in the configuration file.

## Examples

The following example sets the cable length for the router to 300 feet:

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# cablelength 300
```

# cablelength long

To increase the pulse of a signal at the receiver and decrease the pulse from the transmitter using pulse equalization and line build-out for a T1 cable, use the **cablelength long** command in controller configuration or interface configuration mode. To return the pulse equalization and line build-out values to their default settings, use the **no** form of this command.

**cablelength long** *dbgain-value dbloss-value*

**no cablelength long**

|                           |                     |                                                                                                                                                                                                                           |
|---------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>dbgain-value</i> | Number of decibels (dB) by which the receiver signal is increased. Use one of the following values: <ul style="list-style-type: none"> <li>gain26</li> <li>gain36</li> </ul> The default is 26 dB.                        |
|                           | <i>dbloss-value</i> | Number of decibels by which the transmit signal is decreased. Use one of the following values: <ul style="list-style-type: none"> <li>0db</li> <li>-7.5db</li> <li>-15db</li> <li>-22.5db</li> </ul> The default is 0 dB. |

**Defaults** Receiver gain of 26 dB and transmitter loss of 0 dB.

**Command Modes** Controller configuration for the Cisco AS5200 universal access server, Cisco AS5800 universal access server, and Cisco MC3810 multiservice access concentrator.  
Interface configuration for the Cisco 2600 and Cisco 3600 series routers.

| <b>Command History</b> | <b>Release</b>         | <b>Modification</b>                                                                                                                                                                                                       |
|------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | 11.2                   | This command was introduced.                                                                                                                                                                                              |
|                        | 11.3                   | The following choices were added: <b>gain26</b> , <b>gain36</b> , <b>0db</b> , <b>-7.5db</b> , <b>-15db</b> , <b>-22.5db</b> .                                                                                            |
|                        | 12.0(5)T and 12.0(5)XK | This command was modified to include support as an ATM interface configuration command for the Cisco 2600 and 3600 series routers and as a controller configuration command for the Cisco AS5800 universal access server. |
|                        |                        |                                                                                                                                                                                                                           |

---

**Usage Guidelines****Cisco AS5200 Access Server, Cisco AS5800 Universal Access Server, and Cisco MC3810 Multiservice Access Concentrator**

Use this command for configuring the controller T1 interface on the Cisco AS5200 access server, on the Cisco AS5800 universal access server, or on the Cisco MC3810 multiservice access concentrator. The **cablelength long** command is used to configure DS1 links (meaning, to build CSU/DSU links) when the cable length is no longer than 655 feet.

On the Cisco MC3810, this command is supported on T1 controllers only and applies to Voice-over-Frame Relay, Voice-over-ATM, and Voice-over-HDLC.

**Note**

On the Cisco MC3810, you cannot use the **cablelength long** command on a DSX-1 interface only. The **cablelength long** command can be only used on CSU interfaces.

---

A pulse equalizer regenerates a signal that has been attenuated and filtered by a cable loss. Pulse equalization does not produce a simple gain, but it filters the signal to compensate for complex cable loss. A **gain26** receiver gain compensates for a long cable length equivalent to 26 dB of loss, while a **gain36** compensates for 36 dB of loss.

The lengthening or *building out* of a line is used to control far-end crosstalk. Line build-out attenuates the stronger signal from the customer installation transmitter so that the transmitting and receiving signals have similar amplitudes. A signal difference of less than 7.5 dB is ideal. Line build-out does not produce simple flat loss (also known as *resistive* flat loss). Instead, it simulates a cable loss of 7.5 dB, 15 dB, or 22.5 dB so that the resulting signal is handled properly by the receiving equalizer at the other end.

**Cisco 2600 and Cisco 3600 Series Routers**

This command is supported on T1 long-haul links only. If you enter the **cablelength long** command on a DSX-1 (short haul) interface, the command is rejected.

The transmit attenuation value is best obtained by experimentation. If the signal received by the far-end equipment is too strong, reduce the transmit level by entering additional attenuation.

---

**Examples****Cisco AS5200 Access Server, Cisco AS5800 Universal Access Server, and Cisco MC3810 Multiservice Access Concentrator**

The following example increases the receiver gain by 26 decibels and decreases the transmitting pulse by 7.5 decibels for a long cable on a Cisco AS5200:

```
AS5200(config)# controller t1 0
AS5200(config-controller)# cablelength long gain26 -7.5db
```

The following example increases the receiver gain by 36 decibels and decreases the transmitting pulse by 15 decibels for a long cable on a Cisco AS5800:

```
AS5800(config)# controller t1 0
AS5800(config-controller)# cablelength long gain36 -15db
```

The following example configures the cable length for controller T1 0 on a Cisco MC3810 to a decibel pulse gain of 36 decibels and a decibel pulse rate of -22.5 decibels:

```
MC3810(config)# controller t1 0
MC3810(config-controller)# cablelength long gain36 -22.5db
```

**Cisco 2600 and Cisco 3600 Series Routers**

On a Cisco 2600 or 3600 series router, the following example specifies a pulse gain of 36 decibels and a decibel pulse rate of -7.5 decibels:

```
Router(config)# interface atm 0/2
```

```
Router(config-controller)# cablelength long gain36 -7.5db
```

**Related Commands**

| Command                           | Description                                             |
|-----------------------------------|---------------------------------------------------------|
| <a href="#">cablelength short</a> | Sets a cable length 655 feet or shorter for a DS1 link. |

# cablelength short

To set a cable length 655 feet or shorter for a DS1 link on the Cisco MC3810 or Cisco 2600 and 3600 series routers, use the **cablelength short** command in controller configuration or interface configuration mode. This command is supported on T1 controllers only. To delete the **cablelength short** value, use the **no** form of this command. To set cable lengths longer than 655 feet, use the **cablelength long** command.

**cablelength short** *length*

**no cablelength short**

| Syntax Description | <i>length</i> | Specifies a cable length. Use one of the following values to specify this value:                                                                                                                                                                                                                                                                   |
|--------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |               | <ul style="list-style-type: none"> <li>133—Specifies a cable length from 0 to 133 feet.</li> <li>266—Specifies a cable length from 134 to 266 feet.</li> <li>399—Specifies a cable length from 267 to 399 feet.</li> <li>533—Specifies a cable length from 400 to 533 feet.</li> <li>655—Specifies a cable length from 534 to 655 feet.</li> </ul> |

| Defaults | <p>The default is 133 feet for the Cisco AS5200 access server, Cisco AS5800 universal access server, and Cisco MC3810 multiservice access concentrator.</p> <p>There is no default value or behavior for the Cisco 2600 and Cisco 3600 series routers.</p> |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Command Modes | <p>Controller configuration for the Cisco AS5200 access server, Cisco AS5800 universal access server, and Cisco MC3810 multiservice access concentrator.</p> <p>Interface configuration for the Cisco 2600 and Cisco 3600 series routers.</p> |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Command History | Release                | Modification                                                                                                                                                                                                |
|-----------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 11.3(2)AA              | This command was introduced.                                                                                                                                                                                |
|                 | 12.0(5)T and 12.0(5)XK | This command was modified to include support as an ATM interface command for the Cisco 2600 and 3600 series routers and as a controller configuration command for the Cisco AS5800 universal access server. |

| Usage Guidelines | <p><b>Cisco AS5200 Access Server, Cisco AS5800 Universal Access Server, and Cisco MC3810 Multiservice Access Concentrator</b></p> <p>On the Cisco MC3810, the <b>cablelength short</b> command is used to configure DSX-1 links when the cable length is 655 feet or less than 655 feet. On the Cisco MC3810, this command is supported on T1 controllers only.</p> |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Note**

On the Cisco MC3810, you cannot enter the **cablelength short** command on a CSU interface. The **cablelength short** command can be used only on DSX-1 interfaces.

**Cisco 2600 and Cisco 3600 Series Routers**

This command is supported on T1 short-haul links only. If you enter the **cablelength short** command on a long-haul interface, the command is rejected.

**Examples****Cisco AS5200 Access Server, Cisco AS5800 Universal Access Server, and Cisco MC3810 Multiservice Access Concentrator**

In the following example, the cable length is set to 266 for the T1 controller in slot 0 on dial shelf 0:

```
Router# configure terminal
Router(config)# controller t1 1/1/0
Router(config-controller)# cablelength short 266
router (config-controller)# exit
Router(config)# exit
Router#
```

**Cisco 2600 and Cisco 3600 Series Routers**

On a Cisco 2600 or 3600 series router, the following example specifies a cable length from 0 to 133 feet:

```
Router(config)# interface atm 0/2
Router(config-if)# cablelength short 133
```

**Related Commands**

| Command                          | Description                                                                                                                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">cablelength long</a> | Increases the pulse of a signal at the receiver and decreases the pulse from the sender using pulse equalization and line build-out. |

# carrier-delay

To set the carrier delay on a serial interface, use the **carrier-delay** command in interface configuration mode. To return to the default carrier delay value, use the **no** form of this command.

**carrier-delay** [*seconds* | *msec* *milliseconds*]

**no carrier-delay** [*seconds* | *msec* *milliseconds*]

## Syntax Description

|                          |                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <i>seconds</i>           | (Optional) Time, in seconds, to wait for the system to change states. Enter an integer in the range 0 to 60. The default is 2 seconds. |
| <i>msec milliseconds</i> | (Optional) msec keyword followed by time in milliseconds.                                                                              |

## Defaults

The default carrier delay is 2 seconds; default in milliseconds is 50 milliseconds.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.1    | This command was introduced. |

## Usage Guidelines

If a link goes down and comes back up before the carrier delay timer expires, the down state is effectively filtered, and the rest of the software on the switch is not aware that a link-down event occurred. Therefore, a large carrier delay timer results in fewer link-up/link-down events being detected. On the other hand, setting the carrier delay time to 0 means that *every* link-up/link-down event is detected.

In most environments a lower carrier delay is better than a higher one. The exact value you choose depends on the nature of the link outages you expect to see in your network and how long you expect those outages to last.

If your data links are subject to short outages, especially if those outages last less than the time it takes for your IP routing to converge, you should set a relatively long carrier delay value to prevent these short outages from causing unnecessary churn in your routing tables.

However, if your outages tend to be longer, you might want to set a shorter carrier delay so that the outages are detected sooner, and the IP route convergence begins and ends sooner.

## Examples

The following example changes the carrier delay to 5 seconds:

```
Router(config)# interface serial 0  
Router(config-if)# carrier-delay 5
```

# channel-group (Fast EtherChannel)

To assign a Fast Ethernet interface to a Fast EtherChannel group, use the **channel-group** command in interface configuration mode. To remove a Fast Ethernet interface from a Fast EtherChannel group, use the **no** form of this command.

```
channel-group channel-number
no channel-group channel-number
```

Syntax Description

|                |                                                                                                                                                                       |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| channel-number | Port-channel number previously assigned to the port-channel interface when using the <b>interface port-channel</b> global configuration command. The range is 1 to 4. |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Defaults

No channel group is configured.

Command Modes

Interface configuration

Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

Usage Guidelines

Before you assign a Fast Ethernet interface to a Fast EtherChannel group, you must first create a port-channel interface. To create a port-channel interface, use the **interface port-channel** global configuration command.

If the Fast Ethernet interface has an IP address assigned, you must disable it before adding the Fast Ethernet interface to the Fast EtherChannel. To disable an existing IP address on the Fast Ethernet interface, use the **no ip address** command in interface configuration mode.

The Fast EtherChannel feature allows multiple Fast Ethernet point-to-point links to be bundled into one logical link to provide bidirectional bandwidth of up to 800 Mbps. Fast EtherChannel can be configured between Cisco 7500 series routers and Cisco 7000 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI) or between a Cisco 7500 series router or a Cisco 7000 series router with the RSP7000 and RSP700CI and a Catalyst 5000 switch.

A maximum of four Fast Ethernet interfaces can be added to a Fast EtherChannel group.



Caution

The port-channel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet interfaces. Do not assign bridge groups on the physical Fast Ethernet interfaces because it creates loops. Also, you must disable spanning tree.

To display information about the Fast EtherChannel, use the **show interfaces port-channel EXEC** command.



**Examples**

The following example adds Fast Ethernet 1/0 to the Fast EtherChannel group specified by port-channel 1:

```
Router(config)# interface port-channel 1
Router(config-if)# ip address 1.1.1.10 255.255.255.0
Router(config)# interface fastethernet 1/0/0
```

**Related Commands**

| Command                             | Description                                                                                                                                     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>interface port-channel</b>       | Specifies a Fast EtherChannel and enters interface configuration mode.                                                                          |
| <b>show interfaces port-channel</b> | Displays the information about the Fast EtherChannel on Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI. |

# clear aim

To clear the data compression Advanced Interface Module (AIM) daughter card registers and reset the hardware, use the **clear aim** command in privileged EXEC mode.

**clear aim** *element-number*

## Syntax Description

|                       |                                             |
|-----------------------|---------------------------------------------|
| <i>element-number</i> | Number of AIM slot. AIM slots begin with 0. |
|-----------------------|---------------------------------------------|

## Command Modes

Privileged EXEC

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.0(1)T | This command was introduced. |

## Usage Guidelines

The **clear aim** command is used to reset the data compression AIM hardware. This command is used if the compression Advanced Interface Module (CAIM) hardware becomes “stuck” or hangs for some reason. The CAIM registers are cleared, and the hardware is reset upon execution. All compression history is lost when the CAIM is reset.

This command is supported only on Cisco 2600 series routers.

## Examples

The following example shows how to use the **clear aim** command. This command will reset the hardware, flushing the buffers and history for all compression tasks currently under operation:

```
Router# clear aim 0
Router#
1w0d: %CAIM-6-SHUTDOWN: CompressionAim0 shutting down
1w0d: %CAIM-6-STARTUP: CompressionAim0 starting up
```

## Related Commands

| Command                         | Description                                                                         |
|---------------------------------|-------------------------------------------------------------------------------------|
| <a href="#">show pci aim</a>    | Displays the IDPROM contents for each AIM board in the Cisco 2600 series routers.   |
| <a href="#">test aim eeprom</a> | Tests the data compression AIM after it is installed in a Cisco 2600 series router. |

# clear controller

To reset the T1 or E1 controller, use the **clear controller** command in EXEC mode.

## Cisco 7200 Series and Cisco 7500 Series Routers

**clear controller** {**t1** | **e1**} *slot/port*

## Cisco AS5200 Series and Cisco AS5300 Series Routers

**clear controller** {**t1** | **e1**} *number*

| Syntax Description | <b>t1</b>        | T1 controller.                                                                                                                        |
|--------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>e1</b>        | E1 controller.                                                                                                                        |
|                    | <i>slot/port</i> | Backplane slot number and port number on the interface. See your hardware installation manual for the specific slot and port numbers. |
|                    | <i>number</i>    | Network interface module (NIM) number, in the range 0 through 2.                                                                      |

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.1    | This command was introduced. |

**Examples** The following example resets the T1 controller at slot 4, port 0 on a Cisco 7500 series router:

```
Router# clear controller t1 4/0
```

The following example resets the E1 controller at NIM 0:

```
Router# clear controller e1 0
```

| Related Commands | Command                    | Description                                                                |
|------------------|----------------------------|----------------------------------------------------------------------------|
|                  | <a href="#">controller</a> | Configures a T1 or E1 controller and enters controller configuration mode. |

# clear controller lex

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

**clear controller lex** *number* [**prom**]

## Cisco 7500 Series

**clear controller lex** *slot/port* [**prom**]

## Cisco 7200 Series and 7500 Series with a Packet over SONET Interface Processor

**clear controller lex** [*type*] *slot/port*

## Cisco 7500 Series with Ports on VIP Cards

**clear controller lex** [*type*] *slot/port-adapter/port*

| Syntax Description | <i>number</i>       | Number of the LAN Extender interface corresponding to the LAN Extender to be rebooted.                                                  |
|--------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>prom</b>         | (Optional) Forces a reload of the PROM image, regardless of any Flash image.                                                            |
|                    | <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>type</i>         | (Optional) Specifies the interface type. See <a href="#">Table 4</a> under the <b>clear counters</b> command for keywords.              |
|                    | <i>port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |
|                    |                     |                                                                                                                                         |

| Command Modes | Privileged EXEC |
|---------------|-----------------|
|---------------|-----------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.3    | This command was introduced. |

| Usage Guidelines | The <b>clear controller lex</b> command halts operation of the LAN Extender and performs a cold restart.                                                                                                                                                                                                 |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | Without the <b>prom</b> 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 <b>prom</b> 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 counters

To clear the interface counters, use the **clear counters** command in user EXEC mode.

**clear counters** [*type number*]

## Cisco 4000 Series or Cisco 7500 Series with a LAN Extender Interface

**clear counters** [*type slot/port*] [**ethernet** | **serial**]

## Cisco 7200 Series and 7500 Series with a Packet over SONET Interface Processor

**clear counters** [*type*] *slot/port*

## Cisco 7500 Series with Ports on VIP Cards

**clear counters** [*type*] *slot/port-adapter/port*

| Syntax Description  |                                                                                                                                         |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>         | (Optional) Specifies the interface type; one of the keywords listed in <a href="#">Table 4</a> .                                        |
| <i>number</i>       | (Optional) Specifies the interface counter displayed with the <b>show interfaces</b> command.                                           |
| <b>ethernet</b>     | (Optional) If the <i>type</i> is <b>lex</b> , you can clear the interface counters on the Ethernet interface.                           |
| <b>serial</b>       | (Optional) If the <i>type</i> is <b>lex</b> , you can clear the interface counters on the serial interface.                             |
| <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
| <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
| <i>port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release | Modification                                                                                                                                                         |
|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                                                                                         |
|                 | 11.2 F  | The <b>virtual-access</b> keyword was added.                                                                                                                         |
|                 | 11.3    | The following keywords were added or modified: <ul style="list-style-type: none"> <li><b>vg-anylan</b></li> <li><b>posi</b> keyword changed to <b>pos</b></li> </ul> |

**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). [Table 4](#) lists the command keywords and their descriptions.

**Note**

This command does not clear counters retrieved using Simple Network Management Protocol (SNMP), but only those seen with the **show interface EXEC** command.

**Table 4** *clear counters Interface Type Keywords*

| Keyword                  | Interface Type                                                                                                   |
|--------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>async</b>             | Asynchronous interface                                                                                           |
| <b>bri</b>               | ISDN BRI                                                                                                         |
| <b>dialer</b>            | Dialer interface                                                                                                 |
| <b>ethernet</b>          | Ethernet interface                                                                                               |
| <b>fast-ethernet</b>     | Fast Ethernet interface                                                                                          |
| <b>fddi</b>              | FDDI                                                                                                             |
| <b>hssi</b>              | High-Speed Serial Interface (HSSI)                                                                               |
| <b>lex</b>               | LAN Extender interface                                                                                           |
| <b>line</b>              | Terminal line                                                                                                    |
| <b>loopback</b>          | Loopback interface                                                                                               |
| <b>null</b>              | Null interface                                                                                                   |
| <b>port-channel</b>      | Port channel interface                                                                                           |
| <b>pos</b>               | Packet OC-3 interface                                                                                            |
| <b>serial</b>            | Synchronous serial interface                                                                                     |
| <b>switch</b>            | Switch interface                                                                                                 |
| <b>tokenring</b>         | Token Ring interface                                                                                             |
| <b>tunnel</b>            | Tunnel interface (IEEE 02.5)                                                                                     |
| <b>vg-anylan</b>         | 100VG-AnyLAN port adapter                                                                                        |
| <b>virtual-access</b>    | Virtual-access interface (See Cisco IOS Dial Technologies Command Reference for details on virtual templates.)   |
| <b>virtual-template</b>  | Virtual-template interface (See Cisco IOS Dial Technologies Command Reference for details on virtual templates.) |
| <b>virtual-tokenring</b> | Virtual token ring interface                                                                                     |

**Examples**

The following example clears all interface counters:

```
Router# clear counters
```

The following example clears the Packet OC-3 interface counters on a POSIP card in slot 1 on a Cisco 7500 series router:

```
Router# clear counters pos 1/0
```

The following example clears the interface counters on a Fast EtherChannel interface.

```
Router# clear counter port-channel 1
Clear "show interface" counters on all interfaces [confirm] Y
%CLEAR-5-COUNTERS: Clear counter on all interfaces by console 1
```

**Related Commands**

| Command                                      | Description                                                                                                                                     |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a>              | Displays the statistical information specific to a serial interface.                                                                            |
| <a href="#">show interfaces port-channel</a> | Displays the information about the Fast EtherChannel on Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI. |



# clear hub

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

**clear hub ethernet** *number*

## Syntax Description

|                 |                                                                                        |
|-----------------|----------------------------------------------------------------------------------------|
| <b>ethernet</b> | Hub in front of an Ethernet interface.                                                 |
| <i>number</i>   | Hub number to clear, starting with 0. Because there is only one hub, this number is 0. |

## Command Modes

EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Examples

The following example clears hub 0:

```
Router# clear hub ethernet 0
```

## Related Commands

| Command             | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| <a href="#">hub</a> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |

# clear hub counters

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

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

## Syntax Description

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

## Command Modes

EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Examples

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

```
Router# clear hub counters ether 0
```

## Related Commands

| Command                  | Description                                                                                                  |
|--------------------------|--------------------------------------------------------------------------------------------------------------|
| <a href="#">show hub</a> | Displays information about the hub (repeater) on an Ethernet interface of a Cisco 2505 or Cisco 2507 router. |

# clear interface

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

**clear interface** *type number* [*name-tag*]

## Cisco 7200 Series and Cisco 7500 Series with a Packet OC-3 Interface Processor

**clear interface** *type slot/port*

## Cisco 7500 Series with Ports on VIP Cards

**clear interface** *type slot/port-adapter/port*

## Cisco 7500 Series

**clear interface** *type slot/port* [:*channel-group*]

## Cisco 7500 Series with a CT3IP

**clear interface** *type slot/port-adapter/port* [:*t1-channel*]

| Syntax Description     |                                                                                                                                                                                                                                                                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>            | Interface type; it is one of the keywords listed in <a href="#">Table 5</a> .                                                                                                                                                                                                                                                                    |
| <i>number</i>          | Port, connector, or interface card number.                                                                                                                                                                                                                                                                                                       |
| <i>name-tag</i>        | (Optional) Logic name to identify the server configuration so that multiple entries of server configuration can be entered.<br><br>This optional argument is for use with the RLM feature.                                                                                                                                                       |
| <i>slot</i>            | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                                                                                     |
| <i>port</i>            | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                                                                                     |
| <i>port-adapter</i>    | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                                          |
| : <i>channel-group</i> | (Optional) On Cisco 7500 series routers supporting channelized T1, specifies the channel from 0 to 23. This number is preceded by a colon.                                                                                                                                                                                                       |
| : <i>t1-channel</i>    | (Optional) For the CT3IP, the T1 channel is a number between 1 and 28.<br><br>T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment. |

**Command Modes** EXEC

## Command History

| Release  | Modification                                                                                                                                                         |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.0     | This command was introduced.                                                                                                                                         |
| 11.3     | The following keywords were added or modified: <ul style="list-style-type: none"> <li><b>vg-anylan</b></li> <li><b>posi</b> keyword changed to <b>pos</b></li> </ul> |
| 12.0(3)T | The following optional argument was added for the RLM feature: <ul style="list-style-type: none"> <li><i>name-tag</i></li> </ul>                                     |

## Usage Guidelines

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

This command clears all the current interface hardware logic unless the optional arguments *type* and *number* are specified to clear only a specific interface type (serial, Ethernet, Token Ring, and so on). [Table 5](#) lists the command keywords and their descriptions.

**Table 5** clear interface Type Keywords

| Keyword             | Interface Type                     |
|---------------------|------------------------------------|
| <b>async</b>        | Async interface                    |
| <b>atm</b>          | ATM interface                      |
| <b>bri</b>          | ISDN BRI                           |
| <b>ethernet</b>     | Ethernet interface                 |
| <b>fddi</b>         | FDDI                               |
| <b>hssi</b>         | High-Speed Serial Interface (HSSI) |
| <b>loopback</b>     | Loopback interface                 |
| <b>null</b>         | Null interface                     |
| <b>port-channel</b> | Port channel interface             |
| <b>pos</b>          | Packet OC-3 Interface Processor    |
| <b>serial</b>       | Synchronous serial interface       |
| <b>switch</b>       | Switch interface                   |
| <b>tokenring</b>    | Token Ring interface               |
| <b>tunnel</b>       | Tunnel interface                   |
| <b>vg-anylan</b>    | 100VG-AnyLAN port adapter          |

## Examples

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

```
Router# clear interface hssi 1
```

The following example resets the interface logic on Packet OC-3 interface 0 on the POSIP in slot 1:

```
Router# clear interface pos 1/0
```

The following example resets the interface logic on T1 0 on the CT3IP in slot 9:

```
Router# clear interface serial 9/0/0:0
```

The following example resets the interface logic on Fast Etherchannel interface 1:

```
Router# clear interface port-channel 1
```

The following example demonstrates the use of the **clear interface** command with the RLM feature:

```
Router# clear interface loopback 1
```

```
Router#
02:48:52: rlm 1: [State_Up, rx ACTIVE_LINK_BROKEN] over link [10.1.1.1(Loopback1),
10.1.4.1]
02:48:52: rlm 1: link [10.1.1.2(Loopback2), 10.1.4.2] requests activation
02:48:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.4.1] is deactivated
02:48:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.4.1] = socket[10.1.1.1, 10.1.4.1]
02:48:52: rlm 1: [State_Recover, rx USER_SOCKET_OPENED] over link [10.1.1.1(Loopback1),
10.1.4.1] for user RLM_MGR
02:48:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.4.1] is opened
02:48:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.5.1] = socket[10.1.1.1, 10.1.5.1]
02:48:52: rlm 1: [State_Recover, rx USER_SOCKET_OPENED] over link [10.1.1.1(Loopback1),
10.1.5.1] for user RLM_MGR
02:48:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.5.1] is opened
02:48:52: rlm 1: [State_Recover, rx START_ACK] over link [10.1.1.2(Loopback2), 10.1.4.2]
02:48:52: rlm 1: link [10.1.1.2(Loopback2), 10.1.4.2] is activated
02:48:52: rlm 1: [State_Up, rx LINK_OPENED] over link [10.1.1.1(Loopback1), 10.1.4.1]
```

```
Router# show rlm group 1 status
```

```
RLM Group 1 Status
User/Port: RLM_MGR/3000
Link State: Up          Last Link Status Reported: Up_Recovered
Next tx TID: 4          Last rx TID: 0
Server Link Group[r1-server]:
  link [10.1.1.1(Loopback1), 10.1.4.1] = socket[standby, 10.1.1.1, 10.1.4.1]
  link [10.1.1.2(Loopback2), 10.1.4.2] = socket[active, 10.1.1.2, 10.1.4.2]
Server Link Group[r2-server]:
  link [10.1.1.1(Loopback1), 10.1.5.1] = socket[opening, 10.1.1.1, 10.1.5.1]
  link [10.1.1.2(Loopback2), 10.1.5.2] = socket[opening, 10.1.1.2, 10.1.5.2]
```

```
Router#
Router#
02:49:52: rlm 1: [State_Up, rx UP_RECOVERED_MIN_TIMEOUT]
02:49:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.4.1] requests activation
02:49:52: rlm 1: [State_Switch, rx SWITCH_ACK] over link [10.1.1.1(Loopback1), 10.1.4.1]
02:49:52: rlm 1: link [10.1.1.2(Loopback2), 10.1.4.2] is deactivated
02:49:52: rlm 1: link [10.1.1.1(Loopback1), 10.1.4.1] is activated
```

## Related Commands

| Command                        | Description                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------|
| <a href="#">interface</a>      | Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode. |
| <a href="#">shutdown (RLM)</a> | Shuts down all of the links under the RLM group.                                                               |
| <a href="#">show rlm group</a> | Displays the status of the RLM group                                                                           |

# clear interface fastethernet

To reset the controller for a specified Fast Ethernet interface, use the **clear interface fastethernet** command in privileged EXEC mode.

**Cisco 4500 and 4700 series**

**clear interface fastethernet** *number*

**Cisco 7200 and 7500 series**

**clear interface fastethernet** *slot*/*port*

**Cisco 7500 series**

**clear interface fastethernet** *slot*/*port-adapter*/*port*

Syntax Description

|                     |                                                                                                                                                                                                                                      |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>       | Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 router, specifies the network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system. |
| <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                         |
| <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                         |
| <i>port-adapter</i> | Number of the port-adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                              |

Command Modes

Privileged EXEC

Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

Examples

The following example resets the controller for the Fast Ethernet 0 interface on a Cisco 4500:

Router# **clear interface fastethernet 0**

The following example resets the controller for the Fast Ethernet interface located in slot 1 port 0 on a Cisco 7200 series routers or Cisco 7500 series routers:

Router# **clear interface fastethernet 1/0**

The following example resets the controller for the Fast Ethernet interface located in slot 1 port adapter 0 port 0 on a Cisco 7500 series routers:

Router# **clear interface fastethernet 1/0/0**

# clear interface serial

To reset the statistical information specific to a serial interface, use the **clear interface serial** command in user EXEC mode.

**clear interface serial** *dial-shelf/slot/t3-port:t1-num:chan-group*

|                           |                    |                                                                                         |
|---------------------------|--------------------|-----------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>dial-shelf</i>  | Dial shelf chassis in the Cisco AS5800 access server containing the CT3 interface card. |
|                           | <i>slot</i>        | Location of the CT3 interface card in the dial shelf chassis.                           |
|                           | <i>t3-port</i>     | T3 port number. The only valid value is 0.                                              |
|                           | <i>:t1-num</i>     | T1 timeslot in the T3 line. The value can be from 1 to 28.                              |
|                           | <i>:chan-group</i> | Channel group identifier.                                                               |

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 10.0           | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | The <b>clear interface serial</b> command clears the interface hardware. To reset the counters for an interface, use the <b>clear counters</b> command with the <b>serial</b> keyword specified. To confirm at the prompt, use the <b>show interfaces serial</b> command. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example clears the interface hardware, disconnecting any active lines:<br><br>Router# <b>clear interface serial 1/4/0:2:23</b><br>Router# |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

|                         |                                        |                                                                                   |
|-------------------------|----------------------------------------|-----------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                         | <b>Description</b>                                                                |
|                         | <a href="#">clear counters</a>         | Clears the interface counters.                                                    |
|                         | <a href="#">show interfaces</a>        | Displays statistics for all interfaces configured on the router or access server. |
|                         | <a href="#">show interfaces serial</a> | Displays information about a serial interface.                                    |

# clear service-module serial

To reset an integrated CSU/DSU, use the **clear service-module serial** command in privileged EXEC configuration mode.

**clear service-module serial** *number*

## Syntax Description

|               |                                 |
|---------------|---------------------------------|
| <i>number</i> | Number of the serial interface. |
|---------------|---------------------------------|

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

Use this command only in severe circumstances (for example, when the router is not responding to a CSU/DSU configuration command).

This command terminates all DTE and line loopbacks that are locally or remotely configured. It also interrupts data transmission through the router for up to 15 seconds. The software performs an automatic software reset in case of two consecutive configuration failures.

The CSU/DSU module is not reset with the **clear interface** command.



### Caution

If you experience technical difficulties with your router and intend to contact customer support, refrain from using this command. This command erases the router's past CSU/DSU performance statistics. To clear only the CSU/DSU performance statistics, issue the **clear counters** command.

## Examples

The following example resets the CSU/DSU on a router:

```
Router# clear service-module serial 0
Router#
```

## Related Commands

| Command                             | Description                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <a href="#">clear counters</a>      | Clears the interface counters.                                                                              |
| <a href="#">test service-module</a> | Performs self-tests on an integrated CSU/DSU serial interface module, such as a 4-wire, 56/64-kbps CSU/DSU. |



# clock rate

To configure the clock rate for the hardware connections on serial interfaces such as network interface modules (NIMs) and interface processors to an acceptable bit rate, use the **clock rate** command in interface configuration mode. To remove the clock rate if you change the interface from a DCE to a DTE device, use the **no** form of this command. Using the **no** form of this command on a DCE interface sets the clock rate to the hardware-dependent default value.

**clock rate** *bps*

**no clock rate**

## Syntax Description

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>bps</i> | Desired clock rate in bits per second: 1200, 2400, 4800, 9600, 19200, 38400, 56000, 64000, 72000, 125000, 148000, 250000, 500000, 800000, 1000000, 1300000, 2000000, 4000000, or 8000000.<br><br>For the synchronous serial port adapters (PA-8T-V35, PA-8T-X21, PA-8T-232, and PA-4T+), a nonstandard clock rate can be used. You can enter any value from 300 to 8000000 bps. The clock rate you enter is rounded (adjusted), if necessary, to the nearest value your hardware can support except for the following standard rates: 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 64000, 128000, or 2015232.<br><br>The default is no clock rate configured. |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

No clock rate is configured.

## Command Modes

Interface configuration

## Command History

| Release | Modification                                                                                                                                       |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.0    | This command was introduced.                                                                                                                       |
| 11.3    | This command was modified to include nonstandard clock rates for the PA-8T-V35, PA-8T-X21, PA-8T-232, and PA-4T+ synchronous serial port adapters. |

## Usage Guidelines

### Cable Length

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 EIA/TIA-232 signaling. It is recommended that you only use the synchronous serial EIA/TIA-232 signal at speeds up to 64,000 bits per second. To permit a faster speed, use EIA/TIA-449 or V.35.

### Synchronous Serial Port Adapters

For the synchronous serial port adapters (PA-8T-V35, PA-8T-X21, PA-8T-232, and PA-4T+) on Cisco 7200 series routers, and on second-generation Versatile Interface Processors (VIP2s) in Cisco 7500 series routers, the clock rate you enter is rounded (if needed) to the nearest value that your hardware can support. To display the clock rate value for the port adapter, use the **more system:running-config** command.

If you plan to netboot your router over a synchronous serial port adapter interface and have a boot image prior to Cisco IOS Release 11.1(9)CA that does not support nonstandard (rounded) clock rates for the port adapters, you must use one of the following standard clock rates:

- 1200
- 2400
- 4800
- 9600
- 19200
- 38400
- 56000
- 64000

## Examples

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

```
Router(config)# interface serial 0
Router(config-if)# clock rate 64000
```

The following example sets the clock rate on a synchronous serial port adapter in slot 5, port 0 to 1234567. In this example, the clock rate is adjusted to 1151526 bps.

```
Router(config)# interface serial 5/0
Router(config-if)# clock rate 1234567
%clock rate rounded to nearest value that your hardware can support.
%Use Exec Command 'more system:running-config' to see the value rounded to.
```

The following example configures serial interface 5/0 with a clock rate that is rounded to the nearest value that is supported by the hardware:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface serial 5/0
Router(config-if)# clock rate 1234567
%clock rate rounded to nearest value that your hardware can support.
%Use Exec Command 'more system:running-config' to see the value rounded to.
Router(config-if)# exit
Router(config)#
```

The following example shows how to determine the exact clock rate that the serial interface was rounded to using the **more system:running-config** command. This example shows only the relevant information displayed by the **more system:running-config** command; other information was omitted.

```
Router# more system:running-config
Building configuration...
...
!
interface Serial5/0
  no ip address
  clock rate 1151526
!
...
```

# clock source

To configure the clock source of a DS1 link, enter the **clock source** command in interface configuration, controller configuration, or ATM interface configuration mode. To restore the default **line** setting, use the **no** form of this command.

**clock source {line | internal | loop-timed}**

**no clock source**

## Syntax Description

|                   |                                                                                            |
|-------------------|--------------------------------------------------------------------------------------------|
| <b>line</b>       | Specifies that the T1/E1 link uses the recovered clock from the line. This is the default. |
| <b>internal</b>   | Specifies that the T1/E1 link uses the internal clock from the interface.                  |
| <b>loop-timed</b> | Specifies that the T1/E1 interface takes the clock from the Rx (line) and uses it for Tx.  |

## Defaults

The default value is **line**.

## Command Modes

Interface configuration

Controller configuration for the Cisco MC3810 multiservice access concentrator.

ATM interface configuration for the Cisco 2600 and 3600 series routers.

## Command History

| Release                | Modification                                                                                                                            |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 10.3                   | This command was introduced.                                                                                                            |
| 11.1 CA                | This command was modified to support the E1-G.703/G.704 serial port adapter, PA-E3 serial port adapters, and Cisco 7200 series routers. |
| 11.3 MA                | This command was introduced as a controller configuration command for the Cisco MC3810.                                                 |
| 12.0(5)T and 12.0(5)XK | The command was introduced as an ATM interface configuration command for the Cisco 2600 and 3600 series routers.                        |

## Usage Guidelines

This command sets clocking for individual T1/E1 links.

Make sure that you specify the clock source correctly for each link, even if you are planning to specify that a certain link will provide clocking for all the links in an IMA group. Because links may be taken in and out of service, requiring that the system select another link for common clocking, any link in an IMA group may provide the common clock.

If the ATM interface is part of an IMA group, you can use the **loop-timed** keyword to specify that the clock source is the same as the IMA group clock source.

## Examples

On a Cisco 2600 or 3600 series router, the following example specifies an internal clock source for the link:

```
Router(config)# interface atm 0/2  
Router(config-if)# clock source internal
```

---

**Related Commands**

| Command               | Description                                        |
|-----------------------|----------------------------------------------------|
| <b>ima clock-mode</b> | Sets the transmit clock mode for an ATM IMA group. |

# clock source (AS5200)

To select the clock source for the time-division multiplexing (TDM) bus in a Cisco AS5200 access server, use the **clock source** command in interface configuration mode. To restore the clock source to its default setting, use the **no** form of this command.

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

**no clock source line {primary | secondary}**

## Syntax Description

|                  |                                                                                    |
|------------------|------------------------------------------------------------------------------------|
| <b>line</b>      | Clock source on the active line.                                                   |
| <b>primary</b>   | Primary TDM clock source.                                                          |
| <b>secondary</b> | Secondary TDM clock source.                                                        |
| <b>internal</b>  | Selects the free running clock (also known as internal clock) as the clock source. |

## Defaults

The primary TDM clock source is from the T1 0 controller.

The secondary TDM clock source is from the T1 1 controller.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

To use the clocking coming in from a T1 line, configure the **clock source line primary** command on the T1 interface that has the most reliable clocking. Configure the **clock source line secondary** command on the T1 interface that has the next best known clocking. With this configuration, the primary line clocking is backed up to the secondary line if the primary clocking shuts down.

## Examples

The following example configures the Cisco AS5200 access server to use T1 controller 0 as the primary clock source and T1 controller 1 as the secondary clock source:

```
Router(config)# controller t1 0
Router(config-controller)# clock source line primary
Router(config)# controller t1 1
Router(config-controller)# clock source line secondary
```

# clock source (controller)

To set the T1-line clock source for the Multichannel Interface Processor (MIP) in the Cisco 7200 series and Cisco 7500 series, the NPM in the Cisco 4000 series, a T3 interface, or a PA-T3 serial port adapter, use the **clock source** command in controller configuration mode. To restore the clock source to its default setting, use the **no** form of this command.

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

**no clock source**

## Syntax Description

|                  |                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>line</b>      | Specifies that the interface will clock its transmitted data from a clock recovered from the line's receive data stream. This is the default. |
| <b>primary</b>   | Specifies the source of primary line clocking. The default primary TDM clock source is from the T0 controller.                                |
| <b>secondary</b> | Specifies the source of secondary line clocking. The default secondary TDM clock source is from the T1 controller.                            |
| <b>internal</b>  | Specifies that the interface will clock its transmitted data from its internal clock.                                                         |

## Defaults

The default primary TDM clock source is from the T0 controller.

The default secondary TDM clock source is from the T1 controller.

The default clock for the interface's transmitted data is from a clock recovered from the line's receive data stream from the PA-T3 serial port adapter.

## Command Modes

Controller configuration

## Command History

| Release | Modification                                                                                   |
|---------|------------------------------------------------------------------------------------------------|
| 10.3    | This command was introduced.                                                                   |
| 11.1 CA | This command was modified to include the T3 serial port adapter and PA-T3 serial port adapter. |

## Usage Guidelines

This command applies to a Cisco 4000, Cisco 7000 series, Cisco 7200 series, or Cisco 7500 series router. A T3 interface on a PA-T3 serial port adapter can clock its transmitted data either from its internal clock or from a clock recovered from the line's receive data stream.

To use the clocking coming in from a T1 line, configure the **clock source line primary** command on the controller that has the most reliable clocking. Configure the **clock source line secondary** command on the controller that has the next best known clocking. With this configuration, the primary line clocking is backed up to the secondary line if the primary clocking shuts down.

## Examples

The following example configures the Cisco AS5200 to use the T0 controller as the primary clocking source and the T1 controller as the secondary clocking source:

```
AS5200(config)# controller t1 0
AS5200(config-if)# clock source line primary
AS5200(config-if)# exit
AS5200(config)# controller t1 1
AS5200(config-if)# clock source line secondary
```

The following example specifies the T3 interface to clock its transmitted data from its internal clock:

```
Router(config)# interface serial 1/0
Router(config-if)# clock source internal
```

**Related Commands**

| Command                  | Description                                        |
|--------------------------|----------------------------------------------------|
| <a href="#">framing</a>  | Selects the frame type for the T1 or E1 data line. |
| <a href="#">linecode</a> | Selects the linecode type for T1 or E1 line.       |

# clock source (CT3IP)

To specify where the clock source is obtained for use by the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **clock source** command in controller configuration mode. To restore the default clock source, use the **no** form of this command.

**clock source** { **internal** | **line** | **loop-timed** }

**no clock source**

## Syntax Description

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>internal</b>   | Specifies that the internal clock source is used. This is the default.                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>line</b>       | Specifies that the network clock source is used.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>loop-timed</b> | Decouples the controller clock from the system-wide clock set with the <b>network-clock-select</b> command. The loop-timed clock enables the Digital Voice Module (DVM) to connect to a PBX and to connect the multiflex trunk module (MFT) to a central office when both the PBX and the central office function as DCE clock sources. This situation assumes that the PBX also takes the clocking from the central office, thereby synchronizing the clocks on the DVM and the MFT. |

## Defaults

The internal clock source is used.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

If you do not specify the **clock source** command, the default internal clock source is used by the CT3IP. You can also set the clock source for each T1 channel by using the **t1 clock source** controller configuration command.



### Note

This command replaces the **pos internal-clock** command.

## Examples

The following example sets the clock source for the CT3IP to line:

```
Router(config)# controller t3 9/0/0
Router(config-if)# clock source line
```



**Related Commands**

| Command                     | Description                                                                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>t1 clock source</b>      | Specifies where the clock source is obtained for use by each T1 channel on the CT3IP in Cisco 7500 series routers. |
| <b>network-clock-select</b> | Specifies selection priority for the clock sources.                                                                |

# clock source (interface)

To control the clock from which a G.703-E1 interface, an E1-G.703/G.704 serial port adapter, or a PA-E3 serial port adapter clocks its transmitted data, use the **clock source** command in interface configuration mode. To restore the default clock source, use the **no** form of this command.

## Cisco 4000, 7000, 7200, and 7500 Series

**clock source {line | internal}**

**no clock source**

## Cisco AS5200 and AS5300 Access Servers

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

**no clock source line {primary | secondary}**

|                    |                  |                                                                                                                                               |
|--------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>line</b>      | Specifies that the interface will clock its transmitted data from a clock recovered from the line’s receive data stream. This is the default. |
|                    | <b>internal</b>  | Specifies that the interface will clock its transmitted data from its internal clock.                                                         |
|                    | <b>primary</b>   | Primary time-division multiplexing (TDM) clock source.                                                                                        |
|                    | <b>secondary</b> | Secondary TDM clock source.                                                                                                                   |

|          |                                                           |
|----------|-----------------------------------------------------------|
| Defaults | <b>Cisco 4000, 7000, 7200, and 7500 Series</b>            |
|          | The clock source is the line’s receive data stream.       |
|          |                                                           |
|          | <b>Cisco AS5200 and AS5300 Access Servers</b>             |
|          | The primary TDM clock source is from the T0 controller.   |
|          | The secondary TDM clock source is from the T1 controller. |

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |                |                                                                                                                                                   |
|-----------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>                                                                                                                               |
|                 | 10.3           | This command was introduced for the Cisco 4000 series, Cisco 7000 series with RSP7000, and Cisco 7500 series routers with the G.703 E1 interface. |
|                 | 11.1 CA        | This command was introduced for the TDM bus in a Cisco AS5200 or Cisco AS5300 access server.                                                      |
|                 | 11.1 CA        | This command was modified to include the E1-G.703/G.704 serial port adapter, PA-E3 serial port adapters, and Cisco 7200 series routers.           |

---

**Usage Guidelines****Cisco 4000, 7000, 7200, and 7500 Series**

A G.703-E1 interface, E1-G.703/G.704 serial port adapter, or a PA-E3 serial port adapter can clock its transmitted data from either its internal clock or from a clock recovered from the line's receive data stream.

**Cisco AS5200 and AS5300 Access Servers**

To use the clocking coming in from a T1 line, configure the **clock source line primary** command on the controller that has the most reliable clocking. Configure the **clock source line secondary** command on the controller that has the next best known clocking. With this configuration, the primary line clocking is backed up to the secondary line if the primary clocking shuts down.

---

**Examples****Cisco 4000, 7000, 7200, and 7500 Series**

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

```
Router(config)# interface serial 0/1
Router(config-if)# clock source internal
```

**Cisco AS5200 and AS5300 Access Servers**

The following example configures the Cisco AS5200 to use the T0 controller as the primary clocking source and the T1 controller as the secondary clocking source:

```
AS5200(config)# controller t1 0
AS5200(config-if)# clock source line primary
AS5200(config-if)# exit
AS5200(config)# controller t1 1
AS5200(config-if)# clock source line secondary
```

# clock source (MC3810)

To specify the clock source of a DS1 link on the Cisco MC3810 multiservice access concentrator, use the **clock source** command in controller configuration mode. To restore the clock source to its default setting, use the **no** form of this command.

**clock source** { **line** | **internal** | **loop-timed** }

**no clock source**

|                           |                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>line</b>       | Specifies that the DS1 link uses the recovered clock. The line value is the default clock source used when the Multiflex Trunk (MFT) is installed.                                                                                                                                                                                                                                                                                                                                                                                               |
|                           | <b>internal</b>   | Specifies that the DS1 link uses the internal clock. The internal value is the default clock source used when the Digital Voice Module (DVM) is installed.                                                                                                                                                                                                                                                                                                                                                                                       |
|                           | <b>loop-timed</b> | Specifies that the T1/E1 controller will take the clock from the Rx (line) and use it for Tx. This setting decouples the controller clock from the system-wide clock set with the <b>network-clock-select</b> command. The loop-timed clock enables the DVM to connect to a PBX and to connect the MFT to a central office when both the PBX and the central office function as DCE clock sources. This situation assumes that the PBX also takes the clocking from the central office, thereby synchronizing the clocks on the DVM and the MFT. |

|                 |                                      |
|-----------------|--------------------------------------|
| <b>Defaults</b> | Line (when the MFT is installed)     |
|                 | Internal (when the DVM is installed) |

|                      |                          |
|----------------------|--------------------------|
| <b>Command Modes</b> | Controller configuration |
|----------------------|--------------------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.1           | This command was introduced. |

|                         |                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | This command applies to Voice-over-Frame Relay, Voice-over-ATM, and Voice-over-HDLC on the Cisco MC3810. |
|-------------------------|----------------------------------------------------------------------------------------------------------|


**Note**

You cannot configure the clock source to the line setting for both T1/E1 controllers at the same time.

|                 |                                                                                                                                                                      |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example configures the clock source for the MFT to internal, and the clock source for the DVM line on a Cisco MC3810 multiservice access concentrator: |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

```
Router(config)# controller T1 0
Router(config-controller)# clock source internal
```

```
Router(config)# controller T1 1
Router(config-controller)# clock source line
```

# 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** command in EXEC mode.

**cmt connect** [**fddi** [*port* | *slot/port*] [**phy-a** | **phy-b**]]

## Syntax Description

|              |                                                                                                                         |
|--------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>fddi</b>  | (Optional) Identifies this as a FDDI interface.                                                                         |
| <i>port</i>  | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information. |
| <i>slot</i>  | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information. |
| <b>phy-a</b> | (Optional) Selects Physical Sublayer A.                                                                                 |
| <b>phy-b</b> | (Optional) Selects Physical Sublayer B.                                                                                 |

## Command Modes

EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## 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.

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

## 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:

```
Router# cmt connect
```

The following command starts both fibers on FDDI interface unit 0:

```
Router# cmt connect fddi 0
```

The following command on the Cisco 7200 series or Cisco 7500 series starts both fibers on FDDI interface unit 0:

```
Router# cmt connect fddi 1/0
```

The following command starts only Physical Sublayer A on FDDI interface unit 0:

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

The following command on Cisco 7500 series routers starts only Physical Sublayer A on FDDI interface unit 0:

```
Router# 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** command in EXEC mode.

**cmt disconnect** [**fddi** [*port* | *slot/port*] [**phy-a** | **phy-b**]]

|                    |              |                                                                                                                         |
|--------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>fddi</b>  | (Optional) Identifies this as a FDDI interface.                                                                         |
|                    | <i>port</i>  | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information. |
|                    | <i>slot</i>  | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information. |
|                    | <b>phy-a</b> | (Optional) Selects Physical Sublayer A.                                                                                 |
|                    | <b>phy-b</b> | (Optional) Selects Physical Sublayer B.                                                                                 |

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |                |                              |
|-----------------|----------------|------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>          |
|                 | 10.0           | This command was introduced. |

**Usage Guidelines**

In normal operation, the FDDI interface is operational once the interface is connected and configured, and is turned off using the **shutdown** command in interface configuration mode. 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.

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

**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:

```
Router# cmt disconnect
```

The following command stops both fibers on FDDI interface unit 0:

```
Router# cmt disconnect fddi 0
```

The following command on the Cisco 7200 series or Cisco 7500 series stops both fibers on FDDI interface unit 0:

```
Router# cmt disconnect fddi 1/0
```

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

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

The following command on the Cisco 7500 series stops only Physical Sublayer A on FDDI interface unit 0 in slot 1. This command causes the FDDI media to go into a wrapped state so that the ring will be broken.

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



# compress

To configure software compression for Link Access Procedure, Balanced (LAPB), PPP, and High-Level Data Link Control (HDLC) encapsulations, use the **compress** command in interface configuration mode. On Cisco 7200 series routers and Cisco 7500 series routers, hardware compression on the compression service adapter (CSA) is supported for PPP links. To disable compression, use the **no** form of this command.

**compress** {predictor | stac}

**no compress** {predictor | stac}

## Cisco VIP2 Cards

**compress** {predictor | stac [distributed | software]}

## Cisco 7200 Series and Cisco 7500 Series

**compress** {predictor | stac [csa slot | software]}

## PPP Encapsulation

**compress** [predictor | stac | mppc [ignore-pfc]]

| Syntax Description |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>predictor</b>   |  | Specifies that a predictor (RAND) compression algorithm will be used on LAPB and PPP encapsulation. Compression is implemented in the software installed in the router's main processor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>stac</b>        |  | <p>Specifies that a Stacker (LZS) compression algorithm will be used on LAPB, HDLC, and PPP encapsulation. For all platforms except Cisco 7200 series and platforms that support the VIP2, compression is implemented in the software installed in the router's main processor.</p> <p>On Cisco 7200 series, and on VIP2s in Cisco 7500 series, specifying the <b>compress stac</b> command with no options causes the router to use the fastest available compression method for PPP encapsulation only:</p> <ul style="list-style-type: none"> <li>• If the router contains a compression service adapter (CSA), compression is performed in the CSA hardware (hardware compression).</li> <li>• If the CSA is not available, compression is performed in the software installed on the VIP2 (distributed compression).</li> <li>• If the VIP2 is not available, compression is performed in the router's main processor (software compression).</li> </ul> |
| <b>distributed</b> |  | (Optional) Specifies that compression is implemented in the software that is installed in a VIP2. If the VIP2 is not available, compression is performed in the router's main processor (software compression).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>software</b>    |  | (Optional) Specifies that compression is implemented in the Cisco IOS software installed in the router's main processor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>csa slot</b>    |  | (Optional) Specifies the CSA to use for a particular interface. This option applies only to Cisco 7200 series routers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                   |                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------|
| <b>mppc</b>       | (Optional) Specifies that the MPPC compression algorithm will be used.                                |
| <b>ignore-pfc</b> | (Optional) Specifies that the protocol field compression flag negotiated through LCP will be ignored. |

**Defaults**

Compression is disabled.

**Command Modes**

Interface configuration

**Command History**

| Release | Modification                                                                                                                                                    |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.3    | This command was introduced.                                                                                                                                    |
| 11.3 P  | The following keywords were added: <ul style="list-style-type: none"> <li>• <b>distributed</b></li> <li>• <b>software</b></li> <li>• <b>csa slot</b></li> </ul> |
| 11.3 T  | The following keywords were added: <ul style="list-style-type: none"> <li>• <b>mppc</b></li> <li>• <b>ignore-pfc</b></li> </ul>                                 |

**Note**

This command replaces the **compress predictor** command.

**Usage Guidelines**

Compression reduces the size of frames via lossless data compression. You can configure point-to-point software compression for all LAPB, PPP, and HDLC encapsulations. HDLC encapsulations supports the Stacker compression algorithm. PPP and LAPB encapsulations support both predictor and Stacker compression algorithms.

**MPPC Compression**

The **compress** command using the **mppc** and **ignore-pfc** options support compression between Cisco routers and access servers and Microsoft clients, such as Windows 95 and Windows NT. MPPC implements an LZ based compression algorithm that uses a compression dictionary to compress PPP packets. The **ignore-pfc** keyword instructs the router to ignore the protocol field compression flag negotiated by LCP. For example, the uncompressed standard protocol field value for IP is 0x0021 and 0x21 when compression is enabled. When the **ignore-pfc** option is enabled, the router will continue to use the uncompressed value (0x0021). Using the **ignore-pfc** option is helpful for some asynchronous driver devices which use an uncompressed protocol field (0x0021), even though the pfc is negotiated between peers. If protocol rejects are displayed when the **debug ppp negotiation** command is enabled, setting the **ignore-pfc** option may remedy the problem.

**Point-to-Point Compression**

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.

End-point devices must be configured to use the same compression method (predictor, Stacker or MPPC).

### HDLC Encapsulations

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

### Public Data Network Connections

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.

### Cisco 7200 and 7500 Series

Using CSA hardware compression on Cisco 7200 series routers and Cisco 7500 series routers removes the compression and decompression responsibilities from the VIP2 or the main processor installed in the router. By using the **compress stac** command, the router determines the fastest compression method available on the router.

When using hardware compression on Cisco 7200 series routers with multiple CSAs, you can optionally specify which CSA is used by the interface to perform compression. If no CSA is specified, the router determines which CSA is used. On Cisco 7500 series routers, the router uses the CSA on the same VIP2 as the interface.

### System Performance



#### Caution

When compression is performed in software installed in the router's main processor, it might significantly affect system performance. We recommend that you disable compression if the CPU load exceeds 40 percent. To display the CPU load, use the **show process cpu EXEC** command.

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](#) provides general guidelines for deciding which compression type to select.

**Table 6      Compression Guidelines**

| Situation                                                                                   | Compression Type to Use |
|---------------------------------------------------------------------------------------------|-------------------------|
| Bottleneck is caused by the load on the router.                                             | Predictor               |
| Bottleneck is the result of line bandwidth or hardware compression on the CSA is available. | Stacker                 |
| Most files are already compressed.                                                          | None                    |

Software compression makes heavy demands on the router's processor. The maximum compressed serial line rate depends on the type of Cisco router you are using and which compression algorithm you specify. [Table 7](#) shows a summary of the compressed serial line rates for software compression. The maximums shown in [Table 7](#) apply to the "combined" serial compressed load on the router. For example, a Cisco 4000 series router could handle four 64-kbps lines using Stacker or one 256-kbps line. These maximums also assume there is very little processor load on the router aside from compression. Lower these numbers when the router is required to do other processor-intensive tasks.

**Table 7 Combined Compressed Serial-Line Rates (Software Compression)**

| Compression Method | Cisco 1000 Series | Cisco 3000 Series | Cisco 4000 Series | Cisco 4500 Series | Cisco 4700 Series | Cisco 7000 Family |
|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Stacker (kbps)     | 128               | 128               | 256               | 500               | T1                | 256               |
| Predictor (kbps)   | 256               | 256               | 500               | T1                | 2xT1              | 500               |

Hardware compression can support a combined line rate of 16 Mbps.

Cisco recommends that you do not adjust the maximum transmission unit (MTU) for the serial interface and the LAPB maximum bits per frame (N1) parameter.

**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.

**Note**

For information on configuring Frame Relay compression, refer to the “Configuring Frame Relay” chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

**Examples**

The following example enables hardware compression and PPP encapsulation on serial interface 3/1/0.

```
Router(config)# interface serial 3/1/0
Router(config-if)# encapsulate ppp
Router(config-if)# compress stac
```

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

```
Router(config)# interface serial 0
Router(config-if)# encapsulation lapb
Router(config-if)# compress predictor
Router(config-if)# mtu 1509
Router(config-if)# 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:

```
Router(config)# interface serial 0
Router(config-if)# encapsulation lapb
Router(config-if)# compress predictor
```

The following example configures BRI interface 0 to perform MPPC:

```
Router(config)# interface BRI0
Router(config-if)# ip unnumbered ethernet0
Router(config-if)# encapsulation ppp
Router(config-if)# isdn spid1 5551234
Router(config-if)# dialer map ip 172.21.71.74 5551234
Router(config-if)# dialer-group 1
Router(config-if)# compress mppc
```

The following example configures asynchronous interface 1 to implement MPPC and ignore the protocol field compression flag negotiated by LCP:

```
Router(config)# interface async1
Router(config-if)# ip unnumbered ethernet0
Router(config-if)# encapsulation ppp
Router(config-if)# async default routing
Router(config-if)# async dynamic routing
Router(config-if)# async mode interactive
Router(config-if)# peer default ip address 172.21.71.74
Router(config-if)# compress mppc ignore-pfc
```

**Related Commands**

| Command                       | Description                                                  |
|-------------------------------|--------------------------------------------------------------|
| <a href="#">encapsulation</a> | Sets encapsulation method used by the interface.             |
| <b>encapsulation x25</b>      | Specifies operation of a serial interface as an X.25 device. |
| <b>exec</b>                   | Allows an EXEC process on a line.                            |
| <a href="#">show compress</a> | Displays compression statistics.                             |
| <b>show processes</b>         | Displays information about the active processes.             |
| <b>show process cpu</b>       |                                                              |

# compress mppc

To configure compression using the Microsoft PPC (MPPC) compression algorithm on your data compression Advanced Interface Module (AIM) for the Cisco 2600 series router, use the **compress mppc** command in interface configuration mode. The MPPC compression algorithm is used to exchange compressed information with a Microsoft NT remote access server. To disable compression, use the **no** form of this command.

**compress mppc**

**no compress**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no keywords or arguments. |
|---------------------------|--------------------------------------------|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | Release  | Modification                 |
|------------------------|----------|------------------------------|
|                        | 12.0(1)T | This command was introduced. |

|                         |                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | When configuring PPP on a serial interface, you can use hardware compression on the data compression AIM daughtercard for MPPC if one is installed; otherwise you can use software compression. |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                                                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example shows how to configure the data compression AIM daughtercard for MPPC:</p> <pre>Router(config-if)# encapsulate ppp Router(config-if)# compress mppc</pre> |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| <b>Related Commands</b> | Command                            | Description                                                             |
|-------------------------|------------------------------------|-------------------------------------------------------------------------|
|                         | <a href="#">clear aim</a>          | Clears data compression AIM registers and resets the hardware.          |
|                         | <a href="#">compress stac caim</a> | Specifies the exact hardware compression resource preferred.            |
|                         | <a href="#">encapsulation</a>      | Sets the encapsulation method used by the interface.                    |
|                         | <a href="#">show compress</a>      | Displays compression statistics.                                        |
|                         | <a href="#">show pas caim</a>      | Displays debug information about the data compression AIM daughtercard. |
|                         | <a href="#">show processes</a>     | Displays information about the active processes.                        |

# compress predictor

The **compress predictor** command is replaced by the **compress** command. See the description of the **compress** command in this chapter for more information.

# compress stac caim

To specify the exact hardware compression resource preferred, enter the **compress stac caim** command in interface configuration mode. To disable compression, use the **no** form of this command.

**compress stac caim** *element-number*

**no compress stac caim** *element-number*

|                           |                       |                                                                      |
|---------------------------|-----------------------|----------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>element-number</i> | Enables compression for this interface. AIM interfaces begin with 0. |
|---------------------------|-----------------------|----------------------------------------------------------------------|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|------------------------|----------------|------------------------------|
|                        | 12.0(1)T       | This command was introduced. |

|                         |                                                                                                                                |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | Specifying the <b>compress stac</b> command with no options causes the router to use the fastest available compression method. |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------|

## Hardware Compression

If the router contains a data compression Advanced Interface Module (CAIM), compression is performed in the CAIM hardware.

Using hardware compression in the AIM frees the main processor of the router for other tasks. You can also configure the router to use the Compression Port Module to perform compression by using the distributed option, or to use the router's main processor by using the software option. If the Compression Port Module compression is performed in the main processor of the router.

## Software Compression

If the CAIM is not available, compression is performed in the main processor of the router.

When compression is performed in software installed in the router's main memory, it might significantly affect system performance. It is recommended that you disable compression in the main processor if the router CPU load exceeds 40 percent. To display the CPU load, use the **show process cpu** command in EXEC mode.

|                 |                                                                                                   |
|-----------------|---------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example specifies that hardware compression should be activated for CAIM element 0: |
|-----------------|---------------------------------------------------------------------------------------------------|

```
Router(config-if)# encapsulation ppp
Router(config-if)# compress stac caim 0
Router(config)# Ctrl-Z
Router# show compress
```



```
Router(config)# interface serial 3/1  
Router(config-if)# encapsulation ppp  
Router(config-if)# compress stac
```

**Related Commands**

| Command                       | Description                                                             |
|-------------------------------|-------------------------------------------------------------------------|
| <a href="#">clear aim</a>     | Clears data compression AIM registers and resets the hardware.          |
| <a href="#">encapsulation</a> | Sets the encapsulation method used by the interface.                    |
| <a href="#">show compress</a> | Displays compression statistics.                                        |
| <a href="#">show pas caim</a> | Displays debug information about the data compression AIM daughtercard. |

# controller

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

**Cisco 7200 Series and Cisco 7500 Series Routers**

```
controller {t1 | e1} slot/port
```

**Cisco AS5200 and AS5300 Access Servers and Cisco 4000 Series Routers**

```
controller {t1 | e1} number
```

**Cisco AS5800 Access Servers**

```
controller t1 dial-shelf/slot/t3-port:t1-num
```

**Cisco AS5800 Access Servers with Channelized T3 Interface Processor (CT3IP)**

```
controller t3 dial-shelf/slot/t3-port
```

**Cisco 7500 Series Cisco 7500 Series Routers with Channelized T3 Interface Processor (CT3IP)**

```
controller t3 slot/port-adapter/port
```

Syntax Description

|            |                                                                                                                                         |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| t1         | T1 controller.                                                                                                                          |
| e1         | E1 controller.                                                                                                                          |
| slot/port  | Backplane slot number and port number on the interface. See your hardware installation manual for the specific values and slot numbers. |
| number     | Network processor module (NPM) number, in the range 0 through 2.                                                                        |
| dial-shelf | Dial shelf chassis in the Cisco AS5800 access server containing the interface card.                                                     |
| t3-port    | T3 port number. The only valid value is 0.                                                                                              |
| :t1-num    | T1 timeslot in the T3 line. The value can be from 1 to 28.                                                                              |

Defaults

No T1, E1, or T3 controller is configured.

Command Modes

Global configuration

Command History

| Release    | Modification                                                       |
|------------|--------------------------------------------------------------------|
| 10.0       | This command was introduced.                                       |
| 10.3       | The <b>e1</b> keyword was added.                                   |
| 11.3(5)AAA | Support was added for dial shelves on Cisco 7500 series routers.   |
| 12.0(3)T   | Support was added for dial shelves on Cisco AS5800 access servers. |

**Usage Guidelines****T1 or E1 Fractional Data Lines**

This command is used in configurations where the router or access server 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.

**CT3IP Channel Interface Cards**

This command is used to configure the CT3IP and the 28 T1 channels. After the T1 channels are configured, continue to configure each T1 channel as a serial interface by using the **interface serial** global configuration command.

**Examples****Cisco 7500 Series Router as a T1 Controller**

The following example configures the MIP in slot 4, port 0 of a Cisco 7500 series router as a T1 controller:

```
controller t1 4/0
```

**Cisco 4000 Series Router**

The following example configures NIM 0 of a Cisco 4000 series router as a T1 controller:

```
controller t1 0
```

**Cisco AS5800 Access Server with Dial Shelf**

The following example configures the T1 controller in shelf 1, slot 0, port 0:

```
Router(config)# controller t1 1/0/0
Router(config-controller)#
```

**Cisco 7500 Series**

The following example configures the CT3IP in slot 3:

```
Router(config)# controller t3 3/0/0
```

**Cisco AS5800 Access Server**

The following example shows the status of the T1 controllers connected to the Cisco AS5800:

```
Router# show controller T1

T1 1/0/0:1 is up.
No alarms detected.
Framing is ESF, Line Code is AMI, Clock Source is Line.
Data in current interval (770 seconds elapsed):
    5 Line Code Violations, 8 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 7 Line Err Secs, 0 Degraded Mins
    0 Error Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 7 Unavail Secs
Total Data (last 81 15 minute intervals):
    7 Line Code Violations, 4 Path Code Violations,
    6 Slip Secs, 20 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins,
    0 Error Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 2 Unavail Secs
T1 1/0/1:5 is down.
Transmitter is sending remote alarm.
Receiver has loss of frame.
Framing is SF, Line Code is AMI, Clock Source is Line.
Data in current interval (770 seconds elapsed):
    50 Line Code Violations, 5 Path Code Violations
    0 Slip Secs, 7 Fr Loss Secs, 7 Line Err Secs, 0 Degraded Mins
```

```

    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 7 Unavail Secs
Total Data (last 81 15 minute intervals):
    27 Line Code Violations, 22 Path Code Violations,
    0 Slip Secs, 13 Fr Loss Secs, 13 Line Err Secs, 0 Degraded Mins,
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 13 Unavail Secs
Router#

```

Table 8 describes the fields shown in the display.

**Table 8** *show controller t1 Field Descriptions*

| Field                                     | Description                                                                                                                                                                           |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 ... is up                              | Status of T1 line.                                                                                                                                                                    |
| No alarms detected                        | Access server received no alarms.                                                                                                                                                     |
| Framing is ...                            | Standard T1 framing type. In this example, the framing is Extended Super Frame (ESF).                                                                                                 |
| Line Code is ...                          | Standard T1 line-coding format. In this example, the line-coding format is Alternate Mark Inversion (AMI).                                                                            |
| Clock Source is ...                       | Source of the synchronization signal (clock). In this example, the line is providing the clock signal.                                                                                |
| Data in current interval                  | Summary statistics for T1 signal quality for the current time interval of 900 seconds. In this example, the statistics are for current partial interval (770 seconds of 900 seconds). |
| Line Code Violations                      | Number of T1 line code violations for the current interval.                                                                                                                           |
| Path Code Violations                      | Number of T1 path code violations for the current interval.                                                                                                                           |
| Slip Secs                                 | Number of seconds in this interval during which a frame misalignment occurred.                                                                                                        |
| Fr Loss Secs                              | Number of seconds in this interval during which frame loss occurred.                                                                                                                  |
| Line Err Secs                             | Number of seconds in this interval during which line errors occurred.                                                                                                                 |
| Degraded Mins                             | Number of minutes in this interval during which the signal quality was degraded.                                                                                                      |
| Errored Secs                              | Number of seconds in this interval during which an error was reported.                                                                                                                |
| Bursty Err Secs                           | Number of bursty error seconds in this interval.                                                                                                                                      |
| Severely Err Secs                         | Number of severely errored seconds in this interval.                                                                                                                                  |
| Unavail Secs                              | Number of unavailable seconds in this interval.                                                                                                                                       |
| Total Data (last ... 15 minute intervals) | Summary statistics for T1 signal quality for 15 minute intervals. Every 24 hours (96 intervals), the counters in this data block clear.                                               |

#### Related Commands

| Command                                           | Description                                                  |
|---------------------------------------------------|--------------------------------------------------------------|
| <a href="#">channel-group (Fast EtherChannel)</a> | Defines the time slots that belong to each T1 or E1 circuit. |
| <a href="#">clear controller</a>                  | Resets the T1 or E1 controller.                              |
| <a href="#">clock source line</a>                 | Sets the E1 line clock source for the Cisco AS5200.          |

| Command                                      | Description                                                                                                                         |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>controller t3</b>                         | Configures the Channelized T3 Interface Processor.                                                                                  |
| <b>framing</b>                               | Selects the frame type for the T1 or E1 data line.                                                                                  |
| <b>linecode</b>                              | Selects the linecode type for T1 or E1 line.                                                                                        |
| <b>show controllers e1</b>                   | Displays information about the E1 links supported by the NPM (Cisco 4000) or MIP (Cisco 7500 series).                               |
| <b>show controllers t1<br/>call-counters</b> | Displays the total number of calls and call durations on a T1 controller.                                                           |
| <b>interface serial</b>                      | Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling). |

# controller t3

To configure the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers or the CT3 feature board in Cisco AS5800 access servers, use the **controller t3** command in global configuration mode. To delete the defined controller, use the **no** form of this command.

## Cisco 7500 Series

**controller t3** *slot/port-adapter/port*

**no controller t3** *slot/port-adapter/port*

## Cisco AS5800 Access Server

**controller t3** *dial-shelf/slot/t3-port*

**no controller t3** *dial-shelf/slot/t3-port*

## Syntax Description

|                      |                                                                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>          | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information./                           |
| <i>/port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |
| <i>/port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
| <i>dial-shelf</i>    | Dial shelf chassis in the Cisco AS5800 access server containing the CT3 interface card.                                                 |
| <i>/slot</i>         | Location of the CT3 interface card in the dial shelf chassis.                                                                           |
| <i>/t3-port</i>      | T3 port number. The only valid value is 0.                                                                                              |

## Defaults

### Cisco 7500 Series

No T3 controller is configured.

### Cisco AS5800 Access Server

No default behavior or values.

## Command Modes

Global configuration

## Command History

| Release  | Modification                                                    |
|----------|-----------------------------------------------------------------|
| 11.3     | This command was introduced.                                    |
| 12.0(3)T | This command was implemented on the Cisco AS5800 access server. |

---

**Usage Guidelines**

This command is used to configure the CT3IP and the 28 T1 channels. After the T1 channels are configured, continue to configure each T1 channel as a serial interface by using the **interface serial** global configuration command

---

**Examples****Cisco 7500 Series**

The following example configures the CT3IP in slot 3:

```
Router(config)# controller t3 3/0/0
```

**Cisco AS5800 Access Server**

The following example configures the T3 controller in shelf 3, slot 0, port 0 and T1 time slot 1:

```
Router(config)# controller t3 3/0/0
```

---

**Related Commands**

| Command           | Description                                                                                                                         |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>controller</b> | Configures a T1, E1, or J1 controller and enters controller configuration mode.                                                     |
| <b>interface</b>  | Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling). |

# copy flash lex

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

**copy flash lex** *number*

## Syntax Description

|               |                                                                                       |
|---------------|---------------------------------------------------------------------------------------|
| <i>number</i> | Number of the LAN Extender interface to which to download an image from Flash memory. |
|---------------|---------------------------------------------------------------------------------------|

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## 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.

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

## Examples

The following example copies the executable image *namexx* to 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 Commands

| Command                       | Description                                                         |
|-------------------------------|---------------------------------------------------------------------|
| <a href="#">copy tftp lex</a> | Downloads an executable image from a TFTP server to a LAN Extender. |



# copy tftp lex

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

**copy tftp lex** *number*

## Syntax Description

|               |                                                                     |
|---------------|---------------------------------------------------------------------|
| <i>number</i> | Number of the LAN Extender interface to which to download an image. |
|---------------|---------------------------------------------------------------------|

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## 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.

This command does not have a not form.

## Examples

The following example copies the file *namexx* from the TFTP server:

```
Router# copy tftp lex 0
Address or name of remote host (255.255.255.255)? 10.108.1.111
Name of file to copy? namexx
OK to overwrite software version 1.0 with 1.1 ?[confirm] Y
Loading namexx from 10.108.13.111!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[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 7500 series routers or on a 4-port serial adapter of the Cisco 7200 series routers, use the **crc** command in interface configuration mode. 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). The default is 16 bits.

## Defaults

16 bits

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

All interfaces use a 16-bit 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 WANs. CRC-32 is specified by IEEE 802 and as an option by some point-to-point transmission standards. It is often used on Switched Multimegabit Data Service (SMDS) networks and LANs.

## Examples

The following example enables the 32-bit CRC on serial interface 3/0:

```
Router(config)# interface serial 3/0
Router(config-if)# crc 32
```

# crc4

To enable generation of CRC4 (per ITU Recommendation G.704 and G.703) to improve data integrity, use the **crc4** command in interface configuration mode. To disable this feature, use the **no** form of this command.

**crc4**

**no crc4**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                                                                                                 |
|---------|--------------------------------------------------------------------------------------------------------------|
| 10.3    | This command was introduced.                                                                                 |
| 11.1 CA | This command was modified to include the Cisco 7200 series router and the E1-G.703/G.704 serial port adapter |

## Usage Guidelines

This command applies to a Cisco 4000 router and to Cisco 7200 series, Cisco 7000 series, and Cisco 7500 series routers. This command is supported on the Fast Serial Interface Processor (FSIP) and the E1-G.703/G.704 serial port adapter.

This command is useful for checking data integrity while operating in framed mode. CRC4 provides additional protection for a frame alignment signal under noisy conditions. For data transmission at E1 (2.048 Mbps), the G.704 standard suggests 4 bits CRC. Refer to CCITT Recommendation G.704 for a definition of CRC4.

You can also use the **crc** command to set the CRC size for the High-Level Data Link Control (HDLC) controllers.

## Examples

The following example enables CRC4 generation on the E1-G.703/G.704 serial port adapter and also sets the CRC size to 32 bits:

```
Router(config)# interface serial 0/0
Router(config-if)# crc 32
Router(config-if)# crc4
```

# crc bits 5

To enable generation of CRC5 (per ITU Recommendation G.704 and G.703) to improve data integrity, use the **crc bits 5** command in interface configuration mode. To disable this feature, use the **no** form of this command.

**crc bits 5**

**no crc bits 5**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is no CRC5 checking.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

This command is available for the JT2 6.3-MHz serial port adapter (PA-2JT2) on the second-generation Versatile Interface Processor (VIP2), in Cisco 7500 series routers, and in Cisco 7000 series routers with the Cisco 7000 series Route Switch Processor (RSP7000) and the Cisco 7000 series Chassis Interface (RSP7000CI).

This command is useful for checking data integrity while operating in framed mode. CRC5 provides additional protection for a frame alignment signal under noisy conditions. For data transmission at JT2 (6.312 Mbps), the G.704 standard suggests 5 bits CRC. Refer to ITU Recommendation G.704 for a definition of CRC5.

You can also use the **crc** command to set the CRC size for the High-Level Data Link Control (HDLC) controllers.

## Examples

The following example enables CRC 5 generation on the PA-2JT2 port adapter and also sets the CRC size to 32 bits:

```
Router(config)# interface serial 0/0
Router(config-if)# crc 32
Router(config-if)# crc bits 5
```

**Related Commands**

| Command                        | Description                                                     |
|--------------------------------|-----------------------------------------------------------------|
| <b>clns routing</b>            | Enables routing of CLNS packets.                                |
| <b>debug ctunnel</b>           | Displays debug messages for the IP over a CLNS Tunnel feature.  |
| <b>interface ctunnel</b>       | Creates a virtual interface to transport IP over a CLNS tunnel. |
| <b>ip address</b>              | Sets a primary or secondary IP address for an interface.        |
| <b>ip routing</b>              | Enables IP routing.                                             |
| <b>show interfaces ctunnel</b> | Displays information about an IP over CTunnel                   |

# cut-through

To configure the interfaces on the PA-12E/2FE port adapter to use cut-through switching technology between interfaces within the same bridge group, use the **cut-through** command in interface configuration mode. To return each interface to store-and-forward switching, use the **no** form of this command.

**cut-through** [receive | transmit]

**no cut-through**

## Syntax Description

|                 |                                                                          |
|-----------------|--------------------------------------------------------------------------|
| <b>receive</b>  | (Optional) Selects cut-through switching technology on received data.    |
| <b>transmit</b> | (Optional) Selects cut-through switching technology on transmitted data. |

## Defaults

Store-and-forward switching technology (that is, no cut-through)

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2 P  | This command was introduced. |

## Usage Guidelines

Cut-through mode allows switched packets to be transmitted after 64 bytes are received. The transmission of the packets can start before the end of the packet arrives. This reduces the time spent in the switch, but allows packets to be transmitted with bad cyclical redundancy check (CRCs), because the transmission is initiated before the CRC is received or checked. Store-and-forward mode waits for the entire packet to be received before that packet is forwarded, but will check the CRC before starting transmission.

The PA-12E/2FE port adapter offloads Layer 2 switching from the host CPU by using store-and-forward or cut-through switching technology between interfaces within the same virtual LAN (VLAN) on the PA-12E/2FE port adapter. The PA-12E/2FE port adapter supports up to four VLANs (bridge groups).

## Examples

The following example configures interface 3/0 for cut-through switching:

```
Router(config)# interface fastethernet 3/0
Router(config-if)# bridge-group 10
Router(config-if)# cut-through
Router(config-if)# no shutdown
Router(config-if)# exit
Router(config)#
```

## Related Commands

| Command     | Description                |
|-------------|----------------------------|
| <b>more</b> | Displays a specified file. |

# dce-terminal-timing enable

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

**dce-terminal-timing enable**

**no dce-terminal-timing enable**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |                         |
|-----------------|-------------------------|
| <b>Defaults</b> | DCE uses its own clock. |
|-----------------|-------------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

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

|                 |                                                                                      |
|-----------------|--------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example prevents phase shifting of the data with respect to the clock: |
|-----------------|--------------------------------------------------------------------------------------|

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

# default (interface)

To reset the configuration of an interface back to its default values, use the **default** command in global configuration mode.

**default** *interface-type interface-number*

## Syntax Description

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>interface-type</i>   | <p>Type of interface. The interface types that are available to be reset to their default values will vary depending on the available interface types on the networking device and the Cisco IOS release that is installed on the device. Not all possible interface types are documented here.</p> <ul style="list-style-type: none"> <li>• <b>async</b>—Reconfigures the specified async interface to its default value.</li> <li>• <b>atm</b>—Reconfigures the specified ATM interface to its default value.</li> <li>• <b>bvi</b>—Reconfigures the specified bridge-group virtual interface to its default value.</li> <li>• <b>dialer</b>—Reconfigures the specified dialer interface to its default value.</li> <li>• <b>ethernet</b>—Reconfigures the specified Ethernet interface to its default value.</li> <li>• <b>fastethernet</b>—Reconfigures the specified Fast Ethernet interface to its default value.</li> <li>• <b>fdi</b>—Reconfigures the specified FDDI interface to its default value.</li> <li>• <b>gigabitethernet</b>—Reconfigures the specified Gigabit Ethernet interface to its default value.</li> <li>• <b>group-async</b>—Reconfigures the specified group async interface to its default value.</li> <li>• <b>loopback</b>—Reconfigures the specified loopback interface to its default value.</li> <li>• <b>null</b>—Reconfigures the specified null interface to its default value.</li> <li>• <b>pos</b>—Reconfigures the specified Packet over SONET (POS) interface to its default value.</li> <li>• <b>serial</b>—Reconfigures the specified serial interface to its default value.</li> <li>• <b>tunnel</b>—Reconfigures the specified tunnel interface to its default value.</li> </ul> |
| <i>interface-number</i> | <p>Number of the interface, slot, router shelf, unit, port, or port adaptor if appropriate for the interface type. Slash marks may be required between elements of this argument.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## Defaults

Existing interface configuration values are not reset.

## Command Modes

Global configuration



**Command History**

| Release | Modification                 |
|---------|------------------------------|
| 11.1    | This command was introduced. |

**Usage Guidelines**

The **default** command is a general-purpose command that is not limited to interfaces; it resets defaults based on the command name that follows it. Use the **default (interface)** command when you need to remove any configuration for a specified interface and reset the interface to its default values.

**Examples**

The following example demonstrates how to reset serial interface 0 to its default values.

```
Router(config)# default serial 0
```

**Related Commands**

| Commands         | Description                          |
|------------------|--------------------------------------|
| <b>interface</b> | Enters interface configuration mode. |

# delay (interface)

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

**delay** *tens-of-microseconds*

**no delay**

## Syntax Description

|                             |                                                                                                                                                                 |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>tens-of-microseconds</i> | Integer that specifies the delay in tens of microseconds for an interface or network segment. To see the default delay, use the <b>show interfaces</b> command. |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Examples

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

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

## Related Commands

| Command                | Description                                                          |
|------------------------|----------------------------------------------------------------------|
| <b>show interfaces</b> | Displays the statistical information specific to a serial interface. |

# description (controller)

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

**description** *string*

**no description**

## Syntax Description

|               |                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------|
| <i>string</i> | Comment or a description (up to 80 characters) to help you remember what is attached to an interface. |
|---------------|-------------------------------------------------------------------------------------------------------|

## Defaults

No description is added.

## Command Modes

Controller configuration

## Command History

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

## Usage Guidelines

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

## Examples

The following example describes a 3174 controller:

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

## Related Commands

| Command                                     | Description                                                                                           |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>more</b>                                 | Displays a specified file.                                                                            |
| <b>more</b><br><b>system:running-config</b> |                                                                                                       |
| <b>show controllers e1</b>                  | Displays information about the E1 links supported by the NPM (Cisco 4000) or MIP (Cisco 7500 series). |
| <b>show controllers t1</b>                  | Displays information about the T1 links.                                                              |
| <b>show controllers t3</b>                  | Displays information about the CT3IP on Cisco 7500 series routers.                                    |

# down-when-looped

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

## down-when-looped

### Syntax Description

This command has no arguments or keywords.

### Defaults

Disabled

### Command Modes

Interface configuration

### Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

### Usage Guidelines

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

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

#### Backup Interfaces

When an interface has a backup interface configured, it is often desirable that the backup interface be enabled when the primary interface is either down or in loopback. By default, the backup is 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.

#### Testing an Interface with the Loopback Command

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

### Examples

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

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

### Related Commands

| Command                        | Description                                                         |
|--------------------------------|---------------------------------------------------------------------|
| <b>backup interface</b>        | Configures an interface as a secondary or dial backup interface.    |
| <a href="#">logging-events</a> | Diagnoses equipment malfunctions between an interface and a device. |

# dsu bandwidth

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

**dsu bandwidth** *kbps*

**no dsu bandwidth**

| Syntax Description | <i>kbps</i> | Maximum bandwidth in the range of 22 kbps to 44736 kbps. The default values are: <ul style="list-style-type: none"><li>• 34010 kbps for PA-E3</li><li>• 44736 kbps for PA-T3</li></ul> |
|--------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Defaults | 34010 kbps for PA-E3<br>44736 kbps for PA-T3 |
|----------|----------------------------------------------|
|----------|----------------------------------------------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CA | This command was introduced. |

| Usage Guidelines | <p>The local interface configuration must match the remote interface configuration. For example, if you reduce the maximum bandwidth to 16000 on the local port, you must also do the same on the remote port.</p> <p>The <b>dsu bandwidth</b> command reduces the bandwidth by padding the E3 and T3 frame.</p> <p>To verify the data service unit (DSU) bandwidth configured on the interface, use the <b>show controllers serial</b> EXEC command.</p> |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Examples | <p>The following example sets the DSU bandwidth to 16000 kbps on interface 1/0/0:</p> <pre>Router(config)# <b>interface serial 1/0/0</b><br/>Router(config-if)# <b>dsu bandwidth 16000</b></pre> |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Related Commands | Command                                 | Description                                                      |
|------------------|-----------------------------------------|------------------------------------------------------------------|
|                  | <a href="#">show controllers serial</a> | Displays information that is specific to the interface hardware. |

# dsu mode

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

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

**no dsu mode**

|                    |   |                                                                                                                                                                                                                                                                                       |
|--------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | 0 | Sets the interoperability mode to 0. This is the default. Specify mode 0 to connect a PA-E3 port adapter to another PA-E3 port adapter or to a Digital Link DSU (DL3100). Use mode 0 to connect a PA-T3 port adapter to another PA-T3 port adapter or to a Digital Link DSU (DL3100). |
|                    | 1 | Sets the interoperability mode to 1. Specify mode 1 to connect a PA-E3 or PA-T3 port adapter to a Kentrox DSU.                                                                                                                                                                        |
|                    | 2 | Sets the interoperability mode to 2. Specify mode 2 to connect a PA-T3 port adapter to a Larscom DSU.                                                                                                                                                                                 |
|                    |   |                                                                                                                                                                                                                                                                                       |

Defaults 0

Command Modes Interface configuration

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 11.1 CA | This command was introduced. |

**Usage Guidelines**

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

You must know what type of DSU is connected to the remote port to determine if it interoperates with a PA-E3 or a PA-T3 port adapter. Use mode 0 to connect two PA-E3 port adapters or to connect the PA-E3 port adapter to a Digital Link DSU (DL3100). Use mode 1 to connect a PA-E3 or a PA-T3 port adapter to a Kentrox DSU. Use mode 2 to connect a PA-T3 port adapter to a Larscom DSU. The **dsu mode** command enables and improves interoperability with other DSUs.

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

**Examples**

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

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

**Related Commands**

| Command                                 | Description                                                      |
|-----------------------------------------|------------------------------------------------------------------|
| <a href="#">show controllers serial</a> | Displays information that is specific to the interface hardware. |

# dte-invert-txc

On the Cisco 4000 series, you can specify the serial Network Processor Module timing signal configuration. When the board is operating as a DTE, use the **dte-invert-txc** command in interface configuration mode to invert the TXC clock signal received from the DCE. If the DCE accepts serial clock transmit external (SCTE) from the DTE, use the **no** form of this command.

**dte-invert-txc**

**no dte-invert-txc**

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

**Defaults** Disabled

**Command Modes** Interface configuration

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 9.1     | This command was introduced. |

**Usage Guidelines**

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

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

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

**Examples**

The following example inverts the TXC on serial interface 0:

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



# duplex

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

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

**no duplex**

## Syntax Description

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

## Defaults

Half-duplex mode

## Command Modes

Interface configuration

## Command History

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

## Usage Guidelines

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

[Table 9](#) describes the access server's performance for different combinations of the duplex and speed modes. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

**Table 9** Relationship Between duplex and speed Commands

| duplex Command                           | speed Command                       | Resulting System Action                     |
|------------------------------------------|-------------------------------------|---------------------------------------------|
| <b>duplex auto</b>                       | <b>speed auto</b>                   | Autonegotiates both speed and duplex modes. |
| <b>duplex auto</b>                       | <b>speed 100</b> or <b>speed 10</b> | Autonegotiates both speed and duplex modes. |
| <b>duplex half</b> or <b>duplex full</b> | <b>speed auto</b>                   | Autonegotiates both speed and duplex modes. |
| <b>duplex half</b>                       | <b>speed 10</b>                     | Forces 10 Mbps and half duplex.             |
| <b>duplex full</b>                       | <b>speed 10</b>                     | Forces 10 Mbps and full duplex.             |

**Table 9** Relationship Between duplex and speed Commands (continued)

| duplex Command     | speed Command    | Resulting System Action          |
|--------------------|------------------|----------------------------------|
| <b>duplex half</b> | <b>speed 100</b> | Forces 100 Mbps and half duplex. |
| <b>duplex full</b> | <b>speed 100</b> | Forces 100 Mbps and full duplex. |

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

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

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

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

## Examples

The following example shows the different duplex configuration options you can configure on a Cisco AS5300:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 0
Router(config-if)# duplex ?
    auto  Enable AUTO duplex configuration
    full  Force full duplex operation
    half  Force half-duplex operation
```

## Related Commands

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

# e2-clockrate

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

**e2-clockrate**

**no e2-clockrate**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The interfaces are not affected.

## Command Modes

Interface configuration

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 12.0(2)XD | This command was introduced. |
| 12.0(3)T  | This command was modified.   |

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

| Command                    | Description                                                                                                                                  |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">clock rate</a> | Configures the clock rate for the hardware connections on serial interfaces such as NIMs and interface processors to an acceptable bit rate. |

# early-token-release

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

**early-token-release**

**no early-token-release**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

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

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

|                 |                                                                                         |
|-----------------|-----------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example enables the use of early token release on Token Ring interface 1: |
|-----------------|-----------------------------------------------------------------------------------------|

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

On the Cisco 7500 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:

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

# encapsulation

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

**encapsulation** *encapsulation-type*

**no encapsulation** *encapsulation-type*

## Syntax Description

*encapsulation-type*

Encapsulation type; one of the following keywords:

- **atm-dxi**—ATM Mode-Data Exchange Interface.
- **bstun**—Block Serial Tunnel.
- **frame-relay**—Frame Relay (for serial interface).
- **hdlc**—High-Level Data Link Control (HDLC) protocol for serial interface. This encapsulation method provides the synchronous framing and error detection functions of HDLC without windowing or retransmission. This is the default for synchronous serial interfaces.
- **isl**—Inter-Switch Link (ISL) (for virtual LANs).
- **lapb**—X.25 Link Access Procedure, Balanced. Data link layer protocol (LAPB) DTE operation (for serial interface).
- **ppp**—PPP (for serial interface).
- **sdhc**—IBM serial Systems Network Architecture (SNA).
- **sdhc-primary**—IBM serial SNA (for primary serial interface).
- **sdhc-secondary**—IBM serial SNA (for secondary serial interface).
- **slip**—Specifies Serial Line Internet Protocol (SLIP) encapsulation for an interface configured for dedicated asynchronous mode or dial-on-demand routing (DDR). This is the default for asynchronous interfaces.
- **smds**—Switched Multimegabit Data Services (SMDS) (for serial interface).

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

### Usage Guidelines

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

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

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

PPP echo requests are used as keepalive packets to detect line failure. The **no keepalive** command can be used to disable echo requests. For more information about the **no keepalive** command, refer to the chapter “IP Services Commands” in the *Cisco IOS IP Command Reference, Volume 1 of 3: Addressing and Services* and the chapter “Configuring IP Services” in the *Cisco IOS IP Configuration Guide*.

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



#### Note

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

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

### Examples

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

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

The following example enables PPP encapsulation on serial interface 0:

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

In the following example, async interface 1 is configured for PPP encapsulation:

```
Router# configure terminal
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface async 1
Router(config-if)# encapsulation ppp
```

### Related Commands

| Command                  | Description                                                  |
|--------------------------|--------------------------------------------------------------|
| <b>encapsulation x25</b> | Specifies operation of a serial interface as an X.25 device. |
| <b>keepalive</b>         | Sets the keepalive timer for a specific interface.           |

| Command                   | Description                                                                                                             |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>ppp</b>                | Starts an asynchronous connection using PPP.                                                                            |
| <b>ppp authentication</b> | Enables CHAP or PAP or both and specifies the order in which CHAP and PAP authentication are selected on the interface. |
| <b>ppp bap call</b>       | Sets PPP BACP call parameters.                                                                                          |
| <b>slip</b>               | Starts a serial connection to a remote host using SLIP.                                                                 |

# fddi burst-count

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

**fddi burst-count** *number*

**no fddi burst-count**

|                    |               |                                                                             |
|--------------------|---------------|-----------------------------------------------------------------------------|
| Syntax Description | <i>number</i> | Number of preallocated buffers in the range from 1 to 10. The default is 3. |
|--------------------|---------------|-----------------------------------------------------------------------------|

|          |           |
|----------|-----------|
| Defaults | 3 buffers |
|----------|-----------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

|                                                                                             |                                                                       |
|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Usage Guidelines                                                                            | This command applies to the FCI card only.                            |
| <br>Note | The microcode software version should <i>not</i> be 128.45 or 128.43. |

|          |                                                                                                                                                       |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examples | The following example sets the number of buffers to 5:<br><br>Router(config)# <b>interface fddi 0</b><br>Router(config-if)# <b>fddi burst-count 5</b> |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|



# fddi c-min

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

**fddi c-min** *microseconds*

**no fddi c-min**

|                           |                                                                                                                                                                                                                     |                                                                                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>microseconds</i> Sets the timer value, in microseconds. The default is 1600 microseconds.                                                                                                                        |                                                                                                                                                     |
| <b>Defaults</b>           | 1600 microseconds                                                                                                                                                                                                   |                                                                                                                                                     |
| <b>Command Modes</b>      | Interface configuration                                                                                                                                                                                             |                                                                                                                                                     |
| <b>Command History</b>    | <b>Release</b>                                                                                                                                                                                                      | <b>Modification</b>                                                                                                                                 |
|                           | 10.0                                                                                                                                                                                                                | This command was introduced.                                                                                                                        |
| <b>Usage Guidelines</b>   | This command applies to the processor connection management (CMT) only. You need extensive knowledge of the PCM state machine to tune this timer. Use this command when you run into PCM interoperability problems. |                                                                                                                                                     |
| <b>Examples</b>           | The following example sets the C-Min timer to 2000 microseconds:<br><br>Router(config)# <b>interface fddi 0</b><br>Router(config-if)# <b>fddi c-min 2000</b>                                                        |                                                                                                                                                     |
| <b>Related Commands</b>   | <b>Command</b>                                                                                                                                                                                                      | <b>Description</b>                                                                                                                                  |
|                           | <b>fddi tb-min</b>                                                                                                                                                                                                  | Sets the TB-Min timer in the PCM.                                                                                                                   |
|                           | <b>fddi tl-min-time</b>                                                                                                                                                                                             | Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification). |
|                           | <b>fddi t-out</b>                                                                                                                                                                                                   | Sets the t-out timer in the PCM.                                                                                                                    |

# fddi cmt-signal-bits

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

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

Syntax Description

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>signal-bits</i> | A hexadecimal number preceded by 0x; for example, 0x208. The FDDI standard defines 10 bits of signaling information that must be transmitted, as follows: <ul style="list-style-type: none"><li>bit 0—Escape bit. Reserved for future assignment by the FDDI standards committee.</li><li>bits 1 and 2—Physical type, as defined in <a href="#">Table 10</a>.</li><li>bit 3—Physical compatibility. Set if topology rules include the connection of a physical-to-physical type at the end of the connection.</li><li>bits 4 and 5—Link confidence test duration; set as defined in <a href="#">Table 11</a>.</li><li>bit 6—MAC available for link confidence test.</li><li>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.</li><li>bit 8—MAC for local loop.</li><li>bit 9—MAC on physical output.</li></ul> |
| <b>phy-a</b>       | (Optional) Selects Physical Sublayer A. The default is 0x008 (hexadecimal) or 00 0000 1000 (binary). Bits 1 and 2 are set to 00 to select Physical A. Bit 3 is set to 1 to indicate “accept any connection.”                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>phy-b</b>       | (Optional) Selects Physical Sublayer B. The default is 0x20c (hexadecimal) or 10 0000 1100 (binary). Bits 1 and 2 are set to 10 to select Physical B. Bit 3 is set to 1 to indicate “accept any connection.” Bit 9 is set to 1 to select MAC on output. The normal data flow on FDDI is input on Physical A and output on Physical B.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Defaults

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 Modes

Interface configuration

Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

**Usage Guidelines**

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

**Caution**

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

Table 10 lists the physical types.

**Table 10 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 11 lists the duration bits.

**Table 11 FDDI Link Confidence Test Duration Bit Specification**

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

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

**Examples**

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

```
Router(config)# interface fddi 0
Router(config-if)# fddi cmt-signal-bits 208
```

# fddi duplicate-address-check

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

**fddi duplicate-address-check**

**no fddi duplicate-address-check**

---

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

---

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

---

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

---

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

---

---

|                         |                                                                                                                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | If you use this command, the Cisco IOS software will detect a duplicate address if multiple stations are sharing the same MAC address. If the software finds a duplicate address, it will shut down the interface. |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

---

|                 |                                                                       |
|-----------------|-----------------------------------------------------------------------|
| <b>Examples</b> | The following example enables duplicate address checking on the FDDI: |
|-----------------|-----------------------------------------------------------------------|

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

# fddi encapsulate

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

**fddi encapsulate**

**no fddi encapsulate**

## Syntax Description

This command has no arguments or keywords.

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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

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

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



### Caution

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

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

---

**Examples**

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

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

# fddi frames-per-token

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

**fddi frames-per-token** *number*

**no fddi frames-per-token**

| Syntax Description | <i>number</i> | Maximum number of frames to transmit per token capture. Valid values are from 1 to 10. The default is 3. |
|--------------------|---------------|----------------------------------------------------------------------------------------------------------|
|--------------------|---------------|----------------------------------------------------------------------------------------------------------|

| Defaults | 3 frames |
|----------|----------|
|----------|----------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.2 P  | This command was introduced. |

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

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

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

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

```
! Show fddi frames-per-token command options
4700(config-if)# fddi frames-per-token ?
<1-10> Number of frames per token, default = 3
! Specify 4 as the maximum number of frames to be transmitted per token
4700(config-if)# fddi frames-per-token 4
```

# fddi smt-frames

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

**fddi smt-frames**

**no fddi smt-frames**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |         |
|-----------------|---------|
| <b>Defaults</b> | Enabled |
|-----------------|---------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

|                         |                                                                                                                                                                  |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | Use the <b>no</b> form of this command to turn off SMT frame processing for diagnosing purposes. Use the <b>fddi smt-frames</b> command to reenable the feature. |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                             |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example disables SMT frame processing:</p> <pre>Router(config)# <b>interface fddi 0</b> Router(config-if)# <b>no fddi smt-frames</b></pre> |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|



# fddi tb-min

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

**fddi tb-min** *milliseconds*

**no fddi tb-min**

| Syntax Description | <i>milliseconds</i> Number that sets the TB-Min timer value. The range is 0 to 65,535 milliseconds. The default is 100 milliseconds. |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------|

| Defaults | 100 milliseconds |
|----------|------------------|
|----------|------------------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.3    | This command was introduced. |

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

**Note**

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

| Examples | The following example sets the TB-Min timer to 200 ms: |
|----------|--------------------------------------------------------|
|----------|--------------------------------------------------------|

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

| Related Commands | Command                          | Description                                                                                                                                         |
|------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">fddi c-min</a>       | Sets the C-Min timer on the PCM.                                                                                                                    |
|                  | <a href="#">fddi tl-min-time</a> | Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification). |
|                  | <a href="#">fddi t-out</a>       | Sets the t-out timer in the PCM.                                                                                                                    |

# fddi tl-min-time

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

**fddi tl-min-time** *microseconds*

## Syntax Description

|                     |                                                                                                                                                                                                                                                                                     |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>microseconds</i> | Number 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. The range is 0 to 4,294,967,295 microseconds. The default is 30 microseconds. |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

30 microseconds

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

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

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

## Related Commands

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

# fddi t-out

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

**fddi t-out** *milliseconds*

**no fddi t-out**

| Syntax Description                                                                       | <i>milliseconds</i> Number that sets the timeout timer. The range is 0 to 65,535 ms. The default is 100 ms.                                                                                                                                                                                                                                                                                                                                            |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------|--------------|----------------------------|----------------------------------|-----------------------------|-----------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Defaults                                                                                 | 100 milliseconds                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| Command Modes                                                                            | Interface configuration                                                                                                                                                                                                                                                                                                                                                                                                                                |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| Command History                                                                          | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>10.0</td><td>This command was introduced.</td></tr></table>                                                                                                                                                                                                                                                                                                                               |  | Release | Modification | 10.0                       | This command was introduced.     |                             |                                   |                                  |                                                                                                                                                     |
| Release                                                                                  | Modification                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| 10.0                                                                                     | This command was introduced.                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| Usage Guidelines                                                                         | <p>This command applies to the processor connection management (CMT) only. Use this command when you run into PCM interoperability problems.</p>                                                                                                                                                                                                                                                                                                       |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
|  Note | <p>You need extensive knowledge of the PCM state machine to tune this timer.</p>                                                                                                                                                                                                                                                                                                                                                                       |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| Examples                                                                                 | <p>The following example sets the timeout timer to 200 ms:</p> <pre>Router(config)# <b>interface fddi 0</b> Router(config-if)# <b>fddi t-out 200</b></pre>                                                                                                                                                                                                                                                                                             |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| Related Commands                                                                         | <table><tr><th>Command</th><th>Description</th></tr><tr><td><a href="#">fddi c-min</a></td><td>Sets the C-Min timer on the PCM.</td></tr><tr><td><a href="#">fddi tb-min</a></td><td>Sets the TB-Min timer in the PCM.</td></tr><tr><td><a href="#">fddi tl-min-time</a></td><td>Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification).</td></tr></table> |  | Command | Description  | <a href="#">fddi c-min</a> | Sets the C-Min timer on the PCM. | <a href="#">fddi tb-min</a> | Sets the TB-Min timer in the PCM. | <a href="#">fddi tl-min-time</a> | Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification). |
| Command                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| <a href="#">fddi c-min</a>                                                               | Sets the C-Min timer on the PCM.                                                                                                                                                                                                                                                                                                                                                                                                                       |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| <a href="#">fddi tb-min</a>                                                              | Sets the TB-Min timer in the PCM.                                                                                                                                                                                                                                                                                                                                                                                                                      |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |
| <a href="#">fddi tl-min-time</a>                                                         | Controls the TL-Min time (the minimum time to transmit a PHY line state before advancing to the PCM state, as defined by the X3T9.5 specification).                                                                                                                                                                                                                                                                                                    |  |         |              |                            |                                  |                             |                                   |                                  |                                                                                                                                                     |

# fddi token-rotation-time

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

**fddi token-rotation-time** *microseconds*

**no fddi token-rotation-time**

|                           |                     |                                                                                                                                   |
|---------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>microseconds</i> | Number that specifies the token rotation time (TRT). The range is 4000 to 165,000 microseconds. The default is 5000 microseconds. |
|---------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------|

|                 |                   |
|-----------------|-------------------|
| <b>Defaults</b> | 5000 microseconds |
|-----------------|-------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|------------------------|----------------|------------------------------|
|                        | 10.0           | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | 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. |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                      |
|-----------------|----------------------------------------------------------------------|
| <b>Examples</b> | The following example sets the rotation time to 24,000 microseconds: |
|-----------------|----------------------------------------------------------------------|

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

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

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

# fddi valid-transmission-time

To recover from a transient ring error, use the **fddi valid-transmission-time** command in interface configuration mode. To revert to the default value, use the **no** form of this command.

**fddi valid-transmission-time** *microseconds*

**no fddi valid-transmission-time**

| Syntax Description | <i>microseconds</i> Number that specifies the transmission valid timer (TVX) interval. The range is 2500 to 2,147,483,647 microseconds. The default is 2500 microseconds. |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Defaults | 2500 microseconds |
|----------|-------------------|
|----------|-------------------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

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

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

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

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

# fdl

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

## Cisco MC3810 Multiservice Access Concentrator

**fdl** { **att** | **ansi** | **both** }

**no fdl** { **att** | **ansi** | **both** }

## Cisco 2600 or 3600 Series Routers

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

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

### Syntax Description

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

### Defaults

Disabled on the Cisco MC3810 multiservice access concentrator.

The default value is **ansi** on Cisco 2600 or 3600 series routers.

### Command Modes

Controller configuration for the Cisco MC3810 multiservice access concentrator.

ATM interface configuration for the Cisco 2600 or 3600 series routers.

### Command History

| Release                | Modification                                                                                                                                                                                                                           |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.3                   | This command was introduced.                                                                                                                                                                                                           |
| 12.0                   | This command was modified to add the <b>both</b> keyword for the Cisco MC3810.                                                                                                                                                         |
| 12.0(5)T and 12.0(5)XK | The command was introduced as an ATM interface configuration command for the Cisco 2600 and 3600 series. The <b>none</b> keyword was added to the original controller command, and the <b>both</b> keyword was changed to <b>all</b> . |

---

**Usage Guidelines****Cisco MC3810 Multiservice Access Concentrator**

You must configure this command on both T1 controllers if you want to support the CSU function on each T1 line. However, you must use the same facilities data link exchange standard as your service provider. You can have a different standard configured on each T1 controller.

**Cisco 2600 or 3600 Series Routers**

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

**Note**

---

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

---

---

**Examples****Cisco MC3810 Multiservice Access Concentrator**

The following example configures the ANSI T1.403 standard for both T1 controllers:

```
Router(config)# controller t1 0
Router(config-controller)# fdl ansi
Router(config-controller)# exit
Router(config)# controller t1 1
Router(config-controller)# fdl ansi
```

**Cisco 2600 or 3600 Series Routers**

In a Cisco 2600 or 3600 series router, the following example specifies both ANSI and AT&T standards for FDL exchange:

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

# frame-relay

To configure Frame Relay payload compression for each Frame Relay port, use the **frame-relay** command in interface configuration mode. To terminate this form of payload compression over Frame Relay, use the **no** form of this command.

**frame-relay payload-compression frf9 stac caim** [*element-number*]

**no frame-relay payload-compression**

| Syntax Description |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>payload-compression</b>        | Packet-by-packet payload compression, using the Stacker method.                                                                                                                                                                                                                                                                                                                                                                     |
|                    | <b>frf9 stac</b>                  | Enables FRF.9 compression using the Stacker method.<br><br>If the router contains a data compression Advanced Interface Module (AIM) for the Cisco 2600 series router, compression is performed in the hardware (hardware compression).<br><br>If the compression Advanced Interface Module (CAIM) is not available, compression is performed in the software installed on the main processor of the router (software compression). |
|                    | <b>caim</b> <i>element-number</i> | Enable the data compression AIM hardware compression daughtercard to do compression, at the element numbered beginning with 0 and incrementing to include all possible elements.                                                                                                                                                                                                                                                    |

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release  | Modification                 |
|-----------------|----------|------------------------------|
|                 | 12.0(2)T | This command was introduced. |

**Usage Guidelines**

Use the **frame-relay payload-compression** command to enable or disable payload compression on a point-to-point interface or subinterface. Use the **frame-relay map** command to enable or disable payload compression on a multipoint interface or subinterface.

Shut down the interface before changing encapsulation types. Although this is not required, shutting down the interface ensures the interface is reset for the new encapsulation.

**Examples**

The following example shows Frame Relay configured to use payload compression with the frf9 stac algorithm for CAIM hardware compression, using the installed data compression AIM daughtercard as the compression source:

```
Router(config-if)# frame-relay payload-compression frf9 stac caim 0
```



| Related Commands | Command                            | Description                                                                                                     |
|------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">compress stac caim</a> | Specifies the exact hardware compression resource preferred.                                                    |
|                  | <b>encapsulation frame-relay</b>   | Enables Frame Relay encapsulation.                                                                              |
|                  | <b>frame-relay interface-dlci</b>  | Assigns a DLCI to a specified Frame Relay subinterface on the router or access server.                          |
|                  | <b>frame-relay map</b>             | Defines mapping between a destination protocol address and the DLCI used to connect to the destination address. |
|                  | <a href="#">show compress</a>      | Displays compression statistics.                                                                                |

# frame-relay map

To enable Frame Relay compression on a data-link connection (DLC) basis, and to define mapping between a destination protocol address and the data-link connection identifier (DLCI) used to connect to the destination address, use the **frame-relay map** command in interface configuration mode. To deactivate Frame Relay compression, use the **no** form of this command.

**frame-relay map** {*protocol protocol-address dlci*} **payload-compression frf9 stac caim**  
[*element-number*]

**no frame-relay map**

|                           |                            |                                                                                                                                                                                                             |
|---------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>protocol</i>            | Supported protocol, bridging, or logical link control keywords: <b>appletalk</b> , <b>decnet</b> , <b>dls</b> , <b>ip</b> , <b>ipx</b> , <b>llc2</b> , <b>rsrb</b> , <b>vines</b> , and <b>xns</b> .        |
|                           | <i>protocol-address</i>    | Destination protocol address.                                                                                                                                                                               |
|                           | <b>dlci</b>                | Indicates the DLCI number used to connect to the specified protocol address on the interface.                                                                                                               |
|                           | <b>payload-compression</b> | Packet-by-packet payload compression, using the Stacker method.                                                                                                                                             |
|                           | <b>frf9</b>                | Data compression over Frame Relay.                                                                                                                                                                          |
|                           | <b>stac</b>                | Specifies that a Stacker (LZS) compression algorithm will be used on LAPB, HDLC, and PPP encapsulation. Compression is implemented in the hardware Advanced Interface Module (AIM) installed in the router. |
|                           | <b>caim</b>                | Compression Advanced Interface Module (CAIM). Enables the data compression AIM hardware compression daughtercard to do compression.                                                                         |
|                           | <i>element-number</i>      | (Optional) Compression element number, beginning with 0 and including all possible elements.                                                                                                                |

**Defaults** Disabled

**Command Modes** Interface configuration

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 12.0(1)T       | This command was introduced. |

**Usage Guidelines** Many DLCIs known by an access server can be used to send data to many different places, but they are all multiplexed over one physical link. The Frame Relay map tells the Cisco IOS software how to get from a specific protocol and address pair to the correct DLCI.

Although you did not specified the IETF keyword during configuration, the map inherits the attributes set with the encapsulation frame-relay command so that all interfaces use IETF encapsulation.

Use the **frame-relay map** command to enable or disable payload compression on multipoint interfaces. Use the **frame-relay payload-compression** command to enable or disable payload compression on point-to-point interfaces.

The broadcast keyword provides two functions: It forwards broadcasts when multicasting is not enabled, and it simplifies the configuration of (Open Shortest Path First (OSPF) for nonbroadcast networks that will use Frame Relay.

The broadcast keyword might also be required for some routing protocols—for example, AppleTalk—that depend on regular routing table updates, especially when the router at the remote site is waiting for a routing update packet to arrive before adding the route. Network broadcasts are necessary if you intend to use routing protocols such as Routing Information Protocol (RIP) or OSPF running across the Frame Relay link.

The **frame-relay map payload-compression frf9 stac caim 0** command enables compression on the Frame Relay link, but requires the **caim 0** portion of the command. To display Frame Relay output, do not use the **show compress** command; use the **show controllers serial 0/0** command.

### Examples

The following example shows configuration of the **frame-relay map payload-compression** command using the data compression AIM daughtercard for compression mapping the destination address 1.1.1.2 to DLCI 16:

```
Router(config-if)# frame-relay map ip 10.1.1.2 16 broadcast payload-compression frf9 stac  
caim 0
```

### Related Commands

| Command                             | Description                                                                                  |
|-------------------------------------|----------------------------------------------------------------------------------------------|
| <a href="#">compress stac caim</a>  | Specifies the exact hardware compression resource preferred.                                 |
| <b>encapsulation frame-relay</b>    | Enables Frame Relay encapsulation.                                                           |
| <b>frame-relay interface-dlci</b>   | Assigns a DLCI to a specified Frame Relay subinterface on the router or access server.       |
| <b>frame-relay payload-compress</b> | Enables Stacker payload compression on a specified point-to-point interface or subinterface. |
| <b>show controllers serial</b>      | Displays information that is specific to the interface hardware.                             |

# framing

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

## Syntax for T1 Lines

```
framing {sfadm | esfadm}
```

## Syntax for E1 Lines

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

| Syntax Description |                 |                                                         |
|--------------------|-----------------|---------------------------------------------------------|
|                    | <b>sfadm</b>    | Specifies Super Frame as the T1 channel.                |
|                    | <b>esfadm</b>   | Specifies Extended Super Frame as the T1 channel.       |
|                    | <b>crc4adm</b>  | Specifies CRC4 frame as the E1 channel.                 |
|                    | <b>pcm30adm</b> | Specifies CRC4 disabled framing mode as the E1 channel. |
|                    | <b>clear e1</b> | Specifies clear-e1 framing mode for the E1 channel.     |

## Defaults

Extended Super Frame for a T1 line  
CRC4 disabled framing for an E1 line

## Command Modes

Controller configuration

## Command History

| Release    | Modification                                                        |
|------------|---------------------------------------------------------------------|
| 11.3       | This command was introduced.                                        |
| 12.0(5)XE  | The command was enhanced as an ATM interface configuration command. |
| 12.0(7)XE1 | Support for Cisco 7100 series routers was added.                    |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T.        |

## Usage Guidelines

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

## Examples

The following example selects Extended Super Frame as the T1 frame type:

```
framing esfadm
```

**Related Commands**

| Command                  | Description                                                                    |
|--------------------------|--------------------------------------------------------------------------------|
| <b>lbo</b>               | Specifies the distance of the cable from the routers to the network equipment. |
| <a href="#">linecode</a> | Selects the line-code type for a T1 or E1 line.                                |

# framing (E1/T1 controller)

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

## T1 Lines

**framing** {sf | esf}

## E1 Lines

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

### Syntax Description

|                  |                                                                               |
|------------------|-------------------------------------------------------------------------------|
| <b>sf</b>        | Specifies Super Frame as the T1 frame type. This is the default.              |
| <b>esf</b>       | Specifies extended Super Frame as the T1 frame type.                          |
| <b>crc4</b>      | Specifies CRC4 frame as the E1 frame type. This is the default for Australia. |
| <b>no-crc4</b>   | Specifies no CRC4 frame as the E1 frame type.                                 |
| <b>australia</b> | (Optional) Specifies the E1 frame type used in Australia.                     |

### Defaults

Super frame is the default on a T1 line.

CRC4 frame is the default on an E1 line.

### Command Modes

Controller configuration

### Usage Guidelines

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

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

### Examples

The following example selects extended Super Frame as the T1 frame type:

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

### Related Commands

| Command                     | Description                                                                    |
|-----------------------------|--------------------------------------------------------------------------------|
| <a href="#">cablelength</a> | Specifies the distance of the cable from the routers to the network equipment. |
| <a href="#">linecode</a>    | Selects the linecode type for T1 or E1 line.                                   |

## framing (E3/T3 interface)

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

### PA-E3

**framing {bypass | g751}**

**no framing**

### PA-T3

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

**no framing**

| Syntax Description | <b>bypass</b> | Specifies bypass E3 framing.                                                                    |
|--------------------|---------------|-------------------------------------------------------------------------------------------------|
|                    | <b>g751</b>   | Specifies G.751 E3 framing. This is the default for the PA-E3.                                  |
|                    | <b>c-bit</b>  | Specifies that C-bit framing is used as the T3 framing type. This is the default for the PA-T3. |
|                    | <b>m13</b>    | Specifies m13 T3 framing.                                                                       |
|                    |               |                                                                                                 |

### Defaults

G.751 framing for PA-E3

C-bit framing for PA-T3

### Command Modes

Interface configuration

### Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

### Usage Guidelines

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



#### Note

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

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

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

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

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

---

### Examples

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

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

---

### Related Commands

| Command                                 | Description                                                      |
|-----------------------------------------|------------------------------------------------------------------|
| <a href="#">show controllers serial</a> | Displays information that is specific to the interface hardware. |



# framing (T3 controller)

To specify T3 line framing used by the CT3 feature board in a Cisco AS5800 universal access server, or by the CT3IP port adapter in Cisco 7500 series routers, use the **framing** command in controller configuration mode. To restore the default framing type, use the **no** form of this command.

## Cisco AS5800 Universal Access Server

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

**no framing**

## Cisco 7500 Series Routers

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

**no framing**

| Syntax Description | <b>c-bit</b>       | Specifies that C-bit framing is used as the T3 framing type. This is the default for the CT3 in a Cisco AS5800.                                            |
|--------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>m23</b>         | Specifies that M23 framing is used as the T3 framing type.                                                                                                 |
|                    | <b>auto-detect</b> | Specifies that the CT3IP detects the framing type it receives from the far-end equipment. This is the default for the CT3IP in a Cisco 7500 series router. |
|                    |                    |                                                                                                                                                            |

## Defaults

**c-bit** for CT3 in a Cisco AS5800

**auto-detect** for CT3IP in a Cisco 7500 series router

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

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

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

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

## Examples

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

## ■ framing (T3 controller)

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

---

**Related Commands**

| Command                    | Description                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">t1 framing</a> | Specifies the type of framing used by the T1 channels on the CT3IP in Cisco 7500 series routers. |

---

# full-duplex

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

**full-duplex**

**no full-duplex**

## Syntax Description

This command has no arguments or keywords.

## Defaults

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

## Command Modes

Interface configuration

## Command History

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

## Usage Guidelines

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

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

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

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

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

**Caution**

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

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

**Support for this Command**

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

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

**Use on FDDI**

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

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

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

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

**Examples**

The following example configures full-duplex mode on the Cisco 7000 series routers:

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

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

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

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

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

| Related Commands | Command                                | Description                                                                                                                                                                                               |
|------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">half-duplex</a>            | Specifies half-duplex mode on an SDLC interface or on the FDDI full-duplex, single-mode port adapter and FDDI full-duplex, multimode port adapter on the Cisco 7200 series and Cisco 7500 series routers. |
|                  | <a href="#">interface</a>              | Configures an interface type and enters interface configuration mode.                                                                                                                                     |
|                  | <a href="#">interface fastethernet</a> | Selects a particular Fast Ethernet interface for configuration.                                                                                                                                           |
|                  | <a href="#">interface serial</a>       | Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling).                                                                       |
|                  | <a href="#">show interfaces</a>        | Displays statistics for all interfaces configured on the router or access server.                                                                                                                         |
|                  | <a href="#">show interfaces fddi</a>   | Displays information about the FDDI interface.                                                                                                                                                            |

# half-duplex

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

**half-duplex**

**no half-duplex**

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

**Defaults** Disabled

**Command Modes** Interface configuration

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

## Usage Guidelines

### SDLC Interfaces

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



#### Note

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



#### Caution

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

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

### Enabling Full-Duplex Mode

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



#### Note

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

### Port Adapters

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

### Examples

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

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

### Related Commands

| Command                     | Description                                                                        |
|-----------------------------|------------------------------------------------------------------------------------|
| <a href="#">full-duplex</a> | Specifies full-duplex mode on full-duplex single-mode and multimode port adapters. |

# half-duplex controlled-carrier

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

**half-duplex controlled-carrier**

**no half-duplex controlled-carrier**

## Syntax Description

This command has no arguments or keywords.

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

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

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

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



**Related Commands**

| Command                           | Description                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------|
| <a href="#">half-duplex timer</a> | Tunes half-duplex timers.                                                                              |
| <a href="#">physical-layer</a>    | Specifies the mode of a slow-speed serial interface on a router as either synchronous or asynchronous. |

## half-duplex timer

To tune half-duplex timers, use the **half-duplex timer** command in interface configuration mode. To return to the default value for that parameter, use the **no** form of this command along with the appropriate keyword.

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

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

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

**Defaults**

The default **cts-delay** value is 0 ms.

The default **cts-drop-timeout** value is 250 ms.

The default **dcd-drop-delay** value is 100 ms.

The default **dcd-txstart-delay** value is 100 ms.

The default **rts-drop-delay** value is 3 ms.

The default **rts-timeout** value is 3 ms.

The default **transmit-delay** value is 0 ms.

**Command Modes**

Interface configuration

**Command History**

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

**Usage Guidelines****Tuning Half-Duplex Timers**

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

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

**Note**

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

**Value Ranges**

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

**Examples**

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

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

**Related Commands**

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

# hold-queue

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

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

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

## Syntax Description

|               |                                                                                                                |
|---------------|----------------------------------------------------------------------------------------------------------------|
| <i>length</i> | Integer that specifies the maximum number of packets in the queue. The range of allowed values is 0 to 65,535. |
| <b>in</b>     | Specifies the input queue. The default is 75 packets. For asynchronous interfaces, the default is 10 packets.  |
| <b>out</b>    | Specifies the output queue. The default is 40 packets. For asynchronous interfaces, the default is 10 packets. |

## Defaults

The default input hold-queue limit is 75 packets.

The default output hold-queue limit is 40 packets.

For asynchronous interfaces the default is 10 packets.

These limits prevent a malfunctioning interface from consuming an excessive amount of memory. There is no fixed upper limit to a queue size.

## Command Modes

Interface configuration

## Command History

| Release | Modification                                |
|---------|---------------------------------------------|
| 10.0    | This command was introduced.                |
| 11.1    | The <b>no hold-queue</b> command was added. |

## Usage Guidelines

### Back-to-Back Routing Updates

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

### Hold Queues and Priority Queueing

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

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

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

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

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

**Caution**

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

**Examples**

The following example sets a small input queue on a slow serial line:

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

**Related Commands**

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

# hssi external-loop-request

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

**hssi external-loop-request**

**no hssi external-loop-request**

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

**Defaults** Disabled

**Command Modes** Interface configuration

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

**Usage Guidelines** The HSA applique on the High Speed Serial Interface (HSSI) contains an LED that indicates the 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.



**Caution**

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.

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

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

# hssi internal-clock

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

**hssi internal-clock**

**no hssi internal-clock**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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



### Note

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

## Examples

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

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

# hub

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

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

## Syntax Description

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

## Defaults

No hub ports are configured.

## Command Modes

Global configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Usage Guidelines

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

## Examples

The following example enables port 1 on hub 0:

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

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

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

## Related Commands

| Command                        | Description                                                                |
|--------------------------------|----------------------------------------------------------------------------|
| <a href="#">shutdown (hub)</a> | Shuts down a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |



# ignore-dcd

To configure the serial interface to monitor the DSR signal instead of the Data Carrier Detect (DCD) signal as the line up/down indicator, use the **ignore-dcd** command in interface configuration mode. To restore the default, use the **no** form of this command.

**ignore-dcd**

**no ignore-dcd**

## Syntax Description

This command has no arguments or keywords.

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.0    | This command was introduced. |

## Usage Guidelines

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

### Serial Interfaces in DTE Mode

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.

### SDLC Multidrop Environments

In some configurations, such as an Synchronous Data Link Control (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.

## Examples

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

```
Router(config)# interface serial 0
Router(config-if)# ignore-dcd
```

# ignore-hw local-loopback

To disable the monitoring of the LL pin when in DCE mode, use the **ignore-hw local-loopback** command in interface configuration mode. To return to the default, use the **no** form of this command.

**ignore-hw local-loopback**

**no ignore-hw local-loopback**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |         |
|-----------------|---------|
| <b>Defaults</b> | Enabled |
|-----------------|---------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3           | This command was introduced. |

|                         |                                                                                                                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | Use this command if your system is experiencing spurious modem interrupts, which momentarily causes the interface to enter loopback mode. The end result of this behavior is the loss of SDLLC sessions. |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



**Note**

|                                                               |
|---------------------------------------------------------------|
| This command works only with the low-speed serial interfaces. |
|---------------------------------------------------------------|

|                 |                                                                                           |
|-----------------|-------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example shows how to disable the monitoring of the LL pin when in DCE mode: |
|-----------------|-------------------------------------------------------------------------------------------|

```
Router#configure terminal
Router(config)#interface serial 2
```

# interface

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

**interface** *type number [name-tag]*

## Cisco 7200 Series and Cisco 7500 Series with a Packet over SONET Interface Processor

**interface** *type slot/port*

## Cisco 7500 Series with Channelized T1 or E1

**interface serial** *slot/port:channel-group*

## Cisco 7500 Series with Ports on VIP Cards

**interface** *type slot/port-adapter/port* [**ethernet** | **serial**]

## Cisco 4000 Series with Channelized T1 or E1 and the Cisco MC3810

**interface serial** *number:channel-group*

To configure a subinterface, use this form of the **interface** global configuration command:

## Cisco 7200 Series

**interface** *type slot/port.subinterface-number* [**multipoint** | **point-to-point**]

## Cisco 7500 Series

**interface** *type slot/port-adapter.subinterface-number* [**multipoint** | **point-to-point**]

## Cisco 7500 Series with Ports on VIP Cards

**interface** *type slot/port-adapter/port.subinterface-number* [**multipoint** | **point-to-point**]

| Syntax Description |  |                                                                                                                                                                                                                                                                  |
|--------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>        |  | Type of interface to be configured. See <a href="#">Table 12</a> .                                                                                                                                                                                               |
| <i>number</i>      |  | Port, connector, or interface card number. On a Cisco 4000 series router, specifies the NPM 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 <b>show interfaces</b> command. |
| <i>name-tag</i>    |  | (Optional) Specifies the logic name to identify the server configuration so that multiple entries of server configuration can be entered.<br><br>This optional argument is for use with the RLM feature.                                                         |
| <i>slot</i>        |  | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                     |
| <i>port</i>        |  | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                     |

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>port-adapter</i>                       | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                                                                                                                           |
| <b>ethernet</b>                           | (Optional) Ethernet IEEE 802.3 interface.                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>serial</b>                             | (Optional) Serial interface.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <i>:channel-group</i>                     | Cisco 4000 series routers specify the T1 channel group number in the range of 0 to 23 defined with the <b>channel-group</b> controller configuration command. On a dual port card, it is possible to run channelized on one port and primary rate on the other port.<br><br>Cisco MC3810 specifies the T1/E1 channel group number in the range of 0 to 23 defined with the <b>channel-group</b> controller configuration command. |
| <i>.subinterface-number</i>               | Subinterface number in the range 1 to 4,294,967,293. The number that precedes the period (.) must match the number to which this subinterface belongs.                                                                                                                                                                                                                                                                            |
| <b>multipoint</b>   <b>point-to-point</b> | (Optional) Specifies a multipoint or point-to-point subinterface. There is no default.                                                                                                                                                                                                                                                                                                                                            |

**Defaults**

No interface types are configured.

**Command Modes**

Global configuration

**Note**

To use this command with the RLM feature, you must be in interface configuration mode.

**Command History**

| Release  | Modification                                                         |
|----------|----------------------------------------------------------------------|
| 10.0     | This command was introduced for the Cisco 7000 series routers.       |
| 11.0     | This command was introduced for the Cisco 4000 series routers.       |
| 12.0(3)T | The optional <i>name-tag</i> argument was added for the RLM feature. |

**Usage Guidelines**

Subinterfaces can be configured to support partially meshed Frame Relay networks. Refer to the “Configuring Serial Interfaces” chapter in the *Cisco IOS Interface 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.

**Table 12** *interface Type Keywords*

| Keyword      | Interface Type                               |
|--------------|----------------------------------------------|
| <b>async</b> | Port line used as an asynchronous interface. |
| <b>atm</b>   | ATM interface.                               |

**Table 12** *interface Type Keywords (continued)*

| Keyword             | Interface Type                                                                                                                                                                                                                                                                                                        |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>bri</b>          | ISDN 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.                                                                        |
| <b>dialer</b>       | Dialer interface.                                                                                                                                                                                                                                                                                                     |
| <b>ethernet</b>     | Ethernet IEEE 802.3 interface.                                                                                                                                                                                                                                                                                        |
| <b>fastethernet</b> | 100-Mbps Ethernet interface on the Cisco 4500, Cisco 4700, Cisco 7000, and Cisco 7500 series routers.                                                                                                                                                                                                                 |
| <b>fddi</b>         | FDDI.                                                                                                                                                                                                                                                                                                                 |
| <b>group-async</b>  | Master asynchronous interface.                                                                                                                                                                                                                                                                                        |
| <b>hssi</b>         | High-Speed Serial Interface (HSSI).                                                                                                                                                                                                                                                                                   |
| <b>lex</b>          | LAN Extender (LEX) interface.                                                                                                                                                                                                                                                                                         |
| <b>loopback</b>     | Software-only loopback interface that emulates an interface that is always up. It is a virtual interface supported on all platforms. The <i>interface-number</i> 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. |
| <b>null</b>         | Null interface.                                                                                                                                                                                                                                                                                                       |
| <b>port-channel</b> | Port channel interface                                                                                                                                                                                                                                                                                                |
| <b>pos</b>          | Packet OC-3 interface on the Packet over SONET Interface Processor.                                                                                                                                                                                                                                                   |
| <b>serial</b>       | Serial interface.                                                                                                                                                                                                                                                                                                     |
| <b>switch</b>       | Switch interface                                                                                                                                                                                                                                                                                                      |
| <b>tokenring</b>    | Token Ring interface.                                                                                                                                                                                                                                                                                                 |
| <b>tunnel</b>       | Tunnel interface; a virtual interface. The <i>number</i> 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.                                                                                                             |
| <b>vg-anylan</b>    | 100VG-AnyLAN port adapter.                                                                                                                                                                                                                                                                                            |

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

## Examples

The following example configures serial interface 0 with PPP encapsulation:

```
Router(config)# interface serial 0
Router(config-if)# 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:

```
Router(config)# interface loopback 0
Router(config-if)# ip address 131.108.1.1 255.255.255.0
```

The following example for the Cisco 7500 series router shows the interface configuration command for Ethernet port 4 on the Ethernet Interface Processor (EIP) that is installed in (or recently removed from) slot 2:

```
Router(config)# interface ethernet 2/4
```

The following example begins configuration on the Token Ring interface processor in slot 1 on port 0 of a Cisco 7500 series routers:

```
Router(config)# 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 permanent virtual connections (PVCs) associated, and subinterface serial 0.2 is configured as a point-to-point subinterface.

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

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

```
Router(config)# controller t1 4/1
Router(config-controller)# circuit 0 1
Router(config)# interface serial 4/1:0
Router(config-if)# ip address 131.108.13.1 255.255.255.0
Router(config-if)# encapsulation ppp
```

The following example configures LAN Extender interface 0:

```
Router(config)# interface lex 0
```

## Related Commands

| Command                | Description                                                                |
|------------------------|----------------------------------------------------------------------------|
| <b>channel-group</b>   | Defines the time slots of each T1 or E1 circuit.                           |
| <b>clear interface</b> | Resets the hardware logic on an interface.                                 |
| <b>controller</b>      | Configures a T1 or E1 controller and enters controller configuration mode. |
| <b>mac-address</b>     | Sets the MAC layer address of the Cisco Token Ring.                        |
| <b>ppp</b>             | Starts an asynchronous connection using PPP.                               |
| <b>show interfaces</b> | Displays the statistical information specific to a serial interface.       |
| <b>shutdown (RLM)</b>  | Shuts down all of the links under the RLM group.                           |
| <b>slip</b>            | Starts a serial connection to a remote host using SLIP.                    |

# interface ctunnel

To create a virtual interface to transport IP over a Connectionless Network Service (CLNS) tunnel (CTunnel), use the **interface ctunnel** command in global configuration mode. To remove the virtual interface, use the **no** form of this command.

**interface ctunnel** *interface-number*

**no interface ctunnel** *interface-number*

## Syntax Description

|                         |                                                                   |
|-------------------------|-------------------------------------------------------------------|
| <i>interface-number</i> | CTunnel interface number (a number from 0 through 2,147,483,647). |
|-------------------------|-------------------------------------------------------------------|

## Defaults

No virtual interface is configured.

## Command Modes

Global configuration

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.1(5)T | This command was introduced. |

## Usage Guidelines

When configuring an IP over CLNS tunnel, you must first create a virtual interface. In the following example, the **interface ctunnel** command is used to create the virtual interface.

## Examples

The following example configures a CTunnel from one router to another and shows the CTunnel destination set to 49.0001.1111.1111.1111.00:

```
interface ctunnel 301
ip address 10.0.0.3 255.255.255.0
ctunnel destination 49.0001.1111.1111.1111.00
```

## Related Commands

| Command                    | Description                                                    |
|----------------------------|----------------------------------------------------------------|
| <b>clns routing</b>        | Enables routing of CLNS packets.                               |
| <b>ctunnel destination</b> | Configures the destination parameter for a CLNS tunnel.        |
| <b>debug ctunnel</b>       | Displays debug messages for the IP over a CLNS Tunnel feature. |
| <b>ip address</b>          | Sets a primary or secondary IP address for an interface.       |
| <b>ip routing</b>          | Enables IP routing.                                            |

# interface fastethernet

To select a particular Fast Ethernet interface for configuration, use the **interface fastethernet** command in global configuration mode.

## Cisco 4500 and 4700 Series

**interface fastethernet** *number*

## Cisco 7200 Series

**interface fastethernet** *slot/port*

## Cisco 7500 Series

**interface fastethernet** *slot/port-adapter/port*

| Syntax Description  |  |                                                                                                                                                                                                                                                                          |
|---------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>       |  | Port, connector, or interface card number. On a Cisco 4500 or 4700 series routers, specifies the network interface module (NIM) or network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system. |
| <i>slot</i>         |  | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                             |
| <i>port</i>         |  | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                             |
| <i>port-adapter</i> |  | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                  |

**Defaults** No FastEthernet interface will be configured.

**Command Modes** Global configuration

| Command History | Release | Modification                                        |
|-----------------|---------|-----------------------------------------------------|
|                 | 11.2    | This command was introduced.                        |
|                 | 11.3    | The default encapsulation type was changed to ARPA. |

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

**Examples** The following example configures Fast Ethernet interface 0 for standard ARPA encapsulation (the default setting) on a Cisco 4500 or 4700 series router:

```
Router(config)# interface fastethernet 0
```



**Related Commands**

| Command                             | Description                                              |
|-------------------------------------|----------------------------------------------------------|
| <b>show interfaces fastethernet</b> | Displays information about the Fast Ethernet interfaces. |

# interface gigabitethernet

To configure a Gigabit Ethernet interface and enter interface configuration mode, use the **interface gigabitethernet slot/port** command in global configuration mode.

**interface gigabitethernet slot/port**

To configure a Gigabit Ethernet interface and enter interface configuration mode on a Cisco 7200 VXR router used as a router shelf in an AS5800 Universal Access Server, use the **interface gigabitethernet router-shelf/slot/port** command in global configuration mode.

**interface gigabitethernet router-shelf/slot/port**

|                           |                     |                                                         |
|---------------------------|---------------------|---------------------------------------------------------|
| <b>Syntax Description</b> | <i>router-shelf</i> | Router shelf in a Cisco AS5800 Universal Access Server. |
|                           | <i>slot</i>         | Slot number of the interface.                           |
|                           | <i>port</i>         | Port number on the interface.                           |

**Defaults** No Gigabit Ethernet interface is created.

**Command Modes** Global configuration

|                        |                |                                                                |
|------------------------|----------------|----------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                            |
|                        | 11.1 CC        | This command was introduced.                                   |
|                        | 12.1(3a)E      | Support for the Cisco 7200-I/O-GE+E controller was introduced. |
|                        | 12.1(5)T       | This command was integrated into Cisco IOS Release 12.1(5)T.   |

**Usage Guidelines** Many features are enabled on a per-interface basis. The **interface gigabitethernet** global configuration command modifies the operation of the Gigabit Ethernet interface on the Cisco 7200-I/O-GE+E.

**Examples** This example illustrates the command syntax for creating a Gigabit Ethernet interface:

```
Router(config)# interface gigabitethernet 0/0
Router(config-if)#
```

|                         |                                                 |                                                                                                            |
|-------------------------|-------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                                  | <b>Description</b>                                                                                         |
|                         | <a href="#">show interfaces gigabitethernet</a> | Checks the status and configuration settings of the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E. |

# interface group-async

To create a group interface that will serve as master to which asynchronous interfaces can be associated as members, use the **interface group-async** command in global configuration mode. To restore the default, use the **no** form of this command.

**interface group-async** *unit-number*

**no interface group-async** *unit-number*

## Syntax Description

|                    |                                                           |
|--------------------|-----------------------------------------------------------|
| <i>unit-number</i> | Number of the asynchronous group interface being created. |
|--------------------|-----------------------------------------------------------|

## Defaults

No interfaces are designated as group masters.

## Command Modes

Global configuration

## Usage Guidelines

Using the **interface group-async** command, you create a single asynchronous interface to which other interfaces are associated as members using the **group-range** command. This one-to-many configuration allows you to configure all associated member interfaces by entering one command on the group master interface, rather than entering this command on each individual interface. You can create multiple group masters on a device; however, each member interface can be associated only with one group.

## Examples

The following example defines asynchronous group master interface 0:

```
Router(config)# interface group-async 0
```

## Related Commands

| Command            | Description                                                                           |
|--------------------|---------------------------------------------------------------------------------------|
| <b>group-range</b> | Creates a list of member asynchronous interfaces (associated with a group interface). |
| <b>member</b>      | Alters the configuration of an asynchronous interface that is a member of a group.    |

# interface multilink

To create a multilink bundle or enter multilink interface configuration mode, use the **interface multilink** command in global configuration mode. To remove a multilink bundle, use the **no** form of this command.

**interface multilink** *group-name*

**no interface multilink**

| Syntax Description | <i>group-number</i> | Number of the multilink bundle (a nonzero number). |
|--------------------|---------------------|----------------------------------------------------|
|--------------------|---------------------|----------------------------------------------------|

| Defaults | No interfaces are configured. |
|----------|-------------------------------|
|----------|-------------------------------|

| Command Modes | Global configuration |
|---------------|----------------------|
|---------------|----------------------|

| Command History | Release  | Modification                 |
|-----------------|----------|------------------------------|
|                 | 12.0(3)T | This command was introduced. |

| Examples | The following example shows how to create multilink bundle 1: |
|----------|---------------------------------------------------------------|
|----------|---------------------------------------------------------------|

```
interface multilink 1
 ip address 192.168.11.4 255.255.255.192
 encapsulation ppp
 ppp multilink
 keepalive
```

| Related Commands | Command                            | Description                                                        |
|------------------|------------------------------------|--------------------------------------------------------------------|
|                  | multilink-group                    | Designates an interface as part of a multilink leased line bundle. |
|                  | <b>ppp multilink fragmentation</b> | Enables PPP multilink fragmentation.                               |

# interface port-channel

To specify a Fast EtherChannel and enter interface configuration mode, use the **interface port-channel** command in global configuration mode.

**interface port-channel** *channel-number*

## Syntax Description

*channel-number* Channel number assigned to this port-channel interface. Range is 1 to 4.

## Defaults

No Fast EtherChannel is specified.

## Command Modes

Global configuration

## Command History

| Release  | Modification                               |
|----------|--------------------------------------------|
| 11.1 CA  | This command was introduced.               |
| 12.1(5)T | This command was integrated into 12.1(5)T. |

## Usage Guidelines

The Fast EtherChannel feature allows multiple Fast Ethernet point-to-point links to be bundled into one logical link to provide bidirectional bandwidth of up to 800 Mbps. Fast EtherChannel can be configured between networking devices that support EtherChannel capability.

You can configure the port-channel interface as you would do to any Fast Ethernet interface.

After you create a port-channel interface, you assign Fast Ethernet interfaces (up to four) to it. For information on how to assign a Fast Ethernet interface to a port-channel interface, refer to the **channel-group** interface configuration command.



### Caution

The port-channel interface is the routed interface. Do not enable Layer 3 addresses on the physical Fast Ethernet interfaces. Do not assign bridge groups on the physical Fast Ethernet interfaces because it creates loops. Also, you must disable spanning tree.



### Caution

With Release 11.1(20)CC, the Fast EtherChannel supports Cisco Express Forwarding (CEF) and Distributed Cisco Express Forwarding (dCEF). We recommend that you clear all explicit **ip route-cache distributed** commands from the Fast Ethernet interfaces before enabling dCEF on the port-channel interface. Clearing the route cache gives the port-channel interface proper control of its physical Fast Ethernet links. When you enable CEF/dCEF globally, all interfaces that support CEF/dCEF are enabled. When CEF/dCEF is enabled on the port-channel interface, it is automatically enabled on each of the Fast Ethernet interfaces in the channel group. However, if you have previously disabled CEF/dCEF on the Fast Ethernet interface, CEF/dCEF is not automatically enabled. In this case, you must enable CEF/dCEF on the Fast Ethernet interface.

As you work with the **interface port-channel** command, consider the following points:

- If you configure the Inter-Switch Link (ISL) protocol, you must assign the IP address to the subinterface (for example, **interface port-channel 1.1**—an IP address per VLAN) and you must specify the encapsulation with the VLAN number under that subinterface (for example, **encapsulation isl 100**) for ISL to work.
- Currently, if you want to use the Cisco Discovery Protocol (CDP), you must configure it only on the port-channel interface and not on the physical Fast Ethernet interface.
- If you do not assign a static MAC address on the port-channel interface, the Cisco IOS software automatically assigns a MAC address. If you assign a static MAC address and then later remove it, Cisco IOS software automatically assigns a MAC address.

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

## Examples

The following example creates a port-channel interface with a channel group number of 1 and adds three Fast Ethernet interfaces to port-channel 1:

```
Router(config)# interface port-channel 1
Router(config-if)# ip address 10.1.1.10 255.255.255.0
Router(config)# interface fastethernet 1/0/0
Router(config-if)# channel-group 1
Router(config)# interface fastethernet 4/0/0
Router(config-if)# channel-group 1
Router(config)# interface fastethernet 5/0/0
Router(config-if)# channel-group 1
```

## Related Commands

| Command                             | Description                                                                                                                                     |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>channel-group</b>                | Defines the timeslots that belong to each T1 or E1 circuit.                                                                                     |
| <b>show interfaces port-channel</b> | Displays the information about the Fast EtherChannel on Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI. |

# interface pos

To specify the Packet OC-3 interface on the Packet-over-SONET (POS) interface processor and enter interface configuration mode, use the **interface pos** command in global configuration mode.

## Cisco 7000 and Cisco 7500 Series Routers with VIPs

```
interface pos slot/port-adapter/port
```

## Cisco 7200 Series Routers

```
interface pos slot/port
```

|                    |                     |                                                                                                             |
|--------------------|---------------------|-------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>slot</i>         | Specifies the backplane slot number.                                                                        |
|                    | <i>port</i>         | On Cisco 7000 series and Cisco 7500 series routers, specifies the ports on a VIP card. The value must be 0. |
|                    | <i>port-adapter</i> | Port adapter number on the interface. The value must be 0.                                                  |

|          |                                |
|----------|--------------------------------|
| Defaults | No POS interface is specified. |
|----------|--------------------------------|

|               |                      |
|---------------|----------------------|
| Command Modes | Global configuration |
|---------------|----------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.2    | This command was introduced. |

|                  |                                              |
|------------------|----------------------------------------------|
| Usage Guidelines | This command does not have a <b>no</b> form. |
|------------------|----------------------------------------------|

|          |                                                                                                          |
|----------|----------------------------------------------------------------------------------------------------------|
| Examples | The following example specifies the single Packet OC-3 interface on the POS OC-3 port adapter in slot 2: |
|----------|----------------------------------------------------------------------------------------------------------|

```
Router(config)# interface pos 2/0
```

# interface range

To execute commands on multiple subinterfaces at the same time, use the **interface range** command in global configuration command mode.

```
interface range { fastethernet interfacenumber - interfacenumber | gigabitethernet
interfacenumber - interfacenumber | loopback number | tunnel number | port-channel number
| vlan number | macro word }
```

## Syntax Description

|                                          |                                                                                                                     |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>fastethernet</b>                      | Fastethernet interface. Range is 1 to 6.                                                                            |
| <b>gigabitethernet</b>                   | Gigabitethernet interface. Range is 1 to 6.                                                                         |
| <b>loopback</b>                          | Loopback interface. Range is 0 to 2147483647.                                                                       |
| <b>tunnel</b>                            | Tunnel interface. Range is 0 to 2147483647.                                                                         |
| <b>port-channel</b>                      | Port-channel interface. Range is 1 to 256.                                                                          |
| <b>vlan</b>                              | Catalyst virtual LAN (VLAN). Range is 1 to 4094.                                                                    |
| <b>macro</b>                             | Specifies a macro keyword.                                                                                          |
| <i>interfacenumber - interfacenumber</i> | Lowest to highest numbers in the range. A hyphen must separate the lowest and highest numbers. For example, 1 - 34. |
| <i>number</i>                            | Interface number. Loopback, port-channel, tunnel, and vlan are each assigned a single interface number such as “5.” |
| <i>word</i>                              | Previously defined keyword, up to 32 characters long.                                                               |

## Defaults

No default behavior or values

## Command Modes

Global configuration

## Command History

| Release          | Modification                                                          |
|------------------|-----------------------------------------------------------------------|
| 12.0(7)XE        | This command was introduced.                                          |
| 12.1(5)T         | This command was integrated into Cisco IOS Release 12.1(5)T.          |
| 12.2(2)DD        | This command was expanded to support subinterface ranges.             |
| 12.2(4)B         | This command was integrated into Cisco IOS Release 12.2(4)B.          |
| 12.2(8)T         | This modified command was integrated into Cisco IOS Release 12.2(8)T. |
| 12.2(18.10.02)SX | This command was integrated into Cisco IOS Release 12.2(18.10.02)SX   |

## Usage Guidelines

### Configuration Changes

All configuration changes made to a range of subinterfaces are saved to NVRAM, but the range itself does not get saved to NVRAM. Use the **define interface-range** command to create and save a range.

You can enter the range in two ways:

- Specifying up to five interface ranges



- Specifying a previously defined macro

You can specify either the interfaces or the name of a range macro. A range must consist of the same interface type, and the interfaces within a range cannot span slots.

You cannot specify both an interface range and a macro keyword in the same command. After creating a macro, the CLI does not allow you to enter additional ranges. Likewise, if you have already entered an interface range, the CLI does not allow you to enter a macro.

The spaces around the dash in the **interface range** command syntax are required. For example, using a Catalyst 6500 router, the command **interface range fastethernet 1 - 6** is valid; the command **interface range fastethernet 1-6** is not valid.

### VLAN Ranges

When you define a Catalyst Vlan, valid values are from 1 to 4094. The last VLAN number cannot exceed 4094.

You cannot use the **interface range** command to create switch virtual interfaces (SVIs). You must create SVIs with individual **interface VLAN** commands. You can use the **interface range** command on existing VLAN SVIs. To display VLAN SVIs, enter the **show running-config** command. VLANs not displayed cannot be used in the **interface range** command.

The commands entered under the **interface range** command are applied to all existing VLAN SVIs.

### Examples

The following example shows how to use the **interface range** command to configure a fastethernet range:

```
Router(config)# interface range fastethernet5/1 - 4
Router(config-if-range)#
```

The following example shows how to set a vlan:

```
Cisco-65K(config)#interface range vlan 123
Cisco-65K(config-if-range)#
```

The following example configures the Fast Ethernet subinterfaces within the range from 5/1.1 to 5/1.4 and applies the following VLAN IDs to those subinterfaces:

```
Fast Ethernet5/1.1 = VLAN ID 301 (vlan-id)
Fast Ethernet5/1.2 = VLAN ID 302 (vlan-id = 301 + 2 - 1 = 302)
Fast Ethernet5/1.3 = VLAN ID 303 (vlan-id = 301 + 3 - 1 = 303)
Fast Ethernet5/1.4 = VLAN ID 304 (vlan-id = 301 + 4 - 1 = 304)
```

```
Router(config)# interface range fastethernet5/1 - 4
Router(config-if)# encapsulation dot1q 301
Router(config-if)# no shutdown
Router(config-if)#
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.1, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.2, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.3, changed state to up
*Oct 6 08:24:35: %LINK-3-UPDOWN: Interface FastEthernet5/1.4, changed state to up
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.1,
changed state to up
*Oct 6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.2,
changed state to up
```

```
*Oct  6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.3,
changed state to up
*Oct  6 08:24:36: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet5/1.4,
changed state to up
```

The following example shows how to execute a range macro:

```
Router(config)# interface range macro macro1
```

The following example shows how to set a gigabitethernet range:

```
Router(config)# interface range gigabitethernet1/1 - 6
Router(config-if-range)#
```

The following example shows how to use the loopback interface:

```
Router(config)# interface range loopback 34567
Router(config-if-range)#
```

The following example shows how to use the tunnel interface:

```
Router(config)# interface range tunnel 55555
Router(config-if-range)#
```

The following example shows how to use the port-channel interface:

```
Router(config)# interface range port-channel 343
Router(config-if-range)#
```

## Related Commands

| Command                       | Description                                                     |
|-------------------------------|-----------------------------------------------------------------|
| <b>define interface range</b> | Defines an interface range macro.                               |
| <b>encapsulation dot1q</b>    | Applies a unique VLAN ID to each subinterface within the range. |
| <b>interface vlan</b>         | Configures a VLAN interface.                                    |

# interface vg-anylan

To specify the interface on a 100VG-AnyLAN port adapter and enter interface configuration mode on Cisco 7200 series routers and Cisco 7500 series routers, use the **interface vg-anylan** command in global configuration mode.

## Cisco 7200 Series Routers

```
interface vg-anylan slot/port
```

## Cisco 7500 Series Routers with VIPs

```
interface vg-anylan slot/port-adapter/port
```

| Syntax Description | <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|--------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                    | <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |
|                    |                     |                                                                                                                                         |

|                 |                              |
|-----------------|------------------------------|
| <b>Defaults</b> | No interfaces are specified. |
|-----------------|------------------------------|

|                      |                      |
|----------------------|----------------------|
| <b>Command Modes</b> | Global configuration |
|----------------------|----------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.3    | This command was introduced. |

**Usage Guidelines**

The 100VG-AnyLAN port adapter provides a single interface port that is compatible with and specified by IEEE 802.12. The 100VG-AnyLAN port adapter provides 100 Mbps over Category 3 or Category 5 unshielded twisted-pair (UTP) cable with RJ-45 terminators, and supports IEEE 802.3 Ethernet packets. You configure the 100VG-AnyLAN port adapter as you would any Ethernet or Fast Ethernet interface. The 100VG-AnyLAN port adapter can be monitored with the IEEE 802.12 Interface MIB.

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

**Examples**

The following example specifies the 100VG-AnyLAN port adapter in the first port adapter in slot 1:

```
Router(config)# interface vg-anylan 1/0/0
```

**Related Commands**

| Command                          | Description                                                                                                              |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>framing</b>                   | Selects the frame type for the T1 or E1 data line.                                                                       |
| <b>show interfaces vg-anylan</b> | Displays the information about the 100VG-AnyLAN port adapter on Cisco 7200 series routers and Cisco 7500 series routers. |

# international bit

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

**international bit {0 | 1} {0 | 1}**

**no international bit**

## Syntax Description

|              |                                                                                           |
|--------------|-------------------------------------------------------------------------------------------|
| <b>0   1</b> | Specifies the value of the first international bit in the G.751 frame. The default is 0.  |
| <b>0   1</b> | Specifies the value of the second international bit in the G.751 frame. The default is 0. |

## Defaults

The default value for each bit is 0.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

The **international bit** command sets bits 6 and 8, respectively, of set II in the E3 frame.

To verify the international bit configured on the interface, use the **show controllers serial EXEC** command.

## Examples

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

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

## Related Commands

| Command                        | Description                                                                 |
|--------------------------------|-----------------------------------------------------------------------------|
| <b>national bit</b>            | Sets the E3 national bit in the G.751 frame used by the PA-E3 port adapter. |
| <b>show controllers serial</b> | Displays information that is specific to the interface hardware.            |

# invert data

To invert the data stream, use the **invert data** command in interface configuration mode. This command applies only to the Cisco 7000 series routers with the RSP7000 and RSP7000CI, Cisco 7200 series routers, and Cisco 7500 series routers. To disable inverting the data stream, use the **no** form of this command.

**invert data**

**no invert data**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |                       |
|-----------------|-----------------------|
| <b>Defaults</b> | Data is not inverted. |
|-----------------|-----------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | Release            | Modification                 |
|------------------------|--------------------|------------------------------|
|                        | 11.1 CA and 11.2 P | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p><b>T1 Line Without B8ZS Encoding</b></p> <p>If the interface on the PA-8T and PA-4T+ synchronous serial port adapters and the PA-T3 and PA-2T3 synchronous serial port adapters is used to drive a dedicated T1 line that does not have B8ZS encoding (a method to avoid 15 zeros), the data stream must be inverted (both transmitting and receiving data) either in the connecting CSU/DSU or in the interface.</p> |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Inverting is a method of avoiding excessive zeroes that is superseded by the use of B8ZS encryption. This option could be needed for use with legacy equipment that supports this option. By inverting the High-Level Data Link Control (HDLC) data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements. Be careful not to invert data both on the interface and on the CSU/DSU because two data inversions will cancel each other out.

## AMI Line Coding

If the interface on the CT3IP uses alternate mark inversion (AMI) line coding, you must also invert the data on the T1 channel. For more information, see the **t1 linecode** controller configuration command.

|                 |                                                               |
|-----------------|---------------------------------------------------------------|
| <b>Examples</b> | The following example inverts data on serial interface 3/1/0: |
|-----------------|---------------------------------------------------------------|

```
Router(config)# interface serial 3/1/0
Router(config-if)# invert data
```

**Related Commands**

| Command            | Description                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------|
| <b>t1 linecode</b> | Specifies the type of linecoding used by the T1 channels on the CT3IP in Cisco 7500 series routers. |

# invert rxclock

To configure UIO serial port 0 or 1 on the Cisco MC3810 when the cable connected is DCE type, use the **invert rxclock** command in interface configuration mode. The command inverts the phase of the RX clock on the UIO serial interface, which does not use the T1/E1 interface. To disable the phase inversion, use the **no** form of this command.

**invert rxclock**

**no invert rxclock**

---

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

---

|                 |                                           |
|-----------------|-------------------------------------------|
| <b>Defaults</b> | The receive clock signal is not inverted. |
|-----------------|-------------------------------------------|

---

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

---

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.3 MA | This command was introduced. |

---

---

|                 |                                                                       |
|-----------------|-----------------------------------------------------------------------|
| <b>Examples</b> | The following example inverts the clock signal on serial interface 1: |
|-----------------|-----------------------------------------------------------------------|

```
Router(config)# interface serial 1  
Router(config-if)# invert rxclock
```



# invert-transmit-clock

The **invert-transmit-clock** command is replaced by the **invert txclock** command. See the description of the **invert-txclock** command in this chapter for information on the transmit clock signal.

# invert txclock

To invert the transmit (TX) clock signal, use the **invert txclock** command in interface configuration mode. To return the TX clock signal to its initial state, use the **no** form of this command.

**invert txclock**

**no invert txclock**

---

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

---

**Defaults** Transmit clock signal is not inverted.

---

**Command Modes** Interface configuration

---

| Command History | Release | Modification                                                                                |
|-----------------|---------|---------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                |
|                 | 11.3    | The <b>invert-transmit-clock</b> command was replaced by the <b>invert txclock</b> command. |
|                 |         |                                                                                             |

---



---

**Usage Guidelines** Delays between the serial clock transmit external (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 can have variances that differ slightly. The **invert txclock** command compensates for these variances. This command replaces the **invert-transmit-clock** command.

Systems that use long cables or cables that are not transmitting the TxC signal (transmit echoed clock line, also known as TXCE or SCTE clock) can experience high error rates when operating at the higher transmission speeds. For example, if a PA-8T synchronous serial port adapter is reporting a high number of error packets, a phase shift might be the problem. Inverting the clock might correct this shift.

When a PA-8T or PA-4T+ port adapter interface is DTE, the **invert txclock** command inverts the TxC signal it received from the remote DCE. When the PA-8T or PA-4T+ port adapter interface is DCE, this command changes the signal back to its original phase.

---

**Examples** The following example inverts the clock signal on serial interface 3/0:

```
Router(config)# interface serial 3/0
Router(config-if)# invert txclock
```

# ip director default-weights

To configure default weight metrics for the DistributedDirector, use the **ip director default-weights** command in global configuration mode. To restore the default, use the **no** form of this command.

**ip director default-weights** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

**no ip director default-weights** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

| Syntax Description      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>drp-int</b> <i>n</i> | <p>(Optional) Director Response Protocol (DRP) internal metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the distance from themselves to the edge of their Border Gateway Protocol (BGP) autonomous system in the direction of the client originating the Domain Name System (DNS) query. This distance can be used along with the DRP external metric (<b>drp-ext</b>) to help determine the distance between the router and the client originating the DNS query.</p> <p>If the client and the DRP server agent are in the same autonomous system, this metric returns the Interior Gateway Protocol (IGP) cost metric between the client and the DRP server agent.</p>                                                                                                                    |
| <b>drp-ext</b> <i>n</i> | <p>(Optional) DRP external metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the BGP distance between them and the client originating the DNS query. This distance represents the number of BGP hops between the autonomous system of the DRP server agent and the autonomous system of the client originating the DNS query. Because this is BGP information, the DRP server agents need to have access to full Internet BGP information in order for this metric to be useful.</p>                                                                                                                                                                                                                                                                                                          |
| <b>drp-ser</b> <i>n</i> | <p>(Optional) DRP server metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the IGP route metric between them and the distributed servers that they support. This distance can be used with the DRP internal metric (<b>drp-int</b>) to get a finer distance calculation between the distributed servers and the edge of the BGP autonomous system in the direction of the client originating the DistributedDirector query.</p> <p>If a true BGP border router is used as a DRP server agent, the DRP server metric will return the IGP route metric between the distributed server and the BGP border router (autonomous system edge). Because DRP server metrics should not change frequently, DistributedDirector issues DRP server queries (and caches the results) every 10 minutes.</p> |
| <b>drp-rtt</b> <i>n</i> | <p>(Optional) DRP round-trip time metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the round-trip time between the DRP agent and the client originating the DNS query.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>random</b> <i>n</i>       | (Optional) Random metric. The range is 1 to 100.<br><br>This option selects a random number for each distributed server and defines the “best” server as the one with the smallest random number assignment. Using this metric alone results in random redirection of clients to the distributed servers. Because this metric requires no routing table information, it does not trigger DRP requests to the DRP server agents. |
| <b>admin</b> <i>n</i>        | (Optional) Administrative metric. The range is 1 to 100.<br><br>This option specifies a simple preference of one server over another. If the administrative metric has been explicitly set to zero, the Director will not consider the server, so the server is taken out of service.                                                                                                                                           |
| <b>portion</b> <i>n</i>      | (Optional) Portion metric. The range is 1 to 100.<br><br>This option assigns a load “portion” to each server such that servers with a higher portion value will receive a larger percentage of connections at any one time.                                                                                                                                                                                                     |
| <b>availability</b> <i>n</i> | (Optional) Availability metric. The range is 1 to 65,535.<br><br>This option specifies the load information for the DistributedDirector. The default value is 65,535.                                                                                                                                                                                                                                                           |
| <b>route-map</b> <i>n</i>    | (Optional) Route-map metric. The range is 1 to 100.<br><br>This option specifies if a server should be offered to a client.                                                                                                                                                                                                                                                                                                     |

**Defaults**

The availability default value is 65,535.

**Command Modes**

Global configuration

**Command History**

| Release    | Modification                                       |
|------------|----------------------------------------------------|
| 11.1(18)IA | This command was introduced.                       |
| 12.1(5)T   | The availability and route-map metrics were added. |

**Usage Guidelines**

Not all of the metrics need to be configured; however, at least one metric must be configured when this command is used.

Default weights are used for all host names sorted by the DistributedDirector. To override default weights for a certain host, specify host-specific weights in the private DNS server configuration.

When the associated metric is referenced in the sorting decision, it will always be multiplied by the appropriate metric weight. In this way, you can specify that some metrics be weighted more than others. You may determine the weights that you want to use through experimentation. The weights given do not need to add up to 100.

The new availability metric allows the DistributedDirector to attempt to create a TCP connection to each distributed server on a configured port over a configurable time interval.

**Examples**

The following command configures default weights for the internal and external metrics:

```
ip director default-weights drp-int 10 drp-ext 90
```

**Related Commands**

| Command                                 | Description                                                                                                                            |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>debug ip director parse</b>          | Shows debugging information for DistributedDirector parsing of TXT information.                                                        |
| <b>debug ip director sort</b>           | Shows debugging information for DistributedDirector IP address sorting.                                                                |
| <b>ip director access-list</b>          | Defines an access list for the DistributedDirector that specifies which subdomain names and host names should be sorted.               |
| <b>ip director cache</b>                | Enables the sorting cache on the DistributedDirector.                                                                                  |
| <b>ip director host priority</b>        | Configures the order in which the DistributedDirector considers metrics when picking a server.                                         |
| <b>ip director host weights</b>         | Sets host-specific weights for the metrics that the DistributedDirector uses to determine the best server within a specific host name. |
| <b>ip director server admin-pref</b>    | Configures a per-service administrative preference value.                                                                              |
| <b>ip director server portion</b>       | Sets the portion value for a specific server.                                                                                          |
| <b>ip director server preference</b>    | Specifies DistributedDirector preference of one server over others or takes a server out of service.                                   |
| <b>show ip director default-weights</b> | Shows the DistributedDirector default weights.                                                                                         |
| <b>show ip director servers</b>         | Displays the DistributedDirector server preference information.                                                                        |

# ip director dfp

To configure the DistributedDirector Dynamic Feedback Protocol (DFP) agent with which the DistributedDirector should communicate, use the **ip director dfp** command in global configuration mode. To turn off the DFP agent, use the **no** form of this command.

**ip director dfp** *ip-address* [*port*] [**retry** *n*] [**attempts** *n*] [**timeout** *n*]

**no ip director dfp** *ip-address* [*port*] [**retry** *n*] [**attempts** *n*] [**timeout** *n*]

## Syntax Description

|                          |                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| <i>ip-address</i>        | IP address.                                                                                                                     |
| <i>port</i>              | (Optional) Port number to which the distributed servers are configured. The default value is 8080.                              |
| <b>retry</b> <i>n</i>    | (Optional) Number of times a connection will be attempted. The default value is 5 attempts.                                     |
| <b>attempts</b> <i>n</i> | (Optional) Delay, in seconds, between each attempt. The default value is 10,000 seconds.                                        |
| <b>timeout</b> <i>n</i>  | (Optional) Maximum amount of time, in seconds, for which DFP information is assumed valid. The default value is 10,000 seconds. |

## Syntax Description

The port default value is 8080.  
 The retry default value is 5 attempts.  
 The attempts default value is 10,000 seconds.  
 The timeout default value is 10,000 seconds.

## Command Modes

Global configuration

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.1(5)T | This command was introduced. |

## Usage Guidelines

A connection is attempted a specified number of times with a delay of a specified number of seconds between each attempt. Once a connection is established, the DFP protocol will run. If a time interval update has not occurred for this DFP session, the connection breaks and is reestablished as described above.

## Examples

The following example configures the DistributedDirector to communicate with a specified DFP agent:

```
ip director dfp 10.0.0.1 retry 3 attempts 60 timeout 6000
```

# ip director dfp security

To configure a security key for use when connecting to the Dynamic Feedback Protocol (DFP) client named, use the **ip director dfp security** command in global configuration mode. To turn off the security key, use the **no** form of this command.

**ip director dfp security** *ip-address* **md5** *string* [*timeout*]

**no ip director dfp security** *ip-address* **md5** *string* [*timeout*]

## Syntax Description

|                   |                                                                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>ip-address</i> | IP address for the service.                                                                                                                                        |
| <b>md5</b>        | Security data authentication. Message Digest 5.                                                                                                                    |
| <i>string</i>     | Security key.                                                                                                                                                      |
| <i>timeout</i>    | (Optional) Amount of time, in seconds, during which DistributedDirector will continue to accept a previously defined security key. The default value is 0 seconds. |

## Defaults

The timeout default value is 0 seconds.

## Command Modes

Global configuration

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.1(5)T | This command was introduced. |

## Usage Guidelines

The **ip director dfp security** command should be entered before configuring the **ip director dfp** command, resulting in a connection being made, but it can be entered independently of making a connection.

DFP allows servers to take themselves Out-of-Service and place themselves back In-Service. This function could result in a security risk because a network that is hacked could be shut down even though all the servers are still performing. An optional security vector is included in DFP to allow each message to be verified. The security vector is used to describe the security algorithm being used and to provide the data for that algorithm. The security vector itself is also extensible in that it specifies which security algorithm is being used. This specification allows different levels of security from MD5 to Data Encryption Standard (DES) to be used without overhauling the protocol and disrupting any installed base of equipment. If a receiving unit is configured for the specified security type, all DFP packets must contain that security vector or they are ignored. If a receiving unit is not configured for any security type, the security vector does not have to be present, and if it is present, it is ignored while the rest of the message is processed normally.

## Examples

The following example configures the security key hello:

```
ip director dfp security 10.0.0.1 md5 hello 60
```

Related Commands

| Command         | Purpose                                                                                             |
|-----------------|-----------------------------------------------------------------------------------------------------|
| ip director dfp | Configures the DistributedDirector DFP agent with which the DistributedDirector should communicate. |



# ip director host priority

To configure the order in which the DistributedDirector considers metrics when picking a server, use the **ip director host priority** command in global configuration mode. To turn off metric priorities, use the **no** form of this command.

**ip director host** *host-name* **priority** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

**no ip director host** *host-name* **priority** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

## Syntax Description

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>host-name</i>        | Name of the host that maps to one or more IP addresses. Do not use an IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>drp-int</b> <i>n</i> | <p>(Optional) Director Response Protocol (DRP) internal metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the distance from themselves to the edge of their Border Gateway Protocol (BGP) autonomous system in the direction of the client originating the Domain Name System (DNS) query. This distance can be used along with the DRP external metric (<b>drp-ext</b>) to help determine the distance between the router and the client originating the DNS query.</p> <p>If the client and the DRP server agent are in the same autonomous system, this metric returns the Interior Gateway Protocol (IGP) cost metric between the client and the DRP server agent.</p>                                                                                                                    |
| <b>drp-ext</b> <i>n</i> | <p>(Optional) DRP external metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the BGP distance between them and the client originating the DNS query. This distance represents the number of BGP hops between the autonomous system of the DRP server agent and the autonomous system of the client originating the DNS query. Because this is BGP information, the DRP server agents need to have access to full Internet BGP information in order for this metric to be useful.</p>                                                                                                                                                                                                                                                                                                          |
| <b>drp-ser</b> <i>n</i> | <p>(Optional) DRP server metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the IGP route metric between them and the distributed servers that they support. This distance can be used with the DRP internal metric (<b>drp-int</b>) to get a finer distance calculation between the distributed servers and the edge of the BGP autonomous system in the direction of the client originating the DistributedDirector query.</p> <p>If a true BGP border router is used as a DRP server agent, the DRP server metric will return the IGP route metric between the distributed server and the BGP border router (autonomous system edge). Because DRP server metrics should not change frequently, DistributedDirector issues DRP server queries (and caches the results) every 10 minutes.</p> |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>drp-rtt</b> <i>n</i>      | (Optional) DRP round-trip time metric. The range is 1 to 100.<br><br>This option sends a DRP request to all DRP server agents, asking them for the round-trip time between the DRP agent and the client originating the DNS query.                                                                                                                                                                                              |
| <b>random</b> <i>n</i>       | (Optional) Random metric. The range is 1 to 100.<br><br>This option selects a random number for each distributed server and defines the “best” server as the one with the smallest random number assignment. Using this metric alone results in random redirection of clients to the distributed servers. Because this metric requires no routing table information, it does not trigger DRP requests to the DRP server agents. |
| <b>admin</b> <i>n</i>        | (Optional) Administrative metric. The range is 1 to 100.<br><br>This option specifies a simple preference of one server over another. If the administrative metric has been explicitly set to zero, the Director will not consider the server, so the server is taken out of service.                                                                                                                                           |
| <b>portion</b> <i>n</i>      | (Optional) Portion metric. The range is 1 to 100.<br><br>This option assigns a load “portion” to each server such that servers with a higher portion value will receive a larger percentage of connections at any one time.                                                                                                                                                                                                     |
| <b>availability</b> <i>n</i> | (Optional) Availability metric. The range is 1 to 65,535.<br><br>This option specifies the load information for the DistributedDirector. The default value is 65,535.                                                                                                                                                                                                                                                           |
| <b>route-map</b> <i>n</i>    | (Optional) Route-map metric. The range is 1 to 100.<br><br>This option specifies if a server should be offered to a client.                                                                                                                                                                                                                                                                                                     |

**Defaults**

The availability default value is 65,535.

**Command Modes**

Global configuration

**Command History**

| Release    | Modification                                       |
|------------|----------------------------------------------------|
| 11.1(18)IA | This command was introduced.                       |
| 12.1(5)T   | The availability and route-map metrics were added. |

**Usage Guidelines**

Not all of the metrics need to be specified, but at least one must be specified.

The new availability metric allows the DistributedDirector to attempt to create a TCP connection to each distributed server on a configured port over a configurable time interval.

If multiple servers end up with the same metric value, the next metric is considered to determine the “best” server. If multiple metrics have the same priority value, the metrics are added to obtain a *composite metric*. For example, if two metrics have the same priority value, they are first multiplied by their weight values (if specified) and then added together to form the composite metric.

If you do not specify weights for a group of distributed servers, there are no default weights for the Director, and if you have specified priority values, the weight values are set to 1.

Any metrics that have a nonzero weight and that are assigned no priority value are set to a priority value of 101. They are considered after all other metrics that have priority values. As a result, if no priority values are specified for any metric, metrics are treated additively to form one composite metric.

If you do not use priority and multiple servers have the same metric value, the server whose last IP address was looked at will be returned as the “best” server. If you want to return a random IP address in the case of a tie, use metric priority with the **random** metric as the last criterion.

To turn off all priorities on all metrics associated with the defined host name, use the **no ip director host priority** command. You can turn off the priority for a specific metric or metrics using the **no ip director host *host-name* priority [drp-int *n*] [drp-ext *n*] [drp-ser *n*] [drp-rtt *n*] [random *n*] [admin *n*] [portion *n*] [availability *n*] [route-map *n*]** command.

### Examples

The following example sets the external metric as the first priority and the administrative metric as the second priority:

```
ip director host www.xyz.com priority drp-ext 1 admin 2
```

### Related Commands

| Command                         | Description                                                           |
|---------------------------------|-----------------------------------------------------------------------|
| <b>ip director host connect</b> | Enables the DistributedDirector to verify that a server is available. |
| <b>show ip director hosts</b>   | Displays the DistributedDirector host information.                    |

# ip director host weights

To set host-specific weights for the metrics that the DistributedDirector uses to determine the best server within a specific host name, use the **ip director host weights** command in global configuration mode. To turn off weights for a host, use the **no** form of this command.

**ip director host** *host-name* **weights** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

**no ip director host** *host-name* **weights** {[**drp-int** *n*] [**drp-ext** *n*] [**drp-ser** *n*] [**drp-rtt** *n*] [**random** *n*] [**admin** *n*] [**portion** *n*] [**availability** *n*] [**route-map** *n*]}

## Syntax Description

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>host-name</i>        | Name of the host that maps to one or more IP addresses. Do not use an IP address.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>drp-int</b> <i>n</i> | <p>(Optional) Director Response Protocol (DRP) internal metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the distance from themselves to the edge of their Border Gateway Protocol (BGP) autonomous system in the direction of the client originating the Domain Name System (DNS) query. This distance can be used along with the DRP external metric (<b>drp-ext</b>) to help determine the distance between the router and the client originating the DNS query.</p> <p>If the client and the DRP server agent are in the same autonomous system, this metric returns the Interior Gateway Protocol (IGP) cost metric between the client and the DRP server agent.</p>                                                                                                                    |
| <b>drp-ext</b> <i>n</i> | <p>(Optional) DRP external metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the BGP distance between them and the client originating the DNS query. This distance represents the number of BGP hops between the autonomous system of the DRP server agent and the autonomous system of the client originating the DNS query. Because this is BGP information, the DRP server agents need to have access to full Internet BGP information in order for this metric to be useful.</p>                                                                                                                                                                                                                                                                                                          |
| <b>drp-ser</b> <i>n</i> | <p>(Optional) DRP server metric. The range is 1 to 100.</p> <p>This option sends a DRP request to all DRP server agents, asking them for the IGP route metric between them and the distributed servers that they support. This distance can be used with the DRP internal metric (<b>drp-int</b>) to get a finer distance calculation between the distributed servers and the edge of the BGP autonomous system in the direction of the client originating the DistributedDirector query.</p> <p>If a true BGP border router is used as a DRP server agent, the DRP server metric will return the IGP route metric between the distributed server and the BGP border router (autonomous system edge). Because DRP server metrics should not change frequently, DistributedDirector issues DRP server queries (and caches the results) every 10 minutes.</p> |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>drp-rtt</b> <i>n</i>      | (Optional) DRP round-trip time metric. The range is 1 to 100.<br><br>This option sends a DRP request to all DRP server agents, asking them for the round-trip time between the DRP agent and the client originating the DNS query.                                                                                                                                                                                              |
| <b>random</b> <i>n</i>       | (Optional) Random metric. The range is 1 to 100.<br><br>This option selects a random number for each distributed server and defines the “best” server as the one with the smallest random number assignment. Using this metric alone results in random redirection of clients to the distributed servers. Because this metric requires no routing table information, it does not trigger DRP requests to the DRP server agents. |
| <b>admin</b> <i>n</i>        | (Optional) Administrative metric. The range is 1 to 100.<br><br>This option specifies a simple preference of one server over another. If the administrative metric has been explicitly set to zero, the Director will not consider the server, so the server is taken out of service.                                                                                                                                           |
| <b>portion</b> <i>n</i>      | (Optional) Portion metric. The range is 1 to 100.<br><br>This option assigns a load “portion” to each server such that servers with a higher portion value will receive a larger percentage of connections at any one time.                                                                                                                                                                                                     |
| <b>availability</b> <i>n</i> | (Optional) Availability metric. The range is 1 to 65,535.<br><br>This option specifies the load information for the DistributedDirector. The default value is 65,535.                                                                                                                                                                                                                                                           |
| <b>route-map</b> <i>n</i>    | (Optional) Route-map metric. The range is 1 to 100.<br><br>This option specifies if a server should be offered to a client.                                                                                                                                                                                                                                                                                                     |

**Note**

No host weights are set. If the **ip director default-weights** command is configured, the configured weights are the default.

**Defaults**

The availability default value is 65,535.

**Command Modes**

Global configuration

**Command History**

| Release    | Modification                                                 |
|------------|--------------------------------------------------------------|
| 11.1(25)IA | This command was introduced.                                 |
| 12.0(3)T   | This command was integrated into Cisco IOS Release 12.0(3)T. |
| 12.1(5)T   | The availability and route-map metrics were added.           |

**Usage Guidelines**

Use host-specific weights when you want to use different metric weights for different virtual host names (for example, www.xyz.com and ftp.xyz.com).

The new availability metric allows the DistributedDirector to attempt to create a TCP connection to each distributed server on a configured port over a configurable time interval.

If desired, host-specific weights can instead be configured on the DistributedDirector default DNS server.

For example, you could configure host-specific weights with the following DNS TXT record:

```
hostname in txt "ciscoDD: weights {[drp-int n] [drp-ext n] [drp-ser n] [random n]
[admin n]}"
```

To use the default weights for all metrics associated with this host name, use the **no ip director host weights** command. To use the default weights for a specific metric or metrics, use the **no ip director host *host-name* weights [drp-int *n*] [drp-ext *n*] [drp-ser *n*] [drp-rtt *n*] [random *n*] [admin *n*] [portion *n*] [availability *n*] [route-map *n*]** command.

Examples

The following example sets the DRP internal metric to 4:

```
ip director host www.xyz.com weights drp-int 4
```

Related Commands

| Command                                     | Description                                                                                                       |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <a href="#">ip director default-weights</a> | Configures default weight metrics for the DistributedDirector.                                                    |
| <a href="#">show ip director dfp</a>        | Displays information about the current status of the DistributedDirector connections with a particular DFP agent. |

# ip director server availability

To configure a default availability value for all ports on a server, use the **ip director server availability** command in global configuration mode. To restore the default, use the **no** form of this command.

**ip director server** *ip-address* **availability** {*availability-value* | **dfp** [*availability-value*]}

**no ip director server** *ip-address* **availability** {*availability-value* | **dfp** [*availability-value*]}

| Syntax Description | <i>ip-address</i>             | IP address.                                                                                                    |
|--------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------|
|                    | <i>availability-value</i>     | Availability value as it would be represented on the DistributedDirector system. The range is 0 to 65,535.     |
|                    | <b>dfp</b>                    | Availability value as it would be represented on the LocalDirector system. The range for value is 0 to 65,535. |
|                    | [ <i>availability-value</i> ] |                                                                                                                |

**Defaults** The availability default value is 65,535.

**Command Modes** Global configuration

| Command History | Release  | Modification                 |
|-----------------|----------|------------------------------|
|                 | 12.1(5)T | This command was introduced. |

**Usage Guidelines** There are two methods for specifying a default availability value. These two methods exist because the LocalDirector and the DistributedDirector deal with values in two different ways. All metrics for the DistributedDirector are arranged such that lower is better; however the LocalDirector load information is calculated such that higher is better. Thus, the DistributedDirector translates the metric value upon receipt from the LocalDirector by subtracting the availability from the maximum possible value of 65,535.

**Examples** To configure a default availability to be used if there is no other valid availability information, the following configuration would suffice. The following example shows how to specify the LocalDirector load and DistributedDirector availability, respectively:

```
ip director server 10.0.0.1 availability dfp 1
ip director server 10.0.0.1 availability 65534
```

To make the availability clear and to allow for specifying numbers in both schemes easily, there are two methods of specifying availability information. If the servers are running multiple serves, it may be necessary to configure the default availability value on a per-port basis by using the **ip director server port availability** command.

```
ip director server 10.0.0.1 port availability dfp 65535
ip director server 10.0.0.20 port availability dfp 65535
```

| Related Commands | Command                                              | Description                                                              |
|------------------|------------------------------------------------------|--------------------------------------------------------------------------|
|                  | <a href="#">ip director server port availability</a> | Configures a default availability value for a specific port on a server. |



# ip director server port availability

To configure a default availability value for a specific port on a server, use the **ip director server port availability** command in global configuration mode. To restore the default, use the **no** form of this command.

**ip director server** *ip-address* **port availability** { *availability-value* | **dfp** [*availability-value*] }

**no ip director server** *ip-address* **port availability** { *availability-value* | **dfp** [*availability-value*] }

## Syntax Description

|                                             |                                                                                                                |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <i>ip-address</i>                           | IP address.                                                                                                    |
| <i>availability-value</i>                   | Availability value as it would be represented on the DistributedDirector system. The range is 0 to 65,535.     |
| <b>dfp</b><br>[ <i>availability-value</i> ] | Availability value as it would be represented on the LocalDirector system. The range for value is 0 to 65,535. |

## Defaults

The availability default value is 65,535.

## Command Modes

Global configuration

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.1(5)T | This command was introduced. |

## Usage Guidelines

There are two methods for specifying a default availability value. These two methods exist because the LocalDirector and the DistributedDirector deal with values in two different ways. All metrics for the DistributedDirector are arranged such that lower is better; however the LocalDirector load information is calculated such that higher is better. Thus, the DistributedDirector translates the metric value upon receipt from the LocalDirector by subtracting the availability from the maximum possible value of 65,535.

## Examples

To make the availability clear and to allow for specifying numbers in both schemes easily, there are two methods of specifying availability information. If the servers are running multiple serves, it may be necessary to configure the default availability value on a per-port basis by using the **ip director server port availability** command.

```
ip director server 10.0.0.1 port availability dfp 65535
ip director server 10.0.0.20 port availability dfp 65535
```

To configure a default availability to be used if there is no other valid availability information, the following configuration would suffice. The following example shows how to specify the LocalDirector load and DistributedDirector availability, respectively:

```
ip director server 10.0.0.1 availability dfp 1
ip director server 10.0.0.1 availability 65534
```

| Related Commands | Command                                         | Description                                                        |
|------------------|-------------------------------------------------|--------------------------------------------------------------------|
|                  | <a href="#">ip director server availability</a> | Configures a default availability value for all ports on a server. |

# keepalive

To enable keepalive packets and to specify the number of times that the Cisco IOS software tries to send keepalive packets without a response before bringing down the interface, or before bringing the tunnel protocol down for a specific interface, use the **keepalive** command in interface configuration mode. When the keepalive feature is enabled, a keepalive packet is sent at the specified time interval to keep the interface active. To turn off keepalive packets entirely, use the **no** form of this command.

**keepalive** [*period* [*retries*]]

**no keepalive** [*period* [*retries*]]

## Syntax Description

|                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>period</i>  | (Optional) Integer value in seconds greater than 0. The default is 10 seconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <i>retries</i> | (Optional) Specifies the number of times that the device will continue to send keepalive packets without response before bringing the interface down. Integer value greater than 1 and less than 255. If omitted, the value that was previously set is used; if no value had been specified previously, the default of 5 is used.<br><br>If using this command with a tunnel interface, specifies the number of times that the device will continue to send keepalive packets without response before bringing the tunnel interface protocol down. |

## Defaults

*seconds*: 10 seconds

*retries*: 5

## Command Modes

Interface configuration

## Command History

| Release   | Modification                                                                   |
|-----------|--------------------------------------------------------------------------------|
| 10.0      | This command was introduced.                                                   |
| 12.2(8)T  | The <i>retries</i> argument was added and made available on tunnel interfaces. |
| 12.2(13)T | The default value for the <i>retries</i> argument was increased to 5.          |

## Usage Guidelines

### Keepalive Time Interval

You can configure the keepalive time interval, which is the frequency at which the Cisco IOS software sends messages to itself (Ethernet and Token Ring) or to the other end (serial and tunnel), to ensure that a network interface is alive. The interval is 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 unless the retry value is set higher.



### Note

Ethernet interface drivers on some access platforms use keepalive time as the interval to test for network connectivity. By default, Ethernet link failure detection occurs between 1 and 9 seconds. Keepalive packets are still transmitted on the interface during this time.

Setting the keepalive timer to a low value is very useful for rapidly detecting Ethernet interface failures (transceiver cable disconnecting, cable not terminated, and so on).

### Line Failure

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

### Keepalive Packets with Tunnel Interfaces

GRE keepalive packets may be sent from both sides of a tunnel, or from just one side. If they are sent from both sides, the period and retry parameters can be different at each side of the link. If you configure keepalives on only one side of the tunnel, the tunnel interface on the sending side might perceive the tunnel interface on the receiving side to be down because the sending interface is not receiving keepalives. From the receiving side of the tunnel, the link appears normal because no keepalives were enabled on the second side of the link.

### Dropped Packets

Keepalive packets are treated as ordinary packets, so it is possible that they will be dropped. To reduce the chance that dropped keepalive packets will cause the tunnel interface to be taken down, increase the number of retries.



#### 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 values to use for the timeout and the number of retry attempts.

### GRE Tunnels with IPsec

When using GRE with IPsec, the keepalives are encrypted like any other traffic. As with user data packets, if the IKE and IPsec security associations are not already active on the GRE tunnel, the first GRE keepalive packet will trigger IKE/IPsec initialization.

### Default Behaviors

If you enter only the **keepalive** command with no arguments, defaults for both arguments are used.

If you enter only the **keepalive** command and the timeout parameter, the default number of retries (3) is used.

If you enter the **no keepalive** command, keepalive packets are disabled on the interface.

### Examples

The following example sets the keepalive interval to 3 seconds:

```
Router(config)# interface ethernet 0
Router(config-if)# keepalive 3
```

The following example sets the keepalive interval to 3 seconds and the retry value to 7:

```
Router(config)# interface tunnel 1
Router(config-if)# keepalive 3 7
```

# lbo

To set a cable length longer than 655 feet for a DS-1 link, use the **lbo** command in interface configuration mode on the interface for a T1 link. To delete the **lbo long** value, use the **no** form of this command.

```
lbo {long {gain26 | gain36} {-15db | -22.5db | -7.5db | 0db} | short {133 | 266 | 399 | 533 | 655} }
no lbo
```

## Syntax Description

|                |                                                                                  |
|----------------|----------------------------------------------------------------------------------|
| <b>gain26</b>  | Specifies the decibel pulse gain at 26 decibels. This is the default pulse gain. |
| <b>gain36</b>  | Specifies the decibel pulse gain at 36 decibels.                                 |
| <b>-15db</b>   | Specifies the decibel pulse rate at –15 decibels.                                |
| <b>-22.5db</b> | Specifies the decibel pulse rate at –22.5 decibels.                              |
| <b>-7.5db</b>  | Specifies the decibel pulse rate at –7.5 decibels.                               |
| <b>0db</b>     | Specifies the decibel pulse rate at 0 decibels. This is the default.             |
| <b>133</b>     | Specifies a cable length from 0 to 133 feet.                                     |
| <b>266</b>     | Specifies a cable length from 133 to 266 feet.                                   |
| <b>399</b>     | Specifies a cable length from 266 to 399 feet.                                   |
| <b>533</b>     | Specifies a cable length from 399 to 533 feet.                                   |
| <b>655</b>     | Specifies a cable length from 533 to 655 feet.                                   |

## Defaults

**gain26** and **0db**

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                                    |
|------------|---------------------------------------------------------------------------------|
| 11.3 MA    | This command was introduced as a Cisco MC3810 controller configuration command. |
| 12.0(5)XE  | The command was introduced as an ATM interface command.                         |
| 12.0(7)XE1 | Support for Cisco 7100 series routers was added.                                |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T.                    |

## Usage Guidelines

This command is supported on T1 links only.

Each T1 port can operate in long-haul or short-haul mode. In long haul mode, the user must specify the gain and the line build out. In short-haul mode, the user must specify the cable length in feet.

The transmit attenuation value is best obtained by experimentation. If the signal received by the far-end equipment is too strong, reduce the transmit level by entering additional attenuation.

---

**Examples**

On Cisco 7100 or 7200 series routers, the following example specifies a pulse gain of 36 decibels and a decibel pulse rate of  $-7.5$  decibels:

```
interface atm 1/2
 lbo long gain36 -7.5db
```

# lex burned-in-address

To set the burned-in MAC address for a LAN Extender interface, use the **lex burned-in-address** command in interface configuration mode. 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 4-digit hexadecimal numbers.

## Defaults

No burned-in MAC address is set.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

```
Router(config)# interface serial 4
Router(config-if)# encapsulation ppp
Router(config)# interface lex 0
Router(config-if)# lex burned-in-address 0000.0c00.0001
Router(config-if) ip address 10.108.172.21 255.255.255.0
```

# lex input-address-list

To assign an access list that filters on MAC addresses, use the **lex input-address-list** command in interface configuration mode. 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

|                           |                                                                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <i>access-list-number</i> | Number of the access list assigned with the <b>access-list</b> global configuration command. It can be a number from 700 to 799. |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------|

## Defaults

No access lists are preassigned to a LAN Extender interface.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## 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 on the basis of 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 default differs from other access lists, which have an implicit deny everything entry at the end of each access list.

## Examples

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.

```
Router(config-if)# access-list 710 deny 0800.0214.2776
Router(config)# interface lex 0
Router(config-if)# lex input-address-list 710
```

## Related Commands

| Command            | Description                                                                                |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>access-list</b> | Configures the access list mechanism for filtering frames by protocol type or vendor code. |



# lex input-type-list

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

**lex input-type-list** *access-list-number*

**no lex input-type-list**

## Syntax Description

|                           |                                                                                                                              |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <i>access-list-number</i> | Number of the access list that you assigned with the <b>access-list</b> command. It can be a number in the range 200 to 299. |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------|

## Defaults

No access lists are preassigned to a LAN Extender interface.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## 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 default differs from other access lists, which have an implicit deny everything entry at the end of each access list.

## Examples

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.

```
Router(config-if)# access-list 220 deny 0x809B 0x0000
Router(config)# interface lex 0
Router(config-if)# lex input-type-list 220
```

## Related Commands

| Command            | Description                                                                                |
|--------------------|--------------------------------------------------------------------------------------------|
| <b>access-list</b> | Configures the access list mechanism for filtering frames by protocol type or vendor code. |

# lex priority-group

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

**lex priority-group** *group*

**no lex priority-group**

| Syntax Description | <i>group</i> | Number of the priority group. It can be a number in the range 1 to 10. |
|--------------------|--------------|------------------------------------------------------------------------|
|--------------------|--------------|------------------------------------------------------------------------|

| Defaults | Disabled |
|----------|----------|
|----------|----------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.3    | This command was introduced. |

| Usage Guidelines | To define queueing priorities, use the <b>priority-list protocol</b> 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 queueing.

| Examples | The following example activates priority output queueing on LAN Extender interface 0: |
|----------|---------------------------------------------------------------------------------------|
|----------|---------------------------------------------------------------------------------------|

```
Router(config-if)# priority-list 5 protocol bridge medium list 701
Router(config-if)# lex interface 0
Router(config-if)# lex priority-group 5
```

| Related Commands | Command                       | Description                                                 |
|------------------|-------------------------------|-------------------------------------------------------------|
|                  | <b>priority-list protocol</b> | Establishes queueing priorities based on the protocol type. |

# lex retry-count

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

**lex retry-count** *number*

**no lex retry-count** *number*

## Syntax Description

|               |                                                                                                                             |
|---------------|-----------------------------------------------------------------------------------------------------------------------------|
| <i>number</i> | 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. |
|---------------|-----------------------------------------------------------------------------------------------------------------------------|

## Defaults

10 retries

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

```
Router(config-if)# lex interface 0  
Router(config-if)# lex retry-count 20
```

## Related Commands

| Command            | Description                                                              |
|--------------------|--------------------------------------------------------------------------|
| <b>lex timeout</b> | Defines the amount of time to wait for a response from the LAN Extender. |

# lex timeout

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

**lex timeout** *milliseconds*

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

## Syntax Description

|                     |                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>milliseconds</i> | 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 60,000. The default is 2000 ms. |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

2000 ms (2 seconds)

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

```
Router(config-if)# lex interface 0
Router(config-if)# lex timeout 4000
```

## Related Commands

| Command                | Description                                                                 |
|------------------------|-----------------------------------------------------------------------------|
| <b>lex retry-count</b> | Defines the number of times to resend commands to the LAN Extender chassis. |

# linecode

To select the line-code type for T1 or E1 lines, use the **linecode** command in controller configuration mode.

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

## Syntax Description

|             |                                                                                                                                   |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>ami</b>  | Specifies alternate mark inversion (AMI) as the line-code type. Valid for T1 or E1 controllers. This is the default for T1 lines. |
| <b>b8zs</b> | Specifies B8ZS as the line-code type. Valid for T1 controller only.                                                               |
| <b>hdb3</b> | Specifies high-density bipolar 3 (hdb3) as the line-code type. Valid for E1 controller only. This is the default for E1 lines.    |

## Defaults

AMI is the default for T1 lines.  
High-density bipolar 3 is the default for E1 lines.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Usage Guidelines

Use this command in configurations in which the router or access server must communicate with T1 fractional data lines. 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.

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

## Examples

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

```
Router(config-controller)# linecode b8zs
```

# line-termination

To specify the line termination for the E1 port on a trunk card, use the **line-termination** command in controller configuration mode. To return to the default line termination, use the **no** form of this command.

**line-termination** { **75-ohm** | **120-ohm** }

**no line-termination**

| Syntax Description | 75-ohm  | Specifies 75-ohm unbalanced termination.                     |
|--------------------|---------|--------------------------------------------------------------|
|                    | 120-ohm | Specifies 120-ohm balanced termination. This is the default. |

| Defaults | 120-ohms |
|----------|----------|
|----------|----------|

| Command Modes | Controller configuration |
|---------------|--------------------------|
|---------------|--------------------------|

| Command History | Release   | Modification                 |
|-----------------|-----------|------------------------------|
|                 | 11.3(2)AA | This command was introduced. |

| Usage Guidelines | To determine the line termination setting for the port, use the <b>show controllers e1</b> command. |
|------------------|-----------------------------------------------------------------------------------------------------|
|------------------|-----------------------------------------------------------------------------------------------------|

| Examples | In the following example, the line termination is set to 75 ohms for the E1 port located in shelf 6, slot 0, port 0: |
|----------|----------------------------------------------------------------------------------------------------------------------|
|----------|----------------------------------------------------------------------------------------------------------------------|

```
Router# configure terminal
Router(config)# controller e1 6/0/0
Router(config-controller)# line-termination 75-ohm
Router(config-controller)# exit
Router(config)# exit
Router#
```

| Related Commands | Command                    | Description                                                                                           |
|------------------|----------------------------|-------------------------------------------------------------------------------------------------------|
|                  | <b>show controllers e1</b> | Displays information about the E1 links supported by the NPM (Cisco 4000) or MIP (Cisco 7500 series). |

# link-test

To reenable the link-test function on a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router, use the **link-test** command in hub configuration mode. Use the **no** form of this command to disable this feature if a pre-10BaseT twisted-pair device not implementing link test is connected to the hub port.

**link-test**

**no link-test**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled

## Command Modes

Hub configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## 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.

## Examples

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

```
Router(config)# hub ethernet 0 1 3  
Router(config-hub)# no link-test
```

## Related Commands

| Command    | Description                                                                            |
|------------|----------------------------------------------------------------------------------------|
| <b>hub</b> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |

# local-lnm

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

**local-lnm**

**no local-lnm**

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

**Defaults** Management is not enabled.

**Command Modes** Interface configuration

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

**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.

**Examples** The following example enables Lanoptics Hub Networking Management:

```
Router(config-if)# local-lnm
```



# logging event

To enable notification of interface, subinterface, and Frame Relay data link connection identifier (DLCI) data link status changes, use the **logging event** command in interface configuration mode. To disable notification, use the **no** form of this command.

**logging event** { **dlci-status-change** | **link-status** | **subif-link-status** }

**no logging event** { **dlci-status-change** | **link-status** | **subif-link-status** }

## Syntax Description

|                           |                                                                                                                                                               |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>dlci-status-change</b> | Enables notification of Frame Relay DLCI status changes.<br><b>Note</b> This option is supported only when the encapsulation on the interface is Frame Relay. |
| <b>link-status</b>        | Enables notification of interface data link status changes.                                                                                                   |
| <b>subif-link-status</b>  | Enables notification of subinterface data link status changes.                                                                                                |

## Defaults

For system images, notification of interface, subinterface, and Frame Relay DLCI data link status changes is enabled by default.

For boot images, notification of Frame Relay subinterface and DLCI data link status changes is disabled by default. Notification of interface data link status changes is enabled by default.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 12.0    | This command was introduced. |

## Examples

The following example shows how to enable notification of subinterface link status changes:

```
Router(config-if)# logging event subif-link-status
```

The following are examples of Frame Relay DLCI and subinterface status change notification messages filtered by the **logging event** command:

```
00:16:22: %FR-5-DLCICHANGE: Interface Serial3/0/0:1 - DLCI 105 state changed to INACTIVE
00:16:22: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0/0:1.5, changed state to down
```

# logging-events

to print typical T3 controller Up and Down messages on a Channelized T3 Port Adapter, use the **logging-events** command in T3 controller configuration mode. Use the **no** form of this command to disable printing of the T3 controller Up and Down messages.

**logging-events [detail]**

**[no] logging-events**

|                    |                                                                                                                   |
|--------------------|-------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>detail</b> (Optional) Enables printing the reason code when a T3 controller changes from the Up to Down state. |
|--------------------|-------------------------------------------------------------------------------------------------------------------|

|          |                                                   |
|----------|---------------------------------------------------|
| Defaults | The <b>logging-events</b> command is the default. |
|----------|---------------------------------------------------|

|               |                             |
|---------------|-----------------------------|
| Command Modes | T3 controller configuration |
|---------------|-----------------------------|

| Command History | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>12.2(19c)</td><td>This command was introduced.</td></tr></table> | Release | Modification | 12.2(19c) | This command was introduced. |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------|---------|--------------|-----------|------------------------------|
| Release         | Modification                                                                                                                  |         |              |           |                              |
| 12.2(19c)       | This command was introduced.                                                                                                  |         |              |           |                              |

|                  |                                                                                                                                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | When the <b>no logging-events</b> command disables printing of the T3 controller Up and Down messages, these messages will neither appear on the console nor in the logs. |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|          |                                                                                                                                                                                   |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Examples | The following example uses the <b>logging-events [detail]</b> command to show the Out-of-Frame (OOF) reason code when the T3 controller changes from an Up state to a Down state: |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

```
Router(config-controller)# logging-events detail

*Jun 19 17:47:50: %CONTROLLER-5-DOWNDetail: Controller T3 4/1, changed state to down due to OOF
```

| Related Commands                  | <table><tr><th>Command</th><th>Description</th></tr><tr><td><a href="#">t1 logging-events</a></td><td>Prints the typical T1 controller Up and Down messages on a channelized T3 port adapter.</td></tr></table> | Command | Description | <a href="#">t1 logging-events</a> | Prints the typical T1 controller Up and Down messages on a channelized T3 port adapter. |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------|-----------------------------------|-----------------------------------------------------------------------------------------|
| Command                           | Description                                                                                                                                                                                                     |         |             |                                   |                                                                                         |
| <a href="#">t1 logging-events</a> | Prints the typical T1 controller Up and Down messages on a channelized T3 port adapter.                                                                                                                         |         |             |                                   |                                                                                         |

# loopback (interface)

To diagnose equipment malfunctions between the interface and device, use the **loopback** command in interface configuration mode. To disable the test, use the **no** form of this command.

**loopback**

**no loopback**

---

**Syntax Description**

This command has no arguments or keywords.

---

**Defaults**

Disabled

---

**Command Modes**

Interface configuration

---

**Command History**

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

---

**Usage Guidelines****Loopback on HSSI Cards**

On High-Speed Serial Interface (HSSI) cards, the loopback function configures a two-way internal and external loop on the HSA applique of the specific interface.

**Loopback on MCI and SCI Serial Interface Cards**

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

**Loopback on MCI and MEC Ethernet Cards**

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.

**Loopback on CSC-FCI FDDI Cards**

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.

**Loopback on Token Ring Interface Cards**

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.

**Active Loopback Interfaces**

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

**Note**

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

**Examples**

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

```
Router(config)# interface ethernet 4  
Router(config-if)# loopback
```

**Related Commands**

| Command                         | Description                                                                        |
|---------------------------------|------------------------------------------------------------------------------------|
| <b>down-when-looped</b>         | Configures an interface to inform the system it is down when loopback is detected. |
| <b>show interfaces loopback</b> | Displays information about the loopback interface.                                 |

# loopback (E3/T3 interface)

To loop the serial interface on a PA-E3 or PA-T3 port adapter, use the **loopback** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

## PA-E3 Port Adapter

**loopback** { **dte** | **local** | **network** { **line** | **payload** } }

**no loopback**

## PA-T3 Port Adapter

**loopback** { **dte** | **local** | **network** { **line** | **payload** } | **remote** }

**no loopback**

| Syntax Description | <b>dte</b>                                      | Sets the loopback after the LIU toward the terminal.                                                                                       |
|--------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>local</b>                                    | Sets the loopback after going through the framer toward the terminal.                                                                      |
|                    | <b>network</b> { <b>line</b>   <b>payload</b> } | Sets the loopback toward the network before going through the framer ( <b>line</b> ) or after going through the framer ( <b>payload</b> ). |
|                    | <b>remote</b>                                   | Sends a far-end alarm control (FEAC) to set the remote framer in loopback.                                                                 |
|                    |                                                 |                                                                                                                                            |

| Defaults | Disabled |
|----------|----------|
|----------|----------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CA | This command was introduced. |

| Usage Guidelines | Use this command for troubleshooting purposes.                                                                                                   |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | To verify that a loopback is configured on the interface, use the <b>show interfaces serial</b> or <b>show interfaces loopback EXEC</b> command. |

| Examples | The following example configures the serial interface located in slot 3/0/0 for a local loopback: |
|----------|---------------------------------------------------------------------------------------------------|
|----------|---------------------------------------------------------------------------------------------------|

```
Router(config)# interface serial 3/0/0  
Router(config-if)# loopback local
```

**Related Commands**

| Command                         | Description                                                      |
|---------------------------------|------------------------------------------------------------------|
| <b>show controllers serial</b>  | Displays information that is specific to the interface hardware. |
| <b>show interfaces loopback</b> | Displays information about the loopback interface.               |
| <b>show interfaces serial</b>   | Displays information about a serial interface.                   |

# loopback (T1 interface)

To loop individual T1 channels on the CT3IP in Cisco 7000 series routers with the RSP7000 and RSP7000CI and in Cisco 7500 series routers, use the **loopback** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

```
loopback [local | network {line | payload} | remote {line {fdl {ansi | bellcore} | inband} |
payload {fdl} [ansi]}]
```

```
no loopback
```

| Syntax Description                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>local</b>                             | (Optional) Loops the router output data back toward the router at the T1 framer and sends an alarm indication signal (AIS) signal out toward the network.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>network {line   payload}</b>          | (Optional) Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the High-Level Data Link Control (HDLC) controllers (line), or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the HDLC controllers (payload).                                                                                                                                                                                                        |
| <b>remote line fdl {ansi   bellcore}</b> | (Optional) Sends a repeating, 16-bit Extended Superframe (ESF) data link code word (00001110 11111111 for FDL ANSI and 00010010 11111111 for FDL Bellcore) to the remote end requesting that it enter into a network line loopback. Specify the <b>ansi</b> keyword to enable the remote line Facility Data Link (FDL) ANSI bit loopback on the T1 channel, per the ANSI T1.403 Specification. Specify the <b>bellcore</b> keyword to enable the remote SmartJack loopback on the T1 channel, per the TR-TSY-000312 Specification. |
| <b>remote line inband</b>                | (Optional) Sends a repeating, 5-bit inband pattern (00001) to the remote end requesting that it enter into a network line loopback.                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>remote payload {fdl} [ansi]</b>       | (Optional) Sends a repeating, 16-bit ESF data link code word (00010100 11111111) to the remote end requesting that it enter into a network payload loopback. Enables the remote payload FDL ANSI bit loopback on the T1 channel.<br><br>You can optionally specify <b>fdl</b> and <b>ansi</b> , but it is not necessary.                                                                                                                                                                                                           |

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CA | This command was introduced. |

**Usage Guidelines**

Use this command for troubleshooting purposes.

To better diagnose T1 provisioning problems, you can place the remote CSU or remote SmartJack into loopback. The **loopback remote line fdl** interface configuration command allows you to place either the CSU or the SmartJack into loopback:

- **ansi**—Places the CSU into loopback, per the ANSI T1.403 Specification.
- **bellcore**—Places the SmartJack into loopback, per the TR-TSY-000312 Specification.

When both are configured, transmission of LOF indication (yellow alarm) takes priority over transmission of some FDL messages.

If the remote loopback appears not to be working, use the **show controllers t3** command to determine if the given T1 is currently attempting to transmit a LOF indication (yellow alarm):

```
Router# show controllers t3 0/0/0:2
T3 0/0/0 is up.
  CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
  Mx H/W version: 2, Mx ucode ver: 1.34

  T1 2 is down, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  Transmitter is sending LOF Indication.
  Receiver is getting AIS.
```

If the transmitter is sending a LOF indication, as in the previous example, stop the transmission of the LOF indication (yellow alarm) with the **no t1 yellow generation** configuration command as shown in the following example:

```
Router(config)# controllers t3 0/0/0
Router(config-controll)# no t1 2 yellow generation
Router(config-controll)# Ctrl-D
```

To verify that the transmission of the LOF indication (yellow alarm) has stopped, use the **show controllers t3** command:

```
Router# show controllers t3 0/0/0:2
T3 0/0/0 is up.
  CT3 H/W Version: 5, CT3 ROM Version: 1.2, CT3 F/W Version: 2.5.9
  Mx H/W version: 2, Mx ucode ver: 1.34
  T1 2 is down, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  Receiver is getting AIS.
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  Yellow Alarm Generation is disabled
```

Then retry the remote loopback command. When diagnosis is complete, remember to reenabling the LOF indication (yellow alarm).

You can also loopback all the T1 channels by using the **loopback (CT3IP)** interface configuration command.

**Examples**

The following example configures T1 channel 5 for a local loopback:

```
Router(config)# interface serial 3/0/0:5
Router(config-if)# loopback local
```



**Related Commands**

| Command                         | Description                                                                                                   |
|---------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>loopback (T3 controller)</b> | Loops the entire T3 (all 28 T1 channels) on the CT3IP in Cisco 7500 series routers.                           |
| <b>no t1 yellow generation</b>  | Enables detection and generation of yellow alarms for a T1 channel on the CT3IP in Cisco 7500 series routers. |

# loopback (T3 controller)

To loop the entire T3 (all 28 T1 channels) on the CT3 in a Cisco AS5800 universal access server or on the CT3IP in Cisco 7500 series routers, use the **loopback** command in controller configuration mode. To remove the loopback, use the **no** form of this command.

**loopback** [**local** | **network** | **remote**]

**no loopback**

|                           |                |                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>local</b>   | (Optional) Loops the data back toward the router and sends an alarm indication signal (AIS) signal out toward the network.                                                                                                                                                                                                                                                                      |
|                           | <b>network</b> | (Optional) Loops the data toward the network at the T1 framer.                                                                                                                                                                                                                                                                                                                                  |
|                           | <b>remote</b>  | (Optional) Sends a far-end alarm control (FEAC) request to the remote end requesting that it enter into a network line loopback. FEAC requests (and therefore remote loopbacks) are possible only when the T3 is configured for C-bit framing. The type of framing used is determined by the equipment you are connecting to (for more information, see the <b>framing</b> controller command). |

**Defaults** Disabled

**Command Modes** Controller configuration

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3           | This command was introduced. |

**Usage Guidelines** Use this command for troubleshooting purposes.

You can also loopback each T1 channel by using the **loopback** interface configuration command for T1.

For more information, refer to the “Troubleshoot the T3 and T1 Channels” section in the “Configuring Serial Interfaces” chapter of the *Cisco IOS Interface Configuration Guide*.

**Examples** The following example configures the CT3 or CT3IP for a local loopback:

```
Router(config)# controller t3 3/0/0
Router(config-controller)# loopback local
```

**Related Commands**

| Command                            | Description                                                                                                |
|------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>loopback remote (interface)</b> | Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back. |
| <b>framing</b>                     | Selects the frame type for the T1 or E1 data line.                                                         |
| <b>loopback</b>                    | Places the specified module in loopback mode.                                                              |

# loopback applique

To configure an internal loop on the High Speed Serial Interface (HSSI) applique, use the **loopback applique** command in interface configuration mode. To remove the loop, use the **no** form of this command.

**loopback applique**

**no loopback applique**

---

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

---

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

---

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

---

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|------------------------|----------------|------------------------------|
|                        | 10.0           | This command was introduced. |

---

---

|                         |                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>This command loops the packets within the applique to provide a way to test communication within the router or access server. It is useful for sending pings to yourself to check functionality of the applique.</p> <p>To show interfaces that are currently in loopback operation, use the <b>show interfaces loopback EXEC</b> command.</p> |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

---

|                 |                                                                                 |
|-----------------|---------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example configures the loopback test on the HSSI applique:</p> |
|-----------------|---------------------------------------------------------------------------------|

```
Router(config)# interface serial 1  
Router(config-if)# loopback applique
```

---

| <b>Related Commands</b> | <b>Command</b>                  | <b>Description</b>                                 |
|-------------------------|---------------------------------|----------------------------------------------------|
|                         | <b>show interfaces loopback</b> | Displays information about the loopback interface. |

---

# loopback dte

To loop packets back to the DTE from the CSU/DSU, when the device supports this feature, use the **loopback dte** command in interface configuration mode. To remove the loop, use the **no** form of this command.

**loopback dte**

**no loopback dte**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>This command is useful for testing the DTE-to-DCE cable.</p> <p>This command is used to test the performance of the integrated CSU/DSU. Packets are looped from within the CSU/DSU back to the serial interface of the router. Send a test ping to see if the packets successfully looped back. To cancel the loopback test, use the <b>no loopback dte</b> command.</p> <p>When using the 4-wire 56/64-kbps CSU/DSU module, an out-of-service signal is transmitted to the remote CSU/DSU.</p> <p>To show interfaces that are currently in loopback operation, use the <b>show interfaces loopback EXEC</b> command.</p> |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                          |
|-----------------|--------------------------------------------------------------------------|
| <b>Examples</b> | The following example configures the loopback test on the DTE interface: |
|-----------------|--------------------------------------------------------------------------|

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

| Related Commands | Command                         | Description                                        |
|------------------|---------------------------------|----------------------------------------------------|
|                  | <b>show interfaces loopback</b> | Displays information about the loopback interface. |

# loopback line

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

**loopback line** [payload]

**no loopback line** [payload]

|                           |                                                                                                                               |                              |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Syntax Description</b> | <b>payload</b> (Optional) Configures a loopback point at the DSU and loops data back to the network on an integrated CSU/DSU. |                              |
| <b>Defaults</b>           | Disabled                                                                                                                      |                              |
| <b>Command Modes</b>      | Interface configuration                                                                                                       |                              |
| <b>Command History</b>    | <b>Release</b>                                                                                                                | <b>Modification</b>          |
|                           | 10.0                                                                                                                          | This command was introduced. |

## Usage Guidelines

This command is useful for testing the DCE device (CSU/DSU) itself. When the **loopback line** command is configured on the 2-wire 56-kbps CSU/DSU module or the 4-wire 56/64-kbps CSU/DSU modules, the network data loops back at the CSU and the router data loops back at the DSU. If the CSU/DSU is configured for switched mode, you must have an established connection to perform a payload-line loopback. To loop the received data through the minimum amount of CSU/DSU circuitry, issue the **loopback line** command.

When you issue the **loopback line payload** command on an integrated CSU/DSU module, the router cannot transmit data through the serial interface for the duration of the loopback. Choosing the DSU as a loopback point loops the received-network data through the maximum amount of CSU/DSU circuitry. Data is not looped back to the serial interface. An active connection is required when operating in switched mode for payload loopbacks.

If you enable the **loopback line** command on the fractional T1/T1 module, the CSU/DSU performs a full-bandwidth loopback through the CSU portion of the module and data transmission through the serial interface is interrupted for the duration of the loopback. No reframing or corrections of bipolar violation errors or cyclic redundancy check (CRC) errors are performed. When you configure the **loopback line payload** command on the FT1/T1 module, the CSU/DSU performs a loopback through the DSU portion of the module. The **loopback line payload** command reframes the data link, regenerates the signal, and corrects bipolar violations and Extended Super Frame CRC errors.

When performing a T1-line loopback with Extended Super Frame, communication over the facilities data link is interrupted, but performance statistics are still updated. To show interfaces currently in loopback operation, use the **show service-module EXEC** command.

To show interfaces that are currently in loopback operation on other routers, use the **show interfaces loopback EXEC** command.

## Examples

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

```
Router(config)# interface serial 1
Router(config-if)# loopback line
```

The following example shows how to configure a payload loopback on a Cisco 2524 or 2525 router:

```
Router1(config-if)# loopback line payload
Loopback in progress
Router1(config-if)# no loopback line
```

The following example shows the output on a Cisco 2524 or 2525 router when you loop a packet in switched mode without an active connection:

```
Router1(config-if)# service-module 56k network-type switched
Router1(config-if)# loopback line payload
Need active connection for this type of loopback
% Service module configuration command failed: WRONG FORMAT.
```

## Related Commands

| Command                         | Description                                                |
|---------------------------------|------------------------------------------------------------|
| <b>show interfaces loopback</b> | Displays information about the loopback interface.         |
| <b>show service-module</b>      | Displays the performance report for an integrated CSU/DSU. |

# loopback remote (interface)

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

## FT1/T1 CSU/DSU Modules

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

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

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

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

**no loopback remote**

### Syntax Description

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



|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2047</b>                                    | (Optional) Transmits a pseudorandom test pattern that repeats after 2047 bits.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>511</b>                                     | (Optional) Transmits a pseudorandom test pattern that repeats after 511 bits.                                                                                                                                                                                                                                                                                                                                                                      |
| <b>stress-pattern</b><br><i>pattern-number</i> | (Optional) Transmits a DDS stress pattern available only on the 4-wire 56/64-kbps CSU/DSU module. You may enter a stress pattern from 1 to 4. A 1 pattern sends 100 bytes of all 1s and then 100 bytes of all 0s to test the stress clocking of the network. A 2 pattern sends 100 bytes of a 0x7e pattern and then 100 bytes of all 0s. A 3 pattern sends continuous bytes of a 0x46 pattern. A 4 pattern sends continuous bytes of 0x02 pattern. |

**Defaults**

Disabled

**Command Modes**

Interface configuration

**Command History**

| Release | Modification                 |
|---------|------------------------------|
| 11.0    | This command was introduced. |

**Usage Guidelines**

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

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

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

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

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

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

### Examples

The following example configures a remote loopback test:

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

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

```
Router(config)# interface serial 0
Router(config-if)# loopback remote full qrw
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0, changed state to down
%LINK-3-UPDOWN: Interface Serial0, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 0 - Remote unit placed in loopback
```

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

```
Router(config-if)# loopback remote stress-pattern 1
Router(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial1, changed state to down
%LINK-3-UPDOWN: Interface Serial1, changed state to down
%SERVICE_MODULE-5-LOOPUPREMOTE: Unit 1 - Remote unit placed in loopback
```

### Related Commands

| Command                                            | Description                                                                                                              |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <a href="#">clear service-module serial</a>        | Resets an integrated CSU/DSU.                                                                                            |
| <a href="#">loopback dte</a>                       | Loops packets back to the DTE device from the CSU/DSU.                                                                   |
| <a href="#">loopback line</a>                      | Loops packets completely through the CSU/DSU to configure the CSU loop.                                                  |
| <a href="#">service-module 56k remote-loopback</a> | Enables the acceptance of a remote loopback request on a serial interface on a 2- or 4-wire, 56/64-kbps CSU/DSU module.  |
| <a href="#">service-module t1 remote-loopback</a>  | Specifies whether the fractional T1/T1 CSU/DSU module enters loopback mode when it receives a loopback code on the line. |
| <a href="#">show interfaces loopback</a>           | Displays information about the loopback interface.                                                                       |
| <a href="#">show service-module serial</a>         | Displays the performance report for an integrated CSU/DSU.                                                               |

# mdl

To configure the Maintenance Data Link (MDL) message defined in the ANSI T1.107a-1990 specification for the CT3 in a Cisco AS5800 universal access server, or for the CT3IP in Cisco 7500 series routers, use the **mdl** command in interface configuration mode. To remove the message, use the **no** form of this command.

```
mdl { transmit { path | idle-signal | test-signal } | string { eic | lic | fic | unit | pfi | port | generator } string }
```

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

## Syntax Description

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

## Defaults

No MDL message is configured.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

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



### Note

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

Examples

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

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

Related Commands

| Command                             | Description                                                        |
|-------------------------------------|--------------------------------------------------------------------|
| <a href="#">show controllers t3</a> | Displays information about the CT3IP on Cisco 7500 series routers. |

# media-type

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

**media-type** { **au**i | **10baset** | **100baset** | **mii** }

**no media-type** { **au**i | **10baset** | **100baset** | **mii** }

## Syntax Description

|                 |                                                                                                                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>au</b> i     | Selects an AUI 15-pin physical connection. This is the default on Cisco 4000 series routers.                              |
| <b>10baset</b>  | Selects an R-J45 10BASE-T physical connection.                                                                            |
| <b>100baset</b> | Specifies an RJ-45 100BASE-T physical connection. This is the default on Cisco 7000 series and Cisco 7200 series routers. |
| <b>mii</b>      | Specifies a media-independent interface.                                                                                  |

## Defaults

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

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

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

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

The following example specifies a media-independent interface physical connection to Fast Ethernet slot 0, port adapter 1, port 1 on the Cisco 7500 series:

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

# media-type half-duplex

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

# modem dtr-delay

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

**modem dtr-delay** *seconds*

**no modem dtr-delay** *seconds*

## Syntax Description

|                |                                      |
|----------------|--------------------------------------|
| <i>seconds</i> | Number of seconds. The default is 5. |
|----------------|--------------------------------------|

## Defaults

The default DTR signal hold down time is 5 seconds.

## Command Modes

Line configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 12.1    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

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

## Related Commands

| Command           | Description                                                |
|-------------------|------------------------------------------------------------|
| <b>pulse-time</b> | Enables pulsing DTR signal intervals on serial interfaces. |



# mop enabled

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

**mop enabled**

**no mop enabled**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled on Ethernet interfaces and disabled on all other interfaces.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Examples

The following example enables MOP for serial interface 0:

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

## Related Commands

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

# mop sysid

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

**mop sysid**

**no mop sysid**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Enabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

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

## Related Commands

| Command                | Description                                                                            |
|------------------------|----------------------------------------------------------------------------------------|
| <b>mop device-code</b> | Identifies the type of device sending MOP sysid messages and request program messages. |
| <b>mop enabled</b>     | Enables an interface to support the MOP.                                               |

# mtu

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

**mtu** *bytes*

**no mtu**

## Syntax Description

*bytes* Desired size in bytes.

## Defaults

[Table 13](#) lists default MTU values according to media type.

**Table 13 Default Media MTU Values**

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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



### Caution

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

```
%RSP-3-Restart:cbus complex.
```

### Protocol-Specific Versions of mtu Command

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

### ATM and LANE Interfaces

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

### Examples

The following example specifies an MTU of 1000 bytes:

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

### Related Commands

| Command                            | Description                                           |
|------------------------------------|-------------------------------------------------------|
| <a href="#">encapsulation smds</a> | Enables SMDS service on the desired interface.        |
| <a href="#">ip mtu</a>             | Sets the MTU size of IP packets sent on an interface. |

# national bit

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

**national bit {0 | 1}**

**no national bit**

## Syntax Description

|              |                                                                     |
|--------------|---------------------------------------------------------------------|
| <b>0   1</b> | Specifies the E3 national bit in the G.751 frame. The default is 0. |
|--------------|---------------------------------------------------------------------|

## Defaults

0 national bit

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

| Command                                 | Description                                                                      |
|-----------------------------------------|----------------------------------------------------------------------------------|
| <a href="#">international bit</a>       | Sets the E3 international bit in the G.751 frame used by the PA-E3 port adapter. |
| <a href="#">show controllers serial</a> | Displays information that is specific to the interface hardware.                 |

# national reserve

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

**national reserve** <0-1><0-1><0-1><0-1><0-1><0-1>

**no national reserve**

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

**Defaults** 111111

**Command Modes** Interface configuration

| Command History | Release    | Modification                                                 |
|-----------------|------------|--------------------------------------------------------------|
|                 | 12.0(5)XE  | This command was introduced.                                 |
|                 | 12.0(7)XE1 | Support for Cisco 7100 series routers was added.             |
|                 | 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

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

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

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

# negotiation

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

**negotiation {forced | auto}**

**no negotiation auto**

## Syntax Description

|               |                                                                                                                                     |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>forced</b> | Disables flow control and configures the Gigabit Ethernet interface in 1000/full-duplex mode.                                       |
| <b>auto</b>   | Enables the autonegotiation protocol to configures the speed, duplex, and automatic flow-control of the Gigabit Ethernet interface. |

## Defaults

Negotiation auto

## Command Modes

Interface configuration

## Command History

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

## Usage Guidelines

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

## Examples

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

```
configure terminal
interface gigabitethernet 0/0
negotiation auto
```

**Related Commands**

| Command                                         | Description                                                                                                |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <a href="#">show interfaces gigabitethernet</a> | Checks the status and configuration settings of the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E. |



# nrzi-encoding

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

**nrzi-encoding [mark]**

**no nrzi-encoding**

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

| Defaults | Disabled |
|----------|----------|
|----------|----------|

| Command Modes | Interface configuration |
|---------------|-------------------------|
|---------------|-------------------------|

| Command History | Release | Modification                                                                                       |
|-----------------|---------|----------------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                       |
|                 | 11.3    | The <b>mark</b> keyword was added for the Cisco 7200 series routers and Cisco 7500 series routers. |

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

| Examples | The following example configures serial interface 1 for NRZI encoding: |
|----------|------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------|

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

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

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

# physical-layer

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

**physical-layer** {sync | async}

**no physical-layer**

## Syntax Description

|              |                                                                |
|--------------|----------------------------------------------------------------|
| <b>sync</b>  | Places the interface in synchronous mode. This is the default. |
| <b>async</b> | Places the interface in asynchronous mode.                     |

## Defaults

Synchronous mode

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

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

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

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

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

## Examples

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

```
Router(config)# interface serial 2
Router(config-if)# physical-layer async
```

**Related Commands**

| Command     | Description                |
|-------------|----------------------------|
| <b>more</b> | Displays a specified file. |

# port

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

- port**
- no port**

|                    |                                                                                                                                                                                                                                                    |                              |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| Syntax Description | This command has no arguments or keywords.                                                                                                                                                                                                         |                              |
| Defaults           | Station mode                                                                                                                                                                                                                                       |                              |
| Command Modes      | Interface configuration                                                                                                                                                                                                                            |                              |
| Command History    | Release                                                                                                                                                                                                                                            | Modification                 |
|                    | 11.3(3)T                                                                                                                                                                                                                                           | This command was introduced. |
| Usage Guidelines   | By default, the interfaces of the PA-4R-DTR operate as Token Ring stations. Station mode is the typical operating mode. Use this command to enable an interface to operate as a concentrator port.                                                 |                              |
| Examples           | The following example configures the PA-4R-DTR ports to operate in concentrator mode on a Cisco 7000 series router:<br><br>Router# <b>configure terminal</b><br>Router(config)# <b>interface tokenring 3/0/0</b><br>Router(config-if)# <b>port</b> |                              |

# pos ais-shut

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

## pos ais-shut

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no keywords or arguments. |
|---------------------------|--------------------------------------------|

|                 |                  |
|-----------------|------------------|
| <b>Defaults</b> | No LAIS is sent. |
|-----------------|------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.1 CC | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>In Automatic Protection Switching (APS) environments, LAIS can be used to force a protection switch. This command forces an APS switch when the interface is placed in administrative shut down state. For more information on APS, refer to the “Configuring Serial Interfaces” chapter in the <i>Cisco IOS Interface Configuration Guide</i>.</p> <p>This command does not have a <b>no</b> form.</p> |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                                                                                           |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example forces the alarm indication on POS OC-3 interface 0 in slot 3:</p> <pre>Router(config)# <b>interface pos 3/0</b> Router(config-if)# <b>shutdown</b> Router(config-if)# <b>pos ais-shut</b></pre> |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# pos flag

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

**pos flag** { **c2** | **j0** | **s1s0** } *value*

**no pos flag** { **c2** | **j0** | **s1s0** } *value*

## Syntax Description

|                          |                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>c2</b> <i>value</i>   | Path signal identifier used to identify the payload content type. The default value is 0xCF.                                                                                                                                                                                                                                                                                |
| <b>j0</b> <i>value</i>   | Section trace byte (formerly the C1 byte). For interoperability with Synchronous Digital Hierarchy (SDH) equipment in Japan, use the value 0x1. The byte value can be 0 to 255.                                                                                                                                                                                             |
| <b>s1s0</b> <i>value</i> | S1 and S0 bits (bits 5 and 6 of the H1 #1 payload pointer byte). Use the following values to tell the SONET transmission equipment the SS bit: <ul style="list-style-type: none"> <li>For OC-3c, use 0 (this is the default).</li> <li>For AU-4 container in SDH, use 2.</li> </ul> The S1 and S0 bits can be 0 to 3. Values 1 and 3 are undefined. The default value is 0. |

## Defaults

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                                                                          |
|---------|---------------------------------------------------------------------------------------|
| 11.2 GS | This command was introduced to support the Cisco 12000 series Gigabit Switch Routers. |

## Usage Guidelines

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

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

## Examples

The following example sets the path signal identifier used to identify the payload content type to ATM on the **pos** interface in slot 9:

```
Router(config)# interface pos 9/0  
Router(config-if)# pos flag c2 0x13  
Router(config-if)# end  
Router#
```

# pos framing

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

**pos framing {sdh | sonet}**

**no pos framing**

|                           |              |                                                                           |
|---------------------------|--------------|---------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>sdh</b>   | Selects SDH STM-1 framing. This framing mode is typically used in Europe. |
|                           | <b>sonet</b> | Selects SONET STS-3c framing. This is the default.                        |

|                 |                      |
|-----------------|----------------------|
| <b>Defaults</b> | SONET STS-3c framing |
|-----------------|----------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

|                        |                |                                                                                                                        |
|------------------------|----------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                                                                                    |
|                        | 11.2           | This command was introduced.                                                                                           |
|                        | 11.3           | This command was modified to change the <b>posi framing-sdh</b> command to <b>pos framing-sdh</b> .                    |
|                        | 11.2 GS        | The command syntax was changed from <b>pos framing-sdh</b> to <b>pos framing</b> . The <b>sonet</b> keyword was added. |

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

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

|                         |                                          |                                                                                                                |
|-------------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                           | <b>Description</b>                                                                                             |
|                         | <a href="#">clock source (interface)</a> | Controls the clock used by a G.703-E1 interface.                                                               |
|                         | <a href="#">interface</a>                | Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode. |
|                         | <b>pos internal-clock</b>                | The <b>clock source</b> interface command replaces this command.                                               |



## pos framing-sdh

The **pos framing-sdh** command is replaced by the **pos framing** command. See the description of the **pos framing** command in this chapter for more information.

## pos internal-clock

The **pos internal-clock** command is replaced by the [clock source \(interface\)](#) command. See the description of the **clock source** (interface) command in this chapter for information on transmit clock source.

# pos report

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

```
pos report {b1-tca | b2-tca | b3-tca | lais | lrdi | pais | plop | prdi | rdool | sd-ber | sf-ber | slof | slos}
```

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

## Syntax Description

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

## Defaults

The following alarms are reported by default:

- **b1-tca**
- **b2-tca**
- **b3-tca**
- **plop**
- **sf-ber**
- **slof**
- **slos**

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

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

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

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

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

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

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

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

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

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

## Examples

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

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

## Related Commands

| Command                     | Description                                                                                                    |
|-----------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>interface</b>            | Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode. |
| <b>show controllers pos</b> | Displays information about the POS controllers.                                                                |

# pos scramble-atm

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

**pos scramble-atm**

**no pos scramble-atm**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Scrambling is disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CA | This command was introduced. |

## Usage Guidelines

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

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

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



### Note

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

## Examples

The following example enables scrambling on the interface:

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

**Related Commands**

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

# pos threshold

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

**pos threshold** { **b1-tca** | **b2-tca** | **b3-tca** | **sd-ber** | **sf-ber** } *rate*

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

## Syntax Description

|               |                                                         |
|---------------|---------------------------------------------------------|
| <b>b1-tca</b> | B1 BER threshold crossing alarm. The default is 6.      |
| <b>b2-tca</b> | B2 BER threshold crossing alarm. The default is 6.      |
| <b>b3-tca</b> | B3 BER threshold crossing alarm. The default is 6.      |
| <b>sd-ber</b> | Signal degrade BER threshold. The default is 6.         |
| <b>sf-ber</b> | Signal failure BER threshold. The default is 3 (10e-3). |
| <i>rate</i>   | Bit-error rate from 3 to 9 (10-n).                      |

## Defaults

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

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

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

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

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

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

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

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

## Examples

The following example configures thresholds on the interface:

```
Router(config)# interface pos 3/0/0
Router(config-if)# pos threshold sd-ber 8
Router(config-if)# pos threshold sf-ber 4
Router(config-if)# pos threshold b1_tca 4
Router(config-if)# end
Router#
```

## Related Commands

| Command                              | Description                                                                                                    |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <a href="#">interface</a>            | Defines the IP addresses of the server, configures an interface type, and enters interface configuration mode. |
| <a href="#">pos report</a>           | Permits selected SONET alarms to be logged to the console for a POS interface.                                 |
| <a href="#">show controllers pos</a> | Displays information about the POS controllers.                                                                |



# posi framing-sdh

The **posi framing-sdh** command is replaced by the [pos framing](#) command. See the description of the **pos framing** command for more information.

# pri-group

To specify ISDN PRI on a channelized E1 or T1 card on a Cisco 7500 series router, use the **pri-group** command in controller configuration mode. To remove the ISDN PRI, use the **no** form of this command.

**pri-group** [*timeslots range*]

**no pri-group**

|                           |                                                                                                                                                                                                                                                                                              |                                                                                                                                     |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>timeslots</b> <i>range</i> (Optional) Specifies a single range of values from 1 to 23.                                                                                                                                                                                                    |                                                                                                                                     |
| <b>Defaults</b>           | Disabled                                                                                                                                                                                                                                                                                     |                                                                                                                                     |
| <b>Command Modes</b>      | Controller configuration                                                                                                                                                                                                                                                                     |                                                                                                                                     |
| <b>Command History</b>    | <b>Release</b>                                                                                                                                                                                                                                                                               | <b>Modification</b>                                                                                                                 |
|                           | 11.0                                                                                                                                                                                                                                                                                         | This command was introduced.                                                                                                        |
| <b>Usage Guidelines</b>   | When you configure ISDN PRI, you must first specify an ISDN switch type for PRI and an E1 or T1 controller.                                                                                                                                                                                  |                                                                                                                                     |
| <b>Examples</b>           | <p>The following example specifies ISDN PRI on T1 slot 1, port 0:</p> <pre>Router# isdn switch-type primary-4ess Router(config)# controllers t1 1/0 Router(config-controller)# framing esf Router(config-controller)# linecode b8zs Router(config-controller)# pri-group timeslots 2-6</pre> |                                                                                                                                     |
| <b>Related Commands</b>   | <b>Command</b>                                                                                                                                                                                                                                                                               | <b>Description</b>                                                                                                                  |
|                           | <b>controller</b>                                                                                                                                                                                                                                                                            | Configures a T1 or E1 controller and enters controller configuration mode.                                                          |
|                           | <b>interface serial</b>                                                                                                                                                                                                                                                                      | Specifies a serial interface created on a channelized E1 or channelized T1 controller (for ISDN PRI, CAS, or robbed-bit signaling). |
|                           | <b>isdn switch-type (PRI)</b>                                                                                                                                                                                                                                                                | Specifies the central office switch type on the ISDN PRI interface.                                                                 |

# pulse-time

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

**pulse-time** [**msec**] *seconds*

**no pulse-time**

|                    |                |                                                                                                                                                                             |
|--------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>msec</b>    | (Optional) Specifies the use of milliseconds for the DTR signal interval.                                                                                                   |
|                    | <i>seconds</i> | Integer that specifies the DTR signal interval in seconds. If the <b>msec</b> keyword is configured the DTR signal interval is specified in milliseconds. The default is 0. |

|          |           |
|----------|-----------|
| Defaults | 0 seconds |
|----------|-----------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

| Command History | Release  | Modification                                                                                     |
|-----------------|----------|--------------------------------------------------------------------------------------------------|
|                 | 10.0     | This command was introduced.                                                                     |
|                 | 12.1(5)T | The optional <b>msec</b> keyword was added to configure the DTR signal interval in milliseconds. |

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

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

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

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

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

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

# ring-speed

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

**ring-speed** *speed*

## Syntax Description

|              |                                                                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------|
| <i>speed</i> | Integer that specifies the ring speed, either 4 for 4-Mbps operation or 16 for 16-Mbps operation. The default is 16. |
|--------------|----------------------------------------------------------------------------------------------------------------------|

## Defaults

16-Mbps operation



## Caution

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

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

# scramble

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

**scramble**

**no scramble**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |                         |
|-----------------|-------------------------|
| <b>Defaults</b> | Scrambling is disabled. |
|-----------------|-------------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.1 CA        | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>E3/T3 scrambling is used to assist clock recovery on the receiving end.</p> <p>Scrambling can prevent some bit patterns from being mistakenly interpreted as alarms by switches placed between the DSUs.</p> <p>The local interface configuration must match the remote interface configuration. For example, if you enable scrambling on the local port, you must also do the same on the remote port.</p> <p>To verify that scrambling is configured on the interface, use the <b>show controllers serial EXEC</b> command.</p> |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example enables scrambling on the PA-E3 port adapter in slot 1, port adapter slot 0, interface 0:</p> |
|-----------------|------------------------------------------------------------------------------------------------------------------------|

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

|                         |                                         |                                                                  |
|-------------------------|-----------------------------------------|------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                          | <b>Description</b>                                               |
|                         | <a href="#">show controllers serial</a> | Displays information that is specific to the interface hardware. |

## sdlc cts-delay

The **sdlc cts-delay** command is replaced by the **half-duplex timer** command. See the description of the **half-duplex timer** command in this chapter for more information.

## sdlc hdx

The **sdlc hdx** command is replaced by the **half-duplex** command. See the description of the **half-duplex** command in this chapter for more information.

## sdlc rts-delay

The **sdlc rts-delay** command is replaced by the **half-duplex timer** command. See the description of the **half-duplex timer** command in this chapter for more information.



# serial restart-delay

To set the amount of time that the router waits before trying to bring up a serial interface when it goes down, use the **serial restart-delay** command in interface configuration mode. To restore the default, use the **no** form of the command.

**serial restart-delay** *count*

**no serial restart-delay**

## Syntax Description

|              |                                                                                       |
|--------------|---------------------------------------------------------------------------------------|
| <i>count</i> | Value from 0 to 900 in seconds. This is the frequency at which the hardware is reset. |
|--------------|---------------------------------------------------------------------------------------|

## Defaults

0 is the default value.

## Command Modes

Interface configuration

## Command History

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

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

| Command                       | Description                                                    |
|-------------------------------|----------------------------------------------------------------|
| <b>pulse-time</b>             | Enables pulsing DTR signal intervals on the serial interfaces. |
| <b>show interfaces serial</b> | Displays information about a serial interface.                 |

## service-module 56k clock rate

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

**service-module 56k clock rate** *speed*

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

### Syntax Description

|              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>speed</i> | Network line speed in kbps. The default speed is 56 kbps. Choose from one of the following optional speeds: <ul style="list-style-type: none"> <li><b>2.4</b>—2400 kbps</li> <li><b>4.8</b>—4800 kbps</li> <li><b>9.6</b>—9600 kbps</li> <li><b>19.2</b>—19200 kbps</li> <li><b>38.4</b>—38400 kbps</li> <li><b>56</b>—56000 kbps</li> <li><b>64</b>—64000 kbps</li> <li><b>auto</b>—Automatic line speed mode. Configure this option if your line speed is constantly changing.</li> </ul> |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Defaults

56 kbps

### Command Modes

Interface configuration

### Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

### Usage Guidelines

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

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

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

## Examples

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

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

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

a1# ping 10.1.1.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.1.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)

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

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

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

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

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

## Related Commands

| Command                                         | Description                                                                                                         |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <a href="#">service-module 56k clock source</a> | Sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module.                             |
| <a href="#">service-module 56k network-type</a> | Sends packets in switched dial-up mode or DDS mode using a serial interface on a 4-wire, 56/64-kbps CSU/DSU module. |

## service-module 56k clock source

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

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

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

### Syntax Description

|                 |                                                                                             |
|-----------------|---------------------------------------------------------------------------------------------|
| <b>line</b>     | Uses the clocking provided by the active line coming in to the router. This is the default. |
| <b>internal</b> | Uses the internal clocking provided by the hardware module.                                 |

### Defaults

Line clock

### Command Modes

Interface configuration

### Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1    | This command was introduced. |

### Usage Guidelines

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

### Examples

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

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

### Related Commands

| Command                                       | Description                                                                                      |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">clock source (interface)</a>      | Controls the clock used by a G.703-E1 interface.                                                 |
| <a href="#">service-module 56k clock rate</a> | Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module. |

## service-module 56k data-coding

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

**service-module 56k data-coding {normal | scrambled}**

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

### Syntax Description

|                  |                                                                                                                              |
|------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>normal</b>    | Specifies normal transmission of data. This is the default.                                                                  |
| <b>scrambled</b> | Scrambles bit codes or user data before transmission. All control codes such as out-of-service and out-of-frame are avoided. |

### Defaults

Normal data transmission

### Command Modes

Interface configuration

### Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

### Usage Guidelines

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

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

### Examples

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

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

### Related Commands

| Command                                       | Description                                                                                      |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------|
| <a href="#">service-module 56k clock rate</a> | Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module. |

# service-module 56k network-type

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

```
service-module 56k network-type {dds | switched}

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

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

|          |                                                                                       |
|----------|---------------------------------------------------------------------------------------|
| Defaults | DDS is enabled for the 4-wire CSU/DSU.<br>Switched is enabled for the 2-wire CSU/DSU. |
|----------|---------------------------------------------------------------------------------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 11.2    | This command was introduced. |

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | <p>In switched mode, you need additional dialer configuration commands to configure dial-out numbers. Before you enable the <b>service-module 56k network-type switched</b> command, both CSU/DSUs must use a clock source coming from the line and have the clock rate configured to <b>auto</b> or <b>56</b> kbps. If the clock rate is not set correctly, this command will not be accepted.</p> <p>The 2-wire and 4-wire, 56/64-kbps CSU/DSU modules use V.25 <i>bis</i> dial commands to interface with the router. Therefore, the interface must be configured using the <b>dialer in-band</b> command. Data terminal ready (DTR) dial is not supported.</p> |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

  
Note

Any loopbacks in progress are terminated when switching between modes.

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

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

**Related Commands**

| Command                                             | Description                                                                                      |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>dialer in-band</b>                               | Specifies that DDR is to be supported.                                                           |
| <a href="#">service-module 56k clock rate</a>       | Configures the network line speed for a serial interface on a 4-wire, 56/64-kbps CSU/DSU module. |
| <a href="#">service-module 56k clock source</a>     | Sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module.          |
| <a href="#">service-module 56k switched-carrier</a> | Selects a service provider to use with a 2- or 4-wire, 56/64-kbps dial-up serial line.           |

# service-module 56k remote-loopback

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

**service-module 56k remote-loopback**

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

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |         |
|-----------------|---------|
| <b>Defaults</b> | Enabled |
|-----------------|---------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.2           | This command was introduced. |

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

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| <b>Examples</b> | The following example enables transmitting and receiving remote loopbacks: |
|-----------------|----------------------------------------------------------------------------|

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

|                         |                                             |                                                                                                            |
|-------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                              | <b>Description</b>                                                                                         |
|                         | <a href="#">loopback remote (interface)</a> | Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back. |



# service-module 56k switched-carrier

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

**service-module 56k switched-carrier {att | sprint | other}**

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

## Syntax Description

|               |                                                                                                                                             |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>att</b>    | AT&T or other digital network service provider. This is the default on the 4-wire, 56/64-kbps CSU/DSU module.                               |
| <b>sprint</b> | Sprint or other service provider whose network requires echo cancelers. This is the default on the 2-wire, switched 56-kbps CSU/DSU module. |
| <b>other</b>  | Any other service provider.                                                                                                                 |

## Defaults

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

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

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

| Command                                         | Description                                                                                                         |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <a href="#">service-module 56k network-type</a> | Sends packets in switched dial-up mode or DDS mode using a serial interface on a 4-wire, 56/64-kbps CSU/DSU module. |

# service-module t1 clock source

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

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

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

## Syntax Description

|                 |                                                |
|-----------------|------------------------------------------------|
| <b>internal</b> | Specifies the CSU/DSU internal clock.          |
| <b>line</b>     | Specifies the line clock. This is the default. |

## Defaults

Line clock

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Examples

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

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

## Related Commands

| Command                                         | Description                                                                             |
|-------------------------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">service-module 56k clock source</a> | Sets up the clock source on a serial interface for a 4-wire, 56/64-kbps CSU/DSU module. |

# service-module t1 data-coding

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

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

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

## Syntax Description

|                 |                                                                                  |
|-----------------|----------------------------------------------------------------------------------|
| <b>inverted</b> | Inverts bit codes by changing all 1 bits to 0 bits and all 0 bits to 1 bits.     |
| <b>normal</b>   | Requests that no bit codes be inverted before transmission. This is the default. |

## Defaults

Normal transmission

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

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

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

## Related Commands

| Command                                     | Description                                                             |
|---------------------------------------------|-------------------------------------------------------------------------|
| <a href="#">service-module t1 linecode</a>  | Selects the linecode for the fractional T1/T1 module.                   |
| <a href="#">service-module t1 timeslots</a> | Defines time slots that constitute a fractional T1/T1 (FT1/T1) channel. |

# service-module t1 fdl

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

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

**no service-module t1 fdl**

## Syntax Description

|             |                                 |
|-------------|---------------------------------|
| <b>ansi</b> | Sets the FDL parameter to ANSI. |
| <b>att</b>  | Sets the FDL parameter to ATT.  |

## Defaults

Determined by the telephone company.

## Command Modes

Interface configuration mode

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2 P  | This command was introduced. |

## Usage Guidelines

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

# service-module t1 framing

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

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

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

## Syntax Description

|            |                                                                           |
|------------|---------------------------------------------------------------------------|
| <b>esf</b> | Specifies Extended Super Frame as the T1 frame type. This is the default. |
| <b>sf</b>  | Specifies D4 Super Frame as the T1 frame type.                            |

## Defaults

Extended Super Frame (ESF)

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

## Examples

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

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

# service-module t1 lbo

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

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

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

## Syntax Description

|                |                                                                |
|----------------|----------------------------------------------------------------|
| <b>-15 db</b>  | Decreases outgoing signal strength by 15 dB.                   |
| <b>-7.5 db</b> | Decreases outgoing signal strength by 7.5 dB.                  |
| <b>none</b>    | Transmits packets without decreasing outgoing signal strength. |

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

The following example sets the LBO to -7.5 dB:

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

# service-module t1 linecode

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

```
service-module t1 linecode {ami | b8zs}
```

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

## Syntax Description

|             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| <b>ami</b>  | Specifies alternate mark inversion (AMI) as the line code.                         |
| <b>b8zs</b> | Specifies binary 8 zero substitution (B8ZS) as the line code. This is the default. |

## Defaults

The default line code is B8ZS.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

## Examples

The following example specifies AMI as the line code:

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

## Related Commands

| Command                                       | Description                                                                               |
|-----------------------------------------------|-------------------------------------------------------------------------------------------|
| <a href="#">service-module t1 data-coding</a> | Guarantees the ones density requirement on an AMI line using the fractional T1/T1 module. |
| <a href="#">service-module t1 timeslots</a>   | Defines time slots that constitute a fractional T1/T1 (FT1/T1) channel.                   |

# service-module t1 remote-alarm-enable

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

**service-module t1 remote-alarm-enable**

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

## Syntax Description

This command has no arguments or keywords.

## Defaults

Remote alarms are disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

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

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

## Examples

The following example enables remote alarm generation and detection:

```
Router(config)# interface serial 0
Router(config-if)# service-module t1 remote-alarm-enable
```

## Related Commands

| Command                                   | Description                                                                   |
|-------------------------------------------|-------------------------------------------------------------------------------|
| <a href="#">service-module t1 framing</a> | Selects the frame type for a line using the fractional T1/T1 (FT1/T1) module. |



# service-module t1 remote-loopback

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

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

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

## Syntax Description

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



## Note

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

## Defaults

Full and payload loopbacks with standard-loopup codes

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

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

The **no** form of this command disables loopback requests. For example, the **no service-module t1 remote-loopback full** command ignores all full-bandwidth loopback transmissions and requests. Configuring the **no** form of this command may not prevent telco line providers from looping your router in esf mode, because fractional T1/T1 lines use facilities data link messages to initiate loopbacks.

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

## Examples

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

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

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

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

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

## Related Commands

| Command                                     | Description                                                                                                |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <a href="#">loopback remote (interface)</a> | Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back. |

# service-module t1 timeslots

To define time slots that constitute a fractional T1/T1 (FT1/T1) channel, use the **service-module t1 timeslots** command in interface configuration mode. To resume the default setting (all FT1/T1 time slots transmit at 64 kbps), use the **no** form of this command.

**service-module t1 timeslots** {*range* | **all**} [**speed** {**56** | **64**}]

**no service-module t1 timeslots** {*range* | **all**}

## Syntax Description

|              |                                                                                                                                                                                                                                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>range</i> | The DS0 time slots that constitute the FT1/T1 channel. The range is from 1 to 24, where the first time slot is numbered 1 and the last time slot is numbered 24. Specify this field by using a series of subranges separated by commas. |
| <b>all</b>   | Selects all FT1/T1 time slots.                                                                                                                                                                                                          |
| <b>speed</b> | (Optional) Specifies the time slot speed.                                                                                                                                                                                               |
| <b>56</b>    | (Optional) 56 kbps.                                                                                                                                                                                                                     |
| <b>64</b>    | (Optional) 64 kbps. This is the default.                                                                                                                                                                                                |

## Defaults

64 kbps is the default for all time slots.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

This command specifies which time slots are used in fractional T1 operation and determines the amount of bandwidth available to the router in each FT1/T1 channel.

The time-slot range must match the time slots assigned to the channel group. Your service provider defines the time slots that comprise a channel group.

To use the entire T1 line, enable the **service-module t1 timeslots all** command.

## Examples

The following example displays a series of time-slot ranges and a speed of 64 kbps:

```
Router(config-if)# service-module t1 timeslots 1-10,15-20,22 speed 64
```

## Related Commands

| Command                                       | Description                                                                               |
|-----------------------------------------------|-------------------------------------------------------------------------------------------|
| <a href="#">service-module t1 data-coding</a> | Guarantees the ones density requirement on an AMI line using the fractional T1/T1 module. |
| <a href="#">service-module t1 linecode</a>    | Selects the linecode for the fractional T1/T1 module.                                     |

# service single-slot-reload-enable

To enable single line card reloading for all line cards in the Cisco 7500 series router, use the **service single-slot-reload-enable** command in global configuration mode. To disable single line card reloading for the line cards in the Cisco 7500 series router, use the **no** form of this command.

**service single-slot-reload-enable**

**no service single-slot-reload-enable**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |                                                    |
|-----------------|----------------------------------------------------|
| <b>Defaults</b> | Single line card reloading is disabled by default. |
|-----------------|----------------------------------------------------|

|                      |                           |
|----------------------|---------------------------|
| <b>Command Modes</b> | Global configuration mode |
|----------------------|---------------------------|

|                        |                |                                                              |
|------------------------|----------------|--------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                          |
|                        | 12.0(13)S      | This command was introduced.                                 |
|                        | 12.1(5)T       | This command was integrated into Cisco IOS Release 12.1(5)T. |

|                 |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | In the following example, single line card reloading is enabled for all line cards on the Cisco 7500 series router: |
|-----------------|---------------------------------------------------------------------------------------------------------------------|

```
Router(config)# service single-slot-reload-enable
```

|                         |                            |                                              |
|-------------------------|----------------------------|----------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>             | <b>Description</b>                           |
|                         | <b>show running-config</b> | Displays configuration information.          |
|                         | <b>show diag</b>           | Displays hardware information on line cards. |

# set ip df

To change the Don't Fragment (DF) bit value in the IP header, use the **set ip df** command in route-map configuration mode. To disable changing the DF bit value, use the **no** form of this command.

**set ip df {0 | 1}**

**no set ip df {0 | 1}**

| Syntax Description | 0 | Sets the DF bit to 0 (clears the DF bit ) and allows packet fragmentation. |
|--------------------|---|----------------------------------------------------------------------------|
|                    | 1 | Sets the DF bit to 1 which prohibits packet fragmentation.                 |

**Defaults** The DF bit value is not changed in the IP header.

**Command Modes** Route-map configuration

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 12.1(6) | This command was introduced. |

**Usage Guidelines** Using Path MTU Discovery (PMTUD) you can determine an MTU value for IP packets that avoids fragmentation. If ICMP messages are blocked by a router, the path MTU is broken and packets with the DF bit set are discarded. Use the **set ip df** command to clear the DF bit and allow the packet to be fragmented and sent. Fragmentation can slow the speed of packet forwarding on the network but access lists can be used to limit the number of packets on which the DF bit will be cleared.



**Note**

Some IP transmitters (notably some versions of Linux) may set the identification field in the IP header (IPid) to zero when the DF bit is set. If the router should clear the DF bit on such a packet and if that packet should subsequently be fragmented, then the IP receiver will probably be unable to correctly reassemble the original IP packet.

**Examples** The following example shows how to clear the DF bit to allow fragmentation. In this example a router is blocking ICMP messages and breaking the path MTU. Using policy routing both the inbound and outbound packets on interface serial 0 will have their DF bit set to 0 which allows fragmentation.

```
interface serial 0

ip policy route-map clear-df-bit
route-map clear-df-bit permit 10
match ip address 111
set ip df 0

access-list 111 permit tcp any any
```

Related Commands

| Command                   | Description                                              |
|---------------------------|----------------------------------------------------------|
| ip tcp path-mtu-discovery | Enables Path MTU Discovery.                              |
| route-map                 | Defines a route map to control where packets are output. |

# show aps

To display information about the current automatic protection switching (APS) feature, use the **show aps** command in privileged EXEC mode.

**show aps**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Examples

The following is an example of the **show aps** command on a router configured with a working interface. In this example, POS interface 0/0/0 is configured as a working interface in group 1, and the interface is selected (that is, active).

```
router1# show aps
```

```
POS0/0/0 working group 1 channel 1 Enabled Selected
```

The following is an example of the **show aps** command on a router configured with a protect interface. In this example, POS interface 2/0/0 is configured as a protect interface in group 1, and the interface is not selected (the ~ indicates that the interface is not active). The output also shows that the working channel is located on the router with the IP address 15.1.6.1 and that the interface is currently selected (that is, active).

```
router2# show aps
```

```
POS2/0/0 protect group 1 channel 0 bidirectional ~Selected
Rx_K1= 0, Rx_K2= 0 Tx_K1= 0 Tx_K2= 5
Working channel 1 at 10.1.6.1 Enabled
```

For the K1 field (8 bits), the first 4 bits indicate the channel number that has made the request, and the last 4 bits map to the requests (local or external) listed in [Table 14](#). For the K2 field (8 bits), the first 4 bits indicate the channel number bridged onto the protect line, the next bit is the architecture used, and the last 3 bits indicate the mode of operation or non-APS use listed in [Table 14](#).

**Table 14** K1 Bit Descriptions

| Bits (Hexadecimal)  | Description                                                |
|---------------------|------------------------------------------------------------|
| <b>K1 bits 8765</b> | K1 bits 8 through 5: Channel number that made the request. |
| <b>K1 bits 4321</b> | K1 bits 4 through 1: Type of request.                      |
| 1111 (0xF)          | Lockout of protection request.                             |
| 1110 (0xE)          | Forced switch request.                                     |
| 1101 (0xD)          | Signal failure (SF)—high priority request.                 |

**Table 14** K1 Bit Descriptions (continued)

| Bits (Hexadecimal) | Description                                    |
|--------------------|------------------------------------------------|
| 1100 (0xC)         | Signal failure (SF)—low priority request.      |
| 1011 (0xB)         | Signal degradation (SD)—high priority request. |
| 1010 (0xA)         | Signal degradation (SD)—low priority request.  |
| 1001 (0x9)         | Not used.                                      |
| 1000 (0x8)         | Manual switch request.                         |
| 0111 (0x7)         | Not used.                                      |
| 0110 (0x6)         | Wait to restore request.                       |
| 0101 (0x5)         | Not used.                                      |
| 0100 (0x4)         | Exercised request.                             |
| 0011 (0x3)         | Not used.                                      |
| 0010 (0x2)         | Reverse request.                               |
| 0001 (0x1)         | Do not revert request.                         |
| 0000 (0x0)         | No request.                                    |



# show compress

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

**show compress**

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

**Command Modes** EXEC

| Command History | Release | Modification                                                                                                       |
|-----------------|---------|--------------------------------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                                       |
|                 | 11.3    | An example for hardware compression was added as implemented in the Canadian Standards Association (CSA) hardware. |
|                 |         |                                                                                                                    |

**Examples** The following is a sample output display from the **show compress** command when software compression is used on the router:

```
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 15 describes the fields shown in the display.

**Table 15** *show compress Field Descriptions—Software Compression*

| Field                                                                          | Description                                                                               |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Serial0                                                                        | Name and number of the interface.                                                         |
| uncompressed bytes<br>xmt/rcv                                                  | Total number of uncompressed bytes sent and received.                                     |
| 1 min avg ratio xmt/rcv<br>5 min avg ratio xmt/rcv<br>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 (for example, line errors could cause resets).                           |

The following is a sample output display from the **show compress** command when hardware compression is enabled (that is, compression is implemented in the CSA hardware):

Router# **show compress**

```
Serial6/1
  Hardware compression enabled
  CSA in slot3 in use
  Compressed bytes sent:      402 bytes      0 Kbits/sec    ratio: 4.092
  Compressed bytes rcv:      390 bytes      0 Kbits/sec    ratio: 3.476
  restarts:1
  last clearing of counters: 1278 seconds
```

Table 16 describes the fields shown in the display. The information displayed by the **show compress** command is the same for hardware and distributed compression. For Cisco 7200 series routers with multiple CSAs, an additional line is displayed indicating the CSA in use.

**Table 16** *show compress Field Descriptions—Hardware or Distributed Compression*

| Field                        | Description                                                                                                        |
|------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Serial6/1                    | Name and number of the interface.                                                                                  |
| Hardware compression enabled | Type of compression.                                                                                               |
| CSA in slot3 in use          | Identifies the CSA that is performing compression service.                                                         |
| Compressed bytes sent        | Total number of compressed bytes sent including the kilobits per second.                                           |
| Compressed bytes rcv         | Total number of compressed bytes received including the kilobits per second.                                       |
| ratio                        | Compression ratio for bytes sent and received since the link last came up or since the counters were last cleared. |
| restarts                     | Number of times the compression process restarted or reset.                                                        |
| last clearing of counters    | Duration since the last time the counters were cleared with the <b>clear counters</b> command.                     |

#### Related Commands

| Command                  | Description                                                    |
|--------------------------|----------------------------------------------------------------|
| <a href="#">compress</a> | Configures compression for LAPB, PPP, and HDLC encapsulations. |

# show controllers cbus

To display all information under the cBus controller card, use the **show controllers cbus** command in privileged EXEC mode on the Cisco 7500 series routers. 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 Modes** Privileged EXEC

| Command History | Release | Modification                                                             |
|-----------------|---------|--------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                             |
|                 | 11.0    | The ECA hardware version and the resyncs field were added to CIP output. |

**Usage Guidelines** **Verifying the ECA Hardware Version**  
The following partial sample output shows how the ECA hardware version is displayed:

```
Router# show controllers cbus

slot0:CIP2, hw 5.0, sw 206.172, ccb 5800FF20, cmdq 48000080, vps 8192
  software loaded from flash slot0:biff/cip206-172.cbuc_kernel_hw5
  Loaded:seg_eca          Rev. 0    Compiled by biff on Mon 10-Feb-97 09:28

  EPROM version 2.1, VPLD version 5.8
-> ECA0:hw version 03, microcode version C50602D4
  Load metrics:
    Memory    dram 29763656/32M
    CPU       1m  n/a, 5m  n/a, 60m  n/a
    DMA       1m  n/a, 5m  n/a, 60m  n/a
    ECA0      1m  n/a, 5m  n/a, 60m  n/a
```

For details about specific versions and settings for the CIP2, see the *Second-Generation Channel Interface Processor (CIP2) Installation and Configuration* document.

**Examples** The following is partial sample output from the **show controller cbus** command:

```
Router# show controllers cbus

Switch Processor 3, hardware version 11.1, microcode version 215.1
  Microcode loaded from system
  512 Kbytes of main memory, 128 Kbytes cache memory
  16 256 byte buffers, 4 1024 byte buffers, 130 1520 byte buffers, 63 4484 byte buffers
  Restarts: 0 line down, 0 hung output, 0 controller error
  FSIP 0, hardware version 1.1, microcode version 10.13
  Microcode loaded from system
  Controller Sync: 56 timeouts, 56 resyncs 0 failures, 1 max phase count
  Interface 0 - Serial 0/0, electrical interface is V.35 DTE
    31 buffer RX queue threshold, 10 buffer TX queue limit, buffer size 1520
```

```
TX queue length is 1
ift 0001, rql 14, tq 0000 04E0, tql 3
Transmitter delay is 0 microseconds
```

Interface Processors (IPs) must respond to cBus commands within the prescribed time. Sometimes the IPs may not respond within this time due to heavy traffic or some problem in the IP's hardware or firmware. Then the IP's response to cBus commands may be out of sync. When this situation occurs, the Route Processor (RP) must resync the IP. Currently CIP, FSIP, FEIP, RVIP, and SVIP support the resync mechanism.

Table 17 describes significant fields shown in the display.

**Table 17** *show controllers cbus Field Descriptions*

| Field           | Description                                                                                                                                                                                  |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| timeouts        | Number of times the IP did not respond to a cBus command within the allotted time.                                                                                                           |
| resyncs         | If the IP supports the resync mechanism, then this count is the same as the timeouts value.                                                                                                  |
| failures        | Number of resynchronization failures.                                                                                                                                                        |
| max phase count | High count of phase synchronization; that is, the maximum attempts tried before the sync was successful. Maximum number of resync attempts is 16 before the failures counter is incremented. |



**Note**

The timeouts, resyncs, and max phase count values do not imply any problem in the IP. The failures value implies a problem and usually end in a console error message.

The following is a partial output display from the **show controllers cbus** command on a Cisco 7500 series router with one VIP2 interface processor. This example does not show output from additional interface processors that are usually installed in a Cisco 7500 series router.

```
Router# show controller cbus
```

```
MEMD at 40000000, 2097152 bytes (unused 2752, recarves 1, lost 0)
RawQ 48000100, ReturnQ 48000108, EventQ 48000110
BufhdrQ 48000138 (2849 items), LovltrQ 48000150 (42 items, 1632 bytes)
IpcbufQ 48000158 (32 items, 4096 bytes)
3570 buffer headers (48002000 - 4800FF10)
pool0: 15 buffers, 256 bytes, queue 48000140
pool1: 368 buffers, 1536 bytes, queue 48000148
pool2: 260 buffers, 4544 bytes, queue 48000160
pool3: 4 buffers, 4576 bytes, queue 48000168

slot1: VIP2, hw 2.2, sw 200.50, ccb 5800FF30, cmdq 48000088, vps 8192
software loaded from system
FLASH ROM version 255.255
Fast Ethernet1/0/0, addr 0000.0c41.6c20 (bia 0000.0c41.6c20)
gfreeq 48000148, lfreeq 480001D0 (1536 bytes), throttled 0
rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
txq 48001A00, txacc 48001A02 (value 0), txlimit 20
Ethernet1/1/0, addr 0000.0c41.6c28 (bia 0000.0c41.6c28)
gfreeq 48000148, lfreeq 480001D8 (1536 bytes), throttled 0
rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
```

```

    txq 48001A08, txacc 48001A0A (value 0), txlimit 20
Ethernet1/1/1, addr 0000.0c41.6c29 (bia 0000.0c41.6c29)
    gfreeq 48000148, lfreeq 480001E0 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A10, txacc 48001A12 (value 0), txlimit 20
Ethernet1/1/2, addr 0000.0c41.6c2a (bia 0000.0c41.6c2a)
    gfreeq 48000148, lfreeq 480001E8 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A18, txacc 48001A1A (value 0), txlimit 20
Ethernet1/1/3, addr 0000.0c41.6c2b (bia 0000.0c41.6c2b)
    gfreeq 48000148, lfreeq 480001F0 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A20, txacc 48001A22 (value 0), txlimit 20
Ethernet1/1/4, addr 0000.0c41.6c2c (bia 0000.0c41.6c2c)
    gfreeq 48000148, lfreeq 480001F8 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A28, txacc 48001A2A (value 0), txlimit 20
Ethernet1/1/5, addr 0000.0c41.6c2d (bia 0000.0c41.6c2d)
    gfreeq 48000148, lfreeq 48000200 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A30, txacc 48001A32 (value 0), txlimit 20
Ethernet1/1/6, addr 0000.0c41.6c2e (bia 0000.0c41.6c2e)
    gfreeq 48000148, lfreeq 48000208 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A38, txacc 48001A3A (value 0), txlimit 20
Ethernet1/1/7, addr 0000.0c41.6c2f (bia 0000.0c41.6c2f)
    gfreeq 48000148, lfreeq 48000210 (1536 bytes), throttled 0
    rxlo 4, rxhi 30, rxcurr 0, maxrxcurr 0
    txq 48001A40, txacc 48001A42 (value 0), txlimit 20

```

The following is a partial output display of the **show controllers cbus** command for a Packet-over-SONET Interface Processor (POSIP) in slot 0; its single Packet OC-3 interface is Posi0/0:

Router# **show controllers cbus**

```

slot0: POSIP, hw 2.1, sw 200.01, ccb 5800FF30, cmdq 48000080, vps 8192
  software loaded from flash slot0:rsp_posip.new
  FLASH ROM version 160.4, VPLD version 2.2
  Posi0/0, applique is SONET
    gfreeq 48000148, lfreeq 48000158 (4480 bytes), throttled 0
    rxlo 4, rxhi 226, rxcurr 0, maxrxcurr 186
    txq 48000160, txacc 48000082 (value 150), txlimit 150

```

The following is partial output display from the **show controllers cbus** command for a Multichannel Interface Processor (MIP). Not all of the 23 channels defined on serial interface 1/0 are shown.

```

slot1: MIP, hw 1.1, sw 205.03, ccb 5800FF40, cmdq 48000088, vps 8192
  software loaded from system
  T1 1/0, applique is Channelized T1
    gfreeq 48000130, lfreeq 480001B0 (1536 bytes), throttled 0
    rxlo 4, rxhi 360, rxcurr 0, maxrxcurr 3
    Serial1/0:0, txq 480001B8, txacc 48000082 (value 3), txlimit 3
    Serial1/0:1, txq 480001B8, txacc 4800008A (value 3), txlimit 3
    Serial1/0:2, txq 480001B8, txacc 48000092 (value 3), txlimit 3
    Serial1/0:3, txq 480001B8, txacc 4800009A (value 3), txlimit 3
    Serial1/0:4, txq 480001B8, txacc 480000A2 (value 3), txlimit 3
    Serial1/0:5, txq 480001B8, txacc 480000AA (value 3), txlimit 3
    Serial1/0:6, txq 480001B8, txacc 480000B2 (value 3), txlimit 3
    Serial1/0:7, txq 480001B8, txacc 480000BA (value 3), txlimit 3

```

Table 18 describes significant fields in the per-slot part of these displays.

**Table 18** *show controllers cbus Command—Per-Slot Field Descriptions*

| Field                             | Description                                                                                                                                                                                                  |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot1:                            | Slot location of the specific interface processor (in this case Packet-over-SONET Interface Processor).                                                                                                      |
| hw                                | Version number of the card.                                                                                                                                                                                  |
| sw                                | Version number of the card's internal software (in ROM).                                                                                                                                                     |
| software loaded from              | Source device and file name from which the router software was loaded.                                                                                                                                       |
| FLASH ROM version<br>VPLD version | Version of Flash ROM.                                                                                                                                                                                        |
| PosI/O, applique is<br>SONET      | Location of the specific interface and the hardware applique type (in this case a Packet OC-3 interface).                                                                                                    |
| gfreeq                            | Location of the global free queue that is shared among similar interfaces.                                                                                                                                   |
| lfreeq                            | Location of the local free queue, which is a private queue of MEMD buffers.                                                                                                                                  |
| throttled                         | Number of times input packet processing has been throttled on this interface.                                                                                                                                |
| rxlo                              | Minimum number of MEMD buffers held on local free queue. When idle, the interface returns buffers from its local queue to the global free queue until only this number of buffers remain in the local queue. |
| rxhi                              | Maximum number of MEMD buffers that the interface can remove from the global free queue in order to populate its local queue.                                                                                |
| rxcurr                            | Number of MEMD buffers currently on the local free queue.                                                                                                                                                    |
| maxrxcurr                         | Maximum number of MEMD buffers that were enqueued on the local free queue.                                                                                                                                   |
| txq                               | Address of the transmit queue.                                                                                                                                                                               |
| txacc                             | Address of the transmit queue accumulator.                                                                                                                                                                   |
| txlimit                           | Maximum number of buffers allowed in the transmit queue.                                                                                                                                                     |

The following is a sample output display from the **show controllers cbus** command on a Cisco 7500 series router:

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
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 19 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 19** *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 ROM).                                                                                                                             |
| 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 <ul style="list-style-type: none"> <li>0 line down</li> <li>0 hung output</li> <li>0 controller error</li> </ul> | Count of restarts for the following conditions: <ul style="list-style-type: none"> <li>Communication line down</li> <li>Output unable to transmit</li> <li>Internal error</li> </ul> |

Table 20 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 20** *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 ROM). |
| 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).             |

**Table 20** *show controllers cbus Field Descriptions—Part 2 (continued)*

| Field                               | Description                                                                                                                                                                                                                          |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ift 0004                            | Interface type code: <ul style="list-style-type: none"> <li>• 0 = EIP</li> <li>• 1 = FSIP</li> <li>• 4 = HIP</li> <li>• 5 = TRIP</li> <li>• 6 = FIP</li> <li>• 7 = AIP</li> </ul>                                                    |
| 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 following is a sample output display from the **show controllers cbus** command for 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
```

The following is a sample output display from the **show controllers cbus** command for SMIP:

```
Router# show controllers cbus

SMIP 2, hardware version 1.0, microcode version 10.0
  Microcode loaded from system
  Interface 16 - T1 2/0, electrical interface is Channelized T1
    10 buffer RX queue threshold, 14 buffer TX queue limit, buffer size 1580 ift 0001, rql
    7, tq 0000 05B0, tql 14
    Transmitter delay is 0 microseconds
```



# show controllers ethernet

To display information on the Cisco 2500, Cisco 3000, or Cisco 4000 series routers, use the **show controllers ethernet** command in EXEC mode.

**show controllers ethernet** *number*

|                           |                |                                             |
|---------------------------|----------------|---------------------------------------------|
| <b>Syntax Description</b> | <i>number</i>  | Interface number of the Ethernet interface. |
| <b>Command Modes</b>      | EXEC           |                                             |
| <b>Command History</b>    | <b>Release</b> | <b>Modification</b>                         |
|                           | 10.0           | This command was introduced.                |

## Examples

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

```
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
```

# show controllers ethernet

```

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 fastethernet

To display information about initialization block, transmit ring, receive ring and errors for the Fast Ethernet controller chip on the Cisco 4500, Cisco 7200 series, or Cisco 7500 series routers, use the **show controllers fastethernet** command in EXEC mode.

## Cisco 4500 Series

**show controllers fastethernet** *number*

## Cisco 7200 Series

**show controllers fastethernet** *slot/port*

## Cisco 7500 Series

**show controllers fastethernet** *slot/port-adapter/port*

| Syntax Description | <i>number</i>       | Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 router, specifies the network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system. |
|--------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                         |
|                    | <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                         |
|                    | <i>port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                              |
|                    |                     |                                                                                                                                                                                                                                      |

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.2    | This command was introduced. |

| Usage Guidelines | The output from this command is generally useful for diagnostic tasks performed by technical support only. |
|------------------|------------------------------------------------------------------------------------------------------------|
|------------------|------------------------------------------------------------------------------------------------------------|

| Examples | The following is a sample output display from the <b>show controllers fastethernet</b> command on a Cisco 4500 router: |
|----------|------------------------------------------------------------------------------------------------------------------------|
|----------|------------------------------------------------------------------------------------------------------------------------|

```
c4500-1# show controllers fastethernet 0

DEC21140 Slot 0, Subunit 0
dec21140_ds=0x60001234, registers=0x3c001000, ib=0x42301563, ring entries=256
rxring=0x40235878, rxr shadow=0x64528745, rx_head=0, rx_tail=10
```

## show controllers fastethernet

```
txring=0x43562188, txr shadow=0x65438721, tx_head=17, tx_tail=34, tx_count=17
DEC21140 Registers
CSR0=0x23457667, CSR3=0x12349878, CSR4=0x34528745, CSR5=0x76674565
CSR6=0x76453676, CSR7=0x76456574, CSR8=0x25367648, CSR9=0x87253674
CSR11=0x23456454, CSR12=0x76564787, CSR15=0x98273465
DEC21140 PCI registers
bus_no=0, device_no=0
CFID=0x12341234, CFCS=0x76547654, CFRV=0x87658765, CFLT=0x98769876
CBIO=0x12344321, CBMA=0x23454321, CFIT=0x34567654, CFDA=0x76544567
MII registers
Register 0x00: 0x1234 0x1234 0x2345 0x3456 0x4567 0x5678 0x6789 0x7890
Register 0x08: 0x9876 0x8765 0x7654 0x6543 0x5432 0x4321 0x3210 0x2109
Register 0x10: 0x1234 0x2345 0x3456 0x4567 0x5678 0x6789 0x7890
Register 0x18: 0x9876 0x8765 0x7654 0x6543 0x5432 0x4321
DEC21140 statistics
filtered_in_sw=1000, throttled=10, enabled=10
rx_fifo_overflow=10, rx_no_enp=12, rx_late_collision=18
rx_watchdog=15, rx_process_stopped=15, rx_buffer_unavailable=1500
tx_jabber_timeout=10, tx_carrier_loss=2, tx_deferred=15
tx_no_carrier=1, tx_late_collision=10, tx_excess_coll=10
tx_process_stopped=1, fata_tx_err=0
```

The following is a sample output display from the **show controllers fastethernet** command on a Cisco AS5300 router:

```
as5300# show controller fastethernet 0
```

```
DEC21140
Setup Frame
(0 ) 00e0.1e3e.c179
(1 ) 0100.0ccc.cccc
(2 ) 0900.2b00.000f
(3 ) 0900.2b02.0104
(4 ) 0300.0000.0001
dec21140_ds=0x60BD33B8, registers=0x3C210000, ib=0x4002F75C, ring entries=32
rxring=0x4002F844, rxr shadow=0x60F14B58, rx_head=6, rx_tail=6
txring=0x4002FA6C, txr shadow=0x60F14BF8, tx_head=10, tx_tail=10, tx_count=0
tx_size=32, rx_size=32
PHY link up
DEC21140 Registers:
CSR0=0xFE024480, CSR3=0x4002F844, CSR4=0x4002FA6C, CSR5=0xFC660000
CSR6=0x322C2002, CSR7=0xFFFFA241, CSR8=0xE0000000, CSR9=0xFFFD33FF
CSR11=0xFFFE0000, CSR12=0xFFFFF09, CSR15=0xFFFFFEC8
DEC21140 PCI registers:
bus_no=2, device_no=0
CFID=0x00091011, CFCS=0x82800005, CFRV=0x02000021, CFLT=0x0000FF00
CBIO=0x3C210001, CBMA=0x00000000, CFIT=0x28140100, CFDA=0x00000000

MII registers:
Register 0x00: 0000 784D 2000 5C01 0001 0000 0000 0000
Register 0x08: 0000 0000 0000 0000 0000 0000 0000 0000
Register 0x10: 0000 0000 0000 0000 0000 0001 8060
Register 0x18: 8020 0840 0000 3000 A3B9

throttled=7, enabled=7
rx_fifo_overflow=0, rx_no_enp=0, late_collision=0
rx_watchdog=0, rx_process_stopped=0, rx_buffer_unavailable=0
tx_jabber_timeout=0, tx_carrier_loss=1, tx_deferred=0
tx_no_carrier=1, tx_late_collision=0, tx_excess_coll=0
tx_process_stopped=0, fatal_tx_err=0
overflow_resets=0
0 missed datagrams, 0 overruns
0 transmitter underruns, 0 excessive collisions
0 single collisions, 0 multiple collisions
```

```
0 dma memory errors, 0 CRC errors

0 alignment errors, 0 runs, 0 giants
```

The following is a sample output display from the **show controllers fastethernet** command on a Cisco 7200 series router:

```
Router# show controllers fastethernet 0/0

Interface Fast Ethernet0/0
Hardware is DEC21140
dec21140_ds=0x60895888, registers=0x3C018000, ib=0x4B019500
rx ring entries=128, tx ring entries=128
rxring=0x4B019640, rxr shadow=0x60895970, rx_head=0, rx_tail=0
txring=0x4B019EC0, txr shadow=0x60895B98, tx_head=77, tx_tail=77, tx_count=0
CSR0=0xFFFA4882, CSR3=0x4B019640, CSR4=0x4B019EC0, CSR5=0xFC660000
CSR6=0xE20CA202, CSR7=0xFFFFA241, CSR8=0xFFFE0000, CSR9=0xFFFD77FF
CSR11=0xFFFE0000, CSR12=0xFFFFF98, CSR15=0xFFFFFEC8
DEC21140 PCI registers:
bus_no=0, device_no=6
CFID=0x00091011, CFCS=0x02800006, CFRV=0x02000012, CFLT=0x0000FF00
CBIO=0x7C5AFF81, CBMA=0x48018000, CFIT=0x0000018F, CFDA=0x0000AF00
MII registers:
Register 0x00: 2000 780B 2000 5C00 01E1 0000 0000 0000
Register 0x08: 0000 0000 0000 0000 0000 0000 0000 0000
Register 0x10: 0000 0000 0000 0000 0000 0000 0000 8040
Register 0x18: 8000 0000 0000 3800 A3B9
throttled=0, enabled=0, disabled=0
rx_fifo_overflow=0, rx_no_enp=0, rx_discard=0
tx_underrun_err=0, tx_jabber_timeout=0, tx_carrier_loss=1
tx_no_carrier=1, tx_late_collision=0, tx_excess_coll=0
tx_collision_cnt=0, tx_deferred=0, fatal_tx_err=0, mult_ovfl=0
HW addr filter: 0x60895FC0, ISL Enabled
Entry= 0: Addr=0100.0CCC.CCCC
Entry= 1: Addr=0300.0000.0001
Entry= 2: Addr=0100.0C00.0000
Entry= 3: Addr=FFFF.FFFF.FFFF
Entry= 4: Addr=FFFF.FFFF.FFFF
Entry= 5: Addr=FFFF.FFFF.FFFF
Entry= 6: Addr=FFFF.FFFF.FFFF
Entry= 7: Addr=FFFF.FFFF.FFFF
Entry= 8: Addr=FFFF.FFFF.FFFF
Entry= 9: Addr=FFFF.FFFF.FFFF
Entry=10: Addr=FFFF.FFFF.FFFF
Entry=11: Addr=FFFF.FFFF.FFFF
Entry=12: Addr=FFFF.FFFF.FFFF
Entry=13: Addr=FFFF.FFFF.FFFF
Entry=14: Addr=FFFF.FFFF.FFFF
Entry=15: Addr=0060.3E28.6E00
```

#### Related Commands

| Command                                      | Description                                              |
|----------------------------------------------|----------------------------------------------------------|
| <a href="#">show interfaces fastethernet</a> | Displays information about the Fast Ethernet interfaces. |

# show controllers fddi

To display all information under the FDDI Interface Processor (FIP) on the Cisco 7200 series and Cisco 7500 series routers, use the **show controllers fddi** command in user EXEC mode.

## show controllers fddi

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

**Command Modes** User EXEC

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

**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.

**Examples** The following is a sample output display from the **show controllers fddi** command:

```
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 gigabitethernet

To display initialization block information, transmit ring, receive ring, and errors for the Gigabit Ethernet interface controllers of the Cisco 7200-I/O-GE+E, use the **show controllers gigabitethernet** command in privileged EXEC mode.

**show controllers gigabitethernet** *slot/port*

|                           |             |                               |
|---------------------------|-------------|-------------------------------|
| <b>Syntax Description</b> | <i>slot</i> | Slot number on the interface. |
|                           | <i>port</i> | Port number on the interface. |

**Command Modes** Privileged EXEC

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                            |
|------------------------|----------------|----------------------------------------------------------------|
|                        | 11.1 CC        | This command was introduced.                                   |
|                        | 12.1(3a)E      | Support for the Cisco 7200-I/O-GE+E controller was introduced. |
|                        | 12.1(5)T       | This command was integrated into Cisco IOS Release 12.1(5)T.   |

**Usage Guidelines** This command is used on the Cisco 7200-I/O-GE+E to display hardware and software information about the Gigabit Ethernet interface. The I/O controller is always found in slot 0.

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

```
Router# show controllers gigabitethernet 0/0

Interface GigabitEthernet0/0 (idb 0x627D8344)
Hardware is i82543 (Livengood) A1
network connection mode is AUTO
network link is up
loopback type is none
SERDES is enabled (TBI mode), GBIC is enabled
GBIC type is 1000BaseSX
idb->lc_ip_turbo_fs=0x604A82B0, ip_routecache=0x1(dfs=0/mdfs=0), max_mtu=1524
i82543_ds=0x627DA094, registers=0x3C100000, curr_intr=0
rx cache size=2000, rx cache end=1744, rx_nobuffer=0
i82543 MAC registers:
CTRL =0x0ACC0004, STATUS=0x00000FAB, CTRL_X=0x000048E0, IMS =0x00000096
RCTL =0x0042803A, RDBAL =0x2000E000, RDBAH =0x00000000, RDLEN =0x00001000
RDH =0x000000CB, RDT =0x000000CA, RDTR =0x00000000
TCTL =0x000400FA, TDBAL =0x20010000, TDBAH =0x00000000, TDLEN =0x00001000
TDH =0x00000057, TDT =0x00000057, TIPG =0x00600806
ETT =0x00000000, TXDMAC=0x00000001
TXCW =0xC00001A0, RXCW =0xDC004120, FCRTX =0x0000AFF0, FCRTL =0x80001200
FCAH =0x00000100, FCAL =0x00C28001, FCT =0x00008808, FCTTV =0x00000080
RDFH =0x00000BFA, RDFT =0x00000BFA, RDFPC =0x00000000
TDFH =0x00001EBA, TDFT =0x00001EBA, TDFPC =0x00000000
RX is normal, enabled TX is normal, enabled
Device status = full-duplex, link up
```

## show controllers gigabitethernet

```

AN status = done(RF:0 , PAUSE:2 ), bit sync OK, rx idle stream, rx invalid
symbols, rx idle char
GBIC registers:
Register 0x00:  01  00  01  00  00  00  01  00
Register 0x08:  00  00  00  00  0D  00  00  00
Register 0x10:  32  1E  00  00  4D  65  74  68
Register 0x18:  6F  64  65  20  45  6C  65  63
Register 0x20:  2E  20  20  20  00  00  00  00
Register 0x28:  4D  47  42  43  2D  32  30  2D
Register 0x30:  34  2D  31  2D  53  20  20  20
Register 0x38:  31  30  30  30  00  00  00  55
Register 0x40:  00  0A  00  00  41  4A  42  48
Register 0x48:  47  30  36  30  20  20  20  20
Register 0x50:  20  20  20  20  30  30  30  33
Register 0x58:  32  30  20  20  00  00  00  61
PartNumber:MGBC-20-4-1-S
PartRev:G
SerialNo:AJBHG060
Options: 0
Length(9um/50um/62.5um):000/500/300
Date Code:000320
Gigabit Ethernet Codes: 1
PCI configuration registers:
bus_no=0, device_no=8
DeviceID=0x1001, VendorID=0x8086, Command=0x0156, Status=0x0230
Class=0x02/0x00/0x00, Revision=0x01, LatencyTimer=0xFC, CacheLineSize=0x20
BaseAddr0=0x48100000, BaseAddr1=0x00000000, MaxLat=0x00, MinGnt=0xFF
SubsysDeviceID=0x1001, SubsysVendorID=0x8086
Cap_Ptr=0x000000DC  Retry/TRDY Timeout=0x00000000
PMC=0x00220001  PMCSR=0x00000000
I82543 Internal Driver Variables:
rxring(256)=0x2000E000, shadow=0x627DA3F0, head=203, rx_buf_size=512
txring(256)=0x20010000, shadow=0x627DA81C, head=87, tail=87
chip_state=2, pci_rev=1
tx_count=0, tx_limited=0
rx_overshoot=0, rx_seq=0, rx_no_enp=0, rx_discard=0
throttled=0, enabled=0, disabled=0
reset=17(init=1, check=0, restart=3, pci=0), auto_restart=18
link_reset=0, tx_carrier_loss=1, fatal_tx_err=0
isl_err=0, wait_for_last_tdt=0
HW addr filter:0x627DB048, ISL disabled, Promiscuous mode on
Entry= 0: Addr=0000.C000.4000
(All other entries are empty)
i82543 Statistics
CRC error          0          Symbol error      7
Missed Packets     0          Single Collision 0
Excessive Coll     0          Multiple Coll   0
Late Coll          0          Collision        0
Defer              0          Receive Length  0
Sequence Error     0          XON RX          0
XON TX             0          XOFF RX         0
OFF TX             0          FC RX Unsupport 0
Packet RX (64)     11510       Packet RX (127) 17488
Packet RX (255)    1176        Packet RX (511) 7941
Packet RX (1023)   738         Packet RX (1522) 18
Good Packet RX     38871       Broadcast RX     0
Multicast RX       0          Good Packet TX   5208
Good Octets RX.H   0          Good Octets RX.L 5579526
Good Octets TX.H   0          Good Octets TX.L 513145
RX No Buff         0          RX Undersize     0
RX Fragment        0          RX Oversize      0
RX Octets High     0          RX Octets Low    5579526
TX Octets High     0          TX Octets Low    513145
TX Packet          5208       RX Packet        38871

```



|                  |      |                  |      |
|------------------|------|------------------|------|
| TX Broadcast     | 1796 | TX Multicast     | 330  |
| Packet TX (64)   | 1795 | Packet TX (127)  | 3110 |
| Packet TX (255)  | 0    | Packet TX (511)  | 300  |
| Packet TX (1023) | 3    | Packet TX (1522) | 0    |
| TX Underruns     | 0    | TX No CSR        | 0    |
| RX Error Count   | 0    | RX DMA Underruns | 0    |
| RX Carrier Ext   | 0    |                  |      |
| TCP Segmentation | 0    | TCP Seg Failed   | 0    |

**Related Commands**

| Command                                       | Description                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------|
| <a href="#">show controllers ethernet</a>     | Displays software and hardware information about an Ethernet interface.     |
| <a href="#">show controllers fastethernet</a> | Displays software and hardware information about a Fast Ethernet interface. |

# show controllers lex

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

**show controllers lex** [*number*]

**Cisco 7500 Series**

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

|                    |               |                                                                                                                         |
|--------------------|---------------|-------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>number</i> | (Optional) Number of the LAN Extender interface about which to display information.                                     |
|                    | <i>slot</i>   | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information. |
|                    | <i>port</i>   | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information. |
|                    |               |                                                                                                                         |

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 11.0    | This command was introduced. |

|                  |                                                                                                                                                                                                                                          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | Use the <b>show controllers lex</b> 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. |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

```
Router# show controllers lex 1

Lex1 is not bound to a serial interface
```

Table 21 describes the fields shown in the preceding output.

**Table 21** *show controllers lex Field Descriptions*

| Field                      | Description                                                          |
|----------------------------|----------------------------------------------------------------------|
| Lex0:                      | Number of the LAN Extender interface.                                |
| 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

To display all information under the Multiport Communications Interface (MCI) card or the SCI, use the **show controllers mci** command in privileged EXEC mode.

**show controllers mci**

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

**Command Modes** Privileged EXEC

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

**Usage Guidelines** 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.

**Examples** The following is a 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 22](#) describes significant fields shown in the display.

**Table 22** *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.                           |

**Table 22** *show controllers mci Field Descriptions (continued)*

| Field                                                                                                                     | Description                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| microcode version 1.8                                                                                                     | Version number of the card's internal software (in ROM).                                                                                                                             |
| 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.                                                                                                                               |
| largest buffer size 1520                                                                                                  | Largest size of these buffers (in bytes).                                                                                                                                            |
| Restarts <ul style="list-style-type: none"> <li>0 line down</li> <li>0 hung output</li> <li>0 controller error</li> </ul> | Count of restarts for the following conditions: <ul style="list-style-type: none"> <li>Communication line down</li> <li>Output unable to transmit</li> <li>Internal error</li> </ul> |
| Interface 0 is Ethernet0                                                                                                  | Names of interfaces, by number.                                                                                                                                                      |
| electrical interface is V.35 DTE                                                                                          | Line interface type for serial connections.                                                                                                                                          |
| 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, 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, the display presented for the **show interfaces** command incorrectly reports attachment to a DTE device although the software recognizes the DCE interface and behaves accordingly.

**Related Commands**

| Command                        | Description                                                                                          |
|--------------------------------|------------------------------------------------------------------------------------------------------|
| <a href="#">tx-queue-limit</a> | Controls the number of transmit buffers available to a specified interface on the MCI and SCI cards. |

# show controllers pcbus

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

**show controllers pcbus**

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

**Command Modes** Privileged EXEC

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.0    | This command was introduced. |

**Usage Guidelines** This command is valid on LanOptics Branchcard or Stacknet 2000 products only.

**Examples** The following is a 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 pos

To display information about the Packet-over-SONET (POS) controllers, use the **show controllers pos** command in privileged EXEC mode.

**show controllers pos** [*slot-number*] [**details** | **pm** [*time-interval*]]

## Syntax Description

|                      |                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot-number</i>   | (Optional) Number of the chassis slot that contains the POS interface. If you do not specify a slot number, information for all the installed POS controllers is displayed.<br><br><b>Cisco 7500 Series Routers</b><br>Use <i>slot/port-adapter/port</i> (for example, 2/0/0).<br><br><b>Cisco 12000 Series Routers</b><br>Use <i>slot/port</i> (for example, 4/0). |
| <b>details</b>       | (Optional) In addition to the normal information displayed by the <b>show controllers pos</b> command, the <b>details</b> keyword provides a hexadecimal and ASCII “dump” of the path trace buffer.                                                                                                                                                                 |
| <b>pm</b>            | (Optional) Displays SONET performance monitoring statistics accumulated for a 24-hour period in 15-minute intervals.                                                                                                                                                                                                                                                |
| <i>time-interval</i> | (Optional) Number of the SONET MIB 15-minute time interval in the range from 1 to 96. If the <i>time-interval</i> argument is not specified, the performance monitoring statistics for the current time interval are displayed.                                                                                                                                     |

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1 CC | This command was introduced. |

## Usage Guidelines

The **show controllers pos** command with the **pm** keyword displays SONET performance monitoring statistics accumulated at 15-minute intervals, and these statistics can be queried using Simple Network Management Protocol (SNMP) tools. The performance monitoring statistics are collected according to the RFC 1595 specification.

The information that this command displays is generally useful only for diagnostic tasks performed by technical support personnel.

## Examples

The following is sample output from the **show controllers pos** command on a Cisco 7500 series router:

```
Router# show controllers pos

POS2/0/0
SECTION
  LOF = 0          LOS = 2335          BIP(B1) = 77937133
LINE
  AIS = 2335      RDI = 20          FEBE = 3387950089 BIP(B2) = 1622825387
PATH
  AIS = 2340      RDI = 66090      FEBE = 248886263 BIP(B3) = 103862953
  LOP = 246806    NEWPTR = 11428072 PSE = 5067357   NSE = 4645

Active Defects: B2-TCA B3-TCA
Active Alarms:  None
Alarm reporting enabled for: B1-TCA

APS
  COAPS = 12612784   PSBF = 8339
  State: PSBF_state = False
  Rx(K1/K2): 00/CC   Tx(K1/K2): 00/00
  S1S0 = 03, C2 = 96
CLOCK RECOVERY
  RDOOL = 64322060
  State: RDOOL_state = True
PATH TRACE BUFFER: UNSTABLE
  Remote hostname :
  Remote interface:
  Remote IP addr  :
  Remote Rx(K1/K2): ../..   Tx(K1/K2): ../..
BER thresholds: SF = 10e-3 SD = 10e-8
TCA thresholds: B1 = 10e-7 B2 = 10e-3 B3 = 10e-6
```

[Table 23](#) describes the fields shown in the display.

**Table 23** *show controllers pos Field Descriptions*

| Field                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POS2/0/0                | Slot number of the POS interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| LOF                     | Section loss of frame is detected when a severely error framing (SEF) defect on the incoming SONET signal persist for 3 milliseconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| LOS                     | Section loss of signal is detected when an all-zeros pattern on the incoming SONET signal lasts 19 plus or minus 3 microseconds or longer. This defect might also be reported if the received signal level drops below the specified threshold.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| BIP(B1)/BIP(B2)/BIP(B3) | <p>Bit interleaved parity (BIP).</p> <p>For B1, the BIP error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B1 byte of the following frame. Differences indicate that section-level bit errors have occurred.</p> <p>For B2, the BIP error report is calculated by comparing the BIP-8/24 code with the BIP-8 code extracted from the B2 byte of the following frame. Differences indicate that line-level bit errors have occurred.</p> <p>For B3, the BIP error report is calculated by comparing the BIP-8 code with the BIP-8 code extracted from the B3 byte of the following frame. Differences indicate that path-level bit errors have occurred.</p> |



**Table 23** *show controllers pos Field Descriptions (continued)*

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIS                         | Alarm indication signal.<br><br>A line alarm indication signal is sent by the section terminating equipment (STE) to alert the downstream line terminating equipment (LTE) that a loss of signal (LOS) or loss of frame (LOF) defect has been detected on the incoming SONET section.<br><br>A path alarm indication signal is sent by the LTE to alert the downstream path terminating equipment (PTE) that it has detected a defect on its incoming line signal. |
| RDI                         | Remote defect indication.<br><br>A line remote defect indication is reported by the downstream LTE when it detects LOF, LOS, or AIS.<br><br>A path remote defect indication is reported by the downstream PTE when it detects a defect on the incoming signal.                                                                                                                                                                                                     |
| FEBE                        | Far end block errors.<br><br>Line FEBE (accumulated from the M0 or M1 byte) is reported when the downstream LTE detects BIP(B2) errors.<br><br>Path FEBE (accumulated from the G1 byte) is reported when the downstream PTE detects BIP(B3) errors.                                                                                                                                                                                                                |
| LOP                         | Path loss of pointer is reported as a result of an invalid pointer (H1, H2) or an excess number of new data flag (NDF) enabled indications.                                                                                                                                                                                                                                                                                                                        |
| NEWPTR                      | Inexact count of the number of times that the SONET framer has validated a new SONET pointer value (H1, H2).                                                                                                                                                                                                                                                                                                                                                       |
| PSE                         | Inexact count of the number of times that the SONET framer has detected a positive stuff event in the received pointer (H1, H2).                                                                                                                                                                                                                                                                                                                                   |
| NSE                         | Inexact count of the number of times that the SONET framer has detected a negative stuff event in the received pointer (H1, H2).                                                                                                                                                                                                                                                                                                                                   |
| Active Defects              | List of all currently active SONET defects.                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Active Alarms               | List of current alarms as enforced by Sonet Alarm Hierarchy.                                                                                                                                                                                                                                                                                                                                                                                                       |
| Alarm reporting enabled for | List of alarms for which you enabled reporting with the <b>pos report</b> interface command.                                                                                                                                                                                                                                                                                                                                                                       |
| APS                         | Automatic protection switching.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| COAPS                       | An inexact count of the number of times that a new APS value has been detected in the K1, K2 bytes.                                                                                                                                                                                                                                                                                                                                                                |
| PSBF                        | An inexact count of the number of times that a protection switching byte failure has been detected (no three consecutive SONET frames contain identical K1 bytes).                                                                                                                                                                                                                                                                                                 |
| PSBF_state                  | Protection switching byte failure state.                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Rx(K1/K2)/Tx(K1/K2)         | Contents of the received and transmitted K1 and K2 bytes.                                                                                                                                                                                                                                                                                                                                                                                                          |
| S1S0                        | The two S bits received in the last H1 byte.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| C2                          | The value extracted from the SONET path signal label byte (C2).                                                                                                                                                                                                                                                                                                                                                                                                    |

**Table 23** *show controllers pos Field Descriptions (continued)*

| Field             | Description                                                                                                                                                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLOCK RECOVERY    | The SONET clock is recovered using information in the SONET overhead. RDOOL is an inexact count of the number of times that Receive Data Out Of Lock has been detected, which indicates that the clock recovery phased lock loop is unable to lock to the receive stream. |
| PATH TRACE BUFFER | SONET path trace buffer is used to communicate information regarding the remote host name, interface name/number, and IP address. This is a Cisco-proprietary use of the J1 (path trace) byte.                                                                            |
| BER thresholds    | List of the bit error rate (BER) thresholds that you configured with the <b>pos threshold</b> interface command.                                                                                                                                                          |
| TCA thresholds    | List of threshold crossing alarms (TCAs) that you configured with the <b>pos threshold</b> interface command.                                                                                                                                                             |

The following is sample output from the **show controllers pos pm** command that displays performance monitoring statistics on a Cisco 12000 series router:

```
Router# show controllers pos 1/0 pm

POS1/0
Medium is SONET
Line coding is RZ, Line type is LONG SM
Data in current interval (516 seconds elapsed)
SECTION ( NO DEFECT )
    515 Errored Secs, 515 Severely Err Secs
    0 Coding Violations, 515 Sev Err Framing Secs
LINE ( NO DEFECT )
    0 Errored Secs, 0 Severely Err Secs
    0 Coding Violations, 0 Unavailable Secs
FAR END LINE
    0 Errored Secs, 0 Severely Err Secs
    0 Coding Violations, 0 Unavailable Secs
PATH ( NO DEFECT )
    0 Errored Secs, 0 Severely Err Secs
    0 Coding Violations, 0 Unavailable Secs
FAR END PATH
    0 Errored Secs, 0 Severely Err Secs
    0 Coding Violations, 0 Unavailable Secs
```

[Table 24](#) describes the fields shown in the display.

**Table 24** *show controllers pos pm Field Descriptions*

| Field       | Description                                                                                                                                             |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| POS1/0      | Slot number of the POS interface.                                                                                                                       |
| Line coding | Shows the current line encoding type, either return to zero (RZ) or nonreturn to zero (NRZ).                                                            |
| Line type   | Line type for this interface. Optical line types can be either long range (LONG) or short range (SHORT), and either single mode (SM) or multimode (MM). |

**Table 24** *show controllers pos pm Field Descriptions (continued)*

| Field                    | Description                                                                                                                                                                                                                                                                                           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data in current interval | 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.                                                                   |
| Errored Secs             | An errored second is a second in which one of the following is detected: <ul style="list-style-type: none"> <li>One or more coding violations.</li> <li>One or more incoming defects (for example, a severely errored frame (SEF) defect, an LOS defect, an AIS defect, or an LOP defect).</li> </ul> |
| Severely Err Secs        | A severely errored second (SES) is a second with one of the following errors: <ul style="list-style-type: none"> <li>A certain number of coding violations. The number is dependent on the line rate and the BER.</li> <li>A certain number of incoming defects.</li> </ul>                           |
| Coding Violations        | Number of coding violations for the current interval. Coding violations are defined as BIP errors that are detected in the incoming signal. The coding violations counter is incremented for each BIP error detected.                                                                                 |
| Sev Err Framing Secs     | Severely errored framing seconds (SEFS) are seconds with one or more SEF defects.                                                                                                                                                                                                                     |
| Unavailable Secs         | Total number of seconds for which the interface is unavailable. The interface is considered to be unavailable after a series of ten consecutive SESs.                                                                                                                                                 |

**Related Commands**

| Command              | Description                                                                    |
|----------------------|--------------------------------------------------------------------------------|
| <b>pos report</b>    | Permits selected SONET alarms to be logged to the console for a POS interface. |
| <b>pos threshold</b> | Sets the BER threshold values of specified alarms for a POS interface.         |

# show controllers serial

To display information that is specific to the interface hardware, use the **show controllers serial** command in privileged EXEC mode.

```
show controllers serial [slot/port]
```

Cisco 7500 Series and Cisco 7000 Series with the RSP7000 and RSP7000CI

```
show controllers serial [slot/port-adapter/port]
```

|                    |              |                                                                                                                                                                           |
|--------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | slot         | (Optional) Slot number of the interface.                                                                                                                                  |
|                    | port         | (Optional) Port number on the interface. The port value is always 0.                                                                                                      |
|                    | port-adapter | (Optional) On Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI, the location of the port adapter on a VIP. The value can be 0 or 1. |
|                    |              |                                                                                                                                                                           |

|               |                 |
|---------------|-----------------|
| Command Modes | Privileged EXEC |
|---------------|-----------------|

|                 |         |                                                                                     |
|-----------------|---------|-------------------------------------------------------------------------------------|
| Command History | Release | Modification                                                                        |
|                 | 10.0    | This command was introduced.                                                        |
|                 | 11.1 CA | This command was modified to include support for the PA-E3 and PA-T3 port adapters. |

**Usage Guidelines**

The information displayed is generally useful for diagnostic tasks performed by technical support personnel only. For the PA-E3 or PA-T3 port adapters, the **show controllers serial** command also displays configuration information such as the framing, clock source, bandwidth limit, whether scrambling is enabled, the national bit, the international bits, and DSU mode configured on the interface. Also displayed is the performance statistics for the current interval and last 15-minute interval and whether any alarms exist.

**Examples**

The following is a sample output display form the **show controllers serial** command on the Cisco 4000:

```
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 0xFFFFFFF, status=0x30, max_buffer_size=0, packet_size=0
XID/Test RX desc at 0xFFFFFFF, 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, runs=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

```

The following is a sample output display from the **show controllers serial** command for a PA-E3 serial port installed in slot 2:

```

Router# show controllers serial 2/0
M1T-E3 pa: show controller:
PAS unit 0, subunit 0, f/w version 2-55, rev ID 0x2800001, version 2
idb = 0x6080D54C, ds = 0x6080F304, ssb=0x6080F4F4
Clock mux=0x30, ucnd_ctrl=0x0, port_status=0x1
Serial config=0x8, line config=0x1B0202
maxdgram=4474, bufpool=128Kb, 256 particles

rxLOS inactive, rxLOF inactive, rxAIS inactive

```

```

txAIS inactive, rxRAI inactive, txRAI inactive

line state: up
E3 DTE cable, received clockrate 50071882

base0 registers=0x3D000000, base1 registers=0x3D002000
mxt_ds=0x608BA654, rx ring entries=128, tx ring entries=256
rxring=0x4B01F480, rxr shadow=0x6081081C, rx_head=26
txring=0x4B01F960, txr shadow=0x60810E48, tx_head=192, tx_tail=192, tx_count=0
throttled=0, enabled=0, disabled=0
rx_no_eop_err=0, rx_no_stp_err=0, rx_no_eop_stp_err=0
rx_no_buf=0, rx_soft_overnrun_err=0, dump_err= 1
tx_underrun_err=0, tx_soft_underrun_err=0, tx_limited=0
tx_fullring=0, tx_started=11504
  Framing is g751, Clock Source is Line, Bandwidth limit is 34010.
  Scrambling is enabled
  National Bit is 0, International Bits are: 0 0
  DSU mode 1
  Data in current interval (213 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation
    0 P-bit Err Secs, 0 P-bit Severely Err Secs
    0 Severely Err Framing Secs, 0 Unavailable Secs
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
  Total Data (last 24 hours)
    0 Line Code Violations, 0 P-bit Coding Violation,
    0 C-bit Coding Violation,
    0 P-bit Err Secs, 0 P-bit Severely Err Secs,
    0 Severely Err Framing Secs, 0 Unavailable Secs,
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

No alarms detected.

PIO A: 639, PIO B: 303, Gapper register: 50DE
Framer register information:
reg 0: E0      reg 1: 0      reg 2: 0      reg 3: 0
reg 4: 0      reg 5: 8      reg 6: 0      reg 7: 0

```

The following is a sample output display from the **show controllers serial** command that shows serial port 1/0/0 on a 1-port PA-T3 serial port adapter installed on a VIP2 in chassis slot 1:

```

Router# show controllers serial 2/0/1

Serial1/0/0 -
  Mx T3(1) HW Revision 0x3, FW Revision 2.55
  Framing is c-bit, Clock Source is Line
  Bandwidth limit is 35000, DSU mode 1, Cable length is 50

  Data in current interval (325 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation
    0 P-bit Err Secs, 0 P-bit Sev Err Secs
    0 Sev Err Framing Secs, 0 Unavailable Secs
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Sev Err Secs
  Total Data (last 24 hours)
    0 Line Code Violations, 0 P-bit Coding Violation,
    0 C-bit Coding Violation,
    0 P-bit Err Secs, 0 P-bit Sev Err Secs,
    0 Sev Err Framing Secs, 0 Unavailable Secs,
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Sev Err Secs

No alarms detected.

```

# show controllers t1

To display information about the T1 links or to display the hardware and software driver information for the T1 controller, use the **show controllers t1** command in privileged EXEC mode.

## Cisco 7500 Series

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

## Cisco 4000 Series

**show controllers t1** *number*

## Cisco AS5800 Access Servers

**show controller t1** *dial-shelf/slot/t3-port:t1-num*

### Syntax Description

|                   |                                                                                                                                                       |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot/port</i>  | (Optional) Backplane slot number and port number on the interface. Refer to your hardware installation manual for the specific slot and port numbers. |
| <i>number</i>     | Network processor number (NPM)) number, in the range 0 through 2.                                                                                     |
| <i>dial-shelf</i> | Dial shelf chassis in the Cisco AS5800 access server containing the CT3 interface card.                                                               |
| <i>slot</i>       | Location of the CT3 interface card in the dial shelf chassis.                                                                                         |
| <i>t3-port</i>    | T3 port number. The only valid value is 0.                                                                                                            |
| <i>:t1-num</i>    | T1 time slot in the T3 line. The value can be from 1 to 28.                                                                                           |

### Command Modes

Privileged EXEC

### Command History

| Release  | Modification                                                                     |
|----------|----------------------------------------------------------------------------------|
| 11.0     | This command was introduced.                                                     |
| 12.0(3)T | This command was modified to include support for the Cisco AS5800 access server. |

### Usage Guidelines

#### Cisco 7500 Series and Cisco 4000 Series Routers

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.

The NPM or 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.

### Examples

#### Cisco 7500 Series and Cisco 4000 Series Routers

The following is a sample output display from the **show controllers t1** command on the Cisco 7500 series routers:

```
Router# show controllers t1
```

```
T1 4/1 is up.
No alarms detected.
Framing is ESF, Line Code is AMI, Clock Source is line
Data in current interval (0 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 79 15 minute intervals):
  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 25 describes the fields shown in the display.

**Table 25** *show controller 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, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                 |
| No alarms detected.                            | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| 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 Zeros (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 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                                  | Degraded Minute is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3.                                                                                                                                                                                                                                                                                                                       |



**Table 25** *show controller t1 Field Descriptions (continued)*

| Field             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.<br><br>For D4 and E1-noCRC links, the presence of Bipolar Violations also triggers an Errored Second.                                                                                                                                                                                       |
| Bursty Err Secs   | 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.<br><br>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.<br><br>For E1-noCRC signals, a second with 2048 Line Code Violations or more.<br><br>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      | Count of the total number of seconds on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Cisco AS5800 Access Server**

The following example shows the status of the T1 controllers connected to the Cisco AS5800 access servers:

```
Router# show controllers t1
T1 1/0/0:1 is up.
No alarms detected.
Framing is ESF, Line Code is AMI, Clock Source is Line.
Data in current interval (770 seconds elapsed):
    5 Line Code Violations, 8 Path Code Violations
    0 Slip Secs, 0 Fr Loss Secs, 7 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 7 Unavail Secs
Total Data (last 81 15 minute intervals):
    7 Line Code Violations, 4 Path Code Violations,
    6 Slip Secs, 20 Fr Loss Secs, 2 Line Err Secs, 0 Degraded Mins,
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 2 Unavail Secs
T1 1/0/1:5 is down.
Transmitter is sending remote alarm.
Receiver has loss of frame.
Framing is SF, Line Code is AMI, Clock Source is Line.
Data in current interval (770 seconds elapsed):
    50 Line Code Violations, 5 Path Code Violations
    0 Slip Secs, 7 Fr Loss Secs, 7 Line Err Secs, 0 Degraded Mins
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 7 Unavail Secs
Total Data (last 81 15 minute intervals):
    27 Line Code Violations, 22 Path Code Violations,
    0 Slip Secs, 13 Fr Loss Secs, 13 Line Err Secs, 0 Degraded Mins,
    0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 13 Unavail Secs
Router#
```

Table 26 describes the fields shown in the display.

**Table 26** *show controllers t1 Field Descriptions*

| Field                                     | Description                                                                                                                                                                           |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 ... is up                              | Status of T1 line.                                                                                                                                                                    |
| No alarms detected                        | Access server received no alarms.                                                                                                                                                     |
| Framing is ...                            | Standard T1 framing type. In this example, the framing is Extended Super Frame (ESF).                                                                                                 |
| Line Code is ...                          | Standard T1 line-coding format. In this example, the line-coding format is Alternate Mark Inversion (AMI).                                                                            |
| Clock Source is ...                       | Source of the synchronization signal (clock). In this example, the line is providing the clock signal.                                                                                |
| Data in current interval ...              | Summary statistics for T1 signal quality for the current time interval of 900 seconds. In this example, the statistics are for current partial interval (770 seconds of 900 seconds). |
| Line Code Violations                      | Number of T1 line code violations for the current interval.                                                                                                                           |
| Path Code Violations                      | Number of T1 path code violations for the current interval.                                                                                                                           |
| Slip Secs                                 | Number of seconds in this interval during which a frame misalignment occurred.                                                                                                        |
| Fr Loss Secs                              | Number of seconds in this interval during which frame loss occurred.                                                                                                                  |
| Line Err Secs                             | Number of seconds in this interval during which line errors occurred.                                                                                                                 |
| Degraded Mins                             | Number of minutes in this interval during which the signal quality was degraded.                                                                                                      |
| Errored Secs                              | Number of seconds in this interval during which an error was reported.                                                                                                                |
| Bursty Err Secs                           | Number of bursty error seconds in this interval.                                                                                                                                      |
| Severely Err Secs                         | Number of severely errored seconds in this interval.                                                                                                                                  |
| Unavail Secs                              | Number of unavailable seconds in this interval.                                                                                                                                       |
| Total Data (last ... 15 minute intervals) | Summary statistics for T1 signal quality for 15-minute intervals. Every 24 hours (96 intervals) the counters in this data block clear.                                                |

# show controllers t1 bert

To get the results of the bit-error rate testing (BERT) run for all ports, use the **show controllers t1 bert** command in privileged EXEC mode.

**show controllers** {*type*} [*controller-number*] [**bert**]

|                    |                          |                                                                                                                                                 |
|--------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>type</i>              | Specify either T1 or E1 facility.                                                                                                               |
|                    | <i>controller-number</i> | (Optional) Select a specific controller/port numbers. The range is 0 to 7. If not selected, the display will show all ports.                    |
|                    | <b>bert</b>              | (Optional) Type <b>bert</b> to get a specific display for the BERT results. Otherwise, the display will include all other non-BERT information. |

**Defaults** No default behavior or values.

**Command Modes** Privileged EXEC

|                 |                |                              |
|-----------------|----------------|------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>          |
|                 | 12.0(2)XD      | This command was introduced. |
|                 | 12.0(3)T       | This command was modified.   |

**Usage Guidelines** Use the **show controllers** command to display the results of the BERT feature.

**Examples** The following example shows how the **show controllers** command is used to display the BERT status for all ports:

```
Router# show controllers t1 bert
Controller T1 0 Profile default : The Test was aborted by User
Controller T1 0 Profile 2 : Test Never Ran
Controller T1 1 Profile 3 : Test Never Ran
Controller T1 1 Profile 3 : Test Failed with a BER of 10^-2
Controller T1 2 Profile 3 : Current running, BER 0
Controller T1 2 Profile 2 : Passed with a BER of 0
Controller T1 3 Profile default : Test Never Ran
Controller T1 3 Profile 2 : Test Never Ran
Controller T1 4 Profile default : Test Never Ran
Controller T1 4 Profile 2 : Test Never Ran
Controller T1 5 Profile default : Test Never Ran
Controller T1 5 Profile 2 : Test Never Ran
Controller T1 6 Profile default : Test Never Ran
Controller T1 6 Profile 2 : Test Never Ran
Controller T1 7 Profile default : Test Never Ran
Controller T1 7 Profile 2 : Test Never Ran
```

The following example shows how the output display was limited to that of only one T1 port, port 0.

```
Router# show controllers t1 0 bert
Controller T1 0 Profile default : The Test was aborted by User
Controller T1 0 Profile 2 : Test Never Ran
```

# show controllers t3

To display information about the T3 links and to display the hardware and software driver information for the T3 controller, use the **show controllers t3** command in privileged EXEC mode.

**Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 Series, Cisco 3725, and Cisco 3745 Routers**

**show controllers t3** *slot/port* [**brief** | **tabular**]

**Cisco 7200 Series Routers**

**show controllers t3** [*bay/port[/t1-channel]*] [**brief** | **errors** | **tabular** | **remote performance** [**brief** | **tabular**]]

**Cisco 7500 Series Routers**

**show controllers t3** [*slot/bay/port[/t1-channel]*] [**brief** | **errors** | **tabular** | **remote performance** [**brief** | **tabular**]]

**Cisco AS5800 Access Servers**

**show controllers t3** *dial-shelf/slot/t3-port*

| Syntax                    | Description                                                                                                                                                                         |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>               | Slot number. Refer to the appropriate hardware manual for slot information.                                                                                                         |
| <i>/port</i>              | Port number. Refer to the appropriate hardware manual for port information.                                                                                                         |
| <i>port-adapter</i>       | (Optional) Port adapter number. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                          |
| <i>/bay</i>               | (Optional) The port-adaptor-bay number. Refer to the appropriate hardware manual for bay information                                                                                |
| <i>/t1-channel</i>        | (Optional) Number between 1 and 28 that represents the T1 channel for the Channelized T3 Interface Processor (CT3IP) on Cisco 7200 series and Cisco 5200 series routers.            |
| <i>dial-shelf</i>         | Dial shelf chassis in the Cisco AS5800 access server that contains the CT3 interface card.                                                                                          |
| <i>/slot</i>              | Location of the CT3 interface card in the dial shelf chassis.                                                                                                                       |
| <i>/t3-port</i>           | T3 port number. The only valid value is 0.                                                                                                                                          |
| <b>brief</b>              | (Optional) Displays a subset of information.                                                                                                                                        |
| <b>errors</b>             | (Optional) Displays a history of alarm events that causes a T3 controller or a T1 controller of a T3 to transition from an Up state to a Down state. The history size is 18 events. |
| <b>tabular</b>            | (Optional) Displays information in a tabular format.                                                                                                                                |
| <b>remote performance</b> | (Optional) Displays the far-end ANSI performance monitor information when enabled on the T1 channel with the <b>t1 fdl ansi</b> controller configuration command.                   |

**Command Modes** Privileged EXEC

## Command History

| Release    | Modification                                                                                                                                                                                             |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.3       | This command was introduced.                                                                                                                                                                             |
| 12.0(3)T   | This command was implemented on the Cisco AS5800 access server.                                                                                                                                          |
| 12.2(11)YT | This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers. |
| 12.2(15)T  | This command was integrated into Cisco IOS Release 12.2(15)T.                                                                                                                                            |
| 12.2(19c)  | This command was modified to display error throttling and alarm conditions that cause the T3 controller to enter a failure state.                                                                        |

## Usage Guidelines

## Cisco 7500 Series Routers

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.

By using the **errors** keyword, this command displays history that identifies which alarm events caused a T3 or T1 controller of a T3 to go down for the Cisco 7500 and Cisco 7200 series routers.



## Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based numbering scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

The **show controllers t3** command also displays Maintenance Data Link (MDL) information (received strings) if MDL is configured and framing is set to C-bit.

## Examples

## Cisco 7200 Series Routers

The following is partial output from the **show controllers t3 errors** command for Cisco IOS Release 12.2(19c) for a specific T1 controller of a T3 on a Cisco 7200 series router with a bay/port of 4/1, displaying the T1 1 alarm event of OOF:

```
Router# show controllers t3 4/1/1 errors
```

```
T3 4/1: Error Log Information
present alarm: NONE
Error: AIS
17:28:08-17:29:18
T1 1 Error Log Information
present alarm: OOF
Since 17:30:55
Error: OOF
17:30:09-17:30:46
```

The following is partial output from the **show controllers t3 errors** command from Cisco IOS Release 12.2(19c) for a T3 controller on a Cisco 7200 series router with a bay/port of 4/1, displaying a history of all alarm events on all 28 T1 channels:

```
Router# show controllers t3 4/1 errors
```

```
T3 4/1: Error Log Information
present alarm: NONE
Error: AIS
17:28:08-17:29:18
```

```
T1 1 Error Log Information
present alarm: OOF
Since 17:30:55
Error: OOF
17:30:09-17:30:46
T1 2 Error Log Information
present alarm: NONE
T1 3 Error Log Information
present alarm: NONE
T1 4 Error Log Information
present alarm: NONE
T1 5 Error Log Information
present alarm: NONE
T1 6 Error Log Information
present alarm: NONE
T1 7 Error Log Information
present alarm: NONE
T1 8 Error Log Information
present alarm: NONE
T1 9 Error Log Information
present alarm: NONE
T1 10 Error Log Information
present alarm: NONE
T1 11 Error Log Information
present alarm: NONE
T1 12 Error Log Information
present alarm: NONE
T1 13 Error Log Information
present alarm: NONE
.
.
.
```

### Cisco 7500 Series Routers

The following is partial output from the **show controllers t3 errors** command from Cisco IOS Release 12.2(19c) for a T3 controller with a slot/bay/port of 1/4/1, displaying a history of all alarm events on all 28 T1 channels:

Router# **show controllers t3 1/4/1 errors**

```
T3 1/4/1: Error Log Information
present alarm: NONE
Error: AIS
17:28:08-17:29:18
T1 1 Error Log Information
present alarm: OOF
Since 17:30:55
Error: OOF
17:30:09-17:30:46
T1 2 Error Log Information
present alarm: NONE
T1 3 Error Log Information
present alarm: NONE
T1 4 Error Log Information
present alarm: NONE
T1 5 Error Log Information
present alarm: NONE
.
.
.
```

The following is partial output from the **show controllers t3 errors** command from Cisco IOS Release 12.2(19c) for a specific T1 controller of a T3 on a Cisco 7200 series router with a bay/port of 4/1, displaying the T1 1 alarm event of OOF:

```
Router# show controllers t3 4/1/1 errors
T3 4/1: Error Log Information
present alarm: NONE
Error: AIS
17:28:08-17:29:18
T1 1 Error Log Information
present alarm: OOF
Since 17:30:55
Error: OOF
17:30:09-17:30:46
.
.
.
```

[Table 27](#) describes the error field shown in the display.

**Table 27** *show controllers t3 Error Field Description*

| Field | Description                                                                                                                                                                                                                                                                                         |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIS   | alarm indication signal. In a T1 transmission, an all-ones signal transmitted in lieu of the normal signal to maintain transmission continuity and to indicate to the receiving terminal that there is a transmission fault that is located either at, or upstream from, the transmitting terminal. |
| RAI   | remote alarm indication. Indicates a yellow alarm from the remote end of the T1 transmission.                                                                                                                                                                                                       |
| OOF   | out of frame. An OOF defect is detected when any three or more errors in sixteen or fewer consecutive F-bits occur.                                                                                                                                                                                 |
| LOS   | loss of signal. A loss of signal occurs when n consecutive zeros is detected on an incoming signal.                                                                                                                                                                                                 |
| NONE  | No error is detected.                                                                                                                                                                                                                                                                               |

The following is partial output from the **show controllers t3** command from Cisco IOS Release 12.2(19c):

```
Router# show controllers t3 2/1/0
T3 2/1/0 is down. Hardware is 2CT3 single wide port adapter
CT3 H/W Version:0.2.2, CT3 ROM Version:1.0, CT3 F/W Version:2.5.1
FREEDM version:1, reset 0 resurrect 0
Applique type is Channelized T3
Transmitter is sending remote alarm.
Receiver has loss of signal.
FEAC code received:No code is being received
Framing is M23, Line Code is B3ZS, Clock Source is Internal
Rx-error throttling on T1's ENABLED
Rx throttle total 0, equipment customer loopback
Data in current interval (545 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  545 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 1:
```



```

    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    900 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 2:
<snip>

```

The following is partial output from the **show controllers t3** command from Cisco IOS Release 12.2(19c) for the T1 channel of the T3 controller:

```

Router# show controllers t3 2/1/0 /1
T3 2/1/0 is down.  Hardware is 2CT3 single wide port adapter
CT3 H/W Version:0.2.2, CT3 ROM Version:1.0, CT3 F/W Version:2.5.1
FREEDM version:1, reset 0 resurrect 0

T1 1 is down
timeslots:1-24
FDL per AT&T 54016 spec.
Receiver has loss of signal.
Framing is ESF, Clock Source is Internal
Data in current interval (0 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, 0 Stuffed Secs

```

The following is partial output from the **show controllers t3** command:

```

Router# show controllers t3 3/0/0

T3 3/0/0 is up.
CT3 H/W Version: 4, CT3 ROM Version: 0.116, CT3 F/W Version: 0.10.0
Mx H/W version: 2, Mx ucode ver: 1.24
Applique type is Channelized T3
No alarms detected.
FEAC code received: No code is being received
Framing is M23, Line Code is B3ZS, Clock Source is Internal.
Ext1: LOS, Ext2: LOS, Ext3: LOS, Test: OK
Data in current interval (39 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation
    0 P-bit Err Secs, 0 P-bit Severely Err Secs
    0 Severely Err Framing Secs, 0 Unavailable Secs
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Total Data (last 1 15 minute intervals):
    0 Line Code Violations, 0 P-bit Coding Violation,
    0 C-bit Coding Violation,
    0 P-bit Err Secs, 0 P-bit Severely Err Secs,
    0 Severely Err Framing Secs, 0 Unavailable Secs,
    0 Line Errored Secs, 0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
.
.
.
T1 1 is down, speed: 1536 kbs, non-inverted data
timeslots: 1-24
FDL per ANSI T1.403 and AT&T 54016 spec.
Configured for FDL Remotely Line Looped
No alarms detected.
Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
BERT test result (running)
    Test Pattern: All 0's, Status: Sync, Sync Detected: 1
    Interval: 4 minute(s), Tim Remain: 4 minute(s)

```

```

Bit Errors (Sync BERT Started): 0 bits
Bit Errors (Sync last Sync): 0 bits, Bits Received: 7 Mbits

```

The following is partial output from the **show controllers t3 brief** command:

```
Router# show controllers t3 3/0/0 brief
```

```

T3 3/0/0 is up.
  CT3 H/W Version: 4, CT3 ROM Version: 0.116, CT3 F/W Version: 0.10.0
  Mxt H/W version: 2, Mxt ucode ver: 1.24
  Applique type is Channelized T3
  No alarms detected.
  FEAC code received: No code is being received
  Framing is M23, Line Code is B3ZS, Clock Source is Internal.
  Ext1: LOS, Ext2: LOS, Ext3: LOS, Test: OK

T1 1 is up, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per ANSI T1.403 and AT&T 54016 spec.
  Configured for FDL Remotely Line Looped
  No alarms detected.
  Framing is ESF, LineCode is B8ZS, Clock Source is Internal.
  BERT test result (done)
    Test Pattern: All 0's, Status: Not Sync, Sync Detected: 1
    Interval: 4 minute(s), Tim Remain: 0 minute(s)
    Bit Errors(Sync BERT Started): 0 bits
    Bit Errors(Sync last Sync): 0 bits, Bits Received: 368 Mbits
.
.
.

```

The following is partial output from the **show controllers t3 tabular** command:

```
Router# show controllers t3 3/0/0 tabular
```

```

T3 3/0/0 is up.
  CT3 H/W Version: 4, CT3 ROM Version: 1.2, CT3 F/W Version: 2.1.0
  Mx H/W version: 2, Mx ucode ver: 1.25
  Applique type is Channelized T3
  No alarms detected.
  MDL transmission is disabled

  FEAC code received: No code is being received
  Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Internal.
  Ext1: AIS, Ext2: LOS, Ext3: LOS, Test: LOS
  INTERVAL      LCV   PCV   CCV   PES   PSES  SEFS   UAS   LES   CES   CSES
08:56-09:11      0     0     0     0     0     0     0     0     0     0
08:41-08:56      0     0     0     0     0     0     0     0     0     0
08:26-08:41      0     0     0     0     0     0     0     0     0     0
Total            0     0     0     0     0     0     0     0     0     0
.
.
.

T1 2 is up, speed: 1536 kbs, non-inverted data
  timeslots: 1-24
  FDL per AT&T 54016 spec.
  No alarms detected.
  Framing is ESF, Line Code is B8ZS, Clock Source is Internal.
  INTERVAL      LCV   PCV   CSS   SELS   LES   DM    ES   BES   SES   UAS   SS
08:56-09:11      0     0     0     0     0     0     0     0     0     0     0
08:41-08:56      0     0     0     0     0     0     0     0     0     0     0
08:26-08:41      0     0     0     0     0     0     0     0     0     0     0
Total            0     0     0     0     0     0     0     0     0     0     0

```

The following output shows a controller with a high number of errors on the line, thus showing a throttle count (RX throttles).

```
Router# show controllers t3 6/0/0 tabular
```

```
T1 2 is up
timeslots: 1-24
FDL per AT&T 54016 spec.
No alarms detected.
Framing is ESF, Clock Source is Line, Rx throttles 47
INTERVAL      LCV   PCV   CSS   SELS   LES    DM    ES    BES    SES    UAS  SS
07:48-07:53    0     0     0     0     0     0    0     0     0     0    0
```

The following is partial output from the **show controllers t3 remote performance** command. This information is available if the **t1 fdl ansi** controller configuration command is enabled for a T1 channel on a CT3IP.

```
Router# show controllers t3 3/0/0 remote performance
```

```
T3 3/0/0 is up.
CT3 H/W Version: 4, CT3 ROM Version: 0.116, CT3 F/W Version: 20.2.0
Mx H/W version: 2, Mx ucode ver: 1.25

T1 1 - Remote Performance Data
Data in current interval (356 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
Data in Interval 1:
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Data in Interval 2:
  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 2 15 minute intervals):
  1 Path Code Violations
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
.
.
.
```

Table 28 describes the fields shown in the display.

**Table 28** *show controllers t3 Field Descriptions—Cisco 7500 Series*

| Field           | Description                                                                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3 3/0/0 is up  | T3 controller in slot 3 is operating. The controller's state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped). |
| CT3 H/W Version | Version number of the hardware.                                                                                                                                                 |
| CT3 ROM Version | Version number of the ROM.                                                                                                                                                      |
| CT3 F/W Version | Version number of the firmware.                                                                                                                                                 |

**Table 28** *show controllers t3 Field Descriptions—Cisco 7500 Series (continued)*

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mx H/W version      | Hardware version number of the HDLC controller chip.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Mx ucode ver        | Microcode version of the HDLC controller chip.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Applique type       | Controller type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| No alarms detected  | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul>                                                                                                                |
| MDL transmission    | Status of the Maintenance Data Link (either enabled or disabled).                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| FEAC code received  | Whether or not a far-end alarm code request is being received. Possible values are as follows: <ul style="list-style-type: none"> <li>• DS3 Eqpt. Failure (SA)</li> <li>• DS3 LOS/HBER</li> <li>• DS3 Out-of-Frame</li> <li>• DS3 AIS Received</li> <li>• DS3 IDLE Received</li> <li>• DS3 Eqpt. Failure (NSA)</li> <li>• Common Eqpt. Failure (NSA)</li> <li>• Multiple DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure</li> <li>• Single DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure (NSA)</li> <li>• No code is being received</li> </ul> |
| Framing             | Framing type on the CT3IP. Values are M23, C-Bit, and Auto-detect.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Line Code           | Line coding format on the CT3IP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Clock Source        | Clock source on the CT3IP. Values are internal or line.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| RX-error throttling | Indicates that error throttling is enabled. The <b>error throttling</b> command disables the T1 level clock in order to stop receiving error data packets on a T1 controller. If any single interface receives a burst of errors over a short duration, such as 400 errors in 100 milliseconds, the T1 clock will be turned off for a period of 100 milliseconds.                                                                                                                                                                    |

**Table 28** *show controllers t3 Field Descriptions—Cisco 7500 Series (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RX throttles                                  | The presence of the throttle count indicates that there are many input errors on lines. On the CT3 PA, the T1 is throttled when there are a number of input errors on an interface (400 errors in 100 milliseconds). The T1 is throttled even if one of the interfaces on it sees continuous errors. The 1-second periodic process checks for throttled interfaces and unthrottles them back.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| BERT test result                              | <p>BERT test information is available if the <b>t1 bert</b> controller configuration command is enabled for the T1 channel on the CT3IP. The BERT results include the following information:</p> <ul style="list-style-type: none"> <li>• Test Pattern—Type of test pattern selected.</li> <li>• Status—Status of the test.</li> <li>• Sync Detected—Number of times the pattern synch is detected (that is, the number of times the pattern goes from No Sync to Sync).</li> <li>• Interval—Duration selected.</li> <li>• Tim Remain—Time remaining on the BERT test.</li> <li>• Bit Errors (Sync BERT Started)—Number of bit errors during the BERT test.</li> <li>• Bit Errors (Sync last Sync)—Number of bit errors since the last pattern sync was detected.</li> <li>• Bits Received—Total bits received.</li> </ul> <p>When the T1 channel has a BERT test running, the line state is DOWN. Also, when the BERT test is running and the Status field is Not Sync, the information in the total bit errors field is not valid. When the BERT test is done, the Status field is not relevant.</p> |
| Data in current interval (39 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                          | Line Code Violations (LCVs) is a count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| P-bit Coding Violation                        | For all DS3 applications, a P-bit coding violation (PCV) error event is a P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| C-bit Coding Violation                        | For C-bit parity and SYNTRAN DS3 applications, the C-bit coding violation (CCV) is the count of coding violations reported via the C-bits. For C-bit parity, it is the count of CP-bit parity errors that occur during the accumulation interval. For SYNTRAN, it is a count of CRC-9 errors that occur during the accumulation interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Table 28** *show controllers t3 Field Descriptions—Cisco 7500 Series (continued)*

| Field                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P-bit Err Secs                           | P-bit errored seconds (PES) is a second with one or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.                                                                                                                                                                                                                         |
| P-bit Severely Err Secs                  | P-bit severely errored seconds (PSES) is a second with 44 or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.                                                                                                                                                                                                                |
| Severely Err Framing Secs                | Severely errored framing seconds (SEFS) is a second with one or more out-of-frame defects or a detected incoming AIS.                                                                                                                                                                                                                                                                                                    |
| Unavailable Secs                         | The number of unavailable seconds (UAS) is calculated by counting the number of seconds for which the interface is unavailable. For more information, refer to RFC 1407, <i>DS3 MIB Variables</i> .                                                                                                                                                                                                                      |
| Line Errored Secs                        | Line errored seconds (LES) is a second in which one or more code violations or one or more LOS defects occurred.                                                                                                                                                                                                                                                                                                         |
| C-bit Errored Secs                       | C-bit errored seconds (CES) is a second with one or more C-bit code violations (CCV), one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.                                                                                                                                                                                                                 |
| C-bit Severely Errored Secs              | C-bit severely errored seconds (CSES) is a second with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.                                                                                                                                                                                                                               |
| Total Data (last 1 15 minute intervals)  | Shows the last 15-minute accumulation period.                                                                                                                                                                                                                                                                                                                                                                            |
| T1 1 is up                               | T1 channel is operating. The channel's state can be up, down, or administratively down. Loopback conditions are shown by (Locally Looped) or (Remotely Looped).                                                                                                                                                                                                                                                          |
| speed                                    | Speed of the T1 channel, in kbps.                                                                                                                                                                                                                                                                                                                                                                                        |
| non-inverted data                        | Indicates if the T1 channel is configured for inverted data.                                                                                                                                                                                                                                                                                                                                                             |
| timeslots                                | Time slots assigned to the T1 channel.                                                                                                                                                                                                                                                                                                                                                                                   |
| FDL per ANSI T1.403 and AT&T 54016 spec. | Performance monitoring is via Facility Data Link per ANSI T1.403 and AT&T standard specification number 54016.                                                                                                                                                                                                                                                                                                           |
| No alarms detected                       | Any alarms detected by the T1 controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> |
| Framing                                  | Type of framing used on the T1 channel. Values are ESF or SF.                                                                                                                                                                                                                                                                                                                                                            |
| Line Code                                | Type of line coding used on the T1 channel. Values are B8ZS or AMI.                                                                                                                                                                                                                                                                                                                                                      |
| Clock Source                             | Clock source on the T1 channel. Values are internal or line.                                                                                                                                                                                                                                                                                                                                                             |

**Table 28** *show controllers t3 Field Descriptions—Cisco 7500 Series (continued)*

| Field                | Description                                                                                                                                                                                                                                                                                                                                                         |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Path Code Violations | Path coding violation (PCV) error event is a frame synchronization bit error in the D4 and E1-no-CRC formats or a CRC error in the ESF and E1-CRC formats.                                                                                                                                                                                                          |
| Slip Secs            | Controlled slip second (CSS) is a 1-second interval that contains one or more controlled slips.                                                                                                                                                                                                                                                                     |
| Fr Loss Secs         | Frame loss seconds (SELS) is the number of seconds for which an out-of-frame 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        | Degraded minute (DM) is a minute in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3. For more information, refer to RFC 1406, <i>Definitions of Managed Objects for DS1 and E1 Interface Types</i> .                                                                                                                                           |
| Errored Secs         | Errored seconds (ES) is a second with one or more path coding violations, one or more out-of-frame defects, or one or more controlled slip events or a detected AIS defect.                                                                                                                                                                                         |
| Bursty Err Secs      | Bursty errored seconds (BES) is a second with fewer than 320 and more than one path coding violation error events, no severely errored frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.                                                                                                                    |
| Severely Err Secs    | Severely errored seconds (SES) is a second with 320 or more path code violation errors events, one or more out-of-frame defects, or a detected AIS defect.                                                                                                                                                                                                          |
| Unavailable Secs     | Number of seconds during which the interface was not available in this interval. Referred to as UAS.                                                                                                                                                                                                                                                                |
| Stuffed Secs         | Stuffed seconds (SS) is a second in which one more bit stuffings take place. This happens when the Pulse Density Enforcer detects a potential violation in the output stream and inserts a 1 to prevent it. Such bit stuffings corrupt user data and indicate that the network is configured incorrectly. This counter can be used to help diagnose this situation. |

**Cisco AS5800 Access Servers**

The following example shows the summary status of the T3 controller located in shelf 1, slot 4, port 0:

```
Router# show controllers t3 1/4/0 brief
```

```
T3 1/4/0 is up.
  Applique type is Channelized T3
  No alarms detected.
  MDL transmission is disabled

FEAC code received: Multiple DS1 LOS/HBER
Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Line.
Data in current interval (491 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  0 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
```

```

Total Data (last 80 15 minute intervals):
    3 Line Code Violations, 4 P-bit Coding Violation,
    2 C-bit Coding Violation, 0 P-bit Err Secs,
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,
    2 Unavailable Secs, 0 Line Errored Secs,
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

```

The following example shows the detailed status of the T3 controller connected to the Cisco AS5800 in shelf 1, slot 4, port 0. Notice that the detailed information shows the last eighty-six 15-minute time periods.

```
Router# show controllers t3 1/4/0
```

```

T3 1/4/0 is up.
Applique type is Channelized T3
No alarms detected.
MDL transmission is disabled

FEAC code received: Multiple DS1 LOS/HBER
Framing is C-BIT Parity, Line Code is B3ZS, Clock Source is Line.
Data in current interval (91 seconds elapsed):
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 1:
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 2:
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 3:
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Data in Interval 4:
    0 Line Code Violations, 0 P-bit Coding Violation
    0 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    0 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
.
.
.

Data in Interval 86:
    3 Line Code Violations, 4 P-bit Coding Violation
    2 C-bit Coding Violation, 0 P-bit Err Secs
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
    2 Unavailable Secs, 0 Line Errored Secs
    0 C-bit Errored Secs, 0 C-bit Severely Errored Secs
Total Data (last 86 15 minute intervals):
    3 Line Code Violations, 4 P-bit Coding Violation,
    2 C-bit Coding Violation, 0 P-bit Err Secs,
    0 P-bit Severely Err Secs, 0 Severely Err Framing Secs,

```



```

2 Unavailable Secs, 0 Line Errored Secs,
0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

```

Table 29 describes the fields shown in the display.

**Table 29** *show controllers t3 Field Descriptions—Cisco AS5800*

| Field              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T3 1/4/0 is up     | T3 controller connected to this Cisco AS5800 access server in shelf 1, slot 4, port 0 is up. The controller's state can be up, down, or administratively down. Loopback conditions are shown by Locally Looped or Remotely Looped.                                                                                                                                                                                                                                                                                                   |
| Applique type      | Describes the type of controller.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| No alarms detected | Any alarms detected by the controller are displayed here. Possible alarms are as follows: <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending alarm indication signal (AIS).</li> <li>• Receiver has loss of signal (LOS).</li> <li>• Receiver is getting AIS.</li> <li>• Receiver has loss of frame (LOF).</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul>                                                                          |
| MDL transmission   | Maintenance Data Link status (either enabled or disabled). Used for carrying performance information and control signals across the network toward the far-end T3 unit. It is the counterpart of Facility Data Link (FDL) in a T1 link.                                                                                                                                                                                                                                                                                              |
| FEAC code received | Whether or not a far-end alarm code request is being received. Possible values are as follows: <ul style="list-style-type: none"> <li>• DS3 Eqpt. Failure (SA)</li> <li>• DS3 LOS/HBER</li> <li>• DS3 Out-of-Frame</li> <li>• DS3 AIS Received</li> <li>• DS3 IDLE Received</li> <li>• DS3 Eqpt. Failure (NSA)</li> <li>• Common Eqpt. Failure (NSA)</li> <li>• Multiple DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure</li> <li>• Single DS1 LOS/HBER</li> <li>• DS1 Eqpt. Failure (NSA)</li> <li>• No code is being received</li> </ul> |
| Framing            | Standard T3 framing type: M23, C-Bit, or Auto-detect.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Line Code          | Standard T3 line-coding format. In this example, the line-coding format is bipolar 3-zero substitution (B3ZS).                                                                                                                                                                                                                                                                                                                                                                                                                       |

**Table 29** *show controllers t3 Field Descriptions—Cisco AS5800 (continued)*

| Field                                             | Description                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Clock Source                                      | The source of the synchronization signal (clock): line or internal. In this example, the line is providing the clock signal.                                                                                                                                                                                                    |
| Data in current interval<br>(... seconds elapsed) | Summary statistics for T3 signal quality for the current time interval of 900 seconds (15 minutes). In this example, the statistics are for current partial interval. Statistics roll into the 24-hour accumulation buffer every 15 minutes. The oldest 15-minute period falls off the back of the 24-hour accumulation buffer. |
| Line Code Violations                              | Count of both Bipolar Violations (BPVs) and Excessive Zeros (EXZs) that occur over the accumulation period. An EXZ increments the Line Code Violations (LCVs) by one regardless of the length of the zero string.                                                                                                               |
| P-bit Coding Violation                            | P-bit parity error event. A P-bit parity error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally calculated code. Referred to as PCV.                                                                                                                      |
| C-bit Coding Violation                            | Count of coding violations reported via the C-bits. For C-bit parity, it is the count of CP-bit parity errors that occur during the accumulation interval. Referred to as CCV.                                                                                                                                                  |
| P-bit Err Secs                                    | Number of seconds with one or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.                                                                                                                                                      |
| P-bit Severely Err Secs                           | Number of seconds with 44 or more PCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when unavailable seconds are counted.                                                                                                                                                       |
| Severely Err Framing Secs                         | Number of a seconds with one or more out-of-frame defects or a detected incoming AIS.                                                                                                                                                                                                                                           |
| Unavailable Secs                                  | Number of seconds during which the interface was not available in this interval. Referred to as UAS.                                                                                                                                                                                                                            |
| Line Errored Secs                                 | Number of seconds in this interval during which one or more code violations or one or more LOS defects occurred. Referred to as LES.                                                                                                                                                                                            |
| C-bit Errored Secs                                | Number of seconds with one or more C-bit code violations (CCV), one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted. Referred to as CES.                                                                                                                          |
| C-bit Severely Errored Secs                       | Number of seconds with 44 or more CCVs, one or more out-of-frame defects, or a detected incoming AIS. This gauge is not incremented when UASs are counted.                                                                                                                                                                      |
| Total Data (last ... 15 minute intervals)         | Summary statistics for T3 signal quality for 15-minute intervals. Every 24 hours (96 intervals) the counters in this data block clear.                                                                                                                                                                                          |

# show controllers token

To display information about memory management and error counters on the Token Ring Interface Processor (exTRIP) for the Cisco 7500 series routers, use the **show controllers token** command in privileged EXEC mode.

## show controllers token

### Syntax Description

This command has no arguments or keywords.

### Command Modes

Privileged EXEC

### Command History

| Release  | Modification                                                                               |
|----------|--------------------------------------------------------------------------------------------|
| 10.0     | This command was introduced.                                                               |
| 11.3(3)T | The information was modified to include the PA-4R-FDX full-duplex Token Ring port adapter. |

### Usage Guidelines

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

### Examples

The following is sample output from the **show controllers token** command on the Cisco 7500:

```
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 runs 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 30 describes the significant fields shown in the display.

**Table 30** *show controllers token Field Descriptions for the Cisco 7500 Series*

| Field            | Description                                                                                                                                                                                                                                             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tokenring4/0     | Interface processor type, slot, and port.                                                                                                                                                                                                               |
| Last Ring Status | Last abnormal ring condition. Can be any of the following: <ul style="list-style-type: none"> <li>• Signal Loss</li> <li>• HW Removal</li> <li>• Remote Removal</li> <li>• Counter Overflow</li> <li>• Only station</li> <li>• Ring Recovery</li> </ul> |

The following is an example on the PA-4R-DTR from the **show controllers token** command:

```

Router #show controllers token 4/0

Interface TokenRing4/0 state: up
Data from IDB:
  Current MAC address: 0008.2a36.1a04, Burned in MAC address: 0008.2a36.1a04
  Group address: 80000000
  Functional address: 08000000, enables: CDP
  Ring mode: 0000, enables:

Last Ring Status: none
  Stats: soft: 0/0, hard: 0/0, sig loss: 0/0, throttle: 0/0
        tx beacon: 0/0, wire fault 0/0, recovery: 0/0
        only station: 0/0, remote removal: 0/0
Interface failures: 0

```

The current operating mode can be one of the following: classic Token Ring station (standard half-duplex Token Ring station), DTR station (full-duplex Token Ring station), and DTR concentrator (concentrator port). In this case, the current operating mode is classic Token Ring station:

```

Current operating mode:
Classic token ring station

```

The MAC state indicates the state of the Token Ring MAC layer protocol. The state can be not inserted (not connected to any ring), inserting (currently entering a ring), and inserted (connected to an active Token Ring):

```
MAC state: inserted
Duplex: half
Access protocol: TKP
Ring speed: 16 Mbps
Ring monitor role: Standby monitor
```

Internal controller data:

```
MAC microcode version: 0.240
Hawkeye ASIC revision: 0
Node address: 0008.2a36.1a04
Functional address: 08000000, Group address: 80000000
Hawkeye ASIC registers:
  last hisr: 0004h, himr: 00002ABFh, inpace: 0000h
  utility: 6316h, txphthre: 1010h, rxtxdmathre: 2828h
  dmactrl: 0000E004h, earlyrxthre: 0000h, llcstop: 0000h
  reset: 0000h
  txhidescstart: 4B0A45C0h, txlodescstart: 00000000h
  rxdescstart: 4B0A4180h, srbctrl: 0038h, descipoll: 0100h
  congestcnt: 0000h
```

Hawkeye transmit error counts:

```
Underrun: 0/0
```

Hawkeye receive error counts:

```
Out of descriptors: 0/0, Giants: 0/0
Corrupted frames: 0/0, CRC errors: 0/0
FIFO overflow: 0/0
```

Device driver ring buffer data:

```
Transmit ring:
  Descriptors outstanding (curr/max): 0/256
  Head pointer: 7   Tail pointer: 7
Receive ring:
  Ring size: 64 descriptors
  Head pointer: 7
```

Internal controller soft error counts:

```
Line errors: 0/0, Internal errors: 0/0
Burst errors: 0/0, ARI/FCI errors: 0/0
Abort errors: 0/0, Lost frame errors: 0/0
Copy errors: 0/0, Receiver congestion: 0/0
Token errors: 0/0, Frequency errors: 0/0
```

Internal controller SMT state:

```
Adapter MAC:      0008.2a36.1a04, Physical drop:      00000000
NAUN address:     0060.3ebb.0a21, NAUN drop:           00000000
Last beacon src: 0000.0000.0000, Last poll:           0060.3ebb.0a21
Last MVID:        0006, Last attn code:               0000
Txmit priority:   0007, Auth funct class:             FFFF
Monitor error:    0000, Front end errors:             0000
Correlator:       0000, Soft error timer:             00C8
Local ring:       0000, Ring status:                  0000
Beacon rcv type: 0000, Beacon txmit type:             0000
Last beacon type: 0000, Bcn station NAUN:             0000.0000.0000
Beacon drop:      00000000, Phantom support:         0000
```

```
Access prot req: 0000, Access prot resp:             0000
Policy flags:     0110, Protocol event state: 000D
Ctrl ring state: 0001, Protocol join state:          0000
Reserved:         0000, Protocol mon state:          0000
```

The following is sample output from the **show controllers token** command for a Token Ring interface in a full-duplex port mode:

Router# **show controllers token**

Interface TokenRing4/1 state: up

Data from IDB:

Current MAC address: 0008.2a36.1a84, Burned in MAC address: 0008.2a36.1a84

Group address: 80000000

Functional address: 08000000, enables: CDP

Ring mode: 0000, enables:

Last Ring Status: none

Stats: soft: 0/0, hard: 0/0, sig loss: 0/0, throttle: 0/0

tx beacon: 0/0, wire fault 0/0, recovery: 0/0

only station: 0/0, remote removal: 0/0

Interface failures: 0

Current operating mode:

DTR concentrator

MAC state: port open, station connected

Mode: port

Duplex: full

Access protocol: TXI

Ring speed: 16 Mbps

Ring monitor role: Standby monitor

Internal controller data:

MAC microcode version: 0.240

Hawkeye ASIC revision: 0

Node address: 0008.2a36.1a84

Functional address: 08000000, Group address: 80000000

Hawkeye ASIC registers:

last hisr: 0008h, himr: 00002ABFh, inpace: 0000h

utility: 6316h, txphthre: 1010h, rxtxdmathre: 2828h

dmactrl: 0000E004h, earlyrxthre: 0000h, llcstop: 0000h

reset: 0000h

txhidescstart: 4B0A5A40h, txlodescstart: 00000000h

rxdescstart: 4B0A5600h, srbctrl: 0038h, descipoll: 0100h

congestcnt: 0000h

Hawkeye transmit error counts:

Underrun: 0/0

Hawkeye receive error counts:

Out of descriptors: 0/0, Giants: 0/0

Corrupted frames: 0/0, CRC errors: 0/0

FIFO overflow: 0/0

Device driver ring buffer data:

Transmit ring:

Descriptors outstanding (curr/max): 0/256

Head pointer: 5 Tail pointer: 5

Receive ring:

Ring size: 64 descriptors

Head pointer: 2

Internal controller soft error counts:

Line errors: 0/0, Internal errors: 0/0

Burst errors: 0/0, ARI/FCI errors: 0/0

Abort errors: 0/0, Lost frame errors: 0/0

Copy errors: 0/0, Receiver congestion: 0/0

Token errors: 0/0, Frequency errors: 0/0

Internal controller SMT state:

Adapter MAC: 0008.2a36.1a84, Physical drop: 00000000

NAUN address: 0008.2a36.1a44, NAUN drop: 00000000

Last beacon src: 0000.0000.0000, Last poll: 0000.0000.0000

Last MVID: 0006, Last attn code: 0000

Txmit priority: 0007, Auth funct class: FFFF

```

Monitor error: 0000,      Front end errors: 0000
Correlator:    0000,      Soft error timer: 00C8
Local ring:    0000,      Ring status:      0000
Beacon rcv type: 0000,    Beacon txmit type: 0000
Last beacon type:0000,    Bcn station NAUN: 0000.0000.0000
Beacon drop:   00000000,  Phantom support:   0001
Access prot req: 0002,    Access prot resp: 0000
Policy flags:  0590,      Protocol event state:000D
Ctrl ring state: 0001,    Protocol join state: 0007
Reserved:      0000,      Protocol mon state: 0002
    
```

#### Related Commands

| Command                                   | Description                                                                                 |
|-------------------------------------------|---------------------------------------------------------------------------------------------|
| <a href="#">show interfaces tokenring</a> | Displays information about the Token Ring interface and the state of source-route bridging. |
| <a href="#">show source-bridge</a>        | Displays the current source bridge configuration and miscellaneous statistics.              |

# show controllers vg-anylan

To display the controller information for the 100VG-AnyLAN port adapter on Cisco 7200 series routers and Cisco 7500 series routers, use the **show controllers vg-anylan** command in user EXEC mode.

## Cisco 7500 Series with VIP Cards

**show controllers vg-anylan** *slot**port-adapter**port*

## Cisco 7200 Series

**show controllers vg-anylan** *slot**port*

|                    |                     |                                                                                                                                         |
|--------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>slot</i>         | Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>port-adapter</i> | Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |
|                    | <i>port</i>         | Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |

|               |           |
|---------------|-----------|
| Command Modes | User EXEC |
|---------------|-----------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 11.3    | This command was introduced. |

|                  |                                                                                                                   |
|------------------|-------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | The information displayed is generally useful for diagnostic tasks performed by technical support personnel only. |
|------------------|-------------------------------------------------------------------------------------------------------------------|

|          |                                                                                    |
|----------|------------------------------------------------------------------------------------|
| Examples | The following is sample output from the <b>show controllers vg-anylan</b> command: |
|----------|------------------------------------------------------------------------------------|

```
Router> show controllers vg-anylan 3/0

Interface VG-AnyLAN3/0
Hardware is MC68852
mc68852_ds=0x60A4C930, registers=0x3C300000, ib=0x4B056240
rx ring entries=31, tx ring entries=31
rxring=0x4B056340, rxr shadow=0x60A4CA08, rx_head=0, rx_tail=0
txring=0x4B057180, txr shadow=0x60A4D07C, tx_head=0, tx_tail=2,
tx_count=2,

MC68852 Registers:
hw_id: 5048, hw_id & page: 7053, opr1=0x26, opr2=0x2C, opr3=0x00
Page 0 - Performance:
isr=0x3400, imr=0x0A0A, flreg=0x0000
xfrcf=0xC07E0080, rxcnt=0, txcnt=1F
Page 1 - MAC Address/Hash Table:
addrlow= 6009B9, addrhigh=9B1809B9,hash bytes=06 00 20 00 00 00 00 00
```



```
Page 2 - Hardware Mapping:
mmmsw=0x3785, mmlsw=0x0000, bmreg =0x04
Page 4 - LAN Configuration:
tccnf1=0x00, tccnf2=0x01
vccnf=0x99, vtrrg=0x0020, valow1=0x0000, valow2=0x0000
maccr1=0xBE, maccr2=0x00, maccr3=0x04, maccr4=0x03
Page 5 - MMU Registers:
rx mem stop addr=0xFF03, tx mem stop addr=0xFF07
MC68852 PCI registers:
bus_no=6, device_no=0
CFID=0x0005101A, CFCS=0x02800005, CFRV=0x02000000, CFLT=0x0000F800
CBIO=0x00006001, CBMA=0x00000000, CFIT=0x20080100, CFDA=0x0000000C

Actel Hardware CAM Control Registers:
CAM DEVICE BASE: 0x3C300800 Register Address: 0x3C300C00
CSR: 0x8000 CAMCR: 0xFFFF
USAR: 0000 MSAR: 0000 LSAR: 0000
FIFOCR: 0x8000 WRMASK: 0x0080
COMPARAND REG: 0000.0000.0000
PERSISTENT SOURCE: 0x0 PERSISTENT DEST: 0xFD010000
ACTEL CAM PCI registers:
bus_no=6, device_no=1
CFID=0x555511AA, CFCS=0x04800003, CFRV=0xF0F0F001, CFLT=0x00000000
CBIO=0x00006800, CBMA=0x00000000, CFIT=0x00000000, CFDA=0x00000000
pak_to_host=0x0, filtered_pak=0
throttled=0, enabled=0, disabled=0
tx_carrier_loss=0
fatal_tx_err=0, mult_ovfl=0
```

# show diag

To display hardware information for the networking device, use the **show diag** command in EXEC or privileged EXEC mode.

**show diag** [*slot*]

## Syntax Description

*slot* (Optional) Slot number of the interface.

## Command Modes

EXEC  
Privileged EXEC

## Command History

| Release   | Modification                                                                                                             |
|-----------|--------------------------------------------------------------------------------------------------------------------------|
| 11.1 CA   | This command was introduced.                                                                                             |
| 11.2 P    | This command was modified to update the example for PA-12E/2FE port adapter, PA-E3 port adapter, and PA-T3 port adapter. |
| 11.3 XA   | This command was incorporated into Cisco IOS Release 11.3 XA.                                                            |
| 12.0(5)XQ | This command was enhanced and introduced on the Cisco 1750 router.                                                       |
| 12.0(7)T  | This command was integrated into Cisco IOS Release 12.0(7)T and implemented on the Cisco 1750 router.                    |
| 12.2      | This command was implemented on the Cisco AS5300.                                                                        |

## Usage Guidelines

This command displays information for the EEPROM, the motherboard, and the WAN interface cards (WICs) and voice interface cards (VICs). Use this command to determine the type of port adapter installed on a second-generation Versatile Interface Processor (VIP2) in your router.



### Note

The enhancement to display the field replaceable unit (FRU) number in **show diag** command output is not available in all Cisco IOS releases and not all Cisco devices and Cisco network modules will display their FRU numbers.

Examples of output showing the FRU number are included in the Examples section.

### Cisco 7304 Router Usage Guidelines

For the Cisco 7304 router, this command applies to NSEs, line cards, MSCs, and SPAs.

- To display hardware information for an NSE, line card, or MSC in the specified slot, use the *slot-number* argument. For MSCs, information about the MSC and each of its installed SPAs is displayed.
- To display hardware information about the backplane, power supplies, and fan modules, use the **chassis** keyword.

### Shared Port Adapter Usage Guidelines

- To display hardware information for an MSC or SIP only in a specified slot, use the *slot-number* argument.
- To display hardware information for a SPA only, use the **show diag subslot** *slot/subslot* version of this command.

## Examples

### Example for a 1-Port T3 Serial Port Adapter on the Cisco 7200 Series Router

The following is sample output from the **show diag** command for a 1-port T3 serial port adapter in chassis slot 1 on a Cisco 7200 series router:

```
Router# show diag 1

Slot 1:
  Physical slot 1, ~physical slot 0xE, logical slot 1, CBus 0
  Microcode Status 0x4
  Master Enable, LED, WCS Loaded
  Board is analyzed
  Pending I/O Status: None
  EEPROM format version 1
  VIP2 controller, HW rev 2.4, board revision D0
  Serial number: 04372053 Part number: 73-1684-03
  Test history: 0x00 RMA number: 00-00-00
  Flags: cisco 7000 board; 7500 compatible

  EEPROM contents (hex):
    0x20: 01 15 02 04 00 42 B6 55 49 06 94 03 00 00 00 00
    0x30: 68 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

  Slot database information:
  Flags: 0x4 Insertion time: 0x14A8 (5d02h ago)

  Controller Memory Size: 16 MBytes DRAM, 1024 KBytes SRAM

  PA Bay 0 Information:
    T3 Serial PA, 1 ports
    EEPROM format version 1
    HW rev FF.FF, Board revision UNKNOWN
    Serial number: 4294967295 Part number: 255-65535-255
```

### Example Output from a Cisco 7200 Showing the FRU Number

The following is sample output from the **show diag** command on a Cisco 7200 series router showing the FRU number:

```
Router# show diag

Slot 0:
  Dual FastEthernet (RJ-45) I/O Card Port adapter, 2 ports
  Port adapter is analyzed
  Port adapter insertion time 6d02h ago
  EEPROM contents at hardware discovery:
  Hardware Revision      : 2.1
  Top Assy. Part Number  : 800-07114-06
  Part Number            : 73-5003-06
  Board Revision         : B0
  PCB Serial Number      : 31558694
  RMA History             : 00
  Fab Version            : 03
  Fab Part Number        : 28-3455-03
  Product (FRU) Number   : C7200-I/O-2FE/E
  Deviation Number       : 0-0
```

```

EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF 40 02 15 41 02 01 C0 46 03 20 00 1B CA 06
  0x10: 82 49 13 8B 06 42 42 30 C1 8B 33 31 35 35 38 36
  0x20: 39 34 00 00 00 04 00 02 03 85 1C 0D 7F 03 CB 8F
  0x30: 43 37 32 30 30 2D 49 2F 4F 2D 32 46 45 2F 45 80
  0x40: 00 00 00 00 FF FF FF FF FF FF FF FF FF FF FF FF
  0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
Router#

```

### Examples for a Cisco 12000 Series Internet Router

The following is sample output from the **show diag** command on a Cisco 12000 series Internet router:

```

Router# show diag 3

SLOT 3  (RP/LC 3 ): 4 Port Packet Over SONET OC-3c/STM-1 Multi Mode
  MAIN: type 33,  00-0000-00 rev 70 dev 0
      HW config: 0x01      SW key: 00-00-00
  PCA:  73-2147-02 rev 94 ver 2
      HW version 1.0  S/N 04499695
  MBUS: MBUS Agent (1)  73-2146-05 rev 73 dev 0
      HW version 1.1  S/N 04494882
      Test hist: 0x00      RMA#: 00-00-00      RMA hist: 0x00
  DIAG: Test count: 0x05000001      Test results: 0x00000000
  MBUS Agent Software version 01.27 (RAM) using CAN Bus A
  ROM Monitor version 00.0D
  Fabric Downloader version used 00.0D (ROM version is 00.0D)
  Board is analyzed
  Board State is Line Card Enabled (IOS  RUN )
  Insertion time: 00:00:10 (00:04:51 ago)
  DRAM size: 33554432 bytes
  FrFab SDRAM size: 67108864 bytes
  ToFab SDRAM size: 16777216 bytes

```

The following is sample output from the **show diag** command with the **summary** keyword:

```

Router# show diag summary

SLOT 0  (RP/LC 0 ): Route Processor
SLOT 2  (RP/LC 2 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 4  (RP/LC 4 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 7  (RP/LC 7 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 9  (RP/LC 9 ): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 11 (RP/LC 11): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
SLOT 16 (CSC 0 ): Clock Scheduler Card
SLOT 17 (CSC 1 ): Clock Scheduler Card
SLOT 18 (SFC 0 ): Switch Fabric Card
SLOT 19 (SFC 1 ): Switch Fabric Card
SLOT 20 (SFC 2 ): Switch Fabric Card
SLOT 24 (PS A1 ): AC Power Supply
SLOT 26 (PS B1 ): AC Power Supply
SLOT 28 (TOP FAN ): Blower Module
SLOT 29 (BOT FAN ): Blower Module

```

The following is sample output from the **show diag** command with the **details** keyword:

```

Router# show diag 4 details

SLOT 4  (RP/LC 4): 4 Port Packet Over SONET OC-3c/STM-1 Single Mode
  MAIN: type 33,  800-2389-01 rev 71 dev 16777215
      HW config: 0x00      SW key: FF-FF-FF
  PCA:  73-2275-03 rev 75 ver 3

```

```

HW version 1.1 S/N 04529465
MBUS: MBUS Agent (1) 73-2146-06 rev 73 dev 0
HW version 1.1 S/N 04541395
Test hist: 0xFF RMA#: FF-FF-FF RMA hist: 0xFF
DIAG: Test count: 0x05000001 Test results: 0x00000000
EEPROM contents (hex):
00: 01 00 01 00 49 00 08 62 06 03 00 00 00 FF FF FF
10: 30 34 35 34 31 33 39 35 FF FF FF FF FF FF FF FF
20: 01 01 00 00 00 00 00 FF FF FF FF FF FF FF FF
30: A5 FF A5 A5 A5 A5 FF A5 A5 A5 A5 A5 A5 A5 A5
40: 00 21 01 01 00 49 00 08 E3 03 05 03 00 01 FF FF
50: 03 20 00 09 55 01 01 FF FF FF 00 FF FF FF FF FF
60: 30 34 35 32 39 34 36 35 FF FF FF FF FF FF FF FF
70: FF FF FF FF FF FF FF FF 05 00 00 01 00 00 00 00
MBUS Agent Software version 01.24 (RAM)
Fabric Downloader version 00.0D
Board is analyzed
Flags: 0x4
Board State is Line Card Enabled (IOS RUN)
Insertion time: 00:00:10 (00:04:51 ago)
DRAM size: 33554432 bytes
FrFab SDRAM size: 67108864 bytes
ToFab SDRAM size: 16777216 bytes

```

### Example for an ATM SAR AIM in a Cisco 3660

The following is sample output from the **show diag** command for one ATM Segmentation and Reassembly (SAR) AIM in a Cisco 3660 router:

```

Router# show diag 0

3660 Chassis type: ENTERPRISE

c3600 Backplane EEPROM:
  Hardware Revision      : 1.0
  Top Assy. Part Number  : 800-04740-02
.
.
.
ATM AIM: 1
  ATM AIM module with SAR only (no DSPs)
  Hardware Revision      : 1.0
  Top Assy. Part Number  : 800-03700-01
  Board Revision         : A0
  Deviation Number       : 0-0
  Fab Version            : 02
  PCB Serial Number      : JAB9801ABCD

```

### Example Output from a Cisco 3660 Showing the FRU Number

The following is sample output from the **show diag** command on a Cisco 3660 router that shows the FRU numbers for slots 0 and 1:

```

Router# show diag
3660 Chassis type: ENTERPRISE
3660 Backplane EEPROM:
  Hardware Revision      : 1.0
  Top Assy. Part Number  : 800-04740-02
  Board Revision         : C0
  Deviation Number       : 0-0
  Fab Version            : 02
  PCB Serial Number      : HAD04471U36
  RMA Test History       : 00
  RMA Number             : 0-0-0-0

```

## show diag

```

RMA History           : 00
Chassis Serial Number : JAB055180FF
Chassis MAC Address   : 0007.ebea.4460
MAC Address block size : 112
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Fab Part Number       : 28-2651-02
Number of Slots       : 6
EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF 40 00 C8 41 01 00 C0 46 03 20 00 12 84 02
  0x10: 42 43 30 80 00 00 00 00 02 02 C1 8B 48 41 44 30
  0x20: 34 34 37 31 55 33 36 03 00 81 00 00 00 00 04 00
  0x30: C2 8B 4A 41 42 30 35 35 31 38 30 46 46 C3 06 00
  0x40: 07 EB EA 44 60 43 00 70 C4 08 00 00 00 00 00 00
  0x50: 00 00 85 1C 0A 5B 02 01 06 FF FF FF FF FF FF FF
  0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## Slot 0:

```

C3600 Mother board 2FE(TX) Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
PCB Serial Number       : JAB05460CSV
Processor type          : 34
Top Assy. Part Number   : 800-04737-04
Board Revision          : C0
Fab Part Number         : 28-3234-02
Deviation Number        : 65535-65535
Manufacturing Test Data : FF FF FF FF FF FF FF FF
RMA Number              : 255-255-255-255
RMA Test History        : FF
RMA History             : FF
Field Diagnostics Data  : FF FF FF FF FF FF FF FF
Product (FRU) Number    : Leopard-2FE
EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF C1 8B 4A 41 42 30 35 34 36 30 43 53 56 09
  0x10: 34 40 00 B3 C0 46 03 20 00 12 81 04 42 43 30 85
  0x20: 1C 0C A2 02 80 FF FF FF FF C4 08 FF FF FF FF FF
  0x30: FF FF FF 81 FF FF FF FF 03 FF 04 FF C5 08 FF FF
  0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## Slot 1:

```

Mueslix-4T Port adapter, 4 ports
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware revision 1.1      Board revision D0
Serial number      17202570    Part number      800-02314-02
FRU Part Number:  NM-4T=

Test history      0x0          RMA number      00-00-00
EEPROM format version 1
EEPROM contents (hex):
  0x00: 01 54 01 01 01 06 7D 8A 50 09 0A 02 00 00 00 00
  0x10: 68 00 00 00 99 11 21 00 00 05 FF FF FF FF FF FF

```

Router#

**Example for an NM-AIC-64 Installed in a Cisco 2611**

The following is sample output from the **show diag** command for a Cisco 2611 router with the NM-AIC-64 installed.

```
Router# show diag

Slot 0:
C2611 2E Mainboard Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware Revision : 2.3
PCB Serial Number : JAD044808SG (1090473337)
Part Number : 73-2840-13
RMA History : 00
RMA Number : 0-0-0-0
Board Revision : C0
Deviation Number : 0-0
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 00 92 41 02 03 C1 18 4A 41 44 30 34 34
0x10: 38 30 38 53 47 20 28 31 30 39 30 34 37 33 33 33
0x20: 37 29 82 49 0B 18 0D 04 00 81 00 00 00 00 42 43
0x30: 30 80 00 00 00 00 FF FF FF FF FF FF FF FF FF
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Slot 1:
NM_AIC_64 Port adapter, 3 ports
Port adapter is analyzed
Port adapter insertion time unknown
EEPROM contents at hardware discovery:
Hardware Revision : 1.0
Part Number : 74-1923-01
Board Revision : 02
PCB Serial Number : DAN05060012
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 02 55 41 01 00 82 4A 07 83 01 42 30 32
0x10: C1 8B 44 41 4E 30 35 30 36 30 30 31 32 FF FF FF
0x20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

[Table 31](#) describes significant fields shown in the display.

**Table 31** *show diag (AIC) Field Descriptions*

| Field                                    | Description                                 |
|------------------------------------------|---------------------------------------------|
| C2611 2E Mainboard Port adapter, 2 ports | Line card type; number of ports available.  |
| Port adapter is analyzed                 | The system has identified the port adapter. |
| Port adapter insertion time              | Elapsed time since insertion.               |
| Hardware Revision                        | Version number of the port adapter.         |

**Table 31** *show diag (AIC) Field Descriptions*

| Field                 | Description                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| PCB Serial Number     | Serial number of the printed circuit board.                                                                                           |
| Part Number           | Part number of the port adapter.                                                                                                      |
| RMA History           | Counter that indicates how many times the port adapter has been returned and repaired.                                                |
| RMA Number            | Return material authorization number, which is an administrative number assigned if the port adapter needs to be returned for repair. |
| Board Revision        | Revision number (signifying a minor revision) of the port adapter.                                                                    |
| Deviation Number      | Revision number (signifying a minor deviation) of the port adapter.                                                                   |
| EEPROM format version | Version number of the EEPROM format.                                                                                                  |
| EEPROM contents (hex) | Dumps of EEPROM programmed data.                                                                                                      |

**Example for an AIM-VPN in a Cisco 2611XM**

The following example shows how to obtain hardware information about an installed AIM-VPN on the Cisco 2611XM router.

```
Router# show diag 0
```

```
Encryption AIM 1:
```

```

Hardware Revision      :1.0
Top Assy. Part Number  :800-03700-01
Board Revision         :A0
Deviation Number       :0-0
Fab Version            :02
PCB Serial Number      :JAB9801ABCD
RMA Test History       :00
RMA Number             :0-0-0-0
RMA History            :00
EEPROM format version 4
EEPROM contents (hex):
0x00:04 FF 40 03 0B 41 01 00 C0 46 03 20 00 0E 74 01
0x10:42 41 30 80 00 00 00 00 02 02 C1 8B 4A 41 42 39
0x20:38 30 31 41 42 43 44 03 00 81 00 00 00 00 04 00
0x30:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x40:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x50:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```



Table 32 describes significant fields shown in the display.

**Table 32** *show diag (AIM-VPN) Field Descriptions*

| Field                 | Description                                                                                                                           |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Hardware Revision     | Version number of the port adapter.                                                                                                   |
| Top Assy. Part Number | Part number of the port adapter.                                                                                                      |
| Board Revision        | Revision number (signifying a minor revision) of the port adapter.                                                                    |
| Deviation Number      | Revision number (signifying a minor deviation) of the port adapter.                                                                   |
| PCB Serial Number     | Serial number of the printed circuit board.                                                                                           |
| RMA Number            | Return material authorization number, which is an administrative number assigned if the port adapter needs to be returned for repair. |
| RMA History           | Counter that indicates how many times the port adapter has been returned and repaired.                                                |
| EEPROM format version | Version number of the EEPROM format.                                                                                                  |
| EEPROM contents (hex) | Dumps of EEPROM programmed data.                                                                                                      |

#### Example for an MSC-100 on the Cisco 7304 Router

The following is sample output from the **show diag slot-number** version of the command for an MSC-100 located in slot number 4 on a Cisco 7304 router. Information about the MSC is followed by information for its associated SPAs:

```
Router# show diag 4
Slot 4:
  7304-MSC-100 SPA Carrier Card Line Card
  Line Card state: Active
  Insertion time: 00:08:49 ago
  Bandwidth points: 4000000
  EEPROM contents at hardware discovery:
  Hardware Revision      : 0.18
  Boot Time out          : 0000
  PCB Serial Number      : CSJ07288905
  Part Number            : 73-8789-01
  Board Revision         : A0
  Fab Version            : 02
  RMA Test History       : 00
  RMA Number             : 0-0-0-0
  RMA History            : 00
  Deviation Number       : 0-0
  Product Number         : 7304-MSC-100
  Top Assy. Part Number  : 68-1163-04
  Manufacturing Test Data : 00 00 00 00 00 00 00 00
  Field Diagnostics Data : 00 00 00 00 00 00 00 00
  Calibration Data       : Minimum: 0 dBmV, Maximum: 0 dBmV
    Calibration values :
  EEPROM format version 4
  EEPROM contents (hex):
    0x00: 04 FF 40 04 50 41 00 12 46 00 00 C1 8B 43 53 4A
    0x10: 30 37 32 38 38 39 30 35 82 49 22 55 01 42 41 30
    0x20: 02 02 03 00 81 00 00 00 00 04 00 80 00 00 00 00
    0x30: CB 94 37 33 30 34 2D 4D 53 43 2D 31 30 30 20 20
    0x40: 20 20 20 20 20 20 87 44 04 8B 04 C4 08 00 00 00
    0x50: 00 00 00 00 00 C5 08 00 00 00 00 00 00 00 00 C8
    0x60: 09 00 00 00 00 00 00 00 00 00 C7 7C F6 44 3F 30
    0x70: 00 00 00 00 00 00 00 00 00 00 00 00 02 EE FF C8
```

```

0x80: C8 37 26 05 DC 64 28 1E 37 26 09 C4 64 32 28 32
0x90: DD 0C E4 64 32 28 43 24 2E E0 AA 82 64 F4 24 00
0xA0: 00 00 00 00 00 00 F0 2E FF FF FF FF FF FF FF
0xB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0xC0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0xD0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0xE0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0xF0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x100: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x110: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x120: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x130: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x140: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x150: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x160: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x170: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x180: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x190: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1A0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1B0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1C0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1D0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1E0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x1F0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
FPGA information:
  Current FPGA version      : 00.23
  IOS bundled FPGA version  : 00.23
  CPLD version              : 01.02

```

```

Subslot 4/1:
  Shared port adapter: SPA-4FE-7304, 4 ports
  State: ok
  Insertion time: 00:15:13 ago
  Bandwidth: 400000 kbps
  EEPROM contents:

```

### Examples for Shared Port Adapters on the Cisco 7304 Router

The following is sample output from the **show diag subslot** command for a 4-Port 10/100 Fast Ethernet SPA located in the bottom subslot (1) of the MSC that is installed in slot 4 on a Cisco 7304 router:

```

Router# show diag subslot 4/1
Subslot 4/1:
  Shared port adapter: SPA-4FE-7304, 4 ports
  Info: hw-ver=0x100, sw-ver=0x0 fpga-ver=0x0
  State: ok
  Insertion time: 23:20:42 ago
  Bandwidth: 400000 kbps
  EEPROM contents:
  Hardware Revision       : 1.0
  Boot Time out          : 0190
  PCB Serial Number      : JAB073204G5
  Part Number            : 73-8717-03
  73/68 Level Revision   : 01
  Fab Version            : 02
  RMA Test History       : 00
  RMA Number             : 0-0-0-0
  RMA History            : 00
  Deviation Number       : 0
  Product Number         : SPA-4FE-7304
  Product Version Id     : V01
  Top Assy. Part Number  : 68-2181-01
  73/68 Level Revision   : A0
  CLEI Code              : CNS9420AAA

```

```

Base MAC Address      : 0000.0000.0000
MAC Address block size : 1024
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00 00 00 00 00
                       : 00 00 00 00
Calibration Data      : Minimum: 0 dBmV, Maximum: 0 dBmV
  Calibration values :
Power Consumption      : 160000mW max
  Mode 1 : 0mW
  Mode 2 : 0mW
  Mode 3 : 0mW
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 04 35 41 01 00 46 01 90 C1 8B 4A 41 42
0x10: 30 37 33 32 30 34 47 35 82 49 22 0D 03 8A 30 31
0x20: 20 20 02 02 03 00 81 00 00 00 00 04 00 88 00 00
0x30: 00 00 CB 94 53 50 41 2D 34 46 45 2D 37 33 30 34
0x40: 20 20 20 20 20 20 20 20 89 56 30 31 20 87 44 08
0x50: 85 01 8A 41 30 20 20 C6 8A 43 4E 53 39 34 32 30
0x60: 41 41 41 CF 06 00 00 00 00 00 00 00 43 04 00 C4 08
0x70: 00 00 00 00 00 00 00 00 C5 08 00 00 00 00 00 00
0x80: 00 00 F4 00 64 00 00 00 00 00 00 00 00 00 00 00
0x90: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xA0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xB0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xC0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xD0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xE0: 00 00 00 00 00 00 00 00 00 00 C8 09 00 00 00 00
0xF0: 00 00 00 00 D7 08 3E 80 00 00 00 00 00 00 F3 00
0x100: 41 01 08 F6 48 43 34 F6 49 44 35 02 31 04 B0 B4
0x110: A0 8C 00 00 05 DC 64 46 32 00 00 07 08 64 46 32
0x120: 00 00 09 C4 64 46 32 00 00 0C E4 64 46 32 00 00
0x130: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FE 02
0x140: F2 A6 FF FF FF FF FF FF FF FF FF FF FF FF FF
0x150: CC A0 00 00 00 00 00 00 00 00 00 00 00 00 00
0x160: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x170: 00 00 D4 A0 00 00 00 00 00 00 00 00 00 00 00
0x180: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x190: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1A0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1C0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1E0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
FPGA version:
  Software version : 04.17
  Hardware version : 04.17

```

The following is sample output from the **show diag subslot** command for a 2-Port 10/100/1000 Gigabit Ethernet SPA located in the top subslot (0) of the MSC that is installed in slot 4 on a Cisco 7304 router:

```
Router# show diag subslot 4/0
Subslot 4/0:
  Shared port adapter: SPA-2GE-7304, 2 ports
  Info: hw-ver=0x17, sw-ver=0x0 fpga-ver=0x0
  State: ok
  Insertion time: 00:08:47 ago
  Bandwidth: 2000000 kbps
  EEPROM contents:
    Hardware Revision      : 0.23
    Boot Time out         : 0190
    PCB Serial Number     : JAB073406YH
    Part Number           : 73-8792-02
    73/68 Level Revision  : 01
    Fab Version           : 02
    RMA Test History      : 00
    RMA Number            : 0-0-0-0
    RMA History           : 00
    Deviation Number      : 0
    Product Number        : SPA-2GE-7304
    Product Version Id    : V01
    Top Assy. Part Number : 68-2181-01
    73/68 Level Revision  : A0
    CLEI Code             : CNS9420AAA
    Base MAC Address      : 0000.0000.0000
    MAC Address block size : 1024
    Manufacturing Test Data : 00 00 00 00 00 00 00 00 00
    Field Diagnostics Data : 00 00 00 00 00 00 00 00 00
    Field Diagnostics Data : 00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00 00 00 00 00 00
                           00 00 00 00
  Calibration Data       : Minimum: 0 dBmV, Maximum: 0 dBmV
    Calibration values :
  Power Consumption      : 160000mW max
    Mode 1 : 0mW
    Mode 2 : 0mW
    Mode 3 : 0mW
  EEPROM format version 4
  EEPROM contents (hex):
    0x00: 04 FF 40 04 36 41 00 17 46 01 90 C1 8B 4A 41 42
    0x10: 30 37 33 34 30 36 59 48 82 49 22 58 02 8A 30 31
    0x20: 20 20 02 02 03 00 81 00 00 00 00 04 00 88 00 00
    0x30: 00 00 CB 94 53 50 41 2D 32 47 45 2D 37 33 30 34
    0x40: 20 20 20 20 20 20 20 20 89 56 30 31 20 87 44 08
    0x50: 85 01 8A 41 30 20 20 C6 8A 43 4E 53 39 34 32 30
    0x60: 41 41 41 CF 06 00 00 00 00 00 00 43 04 00 C4 08
    0x70: 00 00 00 00 00 00 00 00 C5 08 00 00 00 00 00 00
    0x80: 00 00 F4 00 64 00 00 00 00 00 00 00 00 00 00 00
    0x90: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    0xA0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    0xB0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
    0xC0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```

0xD0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0xE0: 00 00 00 00 00 00 00 00 00 00 C8 09 00 00 00 00
0xF0: 00 00 00 00 D7 08 3E 80 00 00 00 00 00 00 F3 00
0x100: 41 01 08 F6 48 43 34 F6 49 44 35 02 31 03 E8 B4
0x110: A0 8C 37 26 05 DC 64 46 32 37 26 07 08 64 46 32
0x120: 37 26 09 C4 64 46 32 32 DD 0C E4 64 46 32 43 24
0x130: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FE 02
0x140: EF E2 FF FF FF FF FF FF FF FF FF FF FF FF FF
0x150: CC A0 00 00 00 00 00 00 00 00 00 00 00 00 00
0x160: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x170: 00 00 D4 A0 00 00 00 00 00 00 00 00 00 00 00
0x180: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x190: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1A0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1B0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1C0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1D0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1E0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
0x1F0: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
FPGA version:
Software version : 04.17
Hardware version : 04.17

```

### Examples for a Shared Port Adapter on a Cisco 12000 Series Router

The following is sample output from the **show diag subslot** command for the 1-Port OC-192c/STM-64c POS/RPR XFP SPA in subslot 1 of the SIP located in chassis slot 1 on a Cisco 12000 series router:

```

Router# show diag subslot 1/1
SUBSLOT 1/1 (SPA-OC192POS-XFP): 1-port OC192/STM64 POS/RPR XFP Optics Shared Port Adapter
  Product Identifier (PID) : SPA-OC192POS-XFP
  Version Identifier (VID) : V01
  PCB Serial Number       : PRTA1304061
  Top Assy. Part Number   : 68-2190-01
  Top Assy. Revision      : A0
  Hardware Revision       : 2.0
  CLEI Code               : UNASSIGNED
  Insertion Time          : 00:00:10 (13:14:17 ago)
  Operational Status      : ok

```

[Table 33](#) describes the significant fields shown in the display.

**Table 33** *show diag subslot Field Descriptions*

| Field                    | Description                                                        |
|--------------------------|--------------------------------------------------------------------|
| Product Identifier (PID) | Product number of the SPA.                                         |
| Version Identifier (VID) | Version number of the SPA.                                         |
| PCB Serial Number        | Serial number of the printed circuit board.                        |
| Top Assy. Part Number    | Part number of the SPA.                                            |
| Top Assy. Revision       | Revision number (signifying a minor revision) of the SPA.          |
| Hardware Revision        | Revision number (signifying a minor revision) of the SPA hardware. |
| CLEI Code                | Common Language Equipment Identification number.                   |

**Table 33** *show diag subslot Field Descriptions (continued)*

| Field              | Description                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Insertion Time     | Time when the SPA was installed, and elapsed time between that insertion time and the current time.                                          |
| Operational Status | Current status of the SPA. For more information about the status field descriptions, refer to the <b>show hw-module subslot oir</b> command. |

The following is sample output from the **show diag subslot details** command for the 1-Port OC-192c/STM-64c POS/RPR XFP SPA in subslot 1 of the SIP located in chassis slot 1 on a Cisco 12000 series router:

```
Router# show diag subslot 1/1 details
SUBSLOT 1/1 (SPA-OC192POS-XFP): 1-port OC192/STM64 POS/RPR XFP Optics Shared Port Adapter
    EEPROM version          : 4
    Compatible Type         : 0xFF
    Controller Type         : 1100
    Hardware Revision       : 2.0
    Boot Timeout            : 400 msecs
    PCB Serial Number       : PRTA1304061
    PCB Part Number        : 73-8546-01
    PCB Revision            : A0          Fab Version          : 01
    RMA Test History        : 00
    RMA Number              : 0-0-0-0
    RMA History             : 00
    Deviation Number        : 0
    Product Identifier (PID) : SPA-OC192POS-XFP
    Version Identifier (VID) : V01
    Top Assy. Part Number   : 68-2190-01
    Top Assy. Revision      : A0          IDPROM Format Revision : 36
    System Clock Frequency  : 00 00 00 00 00 00 00 00
                                00 00 00 00 00 00 00 00
                                00 00 00 00 00 00
    CLEI Code               : UNASSIGNED
    Base MAC Address        : 00 00 00 00 00 00
    MAC Address block size  : 0
    Manufacturing Test Data : 00 00 00 00 00 00 00 00
    Field Diagnostics Data  : 00 00 00 00 00 00 00 00
    Calibration Data        : Minimum: 0 dBmV, Maximum: 0 dBmV
        Calibration values :
    Power Consumption       : 11000 mWatts (Maximum)
    Environment Monitor Data : 03 30 04 B0 46 32 07 08
                                46 32 09 C4 46 32 0C E4
                                46 32 13 88 46 32 07 08
                                46 32 EB B0 50 3C 00 00
                                00 00 00 00 00 00 00 00
                                00 00 00 00 00 00 00 00
                                00 00 FE 02 F6 AC
    Processor Label         : 00 00 00 00 00 00 00 00
    Platform features       : 00 00 00 00 00 00 00 00
                                00 00 00 00 00 00 00 00
                                00 00 00 00 00 00 00 00
                                00 00 00 00 00 00 00
    Asset ID                :
    Asset Alias              :
    Insertion Time           : 00:00:10 (13:14:24 ago)
    Operational Status       : ok
```

### Example for a SPA Interface Processor on a Cisco 12000 Series Router

The following is sample output from the **show diag** command for a SIP located in chassis slot 2 on a Cisco 12000 series router:

Router# **show diag 2**

```
SLOT 2 (RP/LC 2 ): Modular 10G SPA Interface Card
  MAIN: type 149, 800-26270-01 rev 84
        Deviation: 0
        HW config: 0x00 SW key: 00-00-00
  PCA: 73-9607-01 rev 91 ver 1
        Design Release 1.0 S/N SAD08460678
  MBUS: Embedded Agent
        Test hist: 0x00 RMA#: 00-00-00 RMA hist: 0x00
  DIAG: Test count: 0x00000000 Test results: 0x00000000
  FRU: Linecard/Module: 12000-SIP-650
  FRU: Linecard/Module: 12000-SIP-650
        Processor Memory: MEM-LC5-1024=(Non-Replaceable)
        Packet Memory: MEM-LC5-PKT-256=(Non-Replaceable)
  L3 Engine: 5 - ISE OC192 (10 Gbps)
  MBUS Agent Software version 1.114 (RAM) (ROM version is 3.4)
  ROM Monitor version 255.255
  Fabric Downloader version used 3.7 (ROM version is 255.255)
  Primary clock is CSC 1
  Board is analyzed
  Board State is Line Card Enabled (IOS RUN )
  Insertion time: 1d00h (2d08h ago)
  Processor Memory size: 1073741824 bytes
  TX Packet Memory size: 268435456 bytes, Packet Memory pagesize: 32768 bytes
  RX Packet Memory size: 268435456 bytes, Packet Memory pagesize: 32768 bytes
  0 crashes since restart

SPA Information:
  subslot 2/0: SPA-OC192POS-XFP (0x44C), status is ok
  subslot 2/1: Empty
  subslot 2/2: Empty
  subslot 2/3: Empty
```

### Example for ADSL HWICs

The following is sample output from the **show diag** command for a Cisco 2811 router with HWIC-1ADSL installed in slot 1 and HWIC-1ADSLI installed in slot 2. Each HWIC has a daughtercard as part of its assembly. The command results below give the output from the HWIC followed by the output from its daughtercard.

Router# **show diag 0**

```
Slot 0:
C2811 Motherboard with 2FE and integrated VPN Port adapter, 2 ports
  Port adapter is analyzed
  Port adapter insertion time unknown
  Onboard VPN : v2.2.0
  EEPROM contents at hardware discovery:
  PCB Serial Number : FOC09052HHA
  Hardware Revision : 2.0
  Top Assy. Part Number : 800-21849-02
  Board Revision : B0
  Deviation Number : 0
  Fab Version : 06
  RMA Test History : 00
  RMA Number : 0-0-0-0
  RMA History : 00
  Processor type : 87
```

```

Hardware date code       : 20050205
Chassis Serial Number    : FTX0908A0B0
Chassis MAC Address      : 0013.1ac2.2848
MAC Address block size   : 24
CLEI Code                : CNMJ7N0BRA
Product (FRU) Number     : CISCO2811
Part Number              : 73-7214-09
Version Identifier        : NA
EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF C1 8B 46 4F 43 30 39 30 35 32 48 48 41 40
  0x10: 03 E7 41 02 00 C0 46 03 20 00 55 59 02 42 42 30
  0x20: 88 00 00 00 00 02 06 03 00 81 00 00 00 00 04 00
  0x30: 09 87 83 01 31 F1 1D C2 8B 46 54 58 30 39 30 38
  0x40: 41 30 42 30 C3 06 00 13 1A C2 28 48 43 00 18 C6
  0x50: 8A 43 4E 4D 4A 37 4E 30 42 52 41 CB 8F 43 49 53
  0x60: 43 4F 32 38 31 31 20 20 20 20 20 20 82 49 1C 2E
  0x70: 09 89 20 20 4E 41 D9 02 40 C1 FF FF FF FF FF FF

```

## WIC Slot 1:

```

ADSL over POTS
Hardware Revision        : 7.0
Top Assy. Part Number    : 800-26247-01
Board Revision           : 01
Deviation Number         : 0
Fab Version              : 07
PCB Serial Number        : FHH093600D4
RMA Test History         : 00
RMA Number               : 0-0-0-0
RMA History              : 00
Product (FRU) Number     : HWIC-1ADSL
Version Identifier        : V01
CLEI Code                :
EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF 40 04 C8 41 07 00 C0 46 03 20 00 66 87 01
  0x10: 42 30 31 88 00 00 00 00 02 07 C1 8B 46 48 48 30
  0x20: 39 33 36 30 30 44 34 03 00 81 00 00 00 00 04 00
  0x30: CB 94 48 57 49 43 2D 31 41 44 53 4C 20 20 20 20
  0x40: 20 20 20 20 20 20 89 56 30 31 20 D9 02 40 C1 C6
  0x50: 8A FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
  0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## EM Slot 0:

```

ADSL over POTS non-removable daughtercard
Hardware Revision        : 5.0
Part Number              : 73-9307-05
Board Revision           : 03
Deviation Number         : 0
Fab Version              : 05
PCB Serial Number        : FHH0936006E
RMA Test History         : 00
RMA Number               : 0-0-0-0
RMA History              : 00
Fab Part Number          : 28-6607-05
Manufacturing Test Data   : 00 00 00 00 00 00 00 00 00
Field Diagnostics Data    : 00 00 00 00 00 00 00 00 00
Connector Type           : 01
Version Identifier        : V01
Product (FRU) Number     :
EEPROM format version 4
EEPROM contents (hex):
  0x00: 04 FF 40 04 7A 41 05 00 82 49 24 5B 05 42 30 33

```



```

0x10: 88 00 00 00 00 02 05 C1 8B 46 48 48 30 39 33 36
0x20: 30 30 36 45 03 00 81 00 00 00 00 04 00 85 1C 19
0x30: CF 05 C4 08 00 00 00 00 00 00 00 00 C5 08 00 00
0x40: 00 00 00 00 00 00 05 01 89 56 30 31 20 FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## WIC Slot 2:

```

ADSL over ISDN
Hardware Revision      : 7.0
Top Assy. Part Number : 800-26248-01
Board Revision        : 01
Deviation Number      : 0
Fab Version           : 07
PCB Serial Number     : FHH093600DA
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Product (FRU) Number  : HWIC-1ADSLI
Version Identifier    : V01
CLEI Code             :
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 04 C9 41 07 00 C0 46 03 20 00 66 88 01
0x10: 42 30 31 88 00 00 00 00 02 07 C1 8B 46 48 48 30
0x20: 39 33 36 30 30 44 41 03 00 81 00 00 00 00 04 00
0x30: CB 94 48 57 49 43 2D 31 41 44 53 4C 49 20 20 20
0x40: 20 20 20 20 20 20 89 56 30 31 20 D9 02 40 C1 C6
0x50: 8A FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

## EM Slot 0:

```

ADSL over ISDN non-removable daughtercard
Hardware Revision      : 5.0
Part Number           : 73-9308-05
Board Revision        : 03
Deviation Number      : 0
Fab Version           : 05
PCB Serial Number     : FHH0936008M
RMA Test History      : 00
RMA Number            : 0-0-0-0
RMA History           : 00
Fab Part Number       : 28-6607-05
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Connector Type        : 01
Version Identifier    : V01
Product (FRU) Number  :
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 04 7B 41 05 00 82 49 24 5C 05 42 30 33
0x10: 88 00 00 00 00 02 05 C1 8B 46 48 48 30 39 33 36
0x20: 30 30 38 4D 03 00 81 00 00 00 00 04 00 85 1C 19
0x30: CF 05 C4 08 00 00 00 00 00 00 00 00 C5 08 00 00
0x40: 00 00 00 00 00 00 05 01 89 56 30 31 20 FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

```

The following sample output from a Cisco 6500 series switch shows the FRU number:

```
Router# show diag

Slot 4: Logical_index 8
      2 port adapter FlexWAN controller
      Board is analyzed ipc ready
      HW rev 1.5, board revision A0
      Serial Number: SAD062404C8 Part number: 73-3869-08

      Slot database information:
      Flags: 0x2004   Insertion time: 0x20960 (1d04h ago)

      Controller Memory Size:
          112 MBytes CPU Memory
          16 MBytes Packet Memory
          128 MBytes Total on Board SDRAM
      IOS (tm) cwlcr Software (cwpa-DW-M), Version 12.2(18)SXF2, RELEASE SOFTW)

      PA Bay 0 Information:
          ENHANCED ATM OC3 MM PA, 1 ports, FRU: PA-A3-OC3-MM
          EEPROM format version 1
          HW rev 2.00, Board revision A0
          Serial number: 29360940 Part number: 73-2430-04

Slot 4: Logical_index 9
      2 port adapter FlexWAN controller
      Board is analyzed ipc ready
      HW rev 1.5, board revision A0
      Serial Number: SAD062404C8 Part number: 73-3869-08

      Slot database information:
      Flags: 0x2004   Insertion time: 0x20D10 (1d04h ago)

      Controller Memory Size:
          112 MBytes CPU Memory
          16 MBytes Packet Memory
          128 MBytes Total on Board SDRAM
      IOS (tm) cwlcr Software (cwpa-DW-M), Version 12.2(18)SXF2, RELEASE SOFTW)

      PA Bay 1 Information:
          Mx Serial PA, 4 ports
          EEPROM format version 1
          HW rev 1.00, Board revision A0
          Serial number: 04387628 Part number: 73-1577-04

Router#
```

The following sample output from a Cisco 7600 series router shows the FRU number:

```
Router#show diag

Slot 2: Logical_index 4
      2 port adapter Enhanced FlexWAN controller
      Board is analyzed ipc ready
      HW rev 2.1, board revision A0
      Serial Number: JAE0940MH7Z Part number: 73-9539-04

      Slot database information:
      Flags: 0x2004   Insertion time: 0x256BC (1d01h ago)

      Controller Memory Size:
          384 MBytes CPU Memory
          127 MBytes Packet Memory
          511 MBytes Total on Board SDRAM
      IOS (tm) cwlcr Software (cwpa2-DW-M), Version 12.2(18)SXF2, RELEASE SOFTW)
```

```

PA Bay 0 Information:
    ENHANCED ATM OC3 MM PA, 1 ports, FRU: PA-A3-OC3-MM
    EEPROM format version 4
    HW rev 2.00, Board revision A0
    Serial number: JAE0937KUPX Part number: 73-8728-01
Slot 2: Logical_index 5
    2 port adapter Enhanced FlexWAN controller
    Board is analyzed ipc ready
    HW rev 2.1, board revision A0
    Serial Number: JAE0940MH7Z Part number: 73-9539-04

Slot database information:
Flags: 0x2004 Insertion time: 0x22C34 (1d01h ago)

Controller Memory Size:
    384 MBytes CPU Memory
    127 MBytes Packet Memory
    511 MBytes Total on Board SDRAM
IOS (tm) cwlc Software (cwpa2-DW-M), Version 12.2(18)SXF2, RELEASE SOFT)

PA Bay 1 Information:
    Mx Serial PA, 4 ports
    EEPROM format version 1
    HW rev 1.14, Board revision D0
    Serial number: 33929508 Part number: 73-1577-07
Router#

```

**Related Commands**

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>dsl operating-mode (ADSL)</b>        | Modifies the operating mode of the digital subscriber line for an ATM interface.                                                                       |
| <b>show dsl interface atm</b>           | Shows all of the ADSL-specific information for a specified ATM interface.                                                                              |
| <b>show controllers fastethernet</b>    | Displays Fast Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables.    |
| <b>show controllers gigabitethernet</b> | Displays Gigabit Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables. |

# show diagbus

To display diagnostic information about the controller, interface processor, and port adapters associated with a specified slot of a Cisco 7200 series or Cisco 7500 series router, use the **show diagbus** command in privileged EXEC mode.

**show diagbus** [*slot*]

|                    |                                                                                                                                     |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>slot</i> (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information. |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------|

|               |                 |
|---------------|-----------------|
| Command Modes | Privileged EXEC |
|---------------|-----------------|

| Command History | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>11.2</td><td>This command was introduced.</td></tr></table> | Release | Modification | 11.2 | This command was introduced. |
|-----------------|--------------------------------------------------------------------------------------------------------------------------|---------|--------------|------|------------------------------|
| Release         | Modification                                                                                                             |         |              |      |                              |
| 11.2            | This command was introduced.                                                                                             |         |              |      |                              |

**Examples** The following is sample output from the Cisco 7513 router with a VIP2 in slot 8. This card has two 4-port Token Ring port adapters located in port adapter bays 0 and 1.

```
Router# show diagbus 8

Slot 8:
Physical slot 8, ~physical slot 0x7, logical slot 8, CBus 0
Microcode Status 0x4
Master Enable, LED, WCS Loaded
Board is analyzed
Pending I/O Status: None
EEPROM format version 1
VIP2 controller, HW rev 2.2, board revision UNKNOWN
Serial number: 03341418 Part number: 73-1684-02
Test history: 0x00 RMA number: 00-00-00
Flags: cisco 7000 board; 7500 compatible

EEPROM contents (hex):
0x20: 01 15 02 02 00 32 FC 6A 49 06 94 02 00 00 00 00
0x30: 07 2B 00 2A 1A 00 00 00 00 00 00 00 00 00 00 00

Slot database information:
Flags: 0x4 Insertion time: 0x3188 (01:20:53 ago)

Controller Memory Size: 8 MBytes

PA Bay 0 Information:
Token Ring PA, 4 ports
EEPROM format version 1
HW rev 1.1, Board revision 0
Serial number: 02827613 Part number: 73-1390-04
PA Bay 1 Information:
Token Ring PA, 4 ports
```

```
EEPROM format version 1
HW rev 1.1, Board revision 88
Serial number: 02023786 Part number: 73-1390-04
```

The following is sample output from the **show diagbus** command for the Ethernet interface in slot 2 on a Cisco 7200 series router:

Router# **show diagbus 2**

Slot 2:

```
Ethernet port adapter, 8 ports
Port adapter is analyzed
Port adapter insertion time 1d18h ago
Hardware revision 1.0          Board revision K0
Serial number      2023387      Part number    73-1391-03
Test history       0x0          RMA number     00-00-00
EEPROM format version 1
EEPROM contents (hex):
  0x20: 01 01 01 00 00 1E DF DB 49 05 6F 03 00 00 00 00
  0x30: A0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

# show hub

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

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

## Syntax Description

|                 |                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ethernet</b> | (Optional) Indicates that this is an Ethernet hub.                                                                                                                                                                                                           |
| <i>number</i>   | (Optional) Hub number, starting with 0. Because there is currently only one hub, this number is 0.                                                                                                                                                           |
| <i>port</i>     | (Optional) Port number on the hub. On the Cisco 2505 router, port numbers range from 1 through 8. On the Cisco 2507 router, port numbers range from 1 through 16. If a second port number follows, this port number indicates the beginning of a port range. |
| <i>end-port</i> | (Optional) Ending port number of a range.                                                                                                                                                                                                                    |

## Command Modes

EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## 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 router) by default. Therefore, the **show hub**, **show hub ethernet 0**, and **show hub ethernet 0 1 16** commands 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.

## Examples

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 runs, 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 runs, 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 runs, 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 runs, 0 late,
     0 very long, 0 rate mismatches)
  0 auto partitions, last source address (none)
  Last clearing of "show hub" counters never
```

[Table 34](#) describes significant fields shown in the display.

**Table 34** *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 because of the following: <ul style="list-style-type: none"> <li>The link-state test failed.</li> <li>The MAC address mismatched when source address configured.</li> <li>It has been taken down by an administrator.</li> </ul> |
| 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.                                                                                                                                                                                                                        |
| errors                                   | Sum of FCS, alignment, too long, short, runs, very long, and rate mismatches.                                                                                                                                                                                                                                                         |
| collisions                               | Number of messages retransmitted due to Ethernet collisions.                                                                                                                                                                                                                                                                          |

**Table 34** *show hub Field Descriptions (continued)*

| Field                                              | Description                                                                                                                                                                            |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 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 to 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 to 565 bit times in the frame.                                                                              |
| very longs                                         | Counter for the number of times the transmitter is active in excess of 4 to 7.5 milliseconds.                                                                                          |
| rate mismatches                                    | Counter for the number of occurrences when the frequency, or data rate of incoming signal is noticeably 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 the <b>clear hub counters</b> command was entered. 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 <b>clear hub</b> 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 Commands**

| Command    | Description                                                                            |
|------------|----------------------------------------------------------------------------------------|
| <b>hub</b> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |



# show interfaces

To display statistics for all interfaces configured on the router or access server, use the **show interfaces** command in privileged EXEC mode. The resulting output varies, depending on the network for which an interface has been configured.

**show interfaces** [*type number*] [*first*] [*last*] [**accounting**]

## Cisco 7200 Series and Cisco 7500 Series with a Packet over SONET Interface Processor

**show interfaces** [*type slot/port*] [**accounting**]

## Cisco 7500 Series with Ports on VIPs

**show interfaces** [*type slot/port-adapter/port*] [**ethernet** | **serial**]

| Syntax Description  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>         | (Optional) Interface type. Allowed values for <i>type</i> include <b>async</b> , <b>bri0</b> , <b>dialer</b> , <b>ethernet</b> , <b>fastethernet</b> , <b>fddi</b> , <b>hssi</b> , <b>loopback</b> , <b>null</b> , <b>serial</b> , <b>tokenring</b> , and <b>tunnel</b> .<br><br>For the Cisco 4000 series routers, <i>type</i> can be <b>e1</b> , <b>ethernet</b> , <b>fastethernet</b> , <b>fddi</b> , <b>serial</b> , <b>t1</b> , and <b>token</b> . For the Cisco 4500 series routers, <i>type</i> can also include <b>atm</b> .<br><br>For the Cisco 7000 family, <i>type</i> can be <b>atm</b> , <b>e1</b> , <b>ethernet</b> , <b>fastethernet</b> , <b>fddi</b> , <b>serial</b> , <b>t1</b> , and <b>tokenring</b> . For the Cisco 7500 series <i>type</i> can also include <b>pos</b> . |
| <i>number</i>       | (Optional) Port number on the selected interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <i>first last</i>   | (Optional) For the Cisco 2500 and 3000 series routers, ISDN BRI only. The argument <i>first</i> can be either 1 or 2. The argument <i>last</i> can only be 2, indicating B channels 1 and 2.<br><br>D-channel information is obtained by using the command without the optional arguments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>accounting</b>   | (Optional) Displays the number of packets of each protocol type that has been sent through the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <i>slot</i>         | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>port</i>         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <i>port-adapter</i> | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Command Modes** Privileged EXEC

## Command History

| Release  | Modification                                                                                                  |
|----------|---------------------------------------------------------------------------------------------------------------|
| 10.0     | This command was introduced.                                                                                  |
| 12.0(3)T | This command was modified to include support for flow-based WRED.                                             |
| 12.0(4)T | This command was modified to include enhanced display information for dialer bound interfaces.                |
| 12.0(7)T | This command was modified to include <b>dialer</b> as an interface type, and to reflect the default behavior. |

## Usage Guidelines

## Statistics in the Display

The **show interfaces** command displays statistics for the network interfaces. The resulting display on the Cisco 7200 series routers, for example, shows 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.

## Load Calculations

The load calculation appears in the displays for this command. The load is a 5-minute exponentially weighted average that is updated every five seconds. The load can be adversely affected if the default K values used to calculate metrics are modified.

## Reliability

When PA-A3 input and output error counters increment, they affect the reliability counter, which indicates the likelihood that a packet will be successfully transmitted or received. The value is expressed as a fraction of 255, with a value of 255 indicating a totally reliable link.

```
router#show interface atm 10/1/0
  ATM10/1/0 is up, line protocol is up
  Hardware is cyBus ENHANCED ATM PA
  MTU 1500 bytes, sub MTU 1500, BW 149760 Kbit, DLY 80 usec,
    reliability 249/255, txload 1/255, rxload 1/255
```

Reliability is calculated using the following formula:

```
reliability = number of errors / number of total frames
```

The show interface output displays the average reliability

Significance of the *type slot/port* Argument

If you use the **show interfaces** command on the Cisco 7200 series routers 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.

## Removed Interface Types

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

## Accounting Information

The optional keyword **accounting** displays the number of packets of each protocol type that have been sent through the interface.

### Weighted Fair Queueing Information

If you use the **show interfaces** command on a router or access server for which interfaces are configured to use weighted fair queueing through the **fair-queue** interface command, additional information is displayed. This information consists of the current and high-water mark number of flows.

### Use with Dialer Interfaces

If you use the **show interfaces** command on dialer interfaces configured for binding, the display will report statistics on each physical interface bound to the dialer interface; see the following examples for more information.

### Variations of this Command

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

## Examples



### Note

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 or access server, only a portion of the display is shown.

If an asterisk (\*) appears after the throttles counter value, it means that the interface was throttled at the time the command was run.

```
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, 57186* throttles
    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
  ...
```

### Example with Custom Output Queueing

The following shows partial sample output when custom output queueing is enabled:

```
Router# show interfaces

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
```

When custom queueing is enabled, the drops accounted for in the output queues result from bandwidth limitation for the associated traffic and leads to queue length overflow. Total output drops include drops on all custom queues as well as the system queue. Fields are described with the Weighted Fair Queueing output in [Table 35](#).

### Example including Weighted-Fair-Queueing Output

For each interface on the router or access server configured to use weighted fair queueing, the **show interfaces** command displays the information beginning with *Input queue*: in the following display:

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, 57186* throttles
    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
Input queue: 0/75/0 (size/max/drops); Total output drops: 0
Output queue: 7/64/0 (size/threshold/drops)
  Conversations 2/9 (active/max active)
```

[Table 35](#) describes the input queue and output queue fields shown in the preceding display.

**Table 35**     *Weighted-Fair-Queueing Output Field Descriptions*

| Field                       | Description                                                                                                                          |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Input queue:                |                                                                                                                                      |
| • size                      | Current size of the input queue.                                                                                                     |
| • max                       | Maximum size of the queue.                                                                                                           |
| • drops                     | Number of messages discarded in this interval.                                                                                       |
| • Total output drops        | Total number of messages discarded in this session.                                                                                  |
| Output queue:               |                                                                                                                                      |
| • size                      | Current size of the output queue.                                                                                                    |
| • threshold                 | Congestive-discard threshold. Number of messages in the queue after which new messages for high-bandwidth conversations are dropped. |
| • drops                     | Number of dropped messages.                                                                                                          |
| • Conversations: active     | Number of currently active conversations.                                                                                            |
| • Conversations: max active | Maximum number of concurrent conversations allowed.                                                                                  |

### Example 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 High-Level Data Link Control (HDLC) encapsulation.

Per-packet accounting information is displayed for protocols. The following is an example of protocols for which accounting information is displayed. This list is not inclusive of all protocols and could vary among platforms.

- Apollo
- AppleTalk
- ARP (for IP, Apollo, Frame Relay, SMDS)
- CLNS
- DEC MOP

The routers use MOP packets to advertise their existence to Digital Equipment Corporation 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
- HP Probe
- IP
- LAN Manager (LAN Network Manager and IBM Network Manager)
- Novell
- Serial Tunnel (SDLC)
- Spanning Tree
- SR Bridge
- Transparent Bridge
- VINES
- XNS

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).

The following is sample output from the **show interfaces accounting** command when a switched packet is dropped:

```

Router# show interfaces accounting

FastEthernet0/2
          Protocol    Pkts In   Chars In   Pkts Out   Chars Out
              Other              0           0          9373      562380
              IP          37342      21789327          954      86850
              DEC MOP          0           0           158      12166
              ARP           882       52920            71       4260

Interface FastEthernet1/0 is disabled
Interface FastEthernet1/1 is disabled

          Protocol    Pkts In   Chars In   Pkts Out   Chars Out
No traffic sent or received on this interface

```

[Table 36](#) describes the fields shown in the display.

**Table 36** *show interfaces accounting Field Descriptions*

| Field     | Description                                         |
|-----------|-----------------------------------------------------|
| 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. |

### Example with DWRED

The following is sample output from the **show interfaces** command when distributed weighted RED (DWRED) is enabled on an interface. Notice that the packet drop strategy is listed as “VIP-based weighted RED.”

```
Router# show interfaces hssi 0/0/0
```

```
Hssi0/0/0 is up, line protocol is up
  Hardware is cyBus HSSI
  Description: 45Mbps to R1
  Internet address is 200.200.14.250/30
  MTU 4470 bytes, BW 45045 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 00:00:02, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Packet Drop strategy: VIP-based weighted RED
  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
  1976 packets input, 131263 bytes, 0 no buffer
  Received 1577 broadcasts, 0 runts, 0 giants
  0 parity
  4 input errors, 4 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  1939 packets output, 130910 bytes, 0 underruns
  0 output errors, 0 applique, 3 interface resets
  0 output buffers copied, 0 interrupts, 0 failures
```

### Example with ALC

The following is sample output from the **show interfaces** command for serial interface 2 when ALC is enabled:

```
Router# show interfaces serial 2
```

```
Serial2 is up, line protocol is up
  Hardware is CD2430
  MTU 1500 bytes, BW 115 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation ALC, loopback not set
  Full-duplex enabled.
    ascus in UP state: 42, 46
    ascus in DOWN state:
    ascus DISABLED:
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 3 interface resets
  0 output buffer failures, 0 output buffers swapped out
  DCD=down DSR=down DTR=down RTS=down CTS=down
```

### Example with SDLC

The following is sample output from the **show interfaces** command for an Synchronous Data Link Control (SDLC) primary interface supporting the SDLC 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 37 shows the fields relevant to all SDLC connections.

**Table 37** *show interfaces Field Descriptions When SDLC is Enabled*

| Field                             | Description                                                                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------|
| Timers (msec)                     | List of timers in milliseconds.                                                              |
| poll pause, fair poll, Poll limit | Current values of these timers, as described in the individual commands in this chapter.     |
| T1, N1, N2, K                     | Current values for these variables, as described in the individual commands in this chapter. |

Table 38 shows other data given for each SDLC secondary interface configured to be attached to this interface.



**Table 38** SDLC Field Descriptions

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| addr                        | Address of this secondary interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| State                       | Current state of this connection. The possible values are: <ul style="list-style-type: none"> <li>• DISCONNECT—No communication is being attempted to this secondary.</li> <li>• CONNECT—A normal connect state exists between this router and this secondary.</li> <li>• DISCSENT—This router has sent a disconnect request to this secondary and is awaiting its response.</li> <li>• SNRMSENT—This router has sent a connect request (SNRM) to this secondary and is awaiting its response.</li> <li>• THEMBUSY—This secondary has told this router that it is temporarily unable to receive any more information frames.</li> <li>• USBUSY—This router has told this secondary that it is temporarily unable to receive any more information frames.</li> <li>• BOTHBUSY—Both sides have told each other that they are temporarily unable to receive any more information frames.</li> <li>• ERROR—This router has detected an error, and is waiting for a response from the secondary acknowledging this.</li> </ul> |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| RCNT                        | Number of correctly sequenced I-frames received when the Cisco IOS software was in a state in which it is acceptable to receive I-frames.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 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, 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Example with Flow-based WRED**

The following is sample output from the **show interfaces** command issued for the Serial1 interface for which flow-based weighted RED (WRED) is enabled. The output shows that there are 8 active flow-based WRED flows, that the maximum number of flows active at any time is 9, and that the maximum number of possible flows configured for the interface is 16:

```

Router# show interfaces serial1
Serial1 is up, line protocol is up

Hardware is HD64570
Internet address is 190.1.2.1/24
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
Reliability 255/255, txload 237/255, rxload 1/255
Encapsulation HDLC, loopback not set
Keepalive not set
Last input 00:00:22, output 00:00:00, output hang never
Last clearing of "show interface" counters 00:17:58
Input queue: 0/75/0 (size/max/drops); Total output drops: 2479

Queueing strategy: random early detection (RED)
flows (active/max active/max): 8/9/16
mean queue depth: 27
drops: class random tail min-th max-th mark-prob
      0 946 0 20 40 1/10
      1 488 0 22 40 1/10
      2 429 0 24 40 1/10
      3 341 0 26 40 1/10
      4 235 0 28 40 1/10
      5 40 0 31 40 1/10
      6 0 0 33 40 1/10
      7 0 0 35 40 1/10
      rsvp 0 0 37 40 1/10
30 second input rate 1000 bits/sec, 2 packets/sec
30 second output rate 119000 bits/sec, 126 packets/sec
1346 packets input, 83808 bytes, 0 no buffer
Received 12 broadcasts, 0 runts, 0 giants, 0 throttles
0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
84543 packets output, 9977642 bytes, 0 underruns
0 output errors, 0 collisions, 6 interface resets
0 output buffer failures, 0 output buffers swapped out
0 carrier transitions
DCD=up DSR=up DTR=up RTS=up CTS=up

```

### Example with DWFQ

The following is sample output from the **show interfaces** command when distributed weighted fair queueing (DWFQ) is enabled on an interface. Notice that the queueing strategy is listed as “VIP-based fair queueing.”

```

Router# show interfaces fastethernet 1/1/0

Fast Ethernet 1/1/0 is up, line protocol is up
Hardware is cyBus Fast Ethernet Interface, address is 0007.f618.4448 (bia 00e0)
Description: pkt input i/f for WRL tests (to pagent)
Internet address is 80.0.2.70/24
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive not set, fdx, 100BaseTX/FX
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output 01:11:01, output hang never
Last clearing of "show interface" counters 01:12:31
Queueing strategy: VIP-based fair queueing
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
30 second input rate 0 bits/sec, 0 packets/sec
30 second 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

```

```
1 packets output, 60 bytes, 0 underruns
0 output errors, 0 collisions, 0 interface resets
0 babbles, 0 late collision, 0 deferred
0 lost carrier, 0 no carrier
0 output buffers copied, 0 interrupts, 0 failures
```

### Example with DNIS Binding

When the **show interfaces** command is issued on an unbound dialer interface, the output looks as follows:

```
Router# show interfaces dialer0
```

```
Dialer0 is up (spoofing), line protocol is up (spoofing)
Hardware is Unknown
Internet address is 21.1.1.2/8
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 3/255
Encapsulation PPP, loopback not set
DTR is pulsed for 1 seconds on reset
Last input 00:00:34, output never, output hang never
Last clearing of "show interface" counters 00:05:09
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 1000 bits/sec, 0 packets/sec
  18 packets input, 2579 bytes
  14 packets output, 5328 bytes
```

But when the **show interfaces** command is issued on a bound dialer interface, you will get an additional report that indicates the binding relationship. The output is shown here:

```
Router# show interfaces dialer0
```

```
Dialer0 is up, line protocol is up
Hardware is Unknown
Internet address is 21.1.1.2/8
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation PPP, loopback not set
DTR is pulsed for 1 seconds on reset
Interface is bound to BRI0:1
Last input 00:00:38, output never, output hang never
Last clearing of "show interface" counters 00:05:36

Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  38 packets input, 4659 bytes
  34 packets output, 9952 bytes
Bound to:
BRI0:1 is up, line protocol is up
Hardware is BRI
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation PPP, loopback not set, keepalive not set
Interface is bound to Dialer0 (Encapsulation PPP)
LCP Open, multilink Open
Last input 00:00:39, output 00:00:11, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  78 packets input, 9317 bytes, 0 no buffer
  Received 65 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
```

```

93 packets output, 9864 bytes, 0 underruns
0 output errors, 0 collisions, 7 interface resets
0 output buffer failures, 0 output buffers swapped out
4 carrier transitions

```

At the end of the Dialer0 output, the **show interfaces** command is executed on each physical interface bound to it.

### Example of show interface With BRI

In this example, the physical interface is the B1 channel of the BRI0 link. This example also illustrates that the output under the B channel keeps all hardware counts that are not displayed under any logical or virtual access interface. The line in the report that states “Interface is bound to Dialer0 (Encapsulation LAPB)” indicates that this B interface is bound to Dialer0 and the encapsulation running over this connection is LAPB, not PPP, which is the encapsulation configured on the D interface and inherited by the B channel.

```

Router# show interface bri0:1

BRI0:1 is up, line protocol is up
  Hardware is BRI
  MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation PPP, loopback not set, keepalive not set
  Interface is bound to Dialer0 (Encapsulation LAPB)
  LCP Open, multilink Open
  Last input 00:00:31, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 1 packets/sec
  5 minute output rate 0 bits/sec, 1 packets/sec
    110 packets input, 13994 bytes, 0 no buffer
    Received 91 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    135 packets output, 14175 bytes, 0 underruns
    0 output errors, 0 collisions, 12 interface resets
    0 output buffer failures, 0 output buffers swapped out
    8 carrier transitions

```

Any protocol configuration and states should be displayed from the Dialer0 interface.

# show interfaces ctunnel

To display information about an IP over CLNS tunnel (CTunnel), use the **show interfaces ctunnel** command in privileged EXEC mode.

**show interfaces ctunnel** *interface-number* [**accounting**]

|                           |                         |                                                                                                            |
|---------------------------|-------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>interface-number</i> | Virtual interface number.                                                                                  |
|                           | <b>accounting</b>       | (Optional) Displays the number of packets of each protocol type that have been sent through the interface. |

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 12.1(5)T       | This command was introduced. |

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

```
Router# show interfaces ctunnel 1

CTunnel1 is up, line protocol is up
  Hardware is CTunnel
  Internet address is 10.0.0.1/24
  MTU 1514 bytes, BW 9 Kbit, DLY 500000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation TUNNEL, loopback not set
  Keepalive set (10 sec)
  Tunnel destination 49.0001.2222.2222.2222.cc
  Last input never, output 00:00:05, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/0, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    1 packets output, 104 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
```

Table 39 describes the significant fields shown in the display.



## Note

For the **show interfaces ctunnel** command, all output that relates to a physical medium is irrelevant and should be ignored because the CTunnel is a virtual interface.

**Table 39** *show interfaces ctunnel Field Descriptions*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CTunnel is {up   down   administratively down}     | Interface is currently active (up) or inactive (down). Shows interface is administratively down if disabled.                                                                                                                                                                                                                                                                                                                                                                            |
| line protocol is {up   down}                       | Shows line protocol up if a valid route is available to the CLNS tunnel (CTunnel) destination. Shows line protocol down if no route is available, or if the route would be recursive.                                                                                                                                                                                                                                                                                                   |
| Hardware                                           | Type of interface, in this instance CTunnel.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Internet address                                   | IP address of the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| MTU                                                | Maximum transmission unit of the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| BW                                                 | Bandwidth, as specified by the user, that is available on the link.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| DLY                                                | Delay of the interface, in microseconds.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Encapsulation                                      | Encapsulation method is always TUNNEL for tunnels.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Loopback                                           | Shows whether loopback is set or not.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Keepalive                                          | Shows whether keepalives are set or not.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Tunnel destination                                 | The NSAP address of the tunnel destination. The N-Selector part of the displayed NSAP address is set by the router and cannot be changed.                                                                                                                                                                                                                                                                                                                                               |
| Last input                                         | Number of hours, minutes, and seconds since the last packet was successfully received by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                              |
| 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.<br><br>*** indicates that the elapsed time is too large to be displayed.<br><br>0:00:00 indicates that the counters were cleared more than $2^{31}$ ms (and less than $2^{32}$ ms) ago. |
| Queueing strategy                                  | Type of queueing active on this interface.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Output queue, drops<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                             |
| Five minute input rate,<br>Five minute output rate | Average number of bits and packets transmitted per second in the last 5 minutes.<br><br>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 4 time constants must pass before the average will be within 2 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 in the error-free packets received by the system.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| no buffer                                          | Number of received packets discarded because there was no memory buffer available.                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 39** *show interfaces ctunnel Field Descriptions (continued)*

| Field                      | Description                                                                                                                                                         |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| broadcasts                 | Total number of broadcast or multicast packets received by the interface.                                                                                           |
| runts                      | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| giants                     | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| throttles                  | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| input errors               | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| CRC                        | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| frame                      | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| overrun                    | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| ignored                    | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| abort                      | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| packets output             | Total number of messages transmitted by the system.                                                                                                                 |
| bytes                      | Total number of bytes transmitted by the system.                                                                                                                    |
| underruns                  | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| output errors              | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| collisions                 | This field does not apply to the CTunnel virtual interface.                                                                                                         |
| interface resets           | Number of times an interface has been reset. The interface may be reset manually by the administrator or automatically by the system when an internal error occurs. |
| output buffer failures     | Number of buffer failures.                                                                                                                                          |
| output buffers swapped out | Number of output buffer allocation failures.                                                                                                                        |

**Related Commands**

| Command                         | Description                                                                              |
|---------------------------------|------------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> | Displays the statistical information specific to interfaces.                             |
| <a href="#">show ip route</a>   | Displays all static IP routes, or those installed using the AAA route download function. |

# show interfaces ethernet

To display information about an Ethernet interface on the router, use the **show interfaces ethernet** command in privileged EXEC mode.

```
show interfaces ethernet unit [accounting]
```

Cisco 7200 and 7500 Series

```
show interfaces ethernet [slot/port] [accounting]
```

Cisco 7500 Series with Ports on VIPs

```
show interfaces ethernet [type slot/port-adapter/port]
```

|                    |                     |                                                                                                                                                    |
|--------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>unit</i>         | Must match a port number on the selected interface.                                                                                                |
|                    | <b>accounting</b>   | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                         |
|                    | <i>slot</i>         | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>port</i>         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>type</i>         | (Optional) Type of interface.                                                                                                                      |
|                    | <i>port-adapter</i> | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |

|               |                 |
|---------------|-----------------|
| Command Modes | Privileged EXEC |
|---------------|-----------------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 10.0    | This command was introduced. |

**Usage Guidelines**

If you do not provide values for the argument *unit* (or *slot* and *port* on the Cisco 7200 series routers or slot and port adapter on the Cisco 7500 series routers), the command displays 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.

**Examples**

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

```
Router# show interfaces ethernet 0

Ethernet0 is up, line protocol is up
  Hardware is Lance, address is 0060.3ef1.702b (bia 0060.3ef1.702b)
  Internet address is 172.21.102.33/24
  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 04:00:00
Last input 00:00:20, output 00:00:06, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  115331 packets input, 27282407 bytes, 0 no buffer
    Received 93567 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 input packets with dribble condition detected
  143782 packets output, 14482169 bytes, 0 underruns
    0 output errors, 1 collisions, 5 interface resets
    0 babbles, 0 late collision, 7 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out

```

Table 40 describes significant fields shown in the display.

**Table 40** *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 percent 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched. |

**Table 40** *show interfaces ethernet Field Descriptions (continued)*

| Field                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| output                                          | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                                                                                                  |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>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 because of 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).<br><br>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 Ethernet networks 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 minimum packet size of the medium. 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 maximum packet size of the medium. For example, any Ethernet packet that is greater than 1518 bytes is considered a giant.                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Table 40** *show interfaces ethernet Field Descriptions (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 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 transmitted because of an Ethernet collision. 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. |

**Table 40** *show interfaces ethernet Field Descriptions (continued)*

| Field                  | Description                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| restarts               | Number of times a Type 2 Ethernet controller was restarted because of errors.                                                                                                                                                                      |
| babbles                | The transmit jabber timer expired.                                                                                                                                                                                                                 |
| late collision         | Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble. The most common cause of late collisions is that your Ethernet cable segments are too long for the speed at which you are transmitting. |
| 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 failed buffers and number of buffers swapped out.                                                                                                                                                                                        |

**Example on Cisco 7500 Series Routers**

The following sample output illustrates the **show interfaces ethernet** command on a Cisco 7500 series router:

```
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
    0 babbles, 2 late collision, 7 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

**Example with Accounting Option**

The following is sample output from the **show interfaces ethernet** command with the **accounting** option on a Cisco 7500 series router:

```
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 Fast Ethernet interfaces, use the **show interfaces fastethernet** command in EXEC mode.

## Cisco 4500 and 4700 Series

**show interfaces fastethernet** [*number*]

## Cisco 7200 and 7500 Series

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

## Cisco 7500 Series with a VIP

**show interfaces fastethernet** [*slot/port-adapter/port*]

| Syntax Description | <i>number</i>       | (Optional) Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 series routers, specifies the network interface module (NIM) or NPM number. The numbers are assigned at the factory at the time of installation or when added to a system. |
|--------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <i>slot</i>         | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                        |
|                    | <i>port</i>         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                        |
|                    | <i>port-adapter</i> | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                             |

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.2    | This command was introduced. |

**Examples** The following is sample output from the **show interfaces fastethernet** command on a Cisco 4500 series routers:

```
c4500-1# show interfaces fastethernet 0
```

```
Fast Ethernet0 is up, line protocol is up
  Hardware is DEC21140, address is 0000.0c0c.1111 (bia 0002.eaa3.5a60)
  Internet address is 10.0.0.1 255.0.0.0
  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 runs, 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 is sample output from the **show interfaces fastethernet** command on a Cisco AS5300 access server:

```

as5300# show interface fastethernet 0
Fast Ethernet0 is up, line protocol is up
  Hardware is DEC21140AD, address is 00e0.1e3e.c179 (bia 00e0.1e3e.c179)
  Internet address is 10.17.30.4/16
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Half-duplex, 10Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/120, 8 drops
5 minute input rate 2000 bits/sec, 3 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  158773 packets input, 17362631 bytes, 4 no buffer
  Received 158781 broadcasts, 0 runs, 0 giants, 7 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 watchdog, 0 multicast
  0 input packets with dribble condition detected
6299 packets output, 622530 bytes, 0 underruns
  1 output errors, 0 collisions, 3 interface resets
  0 babbles, 0 late collision, 0 deferred
  1 lost carrier, 1 no carrier
  0 output buffer failures, 0 output buffers swapped out

```

The following shows information specific to the first Fast Ethernet Interface Processor (FEIP) port in slot 0 on a Cisco 7500 series routers:

```

Router# show interface fastethernet 0/1

Fast Ethernet0/1 is administratively down, line protocol is down
  Hardware is cxBus Fast Ethernet, address is 0000.0c35.dc16 (bia 0000.0c35.dc16)
  Internet address is 10.1.0.64 255.255.0.0
  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 runs, 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 41 describes the fields in these displays.

**Table 41** *show interfaces fastethernet Field Descriptions—FEIP*

| Field                                                      | Description                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fast Ethernet0 is ... is up<br>...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 percent 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.   |
| 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. This counter is updated only when packets are process switched, not when packets are fast switched.                                   |
| 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. |

**Table 41** *show interfaces fastethernet Field Descriptions—FEIP (continued)*

| Field                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing                             | <p>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.</p> <p>*** indicates the elapsed time is too large to be displayed.</p> <p>0:00:00 indicates the counters were cleared more than <math>2^{31}</math> ms (and less than <math>2^{32}</math> ms) ago.</p>                                                                                                             |
| 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 because of a full queue.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 5 minute input rate, 5 minute output rate | <p>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).</p> <p>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.</p> |
| 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 minimum packet size of the medium. 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 maximum packet size of the medium. For example, any Ethernet packet that is greater than 1518 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.                                                                                                                                                                                                                                                                                                                      |
| 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.                                                                                                                                                                                                                                                         |



**Table 41** *show interfaces fastethernet Field Descriptions—FEIP (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 because of an Ethernet collision. 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| babbles                                       | The transmit jabber timer expired.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

**Table 41** *show interfaces fastethernet Field Descriptions—FEIP (continued)*

| Field                  | Description                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| late collision         | Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble. The most common cause of late collisions is that your Ethernet cable segments are too long for the speed at which you are transmitting. |
| 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 failed buffers and number of buffers swapped out.                                                                                                                                                                                        |

The following example of the **show interfaces fastethernet** command shows all the information specific to the first PA-12E/2FE interface port (interface port 0) in port adapter slot 3:

```
Router# show interfaces fastethernet 3/0
```

```
Fast Ethernet3/0 is up, line protocol is up
Hardware is TSWITCH, address is 00e0.f7a4.5130 (bia 00e0.f7a4.5130)
MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
Encapsulation ARPA, loopback not set, keepalive set (10 sec)
Half-duplex, 100BaseTX
ARP type: ARPA, ARP Timeout 04:00:00
Last input 00:05:30, output 00:00:00, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 312 packets input, 18370 bytes, 0 no buffer
Received 216 broadcasts, 0 runts, 0 giants, 0 throttles
 3 input errors, 0 CRC, 0 frame, 0 overrun, 3 ignored, 0 abort
 0 input packets with dribble condition detected
15490 packets output, 1555780 bytes, 0 underruns
 2 output errors, 0 collisions, 2 interface resets
 0 babbles, 0 late collision, 0 deferred
 0 lost carrier, 0 no carrier
 2 output buffer failures, 0 output buffers swapped out
```

Table 42 describes the fields in this displays.

**Table 42** *show interfaces fastethernet Field Descriptions—PA-12E/2FE*

| Field                                                     | Description                                                                                                                                       |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Fast Ethernet0 is... is up<br>...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.                                                                                                         |

**Table 42** *show interfaces fastethernet Field Descriptions—PA-12E/2FE (continued)*

| 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 percent 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                            |
| 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. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                            |
| 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                    | <p>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.</p> <p>*** indicates the elapsed time is too large to be displayed.</p> <p>0:00:00 indicates the counters were cleared more than <math>2^{31}</math> ms (and less than <math>2^{32}</math> ms) ago.</p> |
| 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 because of a full queue.                                                                                                                                                                                                                                                                                                                                |

**Table 42** *show interfaces fastethernet Field Descriptions—PA-12E/2FE (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Five minute input rate,<br>Five minute output rate | <p>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).</p> <p>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.</p> |
| 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 minimum packet size of the medium. 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 maximum packet size of the medium. For example, any Ethernet packet that is greater than 1518 bytes is considered a giant.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| throttles                                          | Number of times the receiver on the port was disabled, possibly because of buffer or processor overload.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 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.                                                                                                                                                                                                                                                                                                                      |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 42** *show interfaces fastethernet Field Descriptions—PA-12E/2FE (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| input packets with dribble condition detected | Dribble bit error indicates that a frame is slightly too long. This frame error counter is incremented 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 because of an Ethernet collision. 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. |
| babbles                                       | Transmit jabber timer expired.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| late collision                                | Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble. The most common cause of late collisions is that your Ethernet cable segments are too long for the speed at which you are transmitting.                                                                                                                                                                                                                                                                                                     |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

# show interfaces fddi

To display information about the FDDI interface, use the **show interfaces fddi** command in EXEC mode.

```
show interfaces fddi number [accounting]
```

Cisco 7000 and 7200 Series

```
show interfaces fddi [slot/port] [accounting]
```

Cisco 7500 Series

```
show interfaces fddi [slot/port-adapter/port] [accounting]
```

|                    |              |                                                                                                                                                    |
|--------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | number       | 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) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | port         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | port-adapter | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

| Command History | Release | Modification                                                                                                                        |
|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                                                        |
|                 | 11.3    | This command was modified to include support for FDDI full-duplex, single- and multimode port adapters (PA-F/FD-SM and PA-F/FD-MM). |

**Examples** The following is a sample partial display of FDDI-specific data from the **show interfaces fddi** command on a Cisco 7500 series router:

```
Router# show interfaces fddi 3/0/0

Fddi3/0/0 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 sample output from the **show interfaces fddi** command for the full-duplex FDDI port adapter on a Cisco 7500 series router:

Router# **show interfaces fddi 0/1/0**

```

Fddi0/1/0 is up, line protocol is up
  Hardware is cxBus FDDI, address is 0060.3e33.3608 (bia 0060.3e33.3608)
  Internet address is 10.1.1.1/24
  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 04:00:00
  FDX supported, FDX enabled, FDX state is operation
  Phy-A state is maintenance, neighbor is Unknown, status HLS
  Phy-B state is active, neighbor is A, status SILS
  ECM is in, CFM is c_wrap_b, RMT is ring_op,
  Requested token rotation 5000 usec, negotiated 4997 usec
  Configured tvx is 2500 usec
  LER for PortA = 0A, LER for PortB = 0A ring operational 00:02:45
  Upstream neighbor 0060.3e73.4600, downstream neighbor 0060.3e73.4600
  Last input 00:00:12, output 00:00:13, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    62 packets input, 6024 bytes, 0 no buffer
      Received 18 broadcasts, 0 runts, 0 giants
        0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
      71 packets output, 4961 bytes, 0 underruns
        0 output errors, 0 collisions, 0 interface resets
        0 output buffer failures, 0 output buffers swapped out
        3 transitions, 0 traces, 100 claims, 0 beacon

```

Table 43 describes the fields shown in the display.

**Table 43** *show interfaces fddi Field Descriptions*

| Field                                       | Description                                                                                                                                                                           |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fddi is {up   down   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. |
| line protocol is {up   down}                | Indicates whether the software processes that handle the line protocol consider the interface usable.                                                                                 |
| 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.                                                                                                                                           |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 percent 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FDX           | <p>Displays full-duplex information. Values are: not supported or supported. When the value is supported, the display indicates whether full-duplex is enabled or disabled. When enabled, the state of the FDX negotiation process is displayed. The negotiation states only relate to the full-duplex negotiation process. You must also ensure that the interface is up and working by looking at other fields in the <b>show interfaces fddi</b> command such as line protocol and RMT. Negotiation states are:</p> <ul style="list-style-type: none"> <li>• idle—Interface is working but not in full-duplex mode yet. If persistent, it could mean that the interface did not meet all negotiation conditions (for example, there are more than two stations in the ring).</li> <li>• request—Interface is working but not in full-duplex mode yet. If persistent, it could mean that the remote interface does not support full-duplex or full-duplex is not enabled on the interface.</li> <li>• confirm—Transient state.</li> <li>• operation—Negotiations completed successfully, and both stations are operating in full-duplex mode.</li> </ul> |
| Phy-{ A   B } | Lists the state the Physical A or Physical B connection is in; one of the following: off, active, trace, connect, next, signal, join, verify, or break.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



**Table 43** *show interfaces fddi Field Descriptions (continued)*

| Field           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| neighbor        | <p>State of the neighbor:</p> <ul style="list-style-type: none"> <li>• A—Indicates that the connection management (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 (DAS) or concentrator that attaches to the primary ring IN and the secondary ring OUT when attaching to the dual ring.</li> <li>• 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 attachment station (SAS).</li> <li>• 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 attachment station or concentrator that attaches to the secondary ring IN and the primary ring OUT when attaching to the dual ring.</li> <li>• 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 serving as a Master to a connected station or concentrator.</li> <li>• 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.</li> </ul> |
| cmt signal bits | <p>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 in the display. This applies to FIP interfaces only.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

| Field     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| status    | <p>Status value displayed is the actual status on the fiber. The FDDI standard defines the following values:</p> <ul style="list-style-type: none"> <li>• LSU—Line State Unknown, the criteria for entering or remaining in any other line state have not been met.</li> <li>• NLS—Noise Line State is entered upon the occurrence of 16 potential noise events without satisfying the criteria for entry into another line state.</li> <li>• MLS—Master Line State is entered upon the receipt of eight or nine consecutive HQ or QH symbol pairs.</li> <li>• ILS—Idle Line State is entered upon receipt of four or five idle symbols.</li> <li>• HLS—Halt Line State is entered upon the receipt of 16 or 17 consecutive H symbols.</li> <li>• QLS—Quiet Line State is entered upon the receipt of 16 or 17 consecutive Q symbols or when carrier detect goes low.</li> <li>• ALS—Active Line State is entered upon receipt of a JK symbol pair when carrier detect is high.</li> <li>• 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.</li> </ul> |
| ECM is... | <p>ECM is the SMT entity coordination management, which overlooks the operation of CFM and PCM. The ECM state can be one of the following:</p> <ul style="list-style-type: none"> <li>• out—Router is isolated from the network.</li> <li>• in—Router is actively connected to the network. This is the normal state for a connected router.</li> <li>• trace—Router is trying to localize a stuck beacon condition.</li> <li>• leave—Router is allowing time for all the connections to break before leaving the network.</li> <li>• path_test—Router is testing its internal paths.</li> <li>• insert—Router is allowing time for the optical bypass to insert.</li> <li>• check—Router is making sure optical bypasses switched correctly.</li> <li>• deinsert—Router is allowing time for the optical bypass to deinsert.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

| Field          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CFM is...      | <p>Contains information about the current state of the MAC connection. The Configuration Management state can be one of the following:</p> <ul style="list-style-type: none"> <li>isolated—MAC is not attached to any Physical type.</li> <li>wrap_a—MAC is attached to Physical A. Data is received on Physical A and transmitted on Physical A.</li> <li>wrap_b—MAC is attached to Physical B. Data is received on Physical B and transmitted on Physical B.</li> <li>wrap_s—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).</li> <li>thru—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.</li> </ul>                                                                                                                                                                                                                                              |
| RMT is...      | <p>RMT (Ring Management) is the SMT MAC-related state machine. The RMT state can be one of the following:</p> <ul style="list-style-type: none"> <li>isolated—MAC is not trying to participate in the ring. This is the initial state.</li> <li>non_op—MAC is participating in ring recovery, and ring is not operational.</li> <li>ring_op—MAC is participating in an operational ring. This is the normal state while the MAC is connected to the ring.</li> <li>detect—Ring has been nonoperational for longer than normal. Duplicate address conditions are being checked.</li> <li>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.</li> <li>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.</li> <li>directed—MAC is sending beacon frames notifying the ring of the stuck condition.</li> <li>trace—Trace has been initiated by this MAC, and the RMT state machine is waiting for its completion before starting an internal path test.</li> </ul> |
| token rotation | <p>Token rotation value is the default or configured rotation value as determined by the <b>fddi token-rotation-time</b> command. This value is used by all stations on the ring. The default is 5000 microseconds. For FDDI full-duplex, this indicates the value in use prior to entering full-duplex operation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| negotiated     | <p>Actual (negotiated) target token rotation time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                     |
| Configured tvx                              | Transmission timer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| LER                                         | Link error rate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                             |
| output                                      | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                               |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than 2 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |
| Queueing strategy                           | First-in, first-out queueing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                                                                                                                                                                                                                          |
| 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 because of a full queue.                                                                                                                                                                                                                                                                                                                 |
| 5 minute input rate<br>5 minute output rate | Average number of bits and packets transmitted per second in the last 5 minutes.<br><br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

| 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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                      |
| giants                 | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                |
| 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 can 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 from 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 might not balance with the sum of the enumerated output errors, because some datagrams can have more than one error, and others can 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.                                                                                                                                                                                                                                                                                                                     |
| output buffer failures | Number of no resource errors received on the output.                                                                                                                                                                                                                                                                                                           |

**Table 43** *show interfaces fddi Field Descriptions (continued)*

| output buffers swapped out | Number of packets swapped to DRAM.                                                                                                                                                            |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Field                      | Description                                                                                                                                                                                   |
| 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.                                                                                          |

The following is sample output 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 44](#) describes the fields shown in the display.

**Table 44** *show interfaces fddi Field Descriptions—Accounting*

| Field     | Description                                         |
|-----------|-----------------------------------------------------|
| 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 gigabitethernet

To check the status and configuration settings of the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E, use the **show interfaces gigabitethernet** command in privileged EXEC mode.

**show interfaces gigabitethernet** *slot/port*

## Syntax Description

|             |                               |
|-------------|-------------------------------|
| <i>slot</i> | Slot number on the interface. |
| <i>port</i> | Port number on the interface. |

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                                                   |
|-----------|----------------------------------------------------------------|
| 11.1 CC   | This command was introduced.                                   |
| 12.1(3a)E | Support for the Cisco 7200-I/O-GE+E controller was introduced. |
| 12.1(5)T  | This command was integrated into Cisco IOS Release 12.1(5)T.   |

## Usage Guidelines

This command is used on the Cisco 7200-I/O-GE+E to display the configuration status of the Gigabit Ethernet interface. Slot 0 is always reserved for the Gigabit Ethernet port on the I/O controller.

## Examples

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

```
Router# show interfaces gigabitethernet 0/0

GigabitEthernet0/0 is up, line protocol is up
  Hardware is 82543 (Livengood), address is 00d0.ffb6.4c00 (bia 00d0.ffb6.4c00)
  Internet address is 10.1.1.3/8
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex mode, link type is autonegotiation, media type is SX
  output flow-control is on, input flow-control is on
  ARP type:ARPA, ARP Timeout 04:00:00
  Last input 00:00:04, output 00:00:03, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy:fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2252 packets input, 135120 bytes, 0 no buffer
    Received 2252 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
  2631 packets output, 268395 bytes, 0 underruns
  0 output errors, 0 collisions, 2 interface resets
  0 babbles, 0 late collision, 0 deferred
  0 lost carrier, 0 no carrier, 0 pause output
  0 output buffer failures, 0 output buffers swapped out
```

 show interfaces gigabitethernet

| Related Commands | Command                                          | Description                                                                                                                                                                     |
|------------------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">show controllers gigabitethernet</a> | Displays initialization block information, transmit ring, receive ring, and errors for the interface controllers for the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E. |



# show interfaces hssi

To display information about the high-speed serial interface (HSSI), use the **show interfaces hssi** command in privileged EXEC mode.

**show interfaces hssi** *unit* [**accounting**]

## Cisco 7500 Series

**show interfaces hssi** [*slot/port*] [**accounting**]

| Syntax Description |  |                                                                                                                         |
|--------------------|--|-------------------------------------------------------------------------------------------------------------------------|
| <i>unit</i>        |  | Must match a port number on the selected interface.                                                                     |
| <b>accounting</b>  |  | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.              |
| <i>slot</i>        |  | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information. |
| <i>port</i>        |  | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information. |

| Command Modes | Privileged EXEC |
|---------------|-----------------|
|---------------|-----------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

## Examples

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 131.136.67.190, 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 45](#) describes significant fields shown in the display.

**Table 45** *show interfaces hssi Field Descriptions*

| Field                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| HSSI is {up   down   administratively down}          | Indicates whether the interface hardware is currently active (whether carrier detect is present) and whether it has been taken down by an administrator. “Disabled” indicate that 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 consider 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 percent 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                               |
| output                                               | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                 |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than $2^{31}$ ms (and less than $2^{32}$ ms) ago. |

**Table 45** *show interfaces hssi Field Descriptions (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output queue, drops<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Five minute input rate,<br>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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| giants                                             | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| parity                                             | Report of the parity errors on the HSSI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| rx disabled                                        | Indicates that 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Table 45** *show interfaces hssi 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. 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 ability of the receiver 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 receiver can handle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 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, 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.                                                                                                                                                                                                                                                                                                                   |
| applique         | Indicates that an unrecoverable error has occurred on the HSA applique. The system then invokes an interface reset.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| interface resets | Number of times that 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.                                                                                              |

**Table 45** *show interfaces hssi Field Descriptions (continued)*

| Field               | Description                                                                                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| restarts            | Number of times that the controller was restarted because of errors.                                                                                                    |
| carrier transitions | Number of times that the carrier detect signal of the 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 sample output from the **show interfaces hssi** command on a Cisco 7500 series router:

```
Router# show interfaces 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 sample output from the **show interfaces hssi** command with the **accounting** option on a Cisco 7500 series routers:

```
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 interfaces lex** command in EXEC mode.

**show interfaces lex** *number* [**ethernet** | **serial**]

Syntax Description

|                 |                                                                                                         |
|-----------------|---------------------------------------------------------------------------------------------------------|
| <i>number</i>   | Number of the LAN Extender interface that resides on the core router about which to display statistics. |
| <b>ethernet</b> | (Optional) Displays statistics about the Ethernet interface that resides on the LAN Extender chassis.   |
| <b>serial</b>   | (Optional) Displays statistics about the serial interface that resides on the LAN Extender chassis.     |

Command Modes

EXEC

Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

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.

Examples

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 runs, 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 46 describes the fields shown in the preceding displays.

**Table 46** *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), inactive, or has been taken down by an administrator.                     |
| Lex0-Ethernet0 is up, line protocol is up<br>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 whether 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.                                                                               |

**Table 46** *show interfaces lex Field Descriptions (continued)*

| Field                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MTU                                        | Maximum transmission unit size of the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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 <b>bandwidth</b> 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 percent 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 since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                             |
| output                                     | Number of hours, minutes, and seconds (or never) since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                    |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than 2 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |
| Output queue, drops<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                                 |



**Table 46** *show interfaces lex Field Descriptions (continued)*

| Field                                             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Five minute input rate<br>Five minute output rate | Average number of bits and packets transmitted per second in the last 5 minutes.<br><br>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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                       |
| giants                                            | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                 |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Table 46** *show interfaces lex Field Descriptions (continued)*

| 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 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 because of an Ethernet collision. Some collisions are normal. However, if your collision rate climbs to around 4 or 5 percent, 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.                                                                                                                                                                                         |
| 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

To display information about the loopback interface, use the **show interfaces loopback** command in privileged EXEC mode.

**show interfaces loopback** [*number*] [**accounting**]

|                           |                   |                                                                                                            |
|---------------------------|-------------------|------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>number</i>     | (Optional) Port number on the selected interface.                                                          |
|                           | <b>accounting</b> | (Optional) Displays the number of packets of each protocol type that have been sent through the interface. |

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 10.0           | This command was introduced. |

**Examples** 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 47](#) describes significant fields shown in the displays.

**Table 47** *show interfaces loopback Field Descriptions*

| Field                                                | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loopback is {up   down   administratively down}      | Indicates whether the interface hardware is currently active (whether carrier detect is present), is currently inactive, or has been taken down by an administrator.                                                                                                                                                                                                                                                                                                                        |
| line protocol is {up   down   administratively down} | Indicates whether the software processes that handle the line protocol consider 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 percent 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                             |
| output                                               | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                               |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than 2 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |
| Output queue, drops;<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                                 |

**Table 47** *show interfaces loopback Field Descriptions (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Five minute input rate,<br>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 Ethernet networks 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| runt                                               | Number of packets that are discarded because they are smaller than the minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| giants                                             | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Table 47** *show interfaces loopback Field Descriptions (continued)*

| Field            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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       | Loopback interface does not have collisions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 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 port-channel

To display the information about the Fast EtherChannel on Cisco 7200 series routers, Cisco 7500 series routers, and Cisco 7000 series routers with the RSP7000 and RSP7000CI, use the **show interfaces port-channel** command in EXEC mode.

**show interfaces port-channel** [*channel-number*]

| <b>Syntax Description</b> | <i>channel-number</i> (Optional) Port channel number. Range is 1 to 4.                                                                                                                                                     |         |              |         |                              |          |                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|---------|------------------------------|----------|--------------------------------------------------------------|
| <b>Command Modes</b>      | EXEC                                                                                                                                                                                                                       |         |              |         |                              |          |                                                              |
| <b>Command History</b>    | <table><tr><th>Release</th><th>Modification</th></tr><tr><td>11.1 CA</td><td>This command was introduced.</td></tr><tr><td>12.1(5)T</td><td>This command was integrated into Cisco IOS Release 12.1(5)T.</td></tr></table> | Release | Modification | 11.1 CA | This command was introduced. | 12.1(5)T | This command was integrated into Cisco IOS Release 12.1(5)T. |
| Release                   | Modification                                                                                                                                                                                                               |         |              |         |                              |          |                                                              |
| 11.1 CA                   | This command was introduced.                                                                                                                                                                                               |         |              |         |                              |          |                                                              |
| 12.1(5)T                  | This command was integrated into Cisco IOS Release 12.1(5)T.                                                                                                                                                               |         |              |         |                              |          |                                                              |

## Examples

The following is sample output from the **show interfaces port-channel** command:

```
Router# show interfaces port-channel 1
```

```
Port-channel1 is up, line protocol is up
  Hardware is FEChannel, address is 0000.0ca8.6220 (bia 0000.0000.0000)
  MTU 1500 bytes, BW 400000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive not set, fdx
  ARP type: ARPA, ARP Timeout 04:00:00
    No. of active members in this channel: 4
      Member 0 : Fast Ethernet1/0/0
      Member 1 : Fast Ethernet1/1/0
      Member 2 : Fast Ethernet4/0/0
      Member 3 : Fast Ethernet4/1/0
  Last input 01:22:13, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    223 packets input, 11462 bytes, 0 no buffer
    Received 1 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
    192 packets output, 13232 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
```

Table 48 describes significant fields shown in the display.

**Table 48** *show interfaces port-channel (Fast EtherChannel) Field Descriptions*

| Field                                       | Description                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Port-channel1 is up,<br>line protocol is up | Indicates if the interface hardware is currently active and can transmit and receive or if it has been taken down by an administrator.                                                                                                                                                            |
| Hardware is                                 | Hardware type (Fast EtherChannel).                                                                                                                                                                                                                                                                |
| address is                                  | Address being used by the interface.                                                                                                                                                                                                                                                              |
| 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 percent 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 <b>bandwidth</b> interface configuration command.                                                                      |
| Encapsulation                               | Encapsulation method assigned to the interface.                                                                                                                                                                                                                                                   |
| loopback                                    | Indicates if loopbacks are set.                                                                                                                                                                                                                                                                   |
| keepalive                                   | Indicates if keepalives are set.                                                                                                                                                                                                                                                                  |
| fdx                                         | Indicates the interface is operating in full-duplex mode.                                                                                                                                                                                                                                         |
| ARA type                                    | ARP type on the interface.                                                                                                                                                                                                                                                                        |
| ARP timeout                                 | Number of hours, minutes, and seconds an ARP cache entry will stay in the cache.                                                                                                                                                                                                                  |
| No. of active members in<br>this channel: 4 | Number of Fast Ethernet interfaces that are currently active (not down) and part of the Fast EtherChannel group.                                                                                                                                                                                  |
| Member 0: Fast<br>Ethernet1/0/0             | Specific Fast Ethernet interface that is part of the Fast EtherChannel group.                                                                                                                                                                                                                     |
| Last input                                  | Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.   |
| output                                      | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                     |
| 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. |



**Table 48** *show interfaces port-channel (Fast EtherChannel) Field Descriptions (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| last clearing                               | <p>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. Variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared.</p> <p>*** indicates the elapsed time is too large to be displayed.</p> <p>0:00:00 indicates the counters were cleared more than 2<sup>31</sup> ms (and less than 2<sup>32</sup> ms) ago.</p> |
| Queueing strategy                           | First-in, first-out queueing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                                                                                                                                                                                                                     |
| Output queue, drops<br>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 because a queue was full.                                                                                                                                                                                                                                                                                                           |
| 5 minute input rate<br>5 minute output rate | Average number of bits and packets received or 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.                                                                                                                                                                                                                                             |
| 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                              |
| giants                                      | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                        |
| 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 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.               |
| 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.                                                                                                                                                                                                                                                                                                          |

**Table 48** *show interfaces port-channel (Fast EtherChannel) Field Descriptions (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 ones bit on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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 (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.                                                                                                                                                                                                                                                                                                                                                      |
| 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 can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.                                                                                                                                   |
| collisions                                    | Number of messages retransmitted because of an Ethernet collision. 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 a certain interval. If the system notices that the carrier detect line of an 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 unrecoverable interface processor error occurred, or when an interface is looped back or shut down. |
| babbles                                       | The transmit jabber timer expired.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| late collision                                | Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble. The most common cause of late collisions is that your Ethernet cable segments are too long for the speed at which you are transmitting.                                                                                                                                                                                                                        |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                      |

**Table 48** *show interfaces port-channel (Fast EtherChannel) Field Descriptions (continued)*

| Field                      | Description                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. |

**Related Commands**

| Command                             | Description                                                            |
|-------------------------------------|------------------------------------------------------------------------|
| <a href="#">interface multilink</a> | Specifies a Fast EtherChannel and enters interface configuration mode. |

# show interfaces pos

To display information about the Packet OC-3 interface in Cisco 7500 series routers, use the **show interfaces pos** command in EXEC mode.

## Cisco 7000 and 7500 Series with VIPs

**show interfaces pos** [*slot/port-adapter/port*]

### Syntax Description

|                     |                                                                                                                                                    |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>         | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
| <i>port-adapter</i> | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |
| <i>port</i>         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |

### Command Modes

EXEC

### Command History

| Release | Modification                                                                                                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------|
| 11.2    | The <b>show interface posi</b> command was introduced.                                                                           |
| 11.3    | The name of the command was modified <b>show interface posi</b> to <b>show interfaces pos</b> and the sample output was updated. |

### Examples

The following is sample output from the **show interfaces pos** command on a Cisco 7513 router with one Packet OC-3 Interface Processor (POSIP):

```
Router# show interfaces pos 2/0/0
```

```
POS2/0/0 is up, line protocol is up
  Hardware is cyBus Packet over Sonet
  Description: PRI-T1 net to zippy (4K) to Pac-Bell
  Internet address is 1.1.1.1/27
  MTU 4470 bytes, BW 1000 Kbit, DLY 40000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (3 sec)
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters 00:23:09
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 1 packets/sec
  5 minute output rate 1000 bits/sec, 1 packets/sec
    1046 packets input, 54437 bytes, 0 no buffer
    Received 485 broadcasts, 0 runts, 0 giants, 0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    4013 packets output, 1357412 bytes, 0 underruns
    0 output errors, 0 applique, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```

Table 49 describes the significant fields shown in the display.

**Table 49** *show interfaces pos Field Descriptions*

| Field                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POS2/0/0 is up, line protocol is up | Indicates whether the interface hardware is currently active and can transmit and receive or whether it has been taken down by an administrator.                                                                                                                                                                                                                                                                                                                                         |
| Hardware is cyBus Packet over Sonet | Hardware type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Internet address is                 | Internet address and 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 percent 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 <b>bandwidth</b> interface configuration command.                                                                                                                                                                                                                                                             |
| Encapsulation                       | Encapsulation method assigned to interface.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| loopback                            | Indicates whether loopbacks are set.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| keepalive                           | Indicates whether keepalives are set.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Last input                          | Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                          |
| (Last) output                       | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                            |
| (Last) 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br>0:00:00 indicates the counters were cleared more than 22 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |

**Table 49** *show interfaces pos Field Descriptions (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Queueing strategy                           | First-in, first-out queueing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                                                                                                                                                                                                       |
| Output queue, drops<br>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 because a queue was full.                                                                                                                                                                                                                                                                                             |
| 5 minute input rate<br>5 minute output rate | Average number of bits and packets received or 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.                                                                                                                                                                                                                               |
| 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                |
| giants                                      | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                          |
| parity                                      | Report of the parity errors on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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 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. |
| 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.                                                                                                                                                                  |

**Table 49** *show interfaces pos Field Descriptions (continued)*

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| abort               | Illegal sequence of one bits on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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.                                                                                                                                                                                                                                                                                                                                                      |
| 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 can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.                                                                                                                                   |
| applique            | Indicates an unrecoverable error has occurred on the POSIP 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 a certain interval. If the system notices that the carrier detect line of an 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 unrecoverable interface processor error occurred, or when an interface is looped back or shut down. |
| carrier transitions | Number of times the carrier detect signal of the interface has changed state.                                                                                                                                                                                                                                                                                                                                                                                             |

**Related Commands**

| Command                   | Description                                                           |
|---------------------------|-----------------------------------------------------------------------|
| <a href="#">interface</a> | Configures an interface type and enters interface configuration mode. |

# show interfaces posi

The [show interfaces posi](#) command is replaced by the **show interfaces pos** command. See the description of the **show interfaces pos** command for more information.



# show interfaces serial

To display information about a serial interface, use the **show interfaces serial** command in privileged EXEC mode. When using Frame Relay encapsulation, use the **show interfaces serial** command in user EXEC or privileged EXEC mode to display information about the multicast data-link connection identifier (DLCI), the DLCIs used on the interface, and the DLCI used for the Local Management Interface (LMI).

## Cisco 4000 Series

```
show interfaces serial [number[:channel-group]] [accounting]
```

## Cisco 7000 and Cisco 7500 Series with the RSP7000, RSP7000CI, or Ports on VIPs

```
show interfaces serial [slot/port-adapter/port]
```

## Cisco 7500 Series

```
show interfaces serial [slot/port[:channel-group]] [accounting]
```

## Cisco 7500 Series with a CT3IP

```
show interfaces serial [slot/port-adapter/port][:t1-channel] [accounting | crb]
```

## Cisco AS5350 and Cisco AS5400 Universal Gateways

```
show interfaces serial slot/port
```

## Cisco AS5800 Access Servers

```
show interfaces serial dial-shelf/slot/t3-port:t1-num:chan-group
```

### Syntax Description

|                       |                                                                                                                                                                                                                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>         | (Optional) Number of the port being displayed.                                                                                                                                                                                                                                                      |
| <i>:channel-group</i> | (Optional) On the Cisco 4000 series with a Network Management Processor (NPM) or the Cisco 7500 series routers with a MultiChannel Interface Processor (MIP), specifies the T1 channel-group number in the range of 0 to 23 defined with the <b>channel-group</b> controller configuration command. |
| <b>accounting</b>     | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                                                                                                                                                                          |
| <i>slot</i>           | (Optional) Number of the slot being displayed. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                              |
| <i>/port</i>          | (Optional) Number of the port being displayed. Refer to the appropriate hardware manual for slot and port information.                                                                                                                                                                              |
| <i>/port-adapter</i>  | (Optional) Number of the port adapter being displayed. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                   |

|                    |                                                                                                                                                                                                                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>:t1-channel</i> | (Optional) T1 channel number. For the CT3IP, the T1 channel is a number between 1 and 28.<br><br>T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment. |
| <b>crb</b>         | (Optional) Displays interface routing and bridging information.                                                                                                                                                                                                                                                                                           |
| <i>dial-shelf</i>  | Dial shelf chassis in the Cisco AS5800 access server that contains the CT3 interface card.                                                                                                                                                                                                                                                                |
| <i>slot</i>        | Location of the CT3 interface card in the dial shelf chassis.                                                                                                                                                                                                                                                                                             |
| <i>t3-port</i>     | T3 port number. The only valid value is 0.                                                                                                                                                                                                                                                                                                                |
| <i>:t1-num</i>     | T1 time slot in the T3 line. The value can be from 1 to 28.                                                                                                                                                                                                                                                                                               |
| <i>:chan-group</i> | Channel group identifier.                                                                                                                                                                                                                                                                                                                                 |

**Command Modes**

User EXEC (when Frame Relay encapsulation is used)  
Privileged EXEC

**Command History**

| Release   | Modification                                                                                               |
|-----------|------------------------------------------------------------------------------------------------------------|
| 10.0      | This command was introduced on the Cisco 4000 series routers.                                              |
| 11.0      | This command was implemented on the Cisco 7000 series routers.                                             |
| 11.1 CA   | This command was modified to include sample output for the PA-2JT2, PA-E3, and PA-T3 serial port adapters. |
| 11.3      | This command was modified to include the CT3IP.                                                            |
| 12.0(3)T  | This command was implemented on the Cisco AS5800 access servers.                                           |
| 12.0(4)T  | This command was modified to include enhanced display information for dialer bound interfaces.             |
| 12.2(11)T | This command was implemented on the Cisco AS5350 and Cisco AS5400.                                         |
| 12.2(13)T | This command was modified to display information about Frame Relay interface queueing and fragmentation.   |

**Usage Guidelines****Frame Relay**

Use this command to determine the status of the Frame Relay link. This display also indicates Layer 2 status if switched virtual circuits (SVCs) are configured.

**Channel Groups as Virtual Serial Interfaces**

To find out about channel groups configured as virtual serial interfaces, to verify that the router has High-Level Data Link Control (HDLC) encapsulation on the interface, and to verify that the interface sees the loopback, use the **show interfaces serial** command in privileged EXEC mode.

## Examples

### Example of Synchronous Serial Interface

The following is sample output from the **show interfaces serial** 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 192.168.10.203, 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 50 describes significant fields shown in the display.

**Table 50** *show interfaces serial Field Descriptions—Synchronous Serial Interface*

| Field                                                     | Description                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial ... is {up   down} ...<br>is administratively down | Indicates whether the interface hardware is currently active (whether carrier detect is present), is currently inactive, or has been taken down by an administrator.                                                                                                                                                                                                         |
| line protocol is<br>{up   down}                           | Indicates whether the software processes that handle the line protocol consider the line usable (that is, whether keepalives are successful) or whether the line 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                                                        | Indicates the value of the bandwidth parameter that has been configured for the interface (in kbps). If the interface is attached to a serial line with a line speed that does not match the default (1536 or 1544 kbps for T1 and 56 kbps for a standard synchronous serial line), use the <b>bandwidth</b> 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 percent 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.                                                                                                                                                                                                                                                                                                                                 |

**Table 50** *show interfaces serial Field Descriptions—Synchronous Serial Interface (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last input                                  | Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process-switched, not when packets are fast-switched.                                                                                                                                                                                 |
| Last output                                 | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process-switched, not when packets are fast-switched.                                                                                                                                                                                                                                                                   |
| 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<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                     |
| 5 minute input rate<br>5 minute output rate | Average number of bits and packets transmitted per second in the last 5 minutes.<br><br>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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                       |
| giants                                      | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                 |
| 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.                                                                                                                                                                                                                     |

**Table 50** *show interfaces serial Field Descriptions—Synchronous Serial Interface (continued)*

| Field                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                                                                                                                                                                     |
| 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.                                                                                                                                                                                                                                                          |
| 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 might never be reported on some interfaces.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| output errors                                    | Sum of all errors that prevented the final transmission of datagrams out of the interface from being examined. Note that this might not balance with the sum of the enumerated output errors because some datagrams can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.                                                                                                                                                                                                            |
| collisions                                       | Number of messages retransmitted because of an Ethernet collision. Some collisions are normal. However, if your collision rate climbs to around 4 or 5 percent, 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.                                                                                                                                                                                        |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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.                                                                                                                                                                                                                                                                                                                                                                                         |

### Example of PA-2JT2 Serial Interface

The following is sample output from the **show interfaces serial** command for a PA-2JT2 serial interface:

```
Router# show interfaces serial 3/0/0

Serial3/0/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 10.0.0.1/8
  MTU 1500 bytes, BW 6312 Kbit, DLY 20000 usec, rely 255/255, load 26/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 00:04:31, output 00:04:31, output hang never
  Last clearing of "show interface" counters 00:06:07
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 162000 bits/sec, 8 packets/sec
  5 minute output rate 162000 bits/sec, 8 packets/sec
    20005 packets input, 20080520 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    20005 packets output, 20080520 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
    0 cv errors, 0 crc5 errors, 0 frame errors
    rxLOS inactive, rxLOF inactive, rxPAIS inactive
    rxAIS inactive, rxRAI inactive, rxHBER inactive
```

Table 51 describes significant fields shown in the display that are different from the fields described in Table 50 on page 429.

**Table 51** *show interfaces serial Field Descriptions—PA-2JT2*

| Field                                      | Description                                                                                                                                                                                                                                                                                        |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing of “show interface” counters | Time the counters were last cleared.                                                                                                                                                                                                                                                               |
| Queueing strategy                          | First-in, first-out queueing strategy (other queueing strategies that you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                            |
| output buffer failures                     | Number of “no resource” errors received on the output.                                                                                                                                                                                                                                             |
| output buffers swapped out                 | Number of packets swapped to DRAM.                                                                                                                                                                                                                                                                 |
| 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. |
| cv errors                                  | B8ZS/B6ZS (zero suppression) coding violation counter.                                                                                                                                                                                                                                             |
| crc5 errors                                | CRC-5 error counter.                                                                                                                                                                                                                                                                               |
| frame errors                               | Framing error counter.                                                                                                                                                                                                                                                                             |
| rxLOS                                      | Receive loss of signal alarm. Values are active or inactive.                                                                                                                                                                                                                                       |
| rxLOF                                      | Receive loss of frame alarm. Values are active or inactive.                                                                                                                                                                                                                                        |
| rxPAIS                                     | Receive loss of payload alarm indication signal (AIS). Values are active or inactive.                                                                                                                                                                                                              |
| rxAIS                                      | Receive loss of physical AIS. Values are active or inactive.                                                                                                                                                                                                                                       |

**Table 51** *show interfaces serial Field Descriptions—PA-2JT2 (continued)*

| Field  | Description                                                       |
|--------|-------------------------------------------------------------------|
| rxRAI  | Receive remote AIS. Values are active or inactive.                |
| rxHBER | Receive high bit-error rate alarm. Values are active or inactive. |

**Example of PA-E3 Serial Port Adapter**

The following is sample output from the **show interfaces serial** command for a PA-E3 serial port adapter installed in chassis slot 2:

```
Router# show interfaces serial 2/0

Serial2/0 is up, line protocol is up
  Hardware is M1T-E3 pa
  Internet address is 172.17.1.1/24
  MTU 4470 bytes, BW 34010 Kbit, DLY 200 usec, rely 128/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 1w0d, output 00:00:48, output hang never
  Last clearing of "show interface" counters 1w0d
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    20 packets input, 2080 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    11472 packets output, 3824748 bytes, 0 underruns
    0 output errors, 0 applique, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
  rxLOS inactive, rxLOF inactive, rxAIS inactive
  txAIS inactive, rxRAI inactive, txRAI inactive
```

[Table 52](#) describes significant fields shown in the display that are different from the fields described in [Table 50 on page 429](#).

**Table 52** *show interfaces serial Field Descriptions—PA-E3*

| Field                                      | Description                                                                                                                             |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing of "show interface" counters | Time the counters were last cleared.                                                                                                    |
| Queueing strategy                          | First-in, first-out queueing strategy (other queueing strategies that you might see are priority-list, custom-list, and weighted fair). |
| parity                                     | Number of the parity errors on the interface.                                                                                           |
| applique                                   | Indicates that an unrecoverable error has occurred on the E3 applique. The router then invokes an interface reset.                      |
| output buffer failures                     | Number of "no resource" errors received on the output.                                                                                  |
| output buffers swapped out                 | Number of packets swapped to DRAM.                                                                                                      |

**Table 52** *show interfaces serial Field Descriptions—PA-E3 (continued)*

| Field               | Description                                                                                                                                                                                                                                                                               |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| rxLOS, rxLOF, rxAIS | Receive loss of signal, loss of frame, and alarm indication signal status. Values are inactive or active.                                                                                                                                                                                 |
| txAIS, rxRAI, txRAI | Transmit alarm indication signal, receive remote alarm indicator, and transmit remote alarm indicator status. Values are inactive or active. When the router receives an LOS, LOF, or AIS, the txRAI is active. When the remote router receives an LOS, LOF, or AIS, the rxRAI is active. |

**Example of 1-Port PA-T3 Serial Port Adapter Installed in a VIP2**

The following is sample output from the **show interfaces serial** command for a 1-port PA-T3 serial port adapter installed in a VIP2 in chassis slot 1, in port adapter slot 0:

```
Router# show interfaces serial 1/0/0

Serial1/0/0 is up, line protocol is up
  Hardware is cyBus PODS3 Serial
  Internet address is 172.18.1.1/24
  MTU 4470 bytes, BW 44736 Kbit, DLY 200 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input 00:00:05, output 00:00:02, output hang never
  Last clearing of "show interface" counters 5d02h
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 27269 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    79039 packets input, 14195344 bytes, 0 no buffer
    Received 84506 broadcasts, 0 runts, 0 giants
      0 parity
    9574 input errors, 6714 CRC, 0 frame, 1 overrun, 0 ignored, 2859 abort
    62472 packets output, 13751644 bytes, 0 underruns
    0 output errors, 0 applique, 10 interface resets
    0 output buffer failures, 0 output buffers swapped out
    16 carrier transitions
  rxLOS inactive, rxLOF inactive, rxAIS inactive
  txAIS inactive, rxRAI inactive, txRAI inactive
```

[Table 53](#) describes significant fields shown in the display that are different from the fields described in [Table 50 on page 429](#).

**Table 53** *show interfaces serial Field Descriptions—PA-T3*

| Field                                      | Description                                                                                                                             |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing of "show interface" counters | Time the counters were last cleared.                                                                                                    |
| Queueing strategy                          | First-in, first-out queueing strategy (other queueing strategies that you might see are priority-list, custom-list, and weighted fair). |
| parity                                     | Number of the parity errors on the interface.                                                                                           |
| applique                                   | Indicates that an unrecoverable error has occurred on the T3 applique. The router then invokes an interface reset.                      |
| output buffer failures                     | Number of "no resource" errors received on the output.                                                                                  |



**Table 53** *show interfaces serial Field Descriptions—PA-T3 (continued)*

| Field                      | Description                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| output buffers swapped out | Number of packets swapped to DRAM.                                                                                                                                                                                                                                                        |
| rxLOS, rxLOF, rxAIS        | Receive loss of signal, loss of frame, and alarm indication signal status. Values are inactive or active.                                                                                                                                                                                 |
| txAIS, rxRAI, txRAI        | Transmit alarm indication signal, receive remote alarm indicator, and transmit remote alarm indicator status. Values are inactive or active. When the router receives an LOS, LOF, or AIS, the txRAI is active. When the remote router receives an LOS, LOF, or AIS, the rxRAI is active. |

**Example of CT3IP Serial Interface**

The following is sample output from the **show interfaces serial** command for the CT3IP serial interface:

```
Router# show interfaces serial 3/0/0:25
```

```
Serial3/0/0:25 is up, line protocol is up
  Hardware is cyBus T3
  Internet address is 10.25.25.2/24
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 12/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 00:19:01, output 00:11:49, output hang never
  Last clearing of "show interface" counters 00:19:39
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
    Conversations 0/1 (active/max active)
    Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 69000 bits/sec, 90 packets/sec
  5 minute output rate 71000 bits/sec, 90 packets/sec
    762350 packets input, 79284400 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    150 input errors, 0 CRC, 0 frame, 150 overrun, 0 ignored, 0 abort
    763213 packets output, 80900472 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions no alarm present
  Timeslot(s) Used:1-24, Transmitter delay is 0 flags, transmit queue length 5
  non-inverted data
```

[Table 54](#) describes significant fields relevant to the CT3IP shown in the display that are different from the fields described in [Table 50 on page 429](#).

**Table 54** *show interfaces serial Field Descriptions—CT3IP*

| Field                 | Description                                                             |
|-----------------------|-------------------------------------------------------------------------|
| Timeslot(s) Used      | Number of time slots assigned to the T1 channel.                        |
| Transmitter delay     | Number of idle flags inserted between each HDLC frame.                  |
| transmit queue length | Number of packets allowed in the transmit queue.                        |
| non-inverted data     | Indicates whether or not the interface is configured for inverted data. |

### Example of an HDLC Synchronous Serial Interface on a Cisco 7500 Series Router

The following is sample output from the **show interfaces serial** command for an HDLC synchronous serial interface on a Cisco 7500 series router:

```
Router# show interfaces serial 1/0

Serial1/0 is up, line protocol is up
  Hardware is cxBus Serial
  Internet address is 172.19.190.203, 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
```

[Table 50 on page 429](#) describes significant fields shown in the display.

### Example of HDLC Encapsulation

The following example displays High-Level Data Link Control (HDLC) encapsulation on serial interface 0:

```
Router# show interfaces serial 0

Serial0 is up, line protocol is up (looped)
  Hardware is HD64570
  Internet address is 10.1.1.1, 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 set, keepalive set (10 sec)
```

[Table 50 on page 429](#) describes significant fields shown in the display.

### Example of a G.703 Interface with Framing

The following is sample output from 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 10.4.4.1, 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 50 on page 429 describes significant fields shown in the display.

### Example with Frame Relay Encapsulation

When using Frame Relay encapsulation, use the **show interfaces serial** command to display information on the multicast data-link connection identifier (DLCI), the DLCI of the interface, and the DLCI used for the local management interface (LMI).

The multicast DLCI and the local DLCI can be set using the **frame-relay multicast-dlci** and **frame-relay local-dlci** configuration commands. The status information is taken from the LMI, when active.

The following is sample output from the **show interfaces serial** command when Frame Relay encapsulation and LMI are enabled:

```

Router# show interfaces serial

Serial 2 is up, line protocol is up
  Hardware type is MCI Serial
  Internet address is 172.20.122.1, 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 using the **frame-relay multicast-dlci** interface configuration command.

The display shows the statistics for the LMI as 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). Refer to the *Frame Relay Interface* specification for additional explanations of this output.

### Example with Frame Relay Queueing and Fragmentation at the Interface

The following is sample output from the **show interfaces serial** command when low-latency queueing and FRF.12 end-to-end fragmentation are configured on a Frame Relay interface:

```

Router# show interfaces serial 3/2

Serial3/2 is up, line protocol is up
  Hardware is M4T
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation FRAME-RELAY, crc 16, loopback not set
  Keepalive set (10 sec)
  LMI enq sent 0, LMI stat recvd 0, LMI upd recvd 0, DTE LMI up
  LMI enq recvd 0, LMI stat sent 0, LMI upd sent 0
  LMI DLCI 1023 LMI type is CISCO frame relay DTE

```

```

Fragmentation type: end-to-end, size 80, PQ interleaves 0
Broadcast queue 0/64, broadcasts sent/dropped 0/0, interface broadcasts 0
Last input 2d15h, output 2d15h, output hang never
Last clearing of "show interface" counters 00:01:31
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: weighted fair
Output queue: 0/1000/64/0 (size/max total/threshold/drops)
  Conversations 0/0/256 (active/max active/max total)
  Reserved Conversations 0/0 (allocated/max allocated)
  Available Bandwidth 1094 kilobits/sec
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 output buffer failures, 0 output buffers swapped out
  1 carrier transitions      DCD=up DSR=up DTR=up RTS=up CTS=up

```

Table 55 describes significant fields shown in the display that are different from the fields described in Table 50 on page 429.

**Table 55** *show interfaces serial Field Descriptions—Frame Relay Interface Queueing and Fragmentation*

| Field                   | Description                                                                                                                                                                      |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| txload                  | Interface load in the transmit direction.                                                                                                                                        |
| rxload                  | Interface load in the receive direction.                                                                                                                                         |
| crc                     | Length the cyclic redundancy check (CRC) used on the interface.                                                                                                                  |
| LMI enq sent            | Number of Frame Relay status inquiry messages sent.                                                                                                                              |
| LMI stat recvd          | Number of Frame Relay status request messages received.                                                                                                                          |
| LMI upd recvd           | Number of single PVC asynchronous status messages received.                                                                                                                      |
| DTE LMI up              | LMI peers are synchronized.                                                                                                                                                      |
| LMI enq recvd           | Number of Frame Relay status inquiry messages received.                                                                                                                          |
| LMI stat sent           | Number of Frame Relay status request messages sent.                                                                                                                              |
| LMI upd sent            | Number of single PVC asynchronous status messages sent.                                                                                                                          |
| Fragmentation type      | Type of fragmentation: end-to-end, Cisco, or VoFR                                                                                                                                |
| size                    | Fragmentation size.                                                                                                                                                              |
| PQ interleaves          | Number of priority queue frames that have interleaved data fragments.                                                                                                            |
| Broadcast queue         | Number on queue/queue depth.                                                                                                                                                     |
| broadcasts sent/dropped | Number of broadcasts sent and dropped.                                                                                                                                           |
| interface broadcasts    | Number of broadcasts sent on interface.                                                                                                                                          |
| Input queue             | size—Current size of the input queue.<br>max—Maximum size of the queue.<br>drops—Number of messages discarded.<br>flushes—Number of times that data on queue has been discarded. |
| Queueing strategy       | Type of queueing configured on the interface.                                                                                                                                    |

**Table 55** *show interfaces serial Field Descriptions—Frame Relay Interface Queueing and Fragmentation (continued)*

| Field                      | Description                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output queue               | size—Current size of the output queue.<br>max total—Maximum number of frames that can be queued.<br>threshold—Congestive-discard threshold. Number of messages in the queue after which new messages for high-bandwidth conversations are dropped.<br>drops—Number of dropped messages. |
| Conversations              | active—Number of currently active conversations.<br>max active—Maximum number of conversations that have ever occurred at one time.<br>max total—Maximum number of active conversations allowed.                                                                                        |
| throttles                  | Number of times the receiver on the port was disabled, possibly because of processor or buffer overload.                                                                                                                                                                                |
| output buffer failures     | Number of “no resource” errors received on the output.                                                                                                                                                                                                                                  |
| output buffers swapped out | Number of packets swapped to DRAM.                                                                                                                                                                                                                                                      |

#### Example with ANSI LMI

For a serial interface with the ANSI Local Management Interface (LMI) enabled, use the **show interfaces serial** command to determine the LMI type implemented. The following is sample output from the **show interfaces serial** command 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 172.18.121.1, 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 serial** 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 56](#) describes the few differences that exist.

**Table 56** *show interfaces serial Field Descriptions—ANSI LMI*

| Field                    | Description                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------|
| LMI DLCI 0               | Identifies the DLCI used by the LMI for this interface. The default is 1023.                              |
| LMI sent 10              | Number of LMI packets that 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. |

**Example with LAPB Encapsulation**

Use the **show interfaces serial** command to display operation statistics for an interface that uses Link Access Procedure, Balanced (LAPB) encapsulation. The following is partial sample output from the **show interfaces serial** command for a serial interface that uses LAPB encapsulation:

```
Router# show interfaces serial 1

LAPB state is SABMSENT, T1 3000, N1 12056, N2 20, k7,Protocol ip
VS 0, VR 0, RCNT 0, Remote VR 0, Retransmissions 2
IFRAMEs 0/0 RNRs 0/0 REJs 0/0 SABMs 3/0 FRMRs 0/0 DISCs 0/0
```

[Table 57](#) shows the fields relevant to all LAPB connections.

**Table 57** *show interfaces serial Field Descriptions—LAPB*

| Field                  | Description                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| LAPB state is          | State of the LAPB protocol.                                                                                                                |
| T1 3000, N1 12056, ... | Current parameter settings.                                                                                                                |
| Protocol               | Protocol encapsulated on a LAPB link; this field is not present on interfaces configured for multiprotocol LAPB or X.25 encapsulations.    |
| VS                     | Modulo 8 frame number of the next outgoing information frame.                                                                              |
| VR                     | Modulo 8 frame number of the next information frame expected to be received.                                                               |
| RCNT                   | Number of received information frames that have not yet been acknowledged.                                                                 |
| Remote VR              | Number of the next information frame that the remote device expects to receive.                                                            |
| Retransmissions        | Count of current retransmissions because of expiration of T1.                                                                              |
| Window is closed       | No more frames can be transmitted until some outstanding frames have been acknowledged. This message should be displayed only temporarily. |
| IFRAMEs                | Count of information frames in the form of sent/received.                                                                                  |
| RNRs                   | Count of Receiver Not Ready frames in the form of sent/received.                                                                           |
| REJs                   | Count of Reject frames in the form of sent/received.                                                                                       |
| SABMs                  | Count of Set Asynchronous Balanced Mode commands in the form of sent/received.                                                             |
| FRMRs                  | Count of Frame Reject frames in the form of sent/received.                                                                                 |
| DISCs                  | Count of Disconnect commands in the form of sent/received.                                                                                 |

### Example with PPP Encapsulation

The output for an interface configured for synchronous PPP encapsulation differs from the standard **show interfaces serial** output. An interface configured for PPP might include the following information:

```
Router# show interfaces serial 1
```

```
lcp state = OPEN
ncp ipcp state = OPEN    ncp osicp state = NOT NEGOTIATED
ncp ipxcp state = NOT NEGOTIATED    ncp deccp state = NOT NEGOTIATED
ncp bridgecp state = NOT NEGOTIATED    ncp atalkcp state = NOT NEGOTIATED
```

Table 58 show the fields relevant to PPP connections.

**Table 58** *show interfaces serial Field Descriptions—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 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.         |

### Example with SDLC Connections

Use the **show interfaces serial** command to display the Synchronous Data Link Control (SDLC) information for a given SDLC interface. The following is sample output from the **show interfaces serial** command for an SDLC primary interface that supports the SDLLC function:

```
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
  2 carrier transitions
```

Table 59 shows the fields relevant to all SDLC connections.

**Table 59** *show interfaces serial Field Descriptions—SDLC Enabled*

| Field                                            | Description                                                    |
|--------------------------------------------------|----------------------------------------------------------------|
| Timers (msec): poll pause, fair poll, Poll limit | Current values of these timers for the primary SDLC interface. |
| T1, N1, N2, K                                    | Values for these parameters for the primary SDLC interface.    |

Table 60 shows other data given for each SDLC secondary interface configured to be attached to the serial interface.

**Table 60** *SDLC Secondary Interface Descriptions*

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| addr                        | Address of this SDLC secondary interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| state is                    | Current state of this connection, which is one of the following: <ul style="list-style-type: none"> <li>• DISCONNECT—No communication is being attempted to this secondary.</li> <li>• CONNECT—A normal connect state exists between this router and this secondary.</li> <li>• DISCSENT—This router has sent a disconnect request to this secondary and is awaiting its response.</li> <li>• SNRMSENT—This router has sent a connect request (SNRM) to this secondary and is awaiting its response.</li> <li>• THEMBUSY—This secondary has told this router that it is temporarily unable to receive any more information frames.</li> <li>• USBUSY—This router has told this secondary that it is temporarily unable to receive any more information frames.</li> <li>• BOTHBUSY—Both sides have told each other that they are temporarily unable to receive any more information frames.</li> <li>• ERROR—This router has detected an error and is waiting for a response from the secondary acknowledging this.</li> </ul> |
| VS                          | Sequence number of the next information frame that 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 and maximum size of hold queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| IFRAMEs, RNRs, SNRMs, DISCs | Sent/received count for these frames.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |



**Table 60** SDLC Secondary Interface Descriptions (continued)

| Field      | Description                                                                                                               |
|------------|---------------------------------------------------------------------------------------------------------------------------|
| 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 <i>round robin loop</i> of polled devices. |

**Example 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 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 *Cisco IOS Bridging and IBM Networking Command Reference, Volume 2 of 2: IBM Networking*. [Table 61](#) shows the parameters specific to SDLLC.

**Table 61** SDLLC Parameter Descriptions

| Field                     | 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 <b>sdllc traddr</b> command.                                                                                        |
| largest token ring frame  | Shows the largest Token Ring frame that is accepted on the Logical Link control, type 2 (LLC2) side of the connection.                                        |

**Table 61** SDLLC Parameter Descriptions (continued)

| Field              | Description                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. |

**Example with X.25**

The following is partial sample output from the **show interfaces serial** command for a serial X.25 interface:

```
Router# show interfaces serial 1

X25 address 000000010100, state R1, modulo 8, idle 0, timer 0, nvc 1
  Window size: input 2, output 2, Packet size: input 128, output 128
  Timers: T20 180, T21 200, T22 180, T23 180, TH 0
  Channels: Incoming-only none, Two-way 1-1024, Outgoing-only none
(configuration on RESTART: modulo 8,
  Window size: input 2 output 2, Packet size: input 128, output 128
  Channels: Incoming-only none, Two-way 5-1024, Outgoing-only none)
RESTARTs 3/2 CALLs 1000+2/1294+190/0+0/ DIAGs 0/0
```

The stability of the X.25 protocol requires that some parameters not be changed without a restart of the protocol. Any change to these parameters is held until a restart is sent or received. If any of these parameters changes, information about the router configuration at restart will be displayed as well as the values that are currently in effect.

[Table 62](#) describes significant fields shown in the display.

**Table 62** show interfaces serial Field Descriptions—X.25 Enabled

| Field       | Description                                                                                                                                                                                                                                                                                                     |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| X25 address | Address used to originate and accept calls.                                                                                                                                                                                                                                                                     |
| state       | State of the interface. Possible values follow: <ul style="list-style-type: none"> <li>• R1 is the normal ready state.</li> <li>• R2 is the DTE restarting state.</li> <li>• R3 is the DCE restarting state.</li> </ul> If the state is R2 or R3, the interface is awaiting acknowledgment of a Restart packet. |
| modulo      | Modulo value; determines the packet sequence numbering scheme used.                                                                                                                                                                                                                                             |
| idle        | Number of minutes for which the Cisco IOS software waits before closing idle virtual circuits that it originated or accepted.                                                                                                                                                                                   |
| timer       | Value of the interface timer, which is zero unless the interface state is R2 or R3.                                                                                                                                                                                                                             |
| nvc         | Default maximum number of simultaneous virtual circuits permitted to and from a single host for a particular protocol.                                                                                                                                                                                          |

**Table 62** *show interfaces serial Field Descriptions—X.25 Enabled (continued)*

| Field                                           | Description                                                                                                                                                                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Window size: input, output                      | Default window sizes (in packets) for the interface. The <b>x25 facility</b> interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.                      |
| Packet size: input, output                      | Default maximum packet sizes (in bytes) for the interface. The <b>x25 facility</b> interface configuration command can be used to override these default values for the switched virtual circuits originated by the router.                |
| Timers:                                         | Values of the X.25 timers: <ul style="list-style-type: none"> <li>• T10 through T13 for a DCE device</li> <li>• T20 through T23 for a DTE device</li> </ul>                                                                                |
| TH                                              | Packet acknowledgment threshold (in packets). This value determines how many packets are received before an explicit acknowledgment is sent. The default value (0) sends an explicit acknowledgment only when the incoming window is full. |
| Channels: Incoming-only, Two-way, Outgoing-only | Displays the virtual circuit ranges for this interface.                                                                                                                                                                                    |
| RESTARTs                                        | Shows Restart packet statistics for the interface using the format Sent/Received.                                                                                                                                                          |
| CALLs                                           | Successful calls sent + failed calls/calls received + calls failed/calls forwarded + calls failed. Calls forwarded are counted as calls sent.                                                                                              |
| DIAGs                                           | Diagnostic messages sent and received.                                                                                                                                                                                                     |

**Example with Accounting Option**

The following example illustrates the **show interfaces serial** command with the **accounting** option on a Cisco 7500 series routers:

```
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      |

Table 63 describes the fields shown in the display.

**Table 63** *show interfaces serial Field Descriptions—Accounting*

| Field     | Description                                         |
|-----------|-----------------------------------------------------|
| 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. |

**Example with Cisco AS5800 Access Server**

The following example shows the activity that occurred on the serial interface in shelf 1, slot 4, port 0 for time slot 2 in group 23:

```
Router# show interfaces serial 1/4/0:2:23
```

```
Serial1/4/0:2:23 is up, line protocol is up (spoofing)
Hardware is DS-T1
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set
Last input 00:00:01, output 00:00:01, output hang never
Last clearing of "show interface" counters 22:24:30
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec

5 minute output rate 0 bits/sec, 0 packets/sec
 5274 packets input, 20122 bytes, 0 no buffer
Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
 0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
 5274 packets output, 30836 bytes, 0 underruns
 0 output errors, 0 collisions, 0 interface resets
 0 output buffer failures, 0 output buffers swapped out
 2 carrier transitions no alarm present
Timeslot(s) Used:24, subrate: 64Kb/s, transmit delay is 0 flags
```

[Table 64](#) describes the significant fields shown in the display that are different from the fields described in [Table 50 on page 429](#).

**Table 64** *show interfaces serial Command Field Descriptions—Cisco AS5800*

| Field                                      | Description                                                                                                                               |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing of “show interface” counters | Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) were last reset to zero. |
| Queueing strategy                          | Displays the type of queueing configured for this interface. In the example output, the type of queueing configured is FIFO.              |
| throttles                                  | Number of times that the receiver on the port was disabled, possibly because of buffer or processor overload.                             |
| output buffer failures                     | Number of times that the output buffer has failed.                                                                                        |
| output buffer swapped out                  | Number of times that the output buffer has been swapped out.                                                                              |
| Timeslot(s) Used                           | Number of time slots assigned to the T1 channel.                                                                                          |

**Table 64** *show interfaces serial Command Field Descriptions—Cisco AS5800 (continued)*

| Field                 | Description                                       |
|-----------------------|---------------------------------------------------|
| subrate               | Bandwidth of each time slot.                      |
| transmit delay is ... | Number of idle flags inserted between each frame. |

**Related Commands**

| Command                                 | Description                                              |
|-----------------------------------------|----------------------------------------------------------|
| <a href="#">show controllers serial</a> | Displays information about the virtual serial interface. |

# show interfaces summary

To display a summary of statistics for all interfaces that are configured on a networking device, use the **show interfaces summary** command in privileged EXEC mode.

**show interfaces summary**

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

**Command Modes** Privileged EXEC

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 12.2    | This command was introduced. |

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

Router# **show interfaces summary**

```

*: interface is up
IHQ: pkts in input hold queue      IQD: pkts dropped from input queue
OHQ: pkts in output hold queue    OQD: pkts dropped from output queue
RXBS: rx rate (bits/sec)          RXPS: rx rate (pkts/sec)
TXBS: tx rate (bits/sec)          TXPS: tx rate (pkts/sec)
TRTL: throttle count

```

| Interface         | IHQ | IQD | OHQ | OQD | RXBS | RXPS | TXBS | TXPS | TRTL |
|-------------------|-----|-----|-----|-----|------|------|------|------|------|
| * FastEthernet0/0 | 0   | 0   | 0   | 0   | 0    | 0    | 0    | 0    | 0    |
| Serial0/0         | 0   | 0   | 0   | 0   | 0    | 0    | 0    | 0    | 0    |
| FastEthernet0/1   | 0   | 0   | 0   | 0   | 0    | 0    | 0    | 0    | 0    |
| Serial0/1         | 0   | 0   | 0   | 0   | 0    | 0    | 0    | 0    | 0    |

NOTE: No separate counters are maintained for subinterfaces  
Hence Details of subinterface are not shown.

| Related Commands | Command                             | Description                                                  |
|------------------|-------------------------------------|--------------------------------------------------------------|
|                  | <b>show interfaces</b>              | Displays the statistical information specific to interfaces. |
|                  | <b>show interfaces atm</b>          | Displays information about the ATM interfaces.               |
|                  | <b>show interfaces ethernet</b>     | Displays information about the Ethernet interfaces.          |
|                  | <b>show interfaces fastethernet</b> | Displays information about the Fast Ethernet interfaces.     |
|                  | <b>show interfaces serial</b>       | Displays information about the serial interfaces.            |

# show interfaces tokenring

To display information about the Token Ring interface and the state of source route bridging, use the **show interfaces tokenring** command in privileged EXEC mode.

**show interfaces tokenring** *unit* [**accounting**]

## Cisco 7200 and 7500 Series

**show interfaces tokenring** *slot/port* [**accounting**]

## Cisco 7500 Series with Ports on VIPs

**show interfaces tokenring** [*slot/port-adapter/port*]

| Syntax Description  |                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>unit</i>         | Must match the interface port line number.                                                                                                                                                                                                                                                                                                                           |
| <b>accounting</b>   | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                                                                                                                                                                                                                                           |
| <i>slot</i>         | On the Cisco 7000 series routers, slot location of the interface processor. On the Cisco 7000, the value can be 0, 1, 2, 3, or 4. On the Cisco 7010, value can be 0, 1, or 2.<br><br>On the Cisco 7200 series routers, slot location of the port adapter; the value can be 1, 2, 3, 4, 5, or 6.                                                                      |
| <i>port</i>         | Port number on the interface. On the Cisco 7000 series routers this argument is required, and the values can be 0, 1, 2, or 3.<br><br>(Optional) For the VIP this argument is optional, and the port value can be 0, 1, 2, or 3 for 4-port Token Ring interfaces.<br><br>On the Cisco 7200 series routers, the number depends on the type of port adapter installed. |
| <i>port-adapter</i> | (Optional) On the Cisco 7000 series and Cisco 7500 series routers, specifies the ports on a VIP. The value can be 0 or 1.                                                                                                                                                                                                                                            |

| Command Modes | Privileged EXEC |
|---------------|-----------------|
|---------------|-----------------|

| Command History | Release  | Modification                                                                               |
|-----------------|----------|--------------------------------------------------------------------------------------------|
|                 | 10.0     | This command was introduced.                                                               |
|                 | 11.3(3)T | The information was modified to include the PA-4R-FDX full-duplex Token Ring port adapter. |

| Usage Guidelines | If you do not provide values for the arguments <i>slot</i> and <i>port</i> , the command will display statistics for all the network interfaces. The optional keyword <b>accounting</b> displays the number of packets of each protocol type that have been sent through the interface. |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Examples**

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 131.136.230.203, 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 65](#) describes the significant fields shown in the displays.

**Table 65** *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).<br><br>On the Cisco 7500 series routers, gives the interface processor type, slot number, and port number. |
| 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 percent 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.                                                                               |



**Table 65** *show interfaces tokenring Field Descriptions (continued)*

| Field                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                                                      |
| Functional Address:                       | Bit-significant group address. Each "on" bit represents a function performed by the station.                                                                                                                                                                                                                                                                                                                                                                                                |
| Ethernet Transit OUI:                     | The Organizational Unique Identifier (OUI) code to be used in the encapsulation of Ethernet Type II frames across Token Ring backbone networks.                                                                                                                                                                                                                                                                                                                                             |
| Last input                                | Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                             |
| output                                    | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                                                                                                                                                                                                               |
| 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.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than 2 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |
| Output queue, drops<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                                 |

**Table 65** *show interfaces tokenring Field Descriptions (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Five minute input rate,<br>Five minute output rate | <p>Average number of bits and packets transmitted per second in the last 5 minutes.</p> <p>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.</p> |
| 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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                              |
| giants                                             | Number of packets that are discarded because they exceed the of them mediummaximum 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.                                                                                                                                                                                  |
| 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.                                                                                                                                                                                                                                                                                                                    |

**Table 65** *show interfaces tokenring Field Descriptions (continued)*

| Field            | Description                                                                                                                                                                                                                                                                                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 7500 series routers:

```
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 7500 series routers 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
```

The following is sample output from the **show interfaces tokenring** command on a Cisco 7000 series router:

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 a Cisco 7000 series router 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** command in privileged EXEC mode.

**show interfaces tunnel** *number* [**accounting**]

| Syntax Description | <i>number</i>     | Port line number.                                                                                          |
|--------------------|-------------------|------------------------------------------------------------------------------------------------------------|
|                    | <b>accounting</b> | (Optional) Displays the number of packets of each protocol type that have been sent through the interface. |

| Command Modes | Privileged EXEC |
|---------------|-----------------|
|---------------|-----------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

**Examples** 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 66](#) describes significant fields shown in the display.

**Table 66** *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).<br><br>On the Cisco 7500 series routers, 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.                                                                                                                                                                                                                                                       |
| 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 percent 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 <b>tunnel mode</b> 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 and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.   |
| output                                               | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                     |
| 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. |

**Table 66** *show interfaces tunnel Field Descriptions (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Last clearing                                      | <p>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.</p> <p>*** indicates the elapsed time is too large to be displayed.</p> <p>0:00:00 indicates the counters were cleared more than <math>2^{31}</math> ms (and less than <math>2^{32}</math> ms) ago.</p> |
| Output queue, drops<br>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 because of a full queue.                                                                                                                                                                                                                                                                                                                                |
| Five minute input rate,<br>Five minute output rate | <p>Average number of bits and packets transmitted per second in the last 5 minutes.</p> <p>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.</p>                     |
| 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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                  |
| giants                                             | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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.                                                                                                                                                                                                                                                                                                                              |

**Table 66** *show interfaces tunnel Field Descriptions (continued)*

| Field            | Description                                                                                                                                                                                                                                                                                                                                                          |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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            | 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 because of an Ethernet collision. Some collisions are normal. However, if your collision rate climbs to around 4 or 5 percent, 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. |
| 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 that the controller was restarted because of errors.                                                                                                                                                                                                                                                                                                 |

**Related Commands**

| Command                         | Description                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------|
| <a href="#">show interfaces</a> | Displays the statistical information specific to a serial interface.                    |
| <a href="#">show ip route</a>   | Displays all static IP routes or those installed using the AAA route download function. |



# show interfaces vg-anylan

To display the information about the 100VG-AnyLAN port adapter on Cisco 7200 series routers and Cisco 7500 series routers, use the **show interfaces vg-anylan** command in EXEC mode.

## Cisco 7200 Series

**show interfaces vg-anylan** [*slot/port*]

## Cisco 7500 Series with VIPs

**show interfaces vg-anylan** [*slot/port-adapter/port*]

| Syntax Description | <i>slot</i>         | (Optional) Number of the slot being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|--------------------|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <i>port</i>         | (Optional) Number of the port being configured. Refer to the appropriate hardware manual for slot and port information.                            |
|                    | <i>port-adapter</i> | (Optional) Number of the port adapter being configured. Refer to the appropriate hardware manual for information about port adapter compatibility. |

| Command Modes | EXEC |
|---------------|------|
|---------------|------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.3    | This command was introduced. |

**Examples** The following is sample output from the **show interfaces vg-anylan** command:

```
Router# show interfaces vg-anylan 3/0/0
```

```
VG-AnyLAN3/0/0 is up, line protocol is up
  Hardware is cyBus VG-AnyLAN Interface
  Frame type is 802.3, address is 0060.3e64.2460 (bia 0060.3e64.2460)
  Internet address is 10.1.1.5/16
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:26, output 00:00:09, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    5316 packets input, 857349 bytes, 0 no buffer
    Received 5310 broadcasts, 0 runts, 0 giants
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 input packets with dribble condition detected
    7920 packets output, 754259 bytes, 0 underruns

    0 output errors, 0 collisions, 2 interface resets
```

```

0 output buffer failures, 0 output buffers swapped out
0 vg alignment error, 0 vg balance error
0 vg invalid ipm error, 0 vg symbol error
0 vg skew error, 0 vg frame delimit error
0 vg high priority packets, 0 vg high priority octets

```

Table 67 describes significant fields shown in the display.

**Table 67** *show interfaces vg-anylan Field Descriptions*

| Field                                     | Description                                                                                                                                                                                                                                                                                       |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VG-AnyLAN3/0/0 is up, line protocol is up | Indicates if the interface hardware is currently active and can transmit and receive or if it has been taken down by an administrator.                                                                                                                                                            |
| Hardware is cyBus VG-AnyLAN               | Hardware type.                                                                                                                                                                                                                                                                                    |
| Frame type is 803.2                       | Currently the frame type supported is 803.2.                                                                                                                                                                                                                                                      |
| Internet address                          | Internet address and 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 percent 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 <b>bandwidth</b> interface configuration command.                                                                      |
| Encapsulation                             | Encapsulation method assigned to the interface.                                                                                                                                                                                                                                                   |
| loopback                                  | Indicates if loopbacks are set.                                                                                                                                                                                                                                                                   |
| keepalive                                 | Indicates if keepalives are set.                                                                                                                                                                                                                                                                  |
| ARA type                                  | ARP type on the interface.                                                                                                                                                                                                                                                                        |
| Last input                                | Number of hours, minutes, and seconds since the last packet was successfully received by an interface and processed locally on the router. Useful for knowing when a dead interface failed. This counter is updated only when packets are process switched, not when packets are fast switched.   |
| output                                    | Number of hours, minutes, and seconds since the last packet was successfully transmitted by an interface. This counter is updated only when packets are process switched, not when packets are fast switched.                                                                                     |
| 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. |

**Table 67** *show interfaces vg-anylan Field Descriptions (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. Variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared.<br><br>*** indicates the elapsed time is too large to be displayed.<br><br>0:00:00 indicates the counters were cleared more than 2 <sup>31</sup> ms (and less than 2 <sup>32</sup> ms) ago. |
| Queueing strategy                           | First-in, first-out queueing strategy (other queueing strategies that you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                                                                                                                                                                                                           |
| Output queue, drops<br>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 because a queue was full.                                                                                                                                                                                                                                                                                                      |
| 5 minute input rate<br>5 minute output rate | Average number of bits and packets received or 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 Ethernet networks 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 minimum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                         |
| giants                                      | Number of packets that are discarded because they exceed the maximum packet size of the medium.                                                                                                                                                                                                                                                                                                                                                                                   |
| 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 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.          |
| 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.                                                                                                                                                                                                                                                                                                     |

**Table 67** *show interfaces vg-anylan Field Descriptions (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 the interface.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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 (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.                                                                                                                                                                                                                                                                                                                                                      |
| 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 can have more than one error, and others can have errors that do not fall into any of the specifically tabulated categories.                                                                                                                                   |
| collisions                                    | Number of messages retransmitted because of an Ethernet collision. 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 a certain interval. If the system notices that the carrier detect line of an 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 unrecoverable interface processor error occurred, or when an interface is looped back or shut down. |
| 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.                                                                                                                                                                                                                                                           |
| vg alignment error                            | Number of nonoctets received.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| vg balance error                              | Number of incorrect balanced symbols received.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| vg invalid ipm error                          | Number of packets received with an invalid packet marker (IPM).                                                                                                                                                                                                                                                                                                                                                                                                           |
| vg symbol error                               | Number of symbols received that were not correctly decoded.                                                                                                                                                                                                                                                                                                                                                                                                               |
| vg skew error                                 | Number of skews between four pairs of twisted-pair wire that exceeded the allowable skew.                                                                                                                                                                                                                                                                                                                                                                                 |
| vg frame delimit error                        | Number of start-of-frame errors or false-start errors received.                                                                                                                                                                                                                                                                                                                                                                                                           |
| vg high priority packets                      | Number of high-priority packets received.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| vg high priority octets                       | Number of high-priority octets received.                                                                                                                                                                                                                                                                                                                                                                                                                                  |

**Related Commands**

| Command                             | Description                                                                                                                                                |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">interface vg-anylan</a> | Specifies the interface on a 100VG-AnyLAN port adapter and enters interface configuration mode on Cisco 7200 series routers and Cisco 7500 series routers. |

# show ip director dfp

To display information about the current status of the DistributedDirector connections with a particular Dynamic Feedback Protocol (DFP) agent, use the **show ip director dfp** command in EXEC mode.

```
show ip director dfp [host-name | ip-address]
```

|                    |            |                        |
|--------------------|------------|------------------------|
| Syntax Description | host-name  | (Optional) Host name.  |
|                    | ip-address | (Optional) IP address. |

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |          |                              |
|-----------------|----------|------------------------------|
| Command History | Release  | Modification                 |
|                 | 12.1(5)T | This command was introduced. |

**Examples** The following is sample output from the **show ip director dfp** command:

```
Router# show ip director dfp

172.24.9.9:
Max retries: 5
Timeout between connect attempts: 60
Timeout between updates: 90
Last update received: 00:00:12 ago
Server          Port  BindID Address  Mask
172.28.9.9      80    0      0.0.0.0  0.0.0.0
192.168.25.25
Max retries: 5
Timeout between connect attempts: 60
Timeout between updates: 90
Last update received: 00:00:44 ago
Server          Port  BindID Address  Mask
192.168.30.30  80    0      0.0.0.0  0.0.0.0
```

# show pas caim

To show debug information about the data compression Advanced Interface Module (CAIM) daughtercard, use the **show pas caim** command in EXEC mode.

**show pas caim** { **rings** | **dma** | **coprocessor** | **stats** | **cnxt\_table** | **page\_table** } *element-number*

## Syntax Description

|                                          |                                                                                                   |
|------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>rings</b> <i>element-number</i>       | Displays current content of the Direct Memory Access (DMA) ring buffer.                           |
| <b>dma</b> <i>element-number</i>         | Displays registers of the Jupiter DMA controller.                                                 |
| <b>coprocessor</b> <i>element-number</i> | Displays registers of the Hifn 9711 compression coprocessor.                                      |
| <b>stats</b> <i>element-number</i>       | Displays statistics describing operation of the data compression Advanced Interface Module (AIM). |
| <b>cnxt_table</b> <i>element-number</i>  | Displays the context of the specific data compression AIM element.                                |
| <b>page_table</b> <i>element-number</i>  | Displays the page table for each CAIM element.                                                    |

## Command Modes

EXEC

## Command History

| Release  | Modification                 |
|----------|------------------------------|
| 12.0(2)T | This command was introduced. |

## Usage Guidelines

This command displays performance statistics that describe the operation of the CAIM. This command is primarily intended for engineering debug, but it can also be useful to Cisco support personnel and to Cisco customers in troubleshooting network problems. [Table 68](#) lists the output values for this command.

**Table 68** *show pas caim Output Values and Descriptions*

| Value           | Description                                                                       |
|-----------------|-----------------------------------------------------------------------------------|
| uncomp paks in  | Number of packets containing uncompressed data input to the CAIM for compression. |
| comp paks out   | Number of packets containing uncompressed data that were successfully compressed. |
| comp paks in    | Number of packets containing compressed data input to the CAIM for compression.   |
| uncomp paks out | Number of packets containing compressed data that were successfully decompressed. |

**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| uncomp bytes in / comp bytes out | Summarizes the compression performance of the CAIM. The “uncomp bytes in” statistic gives the total number of uncompressed bytes submitted to the CAIM for compression. The “Comp bytes out” statistic gives the resulting number of compressed bytes output by the CAIM. If one forms the ratio of “uncomp bytes in” to “comp bytes out”, one obtains the average compression ratio achieved by the CAIM.                                                                                                                                                                                                                                                                                                |
| comp bytes in / uncomp bytes out | <p>Summarizes the decompression performance of the CAIM. The “comp bytes in” statistic gives the total number of compressed bytes submitted to the CAIM for decompression. The “uncomp bytes out” statistic gives the resulting number of uncompressed bytes output by the CAIM. The average decompression ratio achieved can be computed as the ratio of “uncomp bytes out” to “comp bytes in”.</p> <p>Note that each packet submitted for compression or decompression has a small header at the front which is always clear data and hence never compressed nor decompressed. The “comp bytes in / uncomp bytes out” and “uncomp bytes in / comp bytes out” statistics do not include this header.</p> |
| uncomp paks/sec in               | A time average of the number of packets per second containing uncompressed data submitted as input to the CAIM for compression. It is computed as the ratio of the “uncomp paks in” statistic to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| comp paks/sec out                | A time average of the number of packets per second containing uncompressed data which were successfully compressed by the CAIM. It is computed as the ratio of the “comp paks out” statistic to the “seconds since last clear” compressed by the CAIM. It is computed as the ratio of the “comp paks out” statistic to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                          |
| comp paks/sec in                 | A time average of the number of packets per second containing compressed data submitted as input to the CAIM for decompression. It is computed as the ratio of the “comp paks in” statistic to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |



**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| uncomp paks/sec out | <p>A time average of the number of packets per second containing compressed data which were successfully decompressed by the CAIM. It is computed as the ratio of the “uncomp paks out” statistic to the “seconds since last clear” statistic.</p> <p>Note that the “uncomp paks/sec in”, “comp paks/sec out”, “comp paks/sec in”, and “uncomp paks/sec out” statistics are averages over the entire time since the last “clear count” command was issued. This means that as time progresses, these statistics become averages over an ever larger time interval. As time progresses, these statistics become ever less sensitive to current prevailing conditions. Note also that the “uncomp paks in”, “comp paks out”, “comp paks in”, and “uncomp paks out” statistics are 32-bit counters and can roll over from 0xffff ffff to 0. When they do so, the “uncomp paks/sec in”, “comp paks/sec out”, “comp paks/sec in”, and “uncomp paks/sec out” statistics can be rendered meaningless. It is therefore recommend that one issue a “clear count” command before sampling these statistics.</p> |
| uncomp bits/sec in  | A time average of the number of bits per second of uncompressed data which were submitted to the CAIM for compression. It is computed as the ratio of the “uncomp bytes in” statistic, times 8, to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| comp bits/sec out   | A time average of the number of bits per second of uncompressed data which were successfully compressed by the CAIM. It is computed as the ratio of the “comp bytes out” statistic, times 8, to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| comp bits/sec in    | A time average of the number of bits per second of compressed data which were submitted to the CAIM for decompression. It is computed as the ratio of the “comp bytes in” statistic, times 8, to the “seconds since last clear” statistic.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| uncomp bits/sec out | <p>A time average of the number of bits per second of compressed data which were successfully decompressed by the CAIM. It is computed as the ratio of the “uncomp bytes in” statistic, times 8, to the “seconds since last clear” statistic.</p> <p>Note again that these “bits/sec” statistics are time averages over the “seconds since last clear” statistics, and therefore become less and less sensitive to current conditions as time progresses. Also, these “bits/sec” statistics are computed from 32-bit counters, and when the counters roll over from the maximum 32-bit value to 0, the “bits/sec” statistics become inaccurate. It is again recommended that one issue the “clear count” command before sampling the “bits/sec” statistics.</p>                                                                                                                                                                                                                                                                                                                                       |

The remaining statistics summarize operational state and error conditions encountered by the CAIM, and have the following interpretations:

**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| holdq        | Gives the number of packets occupying the “hold queue” of the CAIM. The hold queue is a holding area, or “overflow” area, for packets to be processed by the CAIM. Normally, the CAIM is fast enough that no overflow into the hold queue occurs, and so normally this statistic should show zero.                                                                                                                                                                                                                                                       |
| hw_enable    | Flag indicating if the CAIM is disabled or not. Zero implies disabled; one implies enabled. The CAIM can become disabled if certain fatal hardware error conditions are detected. It can be reenabled by issuing the <b>clear aim element-number</b> command.                                                                                                                                                                                                                                                                                            |
| src_limited  | Flag indicating if the CAIM is in “source limited” mode. In source limited mode, the CAIM can only process a single command at a time. In non source limited mode, the CAIM can process several commands at a time using a pipeline built into the 9711 coprocessor. Note that the normal mode of operation is “non-source limited”, and there is no command to place the CAIM in “source limited” mode. Hence, this statistic should always read zero.                                                                                                  |
| num cnxts    | Gives the number of “contexts” which are currently open on the CAIM. Each interface configured for compression opens two contexts, one for each direction of data transfer.                                                                                                                                                                                                                                                                                                                                                                              |
| no data      | Counts the number of times in which the CAIM performed either a compress or decompression operation, and the output data length was reported with a length of zero. In normal operation, this statistic should always read zero. A nonzero value is an indication of a malfunctioning CAIM.                                                                                                                                                                                                                                                              |
| drops        | Counts the total number of times in which the CAIM was forced to drop a packet it was asked to compress or decompress. This can happen for a number of reasons, and the remaining statistics summarize these reasons. This statistic indicates that the CAIM is being overloaded with requests for compression/decompression.                                                                                                                                                                                                                            |
| nobuffers    | Counts the total number of times the CAIM needed to allocate memory for buffers but could not obtain memory. The CAIM allocates memory for buffers for holding the results of compression or decompression operations. In normal operation, there is plenty of memory available for holding CAIM results. This statistic, if nonzero, indicates that there is a significant backup in memory, or perhaps a memory leak.                                                                                                                                  |
| enc adj errs | Each packet compressed or decompressed involves an adjustment of the encapsulation of the packet between the LZS-DCP, FRF9, or MPPC encapsulation used to transport compressed packets to the standard encapsulation used to transport clear data. This statistic counts the number of times this encapsulation adjustment failed. In normal operation, this statistic should be zero. A nonzero value indicates that we are short in a specific memory resource referred to as “paktypes”, and that packets are being dropped because of this shortage. |

**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| fallbacks     | Number of times the data compression AIM card could not use its pre-allocated buffers to store compression results and had to “fallback” to using a common buffer pool.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| no replace    | Each time a compression or decompression operation is completed and the resultant data fill up a buffer, the CAIM software allocates a new buffer to replace the buffer filled. If no buffers are available, then the packet involved in this operation is dropped and the old buffer reused. This statistic thus represents the number of times such an allocation failure occurred. In normal operation there is plenty of memory available for these buffers. A nonzero value for this statistic is thus a serious indication of a memory leak or other backup in buffer usage somewhere in the system.                                                                                                                                                                                                                                 |
| num seq errs  | This statistic is incremented when the CAIM produces results in a different order than that in which the requests were submitted. Packets involved in such errors are dropped. A nonzero value in this statistic indicates a serious malfunction in the CAIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| num desc errs | Incremented when the CAIM reports error in a compression or decompression operation. Such errors are most likely bus errors, and they indicate a serious malfunction in the CAIM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| cmds complete | Reports the number of compression/decompression commands completed. This statistic should steadily increase in normal operation (assuming that the CAIM is continuously being asked to perform compression or decompression). If this statistic is not steadily increasing or decreasing when a steady stream of compression/decompression is expected, this is an indication of a malfunctioning CAIM.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| bad reqs      | Reports the number of compression/decompression requests that the CAIM software determined it could not possibly handle. This occurs only if a severely scattered packet (with more than 64 “particles”, or separate buffers of data) is handed to the CAIM to compress or decompress. This statistic should not increment during normal operation. A nonzero value indicates a software bug.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| dead cntxts   | Number of times a packet was successfully compressed or decompressed, only to find that the software “context”, or stream sourcing the packet, was no longer around. In such a case the packet is dropped. This statistic can be incremented at times when a serial interface is administratively disabled. If the timing is right, the CAIM may be right in the middle of operating on a packet from that interface when the disable takes effect. When the CAIM operation completes, it finds that the interface has been disabled and all “compression contexts” pertaining to that interface have been deleted. Another situation in which this can occur is when a Frame Relay DLC goes down. This is a normal and tolerable. If this statistic is incrementing when no such situations exist, it is an indication of a software bug. |

**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no paks        | If a packet to be compressed or decompressed overflows into the hold queue, then it must undergo an operation called “reparenting”. This involves the allocation of a “paktype” structure for the packet. If no paktype structures are available, then the packet is dropped and this statistic is incremented. A nonzero value of this statistic indicates that the CAIM is being overtaxed, that is, it is being asked to compress/decompress at a rate exceeding its capabilities.                                                                                        |
| enq errors     | Closely related to the “no paks” statistic. The hold queue for the CAIM is limited in length, and if the hold queue grows to this length, no further packets may be placed on it. A nonzero value of this statistic therefore also indicates that the CAIM is being overtaxed.                                                                                                                                                                                                                                                                                               |
| rx pkt drops   | Contains the total number of packets dropped because of “no paks” or “enq errors”, which were destined to be decompressed.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| tx pkt drops   | Contains the total number of packets dropped because of “no paks” or “enq errors”, which were destined to be compressed                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| dequeues       | Indicates the total number of packets which were removed from the CAIM hold queue when the CAIM became available for servicing its hold queue.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| requeues       | Indicates the total number of packets that were removed from the hold queue, only to find that the necessary CAIM resources were not available (it is not possible to determine whether CAIM resources are available until the packet is dequeued). Such packets are requeued onto the hold queue, with order in the queue preserved.                                                                                                                                                                                                                                        |
| drops disabled | Indicates the total number of packets which were submitted for compression or decompression, but that were dropped because the CAIM was disabled.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| clears         | Indicates the number of times the CAIM was reset using the <b>clear aim element-number</b> command.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| # ints         | Indicates the number of interrupts serviced by the CAIM software. This statistic should steadily increase (assuming that the CAIM workload is steady). If this statistic is not incremented when expected, it indicates a severe CAIM malfunction.                                                                                                                                                                                                                                                                                                                           |
| # purges       | Indicates the total number of times the compression history for a session had to be purged. This statistic is incremented a couple of times at startup. Thereafter, any increase in this statistic is an indication that the other side of the serial link detected bad data or gaps in the compressed packets being passed to it, and hence signalled a request to purge compression history in order to get back in synchronization. This can indicate that the CAIM is being overtaxed or that the serial interface is overtaxed and being forced to drop output packets. |

**Table 68** *show pas caim Output Values and Descriptions (continued)*

| Value     | Description                                                                                                                                                                                                                                                                         |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no cnxts  | Indicates the total number of times a request was issued to open a context, but the CAIM could not support any more contexts. Recall that two contexts are required for each interface configured for compression.                                                                  |
| bad algos | Indicates the total number of times a request was issued to open a context for a compression algorithm not supported by the CAIM. Recall that the CAIM supports the LZS and MPPC algorithms only.                                                                                   |
| no crams  | Indicates the total number of times a request was issued to open a context but there was insufficient compression DRAM to open another context. The CAIM software is set up to run out of contexts before it runs out of compression DRAM, so this statistic should always be zero. |
| bad paks  | Indicates the total number of times a packet was submitted for compression or decompression to the CAIM, but the packet had an invalid size.                                                                                                                                        |
| # opens   | Indicates the total number of times a context was opened.                                                                                                                                                                                                                           |
| # closes  | Indicates the total number of times a context was closed.                                                                                                                                                                                                                           |
| # hangs   | Indicates the total number of times a CAIM appeared hung up, necessitating a clear of the CAIM.                                                                                                                                                                                     |

**Examples**

The **show pas caim rings *element-number*** command displays the current state of the DMA ring buffers maintained by the CAIM software. These rings feed the CAIM with data and commands. It is intended for an engineering debug of the compression AIM. It produces the following output:

```
CAIM Command Ring: 0x01A2BC00 Stack: 0x01A2BE40 Shadow: 0x80F88BAC
  Head: 0021 Tail: 0021 Count: 0000
CAIM Source Ring: 0x01A2C900 Shadow: 0x80F88BAC
  Head: 0021 Tail: 0021 Num: 0000
CAIM Results Ring: 0x01A2C280 Stack: 0x01A2C4C0
  Head=021 Tail=021
CAIM Dest Ring: 0x01A2CB40 Shadow: 0x80F892D8 Head=021 Tail=000
  Desc: 0x01A2CBE8 flags: 0x8000060C dptr: 0x019E7EB8 part: 0x80F84BE0
  Desc: 0x01A2CBF0 flags: 0x8000060C dptr: 0x019FC63C part: 0x80F85240
-----cut-----
```

[Table 69](#) describes the fields shown in the display.

**Table 69** *show pas caim rings Field Descriptions*

| Field                      | Description                                                          |
|----------------------------|----------------------------------------------------------------------|
| CAIM Command Ring          | Feeds commands to the CAIM.                                          |
| command ring address       | Address of the command ring.                                         |
| Command Ring Stack         | Ring that feeds additional commands to the CAIM.                     |
| command ring stack address | Address of the command ring stack.                                   |
| Command Ring Shadow        | Software ring that stores additional information about each command. |

**Table 69** *show pas caim rings Field Descriptions (continued)*

| Field                                                  | Description                                                                                                                                                              |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| command ring shadow address                            | Address of the command ring shadow.                                                                                                                                      |
| Command Ring Head                                      | Index into the Source Ring, specifying where the next entry will be extracted from.                                                                                      |
| Command Ring Tail                                      | Index into the Source Ring, specifying where the next entry will be inserted.                                                                                            |
| CAIM Source Ring                                       | Feeds information about input data to the CAIM.                                                                                                                          |
| source ring address                                    | Address of the source ring.                                                                                                                                              |
| Source Ring Shadow                                     | Ring that contains additional information about each source buffer.                                                                                                      |
| source ring shadow address                             | Address of the source ring shadow.                                                                                                                                       |
| Source Ring Head                                       | Specifies where the next entry will be extracted from.                                                                                                                   |
| Source Ring Tail                                       | Specifies where the next entry will be inserted.                                                                                                                         |
| CAIM Results Ring                                      | Receives information about each CAIM command as it is completed.                                                                                                         |
| results ring address                                   | Address of the results ring.                                                                                                                                             |
| Results Ring Stack                                     | Ring that receives additional information about each completed command.                                                                                                  |
| results ring stack address                             | Address of the results ring stack.                                                                                                                                       |
| Results Ring Head                                      | Specifies where the next entry will be extracted from.                                                                                                                   |
| Results Ring Tail                                      | Specifies where the next entry will be inserted.                                                                                                                         |
| CAIM Dest Ring                                         | Holds information about the buffers available to the CAIM for output data.                                                                                               |
| dest ring address                                      | Address of the dest ring.                                                                                                                                                |
| Dest Ring Shadow                                       | Ring that holds additional information about each output buffer.                                                                                                         |
| dest ring shadow address                               | Address of the dest ring shadow.                                                                                                                                         |
| Dest Ring Head                                         | Index into the Source Ring, specifying where the next entry will be extracted from.                                                                                      |
| Dest Ring Tail                                         | Index into the Source Ring, specifying where the next entry will be inserted.                                                                                            |
| The remaining fields describe each output data buffer. |                                                                                                                                                                          |
| dest                                                   | Address of a so-called descriptor, used by the Jupiter DMA engine.                                                                                                       |
| flags                                                  | Contains flags describing attributes of the buffer.                                                                                                                      |
| dptr                                                   | Displays the actual address of the output buffer.                                                                                                                        |
| part                                                   | Displays the address of the corresponding particle type structure, a software-defined structure that describes a buffer when it is a component of a network data buffer. |

The **show pas caim dma *element-number*** command displays the registers of the Jupiter DMA Controller. These registers control the operation of the Jupiter DMA Controller. This command is intended for Engineering debug of the CAIM. You can find detailed descriptions of the various fields in the Jupiter DMA Controller specification. It produces the following output:

```

Jupiter DMA Controller Registers: (0x40200000
  Cmd Ring: 0x01A2BCA8  Src Ring: 0x01A2C9A8
  Res Ring: 0x01A2C328  Dst Ring: 0x01A2CBE8
  Status/Cntl: present: 0x80808084  last int: 0x80808084
  Inten: 0x10100000  config: 0x00100003
  Num DMA ints: 143330469

```

The **show pas caim compressor *element-number*** command displays the registers of the Hifn 9711 compression coprocessor. These registers control the operation of the Hifn 9711 part. This command is intended for engineering to debug the CAIM. Detailed descriptions of the various fields may be found in the Hifn 9711 data book. It produces the following output:

```

Hifn9711 Data Compression Coprocessor Registers (0x40201000):
  Config: 0x000051D4  Inten: 0x00000E00
  Status: 0x00004000  FIFO status: 0x00004000
  FIFO config: 0x00000101

```

Table 70 describes the fields shown in the preceding display.

**Table 70** *show pas caim compressor Field Descriptions*

| Field                                           | Description                                                       |
|-------------------------------------------------|-------------------------------------------------------------------|
| Hifn9711 Data Compression Coprocessor Registers | Controls the operation of the Hifn 9711 part.                     |
| registers address                               | Address of the registers in the address space of the processor.   |
| Config                                          | Displays the current contents of the 9711 configuration register. |
| Inten                                           | Displays the contents of the 9711 interrupt enable register.      |
| Status                                          | Displays the contents of the 9711 status register.                |
| FIFO status                                     | Contents of the 9711 FIFO Status register.                        |
| FIFO config                                     | Contents of the 9711 FIFO Config register.                        |

The **show pas caim cnxt\_table *element-number*** form of this command displays the context table for the specified CAIM element. The context table is a table of information concerning each compression context. It produces the following output:

```

CAIM0 Context Table
Context: 0x8104F320  Type: Compr  Algo: Stac
  HdrLen: 0006  History: 0x0000
  Callback: 0x8011D68C  Shutdown: x8011EBE4  Purge: N
  Comp_db: 0x81034BC0  idb: 0x81038084  ds: 0x8104E514
Context: 0x8104F340  Type: Decomp  Algo: Stac
  HdrLen: 0002  History: 0x0000
  Callback: 0x8011E700  Shutdown: x8011EBE4  Purge: N
  Comp_db: 0x81034BC0  idb: 0x81038084  ds: 0x8104E514

```

Table 71 describes the fields shown in the preceding display.

**Table 71** *show pas caim cnxt-table Fields Descriptions*

| Field    | Description                                                                                                                                  |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Context  | Numeric internal reference for the compression context.                                                                                      |
| Type     | Gives the type of context: <ul style="list-style-type: none"> <li>Compr—compression context</li> <li>Decomp—decompression context</li> </ul> |
| Algo     | Gives the compression algorithm used: <ul style="list-style-type: none"> <li>Stac</li> <li>Mppc</li> </ul>                                   |
| Hdrlen   | Gives the number of bytes in the compression header for each compressed packet.                                                              |
| History  | Gives the 16-KB page number in compression RAM for the context.                                                                              |
| Callback | Gives an internal numeric reference for a control structures or procedure to facilitate debugging.                                           |
| Shutdown | Gives an internal numeric reference for a control structures or procedure to facilitate debugging.                                           |
| Comp_db  | Gives an internal numeric reference for a control structures or procedure to facilitate debugging.                                           |
| idb      | Gives an internal numeric reference for a control structures or procedure to facilitate debugging.                                           |
| idb      | Gives an internal numeric reference for a control structures or procedure to facilitate debugging.                                           |
| Purge    | Indicates whether the compression context has been flagged to have its history purged.                                                       |

The **show pas caim page\_table *element-number*** command displays the page table for the selected CAIM element. The page table is a table of entries describing each page in compression RAM. It produces the following output:

```
CAIM0 Page Table
Page 0x0000 Comp cnxt: 8104F320 Decmp cnxt: 8104F340 Algo: Stac
```

[Table 72](#) describes the fields shown in the preceding display.

**Table 72** *show pas caim page\_table Field Descriptions*

| Field     | Description                                                                       |
|-----------|-----------------------------------------------------------------------------------|
| Page      | 16 Kbyte page number of the page.                                                 |
| Comp cnxt | Contains an internal numeric reference to the context structures using this page. |



**Table 72** *show pas caim page\_table Field Descriptions*

| Field      | Description                                                                                                    |
|------------|----------------------------------------------------------------------------------------------------------------|
| Decmp cnxt | Contains an internal numeric reference to the context structures using this page.                              |
| Algo       | Gives the compression algorithm used: <ul style="list-style-type: none"> <li>• Stac</li> <li>• Mppc</li> </ul> |

The following example shows statistics of an active data compression AIM session:

Router# **show pas caim stats 0**

```

CompressionAim0
  ds:0x80F56A44 idb:0x80F50DB8
    422074 uncomp paks in -->      422076 comp paks out
    422071 comp paks in  -->      422075 uncomp paks out
  633912308 uncomp bytes in-->    22791798 comp bytes out
    27433911 comp bytes in -->    633911762 uncomp bytes out
        974 uncomp paks/sec in-->    974 comp paks/sec out
        974 comp paks/sec in  -->    974 uncomp paks/sec out
    11739116 uncomp bits/sec in-->  422070 comp bits/sec out
        508035 comp bits/sec in --> 11739106 uncomp bits/sec out
  433 seconds since last clear
  holdq: 0  hw_enable: 1  src_limited: 0  num cnxts: 4
  no data: 0  drops: 0  nobuffers: 0  enc adj errs: 0  fallbacks: 0
  no Replace: 0  num seq errs: 0  num desc errs: 0  cmds complete: 844151
  Bad reqs: 0  Dead cnxts: 0  No Paks: 0  enq errs: 0
  rx pkt drops: 0  tx pkt drops: 0  dequeues: 0  requeues: 0
  drops disabled: 0  clears: 0  ints: 844314  purges: 0
  no cnxts: 0  bad algos: 0  no crams: 0  bad paks: 0
  # opens: 0  # closes: 0  # hangs: 0

```

**Related Commands**

| Command                       | Description                      |
|-------------------------------|----------------------------------|
| <a href="#">show compress</a> | Displays compression statistics. |

# show pas eswitch address

To display the Layer 2 learned addresses for an interface, use the **show pas eswitch address** command in EXEC mode.

```
show pas eswitch address [ethernet | fastethernet] [slot/port]
```

|                    |                         |                                          |
|--------------------|-------------------------|------------------------------------------|
| Syntax Description | ethernet   fastethernet | (Optional) Type of interface.            |
|                    | slot                    | (Optional) Slot number of the interface. |
|                    | port                    | (Optional) Interface number.             |

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 11.2 P  | This command was introduced. |

Examples

The following sample output shows that the first PA-12E/2FE interface (listed below as port 0) in port adapter slot 3 has learned the Layer 2 address 00e0.f7a4.5100 for bridge group 30 (listed below as BG 30):

```
Router# show pas eswitch address fastethernet 3/0

U 00e0.f7a4.5100, AgeTs 56273 s, BG 30 (vLAN 0), Port 0
```

# show pas isa controller

To show controller information that is specific to the Virtual Private Network (VPN) accelerator controller when an Integrated Services Adapter (ISA) is installed, use the **show pas isa controller** EXEC command.

**show pas isa controller**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 12.1(5)T       | This command was introduced. |

|                 |                                                                                 |
|-----------------|---------------------------------------------------------------------------------|
| <b>Examples</b> | The following is sample output from the <b>show pas isa controller</b> command: |
|-----------------|---------------------------------------------------------------------------------|

```
Router# show pas isa controller

Interface ISA5/1 :

Encryption Mode = IPSec

Addresses of Rings and instance structure:
High Priority Rings
  TX: 0x4B0E97C0 TX Shadow:0x62060E00
  RX: 0x4B0EB840 RX Pool:0x4B0EBC80 RX Pool Shadow:0x62068E58
Low Priority Rings
  TX: 0x4B0EA800 TX Shadow:0x62066E2C
  RX: 0x4B0EC0C0, RX Shadow:0x62069284

Instance Structure address:0x620603D8

Firmware write head/tail offset:0x4B0EC900
Firmware read  head/tail offset:0x3EA00000
```

|                         |                               |                                                                                     |
|-------------------------|-------------------------------|-------------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                | <b>Description</b>                                                                  |
|                         | <b>show pas isa interface</b> | Displays interface status information that is specific to the VPN accelerator card. |

# show pas isa interface

To display interface information that is specific to the Virtual Private Network (VPN) accelerator card when an Integrated Services Adapter (ISA) is installed, use the **show pas isa interface** command in privileged EXEC mode.

**show pas isa interface**

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

**Command Modes** Privileged EXEC

| Command History | Release  | Modification                 |
|-----------------|----------|------------------------------|
|                 | 12.1(5)T | This command was introduced. |

**Examples** The following is sample output from the **show pas isa interface** command:

```
Router# show pas isa interface

Interface ISA5/1 :
  Statistics of packets and bytes through this interface:
    2876894 packets in          2910021 packets out
      420 paks/sec in           415 paks/sec out
    2327 Kbits/sec in          2408 Kbits/sec out
      632 commands out         632 commands acknowledged
  low_pri_pkts_sent      1911    low_pri_pkts_rcvd:      1911
  invalid_sa:            260    invalid_flow:          33127
  invalid_dh:            0      ah_seq_failure:          0
  ah_spi_failure:        0      esp_auth_failure:    0
  esp_seq_failure:       0      esp_spi_failure:     0
  esp_protocol_absent:   0      ah_protocol_absent: 0
  bad_key_group:         0      no_shared_secret:   0
  no_skeyids:            0      pad_size_error:      0
  cmd_ring_full:         0      bulk_ring_full:      990
  bad_peer_pub_len:      0      authentication_failure: 0
  fallback:              1606642 no_particle:          0
  6922 seconds since last clear of counters
```

[Table 73](#) describes the significant fields shown in the display.

**Table 73** *show pas isa interface Field Descriptions*

| Field            | Description                                                                                                   |
|------------------|---------------------------------------------------------------------------------------------------------------|
| packets in/out   | Number of data packets received from, or sent to, the Integrated Service Adapter (ISA).                       |
| paks/sec in/out  | Number of packets received in, or sent out, with the total number of seconds that the ISA is active.          |
| Kbits/sec in/out | Number of kilobits (Kbits) received in, or sent out, with the total number of seconds that the ISA is active. |

**Table 73** *show pas isa interface Field Descriptions (continued)*

| Field                  | Description                                                                                                                                              |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| commands out           | Number of commands going to the ISA. Examples of commands include setting up encryption sessions and retrieving statistics or status from the ISA.       |
| commands acknowledged  | Number of commands returning from the ISA. Examples of commands include setting up encryption sessions and retrieving statistics or status from the ISA. |
| low_pri_pkts_sent      | This is a summary counter for number of Internet Key Exchange (IKE) and IPsec commands submitted to ISA.                                                 |
| low_pri_pkts_rcvd      | This is a summary counter for number of IKE & IPSEC command responses received from ISA.                                                                 |
| invalid_sa             | Reference to an unusable security association key pair.                                                                                                  |
| invalid_flow           | An invalid packet using an IPsec key is received for encryption or decryption.<br>Example: session has expired.                                          |
| invalid_dh             | Reference to an unusable Diffie-Hellman( DH) key pair.                                                                                                   |
| ah_seq_failure         | Unacceptably late Authentication Header (AH) header received.                                                                                            |
| ah_spi_failure         | SPI specified in the AH header does not match the SPI associated with the IPsec AH key.                                                                  |
| esp_auth_failure       | Number of ESP packets received with authentication failures.                                                                                             |
| esp_seq_failure        | Unacceptably late ESP packet received.                                                                                                                   |
| esp_spi_failure        | SPI specified in the ESP header does not match the SPI associated with the IPsec ESP key.                                                                |
| esp_protocol_absent    | Packet is missing expected ESP header.                                                                                                                   |
| ah_protocol_absent     | Packet is missing expected AH header.                                                                                                                    |
| bad_key_group          | Unsupported key group requested during a Diffie-Hellman generation.                                                                                      |
| no_shared_secret       | Attempting to use a Diffie-Hellman shared secret that is not generated.                                                                                  |
| no_keyids              | Attempting to use a shared secret that is not generated.                                                                                                 |
| pad_size_error         | The length of the ESP padding is greater than the length of the entire packet.                                                                           |
| cmd_ring_full          | New IKE setup messages are not queued for processing until the previous queued requests are processed.                                                   |
| bulk_ring_full         | New packets requiring IPsec functionality are not queued to the ISA until the ISA completes the processing of existing requests.                         |
| bad_peer_pub_len       | Length of peer's DH public key does not match the length specified for the negotiated DH key group.                                                      |
| authentication_failure | Authentication failed.                                                                                                                                   |

**Table 73** *show pas isa interface Field Descriptions (continued)*

| Field       | Description                                                                                                                         |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------|
| fallback    | The number of instances when the driver is successful in getting a replacement buffer from the global pool.                         |
| no_particle | The number of instances when the driver was unable to get a replacement buffer from the driver pool and the global (fallback) pool. |

**Related Commands**

| Command                        | Description                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------|
| <b>show pas isa controller</b> | Displays controller status information that is specific to the VPN accelerator card. |

# show pci aim

To show the IDPROM contents for each compression Advanced Interface Module (AIM) daughtercard in the Cisco 2600 router, use the **show pic aim** command in EXEC mode.

## show pci aim

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 12.0(1)T       | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | This command shows the IDPROM contents for each compression AIM daughtercard present in the system, by AIM slot number (currently 0, since that is the only daughtercard installed for Cisco IOS Release 12.0(1)T). The IDPROM is a small PROM built into the AIM board used to identify it to the system. It is sometimes referred to as an EEPROM because it is implemented using electronically erasable PROM. |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                               |
|-----------------|-----------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example shows the IDPROM output for the installed compression AIM daughtercard: |
|-----------------|-----------------------------------------------------------------------------------------------|

```
Router# show pic aim 0

AIM Slot 0: ID 0x012D
  Hardware Revision      : 1.0
  EEPROM format version 4
  EEPROM contents (hex):
    0x00: 04 FF 40 01 2D 41 01 00 FF FF FF FF FF FF FF FF
    0x10: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
    0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

|                         |                                 |                                                                                     |
|-------------------------|---------------------------------|-------------------------------------------------------------------------------------|
| <b>Related Commands</b> | <b>Command</b>                  | <b>Description</b>                                                                  |
|                         | <a href="#">clear aim</a>       | Clears data compression AIM registers and resets the hardware.                      |
|                         | <a href="#">test aim eeprom</a> | Tests the data compression AIM after it is installed in a Cisco 2600 series router. |

# show service-module serial

To display the performance report for an integrated CSU/DSU, use the **show service-module serial** command in privileged EXEC mode.

**show service-module serial** *number* [**performance-statistics** [*interval-range*]]

## Syntax Description

|                               |                                                                                                                                                                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i>                 | Interface number 0 or 1.                                                                                                                                                                                                                                                                       |
| <b>performance-statistics</b> | (Optional) Displays the CSU/DSU performance statistics for the past 24 hours. This keyword applies only to the fractional T1/T1 module.                                                                                                                                                        |
| <i>interval-range</i>         | (Optional) Specifies the number of 15-minute intervals displayed. You can choose a range from 1 to 96, where each value represents the CSU/DSU activity performed in that 15-minute interval. For example, a range of 2-3 displays the performance statistics for the intervals two and three. |

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

This command applies to the 2- and 4-wire 56/64-kbps CSU/DSU module and FT1/T1 CSU/DSU module. The **performance-statistics** keyword applies only to the FT1/T1 CSU/DSU module.

## Examples

The following sample output shows CSU/DSU performance statistics on a Cisco 2524 or Cisco 2525 router for intervals 30 to 32. Each interval is 15 minutes long. All the data is zero because no errors were discovered on the T1 line:

```
Router# show service-module serial 1 performance-statistics 30-32

Total Data (last 58 15 minute intervals):
  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
Data in current interval (131 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
Data in Interval 30:
  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
Data in Interval 31:
  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
```



```
Data in Interval 32:
  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
```

The following is sample output from the **show service-module serial** command for a fractional T1 line:

```
Router1# show service-module serial 0

Module type is T1/fractional
  Hardware revision is B, Software revision is 1.1 ,
  Image checksum is 0x2160B7C, Protocol revision is 1.1
Receiver has AIS alarm,
Unit is currently in test mode:
  line loopback is in progress
Framing is ESF, Line Code is B8ZS, Current clock source is line,
Fraction has 24 timeslots (64 Kbits/sec each), Net bandwidth is 1536 Kbits/sec.
Last user loopback performed:
  remote loopback
  Failed to loopup remote
Last module self-test (done at startup): Passed
Last clearing of alarm counters 0:05:50
  loss of signal      :    1, last occurred 0:01:50
  loss of frame       :    0,
  AIS alarm           :    1, current duration 0:00:49
  Remote alarm        :    0,
  Module access errors :    0,
Total Data (last 0 15 minute intervals):
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
Data in current interval (351 seconds elapsed):
  1466 Line Code Violations, 0 Path Code Violations
  25 Slip Secs, 49 Fr Loss Secs, 40 Line Err Secs, 1 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs, 49 Unavail Secs
```

The following sample output from the **show service-module serial** command displays the status of a switched 56-KB line:

```
Router1# show service-module serial 1

Module type is 4-wire Switched 56
  Hardware revision is B, Software revision is 1.00,
  Image checksum is 0x44453634, Protocol revision is 1.0
Connection state: active,
Receiver has loss of signal, loss of sealing current,
Unit is currently in test mode:
  line loopback is in progress
Current line rate is 56 Kbits/sec
Last user loopback performed:
  dte loopback
  duration 00:00:58
Last module self-test (done at startup): Passed
Last clearing of alarm counters 0:13:54
  oos/oof             :    3, last occurred 0:00:24
  loss of signal      :    3, current duration 0:00:24
  loss of sealing curren:    2, current duration 0:04:39
  loss of frame       :    0,
  rate adaption attempts:    0,
```

The following shows sample output from the **show service-module serial** command issued on a Cisco 3640 modular access router:

```
Router# show service-module serial 0/1
```

```

Module type is 4-wire Switched 56
  Hardware revision is B, Software revision is 1.00,
  Image checksum is 0x42364436, Protocol revision is 1.0
Connection state: Idle
Receiver has no alarms.
CSU/DSU Alarm mask is 0
Current line rate is 56 Kbits/sec
Last module self-test (done at startup): Passed
Last clearing of alarm counters 4d02h
  oos/oof           : 0,
  loss of signal    : 0,
  loss of sealing curren: 0,
  loss of frame     : 0,
  rate adaptation attemp: 0,

```

The following shows sample output from the **show service-module serial** command issued on a Cisco 1605 router:

```

Router# show service-module serial 0

Module type is 4-wire Switched 56
  Hardware revision is B, Software revision is 1.00,
  Image checksum is 0x42364436, Protocol revision is 1.0
Receiver has oos/oof, loss of signal,
CSU/DSU Alarm mask is 4
Current line rate is 56 Kbits/sec
Last module self-test (done at startup): Passed
Last clearing of alarm counters 1d02h
  oos/oof           : 1, current duration 1d02h
  loss of signal    : 1, current duration 1d02h
  loss of frame     : 0,
  rate adaptation attemp: 0,

```

[Table 74](#) describes the fields displayed by the **show service-module serial** command.

**Table 74** *show service-module serial Field Descriptions*

| Field                                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module type                                     | CSU/DSU module installed in the router. The possible modules are T1/fractional, 2-wire switched 56-kbps, and 4-wire 56/64-kbps.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Receiver has AIS alarm                          | <p>Alarms detected by the FT1/T1 CSU/DSU module or 2- and 4-wire 56/64-kbps CSU/DSU modules.</p> <p>Possible T1 alarms are as follows:</p> <ul style="list-style-type: none"> <li>• Transmitter is sending remote alarm.</li> <li>• Transmitter is sending AIS.</li> <li>• Receiver has loss of signal.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has remote alarm.</li> <li>• Receiver has no alarms.</li> </ul> <p>Possible switched 56k alarms are as follows:</p> <ul style="list-style-type: none"> <li>• Receiver has loss of signal.</li> <li>• Receiver has loss of sealing current.</li> <li>• Receiver has loss of frame.</li> <li>• Receiver has rate adaptation attempts.</li> </ul> |
| Unit is currently in test mode                  | Loopback tests are in progress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Framing is ESF                                  | Indicates frame type used on the line. Can be extended super frame or super frame.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Line Code is B8ZS                               | Indicated line-code type configured. Can be alternate mark inversion (AMI) or binary 8-zero substitution (B8ZS).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Current clock source is line                    | Clock source configured on the line, which can be supplied by the service provider (line) or the integrated CSU/DSU module (internal).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Fraction has 24 time slots                      | Number of time slots defined for the FT1/T1 module, which can range from 1 to 24.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Net bandwidth                                   | Total bandwidth of the line (for example, 24 time slots multiplied by 64 kbps equals a bandwidth of 1536 kbps).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Last user loopback performed                    | Type and outcome of the last performed loopback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Last module self-test (done at startup): Passed | Status of the last self-test performed on an integrated CSU/DSU module.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Last clearing of alarm counters                 | List of network alarms that were detected and cleared on the CSU/DSU module.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Total Data Data in current interval             | Shows the current accumulation period, which rolls into the 24-hour accumulation every 15 minutes. 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 or excessive zeroes error event.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Path Code Violations                            | Indicates a frame synchronization bit error in the D4 and E1-no CRC formats or a CRC error in the ESF and E1-CRC formats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

**Table 74** *show service-module serial Field Descriptions (continued)*

| Field             | Description                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slip Secs         | Indicates the replication or detection 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 error is detected.                                                                                                                                                                                                                                                                            |
| Line Err Secs     | Line errored seconds is a second in which one or more line code violation errors are detected.                                                                                                                                                                                                                                                |
| Errored Secs      | <p>In ESF and E1-CRC links, an errored second is a second in which one of the following is detected: one or more path code violations; one or more Out-of-Frame defects; one or more controlled slip events; a detected AIS defect.</p> <p>For D4 and E1-no CRC links, the presence of bipolar violation also triggers an errored second.</p> |
| Bursty Err Secs   | Second with fewer than 320 and more than 1 path coding violation errors. No severely errored frame defects or incoming AIS defects are detected. Controlled slips are not included in this parameter.                                                                                                                                         |
| Severely Err Secs | <p>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.</p> <p>For D4 signals, a count of 1-second intervals with framing errors, or an Out-of-Frame defect, or 1544 line code violations.</p>                                        |
| Unavail Secs      | Total time the line was out of service.                                                                                                                                                                                                                                                                                                       |

**Related Commands**

| Command                                     | Description                   |
|---------------------------------------------|-------------------------------|
| <a href="#">clear service-module serial</a> | Resets an integrated CSU/DSU. |

# show smf

To display the configured software MAC address filter (SMF) on various interfaces of a router, use the **show smf** command in EXEC mode.

**show smf** [*interface-name*]

## Syntax Description

*interface-name* (Optional) Displays information about the specified interface. Choices can include atm, ethernet, fastethernet, null, serial, tokenring, and async.

## Command Modes

EXEC

## Command History

| Release | Modification                                            |
|---------|---------------------------------------------------------|
| 10.0    | This command was introduced in a release prior to 10.0. |

## Usage Guidelines

The SMF is active whenever the router is doing bridging or Integrated Routing and Bridging (IRB). MAC address filtering can be used as a security feature in bridging or switching environments.

## Examples

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

```
R2-81-7206#sh smf
```

```
Software MAC address filter on FastEthernet0/0.2
Hash Len    Address      Matches  Act    Type
0x00:  0  ffff.ffff.ffff      0  RCV  Physical broadcast
0x0C:  0  0100.0c00.0000      0  RCV  ISL vLAN Multicast
0x2A:  0  0900.2b01.0001      0  RCV  DEC spanning tree
0xA6:  0  0010.a6ae.6000      0  RCV  Interface MAC address
0xC1:  0  0100.0ccc.cccd      0  RCV  SSTP MAC address
0xC2:  0  0180.c200.0000      0  RCV  IEEE spanning tree
0xC2:  1  0180.c200.0000      0  RCV  IBM spanning tree
0xC2:  2  0100.0ccd.cdce      0  RCV  VLAN Bridge STP
```

N

[Table 75](#) describes the fields shown in the display.

**Table 75** *show smf Field Descriptions*

| Field   | Description                                |
|---------|--------------------------------------------|
| Hash    | Position in the hash table for this entry. |
| Len     | Length of the entry.                       |
| Address | MAC address for the interface.             |
| Matches | Number of hits for the address.            |

**Table 75** *show smf Field Descriptions (continued)*

| Field | Description                                                                 |
|-------|-----------------------------------------------------------------------------|
| Act   | Action taken. Values can be receive (RCV), forward (FWD), or discard (DIS). |
| Type  | Type of MAC address.                                                        |

# show tdm backplane

To display modem and PRI channel assignments with streams and channels on the modem side as assigned to the unit and channels on the PRI side of the time-division multiplexing (TDM) assignment, use the **show tdm backplane** command in privileged EXEC mode.

**show tdm backplane** {*stream stream-number*}

|                           |                      |                                                                                                                                                                                                                                                       |
|---------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>stream</b>        | Backplane stream in the range 0 to 7. There are 8 backplane “streams” on the TDM backplane for the Cisco AS5300 access server. Each stream runs at 2 MHz and has 32 channels (running at 64 Hz) on the Cisco AS5300 access server backplane hardware. |
|                           | <i>stream-number</i> | Actual number entered (either 0 to 7 or 0 to 15). An actual number needs to be entered.                                                                                                                                                               |

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                                                                |
|------------------------|----------------|----------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                            |
|                        | 12.0(2)XD      | This command was introduced.                                   |
|                        | 12.0(3)T       | This command was incorporated into Cisco IOS Release 12.0(3)T. |

|                         |                                                                                                                                                                                                                                                                                |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | The <b>show tdm backplane</b> command shows the status of the TDM backplane, related data structure values, and TDM chip memory settings. This commands is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems. |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example shows the general syntax used, and the output displayed for the <b>show tdm backplane</b> command. To display only a subset of the data on most of the commands, further specify particular slots, streams, and devices. When the <b>debug tdm detail</b> command is executed, more detail is shown. The following examples are run with the <b>debug tdm detail</b> command executed: |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

```
5300# show tdm backplane
```

```
Show BackPlane Connections
```

```
TDM Backplane Connection for Stream 0
```

```
Modem (St/Ch)<->PRI (Unit/Ch)  xx/xx:Not Used ??/?:Unknown State
0  :  xx/xx<->xx/xx,  xx/xx<->xx/xx,  00/02<->00/30,  00/03<->03/10
4  :  00/04<->00/15,  00/05<->02/02,  00/06<->02/07,  00/07<->02/08
8  :  xx/xx<->xx/xx,  00/09<->03/11,  00/10<->02/09,  xx/xx<->xx/xx
12 :  00/12<->00/17,  00/13<->02/17,  00/14<->02/18,  00/15<->02/10
16 :  xx/xx<->xx/xx,  xx/xx<->xx/xx,  00/18<->00/19,  00/19<->02/19
20 :  00/20<->02/11,  xx/xx<->xx/xx,  xx/xx<->xx/xx,  00/23<->00/07
24 :  xx/xx<->xx/xx,  00/25<->00/01,  00/26<->00/20,  00/27<->02/20
28 :  xx/xx<->xx/xx,  00/29<->00/18,  xx/xx<->xx/xx,  xx/xx<->xx/xx
```

```
TDM Backplane Connection for Stream 1
```

```
Modem (St/Ch)<->PRI (Unit/Ch)  xx/xx:Not Used ??/?:Unknown State
0  :  xx/xx<->xx/xx,  xx/xx<->xx/xx,  xx/xx<->xx/xx,  01/03<->03/09
```

show tdm backplane

```
4  : 01/04<->00/03, 01/05<->02/13, xx/xx<->xx/xx, xx/xx<->xx/xx
8  : xx/xx<->xx/xx, xx/xx<->xx/xx, 01/10<->02/14, 01/11<->00/04
12 : 01/12<->00/21, xx/xx<->xx/xx, 01/14<->00/05, xx/xx<->xx/xx
16 : xx/xx<->xx/xx, xx/xx<->xx/xx, xx/xx<->xx/xx, 01/08<->02/12
20 : 01/20<->00/06, 01/09<->00/02, xx/xx<->xx/xx, xx/xx<->xx/xx
24 : 01/24<->03/01, xx/xx<->xx/xx, 01/26<->02/15, xx/xx<->xx/xx
28 : 01/28<->03/05, xx/xx<->xx/xx, xx/xx<->xx/xx, xx/xx<->xx/xx
...

```

Related Commands

| Command                              | Description                                                                   |
|--------------------------------------|-------------------------------------------------------------------------------|
| <a href="#">show tdm connections</a> | Displays details about a specific TDM channel programmed on the Mitel chip.   |
| <a href="#">show tdm data</a>        | Displays information about TDM bus connection memory on Cisco access servers. |
| <a href="#">show tdm detail</a>      | Displays information about the specified TDM device.                          |
| <a href="#">show tdm information</a> | Displays TDM resources available for the specified TDM device.                |
| <a href="#">show tdm pool</a>        | Displays information about the specified TDM pool.                            |



# show tdm connections

To display a snapshot of the time-division multiplexing (TDM) bus connection memory in a Cisco AS5200 access server or to display information about the connection memory programmed on the Mitel TDM chip in a Cisco AS5800 access server, use the **show tdm connections** command in privileged EXEC mode.

## Cisco AS5200 Access Server

**show tdm connections** [**motherboard** | **slot** *slot-number*]

## Cisco AS5800 Access Server

**show tdm connections** {**motherboard** {**stream** *stream-number*} | **slot** *slot-number* {**device** *device-number* {**stream** *stream-number*}}}

| Syntax                         | Description                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>motherboard</b>             | <p><b>Cisco AS5200 Access Server</b></p> <p>(Optional) Motherboard in the Cisco AS5200 access server.</p> <p><b>Cisco AS5800 Access Server</b></p> <p>Motherboard in the Cisco AS5800 access server has ethernet and serial interfaces, console port, and aux port. The motherboard has one TDM device (MT8980) for the Cisco 5300 access server.</p>                                        |
| <b>slot</b> <i>slot-number</i> | <p><b>Cisco AS5200 Access Server</b></p> <p>(Optional) Number of the slot being configured.</p> <p><b>Cisco AS5800 Access Server</b></p> <p>There are 3 slots on the Cisco AS5800 access server. The range of the slots is 0 to 2. A modem card or a trunk PRI card can be inserted into each slot. Each card in the slot has one or two TDM devices (either MT8980 or MT90820) on them.</p> |
| <b>stream</b>                  | <p>Device stream in the range 0 to 7. There are 8 backplane “streams” on the TDM backplane for the Cisco AS5800 access server. Each stream runs at 2 Mhz and has 32 channels (running at 64 Hz) on the Cisco AS5800 access server backplane hardware.</p>                                                                                                                                    |
| <i>stream-number</i>           | Stream number (the range is 0 to 7 or 0 to 15).                                                                                                                                                                                                                                                                                                                                              |
| <b>device</b>                  | <p>TDM device on the motherboard or slot cards. The range for the Cisco AS5800 access server is 0 to 1. Each card has at least one TDM device (MT8980 or MT80920), and some of the slot cards have two devices (for example, the Octal PRI has two MT90820 TDM devices). The TDM device is also referred to as “TSI Chip Number” in the online help.</p>                                     |
| <i>device-number</i>           | Valid range is 0 to 1.                                                                                                                                                                                                                                                                                                                                                                       |

**Command Modes** Privileged EXEC

**Command History**

| Release  | Modification                                                                     |
|----------|----------------------------------------------------------------------------------|
| 11.2     | This command was introduced.                                                     |
| 12.0(3)T | This command was modified to include support for the Cisco AS5800 access server. |

**Usage Guidelines****Cisco AS5200 Access Server**

The **show tdm connections** command shows the connection memory for all TDM bus connections in the access server if you do not limit the display to the motherboard or a slot.

**Cisco AS5800 Access Server**

The **show tdm connections** command shows the status of the TDM chip memory settings. This command is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

**Examples****Cisco AS5200 Access Server**

The following example shows source stream 3 (ST3) channel 2 switched out of stream 6 (ST6) channel 2:

```
AS5200# show tdm connections motherboard
```

```
MT8980 motherboard unit 0, Control Register = 0x1F, ODE Register = 0x06
Connection Memory for ST6:
Ch0: 0x62, Ch1: 0x00, Ch2: 0x00, Ch3: 0x00
Ch4: 0x00, Ch5: 0x00, Ch6: 0x00, Ch7: 0x00
Ch8: 0x00, Ch9: 0x00, Ch10: 0x00, Ch11: 0x00
Ch12: 0x00, Ch13: 0x00, Ch14: 0x00, Ch15: 0x00
Ch16: 0x00, Ch17: 0x00, Ch18: 0x00, Ch19: 0x00
Ch20: 0x00, Ch21: 0x00, Ch22: 0x00, Ch23: 0x00
Ch24: 0x00, Ch25: 0x00, Ch26: 0x00, Ch27: 0x00
Ch28: 0x00, Ch29: 0x00, Ch30: 0x00, Ch31: 0x00
```

To interpret the hexadecimal number 0x62 into meaningful information, you must translate it into binary code. These two hexadecimal numbers represent a connection from any stream and a channel on any stream. The number 6 translates into the binary code 0110, which represents the third-source stream. The number 2 translates into the binary code 0010, which represents the second-source channel.

Stream 6 (ST6) channel 0 is the destination for source stream 3 (ST3) channel 2 in this example.

**Cisco AS5800 Access Server**

The following example shows the general syntax used and the output displayed for the **show tdm connections** command. To display only a subset of the data on most of the commands, further specify particular slots, streams, and devices. When the **debug tdm detail** command is executed, more detail is shown. The following examples are run with the **debug tdm detail** executed.

```
5300# show tdm connections slot 0
Slot 0 MT8980 TDM Device 0, Control Register = 0x1E, ODE Register = 0x01
Connection Memory for ST0:
Ch0: 0x00 0xE1, Ch1: 0x00 0xE2, Ch2: 0x01 0xDE, Ch3: 0x00 0x00
Ch4: 0x01 0xCF, Ch5: 0x00 0xE4, Ch6: 0x00 0xE5, Ch7: 0x00 0x00
Ch8: 0x00 0xEB, Ch9: 0x00 0xE6, Ch10: 0x00 0xE7, Ch11: 0x00 0x00
Ch12: 0x01 0xD1, Ch13: 0x00 0xE8, Ch14: 0x00 0x00, Ch15: 0x00 0xE9
Ch16: 0x00 0x00, Ch17: 0x00 0xD2, Ch18: 0x01 0xD3, Ch19: 0x00 0xEA
Ch20: 0x00 0xEB, Ch21: 0x00 0xC1, Ch22: 0x00 0xEC, Ch23: 0x01 0xC7
```

```

Ch24: 0x00 0xED, Ch25: 0x01 0xC1, Ch26: 0x01 0xD4, Ch27: 0x00 0xEE
Ch28: 0x00 0xE1, Ch29: 0x01 0xD2, Ch30: 0x00 0x00, Ch31: 0x00 0x00
Connection Memory for ST1:
Ch0:  0x00 0xEF, Ch1:  0x00 0xC2, Ch2:  0x00 0xED, Ch3:  0x00 0xF1
Ch4:  0x01 0xC3, Ch5:  0x00 0xF2, Ch6:  0x00 0xE2, Ch7:  0x00 0x00
Ch8:  0x00 0xF3, Ch9:  0x00 0xFF, Ch10: 0x00 0xF4, Ch11: 0x01 0xC4
Ch12: 0x01 0xD5, Ch13: 0x00 0xF5, Ch14: 0x01 0xC5, Ch15: 0x00 0xEE
Ch16: 0x00 0xF6, Ch17: 0x00 0xE3, Ch18: 0x00 0x00, Ch19: 0x00 0xF7
Ch20: 0x01 0xC6, Ch21: 0x01 0xC2, Ch22: 0x00 0xF8, Ch23: 0x00 0xE4
Ch24: 0x00 0xF9, Ch25: 0x00 0xC7, Ch26: 0x00 0x00, Ch27: 0x00 0xFA
Ch28: 0x00 0xFB, Ch29: 0x00 0xE5, Ch30: 0x00 0x00, Ch31: 0x00 0x00

```

**Related Commands**

| Command                       | Description                                                                   |
|-------------------------------|-------------------------------------------------------------------------------|
| <a href="#">show tdm data</a> | Displays information about TDM bus connection memory on Cisco access servers. |

# show tdm data

To display a snapshot of the time-division multiplexing (TDM) bus data memory in a Cisco AS5200 access server or to display data memory that is programmed on the Mitel TDM chip in a Cisco 5800 access server, use the **show tdm data** command in privileged EXEC mode.

**Cisco AS5200 Access Server**

```
show tdm data [motherboard | slot slot-number]
```

**Cisco AS5800 Access Server**

```
show tdm data {motherboard {stream stream-number} | slot slot-number {device device-number {stream stream-number}} }
```

|                    |                  |                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | motherboard      | <b>Cisco AS5200 Access Server</b><br>(Optional) Motherboard in the Cisco AS5200 access server.<br><b>Cisco AS5800 Access Server</b><br>Motherboard on the Cisco AS5300 access server has the ethernet I/Fs, serial I/Fs, console port, and aux port. The motherboard has one TDM device (MT8980) for the Cisco AS5300 access server.                                                                        |
|                    | slot slot-number | <b>Cisco AS5200 Access Server</b><br>(Optional) Number of the slot being configured.<br><b>Cisco AS5800 Access Server</b><br>In addition to the motherboard, there are three slots on the Cisco AS5300 access server. The range of the slots is 0 to 2. A modem card or a trunk PRI card can be inserted in each slot. Each card in the slot has one or two TDM devices (either MT8980 or MT90820) on them. |
|                    | stream           | TDM device stream in the range 0 to 15. There are up to 16 streams on a TDM device (Mitel 90820). The TDM device is also known as the TSI chip. The help on the command (by typing ?) indicates whether the stream is “Stream number within the TSI chip” or “Backplane Stream.”                                                                                                                            |
|                    | stream-number    | Stream number within the range of either 0 to 7 or 0 to 15.                                                                                                                                                                                                                                                                                                                                                 |
|                    | device           | TDM device on the motherboard, or slot cards. Valid range for the Cisco AS5300 access server is 0 to 1. Each card has at least one TDM device (MT8980 or MT80920), and the Octal PRI has two MT90820 TDM devices. Also referred to as TSI Chip Number in the help pages.                                                                                                                                    |
|                    | device-number    | Valid range is 0 to 1.                                                                                                                                                                                                                                                                                                                                                                                      |
|                    |                  |                                                                                                                                                                                                                                                                                                                                                                                                             |

|               |                 |
|---------------|-----------------|
| Command Modes | Privileged EXEC |
|---------------|-----------------|

**Command History**

| Release  | Modification                                                                     |
|----------|----------------------------------------------------------------------------------|
| 11.2     | This command was introduced.                                                     |
| 12.0(3)T | This command was modified to include support for the Cisco AS5800 access server. |

**Usage Guidelines****Cisco AS5200 Access Server**

The data memory for all TDM bus connections in the access server is displayed if you do not specify a motherboard or slot.

**Cisco AS5800 Access Server**

The **show tdm data** command shows the status of the TDM data structure values. This command is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

**Examples****Cisco AS5200 Access Server**

The following example shows a snapshot of TDM memory in which the normal ISDN idle pattern (0x7E) is present on all channels of the TDM device resident on the motherboard:

```
AS5200# show tdm data motherboard

MT8980 motherboard unit 0, Control Register = 0x1F, ODE Register = 0x06
Data Memory for ST0:
Ch0: 0x7E, Ch1: 0x7E, Ch2: 0x7E, Ch3: 0x7E
Ch4: 0x7E, Ch5: 0x7E, Ch6: 0x7E, Ch7: 0x7E
Ch8: 0x7E, Ch9: 0x7E, Ch10: 0x7E, Ch11: 0x7E
Ch12: 0x7E, Ch13: 0x7E, Ch14: 0x7E, Ch15: 0x7E
Ch16: 0x7E, Ch17: 0x7E, Ch18: 0x7E, Ch19: 0x7E
Ch20: 0x7E, Ch21: 0x7E, Ch22: 0x7E, Ch23: 0x7E
Ch24: 0x7E, Ch25: 0x7E, Ch26: 0x7E, Ch27: 0x7E
Ch28: 0x7E, Ch29: 0x7E, Ch30: 0x7E, Ch31: 0x7E
Data Memory for ST1:
Ch0: 0x7E, Ch1: 0x7E, Ch2: 0x7E, Ch3: 0x7E
Ch4: 0x7E, Ch5: 0x7E, Ch6: 0x7E, Ch7: 0x7E
Ch8: 0x7E, Ch9: 0x7E, Ch10: 0x7E, Ch11: 0x7E
Ch12: 0x7E, Ch13: 0x7E, Ch14: 0x7E, Ch15: 0x7E
Ch16: 0x7E, Ch17: 0x7E, Ch18: 0x7E, Ch19: 0x7E
Ch20: 0x7E, Ch21: 0x7E, Ch22: 0x7E, Ch23: 0x7E
Ch24: 0x7E, Ch25: 0x7E, Ch26: 0x7E, Ch27: 0x7E
Ch28: 0x7E, Ch29: 0x7E, Ch30: 0x7E, Ch31: 0x7E
```

**Cisco AS5800 Access Server**

The following sample output shows the general syntax used, and the output displayed for the **show tdm data** command. To display a subset of the data on most the commands, further specify particular slots, streams, and devices. When the **debug tdm detail** command is executed, more detail is shown. The following example is run with the **debug tdm detail** executed:

```
Router# show tdm data

Motherboard MT8980 TDM Device 0, Control Register = 0x1F, ODE Register = 0xE1
Data Memory for ST0:
Ch0: 0xFF, Ch1: 0xFF, Ch2: 0x98, Ch3: 0x61
Ch4: 0x0C, Ch5: 0xE1, Ch6: 0x8D, Ch7: 0x86
Ch8: 0xFF, Ch9: 0xF3, Ch10: 0xE4, Ch11: 0xFF
Ch12: 0x51, Ch13: 0x02, Ch14: 0x18, Ch15: 0x14
```

show tdm data

```
Ch16: 0xFF, Ch17: 0xFF, Ch18: 0x05, Ch19: 0xC7
Ch20: 0x00, Ch21: 0xFF, Ch22: 0xFF, Ch23: 0x98
Ch24: 0xFF, Ch25: 0x15, Ch26: 0x5C, Ch27: 0x15
Ch28: 0xFF, Ch29: 0x80, Ch30: 0xFF, Ch31: 0xFF
Data Memory for ST1:
Ch0: 0xFF, Ch1: 0xFF, Ch2: 0xFF, Ch3: 0x62
Ch4: 0x94, Ch5: 0x88, Ch6: 0xFF, Ch7: 0xFF
Ch8: 0xFF, Ch9: 0xFF, Ch10: 0xFB, Ch11: 0x91
Ch12: 0xF7, Ch13: 0xFF, Ch14: 0x96, Ch15: 0xFF
Ch16: 0xFF, Ch17: 0xFF, Ch18: 0xFF, Ch19: 0x94
Ch20: 0x8F, Ch21: 0x95, Ch22: 0xFF, Ch23: 0xFF
Ch24: 0xE2, Ch25: 0xFF, Ch26: 0xD3, Ch27: 0xFF
Ch28: 0x87, Ch29: 0xFF, Ch30: 0xFF, Ch31: 0xFF
Data Memory for ST2:
...
```

| Related Commands | Command                              | Description                                                                 |
|------------------|--------------------------------------|-----------------------------------------------------------------------------|
|                  | <a href="#">show tdm connections</a> | Displays details about a specific TDM channel programmed on the Mitel chip. |

# show tdm detail

To display details about a specific time-division multiplexing (TDM) channel programmed on the Mitel chip, use the **show tdm detail** command in privileged EXEC mode.

**show tdm detail** *slot-number/device-number source-stream-number/source-channel-number*

|                           |                              |                                                                                                                                                                                                                                          |
|---------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>slot-number</i>           | There are three slots on the Cisco AS5300 access server. A modem card or a trunk PRI card can be inserted in each slot. Each card has one or two TDM devices (either MT8980 or MT90820) on it. The valid range is 0 to 2.                |
|                           | <i>device-number</i>         | TDM device on the motherboard or slot cards. Each card has at least one TDM device (MT8980 or MT80920), and the Octal PRI has two MT90820 TDM devices. Also referred to a TSI Chip Number in the online help. The valid range is 0 to 1. |
|                           | <i>source-stream-number</i>  | Source stream number from the TDM device. The valid range is 0 to 15.                                                                                                                                                                    |
|                           | <i>source-channel-number</i> | Source channel from the TDM device stream. The valid range is 0 to 31.                                                                                                                                                                   |

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                                                              |
|------------------------|----------------|--------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                          |
|                        | 12.0(2)XD      | This command was introduced.                                 |
|                        | 12.0(3)T       | This command was integrated into Cisco IOS Release 12.0(3)T. |

**Usage Guidelines**

The **show tdm detail** command shows the status of the TDM backplane, related data structure values, and TDM chip memory settings. This command is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

This command indicates connection memory and map, data memory, and whether the channel is enabled or disabled. Specify the specific slot, TDM device, TDM stream, and TDM channel.

**Examples**

The following example shows the general syntax used and the output displayed for the **show tdm detail** command. To display only a subset of the data on most of the commands, further specify particular slots, streams, and devices. When the **debug tdm detail** command is executed, more detail is shown. The following example was run with the **debug tdm detail** command executed:

```
Router# show tdm detail 0/0 1/2
Show Detail TDM device info: slot 0 unit 0
ODE Register: 0x0001
Connection Memory: 0x00ED, Output is Disable
Connection Map: STi7 CHi13 ----> STo1 CHo2
Data Memory: 0x00FF
```

| Related Commands | Command                              | Description                                                                                                                                                        |
|------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">show tdm backplane</a>   | Displays modem and PRI channel assignments with streams and channels on the modem side as assigned to the unit and channels on the PRI side of the TDM assignment. |
|                  | <a href="#">show tdm connections</a> | Displays details about a specific TDM channel programmed on the Mitel chip.                                                                                        |
|                  | <a href="#">show tdm data</a>        | Displays information about TDM bus connection memory on Cisco access servers.                                                                                      |
|                  | <a href="#">show tdm information</a> | Displays TDM resources available for the specified TDM device.                                                                                                     |
|                  | <a href="#">show tdm pool</a>        | Displays information about the specified TDM pool.                                                                                                                 |



# show tdm information

To display information about the specified time-division multiplexing (TDM) device, use the **show tdm information** command in privileged EXEC mode.

**show tdm information** { **motherboard** | **slot** *slot-number* { **device** *device-number* } }

| Syntax Description   |  |                                                                                                                                                                                                                                           |
|----------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>motherboard</b>   |  | Motherboard on the Cisco AS5300 access server has the ethernet I/Fs, serial I/Fs, console port, and aux port. The motherboard has one TDM device (MT8980) for the Cisco AS5300 access server.                                             |
| <b>slot</b>          |  | There are three slots on the Cisco AS5300 access server. The range of the slots is 0 to 2. A modem card or a trunk PRI card can be inserted in each slot. Each card has one or two TDM devices (either MT8980 or MT90820) on it.          |
| <i>slot-number</i>   |  | Valid range is 0 to 2.                                                                                                                                                                                                                    |
| <b>device</b>        |  | TDM device on the motherboard or slot cards. The valid range is 0 to 1. Each card has at least one TDM device (MT8980 or MT80920), and the Octal PRI has two MT90820 TDM devices. Also referred to as TSI Chip Number in the online help. |
| <i>device-number</i> |  | Valid range is 0 to 1.                                                                                                                                                                                                                    |

**Command Modes** Privileged EXEC

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

**Usage Guidelines** The **show tdm information** command shows the status of the TDM backplane, related data structure values, and TDM chip memory settings. This command is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

This command displays the register base address, device type, and capabilities on a per-slot basis.

**Examples** The following example shows the general syntax used and the output displayed for the **show tdm information** command. To display only a subset of the data on most of the commands, specify particular slots, streams, and devices. When the **debug tdm detail** command is executed, more detail is shown. The following example is run with the **debug tdm detail** command executed:

```
5300# show tdm information
```

```
TDM Slot Info display for Motherboard:
```

```
Slot Info ptr @0x610D39C0 Feature info ptr @0x60B737E8
```

```
Feature board is MOTHERBOARD, NIM ID: 0x30
```

```
TSI device is MT8980, 1 on this board. Each TSI device supports 0 DS1s
```

```
First TSI device is at offset: 0x100
```

## show tdm information

```

TSI device 0, register base 0x3E801100
  TDM Device Info ptr @0x611AA3EC for slot -1
  TSI device Info ptr @0x60FCC0BC    memory size = 0x100
  This device supports 8 streams with 32 channels per stream
TDM Information display for slot 0:
  Slot Info ptr @0x610D39E4  Feature info ptr @0x60B73818
  Feature board is E1 Quad PRI, NIM ID: 0x43
  TSI device is MT8980, 2 on this board. Each TSI device supports 2 DS1s
  First TSI device is at offset: 0x100, Second TSI device is at Offset: 0x200
  HDLC    Streams start at 4
  Framers Streams start at 6
  TSI device 0, register base 0x3C400100
    TDM Device Info ptr @0x61222054 for slot 0
    TSI device Info ptr @0x60FCC0BC    memory size = 0x100
    This device supports 8 streams with 32 channels per stream
  TSI device 1, register base 0x3C400200
    TDM Device Info ptr @0x61222098 for slot 0
    TSI device Info ptr @0x60FCC0BC    memory size = 0x100
    This device supports 8 streams with 32 channels per stream
TDM Information display for slot 1:
  Slot Info ptr @0x610D3A08  Feature info ptr @0x60B738A8
  Feature board is High Density Modems, NIM ID: 0x47
  TSI device is MT8980, 1 on this board. Each TSI device supports 0 DS1s
  First TSI device is at offset: 0x100
  TSI device 0, register base 0x3C500100
    TDM Device Info ptr @0x612F1B80 for slot 1
    TSI device Info ptr @0x60FCC0BC    memory size = 0x100
    This device supports 8 streams with 32 channels per stream
TDM Information display for slot 2:
  Slot Info ptr @0x610D3A2C  Feature info ptr @0x60B738A8
  Feature board is High Density Modems, NIM ID: 0x47
  TSI device is MT8980, 1 on this board. Each TSI device supports 0 DS1s
  First TSI device is at offset: 0x100
  TSI device 0, register base 0x3C600100
    TDM Device Info ptr @0x613A6F60 for slot 2
    TSI device Info ptr @0x60FCC0BC    memory size = 0x100
    This device supports 8 streams with 32 channels per stream

```

### Related Commands

| Command                              | Description                                                                                                                                                        |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">show tdm backplane</a>   | Displays modem and PRI channel assignments with streams and channels on the modem side as assigned to the unit and channels on the PRI side of the TDM assignment. |
| <a href="#">show tdm connections</a> | Displays details about a specific TDM channel programmed on the Mitel chip.                                                                                        |
| <a href="#">show tdm data</a>        | Displays information about TDM bus connection memory on Cisco access servers.                                                                                      |
| <a href="#">show tdm detail</a>      | Displays information about the specified TDM device.                                                                                                               |
| <a href="#">show tdm pool</a>        | Displays information about the specified TDM pool.                                                                                                                 |

# show tdm pool

To display time-division multiplexor (TDM) resources available for the specified TDM device, use the **show tdm pool** command in privileged EXEC mode.

**show tdm pool** [**slot** *slot-number*]

|                           |                    |                                                                                                                                                                                                                                  |
|---------------------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>slot</b>        | (Optional) There are three slots on the Cisco AS5300 access server with a range of 0 to 2. A modem card or a trunk PRI card can be inserted in each slot. Each card has one or two TDM devices (either MT8980 or MT90820) on it. |
|                           | <i>slot-number</i> | (Optional) Valid range is 0 to 2 for the Cisco AS5300 access server.                                                                                                                                                             |

|                      |                 |
|----------------------|-----------------|
| <b>Command Modes</b> | Privileged EXEC |
|----------------------|-----------------|

|                        |                |                                                              |
|------------------------|----------------|--------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                          |
|                        | 12.0(2)XD      | This command was introduced.                                 |
|                        | 12.0(3)T       | This command was integrated into Cisco IOS Release 12.0(3)T. |

**Usage Guidelines** The **show tdm pool** command shows the status of the TDM backplane, related data structure values, and TDM chip memory settings. This command is generally used only by a Cisco technical support representative during troubleshooting of data continuity problems.

This command displays TDM groups, where group 0 is streams 0 to 3 and group 1 is streams 4-7. It also displays register address and capabilities on a per-slot basis.

**Examples** The following example shows the general syntax used and the output displayed for the **show tdm pool** command. To display only a subset of the data on most of the commands, further specify particular slots, streams, and devices. When the **debug tdm detail** command is executed, more detail is shown. The following example was run with the **debug tdm detail** command executed:

```
5300# show tdm pool
```

```
Dynamic Backplane Timeslot Pool:
Grp ST  Ttl/Free  Req(Cur/Ttl/Fail)  Queues(Free/Used)  Pool Ptr
  0 0-3  120 60    60 361        0 0x61077E28 0x61077E28 0x61077E20
  1 4-7   0  0      0  0          0 0x61077E38 0x61077E28 0x61077E24
```

**Related Commands**

| Command                              | Description                                                                                                                                                        |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">show tdm backplane</a>   | Displays modem and PRI channel assignments with streams and channels on the modem side as assigned to the unit and channels on the PRI side of the TDM assignment. |
| <a href="#">show tdm connections</a> | Displays details about a specific TDM channel programmed on the Mitel chip.                                                                                        |
| <a href="#">show tdm data</a>        | Displays information about TDM bus connection memory on Cisco access servers.                                                                                      |
| <a href="#">show tdm detail</a>      | Displays information about the specified TDM device.                                                                                                               |
| <a href="#">show tdm information</a> | Displays TDM resources available for the specified TDM device.                                                                                                     |

# shutdown (controller)

To disable the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **shutdown** command in controller configuration mode. To restart a disabled CT3IP, use the **no** form of this command.

**shutdown**

**no shutdown**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Using this command assumes that the controller is already enabled. By default, if this command is not issued the controller remains enabled.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

Shutting down the CT3IP disables all functions on the interface and sends a blue alarm to the network. The **shutdown** command marks the interface as unavailable. To check if the CT3IP is disabled, use the **show controller t3** command.

## Examples

The following example shuts down the CT3IP:

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

## Related Commands

| Command                             | Description                                                                |
|-------------------------------------|----------------------------------------------------------------------------|
| <a href="#">show controllers t3</a> | Displays the hardware and software driver information for a T3 controller. |

# shutdown (hub)

To shut down a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router, use the **shutdown** command in hub configuration mode. To restart the disabled hub, use the **no** form of this command.

**shutdown**

**no shutdown**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Using this command assumes that the hub is already enabled. By default, if this command is not issued the hub remains enabled.

## Command Modes

Hub configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.3    | This command was introduced. |

## Examples

The following example shuts down hub 0, ports 1 through 3:

```
Router(config)# hub ethernet 0 1 3
Router(config-hub)# shutdown
```

## Related Commands

| Command             | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| <a href="#">hub</a> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |

# shutdown (interface)

To disable an interface, use the **shutdown** command in interface configuration mode. To restart a disabled interface, use the **no** form of this command.

**shutdown**

**no shutdown**

## Syntax Description

This command has no arguments or keywords.

## Defaults

Using this command assumes that the interface is already enabled. By default, if this command is not issued the interface remains enabled.

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

The **shutdown** command disables all functions on the specified interface. On serial interfaces, this command causes the data terminal ready (DTR) signal to be dropped. On Token Ring interfaces, this command causes the interface to be removed 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 **show interfaces EXEC** command. 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:

```
Router(config)# interface ethernet 0
Router(config-if)# shutdown
08:32:03:%LINK-5-CHANGED:Interface Ethernet 0, changed state to administratively down
```

The following example turns the interface back on:

```
Router(config)# interface ethernet 0
Router(config-if)# no shutdown
08:32:16:%LINK-3-UPDOWN:Interface Ethernet 0, changed state to up
08:32:17:%LINEPROTO-5-UPDOWN:Line protocol on Interface Ethernet 0, changed state to up
```

## Related Commands

| Command                         | Description                                                           |
|---------------------------------|-----------------------------------------------------------------------|
| <a href="#">interface</a>       | Configures an interface type and enters interface configuration mode. |
| <a href="#">show interfaces</a> | Displays the statistical information specific to a serial interface.  |

# 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** command in global configuration mode. To restore the queue to the default, use the **no** form of this command.

**smt-queue-threshold** *number*

**no smt-queue-threshold**

|                    |               |                                                                                                                                                                                                                              |
|--------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>number</i> | Number of buffers used to store unprocessed SMT messages that are to be queued for processing. Acceptable values are positive integers. The default value is equal to the number of FDDI interfaces installed in the router. |
|--------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|          |                                                                                                |  |
|----------|------------------------------------------------------------------------------------------------|--|
| Defaults | The default threshold value is equal to the number of FDDI interfaces installed in the router. |  |
|----------|------------------------------------------------------------------------------------------------|--|

|               |                      |  |
|---------------|----------------------|--|
| Command Modes | Global configuration |  |
|---------------|----------------------|--|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Usage Guidelines | <p>This command helps ensure that routers keep track of FDDI <i>upstream</i> and <i>downstream</i> neighbors, particularly when a router includes more than one FDDI interface.</p> <p>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.</p> |  |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|                                                                                                            |                                                                                                                                                                                                                                                                                                          |  |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div><br/>Caution</div> |                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                            | 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. |  |

|          |                                                                                                                                                                                                                     |  |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Examples | <p>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:</p> <pre>Router(Config)# <b>smt-queue-threshold 10</b></pre> |  |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



# snmp ifindex clear

To clear any previously configured SNMP ifIndex commands issued in interface configuration mode for a specific interface, use the **snmp ifindex clear** command in interface configuration mode.

## snmp ifindex clear

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |                            |
|-----------------|----------------------------|
| <b>Defaults</b> | SNMP index is not cleared. |
|-----------------|----------------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release   | Modification                                                 |
|-----------------|-----------|--------------------------------------------------------------|
|                 | 12.0(11)S | This command was introduced.                                 |
|                 | 12.1(5)T  | This command was integrated into Cisco IOS Release 12.1(5Tn. |
|                 |           |                                                              |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>Interface Index Persistence means that ifIndex values in the IF-MIB persist across reboots, allowing for consistent identification of specific interfaces using Simple Network Management Protocol (SNMP).</p> <p>Use the <b>snmp ifindex clear</b> command on a specific interface when you want that interface to use the global configuration setting for ifIndex persistence. This command clears any ifIndex configuration commands previously entered for that specific interface.</p> |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                     |
|-----------------|-------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>In the following example, ifIndex persistence is enabled for all interfaces:</p> |
|-----------------|-------------------------------------------------------------------------------------|

```
router(config)# snmp-server ifindex persist
```

IfIndex persistence is then disabled for Ethernet interface 0/1 only:

```
router(config)# interface ethernet 0/1
router(config-if)# no snmp ifindex persist
router(config-if)# exit
```

Later, the ifIndex configuration command is cleared from the configuration for Ethernet interface 0/1:

```
router(config)# interface ethernet 0/1
router(config-if)# snmp ifindex clear
router(config-if)# exit
```

This leaves ifIndex persistence enabled for all interfaces, as specified by the **snmp-server ifindex persist** global configuration command.

**Related Commands**

| Command                                     | Description                                                                                                                           |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">snmp ifindex persist</a>        | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) only on a specific interface. |
| <a href="#">snmp-server ifindex persist</a> | Enables ifIndex values that will remain constant across reboots for use by SNMP.                                                      |

# snmp ifindex persist

To enable ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) on a specific interface only, use the **snmp ifindex persist** command in interface configuration mode. To disable ifIndex persistence only on a specific interface, use the **no** form of this command.

**snmp ifindex persist**

**no snmp ifindex persist**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command is disabled by default.

## Command Modes

Interface configuration

## Command History

| Release   | Modification                                                 |
|-----------|--------------------------------------------------------------|
| 12.0(11)S | This command was introduced.                                 |
| 12.1(5)T  | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Usage Guidelines

Interface Index Persistence means that ifIndex values in the IF-MIB persist across reboots, allowing for consistent identification of specific interfaces using Simple Network Management Protocol (SNMP).

The **snmp ifindex persistence** interface configuration command enables and disables ifIndex persistence for individual entries (corresponding to individual interfaces) in the ifIndex table of the IF-MIB.

The **snmp-server ifindex persistence** global configuration command enables and disables ifIndex persistence for all interfaces on the routing device (this applies only to interfaces that have ifDescr and ifIndex entries in the ifIndex table of the IF-MIB).

IfIndex commands configured for an interface apply to all subinterfaces on that interface.

## Examples

In the following example, ifIndex persistence is enabled for interface Ethernet interface 0/1 only:

```
router(config)# interface ethernet 0/1
router(config-if)# snmp ifindex persist
router(config-if)# exit
```

In the following example, ifIndex persistence is enabled for all interfaces, and then disabled for interface Ethernet interface 0/1 only:

```
router(config)# snmp-server ifindex persist
router(config)# interface ethernet 0/1
router(config-if)# no snmp ifindex persist
router(config-if)# exit
```

| Related Commands | Command                                     | Description                                                                                                             |
|------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">snmp ifindex clear</a>          | Clears any previously configured snmp ifIndex commands issued in interface configuration mode for a specific interface. |
|                  | <a href="#">snmp-server ifindex persist</a> | Enables ifIndex values that will remain constant across reboots for use by SNMP.                                        |

# snmp-server ifindex persist

To globally enable ifIndex values which will remain constant across reboots for use by SNMP, use the **snmp-server ifindex persist** command in global configuration mode. To globally disable ifIndex persistence, use the **no** form of this command in global configuration mode.

**snmp-server ifindex persist**

**no snmp-server ifindex persist**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command is disabled by default.

## Command Modes

Global configuration

## Command History

| Release   | Modification                                                 |
|-----------|--------------------------------------------------------------|
| 12.0(11)S | This command was introduced.                                 |
| 12.1(5)T  | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Usage Guidelines

Interface Index Persistence means that ifIndex values in the IF-MIB persist across reboots, allowing for consistent identification of specific interfaces using SNMP.

The **snmp-server ifindex persist** global configuration command will not override interface-specific configuration. Interface-specific configuration of ifIndex persistence is performed with the **[no] snmp ifindex persist** and **snmp ifindex clear** interface configuration commands.

The **[no] snmp-server ifindex persist** global configuration command enables and disables ifIndex persistence for all interfaces on the routing device using ifDescr and ifIndex entries in the ifIndex table of the IF-MIB.

## Examples

In the following example, ifIndex persistence is enabled for all interfaces:

```
Router(config)# snmp-server ifindex persist
```

Note that in this example if ifIndex persistence was previously disabled for a specific interface using the **no snmp ifindex persist** interface configuration command, ifIndex persistence will remain disabled for that interface. The global ifIndex command does not override the interface-specific commands.

| Related Commands | Command                              | Description                                                                                                                           |
|------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|                  | <a href="#">snmp ifindex clear</a>   | Clears any previously configured snmp ifIndex commands issued in interface configuration mode for a specific interface.               |
|                  | <a href="#">snmp ifindex persist</a> | Enables ifIndex values in the Interfaces MIB (IF-MIB) that persist across reboots (ifIndex persistence) only on a specific interface. |

# snmp trap illegal-address

To issue an Simple Network Management Protocol (SNMP) trap when a MAC address violation is detected on an Ethernet hub port of a Cisco 2505, Cisco 2507, or Cisco 2516 router, use the **snmp trap illegal-address** command in hub configuration mode. To disable this function, use the **no** form of this command.

**snmp trap illegal-address**

**no snmp trap illegal-address**

## Syntax Description

This command has no arguments or keywords.

## Defaults

No SNMP trap is issued.

## Command Modes

Hub configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.1    | This command was introduced. |

## Usage Guidelines

In addition to setting the **snmp trap illegal-address** command on the Ethernet hub, you can set the frequency that the trap is sent to the network management station (NMS). This is done on the NMS via the Cisco Repeater MIB. The frequency of the trap can be configured for once only or at a decaying rate (the default). If the decaying rate is used, the first trap is sent immediately, the second trap is sent after one minute, the third trap is sent after two minutes, and so on until 32 minutes, at which time the trap is sent every 32 minutes. If you use a decaying rate, you can also set the trap acknowledgment so that the trap will be acknowledged after it is received and will no longer be sent to the network management station.

Because traps are not reliable, additional information on a port basis is provided by the Cisco Repeater MIB. The network management function can query the following information: the last illegal MAC source address, the illegal address trap acknowledgment, the illegal address trap enabled, the illegal address first heard (timestamp), the illegal address last heard (timestamp), the last illegal address trap count for the port, and the illegal address trap total count for the port.

In addition to issuing a trap when a MAC address violation is detected, the port is also disabled as long as the MAC address is invalid. The port is enabled and the trap is no longer sent when the MAC address is valid (that is, either the address was configured correctly or learned).

## Examples

The following example enables an SNMP trap to be issued when a MAC address violation is detected on hub ports 2, 3, or 4. SNMP support must already be configured on the router.

```
Router(config)# hub ethernet 0 2 4
Router(config-hub)# snmp trap illegal-address
```

■ snmp trap illegal-address

**Related Commands**

| Command             | Description                                                                            |
|---------------------|----------------------------------------------------------------------------------------|
| <a href="#">hub</a> | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |



# source-address

To configure source address control on a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router, use the **source-address** command in hub configuration mode. To remove a previously defined source address, use the **no** form of this command.

**source-address** [*mac-address*]

**no source-address**

|                           |                                                                                                                                                                                                                                                                                                                                                            |                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>mac-address</i> (Optional) MAC address in the packets that the hub will allow to access the network.                                                                                                                                                                                                                                                    |                                                                                        |
| <b>Defaults</b>           | Disabled                                                                                                                                                                                                                                                                                                                                                   |                                                                                        |
| <b>Command Modes</b>      | Hub configuration                                                                                                                                                                                                                                                                                                                                          |                                                                                        |
| <b>Command History</b>    | <b>Release</b>                                                                                                                                                                                                                                                                                                                                             | <b>Modification</b>                                                                    |
|                           | 10.3                                                                                                                                                                                                                                                                                                                                                       | This command was introduced.                                                           |
| <b>Usage Guidelines</b>   | 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.                                                                          |                                                                                        |
| <b>Examples</b>           | The following example configures the hub to allow only packets from MAC address 1111.2222.3333 on port 2 of hub 0:<br><br>Router(config)# <b>hub ethernet 0 2</b><br>Router(config-hub)# <b>source-address 1111.2222.3333</b>                                                                                                                              |                                                                                        |
|                           | The following example configures the hub to 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:<br><br>Router(config)# <b>hub ethernet 0 2</b><br>Router(config-hub)# <b>source-address</b> |                                                                                        |
| <b>Related Commands</b>   | <b>Command</b>                                                                                                                                                                                                                                                                                                                                             | <b>Description</b>                                                                     |
|                           | <a href="#">hub</a>                                                                                                                                                                                                                                                                                                                                        | Enables and configures a port on an Ethernet hub of a Cisco 2505 or Cisco 2507 router. |

# speed

To configure the speed for a Fast Ethernet interface, use the **speed** command in interface configuration mode. To disable a speed setting, use the **no** form of this command.

**speed** { **10** | **100** | **auto** }

**no speed**

|                           |             |                                                                                                                                                                                                                                                                                 |
|---------------------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>10</b>   | Configures the interface to transmit at 10 Mbps.                                                                                                                                                                                                                                |
|                           | <b>100</b>  | Configures the interface to transmit at 100 Mbps. This is the default.                                                                                                                                                                                                          |
|                           | <b>auto</b> | Turns on the Fast Ethernet autonegotiation capability. The interface automatically operates at 10 or 100 Mbps depending on environmental factors, such as the type of media and transmission speeds for the peer routers, hubs, and switches used in the network configuration. |

**Defaults** 100 Mbps

**Command Modes** Interface configuration

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.2(10)P      | This command was introduced. |

**Usage Guidelines** The autonegotiation capability is turned on for the Fast Ethernet interface by either configuring the **speed auto** interface configuration command or the **duplex auto** interface configuration command. [Table 76](#) describes the performance of the system for different combinations of the duplex and speed modes. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

**Table 76 Relationship between duplex and speed Commands**

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

**Table 76** Relationship between duplex and speed Commands (continued)

| duplex Command     | speed Command    | Resulting System Action          |
|--------------------|------------------|----------------------------------|
| <b>duplex half</b> | <b>speed 100</b> | Forces 100 Mbps and half duplex. |
| <b>duplex full</b> | <b>speed 100</b> | Forces 100 Mbps and full duplex. |

**Examples**

The following example shows the configuration options for the **speed** command:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface fastethernet 0
Router(config-if)# speed ?
    10      Force 10 Mbps operation
    100     Force 100 Mbps operation
    auto    Enable AUTO speed configuration
```

**Related Commands**

| Command                                       | Description                                                                                                                                                                                                    |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">duplex</a>                        | Configures the duplex operation on an interface.                                                                                                                                                               |
| <a href="#">interface fastethernet</a>        | Selects a particular Fast Ethernet interface for configuration.                                                                                                                                                |
| <a href="#">show controllers fastethernet</a> | Displays information about initialization block information, transmit ring, receive ring, and errors for the Fast Ethernet controller chip on the Cisco 4500, Cisco 7200 series, or Cisco 7500 series routers. |
| <a href="#">show interfaces fastethernet</a>  | Displays information about the Fast Ethernet interfaces.                                                                                                                                                       |

# squelch

To extend the Ethernet twisted-pair 10BASE-T capability beyond the standard 100 meters on the Cisco 4000 platform, use the **squelch** command in interface configuration mode. To restore the default, use the **no** form of this command.

```
squelch {normal | reduced}

no squelch {normal | reduced}
```

|                    |                |                                                |
|--------------------|----------------|------------------------------------------------|
| Syntax Description | <b>normal</b>  | Allows normal capability. This is the default. |
|                    | <b>reduced</b> | Allows extended 10BASE-T capability.           |

|          |              |
|----------|--------------|
| Defaults | Normal range |
|----------|--------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |                |                              |
|-----------------|----------------|------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>          |
|                 | 10.0           | This command was introduced. |

Examples

The following example extends the twisted-pair 10BASE-T capability on the cable attached to Ethernet interface 2:

```
Router(config)# interface ethernet 2
Router(config-if)# squelch reduced
```

# srp buffer-size

To make adjustments to buffer settings on the receive side for different priority traffic, use the **srp buffer-size** command in interface configuration mode. To disable buffer size configurations use the **no** form of this command.

**srp buffer-size** *receive* [*high* | *medium*]

**no srp buffer-size** *receive* [*high* | *medium*]

## Syntax Description

|                             |                                                                                                     |
|-----------------------------|-----------------------------------------------------------------------------------------------------|
| <i>receive</i>              | Allocates synchronous dynamic random-access memory (SDRAM) buffer for incoming packets.             |
| <i>high</i>   <i>medium</i> | (Optional) Buffer size, in bytes, for high- or medium-priority packets. Any number from 16 to 8192. |

## Defaults

low = 8192 kbytes, medium = 4096 kbytes, high = 4096 kbytes

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                 |
|------------|--------------------------------------------------------------|
| 12.0(6)S   | This command was introduced.                                 |
| 12.0(7)XE1 | This command was introduced on Cisco 7500 series routers.    |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Examples

The following example sets the buffer size for the receive side at the high setting of 17 kbytes:

```
Router(config-if)# srp buffer-size receive high 17
```

## Related Commands

| Command                        | Description                                                               |
|--------------------------------|---------------------------------------------------------------------------|
| <b>mtu</b> <i>bytes</i>        | Adjusts the maximum packet size MTU size.                                 |
| <b>srp deficit-round-robin</b> | Transfers packets from the internal receive buffer to Cisco IOS software. |

# srp deficit-round-robin

To transfer packets from the internal receive buffer to IOS, use the **srp deficit-round-robin** command in interface configuration mode. To disable **srp deficit-round-robin**, use the **no** form of this command.

**srp deficit-round-robin** [*input* | *output*] [*high* | *medium* | *low*] [*quantum* | *deficit*]

**no srp deficit-round-robin**

|                           |                                          |                                                                                     |
|---------------------------|------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>input</i>   <i>output</i>             | (Optional) Either input or output is specified.                                     |
|                           | <i>high</i>   <i>medium</i>   <i>low</i> | (Optional) Priority queue level.                                                    |
|                           | <i>quantum</i>                           | (Optional) DRR quantum value. Any number from 9216 to 32,767. The default is 9,216. |
|                           | <i>deficit</i>                           | (Optional) DRR deficit value. Any number from 0 to 65,535. The default is 16,384.   |

|                 |                 |
|-----------------|-----------------|
| <b>Defaults</b> | quantum = 9216  |
|                 | deficit = 16384 |

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| <b>Command History</b> | Release    | Modification                                                 |
|------------------------|------------|--------------------------------------------------------------|
|                        | 12.0(6)S   | This command was introduced.                                 |
|                        | 12.0(7)XE1 | This command was introduced on Cisco 7500 series routers.    |
|                        | 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

**Examples** The following sample shows packets configured for the high-priority input queue:

```
Router(config)# srp deficit-round-robin input high deficit
```

| <b>Related Commands</b> | Command                           | Description                                                                              |
|-------------------------|-----------------------------------|------------------------------------------------------------------------------------------|
|                         | <a href="#">srp priority-map</a>  | Sets priority mapping for transmitting and receiving packets.                            |
|                         | <a href="#">srp buffer-size</a>   | Makes adjustments to buffer settings on the receive side for different priority traffic. |
|                         | <a href="#">srp random-detect</a> | Configures WRED parameters on packets received through an SRP interface.                 |

# srp loopback

To loop the spatial reuse protocol (SRP) interface on an OC-12c DPTIP, use the **srp loopback** command in interface configuration mode. To remove the loopback, use the **no** form of this command.

**srp loopback** { **internal** | **line** } { **a** | **b** }

**no srp loopback**

|                    |                        |                                                                                                                                       |
|--------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>internal   line</b> | Sets the loopback toward the network before going through the framer (internal), or loops the payload data toward the network (line). |
|                    | <b>a</b>               | Loops back the A side of the interface (inner tx, outer rx).                                                                          |
|                    | <b>b</b>               | Loops back the B side of the interface (outer tx, inner rx).                                                                          |

|          |          |
|----------|----------|
| Defaults | Disabled |
|----------|----------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |                |                                                              |
|-----------------|----------------|--------------------------------------------------------------|
| Command History | <b>Release</b> | <b>Modification</b>                                          |
|                 | 12.0(6)S       | This command was introduced.                                 |
|                 | 12.0(7)XE1     | This command was introduced on Cisco 7500 series routers.    |
|                 | 12.1(5)T       | This command was integrated into Cisco IOS Release 12.1(5)T. |

|                  |                                                |
|------------------|------------------------------------------------|
| Usage Guidelines | Use this command for troubleshooting purposes. |
|------------------|------------------------------------------------|

|          |                                                                                        |
|----------|----------------------------------------------------------------------------------------|
| Examples | The following example configures the loopback test on the A side of the SRP interface: |
|          | <pre>srp loopback line a</pre>                                                         |

# srp priority-map

To set priority mapping for transmitting and receiving packets, use the **srp priority-map** command in interface configuration mode. To disable priority mapping use the **no** form of this command.

**srp priority-map** {**receive**} {*high* | *medium* | *low*} {**transmit**} {*high* | *medium*}

**no srp priority-map**

|                           |                                  |                                                                         |
|---------------------------|----------------------------------|-------------------------------------------------------------------------|
| <b>Syntax Description</b> | <b>receive</b>   <b>transmit</b> | Receiving or transmitting.                                              |
|                           | <i>high</i>   <i>medium</i>      | Mapping for high- or medium-priority packets. Range is between 1 and 8. |
|                           | <i>low</i>                       | Specifies mapping for low-priority packets on the receive side.         |

**Defaults** receive medium = 3, receive high = 5, transmit = 7

**Command Modes** Interface configuration

|                        |                |                                                              |
|------------------------|----------------|--------------------------------------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                          |
|                        | 12.0(6)S       | This command was introduced.                                 |
|                        | 12.0(7)XE1     | This command was introduced on Cisco 7500 series routers.    |
|                        | 12.1(5)T       | This command was integrated into Cisco IOS Release 12.1(5)T. |

**Usage Guidelines** The spatial reuse protocol (SRP) interface provides commands to enforce quality of service (QoS) functionality on the transmit side and receive side of Cisco routers. SRP uses the IP type of service (ToS) field values to determine packet priority.

The SRP interface classifies traffic on the transmit side into high- and low-priority traffic. High-priority traffic is rate shaped and has higher priority than low-priority traffic. You have the option to configure high- or low-priority traffic and can rate limit the high-priority traffic.

The **srp priority-map transmit** command enables the user to specify IP packets with values equal to or greater than the ToS value to be considered as high-priority traffic.

On the receive side, when WRED is enabled, SRP hardware classifies packets into high-, medium-, and low-priority packets on the basis of the IP ToS value. After classification, it stores the packet into the internal receive buffer. The receive buffer is partitioned for each priority packet. Cisco routers can employ WRED on the basis of the IP ToS value. Routers also employ the Deficit Round Robin (DRR) algorithm to transfer packets from the internal receive buffer to Cisco IOS software.

The command **srp priority-map receive** enables the user to classify packets as high, medium, or low based on the IP ToS value.



---

**Examples**

The following example configures Cisco 7500 series routers to transmit packets with priority greater than 5 as high-priority packets:

```
Router(config-if)# srp priority-map transmit 5
```

---

**Related Commands**

| Command                           | Description                                                              |
|-----------------------------------|--------------------------------------------------------------------------|
| <a href="#">srp random-detect</a> | Configures WRED parameters on packets received through an SRP interface. |

# srp random-detect

To configure WRED (weighted RED) parameters on packets received through an spatial reuse protocol (SRP) interface, use the **srp random-detect** command in interface configuration mode. To return the value to the default, use the **no** form of this command.

**srp random-detect** {*compute-interval* | *enable* | *input* | [*high* | *low* | *medium*] | [*exponential-weight* | *precedence*]

**no srp random-detect**

## Syntax Description

|                                          |                                                                                                 |
|------------------------------------------|-------------------------------------------------------------------------------------------------|
| <i>compute-interval</i>                  | Interval in the range of 1 to 128 nanoseconds used to specify the queue depth compute interval. |
| <i>enable</i>                            | Enables WRED.                                                                                   |
| <i>input</i>                             | WRED on packet input path.                                                                      |
| <i>high</i>   <i>low</i>   <i>medium</i> | (Optional) Priority queue level.                                                                |
| <i>exponential-weight</i>                | Queue weight in bits. Any number from 0 to 6.                                                   |
| <i>precedence</i>                        | Input queue precedence.                                                                         |

## Defaults

128 seconds

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                 |
|------------|--------------------------------------------------------------|
| 12.0(6)S   | This command was introduced.                                 |
| 12.0(7)XE1 | This command was introduced on Cisco 7500 series routers.    |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Examples

The following example configures WRED parameters on packets received through an SRP interface with a weight factor of 5:

```
Router(config-if)# srp random-detect input high exponential-weight 5
```

# srp shutdown

To disable the spatial reuse protocol (SRP) interface, use the **srp shutdown** command in interface configuration mode. To restart a disabled interface, use the **no** form of this command.

**srp shutdown** [*a* | *b*]

**no srp shutdown** [*a* | *b*]

## Syntax Description

|          |                                                   |
|----------|---------------------------------------------------|
| <i>a</i> | (Optional) Specifies side A of the SRP interface. |
| <i>b</i> | (Optional) Specifies side B of the SRP interface. |

## Defaults

SRP continues to be enabled until this command is issued.

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                 |
|------------|--------------------------------------------------------------|
| 12.0(6)S   | This command was introduced.                                 |
| 12.0(7)XE1 | This command was introduced on Cisco 7500 series routers.    |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Usage Guidelines

The **srp shutdown** command disables all functions on the specified side.

## Examples

The following example turns off side A of the SRP interface:

```
srp shutdown a
```

# srp tx-traffic-rate

To limit the amount of high-priority traffic that the spatial reuse protocol (SRP) interface can handle, use the **srp tx-traffic-rate** command in interface configuration mode. Use the **no** form of this command to disable transmitted traffic rate.

**srp tx-traffic** *number*

**no srp tx-traffic** *number*

|                           |                                                                                                                                                     |                                                              |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <b>Syntax Description</b> | <i>number</i> Range in kilobits per second. The range is 1 to 65535.                                                                                |                                                              |
| <b>Defaults</b>           | 10 Kbps                                                                                                                                             |                                                              |
| <b>Command Modes</b>      | Interface configuration                                                                                                                             |                                                              |
| <b>Command History</b>    | <b>Release</b>                                                                                                                                      | <b>Modification</b>                                          |
|                           | 12.0(6)S                                                                                                                                            | This command was introduced.                                 |
|                           | 12.0(7)XE1                                                                                                                                          | This command was introduced on Cisco 7500 series routers.    |
|                           | 12.1(5)T                                                                                                                                            | This command was integrated into Cisco IOS Release 12.1(5)T. |
| <b>Examples</b>           | <p>The following example configures SRP traffic to transmit at 1000 kilobits per second:</p> <pre>Router(config-if)# srp tx-traffic-rate 1000</pre> |                                                              |

# t1

To create a logical T1 controller from each of the specified time slots of the T3 line, use the **t1** command in controller configuration mode. To delete the defined logical controller, use the **no** form of this command.

**t1** *ds1* **controller**

**no t1** *ds1* **controller**

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                      |                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| <b>Syntax Description</b> | <i>ds1</i> Time slot within the T3 line. The valid time-slot range is from 1 to 28.                                                                                                                                                                                                                                                                                                                                  |                              |
| <b>Defaults</b>           | No default behavior or values.                                                                                                                                                                                                                                                                                                                                                                                       |                              |
| <b>Command Modes</b>      | Controller configuration                                                                                                                                                                                                                                                                                                                                                                                             |                              |
| <b>Command History</b>    | <b>Release</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Modification</b>          |
|                           | 11.3AAA                                                                                                                                                                                                                                                                                                                                                                                                              | This command was introduced. |
| <b>Usage Guidelines</b>   | The purpose of this command is to convert the collection of the 28 T1 controllers comprising the T3 controller into individual T1 controllers that the system can use. In other words, the Cisco AS5800 access server cannot pass data until a T1 controller is configured (using the <b>controller t1</b> command), and you cannot configure a T1 controller until it has been created using the <b>t1</b> command. |                              |
| <b>Examples</b>           | The following example configures a logical T1 controller at T1 time slot 1 for the T3 controller located in shelf 1, slot 4, port 0. Note that you have to enter the command from controller configuration mode.<br><br>Router(config)# <b>controller t3 1/4/0</b><br>Router(config-controller)# <b>t1 1 controller</b><br>Router(config-controller)# <b>end</b><br>Router#                                          |                              |
| <b>Related Commands</b>   | <b>Command</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Description</b>           |
|                           | <b>controller</b>                                                                                                                                                                                                                                                                                                                                                                                                    | Configures a T1 controller.  |
|                           | <b>controller t3</b>                                                                                                                                                                                                                                                                                                                                                                                                 | Configures a T3 controller.  |

# t1 bert

To enable or disable a bit error rate tester (BERT) test pattern for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 bert** command in controller configuration mode. To disable a BERT test pattern, use the **no** form of this command.

**t1 channel bert pattern {0s | 1s | 2^15 | 2^20 | 2^23} interval minutes [unframed]**

**no t1 channel bert pattern {0s | 1s | 2^15 | 2^20 | 2^23} interval minutes [unframed]**

## Syntax Description

|                         |                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------|
| <i>channel</i>          | Number between 1 and 28 that indicates the T1 channel.                                            |
| <b>pattern</b>          | Specifies the length of the repeating BERT test pattern.                                          |
| <b>0s</b>               | 0s—Repeating pattern of zeros (...000...).                                                        |
| <b>1s</b>               | 1s—Repeating pattern of ones (...111...).                                                         |
| <b>2^15</b>             | 2 <sup>15</sup> —Pseudorandom repeating pattern that is 32,767 bits in length.                    |
| <b>2^20</b>             | 2 <sup>20</sup> —Pseudorandom repeating pattern that is 1,048,575 bits in length.                 |
| <b>2^23</b>             | 2 <sup>23</sup> —Pseudorandom repeating pattern that is 8,388,607 bits in length.                 |
| <b>interval minutes</b> | Specifies the duration of the BERT test, in minutes. The interval can be a value from 1 to 14400. |
| <b>unframed</b>         | (Optional) Specifies T1 unframed BERT.                                                            |

## Defaults

No BERT test is performed.

## Command Modes

Controller configuration

## Command History

| Release | Modification                                           |
|---------|--------------------------------------------------------|
| 11.3    | This command was introduced.                           |
| 12.2S   | The <b>unframed</b> keyword was added to this command. |

## Usage Guidelines

The BERT test patterns from the CT3IP are framed test patterns (that is, the test patterns are inserted into the payload of the framed T1 signal).

To view the BERT results, use the **show controller t3** or **show controller t3 brief EXEC** commands. The BERT results include the following information:

- Type of test pattern selected
- Status of the test
- Interval selected
- Time remaining on the BERT test
- Total bit errors
- Total bits received

When the T1 channel has a BERT test running, the line state is DOWN. Also, when the BERT test is running and the Status field is Not Sync, the information in the total bit errors field is not valid. When the BERT test is done, the Status field is not relevant.

The **t1 bert** command is not written to NVRAM because it is only used for testing the T1 channel for a short predefined interval and for avoiding accidentally saving the command, which could cause the interface not to come up the next time the router reboots.

**Note**

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

**Examples**

The following example shows how to run a BERT test pattern of all zeros for 30 minutes on T1 channel 6 on the CT3IP in slot 9:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 bert pattern 0s interval 30
```

**Related Commands**

| Command                    | Description                                                                |
|----------------------------|----------------------------------------------------------------------------|
| <b>show controllers t3</b> | Displays the hardware and software driver information for a T3 controller. |

# t1 clock source

To specify where the clock source is obtained for use by each T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 clock source** controller configuration command.

**t1** *channel* **clock source** {**internal** | **line**}

## Syntax Description

|                 |                                                                        |
|-----------------|------------------------------------------------------------------------|
| <i>channel</i>  | Number between 1 and 28 that indicates the T1 channel.                 |
| <b>internal</b> | Specifies that the internal clock source is used. This is the default. |
| <b>line</b>     | Specifies that the network clock source is used.                       |

## Defaults

Internal

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

If you do not specify the **t1 clock source** command, the default clock source of **internal** is used by all the T1s on the CT3IP.

You can also set the clock source for the CT3IP by using the **clock source** (CT3IP) controller configuration command.



### Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

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

## Examples

The following example sets the clock source for T1 6 and T1 8 on the CT3IP to line:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 clock source line
Router(config-controller)# t1 8 clock source line
```

## Related Commands

| Command                     | Description                                                                                     |
|-----------------------------|-------------------------------------------------------------------------------------------------|
| <b>clock source (CT3IP)</b> | Specifies where the clock source is obtained for use by the CT3IP in Cisco 7500 series routers. |



# t1 external

To specify that a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers is used as an external port so that the T1 channel can be further multiplexed on the Multichannel Interface Processor (MIP) or other multiplexing equipment, use the **t1 external** controller configuration command. To remove a T1 as an external port, use the **no** form of this command.

**t1 external** *channel* [**cablelength** *feet*] [**linecode** *ami* | **b8zs**]

**no t1 external** *channel*

|                    |                                          |                                                                                                                                                           |
|--------------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <i>channel</i>                           | Number 1, 2, or 3 that indicates the T1 channel.                                                                                                          |
|                    | <b>cablelength</b> <i>feet</i>           | (Optional) Specifies the cable length, in feet, from the T1 channel to the external CSU or MIP. Values are 0 to 655 feet. The default is 133 feet.        |
|                    | <b>linecode</b> <i>ami</i>   <b>b8zs</b> | (Optional) Specifies the line coding used by the T1. Values are alternate mark inversion (AMI) or bipolar 8 zero suppression (B8ZS). The default is B8ZS. |

## Defaults

No external T1 is specified.

The default cable length is 133 feet.

The default line coding is B8ZS.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

The first three T1 channels (1, 2, and 3) of the CT3IP can be broken out to the DSUP-15 connectors on the CPT3IP so that the T1 channel can be further demultiplexed by the MIP on the same router or on another router.

After you configure the external T1 channel, you can continue configuring it as a channelized T1 (also referred to as a *fractional* T1) from the MIP. All channelized T1 commands might not be applicable to the T1 interface. After you configure the channelized T1 on the MIP, you can continue configuring it as you would a normal serial interface. All serial interface commands might not be applicable to the T1 interface.

The line coding on the T1 channel and the MIP must be the same. Because the default line coding format on the T1 channel is B8ZS and the default line coding on the MIP is AMI, you must change the line coding on the MIP or on the T1 so that they match.

To determine if the external device connected to the external T1 port is configured and cabled correctly before configuring an external port, use the **show controllers t3** command and locate the line `Ext1...` in the display output. The line status can be one of the following:

- LOS—Loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port.
- AIS—Alarm indication signal indicates that the port is receiving an all-ones signal.
- OK—A valid signal is being received and the signal is not an all-ones signal.

**Note**

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

**Note**

Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

**Examples**

The following example configures the T1 1 on the CT3IP as an external port using AMI line coding and a cable length of 300 feet:

```
Router(config)# controllers t3 9/0/0
Router(config-controller)# t1 external 1 cablelength 300 linecode ami
```

**Related Commands**

| Command                             | Description                                                                |
|-------------------------------------|----------------------------------------------------------------------------|
| <a href="#">show controllers t3</a> | Displays the hardware and software driver information for a T3 controller. |

# t1 fdl ansi

To enable the 1-second transmission of the remote performance reports via the Facility Data Link (FDL) per ANSI T1.403 for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 fdl ansi** controller configuration command. To disable the performance report, use the **no** form of this command.

**t1 channel fdl ansi**

**no t1 channel fdl ansi**

| Syntax Description | <i>channel</i> Number between 1 and 28 that indicates the T1 channel. |
|--------------------|-----------------------------------------------------------------------|
|--------------------|-----------------------------------------------------------------------|

| Defaults | Disabled |
|----------|----------|
|----------|----------|

| Command Modes | Controller configuration |
|---------------|--------------------------|
|---------------|--------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.3    | This command was introduced. |

| Usage Guidelines | The <b>t1 fdl ansi</b> command can be used only if the T1 framing type is Extended Super Frame (ESF). To display the remote performance report information, use the <b>show controllers t3 remote performance</b> command. |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Note**

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

| Examples | The following example generates the performance reports for T1 channel 8 on the CT3IP: |
|----------|----------------------------------------------------------------------------------------|
|----------|----------------------------------------------------------------------------------------|

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# t1 8 fdl ansi
```

| Related Commands | Command                             | Description                                                                |
|------------------|-------------------------------------|----------------------------------------------------------------------------|
|                  | <a href="#">show controllers t3</a> | Displays the hardware and software driver information for a T3 controller. |

# t1 framing

To specify the type of framing used by the T1 channels on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 framing** controller configuration command.

**t1 channel framing {esf | sf}**

## Syntax Description

|                |                                                                                                |
|----------------|------------------------------------------------------------------------------------------------|
| <i>channel</i> | Number between 1 and 28 that indicates the T1 channel.                                         |
| <b>esf</b>     | Specifies that Extended Super Frame (ESF) is used as the T1 framing type. This is the default. |
| <b>sf</b>      | Specifies that Super Frame is used as the T1 framing type.                                     |

## Defaults

Extended Super Frame (ESF)

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

If you do not specify the **t1 framing** command, the default ESF is used.



### Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

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

## Examples

The following example sets the framing for the T1 6 and T1 8 on the CT3IP to super frame:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 framing sf
Router(config-controller)# t1 8 framing sf
```

# t1 linecode

To specify the type of line coding used by the T1 channels on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 linecode** controller configuration command.

**t1 channel linecode {ami | b8zs}**

| Syntax Description | <i>channel</i> | Number between 1 and 28 that indicates the T1 channel.                                                       |
|--------------------|----------------|--------------------------------------------------------------------------------------------------------------|
|                    | <b>ami</b>     | Specifies that alternate mark inversion (AMI) line coding is used by the T1 channel.                         |
|                    | <b>b8zs</b>    | Specifies that bipolar 8 zero suppression (B8ZS) line coding is used by the T1 channel. This is the default. |

| Defaults | B8ZS |
|----------|------|
|----------|------|

| Command Modes | Controller configuration |
|---------------|--------------------------|
|---------------|--------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 11.3    | This command was introduced. |

| Usage Guidelines | If you do not specify the <b>t1 linecode</b> command, the default B8ZS is used. |
|------------------|---------------------------------------------------------------------------------|
|------------------|---------------------------------------------------------------------------------|

## AMI Line Coding

If you select **ami** line coding for the T1 channel, you must also invert the data on the T1 channel by using the **invert data** interface command. This is required because the T1 channel is bundled into the T3 signal, so there are no local T1 line drivers and receivers associated with it. Therefore, the **t1 channel linecode ami** command does not modify local line driver settings. Rather, it advises the CT3IP what line code the remote T1 is using. The CT3IP uses this information solely for the purpose of determining whether or not to enable the pulse density enforcer for that T1 channel.

## B8ZS Line Coding

When you select **b8zs** line coding, the pulse density enforcer is disabled. When you select **ami** line coding, the pulse density enforcer is enabled. To avoid having the pulse density enforcer corrupt data, the T1 channel should be configured for inverted data.



### Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

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

---

**Examples**

The following example sets the line coding for T1 channel 16 on the CT3IP to AMI:

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# t1 16 linecode ami  
Router(config-controller)# exit  
Router(config)# interface serial 9/0/0:16  
Router(config-if)# invert data
```

---

**Related Commands**

| Command                                     | Description                                                                                                |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <a href="#">loopback remote (interface)</a> | Loops packets through a CSU/DSU, over a DS3 link or a channelized T1 link, to the remote CSU/DSU and back. |
| <b>invert data</b>                          | Inverts the data stream.                                                                                   |

# t1 test

To break out a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers to the test port for testing, use the **t1 test** controller configuration command. To remove the T1 channel from the test port, use the **no** form of this command.

```
t1 test channel [cablelength feet] [linecode {ami | b8zs}]
```

```
no t1 test channel
```

## Syntax Description

|                                              |                                                                                                                                                                                           |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>channel</i>                               | Number between 1 and 28 that indicates the T1 channel.                                                                                                                                    |
| <i>cablelength</i> <i>feet</i>               | (Optional) Specifies the cable length from the T1 channel to the external CSU or Multi-Channel Interface Processor (MIP). Values are 0 to 655 feet. The default cable length is 133 feet. |
| <i>linecode</i> { <i>ami</i>   <i>b8zs</i> } | (Optional) Specifies the line coding format used by the T1 channel. Values are alternate mark inversion (AMI) or bipolar 8 zero suppression (B8ZS). The default is B8ZS.                  |

## Defaults

No test port is configured.

The default cable length is 133 feet.

The default line coding is B8ZS.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

You can use the T1 test port available on the CT3IP to break out any of the 28 T1 channels for testing (for example, 24-hour bit error-rate tester (BERT) testing as is commonly done by telephone companies before a line is brought into service).

The T1 test port is also available as an external port. For more information on configuring an external port, see the **t1 external** controller configuration command.

To determine if the external device connected to the T1 test port is configured and cabled correctly before configuring a test port, use the **show controllers t3** command and locate the line `Ext1...` in the display output. The line status can be one of the following:

- LOS—Loss of signal indicates that the port is not receiving a valid signal. This is the expected state if nothing is connected to the port.
- AIS—Alarm indication signal indicates that the port is receiving an all-ones signal.
- OK—A valid signal is being received and the signal is not an all-ones signal.

**Note**

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

**Note**

Although you can specify a cable length from 0 to 655 feet, the hardware only recognizes the following ranges: 0 to 133, 134 to 266, 267 to 399, 400 to 533, and 534 to 655. For example, entering 150 feet uses the 134 to 266 range. If you later change the cable length to 200 feet, there is no change because 200 is within the 134 to 266 range. However, if you change the cable length to 399, the 267 to 399 range is used. The actual number you enter is stored in the configuration file.

**Examples**

The following example configures T1 6 on the CT3IP as a test port using the default cable length and line coding:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 test 6
```

**Related Commands**

| Command                             | Description                                                                                                                                                                                |
|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">show controllers t3</a> | Displays the hardware and software driver information for a T3 controller.                                                                                                                 |
| <a href="#">t1 external</a>         | Specifies that a T1 channel on the CT3IP in Cisco 7500 series routers is used as an external port so the T1 channel can be further multiplexed on the MIP or other multiplexing equipment. |



# t1 timeslot

To specify the time slots and data rate used on each T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 timeslot** controller configuration command. To remove the configured T1 channel, use the **no** form of this command.

**t1 channel timeslot** *range* [**speed** {**56** | **64**}]

**no t1 channel timeslot**

## Syntax Description

|                                        |                                                                                                                                                                                                                                      |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>channel</i>                         | Number between 1 and 28 that indicates the T1 channel.                                                                                                                                                                               |
| <i>range</i>                           | Specifies the time slots assigned to the T1 channel. The range can be 1 to 24. A dash represents a range of time slots, and a comma separates time slots. For example, 1-10,15-18 assigns time slots 1 through 10 and 15 through 18. |
| <b>speed</b> { <b>56</b>   <b>64</b> } | (Optional) Specifies the data rate for the T1 channel. Values are 56 kbps or 64 kbps. The default is 64 kbps. The 56-kbps speed is valid only for T1 channels 21 through 28.                                                         |

## Defaults

No time slots are specified for the T1 channel.  
The default data rate is 64 kbps.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

You must specify the time slots used by each T1 channel.



### Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with telco numbering schemes for T1 channels within channelized T3 equipment.

## Examples

The following example assigns time slots 1 through 24 to T1 1 for full T1 bandwidth usage:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 1 timeslots 1-24
```

The following example assigns time slots 1 to 5 and 20 to 23 to T1 6 for fractional T1 bandwidth usage:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 timeslots 1-5,20-23
```

The following example configures T1 8 for  $n \times 56$  (where  $n$  is 24) bandwidth usage:

```
Router(config)# controller t3 9/0/0  
Router(config-controller)# t1 8 timeslots 1-24 speed 56
```

# t1 yellow

To enable detection and generation of yellow alarms for a T1 channel on the Channelized T3 Interface Processor (CT3IP) in Cisco 7500 series routers, use the **t1 yellow** controller configuration command. To disable the detection and generation of yellow alarms, use the **no** form of this command.

**t1 channel yellow {detection | generation}**

**no t1 channel yellow {detection | generation}**

## Syntax Description

|                   |                                                                             |
|-------------------|-----------------------------------------------------------------------------|
| <i>channel</i>    | Number between 1 and 28 that indicates the T1 channel.                      |
| <b>detection</b>  | Detects yellow alarms. This is the default, along with <b>generation</b> .  |
| <b>generation</b> | Generates yellow alarms. This is the default, along with <b>detection</b> . |

## Defaults

Yellow alarms are detected and generated on the T1 channel.

## Command Modes

Controller configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.3    | This command was introduced. |

## Usage Guidelines

If the T1 framing type is super frame (SF), you should consider disabling yellow alarm detection because the yellow alarm can be incorrectly detected with SF framing.



### Note

T1 channels on the CT3IP are numbered 1 to 28 rather than the more traditional zero-based scheme (0 to 27) used with other Cisco products. This numbering scheme ensures consistency with Telco numbering schemes for T1 channels within channelized T3 equipment.

## Examples

The following example disables the yellow alarm detection on T1 channel 6 on the CT3IP:

```
Router(config)# controller t3 9/0/0
Router(config-controller)# t1 6 framing sf
Router(config-controller)# no t1 6 yellow detection
```

# test aim eeprom

To test the data compression Advanced Interface Module (AIM) after it is installed in the Cisco 2600 router, use the **test aim eeprom** global configuration command.

## test aim eeprom

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

**Defaults** Disabled

**Command Modes** Global configuration

| Release  | Modification                 |
|----------|------------------------------|
| 12.0(2)T | This command was introduced. |

### Usage Guidelines



Using this command can erase all locations in EEPROM memory.

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

This command is the AIM counterpart of the **test pas eeprom** command, which performs similar tasks for port modules.

[Table 77](#) shows the questions asked of the user when the **test aim eeprom** command is entered, and the recommended user responses.

**Table 77 test aim eeprom Command Questions and Responses**

| Questions                           | Responses                                                                                                                                                                                                                                            |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AIM Slot [0]:                       | User responds by entering the slot number of the AIM whose EEPROM is to be modified. If the user presses ENTER, the default slot 0 is used.                                                                                                          |
| Use NMC93C46 ID EEPROM [y]:         | User responds with “y” if the AIM contains an NMC93C46 type EEPROM and “n” if the AIM contains an X2444 EEPROM. The compression Advanced Interface Module (CAIM) contains a NMC93C46 EEPROM, and this is the default if the user just pressed ENTER. |
| AIM Slot %d eeprom (? for help)[%c] | General command prompt for the <b>test aim eeprom</b> command dialog. The AIM slot number chosen is displayed, and the default command is the last command entered.                                                                                  |

**Table 77** test aim eeprom Command Questions and Responses (continued)

| Questions                                       | Responses                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Address within slot %d eeprom, [0x%02x]         | Enter the desired address within the EEPROM to modify. The default is the next address beyond the byte last modified. If the user wishes to enter a hexadecimal number, it must be preceded by "0x".                                                                                                                                       |
| Read or Write access to slot %d at 0x%02x [%c]? | Respond with a W to write to the addressed byte or with an R to read from the addressed byte. The default value is selected by just pressing Enter and is the same as the value specified in the last primitive access.                                                                                                                    |
| Write data (hex 8 bits) [%02x]?:                | If you respond to prompt B with "W", then prompt C is issued, requesting the user to enter the data to write to the addressed byte. The user enters the desired value. Note that if the user desires to enter a hex value, the hex value entered must be preceded by "0x". Otherwise, the value entered is assumed to be in decimal radix. |

There is a danger that you can erase all bytes in the entire EEPROM. Though it is good to have a diagnostic tool that allows you to read and write data, there is a danger that lost data will make the Advanced Interface Module (AIM) card fail.

During your session with the test dialog, you have access to the following commands:

|               |                                                                                                                |
|---------------|----------------------------------------------------------------------------------------------------------------|
| <b>H or h</b> | Displays a summary of the available commands.                                                                  |
| <b>d</b>      | Dump EEPROM contents—Displays the contents of the EEPROM in hex.                                               |
| <b>e</b>      | Erase EEPROM—Erases the entire EEPROM (all bytes set to 0xff).                                                 |
| <b>p</b>      | Primitive access—Erases the EEPROM.                                                                            |
| <b>q</b>      | Exit EEPROM test—Causes the <b>test aim eeprom</b> command dialog to exit to the command line interface (CLI). |
| <b>z</b>      | Zero EEPROM—Zeros the entire EEPROM.                                                                           |

## Examples

The following example displays the **test aim eeprom** command user dialog:

```
Router# test aim eeprom
AIM Slot [0]: 0
Use NMC93C46 ID EEPROM [y]: y
AIM Slot 0 eeprom (? for help)[?]: ?
  d - dump eeprom contents
  e - erase all locations (to 1)
  p - primitive access
  q - exit eeprom test
  z - zero eeprom

'c' rules of radix type-in and display apply.

AIM Slot 0 eeprom (? for help)[?]:
```

# test interface fastethernet

To test the Fast Ethernet interface by causing the interface to ping itself, use the **test interface fastethernet** EXEC command.

**test interface fastethernet** *number*

## Syntax Description

|               |                                                                                                                                                                                                                                                                                                       |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>number</i> | Port, connector, or interface card number. On a Cisco 4500 or Cisco 4700 series router, specifies the network processor module (NPM) number. The numbers are assigned at the factory at the time of installation or when added to a system and are displayed with the <b>show interfaces</b> command. |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Command Modes

EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

This command sends pings from the specified interface to itself. Unlike the **ping** command, the **test interface fastethernet** command does not require the use of an IP address.

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

## Examples

The following example tests a Fast Ethernet interface on a Cisco 4500 router:

```
Router# test interface fastethernet 0
```

## Related Commands

| Command                  | Description                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>ping (privileged)</b> | Diagnoses basic network connectivity on Apollo, AppleTalk, CLNS, DECnet, IP, Novell IPX, VINES, or XNS networks. |
| <b>ping (user)</b>       | Provides simple ping diagnostics of network connectivity.                                                        |

# test service-module

To perform self-tests on an integrated CSU/DSU serial interface module, such as a 4-wire, 56/64 kbps CSU/DSU, use the **test service-module** privileged EXEC command.

**test service-module** *type number*

## Syntax Description

|               |                   |
|---------------|-------------------|
| <i>type</i>   | Interface type.   |
| <i>number</i> | Interface number. |

## Command Modes

Privileged EXEC

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 11.2    | This command was introduced. |

## Usage Guidelines

The following tests are performed on the CSU/DSU:

- ROM checksum test
- RAM test
- EEPROM checksum test
- Flash checksum test
- DTE loopback with an internal pattern test

These self-tests are also performed at power on.

This command cannot be used if a DTE loopback, line loopback, or remote loopback is in progress.

Data transmission is interrupted for 5 seconds when you issue this command. To view the output of the most recent self-tests, use the **show service-module** command.

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

## Examples

This example performs a self-test on serial interface 0:

```
Router# test service-module serial 0
SERVICE_MODULE(0): Performing service-module self test
SERVICE_MODULE(0): self test finished: Passed
```

| Related Commands | Command                                     | Description                                                |
|------------------|---------------------------------------------|------------------------------------------------------------|
|                  | <a href="#">clear counters</a>              | Clears the interface counters.                             |
|                  | <a href="#">clear service-module serial</a> | Resets an integrated CSU/DSU.                              |
|                  | <a href="#">show service-module serial</a>  | Displays the performance report for an integrated CSU/DSU. |



# timeslot

To enable framed mode on a serial interface on a G.703 E1 port adapter, an FSIP, or an E1-G.703/G.704 serial port adapter, use the **timeslot** interface configuration command. Framed mode allows you to specify a bandwidth for the interface by designating some of the 32 time slots for data and reserving the others for framing (timing). Unframed mode, also known as clear channel, does not reserve any time slots for framing. To restore the interface to unframed mode, use the **no** form of this command or set the start slot to 0.

**timeslot** *start-slot stop-slot*

**no timeslot**

## Syntax Description

|                   |                                                                                                                   |
|-------------------|-------------------------------------------------------------------------------------------------------------------|
| <i>start-slot</i> | First subframe in the major frame. Valid range is 1 to 31 and must be less than or equal to <i>stop-slot</i> .    |
| <i>stop-slot</i>  | Last subframe in the major frame. Valid range is 1 to 31 and must be greater than or equal to <i>start-slot</i> . |

## Defaults

The default G.703 E1 interface is not configured for framed mode.

## Command Modes

Interface configuration

## Command History

| Release | Modification                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------|
| 10.3    | This command was introduced.                                                                               |
| 11.1 CA | This command was modified to include the E1-G.703/G.704 serial port adapter and Cisco 7200 series routers. |

## Usage Guidelines

This command applies to Cisco 4000, 7000, 7200, and 7500 series routers. 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.

In framed mode, timeslot 16 is not used for data. To use timeslot 16 for data, use the **ts16** interface configuration command.

## Examples

The following example enables framed mode on a serial interface on a G.703 E1 port adapter or a E1-G.703/G.704 port adapter:

```
Router(config)# interface serial 3/0
Router(config-if)# timeslot 1-3
```

Related Commands

| Command              | Description                                                                                                  |
|----------------------|--------------------------------------------------------------------------------------------------------------|
| <a href="#">ts16</a> | Controls the use of timeslot 16 for data on a G.703 E1 interface or on an E1-G703/G.704 serial port adapter. |

# transmit-buffers backing-store

To buffer short-term traffic bursts that exceed the bandwidth of the output interface, use the **transmit-buffers backing-store** interface configuration command. To disable this function, use the **no** form of this command.

**transmit-buffers backing-store**

**no transmit-buffers backing-store**

## Syntax Description

This command has no arguments or keywords.

## Defaults

The default is off, unless weighted fair queueing is enabled on the interface. If weighted fair queueing is enabled on the interface, the **transmit-buffers backing-store** command is enabled by default.

## Command Modes

Interface configuration

## Command History

| Release | Modification                                          |
|---------|-------------------------------------------------------|
| 10.3    | This command was introduced on the Cisco 7500 router. |

## Usage Guidelines

If the **transmit-buffers backing-store** command is enabled and a full hardware transmit queue is encountered, packets are swapped out of the original memory device (MEMD) into a system buffer in DRAM. If the **transmit-buffers backing-store** command is *not* enabled and the output hold queue is full, packets are dropped instead of being copied if a full hardware transmit queue is encountered. In both cases, the original MEMD buffer is freed so that it can be reused for other input packets.

To preserve packet order, the router checks the output hold queue and outputs previously queued packets first.

## Examples

The following example shows how to enable the **transmit-buffers backing-store** command on a FDDI interface:

```
Router(config)# interface fddi 3/0  
Router(config-if)# transmit-buffers backing-store
```

## Related Commands

| Command                 | Description                   |
|-------------------------|-------------------------------|
| <b>fair-queue (WFQ)</b> | Enables WFQ for an interface. |

# transmit-clock-internal

To enable the internally generated clock on a serial interface on a Cisco 7200 series or Cisco 7500 series router when a DTE does not return a transmit clock, use the **transmit-clock-internal** interface configuration command. To disable the feature, use the **no** form of this command.

```
transmit-clock-internal
no transmit-clock-internal
```

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

**Defaults** Disabled

**Command Modes** Interface configuration

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

**Examples** The following example enables the internally generated clock on serial interface 3/0 on a Cisco 7000 series or Cisco 7500 series router:

```
Router(config)# interface serial 3/0
Router(config-if)# transmit-clock-internal
```

# transmitter-delay

To specify a minimum dead-time after transmitting a packet, use the **transmitter-delay** command in interface configuration mode. To restore the default, use the **no** form of this command.

**transmitter-delay** *delay*

**no transmitter-delay**

|                           |              |                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>delay</i> | On the FSIP, high-speed serial interface (HSSI, and) on the IGS router, the minimum number of High-Level Data Link Control (HDLC) flags to be sent between successive packets. On all other serial interfaces and routers, approximate number of microseconds of minimum delay after transmitting a packet. The valid range is 0 to 13,1071. The default is 0. |
|---------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                         |
|-----------------|-------------------------|
| <b>Defaults</b> | 0 flags or microseconds |
|-----------------|-------------------------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 10.0           | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>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.</p> <p>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 microseconds 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.</p> |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                    |
|-----------------|------------------------------------------------------------------------------------|
| <b>Examples</b> | The following example specifies a delay of 300 microseconds on serial interface 0: |
|-----------------|------------------------------------------------------------------------------------|

```
Router(config)# interface serial 0  
Router(config-if)# transmitter-delay 300
```

# ts16

To control the use of time slot 16 for data on a G.703 E1 interface or on a E1-G.703/G.704 serial port adapter, 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.

## Defaults

Time slot 16 is used for signaling.

## Command Modes

Interface configuration

## Command History

| Release | Modification                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------|
| 10.3    | This command was introduced.                                                                               |
| 11.1 CA | This command was modified to include the E1-G.703/G.704 serial port adapter and Cisco 7200 series routers. |

## Usage Guidelines

This command applies to Cisco 4000, 7000, 7200, and 7500 series routers. 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 time slots, you must use the **ts16** command.

## Examples

The following example configures time slot 16 to be used for data on a G.703 E1 interface or a E1-G.703/G.704 serial port adapter:

```
Router(config-if)# ts16
```

## Related Commands

| Command                  | Description                                                                                                         |
|--------------------------|---------------------------------------------------------------------------------------------------------------------|
| <a href="#">timeslot</a> | Enables framed mode serial interface on a G.703 E1 port adapter, an FSIP, or an E1-G.703/G.704 serial port adapter. |

# 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.

## Defaults

Disabled

## Command Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## 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.

## Examples

In the following example, all protocols will have encapsulator-to-decapsulator checksumming of packets on the tunnel interface:

```
Router(config-if)# tunnel checksum
```

# tunnel destination

To specify the destination for a tunnel interface, 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**

|                           |                   |                                                                                        |
|---------------------------|-------------------|----------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>hostname</i>   | Name of the host destination.                                                          |
|                           | <i>ip-address</i> | IP address of the host destination expressed in decimal in four-part, dotted notation. |

**Defaults** No tunnel interface destination is specified.

**Command Modes** Interface configuration

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 10.0           | This command was introduced. |

**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. Refer to *Cisco IOS AppleTalk and Novell IPX Configuration Guide* for more information on AppleTalk Cayman tunneling.

**Examples** The following example enables Cayman tunneling:

```
Router(config)# interface tunnel0
Router(config-if)# tunnel source ethernet0
Router(config-if)# tunnel destination 10.108.164.19
Router(config-if)# tunnel mode cayman
```

The following example enables GRE (generic routing encapsulation) tunneling:

```
Router(config)# interface tunnel0
Router(config-if)# appletalk cable-range 4160-4160 4160.19
Router(config-if)# appletalk zone Engineering
Router(config-if)# tunnel source ethernet0
Router(config-if)# tunnel destination 10.108.164.19
Router(config-if)# tunnel mode gre ip
```



**Related Commands**

| Command                       | Description                                             |
|-------------------------------|---------------------------------------------------------|
| <b>appletalk cable-range</b>  | Enables an extended AppleTalk network.                  |
| <b>appletalk zone</b>         | Sets the zone name for the connected AppleTalk network. |
| <a href="#">tunnel mode</a>   | Sets the encapsulation mode for the tunnel interface.   |
| <a href="#">tunnel source</a> | Sets the source address of a tunnel interface.          |

# 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 | <i>key-number</i> | Number from 0 to 4,294,967,295 that identifies the tunnel key. |
|--------------------|-------------------|----------------------------------------------------------------|

|          |          |
|----------|----------|
| Defaults | Disabled |
|----------|----------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

|                 |         |                              |
|-----------------|---------|------------------------------|
| Command History | Release | Modification                 |
|                 | 10.0    | This command was introduced. |

**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 improper configuration or injection of packets from a foreign source.

 **Note** IP multicast traffic is not supported when a tunnel ID key is configured unless the traffic is process-switched. You must configure the **no ip mroute-cache** command in interface configuration mode on the interface if an ID key is configured. This note applies only to Cisco IOS Release 12.0 and earlier releases.

 **Note** When GRE is used, the ID key is carried in each packet. We do *not* recommend relying on this key for security purposes.

**Examples** The following example sets the tunnel key to 3:

```
Router(config-if)# tunnel key 3
```

# tunnel mode

To set the encapsulation mode for the tunnel interface, use the **tunnel mode** interface configuration command. To restore the default, use the **no** form of this command.

**tunnel mode { aurp | cayman | dvmrp | eon | gre | ipip [decapsulate-any] | iptalk | mpls | nos }**

**no tunnel mode**

| Syntax Description     |                                                                                                                                                                                                                                                    |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>aurp</b>            | AppleTalk Update Routing Protocol (AURP).                                                                                                                                                                                                          |
| <b>cayman</b>          | Cayman TunnelTalk AppleTalk encapsulation.                                                                                                                                                                                                         |
| <b>dvmrp</b>           | Distance Vector Multicast Routing Protocol.                                                                                                                                                                                                        |
| <b>eon</b>             | EON compatible CLNS tunnel.                                                                                                                                                                                                                        |
| <b>gre</b>             | Generic route encapsulation (GRE) protocol. This is the default.                                                                                                                                                                                   |
| <b>ipip</b>            | IP over IP encapsulation.                                                                                                                                                                                                                          |
| <b>decapsulate-any</b> | (Optional) Terminates any number of IP-in-IP tunnels at one tunnel interface. Note that this tunnel will not carry any outbound traffic; however, any number of remote tunnel endpoints can use a tunnel configured this way as their destination. |
| <b>iptalk</b>          | Apple IPTalk encapsulation.                                                                                                                                                                                                                        |
| <b>mpls</b>            | MPLS encapsulation.                                                                                                                                                                                                                                |
| <b>nos</b>             | KA9Q/NOS compatible IP over IP.                                                                                                                                                                                                                    |

|          |               |
|----------|---------------|
| Defaults | GRE tunneling |
|----------|---------------|

|               |                         |
|---------------|-------------------------|
| Command Modes | Interface configuration |
|---------------|-------------------------|

| Command History | Release | Modification                                                                                                                                  |
|-----------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 10.0    | This command was introduced.                                                                                                                  |
|                 | 10.3    | The following keywords were added: <ul style="list-style-type: none"><li>• <b>aurp</b></li><li>• <b>dvmrp</b></li><li>• <b>ipip</b></li></ul> |
|                 | 11.2    | The optional <b>decapsulate-any</b> keyword was added.                                                                                        |

|                  |                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 an mrouted router to run DVMRP over a tunnel. You must configure Protocol-Independent Multicast (PIM) and an IP address on a DVMRP tunnel.

GRE (generic routing encapsulation) 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:

```
Router(config)# interface tunnel 0
Router(config-if) tunnel source ethernet 0
Router(config-if)# tunnel destination 10.108.164.19
Router(config-if)# tunnel mode cayman
```

The following example enables GRE tunneling:

```
Router(config)# interface tunnel 0
Router(config-if)# appletalk cable-range 4160-4160 4160.19
Router(config-if)# appletalk zone Engineering
Router(config-if)# tunnel source ethernet0
Router(config-if)# tunnel destination 10.108.164.19
Router(config-if)# tunnel mode gre ip
```

## Related Commands

| Command                      | Description                                             |
|------------------------------|---------------------------------------------------------|
| <b>appletalk cable-range</b> | Enables an extended AppleTalk network.                  |
| <b>appletalk zone</b>        | Sets the zone name for the connected AppleTalk network. |
| <b>tunnel destination</b>    | Specifies the destination for a tunnel interface.       |
| <b>tunnel source</b>         | Sets the source address of a tunnel interface.          |

# tunnel path-mtu-discovery

To enable Path MTU Discovery (PMTUD) on a GRE or IP-in-IP tunnel interface, use the **tunnel path-mtu-discovery** command in interface configuration mode. To disable PMTUD on a tunnel interface, use the **no** form of this command.

**tunnel path-mtu-discovery** [**age-timer** {*aging-mins* | **infinite**}]

**no tunnel path-mtu-discovery**

## Syntax Description

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>age-timer</b> | (Optional) Sets a timer to run for a specified interval, in minutes, after which the tunnel interface resets the maximum transmission unit (MTU) of the path to the default tunnel MTU minus 24 bytes for GRE tunnels or minus 20 bytes for IP-in-IP tunnels. <ul style="list-style-type: none"><li>• <i>aging-mins</i>—Number of minutes. Range is from 10 to 30. Default is 10.</li><li>• <b>infinite</b>—Disables the age timer.</li></ul> |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Defaults

Path MTU Discovery is disabled for a tunnel interface.

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                  |
|------------|---------------------------------------------------------------|
| 12.0(5)WC5 | This command was introduced.                                  |
| 12.0(7)T3  | This command was integrated into Cisco IOS Release 12.0(7)T3. |

## Usage Guidelines

When PMTUD (RFC 1191) is enabled on a tunnel interface, the router performs PMTUD processing for the GRE (or IP-in-IP) tunnel IP packets. The router always performs PMTUD processing on the original data IP packets that enter the tunnel. When PMTUD is enabled, no packet fragmentation occurs on the encapsulated packets that travel through the tunnel. Without packet fragmentation, there is a better throughput of TCP connections, and this makes PMTUD a method for maximizing the use of available bandwidth in the network between the endpoints of a tunnel interface.

After PMTUD is enabled, the Don't Fragment (DF) bit of the IP packet header that is forwarded into the tunnel is copied to the IP header of the external IP packets. The external IP packet is the encapsulating IP packet. Adding the DF bit allows the PMTUD mechanism to work on the tunnel path of the tunnel. The tunnel endpoint listens for ICMP unreachable too-big messages and modifies the IP MTU of the tunnel interface, if required.

When the aging timer is configured, the tunnel code resets the tunnel MTU after the aging timer expires. After the tunnel MTU is reset, a set of full-size packets with the DF bit set is required to trigger the tunnel PMTUD and lower the tunnel MTU. At least two packets are dropped each time the tunnel MTU changes.

When PMTUD is disabled, the DF bit of an external (encapsulated) IP packet is set to zero even if the encapsulated packet has a DF bit set to one.

**Note**

PMTUD on a tunnel interface requires that the tunnel endpoint be able to receive ICMP messages generated by routers in the path of the tunnel. Check that ICMP messages can be received before using PMTUD over firewall connections.

PMTUD currently works only on GRE and IP-in-IP tunnel interfaces.

Use the **show interfaces tunnel** command to verify the tunnel PMTUD parameters.

**Examples**

The following example shows how to enable tunnel PMTUD:

```
Router(config)# interface tunnel 0  
Router(config-if)# tunnel path-mtu-discovery
```

**Related Commands**

| Command                       | Description                                                      |
|-------------------------------|------------------------------------------------------------------|
| <b>interface</b>              | Configures an interface and enters interface configuration mode. |
| <b>show interfaces tunnel</b> | Displays information about the specified tunnel interface.       |

# 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**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                 |          |
|-----------------|----------|
| <b>Defaults</b> | Disabled |
|-----------------|----------|

|                      |                         |
|----------------------|-------------------------|
| <b>Command Modes</b> | Interface configuration |
|----------------------|-------------------------|

| Command History | Release | Modification                 |
|-----------------|---------|------------------------------|
|                 | 10.0    | This command was introduced. |

|                         |                                                                                                                                                                                                                                   |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | 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). |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                                                                                               |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Examples</b> | <p>The following example configures the tunnel to drop datagrams that arrive out of order:</p> <pre>Router(config-if)# <b>tunnel sequence-datagrams</b></pre> |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|

# tunnel source

To set source address for a tunnel interface, use the **tunnel source** interface configuration command. To remove the source address, use the **no** form of this command.

**tunnel source** {*ip-address* | *type number*}

**no tunnel source**

|                           |                   |                                                                                                                                                                                                                      |
|---------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>ip-address</i> | IP address to use as the source address for packets in the tunnel.                                                                                                                                                   |
|                           | <i>type</i>       | Interface type.                                                                                                                                                                                                      |
|                           | <i>number</i>     | 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 <b>show interfaces</b> command. |

**Defaults** No tunnel interface source address is set.

**Command Modes** Interface configuration

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 10.0           | This command was introduced. |

**Usage Guidelines**

**Encapsulation Mode**

Two tunnels cannot use 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.

## IP Addresses

The IP address specified as the source address must be an address of an interface on the router.

When using tunnels to Cayman boxes, you must set the **tunnel source** command to an explicit IP address on the same subnet as the Cayman box, not the tunnel itself.

**Examples** The following example enables Cayman tunneling:

```
Router(config)# interface tunnel0
Router(config-if)# tunnel source ethernet0
Router(config-if)# tunnel destination 131.108.164.19
Router(config-if)# tunnel mode cayman
```

The following example enables GRE (generic routing encapsulation) tunneling:

```
Router(config)# interface tunnel0
Router(config-if)# appletalk cable-range 4160-4160 4160.19
Router(config-if)# appletalk zone Engineering
```



```
Router(config-if)# tunnel source ethernet0
Router(config-if)# tunnel destination 131.108.164.19
Router(config-if)# tunnel mode gre ip
```

**Related Commands**

| Command                      | Description                                             |
|------------------------------|---------------------------------------------------------|
| <b>appletalk cable-range</b> | Enables an extended AppleTalk network.                  |
| <b>appletalk zone</b>        | Sets the zone name for the connected AppleTalk network. |
| <b>tunnel destination</b>    | Specifies the destination for a tunnel interface.       |

# 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

|               |                                                                                |
|---------------|--------------------------------------------------------------------------------|
| <i>number</i> | Maximum number of transmit buffers that the specified interface can subscribe. |
|---------------|--------------------------------------------------------------------------------|

## Defaults

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 Modes

Interface configuration

## Command History

| Release | Modification                 |
|---------|------------------------------|
| 10.0    | This command was introduced. |

## Usage Guidelines

This command should be used only under the guidance of a technical support representative. This command does not have a **no** form.

## Examples

The following example sets the maximum number of transmit buffers on the interface to 5:

```
Router(config)# interface ethernet 0
Router(config-if)# tx-queue-limit 5
```

## Related Commands

| Command                              | Description                                             |
|--------------------------------------|---------------------------------------------------------|
| <a href="#">show controllers mci</a> | Displays all information under the MCI card or the SCI. |

# yellow

To enable generation and detection of yellow alarms, use the **yellow** command in interface configuration mode.

**yellow** {*generation* | *detection*}

## Syntax Description

|                   |                                                               |
|-------------------|---------------------------------------------------------------|
| <i>generation</i> | This setting enables or disables generation of yellow alarms. |
| <i>detection</i>  | This setting enables or disables detection of yellow alarms.  |

## Defaults

Yellow alarm generation and detection are enabled.

## Command Modes

Interface Configuration

## Command History

| Release    | Modification                                                 |
|------------|--------------------------------------------------------------|
| 12.0(5)XE  | This command was introduced.                                 |
| 12.0(7)XE1 | Support for Cisco 7100 series routers added.                 |
| 12.1(5)T   | This command was integrated into Cisco IOS Release 12.1(5)T. |

## Usage Guidelines

Use this command to generate and detect yellow alarms.

## Examples

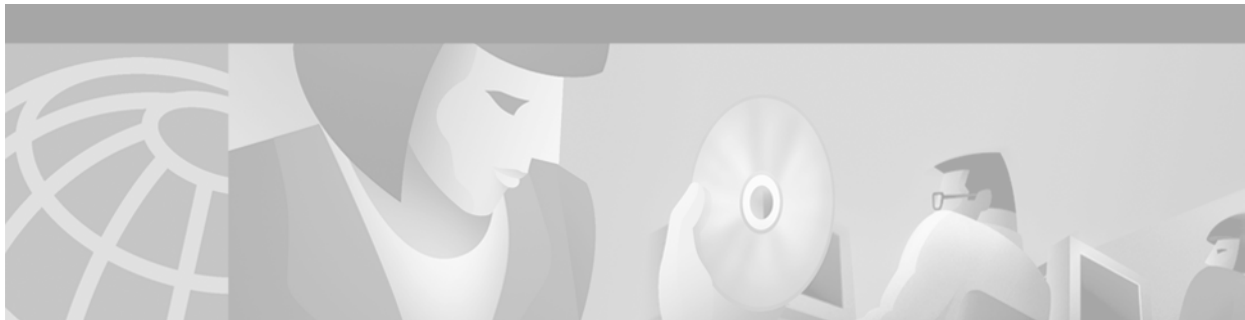
The following example enables generation and detection of yellow alarms on a Cisco 7500 series router:

```
interface atm 3/1/0
  yellow generation
  yellow detection
```

## Related Commands

| Command                                                      | Description                                                                                                 |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>show controllers</b> [ <i>atm slot/ima group-number</i> ] | Displays detailed information about IMA groups and the links they include, as well as about current queues. |

■ yellow



## Dial Shelf Management Commands

---

This chapter describes the commands used to manage dial shelves and dial shelf controller (DSC) cards, including Distributed System Interconnect Protocol (DSIP)<sup>1</sup> commands.

For dial shelf configuration tasks, refer to the “Managing Dial Shelves” chapter in the *Cisco IOS Interfaces Configuration Guide*.

1. DSIP is also referred to as *Dial Shelf Interconnection Protocol*.

# clear dsip tracing

To clear Distributed System Interconnect Protocol (DSIP) tracing statistics (trace logging), use the **clear dsip tracing** command in privileged EXEC mode.

**clear dsip tracing** { **counters** | **tracing** } [**control** | **data** | **ipc**]

## Syntax Description

|                 |                                                                               |
|-----------------|-------------------------------------------------------------------------------|
| <b>counters</b> | Clear the DSIP counters.                                                      |
| <b>tracing</b>  | Clear the DSIP tracing buffers.                                               |
| <b>control</b>  | (Optional) Clear the control counters or tracing buffers.                     |
| <b>data</b>     | (Optional) Clear the data counters or tracing buffers.                        |
| <b>ipc</b>      | (Optional) Clear the inter-process communication counters or tracing buffers. |

## Defaults

If no option is specified, all control, data, and ipc counters or tracing buffers are cleared.

## Command Modes

privileged EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

Use this command to clear the counters displayed with the **show dsip tracing** EXEC command.

## Examples

In the following example, the DSIP counters are cleared (including data, control, and ipc counters):

```
router# clear dsip tracing
router#
```

## Related Commands

| Command                  | Description                        |
|--------------------------|------------------------------------|
| <b>show dsip version</b> | Displays DSIP version information. |

# debug dsc clock

To display debugging output for the time-division multiplexing (TDM) clock switching events on the dial shelf controller (DSC), use the **debug dsc clock** command in privileged EXEC mode. To turn off debugging output, use the **no** form of this command.

[execute-on] **debug dsc clock**

[execute-on] **no debug dsc clock**

## Syntax Description

This command has no arguments or keywords; however it can be used with the **execute-on** command

## Command Modes

privileged EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

To perform this command from the router shelf on the Cisco AS5800 series platform, use the **execute-on slot slot-number debug dsc clock** form of this command.

The **debug dsc clock** command displays TDM clock switching events on the dial shelf controller. The information displayed includes the following:

- Clock configuration messages received from trunks via NBUS
- Dial shelf controller clock configuration messages from the router shelf over the dial shelf interface link
- Clock switchover algorithm events

## Examples

The following example shows that the debug dsc clock command has been enabled, and that trunk messages are received, and that the configuration message has been received:

```
AS5800# debug dsc clock
Dial Shelf Controller Clock debugging is on
AS5800#
00:02:55: Clock Addition msg of len 12 priority 8 from slot 1 port 1 on line 0
00:02:55: Trunk 1 has reloaded
```

## Related Commands

| Command               | Description                                                 |
|-----------------------|-------------------------------------------------------------|
| <b>execute-on</b>     | Executes commands remotely on a line card.                  |
| <b>show dsc clock</b> | Displays information about the Dial Shelf Controller clock. |

# debug dsip

To display debugging output for distributed system interconnect protocol (DSIP) used between a router shelf and a dial shelf, use the **debug dsip** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

**debug dsip** { **all** | **api** | **boot** | **console** | **trace** | **transport** }

**no debug dsip** { **all** | **api** | **boot** | **console** | **trace** | **transport** }

## Syntax Description

|                  |                                                                                                                                                                                        |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>all</b>       | View all DSIP debugging messages.                                                                                                                                                      |
| <b>api</b>       | View DSIP client interface (API) debugging messages.                                                                                                                                   |
| <b>boot</b>      | View DSIP booting messages that are generated when a download of the feature board image is occurring properly.                                                                        |
| <b>console</b>   | View DSIP console operation while debugging.                                                                                                                                           |
| <b>trace</b>     | Enable logging of header information concerning DSIP packets entering the system into a trace buffer. This logged information can be viewed with the <b>show dsip tracing</b> command. |
| <b>transport</b> | Debug the DSIP transport layer, the module that interacts with the underlying physical media driver.                                                                                   |

## Command Modes

privileged EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

The **debug dsip** command is used to enable the display of debugging messages for DSIP between the router shelf and the dial shelf. Using this command, you can display booting messages generated when the download of an image occurs, view console operation, trace logging of MAC header information, and DSIP transport layer information as modules interact with the underlying physical media driver. This command can be applied to a single modem or a group of modems.

Once the **debug dsip trace** command has been enabled, you can read the information captured in the trace buffer using the **show dsip tracing** command.



## Examples

The following example shows the available **debug dsip** command options:

```
AS5800> enable
Password: letmein
AS5800# debug dsip ?
  all           All DSIP debugging messages
  api           DSIP API debugging
  boot          DSIP booting
  console       DSIP console
  trace         DSIP tracing
  transport     DSIP transport
```

The following example indicates the **debug dsip trace** command logs MAC headers of the various classes of DSIP packets. View the logged information using the **show dsip tracing** command:

```
AS5800# debug dsip trace
NIP tracing debugging is on
AS5800# show dsip tracing
NIP Control Packet Trace
-----
Dest:00e0.b093.2238 Src:0007.4c72.0058 Type:200B SrcShelf:1 SrcSlot:11
MsgType:0 MsgLen:82 Timestamp: 00:49:14
-----
Dest:00e0.b093.2238 Src:0007.4c72.0028 Type:200B SrcShelf:1 SrcSlot:5
MsgType:0 MsgLen:82 Timestamp: 00:49:14
-----
```

## Related Commands

| Command                  | Description                                                                              |
|--------------------------|------------------------------------------------------------------------------------------|
| <b>debug modem dsip</b>  | Displays information about the dial shelf, including clocking information.               |
| <b>show dsip tracing</b> | Displays DSIP media header information logged using the <b>debug dsip trace</b> command. |

# dial-tdm- clock

To configure the clock source and priority of the clock source used by the time-division multiplexing (TDM) bus on the dial shelf of the Cisco AS5800, use the **dial-tdm-clock** global configuration command. To return the clock source and priority to the default values, use the no form of the command.

**dial-tdm-clock priority** *number* {**external** {**e1** | **t1**} [**120ohm**] | **freerun** | **trunk-slot** *slot* **port** *port*}

**no dial-tdm-clock priority** *number* {**external** {**e1** | **t1**} [**120ohm**] | **freerun** | **trunk-slot** *slot* **port** *port*}

## Syntax Description

|                                             |                                                                                                                                                                                                                               |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>priority</b> <i>number</i>               | Specify the priority of the clock source. The range is 1 to 50. Priority 1 is the highest priority and 50 is the lowest.                                                                                                      |
| <b>external</b>                             | Specify the priority of an external clock source. The external clock source is connected to the front panel of the dial shelf controller (DSC) card.                                                                          |
| { <b>e1</b>   <b>t1</b> } [ <b>120ohm</b> ] | Specify priority of the E1 (2.048 MHz) or T1 (1.54 MHz) external clock source. The default value of the external coaxial cable impedance is 75 ohm. Specify the <b>120ohm</b> option if a 120 ohm coaxial cable is connected. |
| <b>freerun</b>                              | Specify the priority of the local oscillator clock source.                                                                                                                                                                    |
| <b>trunk-slot</b> <i>slot</i>               | Specify the priority of the trunk card to provide the clock source. The slot number is from 0 to 5 (these are the only slots capable of providing clock sources).                                                             |
| <b>port</b> <i>port</i>                     | Specify the controller number on the trunk used to provide the clock source. The port number is from 0 to 28. The T1 and E1 trunk cards each have 12 ports. The T3 trunk card has 28 ports.                                   |

## Defaults

If no clock sources are specified, the software selects the first available good clock source on a trunk port.

## Command Modes

Global configuration

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

The TDM bus in the backplane on the dial shelf must be synchronized to the T1/E1 clocks on the trunk cards. The Dial Shelf Controller (DSC) card on the dial shelf provides hardware logic to accept multiple clock sources as input and use one of them as the primary source to generate a stable, PPL synchronized output clock. The input clock can be any of the following sources:

- Trunk port in slots 0 through 5 (up to 12 can be selected (two per slot))
- An external T1 or E1 clock source fed directly through a connector on the DSC card
- A free running clock from an oscillator in the clocking hardware on the DSC card

The clock commands are listed in the configuration file with the highest priority listed first.

If the current primary clock source is good, specifying another clock source of higher priority does not cause the clock source to switch to the higher priority clock source. The new higher priority clock source is used as a backup clock source. This prevents switching of the clock source as you enter multiple **dial-tdm-clock priority** configuration commands in random order. Also, it is important not to disturb the existing clock source as long as it is good. To force the new higher priority clock source to take over from a currently good primary clock source, configure the new clock source and use the **no dial-tdm-clock priority** command to remove the current primary clock source.

To display the current primary and backup clocks along with their priorities, use the **show dial-shelf clocks EXEC** commands.

### Examples

In the following example, an external clock source is set at priority 1 and the trunk card in slot 4 port 1 is set at priority 5:

```
router# configure terminal
router(config)# dial-tdm-clock priority 1 external t1
router(config)# dial-tdm-clock priority 5 trunk-slot 4 port 1
router(config)# exit
router#
```

### Related Commands

| Command                | Description                                                                |
|------------------------|----------------------------------------------------------------------------|
| <b>show dial-shelf</b> | Displays information about the dial shelf, including clocking information. |

# hw-module slot

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

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

## Syntax Description

|                    |                                                                                                                                                                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>shelf-id</i>    | The shelf ID is the number of the dial shelf. The default shelf ID for the dial shelf is 1. You must type in the forward slash (/) as part of the command.                                                                                 |
| <i>slot-number</i> | The slot number is number of the slot in the shelf where the target feature board or DSC is intalled. If the <b>start</b> or <b>stop</b> keywords are used, the slot number must be either 12 or 13, as these keywords apply only to DSCs. |
| <b>start</b>       | Restarts the specified DSC.                                                                                                                                                                                                                |
| <b>stop</b>        | Stops the specified DSC.                                                                                                                                                                                                                   |
| <b>reload</b>      | Enables a remote reload of an individual feature board without having to use manual online insertion and removal (OIR).                                                                                                                    |

## Defaults

None

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                                                                                                                                                                                                                   |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.3(6)AA | The <b>hw-module</b> command was introduced.                                                                                                                                                                                   |
| 12.1      | <ul style="list-style-type: none"> <li>The <b>hw-module</b> command was expanded to become the <b>hw-module slot</b> command.</li> <li>The <b>reload</b> keyword was added to enable a remote feature board reload.</li> </ul> |

## Usage Guidelines

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

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

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

**Tips**

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

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

**Examples**

The following example stops the DSC in slot 13 and starts the other in slot 12 (which has previously been stopped):

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

The following example reloads the dial shelf feature board in slot 6:

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

**Related Commands**

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

# shelf-id

To change the shelf number assigned to the router shelf or dial shelf on the Cisco AS5800, use the **shelf-id** command in global configuration mode. To return the shelf numbers to the default value, use the **no** form of the command.

**shelf-id** *number* { **router-shelf** | **dial-shelf** }

**no shelf-id** *number*

## Syntax Description

|                     |                                                  |
|---------------------|--------------------------------------------------|
| <i>number</i>       | Number to assign to the shelf. Range: 0 to 9999. |
| <b>router-shelf</b> | Assign the specified number to the router shelf. |
| <b>dial-shelf</b>   | Assign the specified number to the dial shelf.   |

## Defaults

The default shelf number for the router shelf is 0.

The default shelf number for the dial shelf is 1 or one number higher than the specified router shelf number.

## Command Modes

Global configuration

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

The shelf number is used to distinguish between cards on the router shelf and cards on the dial shelf.



### Caution

You must reload the Cisco AS5800 for the shelf number to take effect. The shelf numbers are part of the interface names. When you reload the Cisco AS5800, all NVRAM interface configuration information is lost.

You can specify the shelf number through the setup facility during initial configuration of the Cisco AS5800. This is the recommended method to specify shelf numbers.

To display the shelf numbers, use the **show running-config** command. If a shelf number has been changed, the pending change is shown in the output of the **show version** command (for example, the dial-shelf ID is 87; will change to 2 on reload).

## Examples

In the following example, the dial shelf is assigned the number 456:

```
router# configure terminal
router(config)# shelf-id 456 dial-shelf
router(config)# exit
router#
```

**Related Commands**

| Command             | Description                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show version</b> | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dial-shelf

To display information about the dial shelf, including clocking information, use the **show dial-shelf** command in user or privileged EXEC mode.

**show dial-shelf** [**clocks** | **slot** *slot-number* [**clocks**]]

## Syntax Description

|                                |                                                                                          |
|--------------------------------|------------------------------------------------------------------------------------------|
| <b>clocks</b>                  | (Optional) Show the current primary and backup clocks along with their priorities.       |
| <b>slot</b> <i>slot-number</i> | (Optional) Show information for a specific slot. <i>Slot-number</i> can be from 0 to 14. |

## Command Modes

EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

To configure the clock source and priority of the clock source used by the TDM bus on the dial shelf, use the **dial-tdm-clock** command in global configuration mode.

## Examples

The following is sample output from the **show dial-shelf** command.

```
router# show dial-shelf
Slot  Board      CPU      DRAM      I/O Memory  State      Elapsed
      Type      Util      Total (free)  Total (free)
1      CT1        0%/0%    22034060 ( 88%)  8388608 ( 49%)  Up         00:37:31
5      Modem     0%/0%    7353996 ( 57%)  6291456 ( 35%)  Up         00:37:29
6      Modem     0%/0%    7353996 ( 58%)  6291456 ( 35%)  Up         00:37:34
7      Modem     5%/5%    7353996 ( 57%)  6291456 ( 35%)  Up         00:37:29
8      Modem    19%/19%   7353996 ( 57%)  6291456 ( 35%)  Up         00:37:33
9      Modem     8%/8%    7353996 ( 57%)  6291456 ( 35%)  Up         00:37:33
11     Modem     0%/0%    7353996 ( 57%)  6291456 ( 35%)  Up         00:37:30
12     DSC       0%/0%    20830044 ( 91%)  8388608 ( 66%)  Up         00:37:35
```

The following table describes the fields shown in the **show dial-shelf** display.

**Table 78 Show Dial-Shelf Command Output**

| Field                   | Description                                                                                                              |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Slot                    | Slot number of the card.                                                                                                 |
| Board Type              | Type of card in the slot. Types include channelized T1/E1 trunk cards, modem cards, or Dial Shelf Controller (DSC) card. |
| CPU Util                | Utilization ratio of the CPU                                                                                             |
| DRAM Total (free)       | Percent of free space                                                                                                    |
| I/O Memory Total (free) | Percent of free disk space                                                                                               |



**Table 78 Show Dial-Shelf Command Output (continued)**

| Field        | Description                                   |
|--------------|-----------------------------------------------|
| State        | Current state of the card. Can be UP or DOWN. |
| Elapsed Time | The elapsed time the shelf has been up.       |

The following are example outputs from the **show dial-shelf clocks** command output.

**Display 1**

```
AS5800# show dial-shelf clocks
Primary Clock:
-----
Slot 12:
System primary is 1/3/1 of priority 3
TDM Bus Master Clock Generator State = NORMAL

Backup clocks:
Source  Slot    Port    Priority    Status    State
-----
Trunk   1           2       10         Good      Configured

Status of trunk clocks:
-----
Slot    Type    11 10  9  8  7  6  5  4  3  2  1  0
1       T1      B  B  B  B  B  B  B  B  B  G  B  B
3       T1      B  B  B  B  B  B  B  B  B  B  G  B
AS5800#
```

**Display 2**

```
router# show dial-shelf clocks
Slot 12:
System primary is 6/76/0 of priority 76
TDM Bus Master Clock Generator State = HOLDOVER

Backup clocks:
Source  Slot    Port    Priority    Status    State
-----

Slot    Type    11 10  9  8  7  6  5  4  3  2  1  0
0       E1      B  B  B  B  B  B  B  B  B  B  B  B
```

**Related Commands**

| Command          | Description                                                     |
|------------------|-----------------------------------------------------------------|
| <b>show diag</b> | Displays advanced troubleshooting information about line cards. |

# show dsc clock

To display information about the dial shelf controller clock, use the **show dsc clock** EXEC command.

**{execute-on} show dsc clock slot-number**

|                           |                    |                                                                                                         |
|---------------------------|--------------------|---------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>slot-number</i> | (Required) Show information for a specific slot. Slot number (12 or 13) must be occupied by a DSC card. |
|---------------------------|--------------------|---------------------------------------------------------------------------------------------------------|

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3(2)AA      | This command was introduced. |

|                         |                                                                                                       |
|-------------------------|-------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | You should use the <b>show dsc clock</b> command from the router using the <b>execute-on</b> command. |
|-------------------------|-------------------------------------------------------------------------------------------------------|

**Examples** The following example shows the output from the **show dsc clock** command:

```
AS5800# execute-on slot 12 show dsc clock
```

```
DA-Slot12#
```

```
Primary Clock:
```

```
-----
```

```
Slot: 3, Port 1, Line 0, Priority = 3 up since 00:37:56
```

```
Time elapsed since last failure of the primary = 00:38:59
```

```
Backup clocks:
```

```
Source Slot Port Line Priority Status State
```

```
-----
```

```
Trunk 1 2 0 10 Good Configured
```

```
All feature boards present are getting good clock from DSC
```

The following table describes fields in the **show dsc clock** command output display:

**Table 79 Show DSC Clock Command Output Fields**

| Field         | Description                                                                                                                     |
|---------------|---------------------------------------------------------------------------------------------------------------------------------|
| Primary clock | The clock designated as the master timing clock.                                                                                |
| Priority      | The order in which a clock is designated to back up the primary clock or the next higher priority clock in case of its failure. |
| Backup Source | The clock signal source, such as a trunk, internal clock, or external generator.                                                |
| Feature board | An application-specific card in the dial shelf, such as a line card.                                                            |
| Trunk         | The trunk line connected to the ISP or central office.                                                                          |

**Table 79**    *Show DSC Clock Command Output Fields (continued)*

| Field  | Description                                                             |
|--------|-------------------------------------------------------------------------|
| Status | Whether the clock source is capable of providing a synch source signal. |
| State  | Whether the clock source is connected and assigned a priority.          |

**Related Commands**

| Command           | Description                                |
|-------------------|--------------------------------------------|
| <b>execute-on</b> | Executes commands remotely on a line card. |

# show dsi

To display information about the dial shelf interconnect (DSI) port adapter parameters, use the **show dsi** command in privileged EXEC mode.

**{execute-on} show dsi**

---

## Syntax Description

This command has no arguments or keywords; however you should use it with the **execute-on** command.

---

## Command Modes

Privileged EXEC

---

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

---

## Usage Guidelines

The dial shelf interconnect (DSI) port adapter connects the Cisco 5814 dial shelf to the Cisco 7206 router shelf. The DSI port adapter allows data transfers between the dial shelf and the router shelf. Data is converted into packets by the feature cards, transmitted to a hub on the dial shelf controller card, and from there sent to the router shelf. Conversely, packets from the router shelf are sent to the dial shelf controller card, where they are transmitted over the backplane to the modem and trunk cards. The **show dsi** command is used to show information about the dial shelf interconnect hardware, interface, physical link, PCI registers, and address filters.

**Examples**

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

```
AS5800# execute-on slot 1 show dsi

DA-Slot1>
DSI-Tx-FastEthernet0 is up, line protocol is up
  Hardware is DEC21140A, address is 0008.26b7.b008 (bia 0008.26b7.b008)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Half-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 01:17:09, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    6 packets input, 596 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast
    0 input packets with dribble condition detected
    6170 packets output, 813483 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
DSI-Rx-FastEthernet1 is up, line protocol is up
  Hardware is DEC21140A, address is 0008.26b7.b008 (bia 0008.26b7.b008)
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output never, output hang never
  Last clearing of "show interface" counters never
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    6280 packets input, 362493 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 watchdog, 0 multicast
    0 input packets with dribble condition detected
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 1 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier
    0 output buffer failures, 0 output buffers swapped out
Interface DSI-Tx-FastEthernet0
Hardware is DEC21140A
dec21140_ds=0x604C9FC4, registers=0x3C000000, ib=0x1912E00
rx ring entries=128, tx ring entries=256
rxring=0x1912F00, rxr shadow=0x604CA16C, rx_head=6, rx_tail=0
txring=0x1913740, txr shadow=0x604CA398, tx_head=138, tx_tail=138, tx_count=0
PHY link up
CSR0=0xFE024882, CSR3=0x1912F00, CSR4=0x1913740, CSR5=0xFC660000
CSR6=0x320CA002, CSR7=0xFFFFA261, CSR8=0xE0000000, CSR9=0xFFFD33FF
CSR11=0xFFFE0000, CSR12=0xFFFFF09, CSR15=0xFFFFFEC8
DEC21140 PCI registers:
  bus_no=0, device_no=1
  CFID=0x00091011, CFCS=0x02800006, CFRV=0x02000022, CFLT=0x0000FF00
  CBIO=0x00000001, CBMA=0x48000000, CFIT=0x28140100, CFDA=0x00000000
MII registers:
```

show dsi

```

Register 0x00:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x08:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x10:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x18:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
throttled=0, enabled=0, disabled=0
rx_fifo_overflow=0, rx_no_enp=0, rx_discard=0
tx_underrun_err=0, tx_jabber_timeout=0, tx_carrier_loss=0
tx_no_carrier=0, tx_late_collision=0, tx_excess_coll=0
tx_collision_cnt=0, tx_deferred=0, fatal_tx_err=0, tbl_overflow=0
HW addr filter: 0x604CABC4, ISL Disabled
Entry= 0:  Addr=FFFF.FFFF.FFFF
Entry= 1:  Addr=FFFF.FFFF.FFFF
Entry= 2:  Addr=FFFF.FFFF.FFFF
Entry= 3:  Addr=FFFF.FFFF.FFFF
Entry= 4:  Addr=FFFF.FFFF.FFFF
Entry= 5:  Addr=FFFF.FFFF.FFFF
Entry= 6:  Addr=FFFF.FFFF.FFFF
Entry= 7:  Addr=FFFF.FFFF.FFFF
Entry= 8:  Addr=FFFF.FFFF.FFFF
Entry= 9:  Addr=FFFF.FFFF.FFFF
Entry=10:  Addr=FFFF.FFFF.FFFF
Entry=11:  Addr=FFFF.FFFF.FFFF
Entry=12:  Addr=FFFF.FFFF.FFFF
Entry=13:  Addr=FFFF.FFFF.FFFF
Entry=14:  Addr=FFFF.FFFF.FFFF
Entry=15:  Addr=0008.26B7.B008

Interface DSI-Rx-FastEthernet1
Hardware is DEC21140A
dec21140_ds=0x604DDA4C, registers=0x3C000800, ib=0x1A01FC0
rx ring entries=128, tx ring entries=256
rxring=0x1A020C0, rxr shadow=0x604DDBF4, rx_head=55, rx_tail=0
txring=0x1A02900, txr shadow=0x604DDE20, tx_head=2, tx_tail=2, tx_count=0
PHY link up
CSR0=0xFE024882, CSR3=0x1A020C0, CSR4=0x1A02900, CSR5=0xFC660000
CSR6=0x320CA202, CSR7=0xFFFFA261, CSR8=0xE0000000, CSR9=0xFFFD33FF
CSR11=0xFFFE0000, CSR12=0xFFFFFFFF09, CSR15=0xFFFFFEC8
DEC21140 PCI registers:
bus_no=0, device_no=2
CFID=0x00091011, CFCS=0x02800006, CFRV=0x02000022, CFLT=0x0000FF00
CBIO=0x00000001, CBMA=0x48000800, CFIT=0x28140100, CFDA=0x00000000
MII registers:
Register 0x00:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x08:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x10:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
Register 0x18:  FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF
throttled=0, enabled=0, disabled=0
rx_fifo_overflow=0, rx_no_enp=0, rx_discard=0
tx_underrun_err=0, tx_jabber_timeout=0, tx_carrier_loss=0
tx_no_carrier=0, tx_late_collision=0, tx_excess_coll=0
tx_collision_cnt=0, tx_deferred=0, fatal_tx_err=0, tbl_overflow=0
HW addr filter: 0x604DE64C, ISL Disabled
Entry= 0:  Addr=FFFF.FFFF.FFFF
Entry= 1:  Addr=FFFF.FFFF.FFFF
Entry= 2:  Addr=FFFF.FFFF.FFFF
Entry= 3:  Addr=FFFF.FFFF.FFFF
Entry= 4:  Addr=FFFF.FFFF.FFFF
Entry= 5:  Addr=FFFF.FFFF.FFFF
Entry= 6:  Addr=FFFF.FFFF.FFFF
Entry= 7:  Addr=FFFF.FFFF.FFFF
Entry= 8:  Addr=FFFF.FFFF.FFFF
Entry= 9:  Addr=FFFF.FFFF.FFFF
Entry=10:  Addr=FFFF.FFFF.FFFF
Entry=11:  Addr=FFFF.FFFF.FFFF

```

```

Entry=12:  Addr=FFFF.FFFF.FFFF
Entry=13:  Addr=FFFF.FFFF.FFFF
Entry=14:  Addr=FFFF.FFFF.FFFF
Entry=15:  Addr=0008.26B7.B008

```

Table 80 describes the fields shown in the **show dsi** display.

**Table 80** *show dsi Command Output Fields*

| Field                                                     | Description                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FastEthernet0 is ... is up<br>...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, <sup>1</sup> CBus <sup>2</sup> 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.                                                                                                                                           |
| 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. |

**Table 80** *show dsi Command Output Fields (continued)*

| Field                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.<br>*** indicates the elapsed time is too large to be displayed.<br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 5 minute input rate, 5 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).<br><br>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 80** *show dsi Command Output Fields (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.                                               |

**Table 80** *show dsi Command Output Fields (continued)*

| 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 a Type 2 Ethernet controller was restarted because of errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 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 failed buffers and number of buffers swapped out.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

1. Single Cell Input
2. Command Bus

**Related Commands**

| Command             | Description                                                                                                                                 |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>execute-on</b>   | Executes commands on a line card.                                                                                                           |
| <b>show dsip</b>    | Displays all information about the Distributed System Interconnect Protocol (DSIP) on a Cisco AS5800.                                       |
| <b>show version</b> | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dsip

To display all information about the Distributed System Interconnect Protocol (DSIP) on a Cisco AS5800, use the **show dsip** EXEC command.

**show dsip**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3(2)AA      | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | <p>Your Cisco AS5800 universal access server uses a protocol used by the Cisco 7206 router shelf to communicate back and forth with the Cisco 5814 dial shelf controller card(s) and feature cards. Although dial shelf interconnect (DSI) configuration is transparent to the user, there are several show commands to help you view your setup, and debug commands to help you troubleshoot your system.</p> <p>To display a subset of this information, use the <b>show dsip transport</b>, <b>show dsip clients</b>, <b>show dsip ports</b>, <b>show dsip queue</b>, <b>show dsip nodes</b>, and <b>show dsip version</b> commands.</p> |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Examples

The following is sample output from the **show dsip** command. For a description of the fields shown in the sample output, refer to the individual **show dsip** commands listed in the “Usage Guidelines” section.

```
router# show dsip
```

DSIP Transport Statistics:

```
IPC : input msgs=8233, bytes=699488; output msgs=8233, bytes=483558
      total consumed ipc msgs=682; total freed ipc msgs = 682
      transmit contexts in use = 11, free = 245, zombie = 0, invalid = 0
      ipc getmsg failures = 0, ipc timeouts=0
      core getbuffer failures=0, api getbuffer failures=0
      dsip test msgs rcvd = 2770, sent = 0
CNTL: input msgs=1112, bytes=91272; output msgs=146, bytes=8760
      getbuffer failures=0
DATA: input msgs=0, bytes=0; output msgs=426, bytes=5112
```

```
DSIP Private Buffer Pool Hits = 0
```

DSIP Registered Addresses:

```
Shelf0 : Master: 00e0.b093.2238, Status=local
Shelf1 : Slot1 : 0007.5387.4808, Status=remote
Shelf1 : Slot5 : 0007.5387.4828, Status=remote
Shelf1 : Slot6 : 0007.5387.4830, Status=remote
Shelf1 : Slot7 : 0007.5387.4838, Status=remote
Shelf1 : Slot8 : 0007.5387.4840, Status=remote
Shelf1 : Slot9 : 0007.5387.4848, Status=remote
Shelf1 : Slot11: 0007.5387.4858, Status=remote
Shelf1 : Slot12: 0007.4b67.8260, Status=remote
```

DSIP Clients:

```
-----
ID    Name
0     Console
1     Clock
2     Modem
3     Logger
4     Trunk
5     Async data
6     TDM
7     Dial shelf manager
8     Environment Mon
9     DSIP Test
```

Dsip Local Ports:

```
-----
Client:Portname      Portid  In-Msgs  Bytes    Last-i/p
Console:Master       10004   0         0         never
Clock:Master         10005   29        3464      00:00:40
Modem:Master         10006   90        70162     00:23:44
Logger:Master        10007   0         0         never
Trunk:Master         10008   1765      140480    00:00:08
Async data:Master    10009   0         0         never
TDM:Master           1000A   7         112       00:24:19
Dial shelf manager:Master 1000B   28        4752      00:00:36
DSIP Test:Master     1000C   2922      2922      00:00:00
```

Dsip Remote Ports:

```
-----
Client:Portname      Portid  Out-Msgs  Bytes    Last-o/p  Last-act
Clock:Slave1         101005F 1         24        00:24:21  00:24:21
Trunk:Slave1         1010061 12        1776      00:24:21  00:24:21
Modem:Slave5         1050050 96        2148      00:23:56  00:24:19
Modem:Slave6         1060050 105       2040      00:24:00  00:24:22
```

```

Modem:Slave7          1070050  106      2188      00:23:56  00:24:20
Modem:Slave8          1080050  112      2212      00:24:13  00:24:35
Modem:Slave9          1090050  115      2224      00:24:09  00:24:35
Modem:Slave11         10B0050  107      2192      00:24:09  00:24:32
Clock:Slave12         10C000D  1        24        00:24:37  00:24:37
Dial shelf manager:Slave12 10C000E  28      4752      00:00:49  00:24:35
DSIP Test:Slave12     10C000F  0        0         never    00:24:35

```

DSIP ipc queue:

-----

There are 0 IPC messages waiting for acknowledgement in the transmit queue.  
There are 0 messages currently in use by the system.

DSIP ipc seats:

-----

There are 9 nodes in this IPC realm.

| ID      | Type  | Name         | Last Sent | Last Heard |
|---------|-------|--------------|-----------|------------|
| 10000   | Local | IPC Master   | 0         | 0          |
| 1060000 | DSIP  | Seat:Slave6  | 10        | 10         |
| 10C0000 | DSIP  | Seat:Slave12 | 2963      | 13         |
| 1080000 | DSIP  | Seat:Slave8  | 10        | 10         |
| 1090000 | DSIP  | Seat:Slave9  | 10        | 10         |
| 1010000 | DSIP  | Seat:Slave1  | 16        | 16         |
| 1070000 | DSIP  | Seat:Slave7  | 10        | 10         |
| 10B0000 | DSIP  | Seat:Slave11 | 10        | 10         |
| 1050000 | DSIP  | Seat:Slave5  | 10        | 10         |

DSIP version information:

-----

Local DSIP major version = 3, minor version = 2

All DS slots are running DSIP versions compatible with RS

Local Clients Registered Versions:

-----

| Client Name | Major Version | Minor Version |
|-------------|---------------|---------------|
| Console     | 3             | 2             |
| Clock       | 1             | 1             |
| Modem       | 0             | 0             |
| Logger      | No version    | No version    |
| Trunk       | No version    | No version    |
| Async data  | No version    | No version    |
| TDM         | No version    | No version    |
| DSIP Test   | No version    | No version    |

Mismatched Remote Client Versions:

-----

## Related Commands

| Command                  | Description                                                                       |
|--------------------------|-----------------------------------------------------------------------------------|
| <b>show dsip clients</b> | Lists the clients registered with DSIP on a system.                               |
| <b>show dsip nodes</b>   | Displays information about the nodes (slots) connected by DSIP on a system.       |
| <b>show dsip ports</b>   | Displays information about local and remote DSIP ports.                           |
| <b>show dsip queue</b>   | Displays the number of IPC messages in the DSIP transmission queue.               |
| <b>show dsip tracing</b> | Displays DSIP media header information logged using the debug dsip trace command. |

| Command                    | Description                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses.                     |
| <b>show dsip version</b>   | Displays Distributed System Interconnect Protocol (DSIP) version information.                                                               |
| <b>show version</b>        | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dsip clients

To display information about Distributed System Interconnect Protocol (DSIP) clients, use the **show dsip clients** EXEC command.

**show dsip clients**

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

**Command Modes** EXEC

| Command History | Release   | Modification                 |
|-----------------|-----------|------------------------------|
|                 | 11.3(2)AA | This command was introduced. |

**Usage Guidelines** Use this command to see whether a client is actually registered with DSIP and using its services. Consider the following example: a client “Trunk” seems to be defunct on a particular node with absolutely no input/output activity. The command **show dsip ports** doesn't show any Trunk port among its local ports though all other client ports show up. The problem might be that the Trunk client didn't even register with DSIP. To confirm this, use the **show dsip clients** command.

**Examples** The following is sample output from the **show dsip clients** command. This command lists the clients:

```
router# show dsip clients

ID      Name
0       Console
1       Clock
2       Modem
3       Logger
4       Trunk
5       Async data
6       TDM
7       Dial shelf manager
8       Environment Mon
9       DSIP Test
```

| Related Commands | Command                  | Description                                                                       |
|------------------|--------------------------|-----------------------------------------------------------------------------------|
|                  | <b>show dsip nodes</b>   | Displays information about the nodes (slots) connected by DSIP on a system.       |
|                  | <b>show dsip ports</b>   | Displays information about local and remote DSIP ports.                           |
|                  | <b>show dsip queue</b>   | Displays the number of IPC messages in the DSIP transmission queue.               |
|                  | <b>show dsip tracing</b> | Displays DSIP media header information logged using the debug dsip trace command. |

| Command                    | Description                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses. |
| <b>show dsip version</b>   | Displays Distributed System Interconnect Protocol (DSIP) version information.                                           |



# show dsip nodes

To display information about the processors running the Distributed System Interconnect Protocol (DSIP), use the **show dsip nodes** EXEC command.

**show dsip nodes**

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3(2)AA      | This command was introduced. |

|                         |                                                                                                                                                                                                                                                                           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | Use <b>show dsip nodes</b> to see the nodes (slots) connected by DSIP and the node specific sequence numbers. The former information is also available from <b>show dsip transport</b> . The sequence numbers are useful for support engineers while debugging a problem. |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                         |
|-----------------|-------------------------------------------------------------------------|
| <b>Examples</b> | The following is sample output from the <b>show dsip nodes</b> command: |
|-----------------|-------------------------------------------------------------------------|

```
router# show dsip nodes
```

```
DSIP ipc nodes:
```

```
-----
```

```
There are 9 nodes in this IPC realm.
```

| ID      | Type  | Name               | Last Sent | Last Heard |
|---------|-------|--------------------|-----------|------------|
| 10000   | Local | IPC Master         | 0         | 0          |
| 1130000 | DSIP  | Dial Shelf:Slave12 | 12        | 12         |
| 1080000 | DSIP  | Dial Shelf:Slave1  | 1         | 1          |
| 10A0000 | DSIP  | Dial Shelf:Slave3  | 1         | 1          |
| 10C0000 | DSIP  | Dial Shelf:Slave5  | 1         | 1          |
| 10D0000 | DSIP  | Dial Shelf:Slave6  | 1         | 1          |
| 10E0000 | DSIP  | Dial Shelf:Slave7  | 1         | 1          |
| 10F0000 | DSIP  | Dial Shelf:Slave8  | 1         | 1          |
| 1100000 | DSIP  | Dial Shelf:Slave9  | 1         | 1          |

The following table describes the fields shown in the **show dsip** display.

**Table 81** *show dsip nodes Command Output Fields*

| Field                | Description                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ID                   | DSIP uses Cisco's IPC (Inter Process Communication) module for non-data related (client control messages etc.) traffic. A seat or node is a computational element, such as a processor, that can be communicated with using IPC services. A seat is where entities and IPC ports reside. The IPC maintains a seat table which contains the seatids of all the seats in the system. Normally this seatid is a function of the slot number. |
| Type                 | Local: Local node<br>DSIP: Remote DSIP node                                                                                                                                                                                                                                                                                                                                                                                               |
| Name                 | Each seat (node) has a name to easily identify it. There is only one master node and rest are slave nodes. The master node name is "IPC Master" and the slave node name is "Seat:Slave X", where "X" is the slot number of the node.                                                                                                                                                                                                      |
| Last Sent/Last Heard | Each node maintains two sequence numbers for the last sent and last heard.                                                                                                                                                                                                                                                                                                                                                                |
| Last Sent            | Whenever a message is sent out 'last sent' counter is updated.                                                                                                                                                                                                                                                                                                                                                                            |
| Last Heard           | Whenever a message is received from a remote node, 'last heard' is updated.                                                                                                                                                                                                                                                                                                                                                               |

**Related Commands**

| Command                    | Description                                                                                                             |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip clients</b>   | Lists the clients registered with DSIP on a system.                                                                     |
| <b>show dsip ports</b>     | Displays information about local and remote DSIP ports.                                                                 |
| <b>show dsip queue</b>     | Displays the number of IPC messages in the DSIP transmission queue.                                                     |
| <b>show dsip tracing</b>   | Displays DSIP media header information logged using the debug dsip trace command.                                       |
| <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses. |
| <b>show dsip version</b>   | Displays Distributed System Interconnect Protocol (DSIP) version information.                                           |

# show dsip ports

To display information about local and remote ports, use the **show dsip ports** EXEC command.

**show dsip ports** [**local** | **remote** [*slot*]]

|                    |               |                                                                                                                                                     |
|--------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax Description | <b>local</b>  | (Optional) Display information for local ports. The local port is the port created at a seat's local end.                                           |
|                    | <b>remote</b> | (Optional) Display information for remote ports. The remote port is the ports residing on a remote seat to which DSIP IPC based connection is open. |
|                    | <i>slot</i>   | (Optional) Specify a slot number to display information for a specific card on the dial shelf.                                                      |

|          |                                                                                        |
|----------|----------------------------------------------------------------------------------------|
| Defaults | If no options are specified, information is displayed for both local and remote ports. |
|----------|----------------------------------------------------------------------------------------|

|               |      |
|---------------|------|
| Command Modes | EXEC |
|---------------|------|

| Command History | Release   | Modification                 |
|-----------------|-----------|------------------------------|
|                 | 11.3(2)AA | This command was introduced. |

|                  |                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Usage Guidelines | <p>The DSIP communication going through the IPC stack uses ports. The creation of a port returns a 32-bit port-id which is the end-point for communication between two IPC clients.</p> |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The **show dsip ports** command is used to check clients up and running:

- to see the local ports that are created and the activity on them
- to see the remote ports to which we are connected and to see the activity on them

**Examples**

The following is sample output from the **show dsip port** command:

```
router# show dsip ports
```

```
Dsip Local Ports:
```

```
-----
```

| Client:Portname           | Portid | In-Msgs | Bytes | Last-i/p |
|---------------------------|--------|---------|-------|----------|
| Console:Master            | 10004  | 0       | 0     | never    |
| Clock:Master              | 10005  | 16      | 1800  | 00:00:05 |
| Modem:Master              | 10006  | 90      | 70162 | 00:10:08 |
| Logger:Master             | 10007  | 0       | 0     | never    |
| Trunk:Master              | 10008  | 792     | 62640 | 00:00:03 |
| Async data:Master         | 10009  | 0       | 0     | never    |
| TDM:Master                | 1000A  | 7       | 112   | 00:10:44 |
| Dial shelf manager:Master | 1000B  | 15      | 2256  | 00:00:27 |
| DSIP Test:Master          | 1000C  | 1294    | 1294  | 00:00:00 |

```
Dsip Remote Ports:
```

```
-----
```

| Client:Portname            | Portid  | Out-Msgs | Bytes | Last-o/p | Last-act |
|----------------------------|---------|----------|-------|----------|----------|
| Clock:Slave1               | 101005F | 1        | 24    | 00:10:46 | 00:10:46 |
| Trunk:Slave1               | 1010061 | 12       | 1776  | 00:10:46 | 00:10:46 |
| Modem:Slave5               | 1050050 | 96       | 2148  | 00:10:21 | 00:10:44 |
| Modem:Slave6               | 1060050 | 105      | 2040  | 00:10:25 | 00:10:48 |
| Modem:Slave7               | 1070050 | 106      | 2188  | 00:10:21 | 00:10:45 |
| Modem:Slave8               | 1080050 | 112      | 2212  | 00:10:25 | 00:10:47 |
| Modem:Slave9               | 1090050 | 115      | 2224  | 00:10:39 | 00:11:05 |
| Modem:Slave11              | 10B0050 | 107      | 2192  | 00:10:39 | 00:11:02 |
| Clock:Slave12              | 10C000D | 1        | 24    | 00:11:07 | 00:11:07 |
| Dial shelf manager:Slave12 | 10C000E | 15       | 2256  | 00:00:45 | 00:11:05 |
| DSIP Test:Slave12          | 10C000F | 0        | 0     | never    | 00:11:05 |

The following table describes the fields shown in the **show dsip ports** display.

**Table 82 Show DSIP Ports Command Output**

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                  |        |                                                                |       |                                                                 |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|--------|----------------------------------------------------------------|-------|-----------------------------------------------------------------|
| Client:Portname     | <p>Client name and port name. Port Name. The port names can be determined because they are based on a uniform naming convention that includes the following elements:</p> <ul style="list-style-type: none"> <li>client name</li> <li>master/slave status</li> <li>slot number</li> </ul> <p>Any client can derive the portname of the other client it wants to talk to once it knows its physical location, using the following formula:</p> <table> <tr> <td>Master/Slave Status</td><td>Port Name Syntax</td></tr> <tr> <td>Master</td><td><i>Client-Name:Master</i>, for example, <b>Console:Master</b></td></tr> <tr> <td>Slave</td><td><i>Client-Name:SlaveSlot</i>, for example, <b>Clock:Slave1</b></td></tr> </table> | Master/Slave Status | Port Name Syntax | Master | <i>Client-Name:Master</i> , for example, <b>Console:Master</b> | Slave | <i>Client-Name:SlaveSlot</i> , for example, <b>Clock:Slave1</b> |
| Master/Slave Status | Port Name Syntax                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |                  |        |                                                                |       |                                                                 |
| Master              | <i>Client-Name:Master</i> , for example, <b>Console:Master</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                  |        |                                                                |       |                                                                 |
| Slave               | <i>Client-Name:SlaveSlot</i> , for example, <b>Clock:Slave1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                  |        |                                                                |       |                                                                 |
| Portid              | <p>Port ID. The Portid is a 32-bit identifier comprised of <b>seatid</b> and the <b>port-number</b>. The IPC maintains a seat table which contains the seatids of all the seats in the system. A seat is where clients and ports reside.</p> <p>The seatid is a function of the slot number. Port-number is the sequential number of the port that is being created on a particular seat, for example: 0,1, 2, etc.</p>                                                                                                                                                                                                                                                                                                        |                     |                  |        |                                                                |       |                                                                 |
| In-Msgs/            | The total number of input messages that were received on a particular port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                  |        |                                                                |       |                                                                 |

**Table 82** Show DSIP Ports Command Output (continued)

| Field         | Description                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Out-Msgs      | The total number of output messages that were sent to a particular remote port.                                                                                                          |
| Bytes(in/out) | The total number of bytes that were received on a particular port or sent to a remote port. The number of bytes on this port up to the time of the execution of the <b>show</b> command. |
| Last-i/p      | Elapsed time since the last input was received on a local port.                                                                                                                          |
| Last-o/p      | Elapsed time since the last message was sent to a particular remote port.                                                                                                                |
| Last-act      | Elapsed time since the connection to a remote port was opened.                                                                                                                           |

**Related Commands**

| Command                    | Description                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip clients</b>   | Lists the clients registered with DSIP on a system.                                                                                         |
| <b>show dsip nodes</b>     | Displays information about the nodes (slots) connected by DSIP on a system.                                                                 |
| <b>show dsip queue</b>     | Displays the number of IPC messages in the DSIP transmission queue.                                                                         |
| <b>show dsip tracing</b>   | Displays DSIP media header information logged using the debug dsip trace command.                                                           |
| <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses.                     |
| <b>show dsip version</b>   | Displays Distributed System Interconnect Protocol (DSIP) version information.                                                               |
| <b>show version</b>        | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dsip queue

To display the number of IPC messages in the transmission queue waiting for acknowledgment, use the **show dsip queue EXEC** command.

## show dsip queue

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

**Command Modes** EXEC

| Command History | Release   | Modification                 |
|-----------------|-----------|------------------------------|
|                 | 11.3(2)AA | This command was introduced. |

**Usage Guidelines** IPC is inter-process communication. Processes communicate by exchanging messages held in queue buffers. Use the show dsip queue to display the status of these queue buffers.

**Examples** The following is sample output from the **show dsip queue** command when the system is operating correctly:

```
router# show dsip queue
```

```
DSIP ipc queue:
-----
```

```
There are 0 IPC messages waiting for acknowledgment in the transmit queue.
There are 0 messages currently in use by the system.
```

| Related Commands | Command                    | Description                                                                                                                                 |
|------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <b>show dsip clients</b>   | Lists the clients registered with DSIP on a system.                                                                                         |
|                  | <b>show dsip nodes</b>     | Displays information about the nodes (slots) connected by DSIP on a system.                                                                 |
|                  | <b>show dsip ports</b>     | Displays information about local and remote DSIP ports.                                                                                     |
|                  | <b>show dsip tracing</b>   | Displays DSIP media header information logged using the debug dsip trace command.                                                           |
|                  | <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses.                     |
|                  | <b>show dsip version</b>   | Displays Distributed System Interconnect Protocol (DSIP) version information.                                                               |
|                  | <b>show version</b>        | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dsip tracing

To display Distributed System Interconnect Protocol (DSIP) tracing buffer information, use the **show dsip tracing** EXEC command.

**show dsip tracing** [**control** | **data** | **ipc**] [*slot* | **entries** *entry-number* [*slot*]]

## Syntax Description

|                                    |                                                                                          |
|------------------------------------|------------------------------------------------------------------------------------------|
| <b>control</b>                     | (Optional) Display the control tracing buffer.                                           |
| <b>data</b>                        | (Optional) Display the data tracing buffer.                                              |
| <b>ipc</b>                         | (Optional) Display the inter-process communication tracing buffer.                       |
| <i>slot</i>                        | (Optional) Specify a specific slot number on the dial shelf. Slot number can be 0 to 14. |
| <b>entries</b> <i>entry-number</i> | (Optional) Specify the number of entries to trace. Entries can be 1 to 500.              |

## Command Modes

EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Usage Guidelines

This feature allows logging of DSIP media header information. Use the **show dsip tracing** command to obtain important information of the various classes of DSIP packets (Control/Data/IPC) coming in. You must first use the **debug dsip trace** command then use the **show dsip tracing** command to display the logged contents. To clear the information, use the **clear dsip tracing** command.

## Examples

The following is sample output from the **show dsip tracing** command:

```
router# debug dsip tracing
DSIP tracing debugging is on
router#
router# show dsip tracing
Dsip Control Packet Trace:
-----
Dest:00e0.b093.2238 Src:0007.5387.4808 Type:200B SrcShelf:1 SrcSlot:1 MsgType:0 MsgLen:82
Timestamp: 00:00:03
-----
Dest:00e0.b093.2238 Src:0007.5387.4838 Type:200B SrcShelf:1 SrcSlot:7 MsgType:0 MsgLen:82
Timestamp: 00:00:03
-----
Dest:00e0.b093.2238 Src:0007.4b67.8260 Type:200B SrcShelf:1 SrcSlot:12 MsgType:0
MsgLen:82 Timestamp: 00:00:03
-----
Dest:00e0.b093.2238 Src:0007.5387.4858 Type:200B SrcShelf:1 SrcSlot:11 MsgType:0
MsgLen:82 Timestamp: 00:00:03
-----
Dest:00e0.b093.2238 Src:0007.5387.4848 Type:200B SrcShelf:1 SrcSlot:9 MsgType:0 MsgLen:82
Timestamp: 00:00:03
```

The following table describes the fields shown in the **show dsip tracing** output display:

**Table 83 Show DSIP Tracing Command Output**

| Field     | Description                                                                                                                                      |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Dest      | The destination MAC address in the DSIP packet.                                                                                                  |
| Src       | The source MAC address in the DSIP packet.                                                                                                       |
| Type      | There are three types of DSIP packets: <ul style="list-style-type: none"> <li>Control—0x200B</li> <li>IPC—0x200C</li> <li>Data—0x200D</li> </ul> |
| SrcShelf  | The source shelfid of the DSIP packet.                                                                                                           |
| SrcSlot   | The source slot of the DSIP packet.                                                                                                              |
| MsgType   | Used to further demultiplex Data packets. Not used for Control and IPC type packets.                                                             |
| MsgLen    | Length of the message excluding the DSIP header                                                                                                  |
| Timestamp | Time elapsed since the packet was received.                                                                                                      |

#### Related Commands

| Command                   | Description                                                             |
|---------------------------|-------------------------------------------------------------------------|
| <b>clear dsip tracing</b> | Clears DSIP tracing logs.                                               |
| <b>debug dsip tracing</b> | Enables DSIP trace logging for use with the show dsip tracing commands. |



# show dsip transport

To display information about the Distributed System Interconnect Protocol (DSIP) transport statistics for the control/data and IPC packets and registered addresses, use the **show dsip transport** EXEC command.

## show dsip transport

|                           |                                            |
|---------------------------|--------------------------------------------|
| <b>Syntax Description</b> | This command has no arguments or keywords. |
|---------------------------|--------------------------------------------|

|                      |      |
|----------------------|------|
| <b>Command Modes</b> | EXEC |
|----------------------|------|

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 11.3(2)AA      | This command was introduced. |

|                 |                                                                             |
|-----------------|-----------------------------------------------------------------------------|
| <b>Examples</b> | The following is sample output from the <b>show dsip transport</b> command: |
|-----------------|-----------------------------------------------------------------------------|

```
router# show dsip transport
DSIP Transport Statistics:
  IPC : input msgs=4105, bytes=375628; output msgs=4105, bytes=248324
        total consumed ipc msgs=669; total freed ipc msgs = 669
        transmit contexts in use = 11, free = 245, zombie = 0, invalid = 0
        ipc getmsg failures = 0, ipc timeouts=0
        core getbuffer failures=0, api getbuffer failures=0
        dsip test msgs rcvd = 1200, sent = 0
  CNTL: input msgs=488, bytes=40104; output msgs=68, bytes=4080
        getbuffer failures=0
  DATA: input msgs=0, bytes=0; output msgs=426, bytes=5112

DSIP Private Buffer Pool Hits = 0

DSIP Registered Addresses:
Shelf0 : Master: 00e0.b093.2238, Status=local
Shelf1 : Slot1 : 0007.5387.4808, Status=remote
Shelf1 : Slot5 : 0007.5387.4828, Status=remote
Shelf1 : Slot6 : 0007.5387.4830, Status=remote
Shelf1 : Slot7 : 0007.5387.4838, Status=remote
Shelf1 : Slot8 : 0007.5387.4840, Status=remote
Shelf1 : Slot9 : 0007.5387.4848, Status=remote
Shelf1 : Slot11: 0007.5387.4858, Status=remote
Shelf1 : Slot12: 0007.4b67.8260, Status=remote
router#
```

The following table describes the fields shown in the **show dsip transport** display:

**Table 84**    *Show DSIP Transport Command Output*

| Field                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DSIP Transport Statistics:   | There are basically three kinds of communication channels between the DSIP modules running on two processors: <ol style="list-style-type: none"> <li>1. IPC: DSIP IPC-based reliable/best-effort channel</li> <li>2. CNTL: Control packet channel for DSIP modules to communicate between themselves. For example, keepalive messages and initial handshake messages between two DSIP modules are exchanged over this channel.</li> <li>3. DATA: DSIP fast data packet channel.</li> </ol> |
| input msgs/output msgs       | The number of input/output packets on a particular channel                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| bytes                        | input bytes. The number of input bytes on a particular channel Number of bytes of messages received or sent.                                                                                                                                                                                                                                                                                                                                                                               |
| total consumed ipc msgs      | The total number of IPC messages consumed so far from the IPC buffer pool.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| total freed ipc msgs         | The total number of IPC messages returned to the IPC buffer pool so far.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| transmit contexts in use     | DSIP for each active reliable connection to a remote port keeps a transmit context. This context holds all the important information pertaining to the remote connection, such as, destination portid, port name, number of message and bytes sent to that port etc. This is created when first time a connection is opened to a remote port and is reused for all subsequent communication to that port.                                                                                  |
| free                         | Free transmit contexts in available                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| zombie                       | When DSIP tears down a connection to a remote slot, all the transmit contexts to that slot should return to the free pool. But instead of immediately returning to the free pool, all such contexts first end up on a zombie queue, spend their last few seconds here and then eventually return to the free queue.                                                                                                                                                                        |
| invalid                      | Each transmit context has a magic number. While returning contexts to the free queue, if any transmit context is found to be corrupted, then it is marked as invalid and is not returned to the free queue.                                                                                                                                                                                                                                                                                |
| ipc getmsg failures          | Number of times we failed to get an ipc message.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ipc timeouts                 | The retry timeouts of the reliable DSIP transport stack.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| core getbuffer failures      | The number of times DSIP transport layer has failed to allocate buffers for the IPC transport.                                                                                                                                                                                                                                                                                                                                                                                             |
| aip getbuffer failures       | The number of times DSIP transport has failed to allocate buffers while preparing to transmit data received from the clients.                                                                                                                                                                                                                                                                                                                                                              |
| dsip test msgs received/sent | The DSIP test messages received and sent by invoking received/sent the “DSIP Test” client.                                                                                                                                                                                                                                                                                                                                                                                                 |

**Table 84** Show DSIP Transport Command Output (continued)

| Field                         | Description                                                                                                                                                                                                                                                                                                      |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DSIP Private Buffer Pool Hits | DSIP by default gets all its buffers from the public buffer pools. If for some reason, it runs out of those buffers, it falls back on a DSIP private pool. This number indicates the number of times DSIP has used this fallback pool.                                                                           |
| DSIP Registered Addresses     | The MAC addresses of nodes (slots) participating in DSIP communication including the local node. The master sees N slaves whereas slave sees only master (excluding themselves). The information is presented in the following form:<br><br>ShelfX: Master   SlotY : <i>MAC Address</i> : Status= local   remote |

**Related Commands**

| Command                  | Description                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip clients</b> | Lists the clients registered with DSIP on a system.                                                                                         |
| <b>show dsip nodes</b>   | Displays information about the nodes (slots) connected by DSIP on a system.                                                                 |
| <b>show dsip ports</b>   | Displays information about local and remote DSIP ports.                                                                                     |
| <b>show dsip queue</b>   | Displays the number of IPC messages in the DSIP transmission queue.                                                                         |
| <b>show dsip tracing</b> | Displays DSIP media header information logged using the debug dsip trace command.                                                           |
| <b>show dsip version</b> | Displays Distributed System Interconnect Protocol (DSIP) version information.                                                               |
| <b>show version</b>      | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show dsip version

To display Distributed System Interconnect Protocol (DSIP) version information, use the **show dsip version** EXEC command.

**show dsip version**

## Syntax Description

This command has no arguments or keywords.

## Command Modes

EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(2)AA | This command was introduced. |

## Examples

The following is sample output from the **show dsip version** command:

```
router# show dsip version

DSIP version information:
-----
Local DSIP major version = 5,      minor version = 2

All feature boards are running DSIP versions compatible with router shelf

Local Clients Registered Versions:
-----
Client Name      Major Version  Minor Version
Console          52
Clock            1              1
Modem            0              0
Logger           No version     No version
Trunk            No version     No version
Async data       No version     No version
TDM              No version     No version
DSIP Test        No version     No version

Mismatched Remote Client Versions:
-----
```

DSIP is version-controlled software which should be identified and kept current.

## Related Commands

| Command                  | Description                                                                 |
|--------------------------|-----------------------------------------------------------------------------|
| <b>show dsip clients</b> | Lists the clients registered with DSIP on a system.                         |
| <b>show dsip nodes</b>   | Displays information about the nodes (slots) connected by DSIP on a system. |
| <b>show dsip ports</b>   | Displays information about local and remote DSIP ports.                     |
| <b>show dsip queue</b>   | Displays the number of IPC messages in the DSIP transmission queue.         |

| Command                    | Description                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show dsip tracing</b>   | Displays DSIP media header information logged using the debug dsip trace command.                                                           |
| <b>show dsip transport</b> | Displays information about the DSIP transport statistics for the control/data and IPC packets and registered addresses.                     |
| <b>show version</b>        | Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images. |

# show redundancy

To display current or historical status and related information on redundant Dial Shelf Controller (DSC), use the **show redundancy** privileged EXEC console command.

**show redundancy [history]**

## Syntax Description

|                |                                                                                                               |
|----------------|---------------------------------------------------------------------------------------------------------------|
| <b>history</b> | (Optional) This optional keyword displays a log of past status and related information on the redundant DSCs. |
|----------------|---------------------------------------------------------------------------------------------------------------|

## Defaults

This command is issued on a per use basis.

## Command Modes

Privileged EXEC

## Command History

| Release   | Modification                 |
|-----------|------------------------------|
| 11.3(6)AA | This command was introduced. |

## Usage Guidelines

This command is issued from the router shelf console. The command is issued on a once-each-time basis and therefore does not have to be turned off.

## Examples

The following is an example output of the **show redundancy** command:

```
Router# show redundancy

DSC in slot 12:

Hub is in 'active' state.
Clock is in 'active' state.

DSC in slot 13:

Hub is in 'backup' state.
Clock is in 'backup' state.

Router#
```

The following is an example output of the **show redundancy history** command:

```
Router# show redundancy history
DSC Redundancy Status Change History:

981130 18:56 Slot 12 DSC: Hub, becoming active - RS instruction
981130 19:03 Slot 12 DSC: Hub, becoming active - D13 order
```

**Related Commands**

| Command                 | Description                                                               |
|-------------------------|---------------------------------------------------------------------------|
| <b>hw-module</b>        | Enables the router shelf to stop a DSC or to restart a stopped DSC.       |
| <b>debug redundancy</b> | Displays information used for troubleshooting dual (redundant) DSC cards. |

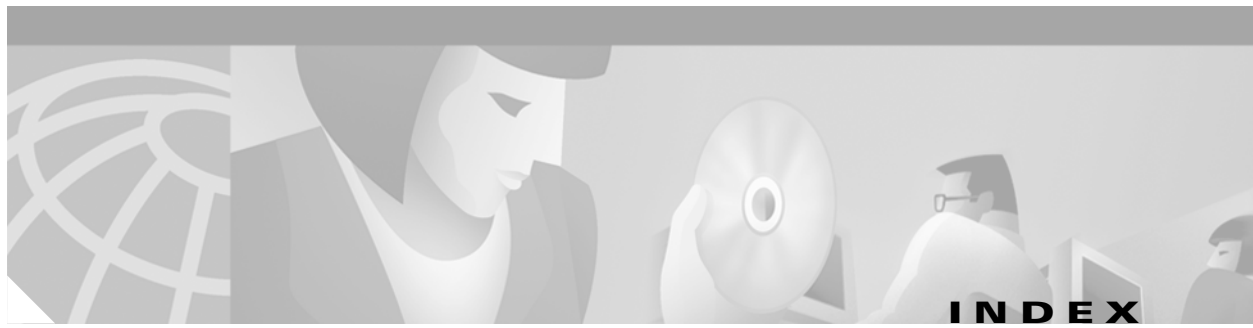
■ show redundancy



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