



## **Cisco 7304 Router Modular Services Card and Shared Port Adapter Software Configuration Guide**

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GLOSSARY





## Preface

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This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- [Objectives, page iii](#)
- [Organization, page iii](#)
- [Related Documentation, page iv](#)
- [Document Conventions, page v](#)
- [Obtaining Documentation and Submitting a Service Request, page vi](#)
- [Cisco Product Security Overview, page vii](#)
- [Obtaining Technical Assistance, page vii](#)

## Objectives

This document describes the configuration and troubleshooting of modular services cards (MSCs) and shared port adapters (SPAs) that are supported on the Cisco 7304 router.

## Organization

This document contains the following chapters:

Chapter	Title	Description
Chapter 1	<a href="#">Using Cisco IOS Software</a>	Provides an introduction to accessing the command-line interface (CLI) and using the Cisco IOS software and related tools.
Chapter 2	<a href="#">Carrier Card and SPA Product Overview</a>	Provides a brief introduction to the MSC and SPA products including compatibility information on Cisco Systems routers.
Chapter 3	<a href="#">Troubleshooting an MSC</a>	Provides information for basic MSC troubleshooting.

Chapter	Title	Description
Chapter 4	<a href="#">Overview of the Fast Ethernet SPA and Gigabit Ethernet SPA</a>	Describes release history, feature and Management Information Base (MIB) support, and an introduction to the SPA architecture for the Fast Ethernet and Gigabit Ethernet SPAs.
Chapter 5	<a href="#">Overview of the POS SPAs</a>	Describes release history, feature and Management Information Base (MIB) support, and an introduction to the SPA architecture for the POS SPAs.
Chapter 6	<a href="#">Overview of the Serial SPAs</a>	Describes release history, feature and Management Information Base (MIB) support, and an introduction to the SPA architecture for the Serial SPAs.
Chapter 7	<a href="#">Upgrading Field-Programmable Devices</a>	Provides information about upgrading FPD on SPAs and Field-Programmable Gate Array (FPGA) on the Cisco 7304 MSC-100.
Chapter 8	<a href="#">Command Reference</a>	Describes Cisco IOS software command reference information including syntax, usage guidelines, and examples for all new and modified commands for the SPAs on the Cisco 7304 Router.

## Related Documentation

This section refers you to other documentation that also might be useful as you configure your Cisco 7304 router. The documentation listed below is available online.

## Cisco 7304 Router Documentation

As you configure MSCs and SPAs on your Cisco 7304 router, you should also refer to the following companion publication for important hardware installation information:

- *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*

Some of the other Cisco 7304 router publications might be useful to you as you configure your Cisco 7304 router. The following documents can be found at this URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/>

- *Cisco 7304 Router Installation and Configuration Guide*
- *Cisco 7304 Quick Start Guide*
- *Cisco 7300 Series Platform-Specific Commands*
- *Cisco 7304 FPGA Bundling and Update*
- *Cisco 7304 Router MIB Specifications Guide*

Several other publications are also related to the Cisco 7304 router. For a complete reference of related documentation, refer to the *Cisco 7304 Internet Router Documentation Roadmap* located at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/3515.htm>

## Cisco IOS Software Publications

Your router, switch, or gateway and the Cisco IOS software running on it contain extensive features. You can find documentation for Cisco IOS software features at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/software/index.htm>

## Cisco IOS Release 12.2S Software Publications

Documentation for Cisco IOS Release 12.2S, including release notes and system error messages, can be found at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/software/ios122s/index.htm>

## Document Conventions

Within the MSC and SPA software configuration guide, 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.

This documentation uses the following conventions:

Convention	Description
^ or Ctrl	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 <i>community</i> string to <i>public</i> , 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>bold</b>	Bold 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
screen	Examples of information displayed on the screen are set in Courier font.
<b>bold screen</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.
!	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.

## Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.

# Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

[http://www.cisco.com/en/US/products/products\\_security\\_vulnerability\\_policy.html](http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html)

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

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

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

[http://www.cisco.com/en/US/products/products\\_psirt\\_rss\\_feed.html](http://www.cisco.com/en/US/products/products_psirt_rss_feed.html)

## Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—[security-alert@cisco.com](mailto:security-alert@cisco.com)
- Nonemergencies—[psirt@cisco.com](mailto:psirt@cisco.com)



Tip

We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.x through 8.x.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

<http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on>

## Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

## Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

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

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

**Note**

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Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

---



# CHAPTER 1

## Using Cisco IOS Software

---

This chapter provides useful information as you prepare to configure a Cisco 7304 Shared Port Adapter (SPA) using the Cisco IOS software. It includes the following sections:

- [Accessing the CLI Using a Router Console, page 1-1](#)
- [Using Keyboard Shortcuts, page 1-5](#)
- [Using the History Buffer to Recall Commands, page 1-5](#)
- [Understanding Command Modes, page 1-6](#)
- [Getting Help, page 1-7](#)
- [Using the no and default Forms of Commands, page 1-10](#)
- [Saving Configuration Changes, page 1-11](#)
- [Filtering Output from the show and more Commands, page 1-11](#)
- [Finding Support Information for Platforms and Cisco IOS Software Images, page 1-12](#)

### Accessing the CLI Using a Router Console

This section describes how to access the command-line interface (CLI) using a directly-connected console, using Telnet, or by using a modem to obtain a remote console:

- [Accessing the CLI Using a Directly-Connected Console, page 1-1](#)
- [Accessing the CLI from a Remote Console Using Telnet, page 1-3](#)
- [Accessing the CLI from a Remote Console Using a Modem, page 1-4](#)

For more detailed information about configuring and accessing a router through various services, refer to the *Cisco IOS Terminal Services Configuration Guide* and *Cisco IOS Terminal Services Command Reference* publications.

For more information about making the console cable connections, refer to the *Cisco 7304 Router Installation and Configuration Guide*.

### Accessing the CLI Using a Directly-Connected Console

This section describes how to connect to the console port on the router and use the console interface to access the CLI.

## Connecting to the Console Port

Before you can use the console interface on the router using a terminal or PC, perform the following steps:

- 
- Step 1** Configure your terminal emulation software with the following settings:
- 9600 bits per second (bps)
  - 8 data bits
  - No parity
  - 2 stop bits



**Note**

These are the default serial communication parameters on the router. For information about how to change those defaults to meet the requirements of your terminal or host, refer to the *Cisco IOS Terminal Services Configuration Guide*.

---

- Step 2** Connect a terminal or PC to the console port using a rollover cable.
- To make this connection, attach one end of an RJ-45 to RJ-45 rollover cable to the router console port. Attach the other end of the cable to an ASCII terminal or a PC running terminal emulation software. The ASCII terminal or PC port might require an RJ-45-to-DB-9 or an RJ-45-to-DB-25 adapter.
- 

## Using the Console Interface

To access the CLI using the console interface, complete the following steps:

- 
- Step 1** Attach the terminal hardware to the console port on the router (after you configure your terminal emulation software with the proper settings), and verify that the following prompt appears:
- ```
Press Return for Console prompt
```
- Step 2** Press **Return** to enter user EXEC configuration mode. The following prompt appears:
- ```
Router>
```
- Step 3** From user EXEC configuration mode, enter the **enable** command as shown in the following example:
- ```
Router> enable
```
- Step 4** At the password prompt, enter your system password. The following example shows entry of the password called “enablepass”:
- ```
Password: enablepass
```
- Step 5** When the enable password is accepted, verify that the privileged EXEC configuration mode prompt appears:
- ```
Router#
```

**Step 6** You now have access to the CLI in privileged EXEC configuration mode. Enter the necessary commands to complete your desired tasks.

**Step 7** To exit the console session, enter the **quit** command as shown in the following example:

```
Router# quit
```

---

## Accessing the CLI from a Remote Console Using Telnet

This section describes how to connect to the console interface on a router using Telnet to access the CLI.

### Preparing to Connect to the Router Console Using Telnet

Before you can access the router remotely using Telnet from a TCP/IP network, you must configure the router to support virtual terminal lines (vty) using the **line vty** global configuration command. You also should configure the vty to require login and specify a password.

**Note**

To prevent disabling login on the line, be careful that you specify a password with the **password** command when you configure the **login** line configuration command. If you are using authentication, authorization, and accounting (AAA), you should configure the **login authentication** line configuration command. To prevent disabling login on the line for AAA when you configure a list with the **login authentication** command, you must also configure that list using the **aaa authentication login** global configuration command. For more information about AAA services, refer to the *Cisco IOS Security Configuration Guide* and *Cisco IOS Security Command Reference* publications.

---

In addition, before you can make a Telnet connection to the router, you must have a valid host name for the router or have an IP address configured on the router. For more information about requirements for connecting to the router using Telnet, information about customizing your Telnet services, and using Telnet key sequences, refer to the *Cisco IOS Terminal Services Configuration Guide*.

### Using Telnet to Access a Console Interface

To access a console interface using Telnet, complete the following steps:

**Step 1** From your terminal or PC, enter one of the following commands:

- **connect** *host* [*port*] [*keyword*]
- **telnet** *host* [*port*] [*keyword*]

where *host* is the router host name or an IP address, *port* is a decimal port number (23 is the default), and *keyword* is a supported keyword. For more information, refer to the *Cisco IOS Terminal Services Command Reference*.

**Note**

If you are using an access server, you also will need to specify a valid port number with the host name or IP address, such as **telnet 172.20.52.40 2003**.

---

The following example shows the **telnet** command to connect to the router named “Router”:

```
unix_host% telnet Router
Trying 172.20.52.40...
Connected to 172.20.52.40.
Escape character is '^]'.
unix_host% connect
```

- Step 2** At the password prompt, enter your login password. The following example shows entry of the password called “mypass”:

```
User Access Verification

Password: mypass
```



**Note** If no password has been configured, press **Return**.

- Step 3** From user EXEC configuration mode, enter the **enable** command as shown in the following example:

```
Router> enable
```

- Step 4** At the password prompt, enter your system password. The following example shows entry of the password called “enablepass”:

```
Password: enablepass
```

- Step 5** When the enable password is accepted, verify that the privileged EXEC configuration mode prompt appears:

```
Router#
```

- Step 6** You now have access to the CLI in privileged EXEC configuration mode. Enter the necessary commands to complete your desired tasks.

- Step 7** To exit the Telnet session, use the **exit** or **logout** command as shown in the following example:

```
Router# logout
```

## Accessing the CLI from a Remote Console Using a Modem

To access the router remotely using a modem through an asynchronous connection, you need to configure the auxiliary (AUX) port and attach a modem to it.

For more information about making a modem connection using the AUX port on the Cisco 7304 router, refer to the *Cisco 7304 Router Installation and Configuration Guide*.

For detailed guidelines on making a connection to the router using a modem, and using reverse Telnet, refer to *Configuring a Modem on the AUX Port for EXEC Dialin Connectivity* located at the following URL:

[http://www.cisco.com/en/US/tech/tk801/tk36/technologies\\_tech\\_note09186a0080094bbc.shtml](http://www.cisco.com/en/US/tech/tk801/tk36/technologies_tech_note09186a0080094bbc.shtml)

## Using Keyboard Shortcuts

Commands are not case-sensitive. You can abbreviate commands and parameters if the abbreviations contain enough letters to be different from any other currently available commands or parameters. You can scroll through the last 20 commands stored in the history buffer, and enter or edit the command at the prompt.

Table 1-1 lists the keyboard shortcuts for entering and editing commands.

**Table 1-1 Keyboard Shortcuts**

| Keystrokes                                               | Purpose                                              |
|----------------------------------------------------------|------------------------------------------------------|
| <b>Ctrl-B</b> or the <b>Left Arrow</b> key <sup>1</sup>  | Move the cursor back one character                   |
| <b>Ctrl-F</b> or the <b>Right Arrow</b> key <sup>1</sup> | Move the cursor forward one character                |
| <b>Ctrl-A</b>                                            | Move the cursor to the beginning of the command line |
| <b>Ctrl-E</b>                                            | Move the cursor to the end of the command line       |
| <b>Esc B</b>                                             | Move the cursor back one word                        |
| <b>Esc F</b>                                             | Move the cursor forward one word                     |

1. The arrow keys function only on ANSI-compatible terminals such as VT100s.

## Using the History Buffer to Recall Commands

The history buffer stores the last 20 commands you entered. History substitution allows you to access these commands without retyping them, by using special abbreviated commands.

Table 1-2 lists the history substitution commands.

**Table 1-2 History Substitution Commands**

| Keystroke or Command                                    | Purpose                                                                                                                                                                                           |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ctrl-P</b> or the <b>Up Arrow</b> key <sup>1</sup>   | Recall commands in the history buffer, beginning with the most recent command. Repeat the key sequence to recall successively older commands.                                                     |
| <b>Ctrl-N</b> or the <b>Down Arrow</b> key <sup>1</sup> | Return to more recent commands in the history buffer after recalling commands with <b>Ctrl-P</b> or the <b>Up Arrow</b> key. Repeat the key sequence to recall successively more recent commands. |
| Router# <b>show history</b>                             | While in EXEC mode, list the last several commands you have just entered.                                                                                                                         |

1. The arrow keys function only on ANSI-compatible terminals such as VT100s.

# 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 that 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 1-3 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 1-3** 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.                           |
| 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. |
| 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 and Network Management 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                                                                                                                  |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <code>help</code>                                 | Provides a brief description of the help system in any command mode.                                                     |
| <code>abbreviated-command-entry?</code>           | Provides a list of commands that begin with a particular character string. (No space between command and question mark.) |
| <code>abbreviated-command-entry&lt;Tab&gt;</code> | Completes a partial command name.                                                                                        |
| <code>?</code>                                    | Lists all commands available for a particular command mode.                                                              |
| <code>command ?</code>                            | Lists the keywords or arguments that you must enter next on the command line. (Space between command and question mark.) |

## Finding Command Options Example

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 1-4 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 1-4 Finding Command Options**

| Command                                                                                                                                                                                                                                                                                                                | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>Router&gt; enable Password: &lt;password&gt; Router#</pre>                                                                                                                                                                                                                                                        | <p>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#.</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <pre>Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)#</pre>                                                                                                                                                                                                     | <p>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)#.</p>                                                                                                                                                                                                                                                                                                                                                                                         |
| <pre>Router(config)# interface serial ? &lt;0-6&gt;      Serial interface number Router(config)# interface serial 4 ? / Router(config)# interface serial 4/ ? &lt;0-3&gt;      Serial interface number Router(config)# interface serial 4/0 ? &lt;cr&gt; Router(config)# interface serial 4/0 Router(config-if)#</pre> | <p>Enter interface configuration mode by specifying the serial interface that you want to configure using the <b>interface serial</b> global configuration command.</p> <p>Enter <b>?</b> 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.</p> <p>When the <b>&lt;cr&gt;</b> symbol is displayed, you can press <b>Enter</b> to complete the command.</p> <p>You are in interface configuration mode when the prompt changes to Router(config-if)#.</p> |

Table 1-4 Finding 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 1-4 Finding Command Options (continued)

| Command                                                                                                                                                                                        | Comment                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>Router(config-if)# ip address ? A.B.C.D          IP address negotiated       IP Address negotiated over PPP Router(config-if)# ip address</pre>                                           | <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> |
| <pre>Router(config-if)# ip address 172.16.0.1 ? A.B.C.D          IP subnet mask Router(config-if)# ip address 172.16.0.1</pre>                                                                 | <p>Enter the keyword or argument that 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>                                                                |
| <pre>Router(config-if)# ip address 172.16.0.1 255.255.255.0 ? secondary       Make this IP address a secondary address &lt;cr&gt; Router(config-if)# ip address 172.16.0.1 255.255.255.0</pre> | <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>                                            |
| <pre>Router(config-if)# ip address 172.16.0.1 255.255.255.0 Router(config-if)#</pre>                                                                                                           | <p>In this example, <b>Enter</b> 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 can also 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

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 and Network Management Configuration Guide*.

# Finding Support Information for Platforms and Cisco IOS Software Images

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, you can use Cisco Feature Navigator or the software release notes.

## Using Cisco Feature Navigator

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://tools.cisco.com/ITDIT/CFN/jsp/index.jsp>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

## Using Software Advisor

To see if a feature is supported by a Cisco IOS release, to locate the software document for that feature, or to check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com at <http://www.cisco.com/cgi-bin/Support/CompNav/Index.pl>

You must be a registered user on Cisco.com to access this tool.

## Using Software Release Notes

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

- Platform support information
- Memory recommendations
- New feature information
- 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. Refer to Cisco Feature Navigator for cumulative feature information.



## CHAPTER 2

# Carrier Card and SPA Product Overview

---

This chapter provides an introduction to the modular services cards (MSCs) and shared port adapters (SPAs). It contains the following sections:

- [Release History, page 2-1](#)
- [Introduction to MSCs and SPAs, page 2-2](#)
- [MSC and SPA Compatibility, page 2-4](#)
- [Modular Optics Compatibility, page 2-4](#)
- [MSC Summary, page 2-5](#)

For more hardware details about the specific carrier cards and SPAs supported that are supported on the Cisco 7304 router, refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*.

## Release History

[Table 2-1](#) provides the release and modification history for all MSC- and SPA- related features on the Cisco 7304 router.

**Table 2-1f Release History**

| Release                      | Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco IOS Release 12.2(25)S3 | <p>Support for the following SPAs was introduced on the Cisco 7304 router:</p> <ul style="list-style-type: none"> <li>• 2-Port OC-3c/STM-1 POS SPA (SPA-2XOC3-POS)</li> <li>• 4-Port OC-3c/STM-1 POS SPA (SPA-4XOC3-POS)</li> <li>• 1-Port OC-12c/STM-4 POS SPA (SPA-1OC12-POS)</li> <li>• 2-Port T3/E3 Serial SPA (SPA-2XT3/E3)</li> <li>• 4-Port T3/E3 Serial SPA (SPA-4XT3/E3)</li> </ul> <p>The following enhancements to the <b>hw-module subslot</b> command were introduced:</p> <ul style="list-style-type: none"> <li>• The <b>powered</b> and <b>unpowered</b> options were added to the <b>hw-module subslot slot/subslot shutdown</b> command.</li> <li>• The <b>reload</b> option was added to the <b>hw-module subslot [start   stop]</b> command.</li> </ul> <p>The following FPD-related changes were introduced:</p> <ul style="list-style-type: none"> <li>• By default, the router automatically reloaded after a manual FPD upgrade. This behavior was changed. By default, the router is no longer reloaded automatically after a manual FPD upgrade.</li> <li>• The <b>force</b> option was removed from the <b>hw-module subslot slot/subslot file file-url force</b> command and replaced by the <b>reload</b> option. With the <b>reload</b> option, the user now has the option of configuring the router to reload or to not reload after an FPD upgrade.</li> </ul> |
| Cisco IOS Release 12.2(20)S6 | <p>The <b>show upgrade</b> commands used to monitor SPA FPD behavior (<b>show upgrade file</b>, <b>show upgrade package default</b>, <b>show upgrade progress</b>, and <b>show upgrade table</b>) have been changed to add the <b>fpd</b> keyword. The output previously generated with the aforementioned commands can now be generated by entering the appropriate <b>show upgrade fpd</b> command (<b>show upgrade fpd file</b>, <b>show upgrade fpd package default</b>, <b>show upgrade fpd progress</b>, and <b>show upgrade fpd table</b>).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Cisco IOS Release 12.2(20)S5 | <p>The <b>test hw-module subslot pause</b> command, which is useful for technical support purposes only, was introduced.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Cisco IOS Release 12.2(20)S3 | <p>The Stateful Switchover/Non-Stop Forwarding feature was introduced for the MSC-100 and the available SPAs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Cisco IOS Release 12.2(20)S2 | <p>Support for the following hardware was introduced on the Cisco 7304 router:</p> <ul style="list-style-type: none"> <li>• Cisco 7304 Modular Services Card 100 (Cisco 7304 MSC-100)</li> <li>• 4-Port 10/100 Fast Ethernet SPA (SPA-4FE-7304)</li> <li>• 2-Port 10/100/1000 Gigabit Ethernet SPA (SPA-2GE-7304)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Introduction to MSCs and SPAs

MSCs and SPAs are a carrier card and port adapter architecture to increase modularity, flexibility, and density across Cisco System routers for network connectivity. This section describes the MSCs and SPAs and provides some guidelines for their use.

## Modular Service Cards

The following lists describes some of the general characteristics of an MSC:

- An MSC is a carrier card that inserts into a router slot like a line card. It provides no network connectivity on its own.



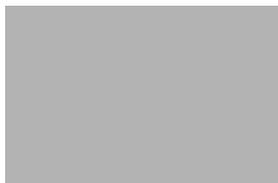
---

**Note** The MSC-100 is the only carrier card currently available for SPAs on the Cisco 7304 router. However, SPAs can be inserted into other carrier cards on other router platforms. For information on carrier cards on other platforms, see the documentation for that platform.

---

- The only MSC currently available is the MSC-100, which contains two subslots used to house SPAs. The SPA provides interface ports for network connectivity.

**Figure 2-1** SPA Sizes for the Cisco 7304 Router



- During normal operation, the MSC should reside in the router fully populated either with functional SPAs in all subslots, or with a blank filler plate inserted in any empty subslots.
- An MSC supports online insertion and removal (OIR) with SPAs inserted in its subslots.

## Shared Port Adapters

The following list describes some of the general characteristics of a SPA:

- A SPA is a modular type of port adapter that inserts into a subslot of a compatible MSC carrier card to provide network connectivity and increased interface port density.
- Each SPA provides a certain number of connectors, or ports, that are the interfaces to one or more networks. These interfaces can be individually configured using the Cisco IOS command-line interface (CLI).
- Either a blank filler plate or a functional SPA should reside in every subslot of an MSC during normal operation.
- SPAs support online insertion and removal (OIR). They can be inserted or removed independently from the MSC. MSCs also support online insertion and removal (OIR) with SPAs inserted in their subslots.

## MSC and SPA Compatibility

The MSCs that are supported on the Cisco 7304 router are shown in [Table 2-2](#). This table also shows the shared port adapters (SPAs) that are supported on each MSC.

**Table 2-2** MSC and SPA Compatibility on the Cisco 7304 Router

| SPA                                                    | MSC-100 |
|--------------------------------------------------------|---------|
| 4-port 10/100 Fast Ethernet SPA (SPA-4FE-7304)         | Yes     |
| 2-port 10/100/1000 Gigabit Ethernet SPA (SPA-2GE-7304) | Yes     |
| 2-Port OC-3c/STM-1 POS SPA (SPA-2XOC3-POS)             | Yes     |
| 4-Port OC-3c/STM-1 POS SPA (SPA-4XOC3-POS)             | Yes     |
| 1-Port OC-12c/STM-4 POS SPA (SPA-1XOC12-POS)           | Yes     |
| 2-Port T3/E3 Serial SPA (SPA-2XT3/E3)                  | Yes     |
| 4-Port T3/E3 Serial SPA (SPA-4XT3/E3)                  | Yes     |

## Modular Optics Compatibility

Some SPAs implement small form-factor pluggable (SFP) optical transceivers to provide network connectivity. An SFP module is a fiber optic receptacle device that mounts flush with the front panel to provide network connectivity.

Cisco Systems qualifies the SFP modules that can be used with SPAs.



### Note

The SPAs will only accept the SFP modules listed as supported in this document. An SFP check is run every time an SFP module is inserted into a SPA and only SFP modules that pass this check will be usable.

[Table 2-3](#) shows the types of optics modules that have been qualified for use with a SPA:

**Table 2-3** SPA Optics Compatibility

| SPA                         | Qualified Optics Modules                                                                                 |
|-----------------------------|----------------------------------------------------------------------------------------------------------|
| 2-Port Gigabit Ethernet SPA | <ul style="list-style-type: none"> <li>• SFP-FCGE-S</li> <li>• SFP-FCGE-L</li> <li>• SFP-GE-Z</li> </ul> |

**Table 2-3 SPA Optics Compatibility**

| SPA                                   | Qualified Optics Modules                                                                                                                                       |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2-Port and 4-Port OC-3c/STM-1 POS SPA | <ul style="list-style-type: none"> <li>• SFP-OC3-MM</li> <li>• SFP-OC3-SR</li> <li>• SFP-OC3-IR1</li> <li>• SFP-OC3-LR1</li> <li>• SFP-OC3-LR2</li> </ul>      |
| 1-Port OC-12c/STM-4 POS SPA           | <ul style="list-style-type: none"> <li>• SFP-OC12-MM</li> <li>• SFP-OC12-SR</li> <li>• SFP-OC12-IR1</li> <li>• SFP-OC12-LR1</li> <li>• SFP-OC12-LR2</li> </ul> |

## MSC Summary

Summary descriptions of the MSCs that are supported on the Cisco 7304 router are shown in [Table 2-4](#).

**Table 2-4MSC Summary**

| MSC     | Product Number | Description               | Number of SPAs | Minimum Cisco IOS Release |
|---------|----------------|---------------------------|----------------|---------------------------|
| MSC-100 | 7304-MSC-100   | Modular Services Card 100 | 2              | Release 12.2(20)S2        |

## Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether MSCs or SPAs within a system are compatible, but it does provide the minimum Cisco IOS requirements for individual hardware modules or components.



### Note

Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.





## CHAPTER 3

# Troubleshooting an MSC

---

This chapter describes techniques that you can use to troubleshoot the operation of your MSCs.

It includes the following sections:

- [General Troubleshooting Information, page 3-1](#)
- [Using the show controllers Command to Troubleshoot Problems, page 3-3](#)
- [Understanding SPA Automatic Recovery, page 3-7](#)
- [Preparing for Online Insertion and Removal of MSCs and SPAs on the Cisco 7304 Router, page 3-8](#)

The first section provides information about basic interface troubleshooting. If you are having a problem with your SPA, use the steps in the “[General Troubleshooting Information](#)” section to begin your investigation of a possible interface configuration problem.

To perform more advanced troubleshooting, see the other sections in this chapter.

## General Troubleshooting Information

This section describes general information for troubleshooting MSCs and SPAs. It includes the following sections:

- [Interpreting Console Error Messages, page 3-1](#)
- [Using debug Commands, page 3-2](#)
- [Using test Commands, page 3-2](#)
- [Using show Commands, page 3-3](#)

## Interpreting Console Error Messages

To view the explanations and recommended actions for Cisco 7304 router error messages, including messages related to Cisco 7304 router MSCs and SPAs, refer to the following documents:

- *System Error Messages for Cisco 7304 Routers* (for error messages on Early Deployment trains)
- *System Error Messages for Cisco IOS Release 12.2S* (for error messages in Cisco IOS Release 12.2S)

System error messages are organized in the documentation according to the particular system facility that produces the messages. The MSC and error messages use the following facility names:

- Cisco 7304 MSC-100: MSC100\_SPA\_CC
- 4-Port 10/100 Fast Ethernet SPA: SPA\_ETHER

## Using debug Commands

Along with the other **debug** commands supported on the Cisco 7304 router, you can obtain specific debug information for SPAs on the Cisco 7304 router using the **debug hw-module subslot** privileged EXEC command.

The **debug hw-module subslot** command is intended for use by Cisco Systems technical support personnel. For more information about the **debug hw-module subslot** command, see [Chapter 8, “Command Reference.”](#)

**Caution**

---

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

---

For information about other **debug** commands supported on the Cisco 7304 router, refer to the *Cisco IOS Debug Command Reference, Release 12.2* and any related feature documents for Cisco IOS Release 12.2 S.

## Using test Commands

The SPAs on the Cisco 7304 router also implement certain **test** commands.

**Caution**

---

The **test hw-module subslot** commands are not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. These commands can produce unexpected operation of your SPA.

---

For more information about the **test hw-module subslot** commands, see [Chapter 8, “Command Reference.”](#)

## Using show Commands

There are several **show** commands that you can use to monitor and troubleshoot the MSCs and SPAs on the Cisco 7304 router. This chapter describes using the **show interfaces** and **show controllers** commands to perform troubleshooting of your SPA.

For more information about **show** commands to verify and monitor MSCs and SPAs, see the following chapters of this guide:

- [Chapter 8, “Command Reference”](#)

## Using the show controllers Command to Troubleshoot Problems

To display diagnostic information and verify the performance of the hardware devices on a SPA on the Cisco 7304 router, you can use the **show controllers** and **show hw-module subslot** privileged EXEC commands.

The following is an example of the **show controllers fastethernet** command output for the 4-Port 10/100 Fast Ethernet SPA:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD Pause capable (Asymmetric)
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD Pause capable
MAC counters:
  Input: packets = 15, bytes = 1776
        FIFO full/reset removed = 0, error drop = 0
  Output: packets = 18, bytes = 2622
        FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 15, TCAM drops: 4
        Satisfy (host-backpressure) drops: 0, CRC drops: 0
        PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 11, bytes = 1476, drops = 0
  Output: packets = 18, bytes = 2550, drops = 0
Egress flow control status: XON
Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
MAC destination address filtering table:
  Table entries: Total = 512, Used = 4, Available = 508
  Index MAC destination address      Mask
  -----
  1      0007.0ed3.ba80                ffff.ffff.ffff
  2      ffff.ffff.ffff                ffff.ffff.ffff
  3      0100.0000.0000                0100.0000.0000
  4      0100.0ccc.cccc                ffff.ffff.ffff
```

```

VLAN filtering table:
  Number of VLANs configured on this interface = 0
  Table entries: Total = 1024, Used = 2, Available = 1022
  Index  VLAN identifier  Enabled  Tunnel
  -----
  1      0                No       No
  2      0                Yes      No
Platform details:
  PXF tif number: 0x10

```

**Note**

None of the SPA SPI4 error counters appear in **show controllers fastethernet** command output until at least one of those types of SPI4 errors occurs.

The following is an example of the **show controllers fastethernet** command output for the 4-Port 10/100 Fast Ethernet SPA, where the “SPA Error counters” section appears reflecting the occurrence of certain System Packet Interface Level 4 (SPI4) errors on the SPA:

```

Router# show controllers fastethernet 4/0/0
.
.
SPA carrier card counters:
  Input: packets = 0, bytes = 0, drops = 0
  Output: packets = 1, bytes = 60, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
SPA Error counters:
  SPI4 TX out of frame error = 2 (00:02:31 ago)
  SPI4 TX Train valid error = 1 (00:02:11 ago)
  SPI4 TX DIP4 error = 1 (00:01:30 ago)
  SPI4 RX out of frame error = 1 (00:00:36 ago)
  SPI4 RX DIP2 error = 1 (00:00:13 ago)
MAC destination address filtering table:
  Table entries: Total = 1024, Used = 3, Available = 1021

```

Table 3-1 describes the significant fields of the **show controllers fastethernet** command that might require further action during troubleshooting.

**Table 3-1 Significant Output Fields in show controllers Command for Troubleshooting**

| Output Field                                                                                                                      | Problem Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Recommended Action                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FPGA counters:<br>Satisfy (host-backpressure) drops                                                                               | Indicates back pressure from the Route Processor (RP), possibly due to higher bandwidth line cards on the router.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Use the <b>show c7300</b> , <b>show pxf accounting</b> , and <b>show pxf interface</b> commands to obtain more information.<br><br>See the “ <a href="#">Troubleshooting Oversubscription</a> ” section on page 3-5.                                                                                                                             |
| SPA Error counters:<br>SPI4 TX out of frame<br>SPI4 TX train valid<br>SPI4 TX DIP4<br>SPI4 TX out of frame<br>SPI4 RX DIP2 errors | Indicates errors on the SPI4 path between the MSC and the FPGA device on the SPA. TX errors occur on the path from the MSC to the FPGA for egress traffic heading toward the network. RX errors occur on the path from the FPGA to the MSC for ingress traffic being received from the network.<br><br>For more information on the SPI4 path, see the “ <a href="#">SPA Architecture</a> ” section on page 4-4.<br><br>For a description of the SPI4 errors, see the <b>show controllers fastethernet</b> command descriptions in <a href="#">Chapter 8, “Command Reference.”</a> | When the SPA reaches a threshold for these errors, it begins automatic recovery. Unless automatic recovery fails, no action is required.<br><br>For more information about automatic recovery, and additional troubleshooting if automatic recovery fails, see the “ <a href="#">Understanding SPA Automatic Recovery</a> ” section on page 3-7. |

## Troubleshooting Oversubscription

When the “Satisfy (host-backpressure) drops” counter increments in the output of the **show controllers fastethernet** command, it indicates oversubscription on the RP.

To troubleshoot further, perform the following steps:

- Step 1** Use the **show c7300** command to verify whether you have exceeded the maximum allowed aggregate throughput for any line cards or interfaces.

The following output shows an example of exceeding the aggregate throughput for the SPAs on a Cisco 7304 router with an NSE-100:

```
Router# show c7300
Slot      Card Type           Status           Insertion time
----      -
0,1       NSE100              Active           00:11:28 ago
2         7304-MSC-100        Active           00:05:38 ago
3         7304-MSC-100        Active           00:00:42 ago
4         10C48-POS           Active           00:05:39 ago

Shared Port Adapter information:
Slot/Subslot SPA Type           Status           Insertion time
-----
2/0          SPA-4FE-7304       ok               00:05:12 ago
2/1          SPA-4FE-7304       ok               00:05:12 ago
3/0          SPA-4FE-7304       ok               00:00:10 ago
3/1          SPA-4FE-7304       ok               00:00:09 ago
```

%NOTE: Line cards present violate configuration guidelines for this NSE.

Maximum allowed aggregate throughput of the line cards  
for a system with this NSE is 3200000 kbps

```
Maximum throughput for line cards in system
Slot      Card Type      Throughput (kbps)
-----
0,1      NSE100          0
2        7304-MSC-100    800000
3        7304-MSC-100    800000
4        10C48-POS       2488000
```

```
Maximum throughput for SPAs in the system
Slot/Subslot SPA Type      Throughput (kbps)
-----
2/0          SPA-4FE-7304  400000
2/1          SPA-4FE-7304  400000
3/0          SPA-4FE-7304  400000
3/1          SPA-4FE-7304  400000
```

%WARNING: The following FPGAs in the system may need an update.

```
Slot      Card Type      Hardware Version  Current FPGA  Bundled FPGA
-----
2        7304-MSC-100    00.11            00.23        00.22
3        7304-MSC-100    00.10            00.23        00.22
4        10C48-POS       01.05            00.13        None
```

```
Network IO Interrupt Throttling:
  throttle count=101112, timer count=101111
  active=0, configured=1
  netint usec=3999, netint mask usec=200
```

- Step 2** To verify oversubscription on the NSE-100, use the **show pxf accounting** and **show pxf interface** commands.



**Note** For Parallel Express Forwarding (PXF) information for SPA interfaces on the 4-Port 10/100 Fast Ethernet SPA, you can use the **show pxf interface fastethernet slot/subslot/port** version of the command.

- Step 3** To verify oversubscription on the NPE-G100, use the **show interfaces** command.

## Understanding SPA Automatic Recovery

When the 4-Port 10/100 Fast Ethernet SPA encounters thresholds for certain types of errors and identifies a fatal error, the SPA initiates an automatic recovery process.

You do not need to take any action unless the error counters reach a certain threshold, and multiple attempts for automatic recovery by the SPA fail.

The 4-Port 10/100 Fast Ethernet SPA might perform automatic recovery for the following types of errors:

- SPI4 TX/RX out of frame
- SPI4 TX train valid
- SPI4 TX DIP4
- SPI4 RX DIP2



### Note

These SPA error counters do not appear in the **show controllers fastethernet** command output until at least one SPI4 error occurs.

## When Automatic Recovery Occurs

If the SPI4 errors occur more than 25 times within 10 milliseconds, the SPA automatically deactivates and reactivates itself. Error messages are logged on the console indicating the source of the error and the status of the recovery.

## If Automatic Recovery Fails

If the SPA attempts automatic recovery more than five times in an hour, then the SPA deactivates itself and remains deactivated.

To troubleshoot automatic recovery failure for a SPA, perform the following steps:

- Step 1** Use the **show c7300** command to verify the status of the SPA. The status is shown as “failed” if the SPA has been powered off due to five consecutive failures, as shown in the following example:

```
Router# show c7300
.
.
.
The FPGA versions for the cards listed above are current

Shared Port Adapter information:
Slot/Subslot  SPA Type          Status          Insertion time
-----
.
.
.
3/0           SPA-4FE-7304       failed         00:00:08 ago
.
.
```

- Step 2** If you verify that automatic recovery has failed, perform OIR of the SPA. For information about performing an OIR, see the [“Preparing for Online Insertion and Removal of MSCs and SPAs on the Cisco 7304 Router”](#) section on page 3-8.
- Step 3** If reseating the SPA after OIR does not resolve the problem, replace the SPA hardware.
- 

## Preparing for Online Insertion and Removal of MSCs and SPAs on the Cisco 7304 Router

The Cisco 7304 router supports online insertion and removal (OIR) of the modular services card (MSC), in addition to each of the shared port adapters (SPAs). Therefore, you can remove an MSC with its SPAs still intact, or you can remove a SPA independently from the MSC, leaving the MSC installed in the router.

This section includes the following topics on OIR support:

- [Preparing for Online Removal of an MSC, page 3-8](#)
- [Preparing for Online Removal of a SPA, page 3-9](#)
- [Verifying Deactivation, page 3-11](#)
- [Verifying Deactivation, page 3-11](#)
- [Deactivation and Activation Configuration Examples, page 3-12](#)

## Preparing for Online Removal of an MSC

The Cisco 7304 router supports OIR of the MSC. To do this, you can stop an MSC (which automatically deactivates any installed SPAs) and remove the MSC with the SPAs still intact.

If you plan to remove an MSC, we recommend that you deactivate the MSC first, using the **hw-module slot** privileged EXEC command. When you deactivate an MSC using this command, it automatically deactivates each of the SPAs that are installed in that MSC. Therefore, it is not necessary to deactivate each of the SPAs prior to deactivating the MSC.

Although graceful deactivation of an MSC or SPA is preferred using the **hw-module slot stop** command or **hw-module subslot stop** command, the Cisco 7304 router supports removal of an MSC or SPA without deactivating it first.

For more information about the recommended procedures for physical removal of the MSC, refer to the *Cisco 7304 Router Modular Services Card and Shared Port Adapter Hardware Installation Guide*.

## Deactivating an MSC

To deactivate an MSC and its installed SPAs prior to removal of the MSC, use the following command in privileged EXEC configuration mode:

| Command                                               | Purpose                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router# <b>hw-module slot <i>slot-number</i> stop</b> | Stops traffic, shuts down any installed interfaces, and deactivates the MSC in the specified slot, where: <ul style="list-style-type: none"> <li><i>slot-number</i>—Specifies the slot (2 through 5) on the Cisco 7304 router in which the MSC that contains SPAs is installed.</li> </ul> |

## Reactivating an MSC



### Note

You do not need to reactivate an MSC after an OIR. If the router is running, then the MSC and its installed SPAs automatically reactivate with insertion of the MSC into the Cisco 7304 router.

If for some reason you deactivate an MSC and need to reactivate it without performing an OIR, you need to use the **hw-module slot start** privileged EXEC command to reactivate the MSC and its SPAs.

To activate an MSC and its installed SPAs after the MSC has been deactivated, use the following command in privileged EXEC configuration mode:

| Command                                                | Purpose                                                                                                                                                                                                                                                 |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router# <b>hw-module slot <i>slot-number</i> start</b> | Activates the MSC in the specified slot and its installed SPAs, where: <ul style="list-style-type: none"> <li><i>slot-number</i>—Specifies the slot (2 through 5) on the Cisco 7304 router in which the MSC that contains SPAs is installed.</li> </ul> |

## Preparing for Online Removal of a SPA

The Cisco 7304 router supports OIR of a SPA independently of removing the MSC. This means that an MSC can remain installed in the router with one SPA remaining active while you remove another SPA from one of the MSC subslots. If you are not planning to immediately replace a SPA into the MSC, then be sure to install a blank filler plate in the subslot. The MSC should always be fully installed with either functional SPAs or blank filler plates.

If you are planning to remove an MSC along with its SPAs, then you do not need to follow the instructions in this section. To remove an MSC, see the [“Preparing for Online Removal of an MSC” section on page 3-8](#).

## Deactivating a SPA



### Note

If you are preparing for an OIR of a SPA, it is not necessary to independently shut down each of the interfaces prior to deactivation of the SPA. The **hw-module subslot stop** command automatically stops traffic on the interfaces and deactivates them along with the SPA in preparation for OIR. In similar fashion, you do not need to independently restart any interfaces on a SPA after OIR of a SPA or MSC.

To deactivate a SPA and all of its interfaces prior to removal of the SPA, use the following command in privileged EXEC configuration mode:

| Command                                            | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router# <b>hw-module subslot slot/subslot stop</b> | <p>Stops traffic and deactivates the SPA in the specified slot and subslot of the MSC, where:</p> <ul style="list-style-type: none"> <li>• <i>slot</i>—Specifies the slot (2 through 5) on the Cisco 7304 router in which the MSC containing the SPA is installed.</li> <li>• <i>subslot</i>—Specifies the secondary slot (top [0] or bottom [1]) on the MSC where the SPA that you want to select is installed. A Cisco 7304 MSC-100 can contain up to two SPAs.</li> </ul> |

## Reactivating a SPA



### Note

You do not need to reactivate a SPA after an OIR of either the MSC or a SPA. If the router is running, then the SPAs automatically start upon insertion into the MSC or with insertion of an MSC into the Cisco 7304 router.

If for some reason you deactivate a SPA using the **hw-module subslot stop** privileged EXEC command and need to reactivate it without performing an OIR, you need to use the **hw-module subslot start** privileged EXEC command to reactivate the SPA and its interfaces.

To activate a SPA and its interfaces after the SPA has been deactivated without performing an OIR, use the following command in privileged EXEC configuration mode:

| Command                                             | Purpose                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Router# <b>hw-module subslot slot/subslot start</b> | <p>Activates the SPA and its interfaces in the specified slot and subslot of the MSC, where:</p> <ul style="list-style-type: none"> <li>• <i>slot</i>—Specifies the slot (2 through 5) on the Cisco 7304 router in which the MSC containing the SPA is installed.</li> <li>• <i>subslot</i>—Specifies the secondary slot (top [0] or bottom [1]) on the MSC where the SPA that you want to select is installed. An Cisco 7304 MSC-100 can contain up to two SPAs.</li> </ul> |

## Verifying Deactivation

When you deactivate an MSC or a SPA, the corresponding interfaces are also deactivated. This means that these interfaces will no longer appear in the output of the **show ip interfaces** commands. However, you can use the **show c7300** command to verify the presence of a SPA in an MSC subslot.

To verify the deactivation of interfaces on a SPA, perform the following steps beginning in privileged EXEC configuration mode prior to deactivating the SPA:

- Step 1** Enter the **show ip interface brief** command and observe the list of interfaces associated with the SPA that you plan to deactivate. The following example shows that the four interfaces (0 through 3) are up for the SPA in the top subslot (0) of the MSC that is installed in slot 3 on the Cisco 7304 router:

```
Router# show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0            13.2.11.100    YES NVRAM  up          up
GigabitEthernet0/0       172.16.4.2     YES NVRAM  up          up
GigabitEthernet0/1       unassigned     YES NVRAM  up          down
FastEthernet3/0/0       192.168.50.2  YES NVRAM up         up
FastEthernet3/0/1       192.168.51.2  YES NVRAM up         up
FastEthernet3/0/2       192.168.52.2  YES NVRAM up         up
FastEthernet3/0/3       192.168.53.2  YES NVRAM up         up
FastEthernet3/1/0        192.168.54.2   YES NVRAM  up          up
FastEthernet3/1/1        192.168.55.2   YES NVRAM  up          up
FastEthernet3/1/2        192.168.56.2   YES NVRAM  up          up
FastEthernet3/1/3        192.168.57.2   YES NVRAM  up          up
```

- Step 2** Deactivate the SPA using the **hw-module subslot stop** command. The following example shows deactivation of the SPA in the top subslot (0) of the MSC that is installed in slot 3 on the Cisco 7304 router, and all of its interfaces being shut down:

```
Router# hw-module subslot 3/0 stop
*Sep  3 07:27:47.775: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/0,
changed state to down
*Sep  3 07:27:47.783: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/1,
changed state to down
*Sep  3 07:27:47.791: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/2,
changed state to down
*Sep  3 07:27:47.799: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/3,
changed state to down
```

- Step 3** Enter the **show ip interface brief** command again, and observe that the interfaces associated with the SPA that you deactivated no longer appear in the output. The following example shows that the four interfaces (FastEthernet3/0/0, FastEthernet3/0/1, FastEthernet3/0/2, and FastEthernet3/0/3) no longer appear in the **show** command output:

```
Router# show ip interface brief
Interface                IP-Address      OK? Method Status      Protocol
FastEthernet0            13.2.11.100    YES NVRAM  up          up
GigabitEthernet0/0       172.16.4.2     YES NVRAM  up          up
GigabitEthernet0/1       unassigned     YES NVRAM  up          down
FastEthernet3/1/0        192.168.54.2   YES NVRAM  up          up
FastEthernet3/1/1        192.168.55.2   YES NVRAM  up          up
FastEthernet3/1/2        192.168.56.2   YES NVRAM  up          up
FastEthernet3/1/3        192.168.57.2   YES NVRAM  up          up
```



### Note

Although deactivating a SPA shows that the interfaces are being changed to the down state, the **show ip interface** commands do not show deactivated interfaces as being down. A deactivated interface does not appear in the **show** output.

- Step 4** To verify the physical configuration status of your MSCs and SPAs, you can use the **show c7300** privileged EXEC command. If the SPA is not present in an MSC subslot, the **show c7300** command displays a value of “missing” for the SPA status.

In the following example, the MSC-100 in slot 3 is active, but there is no SPA installed in the top subslot (0):

```
Router# show c7300
Slot      Card Type          Status          Insertion time
----      -
0,1      NSE100             Active          00:45:29 ago
.
.
.
3      7304-MSC-100     Active        00:44:36 ago
.
.
.
The FPGA versions for the cards listed above are current

Shared Port Adapter information:
Slot/Subslot  SPA Type          Status          Insertion time
-----
.
.
3/0      not present     missing       never
.
```

## Deactivation and Activation Configuration Examples

This section provides the following examples of deactivating and activating MSCs and SPAs:

- [Deactivation of an MSC Configuration Example, page 3-12](#)
- [Activation of an MSC Configuration Example, page 3-13](#)
- [Deactivation of a SPA Configuration Example, page 3-13](#)
- [Activation of a SPA Configuration Example, page 3-14](#)

### Deactivation of an MSC Configuration Example

Deactivate an MSC when you want to perform OIR of the MSC. The following example deactivates the MSC that is installed in slot 3 of the Cisco 7304 router, its SPA, and all of the interfaces. The corresponding console messages are shown:

```
Router# hw-module slot 3 stop
*Sep 3 06:53:47.275: %WS_ALARM-6-INFO: ASSERT CRITICAL slot 3 Card Stopped Responding OIR Alarm
*Sep 3 06:53:48.055: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/0, changed state to down
*Sep 3 06:53:48.059: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/1, changed state to down
*Sep 3 06:53:48.099: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/2, changed state to down
*Sep 3 06:53:48.103: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/3, changed state to down
```

## Activation of an MSC Configuration Example

Activate an MSC if you have previously deactivated it without performing an OIR of the MSC, and you need to reactivate the MSC and its SPAs. Recall that an MSC and its SPAs automatically reactivate with reinsertion during OIR.

The following example activates the MSC that is installed in slot 3 of the Cisco 7304 router, its two SPAs, and all of the interfaces. The corresponding console messages are shown:

```
Router# hw-module slot 3 start
*Sep 3 06:54:20.119: %WS_ALARM-6-INFO: CLEAR CRITICAL slot 3 Card Stopped Responding OIR Alarm
*Sep 3 06:54:21.887: %LINK-3-UPDOWN: Interface FastEthernet3/0/0, changed state to up
*Sep 3 06:54:21.895: %LINK-3-UPDOWN: Interface FastEthernet3/0/1, changed state to up
*Sep 3 06:54:21.899: %LINK-3-UPDOWN: Interface FastEthernet3/0/2, changed state to up
*Sep 3 06:54:21.899: %LINK-3-UPDOWN: Interface FastEthernet3/0/3, changed state to up
*Sep 3 06:54:21.903: %LINK-3-UPDOWN: Interface FastEthernet3/1/0, changed state to up
*Sep 3 06:54:21.903: %LINK-3-UPDOWN: Interface FastEthernet3/1/1, changed state to up
*Sep 3 06:54:21.907: %LINK-3-UPDOWN: Interface FastEthernet3/1/2, changed state to up
*Sep 3 06:54:21.907: %LINK-3-UPDOWN: Interface FastEthernet3/1/3, changed state to up
*Sep 3 06:54:22.887: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/0,
changed state to up
*Sep 3 06:54:22.899: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/1,
changed state to up
*Sep 3 06:54:22.903: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/2,
changed state to up
*Sep 3 06:54:22.903: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/3,
changed state to up
*Sep 3 06:54:22.907: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1/0,
changed state to up
*Sep 3 06:54:22.907: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1/1,
changed state to up
*Sep 3 06:54:22.911: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1/2,
changed state to up
*Sep 3 06:54:22.911: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/1/3,
changed state to up
```

## Deactivation of a SPA Configuration Example

Deactivate a SPA when you want to perform OIR of that SPA. The following example deactivates the SPA (and its four interfaces) that is installed in the top subslot (0) of the MSC located in slot 3 of the Cisco 7304 router. The corresponding console messages are shown:

```
Router# hw-module subslot 3/0 stop
*Sep 3 06:48:47.239: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/0,
changed state to down
*Sep 3 06:48:47.243: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/1,
changed state to down
*Sep 3 06:48:47.243: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/2,
changed state to down
*Sep 3 06:48:47.243: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/3,
changed state to down
```

## Activation of a SPA Configuration Example

Activate a SPA if you have previously deactivated it without performing an OIR of the SPA, and you need to reactivate the SPA and all of its interfaces. Recall that a SPA and its interfaces automatically reactivate with reinsertion during OIR.

The following example activates the SPA (and its four interfaces) that is installed in the top subslot (0) of the MSC located in slot 3 of the Cisco 7304 router. The corresponding console messages are shown:

```
Router# hw-module subslot 3/0 start
*Sep 3 06:49:23.479: %LINK-3-UPDOWN: Interface FastEthernet3/0/0, changed state to up
*Sep 3 06:49:23.483: %LINK-3-UPDOWN: Interface FastEthernet3/0/1, changed state to up
*Sep 3 06:49:23.483: %LINK-3-UPDOWN: Interface FastEthernet3/0/2, changed state to up
*Sep 3 06:49:23.483: %LINK-3-UPDOWN: Interface FastEthernet3/0/3, changed state to up
*Sep 3 06:49:28.095: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/0,
changed state to up
*Sep 3 06:49:28.951: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/3,
changed state to up
*Sep 3 06:49:28.951: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/1,
changed state to up
*Sep 3 06:49:28.955: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet3/0/2,
changed state to up
```



## CHAPTER 4

# Overview of the Fast Ethernet SPA and Gigabit Ethernet SPA

This chapter provides an overview of the release history, and feature and Management Information Base (MIB) support for the Cisco 7304 MSC-100 with the 4-Port 10/100 Fast Ethernet SPA, and the 2-Port 10/100/1000 Gigabit Ethernet SPA.

This chapter includes the following sections:

- [Release History, page 4-1](#)
- [Supported Features, page 4-2](#)
- [Restrictions, page 4-3](#)
- [Supported MIBs, page 4-3](#)
- [SPA Architecture, page 4-4](#)
- [Displaying the SPA Hardware Type, page 4-6](#)

## Release History

[Table 4-1](#) provides the release and modification history for Ethernet SPA-related features and enhancements on the Cisco 7304 router.

**Table 4-1 Release History for Ethernet SPAs**

| Release                      | Modification                                                                                                                                                                                                                                                                                                      |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco IOS Release 12.2(20)S3 | The Stateful Switchover/Non-Stop Forwarding feature was introduced for the MSC-100 and the available SPAs.                                                                                                                                                                                                        |
| Cisco IOS Release 12.2(20)S2 | Support for the following hardware was introduced on the Cisco 7304 router: <ul style="list-style-type: none"><li>• Cisco 7304 Modular Services Card 100 (Cisco 7304 MSC-100)</li><li>• 4-Port 10/100 Fast Ethernet SPA (SPA-4FE-7304)</li><li>• 2-Port 10/100/1000 Gigabit Ethernet SPA (SPA-2GE-7304)</li></ul> |

# Supported Features

This section provides a list of some of the primary features supported with the MSC and SPA hardware and software.

## 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA Features

The following is a list of some of the significant hardware and software features supported by both the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA:

- Autonegotiation of speed, duplex, and IEEE 802.3x flow control (pause frames) when using both copper (RJ45) and fiber (SFP) media types. In copper mode, 10/100/1000 speeds and full/half duplex are advertised during autonegotiation. In fiber mode, only 1000-Mbps speed and full duplex are advertised. The Ethernet pause frame capability is also advertised.
- IEEE 802.3x flow control and asymmetric flow control
- Local (internal) and external loopback
- Auto-sensing of straight-through and Medium Dependent Interface Crossover (MDIX) cables
- Jumbo frames (up to 9216 bytes), plus Layer 2 header bytes
- Frame padding for frames smaller than minimum packet size (64 bytes)
- 2048 total MAC destination address entries per SPA, with the following number of entries supported per interface:
  - For the 4-Port 10/100 Fast Ethernet SPA—512 MAC destination addresses per interface
  - For the 2-Port 10/100/1000 Gigabit Ethernet SPA—1024 MAC destination addresses per interface
- 4096 total VLAN entries per SPA, with the following number of entries supported per interface:
  - For the 4-Port 10/100 Fast Ethernet SPA—1024 VLANs per interface
  - For the 2-Port 10/100/1000 Gigabit Ethernet SPA—2048 VLANs per interface
- Command-line interface (CLI)-controlled OIR independent of the MSC-100, or with the MSC-100
- Per interface port counters for policy drops, oversubscription drops, cyclic redundancy check (CRC) error drops, packet sizes, unicast, multicast, and broadcast packets
- Parity and cyclic redundancy check (CRC) detection for application-specific integrated circuit (ASIC) and discrete memory errors
- Field Programmable Gate Array (FPGA) upgrade support

For more information about FPGA support, see [Chapter 7, “Upgrading Field-Programmable Devices.”](#)

## Restrictions

As of Cisco IOS Release 12.2(20)S2, the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA do not support the following features:

- EtherChannel—802.1AD link aggregation
- Ethernet Automatic Protection Switching (APS)
- Inter-Switch Link (ISL) encapsulation
- Universal Transport Interface (UTI)

## Supported MIBs

The following MIBs are supported in Cisco IOS Release 12.2(20)S2 for the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router:

- CISCO-ENTITY-ALARM-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-ENVMON-MIB (For NPEs, NSEs, line cards, and MSCs only)
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- ENTITY-MIB
- ETHERLIKE-MIB
- IF-MIB
- RMON-MIB
- MPLS-LDP-MIB
- MPLS-LSR-MIB
- MPLS-TE-MIB
- MPLS-VPN-MIB

For more information about MIB support on the Cisco 7304 router, refer to the *Cisco 7304 Router MIB Specifications Guide* found at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/7304mibs/>

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://tools.cisco.com/RPF/register/register.do>

## SPA Architecture

This section provides an overview of the architecture of the 4-Port 10/100 Fast Ethernet SPA and describes the path of a packet in the ingress and egress directions. Some of these areas of the architecture are referenced in the SPA software and can be helpful to understand when troubleshooting or interpreting some of the SPA CLI and **show** command output.

Figure 4-1 identifies some of the hardware devices that are part of the 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA architecture. The figure shows the four RJ-45 ports that are supported by the Fast Ethernet SPA only.

**Figure 4-1** 4-Port 10/100 Fast Ethernet SPA Architecture



Every incoming and outgoing packet on the 4-Port 10/100 Fast Ethernet SPA goes through the physical (PHY), Media Access Control (MAC), and field-programmable gate array (FPGA) devices.

## Path of a Packet in the Ingress Direction

The following steps describe the path of an ingress packet through the 4-Port 10/100 Fast Ethernet SPA:

1. The PHY device receives incoming frames on a per-port basis from one of the four RJ-45 interface connectors.
2. The PHY device processes the frame and sends it over the RGMII path to the MAC device.
3. The MAC device receives the frame into a per-port first-in, first-out (FIFO) receive buffer and performs MAC-level processing of the frame. The CRC is not removed from the frame by the MAC device.
4. After validating received frames, the MAC device forwards the frames to the FPGA device.
5. The FPGA device receives the frame into a per-port FIFO receive buffer.

6. The FPGA device performs filtering based on whether or not the interface is operating in promiscuous mode. If the interface is operating in promiscuous mode, no filtering occurs and the FPGA device passes all frames for further processing.

If the interface is not operating in promiscuous mode, then the FPGA device performs two Ternary Content Addressable Memory (TCAM) table lookups to filter the received frame based on the MAC destination address and virtual LAN (VLAN) identifier. The allowable MAC destination addresses and VLAN IDs are based on the supported router configuration.

For more information about TCAM processing, see the [“TCAM Filtering” section on page 4-5](#).

7. When the frame passes the TCAM filter processing, the FPGA strips the Layer 2 CRC and forwards the frame over the SPI4.2 path to the MSC.
8. The Cisco 7304 MSC-100 receives the frame and stores it in a per-port receive buffer. Once the MSC receives the entire frame, it is sent to the network services engine (NSE) or network processor engine (NPE) for further processing.

## Path of a Packet in the Egress Direction

The following steps describe the path of an egress packet from the Cisco 7304 MSC-100 through the 4-Port 10/100 Fast Ethernet SPA:

1. The Cisco 7304 MSC-100 receives frames from the NSE or NPE, strips the egress link header and stores the frames in a per-port transmit buffer.
2. After the Cisco 7304 MSC-100 receives a complete frame, it forwards the frame to the SPA FPGA device in interleaved mode.
3. The FPGA device pads the frame (as required), adds the Layer 2 CRC, and sends the frame to the MAC device.
4. The MAC device receives the frame into a per-port first-in, first-out (FIFO) transmit buffer and performs MAC-level processing of the frame.
5. After the MAC device receives a complete frame, it forwards the frame to the PHY device.
6. The PHY device encodes and serializes the frame and transmits the frame through the physical interface (one of the four RJ-45 interface connectors for the 4-Port 10/100 Fast Ethernet SPA).

## TCAM Filtering

The 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA support two TCAM regions per interface. One region is for MAC destination address filtering (2048 total entries, with 512 entries per interface on the Fast Ethernet SPA and 1024 entries per interface on the Gigabit Ethernet SPA), and the other is for VLAN ID filtering (4096 total entries, with 1024 entries per interface on the Fast Ethernet SPA and 2048 entries per interface on the Gigabit Ethernet SPA). Filtering is enabled by default when the interface is not operating in promiscuous mode. If the interface is operating in promiscuous mode, or if the TCAM table is full, then no filtering occurs. Otherwise, enabling and disabling of filtering is not user-configurable.

The TCAM entries support permit filtering only. For example, if a MAC destination address is not in the TCAM table for the interface, the frame is dropped. The MAC destination address entries are added to the TCAM for such things as multicast addresses of routing protocols. Unicast addresses do not typically appear in the table. By default when the router reloads, three destination addresses are added to the TCAM table: the local interface address, the Ethernet broadcast address, and the Ethernet multicast address.

For VLAN filtering, two default VLAN ID 0 entries always appear in the table and represent the local interface port for handling of promiscuous mode and non-VLAN packets. Additional VLAN IDs appear in the table based on your interface configuration.

To display the status of the TCAM tables on an interface, use the **show controllers fastethernet** command or **show controllers gigabitethernet** command.

## Displaying the SPA Hardware Type

To verify the SPA hardware type that is installed in your Cisco 7304 router, you can use the **show interfaces** command or the **show controllers** command. There are several other commands on the Cisco 7304 router that also provide SPA hardware information, including the **show c7300** and the **show diag** commands. For more information about these commands, see [Chapter 8, “Command Reference.”](#)

[Table 4-2](#) shows the hardware description that appears in the **show** command output for each type of SPA that is supported on the Cisco 7304 router.

**Table 4-2 SPA Hardware Descriptions in show Commands**

| SPA                                     | Description in show interfaces and show controllers commands |
|-----------------------------------------|--------------------------------------------------------------|
| 4-Port 10/100 Fast Ethernet SPA         | Hardware is SPA-4FE-7304                                     |
| 2-Port 10/100/1000 Gigabit Ethernet SPA | Hardware is SPA-2GE-7304                                     |

## Example of the show interfaces Command

The following example shows output from the **show interfaces fastethernet** command on a Cisco 7304 router with a 4-Port 10/100 Fast Ethernet SPA installed in slot 4:

```
Router# show interfaces fastethernet 4/0/0
FastEthernet4/0/0 is up, line protocol is up
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
  .
  .
```

## Example of the show controllers Command

The following example shows output from the **show controllers fastethernet** command on a Cisco 7304 router with a 4-Port 10/100 Fast Ethernet SPA installed in slot 4:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  .
  .
  .
```



# CHAPTER 5

## Overview of the POS SPAs

---

This chapter provides an overview of the release history, and feature and Management Information Base (MIB) support for the Packet over SONET (POS) SPAs on the Cisco 7304 router.

This chapter includes the following sections:

- [Release History, page 5-1](#)
- [POS Technology Overview, page 5-1](#)
- [Supported Features, page 5-2](#)
- [Restrictions, page 5-4](#)
- [Supported MIBs, page 5-5](#)
- [SPA Architecture, page 5-5](#)
- [Displaying the SPA Hardware Type, page 5-7](#)

## Release History

| Release                      | Modification                                                                                                                                                                                                                        |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco IOS Release 12.2(25)S3 | Support for the following hardware was introduced on the Cisco 7304 router: <ul style="list-style-type: none"><li>• 2-Port OC-3c/STM-1 POS SPA</li><li>• 4-Port OC-3c/STM-1 POS SPA</li><li>• 1-Port OC-12c/STM-4 POS SPA</li></ul> |

## POS Technology Overview

Packet-over-SONET is a high-speed method of transporting IP traffic between two points. This technology combines the Point-to-Point Protocol (PPP) with SONET and Synchronous Digital Hierarchy (SDH) interfaces.

SONET is an octet-synchronous multiplex scheme defined by the American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.840 Mbps to 2.5 Gbps (Synchronous Transport Signal, STS-1 to STS-48) and greater. SDH is an equivalent international standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.5 gigabits per second (Gbps) (STM-16) and greater. SONET specifications have been defined for

single-mode fiber and multimode fiber. The 2-Port OC-3c/STM-1 POS SPA, 4-Port OC-3c/STM-1 POS SPA, and 1-Port OC-12c/STM-4 POS SPA allow transmission over single-mode and multimode optical fiber at Optical Carrier 3 and 12 (OC-3, and OC-12) rates.

SONET/SDH transmission rates are integral multiples of 51.840 Mbps. The following transmission multiples are currently specified and used on the POS SPAs on the Cisco 7304 router:

- OC-3c/STM-1c—155.520 Mbps
- OC-12c/STM-4c—622.080 Mbps

The POS specification (RFC 1619) describes the use of PPP encapsulation over SONET/SDH links. Because SONET/SDH is, by definition, a point-to-point circuit, PPP is well-suited for use over these links. PPP treats SONET/SDH transport as octet-oriented full-duplex synchronous links. PPP presents an octet interface to the physical layer. The octet stream is mapped into the SONET/SDH Synchronous Payload Envelope (SPE), with the octet boundaries aligned with the SPE octet boundaries. The PPP frames are located by row within the SPE payload. Because frames are variable in length, the frames are allowed to cross SPE boundaries.

The basic rate for POS is OC-3/STM-1, which is 155.520 Mbps. The available information bandwidth is 149.760 Mbps, which is the OC-3c/STM-1 SPE with section, line, and path overhead removed.

## Supported Features

This section provides a list of some of the primary features supported by the POS SPA hardware and software.

- Jumbo frames (up to 9216 bytes)
- Online insertion and removal (OIR) independently of the Cisco 7304 MSC-100, or with the Cisco 7304 MSC-100
- Small form-factor pluggable (SFP) optic OIR
- Field-programmable gate array (FPGA) upgrade support
- IPv4 and IPv6 addressing

The POS SPAs also support the following groups of features:

- [SONET/SDH Compliance Features, page 5-2](#)
- [SONET/SDH Error, Alarm, and Performance Monitoring Features, page 5-3](#)
- [SONET/SDH Synchronization Features, page 5-3](#)
- [WAN Protocol Features, page 5-3](#)
- [Network Management Features, page 5-4](#)

## SONET/SDH Compliance Features

This section lists the SONET/SDH Compliance features supported by the POS SPAs on the Cisco 7304 router:

- Bellcore GR-253-CORE
- ITU-T G.707, G.783, G.957, G.958
- 1+1 SONET Automatic Protection Switching (APS) as per G.783 Annex A
- 1+1 SDH Multiplex Section Protection (MSP) as per G.783 Annex A

## SONET/SDH Error, Alarm, and Performance Monitoring Features

This section lists the SONET/SDH error, alarms, and performance monitoring features supported by the POS SPAs on the Cisco 7304 router:

- Signal failure bit error rate (SF-ber)
- Signal degrade bit error rate (SD-ber)
- Signal label payload construction (C2)
- Path trace byte (J1)
- Section:
  - Loss of signal (LOS)
  - Loss of frame (LOF)
  - Error counts for B1
  - Threshold crossing alarms (TCA) for B1
- Line:
  - Line alarm indication signal (LAIS)
  - Line remote defect indication (LRDI)
  - Line remote error indication (LREI)
  - Error counts for B2
  - Threshold crossing alarms (TCA) for B2
- Path:
  - Path alarm indication signal (PAIS)
  - Path remote defect indication (PRDI)
  - Path remote error indication (PREI)
  - Error counts for B3
  - Threshold crossing alarms (TCA) for B3
  - Loss of pointer (LOP)
  - New pointer events (NEWPTR)
  - Positive stuffing event (PSE)
  - Negative stuffing event (NSE)

## SONET/SDH Synchronization Features

This section lists the SONET/SDH synchronization features supported by the POS SPAs on the Cisco 7304 router:

- Local (internal) timing (for inter-router connections over dark fiber or WDM equipment)
- Loop (line) timing (for connecting to SONET/SDH equipment)
- +/- 20 ppm clock accuracy over full operating temperature

## WAN Protocol Features

This section lists the WAN protocols supported by the POS SPAs on the Cisco 7304 router:

- IETF RFC 1661, Point-to-Point Protocol (PPP)
- IETF RFC 1662, PPP in HDLC framing
- IETF RFC 2615, PPP over SONET/SDH with 1+x43 self-synchronous payload scrambling
- Cisco Protect Group Protocol over UDP/IP (Port 172) for APS and MSP
- Multiprotocol Label Switching (MPLS)
- Ethernet over Multiprotocol Label Switching (EoMPLS)
- Frame Relay

## Network Management Features

This section lists the network management features supported by the POS SPAs on the Cisco 7304 router:

- Simple Network Management Protocol (SNMP) Management Information Base (MIB) counters
- Local (diagnostic) loopback
- Network loopback
- NetFlow Data Export
- IP over the Data Communications Channel (DCC)
- RFC 1595 performance statistics for timed intervals (current, 15 minute, multiple 15 minute, and 1-day intervals):
  - Regenerator section
  - Multiplex section
  - Path errored seconds
  - Severely errored seconds
  - Severely errored framed seconds

## Restrictions

As of Cisco IOS Release 12.2(25)S3, the following features are not supported by the POS SPAs:

- Dynamic Packet Transport (DPT)
- Bridge Control Protocol (BCP)

As of Cisco IOS Release 12.2(25)S3, the 4-Port OC-3c/STM-1 POS SPA has the following restriction:

- Section Data Communications Channel (SDCC) is supported on only two ports on the 4-Port OC-3c/STM-1 POS SPA.

## Supported MIBs

The following MIBs are supported in Cisco IOS Release 12.2(25)S3 for the 2-Port and 4-Port OC-3 POS SPA and the 1-Port OC-12c/STM-4 POS SPA on the Cisco 7304 router:

- CISCO-APS-MIB
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENVMON-MIB (For NPEs, NSEs, line cards, and MSCs only)
- CISCO-EXTENDED-ENTITY-MIB
- CISCO-OPTICAL-MIB
- ENTITY-MIB
- OLD-CISCO-CHASSIS-MIB
- IF-MIB
- SONET-MIB RFC 2558

For more information about MIB support on the Cisco 7304 router, refer to the *Cisco 7304 Router MIB Specifications Guide* found at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/7304mibs/>

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://tools.cisco.com/RPF/register/register.do>

## SPA Architecture

This section provides an overview of the architecture of the POS SPAs and describes the path of a packet in the ingress and egress directions. Some of these areas of the architecture are referenced in the SPA software and can be helpful to understand when troubleshooting or interpreting some of the SPA CLI and **show** command output.

**Figure 5-1** identifies some of the hardware devices that are part of the POS SPA architecture. The figure shows the four ports that are supported by the 4-Port OC-3c/STM-1 POS SPA only.

**Figure 5-1** 4-Port OC-3c/STM-1 POS SPA Architecture



Every incoming and outgoing packet on the 4-Port OC-3c/STM-1 POS SPA goes through the SONET/SDH framer, and field programmable gate array (FPGA) devices.

## Path of a Packet in the Ingress Direction

The following steps describe the path of an ingress packet through the 4-Port OC-3c/STM-1 POS SPA:

1. The framer receives SONET/SDH streams from the SFP optics, extracts clocking and data, and processes the section, line, and path overhead.
2. The framer extracts the POS frame payload and verifies the frame size and frame check sequence (FCS).
3. The framer passes valid frames to the field-programmable gate array (FPGA) on the SPA.
4. The FPGA on the SPA transfers frames to the host through the SPI4.2 bus for further processing and switching.

## Path of a Packet in the Egress Direction

The following steps describe the path of an egress packet through the 4-Port OC-3c/STM-1 POS SPA:

1. The host sends packets to the FPGA on the SPA using the SPI4.2 bus.
2. The FPGA on the SPA stores the data in the appropriate channel's first-in first-out (FIFO) queue.
3. The FPGA on the SPA passes the packet to the framer.
4. The framer accepts the data and stores it in the appropriate channel queue.
5. The framer adds the FCS and SONET/SDH overhead.
6. The framer sends the data to the SFP optic for transmission onto the network.

## Displaying the SPA Hardware Type

To verify the SPA hardware type that is installed in your Cisco 7304 router, you can use the **show interfaces** command or the **show controllers** command. There are several other commands on the Cisco 7304 router that also provide SPA hardware information. For more information about these commands, see the “Command Summary for POS SPAs” and the “Command Reference” chapters in this guide.

Table 5-1 shows the hardware description that appears in the **show** command output for each type of SPA that is supported on the Cisco 7304 router.

**Table 5-1 SPA Hardware Descriptions in show Commands**

| SPA                         | Description in show interfaces and show controllers commands |
|-----------------------------|--------------------------------------------------------------|
| 2-Port OC-3c/STM-1 POS SPA  | Hardware is Packet over Sonet                                |
| 4-Port OC-3c/STM-1 POS SPA  | Hardware is Packet over Sonet                                |
| 1-Port OC-12c/STM-4 POS SPA | Hardware is Packet over Sonet                                |

## Example of the show interfaces Command

The following example shows output from the **show interfaces pos** command on a Cisco 7304 router with a 4-Port OC-3c/STM-1 POS SPA installed in slot 5:

```
Router# show interfaces pos 5/0/1
POS5/0/1 is up, line protocol is up
  Hardware is Packet over Sonet
  Internet address is 10.5.5.5/8
  MTU 4470 bytes, BW 155000 Kbit, DLY 100 usec,
    reliability 96/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Scramble disabled
  Last input 00:00:11, output 00:00:11, output hang never
  Last clearing of 'show interface' counters 00:00:23
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  5 packets input, 520 bytes
    Received 0 broadcasts (0 IP multicast)
    0 runts, 0 giants, 0 throttles
    0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  5 packets output, 520 bytes, 0 underruns
    0 output errors, 0 applique, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```

## Example of the show controllers Command

The following example shows output from the **show controllers pos** command on a Cisco 7304 router with a 4-Port OC-3c/STM-1 POS SPA installed in slot 5:

```

Router# show controllers pos 5/0/1
POS5/0/1
SECTION
  LOF = 0 LOS = 0 BIP(B1) = 0
LINE
  AIS = 0 RDI = 0 FEBE = 0 BIP(B2) = 0
PATH
  AIS = 0 RDI = 0 FEBE = 0 BIP(B3) = 0
  LOP = 0 NEWPTR = 0 PSE = 0 NSE = 0

Active Defects: None
Active Alarms: None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

BER thresholds: SF = 10e-3, SD = 10e-6
TCA thresholds: B1 = 10e-6, B2 = 10e-6, B3 = 10e-6
APS
  COAPS = 0 PSBF = 0
  State: PSBF_state = False
  Rx(K1/K2): 00/00 Tx(K1/K2): 00/00
  S1S0 = 00, C2 = CF
CLOCK RECOVERY
  RDOOL = 0
  State: RDOOL_state = False
PATH TRACE BUFFER: STABLE
  Remote hostname : c7600-1
  Remote interface: POS7/1/3
  Remote IP addr : 10.5.5.4
  Remote Rx(K1/K2): 00/00 Tx(K1/K2): 00/00

BER thresholds: SF = 10e-3 SD = 10e-6
TCA thresholds: B1 = 10e-6 B2 = 10e-6 B3 = 10e-6

Clock source: internal

```



## CHAPTER 6

# Overview of the Serial SPAs

---

This chapter provides an overview of the release history, and feature and MIB support for the Cisco 7304 router with the 2 and 4-Port T3/E3 SPAs.

This chapter includes the following sections:

- [Release History, page 6-1](#)
- [Supported Features, page 6-1](#)
- [Supported MIBs, page 6-3](#)
- [Displaying the SPA Hardware Type, page 6-4](#)

## Release History

| Release                      | Modification                                                                                                                                                                                          |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco IOS Release 12.2(25)S3 | Support for the following hardware was introduced on the Cisco 7304 router: <ul style="list-style-type: none"><li>• 2-Port T3/E3 SPA (SPA-2XT3/E3)</li><li>• 4-Port T3/E3 SPA (SPA-4XT3/E3)</li></ul> |

## Supported Features

This section provides a list of some of the primary features supported by the MSC-100 and SPA hardware and software.

# Serial SPA Features

The following is a list of some of the significant software features supported by the 2 and 4-Port T3/E3 SPA.

- Software selectable between E3 or T3 framing on each card
- Layer 2 encapsulation support:
  - Point-to-Point Protocol (PPP)
  - High-level Data Link Control (HDLC)
  - Frame Relay
- Internal or network clock (selectable per port)
- Online insertion and removal (OIR)
- Alarm reporting-24-hour history maintained, 15-minute intervals on all errors
- 16- and 32-bit cyclic redundancy checks (CRC) supported (16-bit default)
- Local and remote loopback
- Bit error rate testing (BERT) pattern generation and detection per port
- FPD (field programmable device upgrades)
- E3 Features
  - Full duplex connectivity at E3 rate (34.368 MHz)
  - Supports G.751 or G.832 framing (software selectable)
  - Hi-density bipolar with three zones (HD3B) line coding
  - Compliant with E3 pulse mask
  - Line build-out: configured for up to 450 feet (135 m) of type 728A or equivalent coaxial cable
  - Loopback modes: DTE, local, dual, and network
  - E3 alarm/event detection (once per second polling)
    - Alarm indication signal (AIS)
    - Loss of frame (LOF)
    - Remote alarm indication (RAI)
  - Subrate and scrambling features for these DSU vendors:
    - Digital Link
    - ADC Kentrox
- T3 Features
  - Binary 3-zero substitution (B3ZS) line coding
  - Compliant with DS3 pulse mask per ANSI T1.102-1993
  - DS3 far-end alarm and control (FEAC) channel support
  - Full duplex connectivity at DS-3 rate (44.736 MHz)
  - Loopback modes: DTE, local, dual, and network
  - C-bit or M23 framing (software selectable)
  - Line build-out: configured for up to 450 feet (135 m) of type 734A or equivalent coaxial cable

- DS-3 alarm/event detection (once per second polling)
  - Alarm indication signal (AIS)
  - Out of frame (OOF)
  - Far-end receive failure (FERF)
- Generation and termination of DS3 Maintenance Data Link (MDL) in C-bit framing
- Subrate and scrambling features for these DSU vendors:
  - Adtran
  - ADC Kentrox
  - Digital Link
  - Larscom
  - Verilink

## Supported MIBs

The following MIBs are supported in Cisco IOS Release 12.2S for the serial SPAs on the Cisco 7304 router:

All serial SPAs:

- CISCO-ENTITY-ALARM-MIB
- CISCO-CLASS-BASED-QOS-MIB
- CISCO-ENVMON-MIB
- CISCO-ENTITY-ASSET-MIB
- CISCO-ENTITY-FRU-CONTROL-MIB
- CISCO-ENTITY-SENSOR-MIB
- ENTITY-MIB
- IF-MIB
- RMON-MIB
- MPLS-LDP-MIB
- MPLS-LSR-MIB
- MPLS-TE-MIB
- MPLS-VPN-MIB

2 and 4-Port T3/E3 SPAs:

- DS3/E3 MIB

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://tools.cisco.com/RPF/register/register.do>

## Displaying the SPA Hardware Type

To verify the SPA hardware type that is installed in your Cisco 7304 router, you can use the **show interfaces** command. There are several other commands on the Cisco 7304 router that also provide SPA hardware information.

Table 6-1 shows the hardware description that appears in the **show** command output for each type of SPA that is supported on the Cisco 7304 router.

**Table 6-1 SPA Hardware Descriptions in show Commands**

| SPA              | Description in show interfaces and show controllers commands |
|------------------|--------------------------------------------------------------|
| 4-Port T3/E3 SPA | “Hardware is SPA-4XT3/E3”                                    |
| 2-Port T3/E3 SPA | “Hardware is SPA-2XT3/E3”                                    |

## Example of the show interface Command

The following example shows output from the **show interface serial 5/0/0** command on a Cisco 7304 router with a 4-Port T3/E3 SPA installed in slot 5:

```
Serial5/0/0 is up, line protocol is up
  Hardware is SPA-4XT3/E3
  Internet address is 3.0.0.2/24
  MTU 4470 bytes, BW 44210 Kbit, DLY 200 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive not set
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    0 packets input, 0 bytes, 0 no buffer
    Received 0 broadcasts (0 IP multicast)
    0 runts, 0 giants, 0 throttles
      0 parity
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 applique, 1 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```

## Example of the show controllers Command

The following example shows output from the **show controller serial details** command on a Cisco 7304 router with a 4-Port T3/E3 SPA installed in slot 5:

```
Router# show controllers serial 5/1/2 details
Interface Serial5/1/2 (DS3 port 2)
Hardware is SPA-4XT3/E3
Framing is c-bit, Clock Source is Internal
Bandwidth limit is 44210, DSU mode 0, Cable length is 10 feet
rx FEBE since last clear counter 0, since reset 0
Data in current interval (810 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
 0 Severely Errored Line Secs
 0 Far-End Errored Secs, 0 Far-End Severely Errored Secs
 0 CP-bit Far-end Unavailable Secs
 0 Near-end path failures, 0 Far-end path failures
 0 Far-end code violations, 0 FERF Defect Secs
 0 AIS Defect Secs, 0 LOS Defect 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 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
 0 Severely Errored Line Secs
 0 Far-End Errored Secs, 0 Far-End Severely Errored Secs
 0 CP-bit Far-end Unavailable Secs
 0 Near-end path failures, 0 Far-end path failures
 0 Far-end code violations, 0 FERF Defect Secs
 0 AIS Defect Secs, 0 LOS Defect 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 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
 0 Severely Errored Line Secs
 0 Far-End Errored Secs, 0 Far-End Severely Errored Secs
 0 CP-bit Far-end Unavailable Secs
 0 Near-end path failures, 0 Far-end path failures
 0 Far-end code violations, 0 FERF Defect Secs
 0 AIS Defect Secs, 0 LOS Defect Secs
[output omitted]
```





## CHAPTER 7

# Upgrading Field-Programmable Devices

---

In general terms, field-programmable devices (FPDs) are hardware devices implemented on router cards that support separate software upgrades. A field-programmable gate array (FPGA) is a type of programmable memory device that exists on most hardware components of a Cisco 7304 router. The term “FPD” has been introduced to collectively and generically describe any type of programmable hardware device on SPAs, including FPGAs. Cisco IOS Release 12.2(20)S2 introduces the Cisco FPD upgrade feature to manage the upgrade of FPD images on SPAs only. This feature does not upgrade images on an MSC.

This chapter describes the difference between upgrading FPGA versions on MSCs versus SPAs, and the information that you need to know to verify image versions and to perform an upgrade for MSC FPGA images and FPD images when incompatibilities arise.

This chapter includes the following sections:

- [Release History, page 7-1](#)
- [SPA FPD Quick Upgrade, page 7-2](#)
- [Overview of MSC FPGA Image and SPA FPD Image Upgrade Support, page 7-3](#)
- [Upgrading MSC FPGA Images, page 7-4](#)
- [Optional FPD Procedures, page 7-10](#)
- [Optional FPD Procedures, page 7-10](#)
- [FPD Image Upgrade Examples, page 7-15](#)
- [Troubleshooting Problems with FPD Image Upgrades, page 7-20](#)

## Release History

[Table 7-1](#) provides the release and modification history for all FPD-related features on the Cisco 7304 router.

Table 7-1f Release History

| Release                      | Modification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco IOS Release 12.2(25)S3 | <p>The following FPD-related changes were introduced:</p> <ul style="list-style-type: none"> <li>• By default, the SPA used to automatically reload before and after a manual FPD upgrade. This behavior was changed. By default, the SPA is no longer reloaded automatically before and after a manual FPD upgrade.</li> <li>• The <b>force</b> option was removed from the <b>hw-module subslot slot/subslot file file-url force</b> command and replaced by the <b>reload</b> option. With the <b>reload</b> option, the user now has the option of reloading or not reloading after an FPD upgrade.</li> <li>• The output of the <b>show upgrade fpd file file-url</b> command was changed to only display brief versioning information. The output generated from this command in previous Cisco IOS releases can still be generated in this release by entering the <b>show upgrade fpd file-url detail</b> command.</li> <li>• The multiple periods (“....”) used to show an FPD procedure is being processed are no longer used starting with this release.</li> </ul> |
| Cisco IOS Release 12.2(20)S6 | <p>The <b>show upgrade</b> commands used to monitor FPD behavior (<b>show upgrade file</b>, <b>show upgrade package default</b>, <b>show upgrade progress</b>, and <b>show upgrade table</b>) have been changed to add the <b>fpd</b> keyword. The output previously generated with the aforementioned commands can now be generated by entering the appropriate <b>show upgrade fpd</b> command (<b>show upgrade fpd file</b>, <b>show upgrade fpd package default</b>, <b>show upgrade fpd progress</b>, and <b>show upgrade fpd table</b>).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Cisco IOS Release 12.2(20)S2 | <p>SPAs and MSCs were introduced, as was the FPD upgrade process and all functions and features related to FPD.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## SPA FPD Quick Upgrade

This section provides information if you simply want to upgrade FPD for SPAs as quickly as possible. These instructions are not always feasible for operating network environments and are not the only methods available for upgrading FPD. If you need more information on FPD upgrades, see the various other sections of this document for detailed information related to FPD upgrades.

This section addresses the following topics:

- [FPD Quick Upgrade Before Upgrading your Cisco IOS Release \(Recommended\)](#), page 7-3
- [FPD Quick Upgrade After Upgrading your Cisco IOS Release](#), page 7-3

## FPD Quick Upgrade Before Upgrading your Cisco IOS Release (Recommended)

- 
- Step 1** When getting your Cisco IOS image, download the FPD image package for the Cisco IOS release that you are upgrading to the disk0: Flash disk before booting the new version of Cisco IOS. The FPD image package can be retrieved from the same site where you go to get your Cisco IOS image.
- Step 2** Boot using the new version of Cisco IOS. When the new Cisco IOS boots, it by defaults searches for the FPD image package in disk0: and the FPD images will be updated automatically as part of the IOS boot process.
- 

## FPD Quick Upgrade After Upgrading your Cisco IOS Release

- 
- Step 1** Go to the cisco.com site where you downloaded your specific Cisco IOS software and locate the FPD image package, if you haven't already.
- Step 2** Download this FPD image package to disk0:.
- Do not change any FPD-related settings on your system (if **upgrade fpd auto** or **upgrade fpd path** has been changed, change the settings back to the default settings using the **no** form of the command). Reboot your Cisco IOS release software. When the new Cisco IOS boots, it by defaults searches for the FPD image package in disk0: and the FPD images will be updated automatically as part of the IOS boot process.
- 

## Overview of MSC FPGA Image and SPA FPD Image Upgrade Support

FPGA versions must be compatible with the Cisco IOS software that is running on the router; if an incompatibility exists between an FPGA version and the Cisco IOS software release running the router, the device with the FPGA will not operate properly until the incompatibility is resolved.

The Cisco 7304 router supports upgrades for FPGA devices on its MSCs and SPAs, but uses different methods to upgrade those images:

- Cisco 7304 MSC-100—FPGA images are bundled with the Cisco IOS software, like the FPGA bundles for other Cisco 7304 router hardware. The MSC-100 supports automatic upgrades only for its FPGA device.
- Shared Port Adapters—FPGA software upgrades are part of an FPD image package that corresponds to a Cisco IOS software release. The SPA supports automatic and manual upgrades for its FPGA device using the Cisco FPD upgrade feature that is further described in this chapter.

## Overview of SPA FPD Images and Packages

An FPD image package is used to upgrade FPD images. Whenever a Cisco IOS image is released that supports SPAs, a companion SPA FPD image package is also released for that Cisco IOS software release. The SPA FPD image package is available from Cisco.com and is accessible from the Cisco Software Center page where you also go to download your Cisco IOS software image.

If you are running SPAs on your router and are upgrading your Cisco IOS image, you should download the FPD image package file before booting the router using the new Cisco IOS release. If the SPA requires an FPD upgrade and the Cisco IOS image is unable to locate an FPD image package, the system messages will indicate that the FPD image is incompatible and you will need to go to the Cisco Software Center on Cisco.com to download the FPD image package for your Cisco IOS software release.

**Note**

The FPD automatic upgrade feature only searches for the FPD image package file that is the same version number as the Cisco IOS release being used by the system. For example, if the Cisco IOS release being used is Cisco IOS Release 12.2(20)S2, then the system will search for the FPD image package file that supports the specific Cisco IOS release (spa\_fpd.122-20.S2.pkg). Therefore, ensure the FPD image package file on your system is compatible with your Cisco IOS release and do not change the name of the FPD image package file.

## Upgrading MSC FPGA Images

On the Cisco 7304 router, automatic FPGA version checking and updating is performed during every system startup for all line cards, NSEs, NPEs, MSCs, and the 7300-CC-PA in the system. However, the Cisco 7304 MSC-100 FPGA version cannot be updated manually.

For more information about FPGA upgrade processes that apply to the Cisco 7304 MSC-100, refer to the *Cisco 7304 FPGA Bundling and Update* document at the URL:

[http://www.cisco.com/en/US/docs/ios/12\\_1/12\\_1ex/feature/guide/73fpga.html](http://www.cisco.com/en/US/docs/ios/12_1/12_1ex/feature/guide/73fpga.html)

## Verifying the FPGA Version on an MSC

To verify FPGA version information on MSCs, you can use the following commands on the Cisco 7304 router:

- **show diag**—Displays current software and hardware FPGA versions for MSCs and SPAs.
- **show c7300**—Displays FPGA status for NPEs, NSEs, line cards, and MSCs.

## Verifying Current FPGA Versions Using the show diag Command

To verify the FPGA version on the Cisco 7304 MSC-100 and on all of the SPAs in its subslots, use the **show diag** command and specify only the slot number of the MSC.

The following example shows output from the **show diag** command for a Cisco 7304 MSC-100 located in slot number 4 and a 4-Port 10/100 Fast Ethernet SPA located in subslot 0. The FPGA version information appears at the end of the output for each card:

```
Router# show diag 4
Slot 4:
      7304-MSC-100 SPA Carrier Card Line Card
Line Card state: Active
```

```

Insertion time: 2d19h ago
Bandwidth points: 400000
EEPROM contents at hardware discovery:
Hardware Revision      : 0.18
Boot Time out         : 0000
PCB Serial Number     : CSJ0714YZC8
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

```

```

FPGA information:
  Current FPGA version : 00.23
  IOS bundled FPGA version : 00.23
  CPLD version         : 01.02

```

**Subslot 4/0:**

```

Shared port adapter: SPA-4FE-7304, 4 ports
Info: hw-ver=0x100, sw-ver=0x0 fpga-ver=0x0
State: ok
Insertion time: 23:17:47 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

```

```

FPGA version:
  Software version : 04.17
  Hardware version : 04.17

```

Subslot 4/1: Empty subslot

## Verifying Current FPGA Versions Using the show c7300 Command

You can also use the **show c7300** command to verify the FPGA status for all of the NPEs, NSEs, line cards, and MSCs on the Cisco 7304 router. The following example shows that all FPGAs are current for the NSE-100 and the Cisco 7304 MSC-100 cards in slots 0 through 5:

```
Router# show c7300
Slot      Card Type           Status           Insertion time
-----
0,1       NSE100              Active           00:45:29 ago
2         7304-MSC-100        Active           00:44:36 ago
3         7304-MSC-100        Active           00:44:36 ago
4         7304-MSC-100        Active           00:44:36 ago
5         7304-MSC-100        Active           00:14:39 ago
```

The FPGA versions for the cards listed above are current

.

## Upgrading SPA FPD Images

This section documents some of the common scenarios where FPD image updates are necessary. It discusses the following scenarios:

- [Migrating to a Newer Cisco IOS Release, page 7-6](#)
- [Upgrading FPD Images for SPAs in a Production System, page 7-8](#)

## Migrating to a Newer Cisco IOS Release

This section discusses the following topics:

- [Upgrading FPD Images Before Booting the New Cisco IOS Release \(Recommended\), page 7-6](#)
- [Upgrading FPD Images for SPAs in a Production System, page 7-8](#)

### Upgrading FPD Images Before Booting the New Cisco IOS Release (Recommended)

If you are still running your old Cisco IOS Release but are preparing to load a newer version of Cisco IOS, you can upgrade FPD for the new Cisco IOS Release one of the following ways:

- [Placing FPD Image Package on Flash Disk Before Upgrading IOS \(Recommended\), page 7-6](#)
- [Online FPD Upgrade, page 7-7](#)

#### Placing FPD Image Package on Flash Disk Before Upgrading IOS (Recommended)

Placing the FPD image package for the IOS release that you are upgrading to before upgrading IOS is the recommended method for upgrading FPD because it is the simple in addition to being fast. To perform this type of FPD upgrade, follow these steps:

- 
- Step 1** While still running the Cisco IOS release that will be upgraded, place the FPD image package for the new version of Cisco IOS onto disk0:. For instance, if you are running Cisco IOS Release 12.2(20)S5 and are upgrading to Cisco IOS Release 12.2(25)S3, place the FPD image package for Cisco IOS Release 12.2(25)S3 onto disk0: while still running Cisco IOS Release 12.2(20)S5. The FPD image package for

a specific IOS release can be located on cisco.com from the same area where you download that Cisco IOS software image. Your router and SPAs should continue to operate normally since this action will have no impact on the current SPA FPDs.

**Caution**

Do not change the filename of the FPD image package file. The Cisco IOS searches for the FPD image package file by filename, so the FPD image package file cannot be found if it has been renamed.

**Step 2**

Reboot your router using the new upgraded Cisco IOS image. As part of the bootup process, the router will search for the FPD image package. Since the default settings for the FPD image package search are to check for the FPD image package for the specific Cisco IOS Release in disk0:, the FPD image package will be located during the bootup procedure and all SPA FPDs that required upgrades will be upgraded.

**Step 3**

When the router has booted, verify the upgrade was successful by entering the **show hw-module subslot fpd** command.

## Online FPD Upgrade

**Note**

The Online FPD Upgrade was introduced in Cisco IOS Release 12.2(25)S3. The method of FPD upgrade cannot be used on routers running pre-Cisco IOS Release 12.2(25)S3 software.

The online FPD upgrade allows users to upgrade FPD before a Cisco IOS release without having to reload the router. The online FPD upgrade is the fastest method of upgrading FPD and will keep the system online for the duration of the upgrade, but it is more complicated than the offline FPD upgrade. If you are not familiar with the FPD upgrade procedure, we recommend using the instructions in the [“Placing FPD Image Package on Flash Disk Before Upgrading IOS \(Recommended\)”](#) section on page 7-6 to perform the FPD upgrade.

To perform an online FPD upgrade, follow these steps:

**Step 1**

While still running the Cisco IOS release that will be upgraded, place the FPD image package for the new version of Cisco IOS onto the router’s Flash Disk or on an accessible FTP or TFTP server. The FPD image package can be located on cisco.com from the same area where you download your Cisco IOS software image.

**Step 2**

Before proceeding, be aware of the following issues:

- If you enter the **upgrade hw-module subslot** command as specified in [Step 3](#) and then need to reload the router using the non-upgraded IOS release for any reason, the SPA FPD information will be corrupted and a SPA FPD upgrade will need to be performed to restore FPD compatibility on these SPAs. Other router events, such as router reloads or SPA OIRs, will also have this effect. If you are going to use this method to perform an FPD upgrade, we strongly recommend entering the **upgrade hw-module subslot** command to make the upgrade as close to the time of the IOS upgrade as possible to avoid any potential complications.
- Do not use the **reload** option with the **upgrade hw-module subslot** command to perform an online upgrade.

- Step 3** Before upgrading the Cisco IOS image, enter the **upgrade hw-module subslot *file-url*** command. The *file-url* command should direct users to the location of the FPD image package. For instance, if you had placed the FPD image package for Release 12.2(25)S3 on the TFTP server `abrick/muck/myfolder`, you would enter **upgrade hw-module subslot tftp://abrick/muck/myfolder/c7304-fpd.122-25.S3.pkg** to complete this step.
- Step 4** Upgrade IOS on the router. When IOS is upgraded, FPD will be upgraded with minimal time needed to complete the upgrade.
- Step 5** Verify the upgrade was successful by entering the **show hw-module subslot fpd** command.
- 

## Upgrade FPD Images after Booting the New Cisco IOS Release

The following steps explain how to upgrade FPD images if you have already upgraded your Cisco IOS release but have not upgraded your FPD images.

To perform an FPD upgrade after the new Cisco release has been booted, follow these steps:

- Step 1** If you are unsure if your FPD images are compatible with the SPAs in your carrier card, enter the **show hw-module subslot fpd** command.
- Step 2** If an FPD upgrade is necessary, place the FPD image package for the new version of Cisco IOS onto the router's Flash Disk or on an accessible FTP or TFTP server. The FPD image package can be located on `cisco.com` from the same area where you downloaded your Cisco IOS software image.
- Step 3** Enter the **upgrade hw-module subslot *file-url* reload** command. The *file-url* command should direct users to the location of the FPD image package. For instance, if you had placed the FPD image package for Release 12.2(25)S3 on the TFTP server `abrick/muck/myfolder`, you would enter **upgrade hw-module subslot tftp://abrick/muck/myfolder/c7304-fpd.122-25.S3.pkg** to complete this step.
- Note that the **reload** option is used in this command. When this option is used the SPA will automatically be reloaded to complete the FPD upgrade.
- Step 4** Verify the upgrade was successful by entering the **show hw-module subslot fpd** command.
- 

## Upgrading FPD Images for SPAs in a Production System

Adding a SPA to a production system presents the risk that the SPA may contain versions of FPD images that are incompatible with the Cisco IOS release currently running the router. In addition, the FPD upgrade operation is a very CPU-intensive operation and therefore the upgrade operation may take more time when it is performed on a production system. The performance impact will vary depending on various factors, including network traffic load, the type of processing engine used, and the type of service configured.

Because of the potential complications, we highly recommend that one of the following alternatives be used to perform the FPD upgrade on a production system if possible:

- [Using a Non-Production System to Upgrade the SPA FPD Image, page 7-9](#)
- [Verifying System Compatibility First, page 7-9](#)

## Using a Non-Production System to Upgrade the SPA FPD Image

Before beginning the upgrade, ensure:

- The spare system is running the same version of the Cisco IOS software release that the target production system is running.
- The automatic upgrade feature is enabled on the spare system (the automatic upgrade feature is enabled by default. It can also be enabled using the **upgrade fpd auto** command).

Use the following procedure to perform an upgrade on a spare system:

- 
- Step 1** Download the FPD image package file to the router's flash file system or TFTP or FTP server accessible by the spare system. In most cases, it is preferable to place the file in disk0: since the router, by default, searches for the FPD image package in disk0:. If disk0: is full, use the **upgrade fpd path** command to direct the router to search for the FPD image package in the proper location.
- Step 2** Insert the SPA into the spare system.
- If an upgrade is required, the system will perform the necessary FPD image updates so that when this SPA is inserted to the target production system it will not trigger an FPD upgrade operation there.
- Step 3** Remove the SPA from the spare system after the upgrade.
- Step 4** Insert the SPA into the target production system.
- 

## Verifying System Compatibility First

If a spare system is not available to perform an upgrade, you can check for system compatibility by disabling the automatic upgrade feature before inserting the SPA.

- If the FPD images on the SPA are compatible with the system, you will only need to re-enable the automatic upgrade feature.
- If the FPD images on the SPA are not compatible with the system, the SPA is disabled but will not impact system performance by attempting to perform an automatic upgrade.

Use the following procedure to check the FPD images on the SPA for system compatibility:

- 
- Step 1** Disable the automatic upgrade feature using the **no upgrade fpd auto** global configuration command.
- Step 2** Insert the SPA into the system.
- If the FPD images are compatible, the SPA is up and running.
- If the FPD images are not compatible, the SPA is disabled. At this point we recommend that you wait for a scheduled maintenance when the system is offline to manually perform the FPD upgrade using the **upgrade hw-module subslot** privileged EXEC command.
- Step 3** Re-enable the automatic upgrade feature using the **upgrade fpd auto** global configuration command.
-

## Optional FPD Procedures

This section provides information for optional FPD-related functions. None of the topics discussed in this section are necessary for completing FPD upgrades, but may be useful in some FPD-related scenarios. It covers the following topics:

- [Manually Upgrading SPA FPD Images, page 7-10](#)
- [Upgrading FPD From an FTP or TFTP Server, page 7-10](#)
- [Modifying the Default Path for the FPD Image Package File Location, page 7-12](#)
- [Displaying Current and Minimum Required FPD Image Versions, page 7-13](#)
- [Displaying Information About the Default FPD Image Package, page 7-14](#)
- [Verifying the FPD Image Upgrade Progress, page 7-14](#)

### Manually Upgrading SPA FPD Images

To manually upgrade the current FPD version on a SPA card, use the following command:

```
Router# upgrade hw-module subslot slot-number/subslot-number file file-url [reload]
```

In this example, *slot-number* is the slot where the MSC is installed, *subslot-number* is the subslot number where the SPA is located, *file-url* is the location and name of the FPD image package file, and **reload** reloads the SPA to complete the FPD upgrade. By default, the SPA will not be reloaded to complete the FPD upgrade unless the **reload** option is entered. Reloading the SPA drops all traffic traversing that SPA's interfaces. If you would like to reload the SPA later to complete the upgrade, do not enter the reload option and OIR the SPA later to complete the FPD upgrade.



#### Note

The default behavior for SPA automatic upgrades was changed in Cisco IOS Release 12.2(25)S3. If you are using a release prior to Release 12.2(25)S3, your SPA will automatically be reloaded after every FPD upgrade.

The **force** option was also removed in Release 12.2(25)S3 because it was no longer needed with the new behavior for this command.



#### Caution

An image upgrade can require a long period of time to complete depending on the SPA.

### Upgrading FPD From an FTP or TFTP Server

The generally recommended method to perform an FPD image upgrade is to download the FPD image package to Flash disk0: and use the FPD automatic upgrade. By default, the system searches disk0: for the FPD image package file when an FPD incompatibility is detected.

This default behavior of loading an FPD image from Flash can be changed using the **upgrade fpd path** global configuration command, which sets the path to search for the FPD image package file to a location other than the router's default Flash location.

For large deployments where all the systems are being upgraded to a specific Cisco IOS software release, we recommend that the FPD image package file be placed on an FTP or TFTP server that is accessible to all the affected systems, and then use the **upgrade fpd path** global configuration command to configure the routers to look for the FPD image package file from the FTP or TFTP server prior to the reloading of the system with the new Cisco IOS release.



**Note**

This approach can also be used if there is not enough disk space on the system Flash card to hold the FPD image package file.

To download an FPD image package file to an FTP or TFTP server, use the following procedure:

- Step 1** Copy the FPD image package file to the FTP or TFTP server.
- Step 2** Access the router from a connection that does not use the SPA interface for access, if possible. We recommend not using the SPA interface as your connection to the router because an FPD incompatibility disables all interfaces on the SPA, making a manual FPD upgrade impossible through a SPA interface. If access through one of the SPA ports is the only access to the router you have, do not use the TFTP or FTP upgrade method. Instead, copy the FPD image package to your router's default Flash card before upgrading your Cisco IOS Release. This will allow the router to find the FPD image package during the first IOS bootup and upgrade FPD automatically.
- Step 3** From global configuration mode, use the **upgrade fpd path** command to instruct the router to locate the FPD image package file from the FTP or TFTP server location.

For example, enter one of the following global configuration commands from the target system's console:

```
Router(config)# upgrade fpd path tftp://my_tftpserver/fpd_pkg_dir/
or
Router(config)# upgrade fpd path ftp://login:password@my_ftpserver/fpd_pkg_dir/
```

In these examples, *my\_tftpserver* or *my\_ftpserver* is the path to server name, *fpd\_pkg\_dir* is the directory on the TFTP server where the FPD image package is located, and *login:password* is your FTP login name and password.

- Step 4** Make sure that the FPD automatic upgrade feature is enabled by examining the output of the **show running-config** command (look for the *upgrade fpd auto* configuration line in the output. If there are no upgrade commands in the output, then **upgrade fpd auto** is enabled because it is the default setting.) If automatic upgrades are disabled, use the **upgrade fpd auto** global configuration command to enable automatic FPD upgrades.
- Step 5** Enter the **show upgrade fpd file** command to ensure your router is connecting properly to the default FPD image package. If you are able to generate output related to the FPD image package using this command, the upgrade should work properly. In the following example, the router is able to generate FPD image package information for the FPD image package on the TFTP server.

```
Router# show upgrade fpd file tftp://mytftpserver/myname/myfpdpgk/c7304-fpd.122-25.S3.pkg
Loading myname/myfpdpgk/c7304-fpd.122-25.S3.pkg from 223.255.254.254 (via FastEthernet0):
!!
!!
!!
!!
!!
[OK - 1740288 bytes]

Cisco Field Programmable Device Image Package for IOS
C7304 FPD Image Package (c7304-fpd-pkg.122.pkg), Version 12.2(20050304:175718)
Copyright (c) 2004-2005 by cisco Systems, Inc.
Built Fri 04-Mar-2005 09:57 by yega
```

```
=====
                                Bundled FPD Image Version Matrix
=====
```

| Supported Card Types       | ID | Image Name               | Version | Min. Req.<br>H/W Ver. |
|----------------------------|----|--------------------------|---------|-----------------------|
| 4-port FastEthernet SPA    | 1  | 4xFE/2xGE SPA Data & I/O | 4.18    | 0.0                   |
| 2-port GigabitEthernet SPA | 1  | 4xFE/2xGE SPA Data & I/O | 4.18    | 0.0                   |
| 2-port OC3 POS SPA         | 1  | POS SPA IOFPGA P1        | 3.4     | 0.0                   |
|                            | 1  | POS SPA IOFPGA P2        | 3.4     | 0.200                 |
| 4-port OC3 POS SPA         | 1  | POS SPA IOFPGA P1        | 3.4     | 0.0                   |
|                            | 1  | POS SPA IOFPGA P2        | 3.4     | 0.200                 |
| 1-port OC12 POS SPA        | 1  | POS SPA IOFPGA P1        | 3.4     | 0.0                   |
|                            | 1  | POS SPA IOFPGA P2        | 3.4     | 0.200                 |
| 2-port OC12 POS SPA        | 1  | POS SPA IOFPGA P1        | 3.4     | 0.0                   |
|                            | 1  | POS SPA IOFPGA P2        | 3.4     | 0.200                 |
| 2-port T3/E3 Serial SPA    | 1  | T3E3 SPA ROMMON          | 2.12    | 0.0                   |
|                            | 2  | T3E3 SPA I/O FPGA        | 0.24    | 0.0                   |
|                            | 3  | T3E3 SPA E3 FPGA         | 0.6     | 0.0                   |
|                            | 4  | T3E3 SPA T3 FPGA         | 0.14    | 0.0                   |
| 4-port T3/E3 Serial SPA    | 1  | T3E3 SPA ROMMON          | 2.12    | 0.0                   |
|                            | 2  | T3E3 SPA I/O FPGA        | 0.24    | 0.0                   |
|                            | 3  | T3E3 SPA E3 FPGA         | 0.6     | 0.0                   |
|                            | 4  | T3E3 SPA T3 FPGA         | 0.14    | 0.0                   |

**Step 6** Save the configuration and reload the system with the new Cisco IOS release.

During the system startup after the reload, the necessary FPD image version check for all the SPAs will be performed and any upgrade operation will occur automatically if an upgrade is required. In each upgrade operation, the system extracts the necessary FPD images to the SPA from the FPD image package file located on the FTP or TFTP server.

## Modifying the Default Path for the FPD Image Package File Location

By default, the Cisco IOS software looks for the FPD image package file on disk0: when performing an automatic FPD image upgrade.



### Note

Be sure there is enough space on disk0: to accommodate the FPD image package file.

Alternatively, you can store an FPD image package file in another file system. However, because the system looks on disk0: as the default, you need to change the FPD image package file location so that the system is directed to search the alternate location (such as in another file system on the router, or on an FTP or TFTP server) accessible by the Cisco IOS software, enter the **upgrade fpd path** *fpd-pkg-dir-url* global configuration command, where *fpd-pkg-dir-url* is the alternate location.

If the **upgrade fpd path** global configuration command has not been entered to direct the router to locate an FPD image package file in an alternate location, the system searches disk0: on the Cisco 7304 router for the FPD image package file.

Failure to locate an FPD image package file when an upgrade is required will disable the SPA. Because SPAs will not come online until FPD is compatible, the SPA will also be disabled if it requires an FPD upgrade and the automatic upgrade feature is disabled.

## Displaying Current and Minimum Required FPD Image Versions

To display the current version of FPD images on the SPAs installed on your router, use the **show hw-module subslot** [*slot-number/subslot-number*] **fpd** command, where *slot-number* is the slot number where the MSC is installed, and *subslot-number* is the number of the MSC subslot where the target SPA is located.



### Note

This command can be used to identify information about FPDs on any SPA. If you enter the location of a line card that is not a SPA, the output displays information about any programmable devices on that line card.

The following examples show the output when using this **show** command.

The output display in this example shows that FPD versions on the SPAs in the system meet the minimum requirements:

```
Router# show hw-module subslot fpd
```

```
====
Slot Card Description      H/W  Field Programmable  Current  Min. Required
Ver.  Device:"ID-Name"    Version  Version
====
 2/0 SPA-4FE-7304         0.32  1-Data & I/O FPGA   4.13    4.13
-----
 2/1 SPA-2GE-7304         0.15  1-Data & I/O FPGA   4.13    4.13
====
```

This example shows the output when using the *slot-number/subslot-number* argument to identify a particular SPA:

```
Router# show hw-module subslot 2/1 fpd
```

```
====
Slot Card Description      H/W  Field Programmable  Current  Min. Required
Ver.  Device:"ID-Name"    Version  Version
====
 2/1 SPA-2GE-7304         0.15  1-Data & I/O FPGA   4.13    4.13
====
```

The output display in this example shows that the SPA in slot 2/0 is disabled because one of the programmable devices on the SPA does not meet the minimum version requirements. The output also contains a “NOTES” section that provides the name of the FPD image package file needed to upgrade the disabled SPA’s FPD image.

```
Router# show hw-module subslot fpd
```

```
====
Slot Card Description      H/W  Field Programmable  Current  Min. Required
Ver.  Device:"ID-Name"    Version  Version
====
 2/0 SPA-4FE-... <DISABLED> 0.32  1-Data & I/O FPGA   4.12    4.13  *
-----
 2/1 SPA-2GE-7304         0.15  1-Data & I/O FPGA   4.13    4.13
====
```

**NOTES:**

- FPD images that are required to be upgraded are indicated with a '\*' character in the "Minimal Required Version" field.
- The following FPD image package files is required for the upgrade:  
"spa\_fpd.122-20.S2.pkg"

## Displaying Information About the Default FPD Image Package

You can use the **show upgrade fpd package default** command to find out which SPAs are supported with your current Cisco IOS release and which FPD image package you need for an automatic upgrade.



### Note

In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the **show upgrade fpd package default** command is not available. In these releases, enter the **show upgrade package default** command to gather this output.

```
Router# show upgrade fpd package default

*****
This IOS release supports the following default FPD Image Package(s) for
automatic upgrade:
*****

SPA FPD Image Package:spa_fpd.122-20.S6.pkg

List of SPAs supported in this package:

          Minimal
        No. SPA Name      HW Ver.
-----
        1) SPA-4FE-7304   0.0
        2) SPA-2GE-7304   0.0
-----
```

## Verifying the FPD Image Upgrade Progress

You can use the **show upgrade fpd progress** command to view a “snapshot” of the upgrade progress while an FPD image upgrade is taking place. The following example shows the type of information this command displays:



### Note

In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the **show upgrade fpd progress** command is not available. In these releases, enter the **show upgrade progress** command to gather this output.

```
Router# show upgrade fpd progress

FPD Image Upgrade Progress Table:

====
Slot Card Description      Field Programmable Device : "ID-Name"  Time Needed  Time Left  State
====
2/0 SPA-2GE-7304          1-4FE/2GE FPGA                        00:06:00    00:05:17  Updating...
-----
```

```
2/1 SPA-4FE-7304      1-4FE/2GE FPGA      --:--:--  --:--:--  Waiting...
=====
```

## FPD Image Upgrade Examples

This section provides examples of automatic and manual FPD image upgrades. It includes the following examples:

- [System Cannot Locate FPD Image Package File for an Automatic FPD Image Upgrade Example, page 7-15](#)
- [Automatic FPD Image Upgrade Example, page 7-15](#)
- [Downloading the FPD Image Package from a TFTP Server and Automatic FPD Image Upgrade from Flash Example, page 7-16](#)
- [Incompatible FPD Image Version Detection and Disabled Automatic FPD Image Upgrade Example, page 7-18](#)
- [Manual FPD Image Upgrade Example, page 7-19](#)

### System Cannot Locate FPD Image Package File for an Automatic FPD Image Upgrade Example

The following example displays the output when a SPA requires an FPD upgrade and the **upgrade fpd auto** command is *enabled*, but the system cannot find the FPD image package file.

```
*Jan 13 22:36:56:%FPD_MGMT-3-INCOMP_FPD_VER:Incompatible 4FE/2GE FPGA (FPD ID=1) image
version detected for SPA-4FE-7304 card in subslot 2/0. Detected version = 4.12, minimal
required version = 4.13. Current HW version = 0.32.
*Jan 13 22:36:56:%FPD_MGMT-5-FPD_UPGRADE_ATTEMPT:Attempting to automatically upgrade the
FPD image(s) for SPA-4FE-7304 card in subslot 2/0 ...
*Jan 13 22:36:56:%FPD_MGMT-6-BUNDLE_DOWNLOAD:Downloading FPD image bundle for SPA-4FE-7304
card in subslot 2/0 ...
*Jan 13 22:36:56:%FPD_MGMT-3-OPEN_FAILED:Failed to open disk0:/spa_fpd.122-20.S2.pkg (File
not found). Please make sure that the required file is in a valid path.
*Jan 13 22:36:56:%FPD_MGMT-5-CARD_DISABLED:SPA-4FE-7304 card in subslot 2/0 is being
disabled because of incompatible FPD image version. Note that the spa_fpd.122-20.S2.pkg
package will be required if you want to perform the upgrade operation with the "upgrade
hw-module ..." command.
```

### Automatic FPD Image Upgrade Example

The following example shows the output displayed when a SPA requires an FPD image upgrade and the **upgrade fpd auto** command is *enabled*. The required FPD image is automatically upgraded.

```
% Uncompressing the bundle ... [OK]
*Jan 13 22:38:47:%FPD_MGMT-3-INCOMP_FPD_VER:Incompatible 4FE/2GE FPGA (FPD ID=1) image
version detected for SPA-4FE-7304 card in subslot 2/0. Detected version = 4.12, minimal
required version = 4.13. Current HW version = 0.32.
*Jan 13 22:38:47:%FPD_MGMT-5-FPD_UPGRADE_ATTEMPT:Attempting to automatically upgrade the
FPD image(s) for SPA-4FE-7304 card in subslot 2/0 ...

*Jan 13 22:38:47:%FPD_MGMT-6-BUNDLE_DOWNLOAD:Downloading FPD image bundle for SPA-4FE-7304
card in subslot 2/0 ...
*Jan 13 22:38:49:%FPD_MGMT-6-FPD_UPGRADE_TIME:Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 2/0 = 00:06:00.
```

```

*Jan 13 22:38:49:%FPD_MGMT-6-FPD_UPGRADE_START:4FE/2GE FPGA (FPD ID=1) image upgrade in
progress for SPA-4FE-7304 card in subslot 2/0. Updating to version 4.13. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:06:00)
...[.....
(part of the output has been removed for brevity)
.....]
.....]
SUCCESS - Completed XSVF execution.

*Jan 13 22:44:33:%FPD_MGMT-6-FPD_UPGRADE_PASSED:4FE/2GE FPGA (FPD ID=1) image upgrade for
SPA-4FE-7304 card in subslot 2/0 has PASSED. Upgrading time = 00:05:44.108
*Jan 13 22:44:33:%FPD_MGMT-6-OVERALL_FPD_UPGRADE:All the attempts to upgrade the required
FPD images have been completed for SPA-4FE-7304 card in subslot 2/0. Number of
successful/failure upgrade(s):1/0.
*Jan 13 22:44:33:%FPD_MGMT-5-CARD_POWER_CYCLE:SPA-4FE-7304 card in subslot 2/0 is being
power cycled for the FPD image upgrade to take effect.

```

## Downloading the FPD Image Package from a TFTP Server and Automatic FPD Image Upgrade from Flash Example

In the following example, a Cisco IOS image (c7300-js-mz.122-20.S2.bin) and the FPD image package file that supports that particular Cisco IOS image (spa-fpd.122-20.S2.pkg) are loaded onto disk0: from a TFTP server. The router is then configured to boot using the new Cisco IOS image and reloaded. When the router reboots using the new Cisco IOS image, the FPD version check that occurs at bootup detects the FPD incompatibility and then initiates the FPD image upgrade process. The FPD image is then upgraded automatically. After the system messages indicate that the FPD upgrade was successful, the **show hw-module subslot fpd** command is entered to verify the procedure. The FPD messages are italicized in this example for emphasis.

```

Router# copy tftp://hostname/path/c7300-js-mz.122-20.S2.bin disk0:
Destination filename [c7300-js-mz.122-20.S2.bin]?
Accessing tftp://hostname/path/c7300-js-mz.122-20.S2.bin...
Loading path/c7300-js-mz.122-20.S2.bin from 223.255.254.254 (via
FastEthernet0):!!
!!
!!
!!
!!
[OK - 22870596 bytes]

22870596 bytes copied in 133.476 secs (171346 bytes/sec)

Router# copy tftp://hostname/path/spa-fpd.122-20.S2.pkg disk0:
Destination filename [spa-fpd.122-20.S2.pkg]?
Accessing tftp://hostname/path/spa-fpd.122-20.S2.pkg...
Loading path/spa-fpd.122-20.S2.pkg from 223.255.254.254 (via
FastEthernet0):!!
!!
!!
[OK - 703488 bytes]

703488 bytes copied in 3.672 secs (191582 bytes/sec)

Router# dir disk0:
Directory of disk0:/

   1  -rw-   22802060   Jan 3 2004 15:13:30 -08:00  c7300-js-mz.122-20.S1.bin
   2  -rw-   22870596   Apr 2 2004 09:02:50 -08:00  c7300-js-mz.122-20.S2.bin
   3  -rw-    703488    Apr 2 2004 09:07:02 -08:00  spa-fpd.122-20.S2.pkg

63706112 bytes total (17329152 bytes free)

```

```

Router# config t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# boot system disk0:c7300-js-mz.122-20.S2.bin
Router(config)# end
Router#
Apr  2 17:09:22:%SYS-5-CONFIG_I:Configured from console by console

Router# reload

System configuration has been modified. Save? [yes/no]:y
Building configuration...
[OK]
Proceed with reload? [confirm]

*Apr  2 17:52:04:%SYS-5-RELOAD:Reload requested by console. Reload Reason:Reload Command.
System Bootstrap, Version 12.1(12r)EX1, RELEASE SOFTWARE (fc1)
TAC Support:http://www.cisco.com/tac
Copyright (c) 2002 by cisco Systems, Inc.

C7300 platform with 524288 Kbytes of main memory

Currently running ROMMON from ROM 0

Self decompressing the image
:#####
#####
##### [OK]

(Note:Some output removed for brevity)

Press RETURN to get started!

00:00:18:%LINK-5-CHANGED:Interface FastEthernet0, changed state to reset
00:00:18:%LINK-3-UPDOWN:Interface GigabitEthernet0/0, changed state to down
00:00:18:%LINK-3-UPDOWN:Interface GigabitEthernet0/1, changed state to down
00:00:22:%LINK-3-UPDOWN:Interface FastEthernet0, changed state to up
*Apr  2 17:53:35:%SYS-5-CONFIG_I:Configured from memory by console
*Apr  2 17:53:35:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet0, changed
state to down
*Apr  2 17:53:36:%SYS-5-RESTART:System restarted --
Cisco Internetwork Operating System Software
IOS (tm) 7300 Software (C7300-JS-M), Version 12.2(20)S2, RELEASE SOFTWARE (fc2)
Technical Support:http://www.cisco.com/techsupport
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Mon 15-Mar-04 16:54 by ccai
*Apr  2 17:53:36:%FPD_MGMT-3-INCOMP_FPD_VER:Incompatible Data & I/O FPGA (FPD ID=1) image
version detected for SPA-4FE-7304 card in subslot 2/0. Detected version = 4.13, minimum
required version = 4.17. Current HW version = 0.32.
*Apr  2 17:53:36:%FPD_MGMT-5-FPD_UPGRADE_ATTEMPT:Attempting to automatically upgrade the
FPD image(s) for SPA-4FE-7304 card in subslot 2/0 ...
*Apr  2 17:53:36:%FPD_MGMT-6-BUNDLE_DOWNLOAD:Downloading FPD image bundle for SPA-4FE-7304
card in subslot 2/0 ...
*Apr  2 17:53:36:%LINK-5-CHANGED:Interface GigabitEthernet0/1, changed state to
administratively down
*Apr  2 17:53:38:%LINK-3-UPDOWN:Interface FastEthernet0, changed state to down
*Apr  2 17:53:38:%LINK-5-CHANGED:Interface GigabitEthernet0/0, changed state to
administratively down
*Apr  2 17:53:38:%LINK-5-CHANGED:Interface FastEthernet2/0/0, changed state to
administratively down
*Apr  2 17:53:38:%LINK-5-CHANGED:Interface FastEthernet2/0/1, changed state to
administratively down
*Apr  2 17:53:38:%LINK-5-CHANGED:Interface FastEthernet2/0/2, changed state to
administratively down

```

```

*Apr 2 17:53:38:%LINK-5-CHANGED:Interface FastEthernet2/0/3, changed state to
administratively down
*Apr 2 17:53:38:%LINEPROTO-5-UPDOWN:Line protocol on Interface GigabitEthernet0/1,
changed state to down
*Apr 2 17:53:38:%WS_ALARM-6-INFO:ASSERT INFO Gi0/0 Physical Port Administrative State
Down
*Apr 2 17:53:38:%WS_ALARM-6-INFO:ASSERT INFO Gi0/1 Physical Port Administrative State
Down
*Apr 2 17:53:39:%SYS-6-BOOTTIME:Time taken to reboot after reload = 95 seconds
*Apr 2 17:53:39:%LINEPROTO-5-UPDOWN:Line protocol on Interface GigabitEthernet0/0,
changed state to down
*Apr 2 17:53:39:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet2/0/0, changed
state to down
*Apr 2 17:53:39:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet2/0/1, changed
state to down
*Apr 2 17:53:39:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet2/0/2, changed
state to down
*Apr 2 17:53:39:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet2/0/3, changed
state to down
*Apr 2 17:53:39:%WS_ALARM-6-INFO:ASSERT CRITICAL GBIC Slot 0/1 GBIC is missing
*Apr 2 17:53:40:%LINK-3-UPDOWN:Interface FastEthernet0, changed state to up
*Apr 2 17:53:41:%LINEPROTO-5-UPDOWN:Line protocol on Interface FastEthernet0, changed
state to up
*Apr 2 17:53:50:%FPD_MGMT-6-FPD_UPGRADE_TIME:Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 2/0 = 00:07:00.
*Apr 2 17:53:50:%FPD_MGMT-6-FPD_UPGRADE_START:Data & I/O FPGA (FPD ID=1) image upgrade in
progress for SPA-4FE-7304 card in subslot 2/0. Updating to version 4.17. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:07:00)
...[.....]
(Note:Some output removed for brevity)
.....]
SUCCESS - Completed XSVF execution.

*Apr 2 17:59:16:%FPD_MGMT-6-FPD_UPGRADE_PASSED:Data & I/O FPGA (FPD ID=1) image in the
SPA-4FE-7304 card in subslot 2/0 has been successfully updated from version 4.13 to
version 4.17. Upgrading time = 00:05:26.136
*Apr 2 17:59:16:%FPD_MGMT-6-OVERALL_FPD_UPGRADE:All the attempts to upgrade the required
FPD images have been completed for SPA-4FE-7304 card in subslot 2/0. Number of
successful/failure upgrade(s):1/0.
*Apr 2 17:59:16:%FPD_MGMT-5-CARD_POWER_CYCLE:SPA-4FE-7304 card in subslot 2/0 is being
power cycled for the FPD image upgrade to take effect.

```

```
Router> show hw-module subslot fpd
```

```

=====
Slot Card Description          H/W   Field Programmable   Current   Min. Required
                               Ver.   Device:"ID-Name"    Version   Version
=====
2/0 SPA-4FE-7304              0.32  1-Data & I/O FPGA    4.17     4.17
=====

```

## Incompatible FPD Image Version Detection and Disabled Automatic FPD Image Upgrade Example

The following example displays the output when a SPA requires an FPD upgrade, but the **upgrade fpd auto** command is *disabled*. The SPA is disabled after the OIR insertion or after the system boot and will remain disabled until the FPD incompatibility upgrade is addressed.

```

*Jan 13 22:30:30:%FPD_MGMT-3-INCOMP_FPD_VER:Incompatible 4FE/2GE FPGA (FPD ID=1) image
version detected for SPA-4FE-7304 card in subslot 2/0. Detected version = 4.12, minimal
required version = 4.13. Current HW version = 0.32.
*Jan 13 22:30:30:%FPD_MGMT-4-BYPASS_FPD_AUTO_UPGRADE:Automatic FPD image upgrade is not
enabled, bypassing the image upgrade for SPA-4FE-7304 card in subslot 2/0.

```

```
*Jan 13 22:30:30:%FPD_MGMT-5-CARD_DISABLED:SPA-4FE-7304 card in subslot 2/0 is being
disabled because of incompatible FPD image version. Note that the spa_fpd.122-20.S2.pkg
package will be required if you want to perform the upgrade operation with the "upgrade
hw-module ..." command.
```

## Manual FPD Image Upgrade Example

The following example displays the output from the **upgrade hw-module subslot** command using the manual FPD image upgrade method. In this example, the **hw-module subslot reload** command is then used to reload the router and complete the FPD image upgrade.

```
Router# upgrade hw-module subslot tftp://abrick/muck/luislu/c7304-fpd.122-25.S3.pkg
Loading muck/luislu/c7304-fpd.122-25.S3.pkg from 223.255.254.254 (via FastEthernet0):
!!
!!

% The following FPD(s) will be updated for SPA-4FE-7304 (H/W ver = 0.32) in subslot 5/1:

=====
Field Programmable   Current   Upgrade   Estimated
Device: "ID-Name"    Version   Version   Upgrade Time
=====
1-Data & I/O FPGA    4.12     4.18     00:03:00
=====

% NOTES:
- Use 'show upgrade fpd progress' command to view the progress of the FPD
  upgrade.
- You must reload the card after the upgrade. The FPD upgrade is not
  finalized until the card is reloaded.
- The output of 'show hw-module <target> fpd' will not reflect the
  upgraded FPD version until the card is reloaded to finalize the upgrade.

% Are you sure that you want to perform this operation? [no]: y
% Target card is already disabled, proceeding with upgrade operation without enabling the
card ...

Router#
*Mar 22 14:23:58: %FPD_MGMT-6-UPGRADE_TIME: Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 5/1 = 00:03:00.
*Mar 22 14:23:59: %FPD_MGMT-6-UPGRADE_START: Data & I/O FPGA (FPD ID=1) image upgrade in
progress for SPA-4FE-7304 card in subslot 5/1. Updating to version 4.18. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:03:00) ...

*Mar 22 14:26:06: %FPD_MGMT-6-UPGRADE_PASSED: Data & I/O FPGA (FPD ID=1) image in the
SPA-4FE-7304 card in subslot 5/1 has been successfully updated from version 4.12 to
version 4.18. Upgrading time = 00:02:06.884
*Mar 22 14:26:06: %FPD_MGMT-6-OVERALL_UPGRADE: All the attempts to upgrade the required
FPD images have been completed for SPA-4FE-7304 card in subslot 5/1. Number of
successful/failure upgrade(s): 1/0.
Router#hw-module subslot 5/1 reload
Router#
*Mar 22 14:33:03: %WS_ALARM-6-INFO: ASSERT CRITICAL FastEthernet5/1/0 Physical Port Link
Down
*Mar 22 14:33:03: %WS_ALARM-6-INFO: ASSERT INFO FastEthernet5/1/1 Physical Port
Administrative State Down
*Mar 22 14:33:03: %WS_ALARM-6-INFO: ASSERT INFO FastEthernet5/1/2 Physical Port
Administrative State Down
*Mar 22 14:33:03: %WS_ALARM-6-INFO: ASSERT INFO FastEthernet5/1/3 Physical Port
Administrative State Down
```

# Troubleshooting Problems with FPD Image Upgrades

This section contains information to help troubleshoot problems that can occur during the upgrade process.

## Power Failure or Removal of a SPA During an FPD Image Upgrade

If the FPD upgrade operation is interrupted by a power failure or the removal of the SPA, it could corrupt the FPD image. This corruption of the FPD image file makes the SPA unusable by the router and the system will display the following messages when it tries to power up the SPA:



### Note

To find more information about FPD-related messages, check the system error messages guide for your Cisco IOS software release.

```
00:00:32:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
00:00:47:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
00:01:02:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
00:01:22:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
00:01:37:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
00:01:52:%SPA_OIR-3-SPA_POWERED_OFF:subslot 2/0:SPA SPA-4FE-7304 powered off after 5
failures within 3600 seconds
00:01:52:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK deasserted, SPA_OK deasserted;
attempting recovery
```

The **show hw-module subslot fpd** command can be used to verify that the SPA is using a corrupted FPD image. The following example shows that the SPA in slot 2/0 is unable to identify the FPD image, indicating that the image is probably corrupt. At this point, the automatic upgrade procedure cannot correct the problem. Therefore, you will need to perform a recovery upgrade to the SPA.

```
Router# show hw-module subslot fpd
```

```
==== =====
Slot Card Description          H/W  Field Programmable  Current  Min. Required
Ver.  Device:"ID-Name"     Version  Version
-----
 2/0 SPA-4FE-7304<DISABLED>  ?.?  ??????????????    ?.?     ?.?
-----
 2/1 SPA-2GE-7304           0.15  1-Data & I/O FPGA    4.13    4.13
==== =====
```

## Performing a FPD Recovery Upgrade

The recovery upgrade procedure can only be performed on a SPA that has been powered off by the system after it has failed all of the retries attempted to initialize the SPA.

The following example displays the output of an attempt to perform a recovery upgrade before all the initialization retries have been attempted for the SPA in slot 2/0.

```
Router#
07:23:54:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery
```

```

Router# upgrade hw-module subslot 2/0 file disk0:spa_fpd.122-20.S2.pkg

% Can not get FPD version information for version checking. If a previous upgrade attempt
has failed for the target card, then a recovery upgrade would be required to fix the
failure.

% Do you want to perform the recovery upgrade operation? [no]:y
% Uncompressing the bundle ... [OK]

% The following FPD(s) will be upgraded for card in subslot 2/0 :

=====
Field Programmable   Current      Upgrade     Estimated
Device:"ID-Name"    Version      Version      Upgrade Time
=====
1-Data & I/O FPGA   ?.?         4.13        00:06:30
=====

% Are you sure that you want to perform this operation? [no]:y
% Can not perform recovery upgrade operation because the target card is not in a failed
state. Please try again later.

Router#
07:24:09:%SPA_OIR-3-HW_INIT_TIMEOUT:subslot 2/0:PWR_OK asserted, SPA_OK deasserted;
attempting recovery

```

Once the following error message is displayed, you can perform the recovery upgrade:

**Note**


---

You must wait to see this error message before you attempt the upgrade.

---

```

07:25:15:%SPA_OIR-3-SPA_POWERED_OFF:subslot 2/0:SPA SPA-4FE-7304 powered off after 5
failures within 3600 seconds

```

Perform the manual FPD image upgrade method using the **upgrade hw-module subslot** command to recover from a corrupted image after the SPA has been powered off by the system. In this command, *slot-number* is the slot where the MSC is installed, *subslot-number* is the subslot of the MSC where the SPA is located, and *file-url* is the location of the FPD image package file.

**Note**


---

Before proceeding with this operation, make sure that the correct version of the FPD image package file has been obtained for the corresponding Cisco IOS release that the system is using.

---

The following example displays the console output of a recovery upgrade operation:

```

Router# upgrade hw-module subslot 2/0 file disk0:spa_fpd.122-20.S2.pkg

% Can not get FPD version information for version checking. If a previous upgrade attempt
has failed for the target card, then a recovery upgrade would be required to fix the
failure.

% Do you want to perform the recovery upgrade operation? [no]:y
% Uncompressing the bundle ... [OK]

% The following FPD(s) will be upgraded for card in subslot 2/0 :

```

```

=====
Field Programmable   Current   Upgrade   Estimated
Device:"ID-Name"    Version   Version   Upgrade Time
=====
1-Data & I/O FPGA   ?.?       4.13      00:06:30
=====

% Are you sure that you want to perform this operation? [no]:y
% Proceeding with recovery upgrade operation ...

Router#
07:28:42:%FPD_MGMT-6-FPD_UPGRADE_TIME:Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 2/0 = 00:03:30.
07:28:42:%FPD_MGMT-6-FPD_UPGRADE_START:Unknown FPD (FPD ID=1) image upgrade in progress
for SPA-4FE-7304 card in subslot 2/0. Updating to version 4.13. PLEASE DO NOT INTERRUPT
DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:03:30)
...[.....]
.....(part of the output has been removed for brevity)
.....]
SUCCESS - Completed XSVF execution.

07:34:25:%FPD_MGMT-6-FPD_UPGRADE_PASSED:Unknown FPD (FPD ID=1) image upgrade for
SPA-4FE-7304 card in subslot 2/0 has PASSED. Upgrading time = 00:05:42.692
07:34:25:%FPD_MGMT-6-OVERALL_FPD_UPGRADE:All the attempts to upgrade the required FPD
images have been completed for SPA-4FE-7304 card in subslot 2/0. Number of
successful/failure upgrade(s):1/0.
07:34:25:%FPD_MGMT-5-CARD_POWER_CYCLE:SPA-4FE-7304 card in subslot 2/0 is being power
cycled for the FPD image upgrade to take effect.
Router#

```

## Verifying a Successful Upgrade

After the upgrade process is complete, you can use the **show hw-module subslot fpd** command to verify that the FPD image on the SPA has been successfully upgraded:

```

Router# show hw-module subslot fpd

====
Slot Card Description          H/W   Field Programmable   Current   Min. Required
Ver.   Device:"ID-Name"     Version   Version           Version
====
2/0 SPA-4FE-7304              0.32  1-Data & I/O FPGA    4.13      4.13
-----
2/1 SPA-2GE-7304              0.15  1-Data & I/O FPGA    4.13      4.13
====

```



# CHAPTER 8

## Command Reference

---

This chapter documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference and master index publications.

Commands in this document that have been replaced by new commands continue to perform their normal function in this release but are no longer documented. Support for these commands will cease in a future release.



### Note

Some of the commands in this chapter apply to multiple Cisco products and are supported on different platforms. The documentation for these commands describes differences in syntax and usage for certain platform or product variations. Therefore, when you see multiple forms of syntax, examples, or usage guidelines for a command in this guide, be sure to locate the heading within the command reference page that corresponds to the related SPA (or MSC) for your platform.

---

### New Commands

- [flowcontrol \(Gigabit Ethernet\)](#)
- [debug hw-module subslot](#)
- [debug platform ge-autoneg register](#)
- [debug platform ge-autoneg state](#)
- [show hw-module subslot](#)
- [show hw-module subslot fpd](#)
- [show upgrade fpd file](#)
- [show upgrade fpd package default](#)
- [show upgrade fpd progress](#)
- [show upgrade fpd table](#)
- [test hw-module subslot c2w](#)
- [test hw-module subslot failed](#)
- [test hw-module subslot mac](#)
- [test hw-module subslot mdio](#)
- [test hw-module subslot pause](#)
- [test hw-module subslot phy](#)
- [test hw-module subslot policycram](#)

- test hw-module subslot tcam
- test hw-module subslot temperature
- upgrade fpd auto
- upgrade fpd path
- upgrade hw-module subslot

**Modified Commands**

- bert errors
- bert pattern
- card type (T1/E1)
- card type (T3/E3)
- framing (T1/E1 controller)
- framing (T3 controller)
- framing (T3/E3 interface)
- hw-module subslot reload
- interface
- mac-address
- mdl
- negotiation
- show c7300
- show controllers fastethernet
- show controllers gigabitethernet
- show controllers pos
- show controllers serial
- show diag
- show environment
- show hw-module subslot
- show hw-module subslot fpd
- show hw-module subslot oir
- show interface sdc
- show interfaces fastethernet
- show interfaces gigabitethernet
- show interfaces pos
- show interfaces serial
- show tcam-mgr subslot
- t1 framing
- test tcam-mgr subslot
- ttb

**Other Supported Commands**

- [debug tcam\\_mgr](#)
- [duplex](#)
- [loopback driver](#)
- [loopback mac](#)
- [media-type \(Gigabit Ethernet\)](#)
- [show environment](#)
- [show interfaces fastethernet](#)
- [show interfaces gigabitethernet](#)
- [speed](#)

**Replaced Commands**

| <b>Command Until Cisco IOS Release 12.2(20)S6</b> | <b>Replacement Command in Cisco IOS Release 12.2(20)S6</b> |
|---------------------------------------------------|------------------------------------------------------------|
| show upgrade file                                 | show upgrade fpd file                                      |
| show upgrade package default                      | show upgrade fpd package default                           |
| show upgrade progress                             | show uprade fpd progress                                   |
| show upgrade table                                | show upgrade fpd table                                     |

## flowcontrol (Gigabit Ethernet)

To control whether the pause frames are received on a Gigabit Ethernet interface (NSE100/NSE150 native GIGE ports) or not, use the **[no]flowcontrol receive** command in interface configuration mode.

```
flowcontrol {receive}
```

```
no flowcontrol {receive}
```

### Syntax Description

|                |                                         |
|----------------|-----------------------------------------|
| <b>receive</b> |                                         |
| <b>receive</b> | Configure flowcontrol receive operation |

### Defaults

receive

### Command Modes

Interface configuration

### Command History

| Release      | Modification                                                     |
|--------------|------------------------------------------------------------------|
| 12.2(31)SB14 | This command was integrated into Cisco IOS Release 12.2(31)SB14. |
| 12.2(33)SB2  | This command was integrated into Cisco IOS Release 12.2(33)SB2.  |

### Usage Guidelines

Use the **flowcontrol receive** command to enable or disable the receiving of pause frames on the Native Gigabit Ethernet Ports on the 7304-NSE100/NSE150 processors.

### Examples

The following example configures the first GIGE port on a NSE100.

```
Router(config)#interface gigabitEthernet 0/0
Router(config-if)#flowcontrol receive
Router(config-if)#
// to deactivate
Router(config-if)#no flowcontrol receive
```

| Command                                 | Description                                                                                     |
|-----------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>show interfaces giga-bitethernet</b> | Displays information about the Gigabit Ethernet interfaces. (including flowcontrol information) |

# bert errors

To transmit bert errors while running any bert pattern, use the **bert error** command in interface configuration mode.

**bert errors** [*number*]

|                           |                                                                                                      |
|---------------------------|------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>number</i> (Optional) Range of <b>1-255</b> bert errors that may be introduced in a bert pattern. |
|---------------------------|------------------------------------------------------------------------------------------------------|

|                 |              |
|-----------------|--------------|
| <b>Defaults</b> | Default is 1 |
|-----------------|--------------|

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

| Command History | Release      | Modification                                                                                             |
|-----------------|--------------|----------------------------------------------------------------------------------------------------------|
|                 | 12.1(12c)EX1 | This command was introduced for Cisco 7304 routers.                                                      |
|                 | 12.2(18)S    | This command was introduced on Cisco 7304 routers running Cisco IOS Release 12.2 S.                      |
|                 | 12.2(18)SXE  | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
|                 | 12.0(31)S    | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |
|                 | 12.2(25)S3   | This command was integrated into Cisco IOS Release 12.2(18)SXE.                                          |

|                         |                                                                                                                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | Use this command to test link availability by injecting a fixed number of bert errors when a pattern is running and check that the same number of errors were received on the remote end. |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                                                                                |
|-----------------|--------------------------------------------------------------------------------|
| <b>Examples</b> | This example injects 200 bit errors in a running bit pattern on slot 5, bay 2. |
|-----------------|--------------------------------------------------------------------------------|

```
Router# configure terminal
Router(config)#int serial 5/0/0
Router(config-if)#bert errors 200
```

| Related Commands | Command                       | Description                      |
|------------------|-------------------------------|----------------------------------|
|                  | <b>bert pattern</b>           | Start a BERT pattern on a port.  |
|                  | <b>show controller serial</b> | Displays serial line statistics. |

# bert pattern

To start a BERT pattern on a port, use the **bert pattern** command in interface configuration mode. Use the **no bert pattern** command to stop the sequence.

```
bert pattern {0s | 1s | 2^15 | 2^20 | 2^23 | alt-0-1 | qrss} interval minutes}
```

```
no bert pattern {0s | 1s | 2^15 | 2^20 | 2^23 | alt-0-1 | qrss} interval minutes}
```

## Syntax Description

|                                |                                                                                                       |
|--------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>0s</b>                      | Repeating pattern of zeros (...000...).                                                               |
| <b>1s</b>                      | Repeating pattern of ones (...111...).                                                                |
| <b>2^15</b>                    | Pseudorandom 0.151 test pattern that is 32,768 bits in length.                                        |
| <b>2^20</b>                    | Pseudo-andom 0.153 test pattern that is 1,048,575 bits in length.                                     |
| <b>2^23</b>                    | Pseudorandom 0.151 test pattern that is 8,388,607 bits in length.                                     |
| <b>alt-0-1</b>                 | Repeating pattern of alternating zeros and ones (...01010...).                                        |
| <b>qrss</b>                    | Pseudorandom quasi-random signal sequence (QRSS) 0.151 test pattern that is 1,048,575 bits in length. |
| <b>interval <i>minutes</i></b> | Specifies the length of the BERT test in minutes.                                                     |

## Defaults

Bert is disabled by default.

## Command Modes

Interface 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.                                             |
| 12.1(12c)EX1 | Support for Cisco 7304 routers was added.                                                                |
| 12.2(18)S    | Support for Cisco 7304 routers was added.                                                                |
| 12.2(18)SXE  | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
| 12.0(31)S    | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |
| 12.2(25)S3   | This command was integrated into Cisco IOS Release 12.2(25)S3.                                           |

## Usage Guidelines

Use the **bert pattern** commamd to start or stop a specific bit pattern. To test link availability, start a pattern on one end and put the remote end in network loopback and verify that there are no bert errors.

## Examples

This example starts a bert pattern on slot 5, bay 0.

```
Router# configure terminal  
Router(config)#int serial 5/0/0  
Router(config-if)#bert pattern 0s
```

**Related Commands**

| <b>Command</b>                | <b>Description</b>                                           |
|-------------------------------|--------------------------------------------------------------|
| <b>bert errors</b>            | Transmit bert errors while running any bert pattern.         |
| <b>show controller serial</b> | Displays serial line statistics.                             |
| <b>loopback</b>               | Loopback at various points in the transmit and receive path. |

## card type (T1/E1)

To configure the ports on SPA in T1 or E1 mode, use the **card type** command in global configuration mode. To deselect the card type, use the **no** form of this command.

**card type** {t1 | e1} slot subslot

**no card type** {t1 | e1} slot subslot

### Syntax Description

|                |                                                                                                                                                                                                                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>    | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.        |
| <i>subslot</i> | Secondary slot number on a SPA interface processor (MSC) where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information. |
| t1             | Clear-channel T1 with integrated data service units (DSUs).                                                                                                                                                                                                                                                         |
| e1             | Clear-channel E1 with integrated data service units (DSUs).                                                                                                                                                                                                                                                         |

### Defaults

No default behavior or values. There is no card type when the SPA is inserted for first time. The user must configure this command before they can configure individual ports.

### Command Modes

Global configuration

### Command History

| Release     | Modification                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------|
| 12.0(5)XE   | This command was introduced.                                                                             |
| 12.0(7)T    | This command was integrated into Cisco IOS Release 12.0(7)T.                                             |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                           |

### Usage Guidelines

To change all the SPA ports from T1 or T3 to E1 or E3 (or E3 to T3), you must deselect the card type and then configure the card with the new type of interface.

### Examples

The following example configures all ports of a T3/E3 SPA, seated in slot 5, bay 2, in T3 mode:

```
Router# configure terminal  
Router(config)# card type t3 5 2
```

| <b>Command</b>               | <b>Description</b>                                        |
|------------------------------|-----------------------------------------------------------|
| <b>show interface serial</b> | Displays the serial interface type and other information. |

## card type (T3/E3)

To configure the ports on SPA in T3 or E3 mode, use the **card type** command in global configuration mode. To deselect the card type, use the **no** form of this command.

```
card type {t3 | e3} slot subslot
```

```
no card type {t3 | e3} slot subslot
```

### Syntax Description

|                |                                                                                                                                                                                                                                                                                                              |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>    | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>subslot</i> | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <b>t3</b>      | Clear-channel T3 with integrated data service units (DSUs).                                                                                                                                                                                                                                                  |
| <b>e3</b>      | Clear-channel E3 with integrated data service units (DSUs).                                                                                                                                                                                                                                                  |

### Defaults

No default behavior or values. There is no card type when the SPA is inserted for first time. The user must configure this command before they can configure individual ports.

### Command Modes

Global configuration

### Command History

| Release    | Modification                                                                                                                                                                                                                                       |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12.0(5)XE  | This command was introduced.                                                                                                                                                                                                                       |
| 12.0(7)T   | This command was integrated into Cisco IOS Release 12.0(7)T.                                                                                                                                                                                       |
| 12.1(1)T   | This command was introduced.                                                                                                                                                                                                                       |
| 12.2(11)YT | This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers.                                           |
| 12.2(15)T  | This command was integrated into Cisco IOS Release 12.2(15)T.                                                                                                                                                                                      |
| 12.3(1)    | This command was integrated into Cisco IOS Release 12.3(1) and support was added for Cisco 2610XM, Cisco 2611XM, Cisco 2620XM, Cisco 2621XM, Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3631, Cisco 3660, Cisco 3725, and Cisco 3745 platforms. |
| 12.2S      | This command was integrated into Cisco IOS Release 12.2S.                                                                                                                                                                                          |
| 12.2(25)S3 | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                                                                                                                     |

| Release     | Modification                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------|
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |

### Usage Guidelines

To change all the SPA ports from T3 to E3, you must deselect the **card type** and then configure the card with the new type of interface.

Once a card type is issued, the user can enter the **no card type** command and then another card type command to configure a new card type. The user must save the configuration to NVRAM and reboot the router in order for the new configuration to take effect.

When the router comes up, the software comes up with the new card type. Note that the software will reject the configuration associated with the old controller and old interface. The user will now have to configure the new controller and serial interface and save it.

### Examples

The following example configures all ports of a T3/E3 SPA, seated in slot 5, bay 2, in T3 mode:

```
Router# configure terminal
Router(config)# card type t3 5 2
```

| Command                      | Description                                               |
|------------------------------|-----------------------------------------------------------|
| <b>show interface serial</b> | Displays the serial interface type and other information. |

# debug platform ge-autoneg register

To dump the register information during the auto-negotiation use the debug platform ge-autoneg register command in the Privileged Exec mode.

**debug platform ge-autoneg register**

**no debug platform ge-autoneg register**

|                           |                     |                                                         |
|---------------------------|---------------------|---------------------------------------------------------|
| <b>Syntax Description</b> | <i>register</i>     | To enable debugs for auto-negotiation.                  |
| <b>Command Modes</b>      | Privileged EXEC (#) |                                                         |
| <b>Command History</b>    | <b>Release</b>      | <b>Modification</b>                                     |
|                           | 12.2.(33)SB7        | This command was introduced on the 7304 series routers. |

**Usage Guidelines** The **debug platform ge-autoneg register** command is used to dump the register information during auto-negotiation.

**Examples** The following example shows the register information during auto-negotiation:

```
PE2#debug platform ge-autoneg register
WS Gigabit Ethernet auto-negotiation registers debugging is on

PE2#sh debugging
WS debug subsystem:
  WS Gigabit Ethernet auto-negotiation registers debugging is on

PE2#
*Jan 1 00:03:46.343:   Port-1: pinn_an_no_ack_detect: sync_status:[0x11]
*Jan 1 00:03:46.343:   Port-1: rx_cfg:[0x1E0]
*Jan 1 00:03:46.343:   Port-1: First Read: sync_status:[0x11] rx_cfg:[0x1E0]
*Jan 1 00:03:46.343:   Port-1: Second Read: sync_status:[0x11] rx_cfg:[0x1E0]
*Jan 1 00:03:46.343:   Port-1: gmac_ack_match_word:[0x1E0]
*Jan 1 00:03:46.343: Port-1: gmac_tx_config:[0x1A0]
*Jan 1 00:03:46.343: Port-1: AN_STATE_ABILITY_DETECT
*Jan 1 00:03:46.343:   Port-1: First Read: mac_status:[0x11]rx_cfg:[0x41E0]
rx_cfg_read:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: Second Read: mac_status:[0x11]rx_cfg_read:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: gmac_ability_detect_word:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: pinn_an_ack_detect: macstatus:[0x11]
*Jan 1 00:03:46.343:   Port-1: rxCfg:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: First Read: macstatus:[0x11] rx_cfg_read:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: Second Read: macstatus:[0x11] rx_cfg_read:[0x41E0]
*Jan 1 00:03:46.343:   Port-1: gmac_ack_match_word:[0x41E0]
*Jan 1 00:03:46.363: Port-1: AN_STATE_COMPLETE_ACK
*Jan 1 00:03:46.363: Port-1: AN_STATE_IDLE_DETECT
*Jan 1 00:03:46.383: Port-1: AN_STATE_IDLE_DETECT
*Jan 1 00:03:46.383: Port-1: AN_STATE_LINK_OK
*Jan 1 00:03:46.383:   Port-1: pinn_gmac_is_sync: sync_status:[0x10]
```

```
*Jan 1 00:03:46.383: Port-1: AN_STATE_AN_DONE  
  
PE2#no debug platform ge-autoneg register  
WS Gigabit Ethernet auto-negotiation registers debugging is off
```

# debug platform ge-autoneg state

To dump the state information during the auto-negotiation use the debug platform ge-autoneg state command in the Privileged Exec mode.

**debug platform ge-autoneg state**

**no debug platform ge-autoneg state**

|                           |              |                                        |
|---------------------------|--------------|----------------------------------------|
| <b>Syntax Description</b> | <i>state</i> | To enable debugs for auto-negotiation. |
|---------------------------|--------------|----------------------------------------|

|                      |                     |
|----------------------|---------------------|
| <b>Command Modes</b> | Privileged EXEC (#) |
|----------------------|---------------------|

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                     |
|------------------------|----------------|---------------------------------------------------------|
|                        | 12.2.(33)SB7   | This command was introduced on the 7304 series routers. |

|                         |                                                                                                                   |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Usage Guidelines</b> | The <b>debug platform ge-autoneg state command</b> is used to dump the state information during auto-negotiation. |
|-------------------------|-------------------------------------------------------------------------------------------------------------------|

|                 |                                                                            |
|-----------------|----------------------------------------------------------------------------|
| <b>Examples</b> | The following example shows the state information during auto-negotiation: |
|-----------------|----------------------------------------------------------------------------|

```
PE2#debug platform ge-autoneg state
WS Gigabit Ethernet auto-negotiation states debugging is on

PE2#sh debugging
WS debug subsystem:
  WS Gigabit Ethernet auto-negotiation states debugging is on

*Jan 1 00:04:17.971: Port-1: AN_STATE_AN_ENABLE_RESTART
*Jan 1 00:04:18.003: Port-1: AN_STATE_TX_CAPABILITY
*Jan 1 00:04:18.003: Port-1: AN_STATE_ABILITY_DETECT
*Jan 1 00:04:18.003: Port-1: AN_STATE_ACK_DETECT
*Jan 1 00:04:18.023: Port-1: AN_STATE_COMPLETE_ACK
*Jan 1 00:04:18.023: Port-1: AN_STATE_IDLE_DETECT
*Jan 1 00:04:18.043: Port-1: AN_STATE_IDLE_DETECT
*Jan 1 00:04:18.043: Port-1: AN_STATE_LINK_OK
*Jan 1 00:04:18.043: Port-1: AN_STATE_AN_DONE

PE2#no debug platform ge-autoneg state
WS Gigabit Ethernet auto-negotiation states debugging is off
```

# debug tcam\_mgr

To debug the ternary content addressable memory (TCAM) manager, use the **debug tcam\_mgr** command in privileged EXEC configuration mode.

```
debug tcam_mgr {error | event | profile}
```

```
no debug tcam_mgr {error | event | profile}
```

## Syntax Description

|                |                                                                                                           |
|----------------|-----------------------------------------------------------------------------------------------------------|
| <b>error</b>   | Enables debug messages related to TCAM manager errors.                                                    |
| <b>event</b>   | Enables debug messages for TCAM manager events.                                                           |
| <b>profile</b> | Enables debug messages about the amount of time it takes to add and remove entries from the TCAM regions. |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release    | Modification                                                   |
|------------|----------------------------------------------------------------|
| 12.0 S     | This command was introduced.                                   |
| 12.2(20)S2 | This command was integrated into Cisco IOS Release 12.2(20)S2. |

## Usage Guidelines

The **debug tcam\_mgr** command is intended for use by Cisco Systems technical support personnel.



### Caution

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco Systems technical support personnel. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

## Examples

The following example enables TCAM manager event debug messages. It shows the messages associated with shutting down and restarting an interface on the the 4-Port 10/100 Fast Ethernet SPA located in the top subslot (0) of the MSC that is installed in slot 4 of the Cisco 7304 router:

```
Router# debug tcam_mgr event
TCAM Manager Events debugging is on
Router# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# int fast 4/0/0
Router(config-if)# shut
Router(config-if)#
```

```

4d01h: %LINK-5-CHANGED: Interface FastEthernet4/0/0, changed state to administratively
down
4d01h: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0/0, changed state to
down
Router(config-if)#
Router(config-if)# no shut
Router(config-if)#
4d01h: Freeing VC at 0 from mask at 0
4d01h: Freeing VC at 1 from mask at 0
4d01h: Freeing VC at 0 from mask at 8
4d01h: Found Mbu at offset 0 index 0
4d01h: Allocated mbu at offset 0 index 0, vc_index 0 region 0
4d01h: Found Mbu at offset 0 index 0
4d01h: Allocated mbu at offset 0 index 0, vc_index 1 region 0
4d01h: Found Mbu at offset 0 index 1
4d01h: Allocated mbu at offset 0 index 1, vc_index 0 region 0
4d01h: %LINK-3-UPDOWN: Interface FastEthernet4/0/0, changed state to up
4d01h: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet4/0/0, changed state to
up

```

**Related Commands**

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show controllers fastethernet</b>    | Displays Fasgt 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. |
| <b>show tcam-mgr subslot</b>            | Displays TCAM manager information for SPAs.                                                                                                            |
| <b>test hw-module subslot policynam</b> | Tests the policy table used by the FPGA device for TCAM lookup on a SPA.                                                                               |
| <b>test hw-module subslot tcam</b>      | Tests the TCAM device on a SPA.                                                                                                                        |

# duplex

To configure duplex operation on an interface, use the **duplex** command in interface configuration mode. To return to the default value, 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.                                                                                                                                                                                                                           |
| <b>auto</b> | Enables autonegotiation. 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

For the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router, the default is **auto**.

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                                                                                                  |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 11.2(10)P  | This command was introduced.                                                                                                                  |
| 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                    |
| 12.2(20)S2 | This command was implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

## Usage Guidelines

### General 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 8-2](#) 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 8-1 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. |

**Table 8-1 Relationship Between duplex and speed Commands (continued)**

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

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

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

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

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

#### Usage Guidelines for the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.

The **duplex** command applies to SPA interfaces that are using RJ-45 media. Gigabit Ethernet interfaces using fiber media support full-duplex mode only, and use the **negotiation** command to enable and disable autonegotiation.

To enable the autonegotiation capability on an RJ-45 interface, you must set either the **speed** command or the **duplex** command to **auto**. The default configuration is that both commands are set to **auto**.

Table 8-2 describes the interface behavior for different combinations of the **duplex** and **speed** command settings. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

If you specify both a **duplex** and **speed** setting other than **auto** on an RJ-45 interface, then autonegotiation is disabled for the interface.



#### Note

If you need to force an interface port to operate with certain settings and therefore disable autonegotiation, you must be sure that the remote link is configured with compatible link settings for proper transmission. This includes support of flow control on the link.



#### Note

Every interface on a 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA automatically supports transmission of pause frames to stop packet flow when the MSC is full. You cannot disable flow control for an interface on the 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA. Therefore, flow control support is not configurable, but it is advertised during autonegotiation.

If you disable autonegotiation, then you must be sure that the remote device is configured to support flow control because flow control is automatically enabled for all interfaces on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA.

**Table 8-2 Relationship Between duplex and speed Commands**

| <b>duplex Command</b>                    | <b>speed Command</b>                                     | <b>Resulting System Action</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>duplex auto</b>                       | <b>speed auto</b>                                        | Autonegotiates both speed and duplex mode. The interface advertises capability for the following link settings: <ul style="list-style-type: none"> <li>• 10 Mbps and half duplex</li> <li>• 10 Mbps and full duplex</li> <li>• 100 Mbps and half duplex</li> <li>• 100 Mbps and full duplex</li> <li>• 1000 Mbps and half duplex</li> <li>• 1000 Mbps and full duplex</li> </ul>                                                                                                                                                                                                                                 |
| <b>duplex auto</b>                       | <b>speed 10</b> or <b>speed 100</b> or <b>speed 1000</b> | Autonegotiates the duplex mode. The interface advertises capability for the configured speed with capability for both half-duplex or full-duplex mode. <p>For example, if the <b>speed 100</b> command is configured with <b>duplex auto</b>, then the interface advertises the following capability:</p> <ul style="list-style-type: none"> <li>• 100 Mbps and half duplex</li> <li>• 100 Mbps and full duplex</li> </ul>                                                                                                                                                                                       |
| <b>duplex half</b> or <b>duplex full</b> | <b>speed auto</b>                                        | Autonegotiates the speed. The interface advertises capability for the configured duplex mode with capability for both 10-Mbps and 100-Mbps operation for Fast Ethernet interfaces, and 10-Mbps, 100-Mbps, and 1000-Mbps for Gigabit Ethernet interfaces. <p>For example, if the <b>duplex full</b> command is configured with the <b>speed auto</b> command, then the interface advertises the following capability:</p> <ul style="list-style-type: none"> <li>• 10 Mbps and full duplex</li> <li>• 100 Mbps and full duplex</li> <li>• 1000 Mbps and full duplex (Gigabit Ethernet interfaces only)</li> </ul> |
| <b>duplex half</b>                       | <b>speed 10</b>                                          | Forces 10-Mbps and half-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>duplex full</b>                       | <b>speed 10</b>                                          | Forces 10-Mbps and full-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>duplex half</b>                       | <b>speed 100</b>                                         | Forces 100-Mbps and half-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Table 8-2 Relationship Between duplex and speed Commands (continued)**

| duplex Command     | speed Command     | Resulting System Action                                                                                            |
|--------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>duplex full</b> | <b>speed 100</b>  | Forces 100-Mbps and full-duplex operation, and disables autonegotiation on the interface.                          |
| <b>duplex half</b> | <b>speed 1000</b> | Forces 1000-Mbps and half-duplex operation, and disables autonegotiation on the interface (Gigabit Ethernet only). |
| <b>duplex full</b> | <b>speed 1000</b> | Forces 1000-Mbps and full-duplex operation, and disables autonegotiation on the interface (Gigabit Ethernet only). |

**Examples**

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

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

The following example specifies advertisement of half-duplex support only, and either 10-Mbps or 100-Mbps capability during autonegotiation for the second interface (port 1) on the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
Router# configure terminal
Router(config)# interface fastethernet 2/1/1
Router(config-if)# duplex half
Router(config-if)# speed auto
```

With this configuration, the interface advertises the following capabilities during autonegotiation:

- 10 Mbps and half duplex
- 100 Mbps and half duplex

**Note**

Recall that flow control support is always advertised when autonegotiation is enabled.

**Related Commands**

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>speed</b>                            | Configures the speed for a Fast Ethernet interface.                                                                                                    |
| <b>interface fastethernet</b>           | Selects a particular Fast Ethernet interface for configuration.                                                                                        |
| <b>interface gigabitethernet</b>        | Selects a particular Gigabit Ethernet interface for configuration.                                                                                     |
| <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. |
| <b>show interfaces fastethernet</b>     | Displays information about the Fast Ethernet interfaces.                                                                                               |
| <b>show interfaces gigabitethernet</b>  | Displays information about the Gigabit Ethernet interfaces.                                                                                            |

# framing (T1/E1 controller)

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

## T1 Lines

```
framing {sf | esf}
```

## E1 Lines

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

## T1 Shared Port Adapter

```
framing {sf | esf}
```

```
no framing {sf | esf}
```

## E1 Shared Port Adapter

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

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

### Syntax Description

|                  |                                                                         |
|------------------|-------------------------------------------------------------------------|
| <b>sf</b>        | Specifies super frame as the T1 frame type. This is the default for T1. |
| <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 E1.  |
| <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

**sf** (for a T1 line)  
**no-crc4** (for an E1 line)

### Command Modes

Controller configuration

### Command History

| Release     | Modification                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------|
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                           |

**Usage Guidelines**

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

To return to the default mode on a T1/E1 SPA, use the **no** form of this command. This command does not have a **no** form for other T1/E1 lines.

**Examples**

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

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

**Related Commands**

| Command            | Description                                                                    |
|--------------------|--------------------------------------------------------------------------------|
| <b>cablelength</b> | Specifies the distance of the cable from the routers to the network equipment. |
| <b>linecode</b>    | Selects the linecode type for T1 or E1 line.                                   |

# framing (T3 controller)

To choose framing mode on a T3 port, use the **framing** command in controller configuration mode. To return to the default mode, use the **no** form of this command.

## T3 Controllers

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

**no framing**

## T3/E3 Shared Port Adapters and the Cisco 7500 Series Routers with CT3IP Port Adapter

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

**no framing**

| Syntax Description | auto-detect | Specifies detection of the framing type that it receives from the far-end equipment. |
|--------------------|-------------|--------------------------------------------------------------------------------------|
|                    | c-bit       | Specifies that C-bit framing is used as the T3 framing type.                         |
|                    | m23         | Specifies that M23 framing is used as the T3 framing type.                           |

## Defaults

**c-bit** (for T3 and most T3 controllers)

**auto-detect** (for the CT3IP in a Cisco 7500 series router)

## Command Modes

Controller configuration

## Command History

| Release     | Modification                                                                                                                                                                                                    |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.1CA      | This command was introduced.                                                                                                                                                                                    |
| 12.2(11)YT  | This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for T3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers. |
| 12.2(15)T   | This command was integrated into Cisco IOS Release 12.2(15)T.                                                                                                                                                   |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                                                                                                                       |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router.                                                                                                        |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                                                                                                   |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                                                                                  |

## Usage Guidelines

Use the **framing** command to set the framing mode on the T3/E3 port.

**Examples**

The following example sets the framing mode on a T3 interface.

```
Router# configure terminal
Router(config)# controller t1 6/0/0
Router(config-controller)# framing m23
```

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

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

**Related Commands**

| <b>Command</b>         | <b>Description</b>                                                              |
|------------------------|---------------------------------------------------------------------------------|
| <b>controller</b>      | Configures a T1, E1, or T3 controller and enters controller configuration mode. |
| <b>show controller</b> | Displays controller configuration.                                              |

## framing (T3/E3 interface)

To choose framing mode on a T3 port, use the **framing** command in interface configuration mode. To return to the default mode, use the **no** form of this command.

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

```
no framing { bypass | c-bit | m13 }
```

To choose framing mode on an E3 port, use the **framing** command in interface configuration mode. To return to the default mode, use the **no** form of this command.

```
framing { bypass | g751 | g832 }
```

```
no framing { bypass | g751 | g832 }
```

### Syntax Description

|               |                                 |
|---------------|---------------------------------|
| <i>bypass</i> | Bypasses DS3 framing mode.      |
| <i>c-bit</i>  | Enables DS3 C-bit framing mode. |
| <i>m13</i>    | Enables DS3 M13 framing mode.   |
| <i>g751</i>   | Enables E3 G.751 framing mode.  |
| <i>g832</i>   | Enables E3 G.832 framing mode.  |

### Defaults

T3: C-bit framing

E3: g751 framing

### Command Modes

Interface configuration

### Command History

| Release     | Modification                                                                                                                                                      |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.1        | This command was introduced.                                                                                                                                      |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                                                                         |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. The <b>g832</b> keyword option was added to the command. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                                                     |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                                    |

### Usage Guidelines

Use the **framing** command to set the framing mode on the T3 port.

### Examples

The following example sets the framing mode on the first port on slot 5.

```
Router# configure terminal
Router(config)# interface serial 5/0/0
```

```
Router(config-if)# framing bypass
```

**Related Commands**

| <b>Command</b>                | <b>Description</b>               |
|-------------------------------|----------------------------------|
| <b>show controller serial</b> | Displays serial line statistics. |

# hw-module subslot reload

To restart a shared port adapter (SPA) and its interfaces, use the **hw-module subslot reload** command in privileged EXEC configuration mode. The command does not have a **no** form.

## **hw-module subslot** *slot/subslot* **reload**

### Syntax Description

|                 |                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>     | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i> | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |

### Defaults

No default behavior or values

### Command Modes

Privileged EXEC

### Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(25)S3 | This command was introduced. |

### Usage Guidelines

The **hw-module subslot reload** command stops and starts power to the SPA. This command is useful when you want to restart all interfaces on a SPA.

The command is recommended to restart a SPA under some of the following conditions:

- To restart a SPA after it has been powered off because of a failure.
- To recover from corrupted messaging between the route processor (RP) and the MSC.

### Examples

The following command power cycles the SPA in subslot 2 of the MSC installed in chassis slot 13:

```
Router# hw-module subslot 13/2 reload
```

```
SLOT 13/0: 00:27:08: %SCC-2-PROTO_HW: Module (13/2/-1) is a registered proto-type for Cisco Lab use only, and not certified for live network operation.
```

| Command                           | Description                               |
|-----------------------------------|-------------------------------------------|
| <b>show hw-module subslot oir</b> | Displays the operational status of a SPA. |

# interface

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

## Standard Syntax

```
interface type number [name-tag]
```

## Analysis Module Network Module

```
interface analysis-module slot/unit
```

## Content Engine Network Module

```
interface content-engine slot/unit
```

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

```
interface type slot/port
```

## Cisco 7200 VXR Router used as a Router Shelf in a Cisco AS5800 Universal Access Server

```
interface type router-shelf/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
```

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]
```

## Shared Port Adapters

```
interface type slot/subslot/port[.subinterface-number]
```

| Syntax Description                 |  |                                                                                                                                                                                                                                                                                                                              |
|------------------------------------|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>type</i>                        |  | Type of interface to be configured. See <a href="#">Table 8-3</a> .                                                                                                                                                                                                                                                          |
| <i>number</i>                      |  | Port, connector, or interface card number. On Cisco 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, 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 server configurations can be entered.<br><br>This optional argument is for use with the Redundant Link Manager (RLM) feature.                                                                                                      |
| <i>slot</i>                        |  | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                 |
| <i>lsubslot</i>                    |  | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                    |
| <i>lunit</i>                       |  | Number of the daughter card on the network module. For analysis module and content engine (CE) network modules, always use 0.                                                                                                                                                                                                |
| <i>lport</i>                       |  | Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                                           |
| <i>router-shelf</i>                |  | Router shelf number in a Cisco AS5800 universal access server. Refer to the appropriate hardware manual for router shelf information.                                                                                                                                                                                        |
| <i>:channel-group</i>              |  | Channel group number. Cisco 7500 series routers specify the channel group number in the range of 0 to 4 defined with the <b>channel-group</b> controller configuration command.                                                                                                                                              |
| <i>lport-adapter</i>               |  | Port adapter number. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                                              |
| <i>.subinterface-number</i>        |  | Subinterface number in the range 1 to 4294967293. The number that precedes the period (.) must match the number to which this subinterface belongs.                                                                                                                                                                          |
| <b>multipoint   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 implemented on the Cisco 4000 series routers.                                                     |
| 12.0(3)T   | The optional <i>name-tag</i> argument was added for the RLM feature.                                               |
| 12.2(13)T  | The <b>content-engine</b> keyword was added.                                                                       |
| 12.2(15)T  | The <b>lex</b> keyword was removed because the LAN Extension feature is no longer available in Cisco IOS software. |
| 12.3(7)T   | The <b>analysis-module</b> keyword was added.                                                                      |
| 12.2(20)S2 | This command was implemented for SPAs on the Cisco 7304 router.                                                    |

**Usage Guidelines**

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

Subinterfaces can be configured to support partially meshed Frame Relay networks. Refer to the “Configuring Serial Interfaces” chapter in the *Cisco IOS Interface and Hardware Component Configuration Guide*.

[Table 8-3](#) displays the keywords that represent the types of interfaces that can be configured with the **interface** command. Replace the *type* argument with the appropriate keyword from the table.

**Table 8-3 Interface Type Keywords**

| Keyword                | Interface Type                                                                                                                                                                                                                                                                                                                                                       |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>analysis-module</b> | Analysis module interface. The analysis module interface is a Fast Ethernet interface on the router that connects to the internal interface on the Network Analysis Module (NAM). This interface cannot be configured for subinterfaces or for speed, duplex mode, and similar parameters. See the command-line interface (CLI) help for a list of valid parameters. |
| <b>async</b>           | Port line used as an asynchronous interface.                                                                                                                                                                                                                                                                                                                         |
| <b>atm</b>             | ATM interface.                                                                                                                                                                                                                                                                                                                                                       |
| <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>content-engine</b>  | Content engine (CE) network module interface. The CE network module interface cannot be configured for subinterfaces or for speed, duplex mode, and similar parameters. See the command-line interface (CLI) help for a list of valid parameters. The <b>content-engine</b> keyword was formerly documented as the <b>interface content-engine</b> command.          |
| <b>dialer</b>          | Dialer interface.                                                                                                                                                                                                                                                                                                                                                    |
| <b>ethernet</b>        | Ethernet IEEE 802.3 interface.                                                                                                                                                                                                                                                                                                                                       |

**Table 8-3 Interface Type Keywords (continued)**

| Keyword                | Interface Type                                                                                                                                                                                                                                                                                                            |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>fastethernet</b>    | 100-Mbps Ethernet interface. The <b>fastethernet</b> keyword was formerly documented as the <b>interface fastethernet</b> command.                                                                                                                                                                                        |
| <b>fddi</b>            | FDDI interface.                                                                                                                                                                                                                                                                                                           |
| <b>gigabitethernet</b> | 1000-Mbps Ethernet interface. The <b>gigabitethernet</b> keyword was formerly documented as the <b>interface gigabitethernet</b> command.                                                                                                                                                                                 |
| <b>group-async</b>     | Master asynchronous interface. The <b>group-async</b> keyword was formerly documented as the <b>interface group-async</b> command.                                                                                                                                                                                        |
| <b>hssi</b>            | High-Speed Serial Interface (HSSI).                                                                                                                                                                                                                                                                                       |
| <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>number</i> argument is the number of the loopback interface that you want to create or configure. There is no limit on the number of loopback interfaces that you can create. |
| <b>null</b>            | Null interface.                                                                                                                                                                                                                                                                                                           |
| <b>port-channel</b>    | Port channel interface. The <b>port-channel</b> keyword was formerly documented as the <b>interface port-channel</b> command.                                                                                                                                                                                             |
| <b>pos</b>             | Packet OC-3 interface on the Packet-over-SONET (POS) interface processor. The <b>pos</b> keyword was formerly documented as the <b>interface pos</b> command.                                                                                                                                                             |
| <b>sdcc</b>            | Section data communications channel interface.                                                                                                                                                                                                                                                                            |
| <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> argument is the number of the tunnel interface that you want to create or configure. There is no limit on the number of tunnel interfaces that you can create.                                                                                                   |
| <b>vg-anylan</b>       | 100VG-AnyLAN port adapter. The <b>vg-anylan</b> keyword was formerly documented as the <b>interface vg-anylan</b> command.                                                                                                                                                                                                |

**Using the analysis-module Keyword**

The analysis module interface is used to access the NAM console for the initial configuration. After the NAM IP parameters are configured, the analysis module interface is typically used only during NAM software upgrades and while troubleshooting if the NAM Traffic Analyzer is inaccessible.

Visible only to the Cisco IOS software on the router, the analysis module interface is an internal Fast Ethernet interface on the router that connects to the internal NAM interface. The analysis module interface is connected to the router's Peripheral Component Interconnect (PCI) backplane, and all configuration and management of the analysis module interface must be performed from the Cisco IOS CLI.

### Using the **group-async** Keyword

Using the **group-async** keyword, you create a single asynchronous interface with 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.

### Using the **port-channel** Keyword

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. You can configure the port-channel interface as you would 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 **port-channel** keyword, consider the following points:

- 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.

### Using the **vg-anylan** Keyword

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.

## Examples

### Serial Interface Example

The following example shows how to configure serial interface 0 with PPP encapsulation:

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

```
Router(config-if)# encapsulation ppp
```

### Loopback Interface Example

The following example shows how to enable 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 10.108.1.1 255.255.255.0
```

### Cisco 7500 Series Router Ethernet Interface Processor Example

The following example shows how to configure Ethernet port 4 on the Ethernet Interface Processor (EIP) in slot 2 on the Cisco 7500 series router:

```
Router(config)# interface ethernet 2/4
```

### Cisco 7500 Series Router Token Ring Interface Example

The following example shows how to configure the Token Ring interface processor in slot 1 on port 0 of a Cisco 7500 series router:

```
Router(config)# interface tokenring 1/0
```

### Network Analysis Module Interface Example

The following example configures an analysis module interface when the NAM router is in router slot 1:

```
Router(config)# interface analysis-module 1/0
```

### Content Engine Network Module Interface Example

The following example configures an interface for a content engine network module in slot 1:

```
Router(config)# interface content-engine 1/0
```

### Cisco 4700 Series Router Fast Ethernet Interface Example

The following example shows how to configure Fast Ethernet interface 0 for standard ARPA encapsulation (the default setting) on a Cisco 4700 series router:

```
Router(config)# interface fastethernet 0
```

### Gigabit Ethernet Interface Example

The following example shows how to configure the Gigabit Ethernet interface for slot 0, port 0:

```
Router(config)# interface gigabitethernet 0/0
```

### Asynchronous Group Master Interface Example

The following example shows how to define asynchronous group master interface 0:

```
Router(config)# interface group-async 0
```

### Port Channel Interface Example

The following example shows how to create a port-channel interface with a channel group number of 1 and adds two 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-if)# exit
Router(config)# interface fastethernet 1/0/0
Router(config-if)# channel-group 1
Router(config-if)# exit
Router(config)# interface fastethernet 4/0/0
Router(config-if)# channel-group 1
```

### Packet over SONET Interface Example

The following example shows how to specify the single Packet OC-3 interface on port 0 of the POS OC-3 port adapter in slot 2:

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

### 100VG-AnyLAN Interface Example

The following example shows how to specify the 100VG-AnyLAN port adapter in the first port adapter in slot 1:

```
Router(config)# interface vg-anylan 1/0/0
```

### Frame Relay Subinterface Example

The following example shows how to configure a partially meshed Frame Relay network. In this example, subinterface serial 0.1 is configured as a multipoint subinterface with two associated Frame Relay permanent virtual connections (PVCs), 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-if)# exit
Router(config)# interface serial 0/0.1 multipoint
Router(config-if)# ip address 10.108.10.1 255.255.255.0
Router(config-if)# frame-relay interface-dlci 42 broadcast
Router(config-if)# frame-relay interface-dlci 53 broadcast
Router(config-if)# exit
Router(config)# interface serial 0/0.2 point-to-point
Router(config-if)# ip address 10.108.11.1 255.255.255.0
Router(config-if)# frame-relay interface-dlci 59 broadcast
```

### T1 Serial Interface Example

The following example shows how to configure circuit 0 of a T1 link for PPP encapsulation:

```
Router(config)# controller t1 4/1
Router(config-controller)# circuit 0 1
Router(config-controller)# exit
Router(config)# interface serial 4/1:0
Router(config-if)# ip address 10.108.13.1 255.255.255.0
Router(config-if)# encapsulation ppp
```

### SDCC Interface on a POS Shared Port Adapter Example

The following example configures the first interface (port 0) as a section data communications channel (SDCC) interface on a POS SPA, where the SPA is installed in the top subslot (0) of the MSC, and the MSC is installed in slot 4 of the Cisco 7304 router:

```
Router(config)# interface sdcc 4/3/0
Router(config-if)# ip address 10.1.9.2 255.255.255.0
Router(config-if)# logging event link-status
Router(config-if)# load-interval 30
Router(config-if)# no keepalive
Router(config-if)# no fair-queue
Router(config-if)# no cdp enable
```

### Shared Port Adapter Interface Example

The following example configures the second interface (port 1) on a 4-Port 10/100 Fast Ethernet SPA for standard ARPA encapsulation (the default setting), where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router:

```
Router(config)# interface fastethernet 2/1/1
```

| Related Commands | Command                                  | Description                                                                                              |
|------------------|------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                  | <b>channel-group</b>                     | Defines the timeslots that belong to each T1 or E1 circuit.                                              |
|                  | <b>channel-group (Fast EtherChannel)</b> | Assigns a Fast Ethernet interface to a Fast EtherChannel group.                                          |
|                  | <b>clear interface</b>                   | Resets the hardware logic on an interface.                                                               |
|                  | <b>controller</b>                        | Configures an E1, J1, T1, or T3 controller and enters controller configuration mode.                     |
|                  | <b>group-range</b>                       | Creates a list of asynchronous interfaces that are associated with a group interface on the same device. |
|                  | <b>mac-address</b>                       | Sets the MAC layer address.                                                                              |
|                  | <b>ppp</b>                               | Starts an asynchronous connection using PPP.                                                             |
|                  | <b>show controllers content-engine</b>   | Displays controller information for CE network modules.                                                  |
|                  | <b>show interfaces</b>                   | Displays information about interfaces.                                                                   |
|                  | <b>show interfaces content-engine</b>    | Displays basic interface configuration information for a CE network module.                              |
|                  | <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.                                                  |

## loopback (T3/E3 interface)

To loopback at various points in the transmit and receive path, use the **loopback** command in interface configuration mode. To stop the loopback, use the **no** form of this command.

### PA-T3 Port Adapter

```
loopback {dte | local | network {line | payload} | remote}
```

```
no loopback
```

### PA-E3 Port Adapter

```
loopback {dte | local | network {line | payload}}
```

```
no loopback
```

### T3/E3 Shared Port Adapters

```
loopback {dte | local | dual | network {line | payload} | remote}
```

```
no loopback {dte | local | dual | network {line | payload} | remote}
```

| Syntax Description              |  |                                                                                                                                            |
|---------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------|
| <i>dte</i>                      |  | Loopback after the line interface unit (LIU) towards the terminal.                                                                         |
| <i>local</i>                    |  | Loopback after going through the framer toward the terminal.                                                                               |
| <i>dual</i>                     |  | Sets both local loopback and network line loopback.                                                                                        |
| <b>network {line   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> ). |
| <i>remote</i>                   |  | Sends FEAC to set remote in loopback.                                                                                                      |

**Defaults** No loopback by default.

**Command Modes** Interface configuration

| Command History | Release    | Modification                                                                                                                                                                                                    |
|-----------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 11.1       | This command was introduced.                                                                                                                                                                                    |
|                 | 11.3       | This command was introduced.                                                                                                                                                                                    |
|                 | 12.2(11)YT | This command was integrated into Cisco IOS Release 12.2(11)YT and implemented on the following platforms for E3: Cisco 2650XM, Cisco 2651XM, Cisco 2691, Cisco 3660 series, Cisco 3725, and Cisco 3745 routers. |
|                 | 12.2(15)T  | This command was integrated into Cisco IOS Release 12.2(15)T.                                                                                                                                                   |
|                 | 12.2S      | This command was integrated into Cisco IOS Release 12.2S.                                                                                                                                                       |

| Release     | Modification                                                                                                                                |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. The <b>dual</b> keyword was added. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                               |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                              |

### Usage Guidelines

Use the **loopback** command to diagnose problems on the local port, between the framer and the line interface unit (LIU) level.

### Examples

The following example creates a loopback on slot 5, bay 0 after the LIU towards the terminal.

```
Router# configure terminal
Router(config)# interface serial 5/0/0
Router(config-if)# loopback dte
```

# loopback driver

To enable internal loopback at the PHY device or transceiver level on a Gigabit Ethernet interface, use the **loopback driver** command in interface configuration mode. To disable loopback, use the **no** form of this command.

**loopback driver**

**no loopback driver**

## Syntax Description

|               |                                                               |
|---------------|---------------------------------------------------------------|
| <b>driver</b> | Enables internal loopback at the PHY device on the interface. |
|---------------|---------------------------------------------------------------|

## Defaults

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                                                          |
|------------|-------------------------------------------------------------------------------------------------------|
| 11.2       | This command was introduced.                                                                          |
| 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                            |
| 12.2(20)S2 | This command was implemented on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

## Usage Guidelines

You can use the **loopback driver** and **loopback mac** interface configuration commands with the 2-Port 10/100/1000 Gigabit Ethernet SPA. These commands do not apply to the 4-Port 10/100 Fast Ethernet SPA.

To properly enable internal loopback, you must disable autonegotiation.

## Examples

The following example configures the second interface (port 1) on a 2-Port 10/100/1000 Gigabit Ethernet SPA to loop data back at the PHY device, where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router. The **no negotiation auto** interface configuration command disables autonegotiation for a fiber interface:

```
Router(config)# interface gigabitethernet 2/1/1
Router(config-if)# no negotiation auto
Router(config-if) loopback driver
```

## Related Commands

| Command                                | Description                                                  |
|----------------------------------------|--------------------------------------------------------------|
| <b>loopback mac</b>                    | Enables internal loopback at the MAC device on an interface. |
| <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces.  |

# loopback mac

To enable internal loopback at the MAC device on a Gigabit Ethernet interface, use the **loopback mac** command in interface configuration mode. To disable loopback, use the **no** form of this command.

**loopback mac**

**no loopback mac**

| Syntax Description | mac | Enables internal loopback at the MAC device on the interface. |
|--------------------|-----|---------------------------------------------------------------|
|--------------------|-----|---------------------------------------------------------------|

| Defaults | No default behavior or values |
|----------|-------------------------------|
|----------|-------------------------------|

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

| Command History | Release    | Modification                                                                                          |
|-----------------|------------|-------------------------------------------------------------------------------------------------------|
|                 | 11.2       | This command was introduced.                                                                          |
|                 | 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                            |
|                 | 12.2(20)S2 | This command was implemented on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

**Usage Guidelines** You can use the **loopback mac** and **loopback driver** interface configuration commands with the 2-Port 10/100/1000 Gigabit Ethernet SPA. These commands do not apply to the 4-Port 10/100 Fast Ethernet SPA.

To properly enable internal loopback, you must disable autonegotiation.

**Examples** The following example configures the second interface (port 1) on a 2-Port 10/100/1000 Gigabit Ethernet SPA to loop data back at the MAC device, where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router. The **no negotiation auto** interface configuration command disables autonegotiation for a fiber interface:

```
Router(config)# interface gigabitethernet 2/1/1
Router(config-if)# no negotiation auto
Router(config-if) loopback mac
```

| Related Commands | Command                                | Description                                                                       |
|------------------|----------------------------------------|-----------------------------------------------------------------------------------|
|                  | <b>loopback driver</b>                 | Enables internal loopback at the PHY device or transceiver level on an interface. |
|                  | <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces.                       |

# mac-address

To modify the default MAC address of an interface to some user-defined address, use the **mac-address** command in interface configuration mode. To return to the default MAC address on the interface, use the **no** form of this command.

**mac-address** *ieee-address*

**no mac-address** *ieee-address*

## Syntax Description

|                     |                                                                                       |
|---------------------|---------------------------------------------------------------------------------------|
| <i>ieee-address</i> | 48-bit IEEE MAC address written as a dotted triple of four-digit hexadecimal numbers. |
|---------------------|---------------------------------------------------------------------------------------|

## Defaults

The interface uses a default MAC address that is derived from the base address stored in the electrically erasable programmable read-only memory (EEPROM) on the backplane of the Cisco 7304 router.

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                                                                                                  |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 10.0       | This command was introduced.                                                                                                                  |
| 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                    |
| 12.2(20)S2 | This command was implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

## Usage Guidelines

Be sure that no other interface on the network is using the MAC address that you assign.

## Examples

The following example changes the default MAC address on the interface to 1111.2222.3333:

```
Router# configure terminal
Router(config)# interface fastethernet 2/1/1
Router(config-if)# mac-address 1111.2222.3333
```

## Related Commands

| Command                                | Description                                                 |
|----------------------------------------|-------------------------------------------------------------|
| <b>show interfaces fastethernet</b>    | Displays information about the Fast Ethernet interfaces.    |
| <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces. |

# mdl

To configure the Maintenance Data Link (MDL) message defined in the ANSI T1.107a-1990 specification, use the **mdl** command in controller configuration mode.

```
mdl [string {eic | fic | generator | lic | pfi | port | unit}string] [transmit {idle-signal | path | test-signal}]
```

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

## Syntax Description

|                                       |                                                                                                           |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>string eic</b> <i>string</i>       | Specifies the Equipment Identification Code; can be up to 10 characters.                                  |
| <b>string fic</b> <i>string</i>       | Specifies the Frame Identification Code; can be up to 10 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.    |
| <b>string lic</b> <i>string</i>       | Specifies the Location Identification Code; can be up to 11 characters.                                   |
| <b>string pfi</b> <i>string</i>       | Specifies the Path 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 unit</b> <i>string</i>      | Specifies the Unit Identification Code; can be up to 6 characters.                                        |
| <b>transmit idle-signal</b>           | Enables MDL Idle-Signal message transmission.                                                             |
| <b>transmit path</b>                  | Enables MDL Path message transmission.                                                                    |
| <b>transmit test-signal</b>           | Enables MDL Test-Signal message transmission.                                                             |

## Defaults

No default behavior or values

## Command Modes

Controller configuration

## Command History

| Release     | Modification                                                                                                                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.3        | This command was introduced.                                                                                                                                                                             |
| 12.1(13)EX  | This command was introduced on the Cisco 7304 router.                                                                                                                                                    |
| 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(18)S   | This command was introduced on Cisco 7304 routers running Cisco IOS Release 12.2 S.                                                                                                                      |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router.                                                                                                 |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                                                                                            |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                                                                           |

**Usage Guidelines**

Use the **mdl** command to send msgs in maintenance data link in T3 c-bit framing mode.

**Examples**

The following example sends a test signal on the maintenance data link.

```
Router# configure terminal
Router(config)#controller t3 5/0/0
Router(config-controller)#mdl transmit test-signal
```

**Related Commands**

| <b>Command</b>                 | <b>Description</b>                                                              |
|--------------------------------|---------------------------------------------------------------------------------|
| <b>controller</b>              | Configures a T1, E1, or T3 controller and enters controller configuration mode. |
| <b>show controllers serial</b> | Displays serial line statistics.                                                |

# media-type (Gigabit Ethernet)

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

```
media-type { rj45 | gbic }
```

```
no media-type { rj45 | gbic }
```

| Syntax Description | Command     | Description                                                                                                              |
|--------------------|-------------|--------------------------------------------------------------------------------------------------------------------------|
|                    | <b>rj45</b> | Specifies an RJ-45 physical connection. This is the default.                                                             |
|                    | <b>gbic</b> | Specifies a Gigabit Interface Converter (GBIC) or small-form factor pluggable (SFP) physical connection for fiber media. |

| Defaults | Default Value |
|----------|---------------|
|          | <b>rj45</b>   |

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

| Command History | Release    | Modification                                                                                          |
|-----------------|------------|-------------------------------------------------------------------------------------------------------|
|                 | 12.1 E     | This command was introduced.                                                                          |
|                 | 12.2(14)S  | This command was integrated into Cisco IOS Release 12.2(14)S.                                         |
|                 | 12.2(20)S2 | This command was implemented on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

**Usage Guidelines** Use the **media-type** interface configuration command to modify the default physical media connection type from **rj45** to **gbic**, to configure a Gigabit Ethernet interface to support fiber media using a GBIC or small form-factor pluggable (SFP) optical transceiver.

RJ-45 is the only media type supported by the 4-Port 10/100 Fast Ethernet SPA on the Cisco 7304 router is RJ-45, so the **media-type** command does not apply.

**Examples** The following example configures the second interface (port 1) on a 2-Port 10/100/1000 Gigabit Ethernet SPA for a fiber SFP, where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router:

```
Router(config)# interface gigabitethernet 2/1/1
Router(config-if) media-type gbic
```

| Related Commands | Command                                | Description                                                 |
|------------------|----------------------------------------|-------------------------------------------------------------|
|                  | <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces. |

# negotiation

To enable advertisement of speed and duplex mode, and flow control on a Gigabit Ethernet interface, 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.<br><br><b>Note</b> This keyword is not supported on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |
| <b>auto</b>   | Enables the autonegotiation protocol to configure 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          | The command was integrated into Cisco IOS Release 12.1 E and implemented on the Cisco 7200-I/O-GE+E controller.                                   |
| 12.1(5)T           | This command was integrated into Cisco IOS Release 12.1(5)T.                                                                                      |
| 12.2(20)S2         | This command was implemented on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. The <b>forced</b> keyword is not supported. |

## Usage Guidelines

The **negotiation** command is applicable to the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E and interfaces on the 2-Port 10/100/1000 Gigabit Ethernet SPA that are using fiber media. The **negotiation auto** command is used instead of the **duplex** and **speed** commands (which are used on Ethernet and Fast Ethernet interfaces, and interfaces on the 2-Port 10/100/1000 Gigabit Ethernet SPA that are using RJ-45 media) to automatically configure the duplex and speed settings of the interfaces.

The **negotiation forced** command is used to configure the Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E to be 1000/full-duplex only and to disable flow control. The **negotiation forced** command is not supported by the 2-Port 10/100/1000 Gigabit Ethernet SPA.

The Gigabit Ethernet interface of the Cisco 7200-I/O-GE+E and the interfaces on the 2-Port 10/100/1000 Gigabit Ethernet SPA that are using fiber media are restricted to 1000 Mbps/full duplex only. Autonegotiation advertises and negotiates only to these values.

---

**Examples**

The following example enables the second interface (port 1) on a 2-Port 10/100/1000 Gigabit Ethernet SPA for autonegotiation, where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router:

```
Router(config)# interface gigabitethernet 2/1/1  
Router(config-if) media-type gbic  
Router(config-if) negotiation auto
```

The following example disables the second interface (port 1) on a 2-Port 10/100/1000 Gigabit Ethernet SPA for autonegotiation, where the SPA is installed in the bottom subslot (1) of the MSC, and the MSC is installed in slot 2 of the Cisco 7304 router:

```
Router(config)# interface gigabitethernet 2/1/1  
Router(config-if) no negotiation auto
```

---

**Related Commands**

| <b>Command</b>                         | <b>Description</b>                                          |
|----------------------------------------|-------------------------------------------------------------|
| <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces. |

---

# show c7300

To display the types and status of cards (NSEs, line cards, MSCs, and SPAs) installed in a Cisco 7300 series router, use the **show c7300** command in privileged EXEC configuration mode.

**show c7300**

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

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                                                                                 |
|-----------------|------------|----------------------------------------------------------------------------------------------|
|                 | 12.1(9)EX  | This command was introduced.                                                                 |
|                 | 12.2(18)S  | This command was integrated into Cisco IOS Release 12.2 S on the Cisco 7300 series routers.  |
|                 | 12.2(20)S2 | The command output was modified to provide status on MSCs and SPAs on the Cisco 7304 router. |

**Usage Guidelines** This command displays the types and status of cards (NSEs and line cards) installed in a Cisco 7300 series router. This command also displays whether your system is in compliance with line card configuration guidelines.

On the Cisco 7304 router, the command provides information about any modular services cards (MSCs) or shared port adapters (SPAs) that are installed.

For NSEs and line cards, empty slots are not displayed in the output. However, for SPAs, several status values are reported, including an empty subslot, which is reported as “missing.”

**Examples** The following example displays information about a Cisco 7304 router with an NSE-100, MSC-100s, and 4-Port 10/100 Fast Ethernet SPAs:

```
Router# show c7300
Slot      Card Type          Status      Insertion time
----      -
0,1       NSE100             Active      00:45:29 ago
2         7304-MSC-100       Active      00:44:36 ago
3         7304-MSC-100       Active      00:44:36 ago
4         7304-MSC-100       Active      00:44:36 ago
5         7304-MSC-100       Active      00:14:39 ago
```

The FPGA versions for the cards listed above are current

Shared Port Adapter information:

```
Slot/Subslot SPA Type          Status      Insertion time
-----
```

```

2/0          SPA-4FE-7304      ok          00:44:36 ago
2/1          SPA-4FE-7304      ok          00:44:36 ago
3/0          SPA-4FE-7304      ok          00:44:35 ago
3/1          not present      missing     never
4/0          SPA-4FE-7304      ok          00:44:35 ago
4/1          SPA-4FE-7304      ok          00:44:35 ago
5/0          SPA-4FE-7304      ok          00:14:36 ago
5/1          SPA-4FE-7304      ok          00:14:36 ago

```

```

Network IO Interrupt Throttling:
  throttle count=1, timer count=1
  active=0, configured=1
  netint usec=3999, netint mask usec=200

```

Table 8-4 provides a description for each of the possible status fields for SPAs.

**Table 8-4 SPA Status Field Descriptions**

| Status Field for SPAs | Description                                                                         |
|-----------------------|-------------------------------------------------------------------------------------|
| booting               | SPA is initializing.                                                                |
| failed                | SPA is powered off due to five automatic recovery failures.                         |
| FW mismatch           | An FPGA version mismatch with the Cisco IOS software has been detected for the SPA. |
| missing               | SPA is not present in the MSC subslot.                                              |
| not allowed online    | SPA is not supported.                                                               |
| ok                    | SPA is operational.                                                                 |
| stopped               | SPA is deactivated by the <b>hw-module subslot stop</b> command.                    |
| unknown               | SPA is in unrecognizable state.                                                     |

#### Related Commands

| Command                          | Description                                                                                                                                                                                                                                       |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show diag</b>                 | Displays hardware information for any slot or the chassis.                                                                                                                                                                                        |
| <b>show version</b> <sup>1</sup> | Displays the configuration of the system hardware, the number of each interface type installed, the Cisco IOS software version, the names and sources of configuration files, and the boot images. Displays the configuration of the ROM monitor. |

1. Refer to the Cisco IOS Release 12.2 command reference and master index publications.

# show controllers fastethernet

To display Fast Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables, use the **show controllers fastethernet** command in privileged EXEC configuration mode.

**show controllers fastethernet slot/subslot/port [detail]**

| Syntax Description |                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>        | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>lsubslot</i>    | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>lport</i>       | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                           |
| <b>detail</b>      | Specifies display of additional low-level diagnostic information.                                                                                                                                                                                                                                                       |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                                                                                                                                 |
|-----------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 11.2       | This command was introduced.                                                                                                                 |
|                 | 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                   |
|                 | 12.2(20)S2 | This command was implemented on the 4-Port 10/100 Fast Ethernet SPA on the Cisco 7304 router and introduced a new address format and output. |

**Usage Guidelines** The output from the **show controllers fastethernet** command for the 4-Port 10/100 Fast Ethernet SPA provides several different sections of information and statistics that are organized according to the internal hardware devices and the various paths in the flow of data on the SPA. The following sections are provided:

- Interface configuration information—[Table 8-5 on page 8-50](#)
- Media Access Control (MAC) device counters—[Table 8-6 on page 8-51](#)
- Field programmable gate array (FPGA) device counters—[Table 8-7 on page 8-52](#)

- SPA carrier card counters—[Table 8-8 on page 8-53](#)
- SPA error counters—[Table 8-9 on page 8-54](#)
- MAC destination address filtering table—[Table 8-10 on page 8-55](#)
- Virtual LAN (VLAN) filtering table—[Table 8-11 on page 8-56](#)
- Platform details (including Parallel Express Forwarding [PXF] information)—[Table 8-12 on page 8-57](#)

Several areas of the output are generally useful for diagnostic tasks performed by Cisco Systems technical support personnel only.

### Examples

The following is sample output from the **show controllers fastethernet** command for the first interface (port 0) on a 4-Port 10/100 Fast Ethernet SPA that is located in the top subslot (0), of the MSC that is installed in slot 4 on a Cisco 7304 router:

```
Router# show controllers fastethernet 4/0/0
Interface FastEthernet4/0/0
  Hardware is SPA-4FE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 100 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD Pause capable (Asymmetric)
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD Pause capable
MAC counters:
  Input: packets = 15, bytes = 1776
        FIFO full/reset removed = 0, error drop = 0
  Output: packets = 18, bytes = 2622
         FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 15, TCAM drops: 4
        Satisfy (host-backpressure) drops: 0, CRC drops: 0
        PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 11, bytes = 1476, drops = 0
  Output: packets = 18, bytes = 2550, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
SPA Error counters:
  SPI4 TX out of frame error = 2 (00:02:31 ago)
  SPI4 TX Train valid error = 1 (00:02:11 ago)
  SPI4 TX DIP4 error = 1 (00:01:30 ago)
  SPI4 RX out of frame error = 1 (00:00:36 ago)
  SPI4 RX DIP2 error = 1 (00:00:13 ago)
MAC destination address filtering table:
  Table entries: Total = 512, Used = 4, Available = 508
  Index MAC destination address      Mask
  -----
  1      0007.0ed3.ba80                ffff.ffff.ffff
  2      ffff.ffff.ffff                ffff.ffff.ffff
```

```

3      0100.0000.0000      0100.0000.0000
4      0100.0ccc.cccc      ffff.ffff.ffff
VLAN filtering table:
Number of VLANs configured on this interface = 0
Table entries: Total = 1024, Used = 2, Available = 1022
Index  VLAN identifier  Enabled  Tunnel
-----
1      0                No       No
2      0                Yes      No
Platform details:
  PXF tif number: 0x10

```

Table 8-5 describes the fields shown in the interface configuration section of the display. This section is useful for verifying the status of autonegotiation and configured parameters on the link, and the amount of traffic being handled by the interface.

**Table 8-5** *show controllers Command Field Descriptions—Interface Section*

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface                   | Name of the interface.                                                                                                                                                                                                                                                                                                                                                          |
| Hardware                    | Type of hardware.                                                                                                                                                                                                                                                                                                                                                               |
| Connection mode             | Indicator of autonegotiation used to establish the connection.                                                                                                                                                                                                                                                                                                                  |
| Link                        | State of the link.                                                                                                                                                                                                                                                                                                                                                              |
| Configuration               | Configuration of the speed and duplex operation on the interface.                                                                                                                                                                                                                                                                                                               |
| Selected media-type         | Interface port media type. RJ-45 is the only type supported on the 4-Port 10/100 Fast Ethernet SPA.                                                                                                                                                                                                                                                                             |
| Promiscuous mode            | State of promiscuous mode (on or off). When promiscuous mode is on, the SPA disables MAC destination address and VLAN filtering. When promiscuous mode is off, the SPA enables MAC destination address and VLAN filtering.                                                                                                                                                      |
| VLAN filtering              | Status of ternary content addressable memory (TCAM) filtering of VLANs (enabled or disabled). By default, the SPA always enables VLAN filtering.<br><br>The SPA disables VLAN filtering if the TCAM table is full, or if the SPA is operating in promiscuous mode.<br><br><b>Note</b> VLAN filtering is not enabled or disabled using any command-line interface (CLI) command. |
| MDI crossover status        | State of the media dependent interface (MDI) for the PHY device on the specified interface. The possible values are MDI for straight-through cables or media dependent interface crossover (MDI-X) for crossover cables.                                                                                                                                                        |
| Auto-negotiation            | State of autonegotiation (enabled or disabled) on the interface and its current status.                                                                                                                                                                                                                                                                                         |
| Speed/duplex is resolved to | Results of autonegotiated parameter values (speed and duplex) currently being used on the link.                                                                                                                                                                                                                                                                                 |

**Table 8-5** *show controllers Command Field Descriptions—Interface Section (continued)*

| Field                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Advertised capabilities | <p>List of the possible combinations of speed and duplex modes (in <i>speed/duplex</i> format) and flow control that the local interface has advertised it supports to the remote device:</p> <ul style="list-style-type: none"> <li>• For speed—10M is 10 Mbps, and 100M is 100 Mbps.</li> <li>• For duplex—HD is half duplex, and FD is full duplex.</li> <li>• For flow control—“Pause capable (Asymmetric)” means that the SPA advertises support of the PAUSE flow control bit and the ASM_DIR (asymmetric) flow control bit.</li> </ul>                                                                                                                    |
| Partner capabilities    | <p>List of the possible combinations of speed and duplex modes (in <i>speed/duplex</i> format) and flow control that the remote device has advertised it supports to the local interface:</p> <ul style="list-style-type: none"> <li>• For speed—10M is 10 Mbps, and 100M is 100 Mbps.</li> <li>• For duplex—HD is half duplex, and FD is full duplex.</li> <li>• For flow control—“Pause capable” means that the remote device supports implementation of the PAUSE flow control bit; “Pause capable (Asymmetric)” means that the remote device supports implementation of the PAUSE flow control bit and the ASM_DIR (asymmetric) flow control bit.</li> </ul> |

**Table 8-6** describes the fields shown in the MAC counters section of the display. This section is useful for verifying the status of packets processed by the MAC device for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-6** *show controllers Command Field Descriptions—MAC Counters Section*

| Field                          | Description                                                                                                                                                                                                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: packets, bytes          | <p>Total number of packets and bytes received by the MAC device for the interface since it was activated or cleared.</p> <p>You can clear these counters using the <b>clear counters</b> privileged EXEC command.</p>    |
| Input: FIFO full/reset removed | <p>Total number of packets removed by the MAC device due to a first-in, first-out (FIFO) overflow condition in the input buffer for the interface.</p>                                                                   |
| Input: error drop              | <p>Total number of input packets with errors that are dropped by the MAC device for the interface.</p>                                                                                                                   |
| Output: packets, bytes         | <p>Total number of packets and bytes transmitted by the MAC device for the interface since it was activated or cleared.</p> <p>You can clear these counters using the <b>clear counters</b> privileged EXEC command.</p> |

**Table 8-6** *show controllers Command Field Descriptions—MAC Counters Section (continued)*

| Field                           | Description                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Output: FIFO full/reset removed | Total number of packets removed by the MAC device due to a first-in, first-out (FIFO) overflow condition in the output buffer for the interface. |
| Output: error drop              | Total number of output packets with errors that are dropped by the MAC device for the interface.                                                 |
| Total pause frames              | Total number of Ethernet 802.3x pause frames transmitted and received by the MAC device for flow control on the interface.                       |

Table 8-7 describes the fields shown in the FPGA counters section of the display. This section is useful for verifying the status of packets processed by the FPGA device for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-7** *show controllers Command Field Descriptions—FPGA Counters Section*

| Field                                    | Description                                                                                                                                                                                                                                                                                                           |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: Total (good & bad) packets        | Total number of packets received by the FPGA device in the ingress direction for the interface.                                                                                                                                                                                                                       |
| Input: TCAM drops                        | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to a ternary content addressable memory (TCAM) lookup failure. This counter increments when the interface receives a frame with a destination MAC address or VLAN identifier that is not present in the TCAM table. |
| Input: Satisfy (host-backpressure) drops | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to back-pressure from the MSC.                                                                                                                                                                                      |
| Input: CRC drops                         | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to cyclic redundancy check (CRC) errors.                                                                                                                                                                            |
| Input: PL3 RERRs                         | Total number of packets with errors received for the interface by the FPGA device in the ingress direction over the System Packet Interface Level 3 (SPI3) (also called PL3) path from the MAC device to the FPGA device.                                                                                             |
| Output: EOP (SPI4) errors                | Total number of packets with end-of-packet (EOP) errors received by the FPGA device in the egress direction for the interface over the System Packet Interface Level 4 (SPI4) path from the MSC to the FPGA device.                                                                                                   |

Table 8-8 describes the fields shown in the SPA carrier card counters section of the display. This section is useful for verifying the status of packets processed by the MSC for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-8** *show controllers Command Field Descriptions—SPA Carrier Card Counters Section*

| Field                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: packets, bytes, drops  | Total number of packets, bytes, and packet drops that have occurred on the SPI4 path from the FPGA device to the MSC.                                                                                                                                                                                                                                                                                                                   |
| Output: packets, bytes, drops | Total number of packets, bytes, and packet drops that have occurred on the SPI4 path from the MSC to the FPGA device.                                                                                                                                                                                                                                                                                                                   |
| Egress flow control status    | Status of flow control between the MSC and the Route Processor (RP). The possible values are: <ul style="list-style-type: none"> <li>• XON—A control frame has been sent by the MSC to the RP to indicate that the MSC is ready to accept data.</li> <li>• XOFF—A control frame has been sent by the MSC to the RP to indicate congestion on the MSC. The MSC cannot accept any more data from the RP during this condition.</li> </ul> |
| General errors                | Total number of errors (such as parity) on the MSC in the ingress and egress direction.                                                                                                                                                                                                                                                                                                                                                 |
| SPI4 errors: ingress dip4     | Total number of 4-bit Diagonal Interleaved Parity (DIP4) errors in the ingress direction on the SPI4 path from the FPGA device to the MSC.<br><br>DIP4 is a parity algorithm where a 4-bit odd parity is computed diagonally over control and data words.                                                                                                                                                                               |
| SPI4 errors: egress dip2      | Total number of 2-bit Diagonal Interleaved Parity (DIP2) errors in the egress direction on the SPI4 path from the FPGA device to the MSC.<br><br>DIP2 is a parity algorithm where a 2-bit odd parity is computed diagonally over status words.                                                                                                                                                                                          |

[Table 8-9](#) describes the fields shown in the SPA error counters section of the display. This section appears only when one of the SPI4 transmit or receive errors occurs on the interface. This information is useful for Cisco Systems technical support personnel.

**Note**

None of the SPA SPI4 error counters appear in **show controllers fastethernet** command output until at least one of those types of SPI4 errors occurs.

All of the errors in the SPA error counters section are subject to the SPA automatic recovery process when certain thresholds are reached.

**Table 8-9** *show controllers Command Field Descriptions—SPA Error Counters Section*

| Field                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPI4 TX out of frame error =<br>(hh:mm:ss ago) | <p>Number of SPI4 out-of-frame errors (events) detected in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>This error indicates a loss of synchronization between the synchronization block and the data received on the SPI4 path. When synchronization is reacquired, the error no longer occurs.</p> |
| SPI4 TX Train valid error =<br>(hh:mm:ss ago)  | <p>Number of times that a low-level synchronization problem was detected in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p>                                                                                                                                                                                |
| SPI4 TX DIP4 error =<br>(hh:mm:ss ago)         | <p>Number of 4-bit Diagonal Interleaved Parity (DIP4) errors in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>DIP4 is a parity algorithm where a 4-bit odd parity is computed diagonally over control and data words.</p>                                                                             |
| SPI4 RX out of frame error =<br>(hh:mm:ss ago) | <p>Number of SPI4 out-of-frame errors (events) detected in the receive direction (from the network), from the SPA FPGA device to the MSC. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>This error indicates a loss of synchronization between the synchronization block and the data received on the SPI4 path. When synchronization is reacquired, the error no longer occurs.</p>    |
| SPI4 RX DIP2 error =<br>(hh:mm:ss ago)         | <p>Number of 2-bit Diagonal Interleaved Parity (DIP2) errors in the receive direction (from the network), from the SPA FPGA device to the MSC. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>DIP2 is a parity algorithm where a 2-bit odd parity is computed diagonally over status words.</p>                                                                                          |

**Table 8-10** describes the fields shown in the MAC destination address filtering table section of the display. This section is useful for verifying the multicast destination addresses that are in the TCAM table and permitted by the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-10** *show controllers Command Field Descriptions—MAC Destination Address Filtering Table Section*

| Field                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Table entries: Total, Used, Available | <p>Total number of MAC destination address entries possible in the TCAM table for the interface, the number of table entries currently used by the interface, and the number of table entries that remain available.</p> <p>The 4-Port 10/100 Fast Ethernet SPA supports a 512-entry MAC filtering table for each supported interface (2048 entries total on the card).</p>                                                                                                                                                                                   |
| Index                                 | Table entry identifier.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| MAC destination address               | <p>MAC destination address (multicast) permitted by the interface and used in the TCAM lookup table for packet filtering.</p> <p>The multicast MAC entries typically come from routing protocols [such as Open Shortest Path First (OSPF) and Enhanced IGRP (EIGRP)], and other protocols including the Hot Standby Router Protocol (HSRP).</p> <p>When the router reloads, three addresses appear by default in the MAC filtering table: the unicast address of the local interface, the Ethernet broadcast address, and the Ethernet multicast address.</p> |
| Mask                                  | Mask for the corresponding destination address. The SPA uses the bits that are set in the mask to look up the address in the TCAM table.                                                                                                                                                                                                                                                                                                                                                                                                                      |

[Table 8-11](#) describes the fields shown in the VLAN filtering table section of the display. This section is useful for verifying the VLANs that are in the TCAM table and are permitted by the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-11** *show controllers Command Field Descriptions—VLAN Filtering Table Section*

| <b>Field</b>                                 | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of VLANs configured on this interface | <p>Number of VLANs that are configured on the interface.</p> <p>If the number of VLANs configured on the interface is 1022 or less, then the VLAN filtering table also shows an index entry for every VLAN ID. The number of VLANs configured on the interface can be 0, while the number of used table entries reports 2, because the SPA always uses two entries to provide valid matching criteria for promiscuous mode and non-VLAN packets.</p> |
| Table entries: Total, Used, Available        | <p>Total number of VLAN entries possible in the TCAM filtering table for the interface, the number of table entries currently used by the interface (two are always in use by default), and the number of table entries that remain available.</p> <p>The 4-Port 10/100 Fast Ethernet SPA supports a 1024-entry VLAN filtering table for each supported interface (4096 entries total on the card).</p>                                              |
| Index                                        | Table entry identifier.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| VLAN identifier                              | <p>Number of the VLAN. Two VLAN ID 0 entries always appear in the table and represent the local interface port for handling of promiscuous mode and non-VLAN packets.</p> <p>Other VLAN entries appear in this table when VLANs are configured on the interface.</p>                                                                                                                                                                                 |

**Table 8-11** *show controllers Command Field Descriptions—VLAN Filtering Table Section*

| Field   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enabled | <p>Status of the VLAN ID for TCAM filtering, with the following possible values:</p> <ul style="list-style-type: none"> <li>• No—The entry is disabled for filtering.</li> <li>• Yes—The entry is enabled for filtering.</li> </ul> <p>The TCAM filter uses the “first-match” rule to filter packets that the SPA receives against entries in the table. The matching assessment begins at the top of the table with the VLAN ID 0 entries.</p> <p><b>Note</b> The SPA always supports two VLAN ID 0 entries. The first VLAN ID 0 entry of the TCAM table is used for promiscuous mode. It has a value of “No,” meaning it is disabled, whenever promiscuous mode is disabled for the interface. The second VLAN ID 0 entry is used for filtering of non-VLAN packets.</p> |
| Tunnel  | <p>Status of tunneling for the interface, with the following possible values:</p> <ul style="list-style-type: none"> <li>• No—Tunneling is disabled and the SPA performs MAC destination address filtering.</li> <li>• Yes—Tunneling is enabled and the SPA does not perform MAC destination address filtering.</li> </ul> <p><b>Note</b> If promiscuous mode is enabled, then the first VLAN ID 0 entry shows tunnel = Yes. All other VLAN ID entries show tunnel = No.</p>                                                                                                                                                                                                                                                                                               |

[Table 8-12](#) describes the fields shown in the Platform details section of the display.

**Table 8-12** *show controllers Command Field Descriptions—Platform Details Section*

| Field          | Description                                                                                                                                                                          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PXF tif number | Number of the interface (in hexadecimal format) used for PXF on the network services engine (NSE) or by the Hyper Transport (HT) FPGA device on the network processing engine (NPE). |

**Related Commands**

| Command                             | Description                                              |
|-------------------------------------|----------------------------------------------------------|
| <b>show interfaces fastethernet</b> | Displays information about the Fast Ethernet interfaces. |

# show controllers gigabitethernet

To display Gigabit Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables, use the **show controllers gigabitethernet** command in privileged EXEC configuration mode.

**show controllers gigabitethernet** *slot/subslot/port* [**detail**]

| Syntax Description |                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>        | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>lsubslot</i>    | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>lport</i>       | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                           |
| <b>detail</b>      | Specifies display of additional low-level diagnostic information.                                                                                                                                                                                                                                                       |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                                                                                                                               |
|-----------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 11.2       | This command was introduced.                                                                                                               |
|                 | 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                 |
|                 | 12.2(20)S2 | This command was implemented on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router with a new address format and output. |

**Usage Guidelines** The output from the **show controllers gigabitethernet** command for the 2-Port 10/100/1000 Gigabit Ethernet SPA provides several different sections of information and statistics that are organized according to the internal hardware devices and the various paths in the flow of data on the SPA. The following sections are provided:

- Interface configuration information—Table 8-13 on page 8-61
- Media Access Control (MAC) device counters—Table 8-14 on page 8-62
- Field Programmable Gate Array (FPGA) device counters—Table 8-15 on page 8-63

- SPA carrier card counters—Table 8-16 on page 8-64
- SPA error counters—Table 8-17 on page 8-65
- MAC destination address filtering table—Table 8-18 on page 8-66
- Virtual LAN (VLAN) filtering table—Table 8-19 on page 8-67
- Platform details, including Parallel Express Forwarding (PXF) information—Table 8-20 on page 8-68

Several areas of the output are generally useful for diagnostic tasks performed by technical support only.

### Examples

The following is sample output from the **show controllers gigabitethernet** command for the first RJ-45 interface (port 0) in a 2-Port 10/100/1000 Gigabit Ethernet SPA located in the top subslot (0) of the MSC that is installed in slot 5 on a Cisco 7304 router. This output also shows the SPA Error counters section that appears only if one of the types of SPI4 errors occurs on the interface:

```
Router# show controllers gigabitethernet 5/0/0
Interface GigabitEthernet5/0/0
  Hardware is SPA-2GE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is RJ45
  Promiscuous mode is off, VLAN filtering is enabled
  MDI crossover status: MDIX
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 1000 Mbps, full duplex
    Advertised capabilities: 10M/HD 10M/FD 100M/HD 100M/FD 1000M/HD 1000M/FD
                          Pause capable (Asymmetric)
    Partner capabilities: 10M/HD 10M/FD 100M/HD 100M/FD 1000M/FD Pause capable
MAC counters:
  Input: packets = 0, bytes = 0
        FIFO full/reset removed = 0, error drop = 0
  Output: packets = 1, bytes = 64
         FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 0, TCAM drops: 0
        Satisfy (host-backpressure) drops: 0, CRC drops: 0
        PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 0, bytes = 0, drops = 0
  Output: packets = 1, bytes = 60, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
SPA Error counters:
  SPI4 TX out of frame error = 2 (00:02:31 ago)
  SPI4 TX Train valid error = 1 (00:02:11 ago)
  SPI4 TX DIP4 error = 1 (00:01:30 ago)
  SPI4 RX out of frame error = 1 (00:00:36 ago)
  SPI4 RX DIP2 error = 1 (00:00:13 ago)
MAC destination address filtering table:
  Table entries: Total = 1024, Used = 3, Available = 1021
  Index MAC destination address      Mask
  -----
  1      00b0.64ff.5aa0                ffff.ffff.ffff
```

## show controllers gigabitethernet

```

2      ffff.ffff.ffff      ffff.ffff.ffff
3      0100.0000.0000      0100.0000.0000
VLAN filtering table:
Number of VLANs configured on this interface = 0
Table entries: Total = 2048, Used = 2, Available = 2046
Index  VLAN identifier  Enabled  Tunnel
-----  -
1      0                  No       No
2      0                  Yes      No
Platform details:
  PXF tif number: 0x10

```

The following is sample output from the **show controllers gigabitethernet** command for the first fiber interface (port 0) in a 2-Port 10/100/1000 Gigabit Ethernet SPA located in the bottom subslot (1) of the MSC that is installed in slot 4 on a Cisco 7304 router:

```

Router# show controllers gigabitethernet 4/1/0
Interface GigabitEthernet4/1/0
  Hardware is SPA-2GE-7304
  Connection mode is auto-negotiation
  Interface state is up, link is up
  Configuration is Auto Speed, Auto Duplex
  Selected media-type is GBIC, GBIC type is 1000BaseSX
  SFP is present, LOS: no, Tx fault: no, Security check status: Pass
  Promiscuous mode is off, VLAN filtering is enabled
  MDI configuration is automatic crossover, status is MDI
  Auto-negotiation configuration and status:
    Auto-negotiation is enabled and is completed
    Speed/duplex is resolved to 1000 Mbps, full duplex
    Advertised capabilities: 1000BaseX/FD Pause capable (Asymmetric)
    Partner capabilities: 1000BaseX/FD Pause capable(Asymmetric)
MAC counters:
  Input: packets = 213, bytes = 21972
        FIFO full/reset removed = 0, error drop = 0
  Output: packets = 216, bytes = 22932
        FIFO full/reset removed = 0, error drop = 0
  Total pause frames: transmitted = 0, received = 0
FPGA counters:
  Input: Total (good & bad) packets: 213, TCAM drops: 183
        Satisfy (host-backpressure) drops: 0, CRC drops: 0
        PL3 RERRs: 0
  Output: EOP (SPI4) errors: 0
SPA carrier card counters:
  Input: packets = 30, bytes = 10140, drops = 0
  Output: packets = 216, bytes = 22068, drops = 0
  Egress flow control status: XON
  Per bay counters:
  General errors: input = 0, output = 0
  SPI4 errors: ingress dip4 = 0, egress dip2 = 0
MAC destination address filtering table:
Table entries: Total = 1024, Used = 4, Available = 1020
Index  MAC destination address      Mask
-----  -
1      0007.0ed3.ba88                  ffff.ffff.ffff
2      ffff.ffff.ffff                  ffff.ffff.ffff
3      0100.0000.0000                  0100.0000.0000
4      0100.0ccc.cccc                  ffff.ffff.ffff
VLAN filtering table:
Number of VLANs configured on this interface = 0
Table entries: Total = 2048, Used = 2, Available = 2046
Index  VLAN identifier  Enabled  Tunnel
-----  -
1      0                  No       No

```

```

2          0          Yes    No
Platform details:
  PXF tif number: 0x14

```

Table 8-13 describes the fields shown in the interface configuration section of the display. This section is useful for verifying the status of autonegotiation and configured parameters on the link, and the amount of traffic being handled by the interface.

**Table 8-13** *show controllers Command Field Descriptions—Interface Section*

| Field                 | Description                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interface             | Name of the interface.                                                                                                                                                                                                                                                                                                                                                          |
| Hardware              | Type of hardware.                                                                                                                                                                                                                                                                                                                                                               |
| Connection mode       | Indicator of autonegotiation used to establish the connection.                                                                                                                                                                                                                                                                                                                  |
| Link                  | State of the link.                                                                                                                                                                                                                                                                                                                                                              |
| Configuration         | Configuration of the speed and duplex operation on the interface.                                                                                                                                                                                                                                                                                                               |
| Selected media-type   | Interface port media type: RJ45 or Gigabit Interface Converter (GBIC).                                                                                                                                                                                                                                                                                                          |
| GBIC type is          | GBIC interface type: 1000BaseSX, 1000BaseLX, or 1000BaseZX                                                                                                                                                                                                                                                                                                                      |
| SFP is                | Indicates presence of an SFP optical transceiver.                                                                                                                                                                                                                                                                                                                               |
| LOS                   | Indicates whether or not the SFP detects a loss of signal (LOS).                                                                                                                                                                                                                                                                                                                |
| Tx fault              | Indicates whether or not the SFP detects a transmission fault.                                                                                                                                                                                                                                                                                                                  |
| Security check status | Indicates whether or not the SFP passes the security check. The SPA enables a security check by default to verify whether a Cisco-approved SFP is inserted. If the SFP is not a Cisco-approved device, the link is brought down.                                                                                                                                                |
| Promiscuous mode      | State of promiscuous mode (on or off). When promiscuous mode is on, the SPA disables MAC destination address and VLAN filtering. When promiscuous mode is off, the SPA enables MAC destination address and VLAN filtering.                                                                                                                                                      |
| VLAN filtering        | Status of ternary content addressable memory (TCAM) filtering of VLANs (enabled or disabled). By default, the SPA always enables VLAN filtering.<br><br>The SPA disables VLAN filtering if the TCAM table is full, or if the SPA is operating in promiscuous mode.<br><br><b>Note</b> VLAN filtering is not enabled or disabled using any command-line interface (CLI) command. |
| MDI crossover status  | State of the media dependent interface (MDI) for the PHY device on the specified interface. The possible values are MDI for straight-through cables or media dependent interface crossover (MDI-X) for crossover cables.                                                                                                                                                        |
| Auto-negotiation      | State of autonegotiation (enabled or disabled) on the interface and its current status.                                                                                                                                                                                                                                                                                         |

**Table 8-13** show controllers Command Field Descriptions—Interface Section (continued)

| Field                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Speed/duplex is resolved to | Results of autonegotiated parameter values (speed and duplex) currently being used on the link.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Advertised capabilities     | List of the possible combinations of speed and duplex modes (in <i>speed/duplex</i> format) and flow control that the local interface has advertised it supports to the remote device: <ul style="list-style-type: none"> <li>For speed—10M is 10 Mbps, 100M is 100 Mbps, and 1000M is 1000 Mbps.</li> <li>For duplex—HD is half duplex, and FD is full duplex.</li> <li>For flow control—“Pause capable (Asymmetric)” means that the SPA advertises support of the PAUSE flow control bit and the ASM_DIR (asymmetric) flow control bit.</li> </ul>                                                                                                                    |
| Partner capabilities        | List of the possible combinations of speed and duplex modes (in <i>speed/duplex</i> format) and flow control that the remote device has advertised it supports to the local interface: <ul style="list-style-type: none"> <li>For speed—10M is 10 Mbps, 100M is 100 Mbps, and 1000M is 1000 Mbps.</li> <li>For duplex—HD is half duplex, and FD is full duplex.</li> <li>For flow control—“Pause capable” means that the remote device supports implementation of the PAUSE flow control bit; “Pause capable (Asymmetric)” means that the remote device supports implementation of the PAUSE flow control bit and the ASM_DIR (asymmetric) flow control bit.</li> </ul> |

Table 8-14 describes the fields shown in the MAC counters section of the display. This section is useful for verifying the status of packets processed by the MAC device for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-14** show controllers Command Field Descriptions—MAC Counters Section

| Field                          | Description                                                                                                                                                                                                    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: packets, bytes          | Total number of packets and bytes received by the MAC device for the interface since it was activated or cleared.<br><br>You can clear these counters using the <b>clear counters</b> privileged EXEC command. |
| Input: FIFO full/reset removed | Total number of packets removed by the MAC device due to a first-in, first-out (FIFO) overflow condition in the input buffer for the interface.                                                                |
| Input: error drop              | Total number of input packets with errors that are dropped by the MAC device for the interface.                                                                                                                |

**Table 8-14** *show controllers Command Field Descriptions—MAC Counters Section (continued)*

| Field                           | Description                                                                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output: packets, bytes          | Total number of packets and bytes transmitted by the MAC device for the interface since it was activated or cleared.<br><br>You can clear these counters using the <b>clear counters</b> privileged EXEC command. |
| Output: FIFO full/reset removed | Total number of packets removed by the MAC device due to a first-in, first-out (FIFO) overflow condition in the output buffer for the interface.                                                                  |
| Output: error drop              | Total number of output packets with errors that are dropped by the MAC device for the interface.                                                                                                                  |
| SPI3: disabled port drop        | Total number of packets dropped by the MAC device at the System Packet Interface Level 3 (SPI3) path between the MAC device and FPGA device due to a disabled port condition.                                     |
| SPI3: sync error drop           | Total number of packets dropped by the MAC device at the SPI3 path between the MAC device and FPGA device due to a sync error (synchronization bits altered) condition.                                           |
| SPI3: short packet drop         | Total number of packets dropped by the MAC device at the SPI3 path between the MAC device and FPGA device due to a short packet (packet length is less than 64 bytes) condition.                                  |
| SPI3: parity error drop         | Total number of packets dropped by the MAC device at the path between the MAC device and FPGA device due to a parity error (parity bit is altered during data transmission) condition.                            |
| Total pause frames              | Total number of Ethernet 802.3x pause frames transmitted and received by the MAC device for flow control on the interface.                                                                                        |

[Table 8-15](#) describes the fields shown in the FPGA counters section of the display. This section is useful for verifying the status of packets processed by the FPGA device for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-15** *show controllers Command Field Descriptions—FPGA Counters Section*

| Field                                    | Description                                                                                                                                                                                                                                                                                                           |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: Total (good & bad) packets        | Total number of packets received by the FPGA device in the ingress direction for the interface.                                                                                                                                                                                                                       |
| Input: TCAM drops                        | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to a ternary content addressable memory (TCAM) lookup failure. This counter increments when the interface receives a frame with a destination MAC address or VLAN identifier that is not present in the TCAM table. |
| Input: Satisfy (host-backpressure) drops | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to back-pressure from the MSC.                                                                                                                                                                                      |

**Table 8-15** *show controllers Command Field Descriptions—FPGA Counters Section (continued)*

| Field                     | Description                                                                                                                                                                                                         |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: CRC drops          | Total number of packets dropped by the FPGA device in the ingress direction for the interface due to cyclic redundancy check (CRC) errors.                                                                          |
| Input: PL3 RERRs          | Total number of packets with errors received for the interface by the FPGA device in the ingress direction over the SPI3 (PL3) path from the MAC device to the FPGA device.                                         |
| Output: EOP (SPI4) errors | Total number of packets with end-of-packet (EOP) errors received by the FPGA device in the egress direction for the interface over the System Packet Interface Level 4 (SPI4) path from the MSC to the FPGA device. |

Table 8-16 describes the fields shown in the SPA carrier card counters section of the display. This section is useful for verifying the status of packets processed by the MSC for the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-16** *show controllers Command Field Descriptions—SPA Carrier Card Counters Section*

| Field                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input: packets, bytes, drops  | Total number of packets, bytes, and packet drops that have occurred on the SPI4 path from the FPGA device to the MSC.                                                                                                                                                                                                                                                                                                               |
| Output: packets, bytes, drops | Total number of packets, bytes, and packet drops that have occurred on the SPI4 path from the MSC to the FPGA device.                                                                                                                                                                                                                                                                                                               |
| Egress flow control status    | Status of flow control between the MSC and the Route Processor (RP). The possible values are: <ul style="list-style-type: none"> <li>XON—A control frame has been sent by the MSC to the RP to indicate that the MSC is ready to accept data.</li> <li>XOFF—A control frame has been sent by the MSC to the RP to indicate congestion on the MSC. The MSC cannot accept any more data from the RP during this condition.</li> </ul> |
| General errors                | Total number of errors (such as parity) on the MSC in the ingress and egress direction.                                                                                                                                                                                                                                                                                                                                             |
| SPI4 errors: ingress dip4     | Total number of 4-bit Diagonal Interleaved Parity (DIP4) errors in the ingress direction on the SPI4 path from the FPGA device to the MSC.<br><br>DIP4 is a parity algorithm where a 4-bit odd parity is computed diagonally over control and data words.                                                                                                                                                                           |
| SPI4 errors: egress dip2      | Total number of 2-bit Diagonal Interleaved Parity (DIP2) errors in the egress direction on the SPI4 path from the FPGA device to the MSC.<br><br>DIP2 is a parity algorithm where a 2-bit odd parity is computed diagonally over status words.                                                                                                                                                                                      |

Table 8-17 describes the fields shown in the SPA error counters section of the display. This section appears only when one of the SPI4 transmit or receive errors occurs on the interface. This information is useful for Cisco Systems technical support personnel.

**Note**

None of the SPA SPI4 error counters appear in **show controllers fastethernet** command output until at least one of those types of SPI4 errors occurs.

All of the errors in the SPA error counters section are subject to the SPA automatic recovery process when certain thresholds are reached.

**Table 8-17** *show controllers Command Field Descriptions—SPA Error Counters Section*

| Field                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPI4 TX out of frame error =<br>(hh:mm:ss ago) | Number of SPI4 out of frame errors (events) detected in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.<br><br>This error indicates a loss of synchronization between the synchronization block and the data received on the SPI4 path. When synchronization is reacquired, the error no longer occurs. |
| SPI4 TX Train valid error =<br>(hh:mm:ss ago)  | Number of times that a low-level synchronization problem was detected in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.                                                                                                                                                                                |
| SPI4 TX DIP4 error =<br>(hh:mm:ss ago)         | Number of 4-bit Diagonal Interleaved Parity (DIP4) errors in the transmit direction (toward the network), from the MSC to the SPA FPGA device. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.<br><br>DIP4 is a parity algorithm where a 4-bit odd parity is computed diagonally over control and data words.                                                                             |

**Table 8-17** *show controllers Command Field Descriptions—SPA Error Counters Section*

| Field                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPI4 RX out of frame error =<br>(hh:mm:ss ago) | <p>Number of SPI4 out of frame errors (events) detected in the receive direction (from the network), from the SPA FPGA device to the MSC. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>This error indicates a loss of synchronization between the synchronization block and the data received on the SPI4 path. When synchronization is reacquired, the error no longer occurs.</p> |
| SPI4 RX DIP2 error =<br>(hh:mm:ss ago)         | <p>Number of 2-bit Diagonal Interleaved Parity (DIP2) errors in the receive direction (from the network), from the SPA FPGA device to the MSC. The time stamp indicates how long ago (in hours:minutes:seconds) from the current system time, that the last error was detected.</p> <p>DIP2 is a parity algorithm where a 2-bit odd parity is computed diagonally over status words.</p>                                                                                       |

[Table 8-18](#) describes the fields shown in the MAC destination address filtering table section of the display. This section is useful for verifying the multicast destination addresses that are in the TCAM table and permitted by the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-18** *show controllers Command Field Descriptions—MAC Destination Address Filtering Table Section*

| Field                      | Description                                                                                                                                                                                                                                                                                                                      |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Table entries: Total, Used | <p>Total number of MAC destination address entries possible in the TCAM table for the interface, and the number of table entries currently used by the interface.</p> <p>The 2-Port 10/100/1000 Gigabit Ethernet SPA supports a 512-entry MAC filtering table for each supported interface (1024 entries total on the card).</p> |
| Index                      | Table entry identifier.                                                                                                                                                                                                                                                                                                          |

**Table 8-18** *show controllers Command Field Descriptions—MAC Destination Address Filtering Table Section (continued)*

| Field                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAC destination address | <p>MAC destination address (multicast) permitted by the interface and used in the TCAM lookup table for packet filtering.</p> <p>The multicast MAC entries typically come from routing protocols [such as Open Shortest Path First (OSPF) and Enhanced IGRP (EIGRP)], and other protocols including the Hot Standby Router Protocol (HSRP).</p> <p>When the router reloads, three addresses appear by default in the MAC filtering table: the unicast address of the local interface, the Ethernet broadcast address, and the Ethernet multicast address.</p> |
| Mask                    | Mask for the corresponding destination address. The SPA uses the bits that are set in the mask to look up the address in the TCAM table.                                                                                                                                                                                                                                                                                                                                                                                                                      |

[Table 8-19](#) describes the fields shown in the VLAN filtering table section of the display. This section is useful for verifying the VLANs that are in the TCAM table and are permitted by the interface. This information is useful for Cisco Systems technical support personnel.

**Table 8-19** *show controllers Command Field Descriptions—VLAN Filtering Table Section*

| Field                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of VLANs configured on this interface | <p>Number of VLANs that are configured on the interface.</p> <p>If the number of VLANs configured on the interface is 1022 or less, then the VLAN filtering table also shows an index entry for every VLAN ID. The number of VLANs configured on the interface can be 0, while the number of used table entries reports 2, because the SPA always uses two entries to provide valid matching criteria for promiscuous mode and non-VLAN packets.</p> |
| Table entries: Total, Used, Available        | <p>Total number of VLAN entries possible in the TCAM filtering table for the interface, the number of table entries currently used by the interface (two are always in use by default), and the number of table entries that remain available.</p> <p>The 2-Port 10/100/1000 Gigabit Ethernet SPA supports a 1024-entry VLAN filtering table for each supported interface (2048 entries total on the card).</p>                                      |
| Index                                        | Table entry identifier.                                                                                                                                                                                                                                                                                                                                                                                                                              |
| VLAN identifier                              | <p>Number of the VLAN. Two VLAN ID 0 entries always appear in the table and represent the local interface port for handling of promiscuous mode and non-VLAN packets.</p> <p>Other VLAN entries appear in this table when VLANs are configured on the interface.</p>                                                                                                                                                                                 |

**Table 8-19** *show controllers Command Field Descriptions—VLAN Filtering Table Section*

| Field   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enabled | <p>Status of the VLAN ID for TCAM filtering, with the following possible values:</p> <ul style="list-style-type: none"> <li>• No—The entry is disabled for filtering.</li> <li>• Yes—The entry is enabled for filtering.</li> </ul> <p>The TCAM filter uses the “first-match” rule to filter packets that the SPA receives against entries in the table. The matching assessment begins at the top of the table with the VLAN ID 0 entries.</p> <p><b>Note</b> The SPA always supports two VLAN ID 0 entries. The first VLAN ID 0 entry of the TCAM table is used for promiscuous mode. It has a value of “No,” meaning it is disabled, whenever promiscuous mode is disabled for the interface. The second VLAN ID 0 entry is used for filtering of non-VLAN packets.</p> |
| Tunnel  | <p>Status of tunneling for the interface, with the following possible values:</p> <ul style="list-style-type: none"> <li>• No—Tunneling is disabled and the SPA performs MAC destination address filtering.</li> <li>• Yes—Tunneling is enabled and the SPA does not perform MAC destination address filtering.</li> </ul> <p><b>Note</b> If promiscuous mode is enabled, then the first VLAN ID 0 entry shows tunnel = Yes. All other VLAN ID entries show tunnel = No.</p>                                                                                                                                                                                                                                                                                               |

[Table 8-20](#) describes the fields shown in the platform details section of the display.

**Table 8-20** *show controllers Command Field Descriptions—Platform Details Section*

| Field          | Description                                                                                                                                                                          |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PXF tif number | Number of the interface (in hexadecimal format) used for PXF on the network services engine (NSE) or by the Hyper Transport (HT) FPGA device on the network processing engine (NPE). |

**Related Commands**

| Command                                | Description                                                 |
|----------------------------------------|-------------------------------------------------------------|
| <b>show interfaces gigabitethernet</b> | Displays information about the Gigabit Ethernet interfaces. |

# show controllers pos

To display information about a Packet over SONET (POS) interface, use the **show controllers pos** command in privileged EXEC mode. The command does not have a **no** form.

## Cisco 7500 Series Routers

```
show controllers pos [slot/port-adapter/port] [details | pm [time-interval]]
```

## Cisco 12000 Series Routers

```
show controllers pos [slot/port] [details | pm [time-interval]]
```

## POS Shared Port Adapters

```
show controllers pos [slot/subslot/port[/sub_int]] [details | pm [time-interval]]
```

| Syntax Description   |                                                                                                                                                                                                                                                                                                                         |
|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>          | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/port-adapter</i> | (Optional) Port adapter number.<br><br>Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                       |
| <i>/subslot</i>      | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>/port</i>         | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                           |
| <i>/sub_int</i>      | (Optional) Subinterface number.                                                                                                                                                                                                                                                                                         |
| <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.                                                                                         |

## Defaults

If you do not specify any slot addressing, information for all installed POS interfaces is displayed.

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.

If no interface is specified, the command displays information for all POS interfaces.

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                                                                                   |
|-----------------|------------|------------------------------------------------------------------------------------------------|
|                 | 11.1CC     | This command was introduced.                                                                   |
|                 | 12.2S      | This command was integrated into Cisco IOS release 12.2S.                                      |
|                 | 12.2(25)S3 | The command was modified to support a new addressing format for SPAs on the Cisco 7304 router. |

## Examples

### Example of the show controllers pos Command on the Cisco 7500 Series Router

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 8-21 describes the fields shown in this display.

**Table 8-21** *show controllers pos* Field Descriptions

| Field                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POSx/y/z                | 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) | Bit interleaved parity (BIP).<br><br>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.<br><br>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.<br><br>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. |
| 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).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Table 8-21** show controllers pos Field Descriptions (continued)

| Field                       | Description                                                                                                                                                                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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).                                                                                                                                                                                                           |
| 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.                                                                                                                                                             |

**Example of the show controllers pos Command on a POS Shared Port Adapter**

The following is sample output from the **show controllers pos** command on a Cisco 7600 series router for POS interface 4/3/0 (which is the interface for port 0 of the SPA in subslot 3 of the MSC in chassis slot 4):

```

Router# show controllers pos 4/3/0
POS4/3/0
SECTION
  LOF = 0          LOS   = 0          BIP(B1) = 60
LINE
  AIS = 0          RDI   = 0          FEBE = 261      BIP(B2) = 553
PATH
  AIS = 0          RDI   = 0          FEBE = 85       BIP(B3) = 75
  LOP = 0          NEWPTR = 0        PSE  = 0        NSE   = 0

Active Defects:None

```

```

Active Alarms: None
Alarm reporting enabled for:SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Framing:SONET
APS
  working (active)
  COAPS = 3          PSBF = 0
  State:PSBF_state = False
  ais_shut = TRUE
  Rx(K1/K2):00/00  S1S0 = 00, C2 = CF
  Remote aps status (none); Reflected local aps status (none)
CLOCK RECOVERY
  RDOOL = 0
  State:RDOOL_state = False
PATH TRACE BUFFER :STABLE
  Remote hostname :r-c7600
  Remote interface:POS4/0
  Remote IP addr  :50.0.0.2
  Remote Rx(K1/K2):00/00  Tx(K1/K2):00/00

BER thresholds: SF = 10e-3  SD = 10e-6
TCA thresholds: B1 = 10e-6  B2 = 10e-6  B3 = 10e-6

```

Table 8-21 describes the fields shown in this display.

#### Example of the show controllers pos pm Command on the Cisco 12000 Series Router

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 8-22 describes the fields shown in the display.

**Table 8-22** *show controllers pos pm Field Descriptions*

| Field       | Description                                                                                  |
|-------------|----------------------------------------------------------------------------------------------|
| POSx/y      | Slot number of the POS interface.                                                            |
| Line coding | Shows the current line encoding type, either return to zero (RZ) or nonreturn to zero (NRZ). |

**Table 8-22** *show controllers pos pm Field Descriptions (continued)*

| Field                    | Description                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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).                                                                                                                                                   |
| 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.                                                                                                                                                     |

**POS Shared Port Adapter Example**

The following is sample output from the **show controllers pos** command on a Cisco 7304 router for POS interface 2/0/0 (which is the interface for port 0 of the SPA in subslot 0 of the MSC in chassis slot 2):

```
Router# show controllers pos 2/0/0 details
POS2/0/0
SECTION
LOF = 0 LOS = 1 BIP(B1) = 5
LINE
AIS = 0 RDI = 1 FEBE = 5790 BIP(B2) = 945
PATH
AIS = 0 RDI = 0 FEBE = 0 BIP(B3) = 5
PLM = 0 UNEQ = 0 TIM = 0 TIU = 0
LOP = 1 NEWPTR = 0 PSE = 0 NSE = 0

Active Defects: None
Active Alarms: None
Alarm reporting enabled for: SF SLOS SLOF B1-TCA B2-TCA PLOP B3-TCA

Line alarm trigger delay = 100 ms
Path alarm trigger delay = 100 ms
.
.
.
```

| 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 serial controller statistics, use the **show controllers serial** command in privileged EXEC mode.

## Standard Syntax

```
show controllers serial [slot/port]
```

## Cisco 7000 Series Routers with the RSP7000 and RSP7000CI and Cisco 7500 Series Routers

```
show controllers serial [slot/port-adapter/port]
```

## T3/E3 Shared Port Adapters and 2-Port and 4-Port Channelized T3 SPA in Unchannelized Mode

```
show controllers serial [slot/subslot/port]
```

## Channelized T3 Shared Port Adapters

```
show controllers serial [slot/subslot/port/t1-number]
```

| Syntax Description  |                                                                                                                                                                                                                                                                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>         | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>port-adapter</i> | (Optional) On Cisco 7500 series routers and Cisco 7000 series routers with the RSP7000 and RSP7000CI, the location of the port adapter on a Versatile Interface Processor (VIP). The value can be 0 or 1.                                                                                                               |
| <i>/subslot</i>     | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>/port</i>        | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                           |
| <i>t1-number</i>    | (Optional) Logical T1 number in channelized mode.<br><br>For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                                                                             |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

**Command History**

| Release     | Modification                                                                                                                                           |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10.0        | This command was introduced.                                                                                                                           |
| 11.1CA      | This command was modified to include support for the PA-E3 and PA-T3 port adapters.                                                                    |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                                                              |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE and introduced a new output for interfaces on the serial SPAs on the Cisco 7304 router. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                                          |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                         |

**Usage Guidelines**

The output from the **show controllers serial** command provides error and alarm information that is useful in troubleshooting line problems.

The information displayed is generally useful for diagnostic tasks performed by Cisco Systems 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 are the performance statistics for the current interval and last 15-minute interval and whether any alarms exist.

**Examples****Example of the show controllers serial Command on the Cisco 4000 Series Router**

The following is sample output from 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 0xFFFFF, status=0x30, max_buffer_size=0, packet_size=0
XID/Test RX desc at 0xFFFFF, status=0x0, max_buffer_size=0, packet_size=0
Status Buffer at 0x60459C8: rcv=0, tcv=0, local_state=0, remote_state=0
phase=0, tac=0, currd=0x00000, curxd=0x00000
bad_frames=0, frmrs=0, T1_timeouts=0, rej_rxs=0, runts=0
0 missed datagrams, 0 overruns, 0 bad frame addresses
0 bad datagram encapsulations, 0 user primitive errors
0 provider primitives lost, 0 unexpected provider primitives
0 spurious primitive interrupts, 0 memory errors, 0 tr
%LINEPROTO-5-UPDOWN: Linansmitter underruns
mk5025 registers: csr0 = 0x0E00, csr1 = 0x0302, csr2 = 0x0704
                  csr3 = 0x5500, csr4 = 0x0214, csr5 = 0x0008

```

### Example of the show controllers serial Command for a PA-E3 Serial Port Adapter

The following is sample output from the **show controllers serial** command for a PA-E3 serial port adapter 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, ucmd_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_overrun_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.

```

### Example of the show controllers serial Command for a PA-T3 Serial Port Adapter

The following is sample output 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.

```

### Example of the show controllers serial Command for a Channelized T3 SPA

The following is sample output from the **show controllers serial** command for a 2-port or 4-Port CT3 SPA located in slot 3 of a Cisco 7304 router:

```

Router# show controllers serial
Serial3/1/0 -
Framing is c-bit, Clock Source is Internal
Bandwidth limit is 44210, DSU mode 0, Cable length is 10
rx FEBE since last clear counter 0, since reset 0
Data in current interval (0 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
  0 Severely Errored Line Secs
  0 Far-End Errored Secs, 0 Far-End Severely Errored Secs

```

```

0 CP-bit Far-end Unavailable Secs
0 Near-end path failures, 0 Far-end path failures
0 Far-end code violations, 0 FERF Defect Secs
0 AIS Defect Secs, 0 LOS Defect Secs

Transmitter is sending AIS.

Receiver has loss of signal.
Serial3/1/3 -
Framing is c-bit, Clock Source is Line
Bandwidth limit is 44210, DSU mode 0, Cable length is 10
rx FEBE since last clear counter 0, since reset 0
Data in current interval (757 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
 0 Severely Errored Line Secs
 0 Far-End Errored Secs, 0 Far-End Severely Errored Secs
 0 CP-bit Far-end Unavailable Secs
 0 Near-end path failures, 0 Far-end path failures
 0 Far-end code violations, 0 FERF Defect Secs
 0 AIS Defect Secs, 0 LOS Defect Secs

No alarms detected.
```

Table 8-5 describes the fields shown in the **show controllers serial** output.



**Note** The fields appearing in the output will vary depending on card type, controller configuration, and the status of the controller line.

**Table 8-23** *show controllers serial Field Descriptions*

| Field                            | Description                                                                                                                                                                                                                                                                                                  |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial                           | Name of the serial controller.                                                                                                                                                                                                                                                                               |
| Framing                          | Framing type.                                                                                                                                                                                                                                                                                                |
| Clock source                     | Source of the synchronization signal (clock).                                                                                                                                                                                                                                                                |
| Bandwidth limit                  | The allowable bandwidth for the controller.                                                                                                                                                                                                                                                                  |
| DSU mode                         | The Data Service Unit (DSU) interoperability mode.                                                                                                                                                                                                                                                           |
| Cable length                     | The distance to the first repeater.                                                                                                                                                                                                                                                                          |
| rx FEBE since last clear counter | Number of received far-end block errors.<br><br><b>Note</b> Line far-end block error (accumulated from the M0 or M1 byte) is reported when the downstream LTE detects BIP(B2) errors.<br>Path far-end block error (accumulated from the G1 byte) is reported when the downstream PTE detects BIP(B3) errors. |
| rx FEBE since last reset         | Number of received far-end block errors.                                                                                                                                                                                                                                                                     |
| Line Code Violations             | Number of Bipolar Violation (BPV) errors or Excessive Zeros (EXZ) errors.                                                                                                                                                                                                                                    |

**Table 8-23** *show controllers serial Field Descriptions (continued)*

| Field                     | Description                                                                                                                                                                                                                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| P-bit Coding Violations   | Number of P-bit errors encountered between source and destination.                                                                                                                                                                                                                            |
| C-bit coding violations   | Number of C-bit errors encountered between source and destination.                                                                                                                                                                                                                            |
| P-bit Err Secs (PES)      | Number of seconds with P-bit errors.<br><b>Note</b> A PES is a second with one or more PCVs or one or more Out of Frame defects or a detected incoming AIS. This gauge is not incremented when UASs are counted.                                                                              |
| P-bit Sev Err Secs (PSES) | Number of seconds with P-bit severe errors.<br><b>Note</b> A PSES is a second with 44 or more PCVs or one or more Out of Frame defects or a detected incoming AIS. This gauge is not incremented when UASs are counted.                                                                       |
| Sev Err Framing Secs      | The number of 1-second intervals in which either a Remote Alarm Indication was received or a Loss Of Frame condition occurred.                                                                                                                                                                |
| Unavailable Secs          | The number of 1-second intervals in which the controller was down.                                                                                                                                                                                                                            |
| Line Errored Secs         | The number of 1-second intervals in which a Line Code Violation occurred.                                                                                                                                                                                                                     |
| C-bit Errored Secs (CES)  | Number of seconds with C-bit errors.<br><b>Note</b> A CES is a second with one or more CCVs or one or more Out of Frame defects or a detected incoming AIS. This count is only for the SYNTRAN and C-bit Parity DS3 applications. This gauge is not incremented when UASs are counted.        |
| C-bit Sev Err Secs (CSES) | Number of seconds with severe C-bit errors.<br><b>Note</b> A CSES is a second with 44 or more CCVs or one or more Out of Frame defects or a detected incoming AIS. This count is only for the SYNTRAN and C-bit Parity DS3 applications. This gauge is not incremented when UASs are counted. |

**Table 8-23** *show controllers serial Field Descriptions (continued)*

| Field                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Severely Errored Line Secs      | <p>For ESF signals, this is a second in which one of the following defects is detected:</p> <ul style="list-style-type: none"> <li>• 320 or more Path Code Violation errors.</li> <li>• One or more Out of Frame defects.</li> <li>• An AIS defect.</li> </ul> <p>For E1-CRC signals, this is a second with one of the following errors:</p> <ul style="list-style-type: none"> <li>• 832 or more Path Code Violation errors.</li> <li>• One or more Out of Frame defects.</li> </ul> <p>For E1-nonCRC signals, this is a second with 2048 or more Line Code Violations.</p> |
| Far-End Errored Secs            | Number of seconds of far-end failures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Far-End Severely Errored Secs   | The number of 1-second intervals in which either a Remote Alarm Indication was received or a Loss Of Frame condition occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| P-bit Unavailable Secs          | Number of seconds the interface is unavailable because of P-bit errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| CP-bit Unavailable Secs         | Number of seconds the interface is unavailable because of CP-bit errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| CP-bit Far-end Unavailable Secs | Number of seconds the interface is unavailable because of CP-bit errors from the far-end device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Near-end path failures          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Far-end path failures           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Far-end code violations         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FERF Defect Secs                | Number of far-end receive failures detected per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| AIS Defect Secs                 | Number of alarm indication signals per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| LOS Defect Secs                 | Number of loss of signal alarms per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Path Code Violations            | Indicates a frame synchronization bit error in the D4 and E1-no CRC formats, or a CRC error in the Extended Superframe (ESF) and E1-CRC formats.                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Slip Secs                       | Indicates the replication or deletion of the payload bits of a domestic trunk interface (DS1) frame. A slip might happen when there is a difference between the timing of a synchronous receiving terminal and the received signal.                                                                                                                                                                                                                                                                                                                                          |
| Fr Loss Secs                    | Indicates the number of seconds an Out of Frame (OOF) error is detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Line Err Secs                   | Line Errored Seconds (LES) is a second in which one or more Line Code Violation errors are detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Degraded Mins                   | A degraded minute is one in which the estimated error rate exceeds 1E-6 but does not exceed 1E-3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Table 8-23** *show controllers serial Field Descriptions (continued)*

| <b>Field</b>    | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                       |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Errored Secs    | <p>In ESF and E1-CRC links, an errored second is a second in which one of the following defects is detected:</p> <ul style="list-style-type: none"> <li>• One or more Path Code Violations.</li> <li>• One or more Controlled Slip events.</li> </ul> <p><b>Note</b> For SF and E1 no-CRC links, the presence of Bipolar Violations also triggers an errored second.</p> |
| Bursty Err Secs | <p>A second with more than one but fewer than 320 Path Coding Violation errors, no Severely Errored Frame defects, and no detected incoming AIS defects. Controlled slips are not included in this parameter.</p>                                                                                                                                                        |

# show diag

To display hardware and diagnostic information for a networking device, a line card, a processor, a jacket card, or a chassis, use the **show diag** command in privileged EXEC configuration mode.

```
show diag [slot-number] [details | summary]
```

## Cisco 7304 Router

```
show diag [slot-number | chassis | subslot slot/subslot] [details | summary]
```

## Shared Port Adapters

```
show diag [subslot slot/subslot] [details | summary]
```

| Syntax Description                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot-number</i>                 | (Optional) Slot number of the interface. If a slot number is not specified, diagnostic information for all slots is displayed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>chassis</b>                     | (Optional) <b>Cisco 7304 Router</b><br>Specifies the display of diagnostic information about the backplane, power supplies, and fan modules.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>subslot</b> <i>slot/subslot</i> | (Optional) <b>Shared Port Adapters</b><br>Specifies the display of diagnostic information about the shared port adapter (SPA), where: <ul style="list-style-type: none"> <li><i>slot</i>—Chassis slot number.</li> </ul> Refer to the appropriate hardware manual for slot information. For SIPs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for SIPs and SPAs” topic in the platform-specific SPA software configuration guide. <ul style="list-style-type: none"> <li><i>subslot</i>—Secondary slot number on a SIP where a SPA is installed.</li> </ul> Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information. |
| <b>details</b>                     | (Optional) Displays more details than the normal <b>show diag</b> output.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>summary</b>                     | (Optional) Displays a summary (one line per slot) of the chassis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release | Modification                                             |
|-----------------|---------|----------------------------------------------------------|
|                 | 11.1CA  | This command was introduced.                             |
|                 | 11.2    | This command was integrated into Cisco IOS Release 11.2. |

| Release    | Modification                                                                                                                                                                                        |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11.2P      | This command output was modified for the PA-12E/2FE port adapter, PA-E3 port adapter, and PA-T3 port adapter.                                                                                       |
| 11.2GS     | This command was implemented on the Cisco 12000 series Gigabit Switch Routers (GSRs).                                                                                                               |
| 11.3 XA    | This command was integrated in Cisco IOS Release 11.3 XA.                                                                                                                                           |
| 12.0       | This command was implemented on the Cisco AS5300.                                                                                                                                                   |
| 12.0(5)XQ  | This command was implemented on the Cisco 1750 router.                                                                                                                                              |
| 12.0(7)T   | This command was integrated into Cisco IOS Release 12.0(7)T.                                                                                                                                        |
| 12.1(9)EX  | This command was introduced on the Cisco 7300 series routers, and the <i>slot-number</i> argument and <b>chassis</b> keyword were added.                                                            |
| 12.1(10)EX | This command was enhanced to display information about Field-Programmable Gate Array (FPGA) image versions on installed NSEs and line cards on Cisco 7304 routers.                                  |
| 12.2(11)YZ | Support was added for the 7300-CC-PA.                                                                                                                                                               |
| 12.2(8)T   | This command was implemented for AIC and WIC cards on the Cisco 2600 series routers and the Cisco 3600 series routers.                                                                              |
| 12.2(13)T  | This command was implemented for the AIM-VPN/EPII and AIM-VPN/HPII cards on the Cisco 2691, Cisco 3660, Cisco 3725, and Cisco 3745.                                                                 |
| 12.2(15)ZJ | This command was implemented for the AIM-VPN/BPII card on the Cisco 2610XM, Cisco 2611XM, Cisco 2620XM, Cisco 2621XM, Cisco 2650XM, and Cisco 2651XM.                                               |
| 12.2(18)S  | This command was integrated into Cisco IOS Release 12.2(18)S and implemented on the Cisco 7304 router.                                                                                              |
| 12.3(4)T   | Support for the AIM-VPN/BPII card on the Cisco 2600XM series was integrated into Cisco IOS Release 12.3(4)T.                                                                                        |
| 12.2(20)S2 | This command was integrated into Cisco IOS Release 12.2(20)S2 and the <b>subslot</b> <i>slot/subslot</i> keyword and arguments were added to support SPAs on the Cisco 7304 router.                 |
| 12.0(31)S  | This command was integrated into Cisco IOS Release 12.0(31)S and the <b>subslot</b> <i>slot/subslot</i> keyword and arguments were added to support SIPs and SPAs on the Cisco 12000 series router. |
| 12.4(4)T   | This command was implemented for the HWIC-1ADSL and HWIC-1ADSLI interface cards on the following platforms: Cisco 1800 (modular) series, Cisco 2800 series, and Cisco 3800 series.                  |

### Usage Guidelines

Use this command to determine the type of hardware installed in your router, and to show detailed hardware information and EEPROM version information.

This command displays information for the motherboard, WAN interface cards (WICs), voice interface cards (VICs), high-speed WICs (HWICs), ATM interface cards (AICs), advanced integration modules (AIMs), port adapters, shared port adapters (SPAs), modular services cards (MSCs), and SPA interface processors (SIPs).

**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****1-Port T3 Serial Port Adapter: Example**

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
```

**Cisco 12000 Series Internet Router: Example**

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
```

### ATM SAR AIM in a Cisco 3660: Example

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
```

### NM-AIC-64 Installed in a Cisco 2611: Example

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 FF
0x40: FF FF
0x50: FF FF
0x60: FF FF
0x70: 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
0x30: FF FF
0x40: FF FF
0x50: FF FF
0x60: FF FF
0x70: FF FF

```

Table 8-24 describes significant fields shown in the display.

**Table 8-24** *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.                                                                                                   |
| 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.                                                                                                      |

#### AIM-VPN in a Cisco 2611XM: Example

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 02 02 C1 8B 4A 41 42 39
0x20:38 30 31 41 42 43 44 03 00 81 00 00 00 04 00
0x30:FF FF FF
0x40:FF FF FF
0x50:FF FF FF
0x60:FF FF FF
0x70:FF FF FF

```

Table 8-25 describes significant fields shown in the display.

**Table 8-25** 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.                                                                                                      |

#### MSC-100 on the Cisco 7304 Router: Example

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 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
0xC0: FF FF
0xD0: FF FF
0xE0: FF FF
0xF0: FF FF
0x100: FF FF
0x110: FF FF
0x120: FF FF
0x130: FF FF
0x140: FF FF
0x150: FF FF
0x160: FF FF
0x170: FF FF
0x180: FF FF
0x190: FF FF
0x1A0: FF FF
0x1B0: FF FF
0x1C0: FF FF
0x1D0: FF FF
0x1E0: FF FF
0x1F0: 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:
.
.
.

```

### NSE-100 on the Cisco 7304 Router: Example

The following example displays diagnostic information about the NSE-100 in slot 0 of a Cisco 7304 router:

```

Router# show diag 0
Slot 0/1:
NSE Card state:Primary
Insertion time:00:03:47 ago
C7300 NSE Mainboard EEPROM:
Hardware Revision      :2.3
PCB Serial Number     :CAB0532JYYT
Part Number           :73-5198-02
Board Revision        :A0
Fab Version           :02
RMA Test History      :00

```

show diag

```

RMA Number           :0-0-0-0
RMA History          :00
Deviation Number     :0-0
Product Number       :7300-NSE-100
Top Assy. Part Number :68-1002-02
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 02 8B 41 02 03 C1 8B 43 41 42 30 35 33
 0x10:32 4A 59 59 54 82 49 14 4E 02 42 41 30 02 02 03
 0x20:00 81 00 00 00 00 04 00 80 00 00 00 00 CB 94 37
 0x30:33 30 30 2D 4E 53 45 2D 31 30 30 20 20 20 20 20
 0x40:20 20 20 87 44 03 EA 02 C4 08 00 00 00 00 00 00
 0x50:00 00 C5 08 00 00 00 00 00 00 00 00 00 C8 09 00 00
 0x60:00 00 00 00 00 00 00 C7 7C F6 44 3F 30 F6 44 3F
 0x70:30 F6 44 3F 30 00 00 00 00 07 08 64 32 28 37 26
 0x80:09 C4 5A 32 28 32 DD 0C E4 5A 2D 23 43 24 13 88
 0x90:64 32 28 65 BA 2E E0 AA 82 64 F4 24 00 00 00 00
 0xA0:00 00 00 EF 1C FF FF
 0xB0:FF FF FF
 0xC0:FF FF FF
 0xD0:FF FF FF
 0xE0:FF FF FF
 0xF0:FF FF FF

```

## C7300 NSE Daughterboard EEPROM:

```

Hardware Revision    :2.0
PCB Serial Number    :CAB0533K3PP
Part Number          :73-5673-03
Board Revision       :A0
Fab Version          :03
RMA Test History     :00
RMA Number           :0-0-0-0
RMA History          :00
Deviation Number     :0-0
Product Number       :7300-NSE-100
Top Assy. Part Number :68-1002-02
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 02 8C 41 02 00 C1 8B 43 41 42 30 35 33
 0x10:33 4B 33 50 50 82 49 16 29 03 42 41 30 02 03 03
 0x20:00 81 00 00 00 00 04 00 80 00 00 00 00 CB 94 37
 0x30:33 30 30 2D 4E 53 45 2D 31 30 30 20 20 20 20 20
 0x40:20 20 20 87 44 03 EA 02 C4 08 00 00 00 00 00 00
 0x50:00 00 C5 08 00 00 00 00 00 00 00 00 00 C8 09 00 00
 0x60:00 00 00 00 00 00 00 C7 7C F6 44 3F 30 00 00 00
 0x70:00 00 00 00 00 00 00 00 00 06 72 64 1E 1C 37 26
 0x80:07 08 64 32 28 37 26 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 FB BA FF FF
 0xB0:FF FF FF
 0xC0:FF FF FF
 0xD0:FF FF FF
 0xE0:FF FF FF
 0xF0:FF FF FF

```

FPGA information:

```

Current NSE MB FPGA version      :0.3
IOS bundled NSE MB FPGA version  :0.12
Current NSE DB FPGA version      :0.3
IOS bundled NSE DB FPGA version  :0.10

Fault History Buffer:
7300 Software (C7300-IS-M), Experimental Version 12.1(20011206:191841) [user-ws1 179]
Compiled Tue 29-Jan-02 08:10 by
Signal = 22, Code = 0x0, Uptime 00:00:48
$0 :FFFFFFFF, AT :47001098, v0 :10020028, v1 :0000006F
a0 :A0000000, a1 :00000005, a2 :00000001, a3 :10020028
t0 :00000028, t1 :3401E101, t2 :34018100, t3 :FFFF00FF
t4 :40332E68, t5 :43204650, t6 :70646174, t7 :69707065
s0 :FFFFFFFF, s1 :FFFFFFFF, s2 :FFFFFFFF, s3 :FFFFFFFF
s4 :FFFFFFFF, s5 :FFFFFFFF, s6 :FFFFFFFF, s7 :FFFFFFFF
t8 :00000000, t9 :00000000, k0 :3041D001, k1 :30410000
gp :FFFFFFFF, sp :41AA8F20, s8 :FFFFFFFF, ra :4036B6A4
EPC :4036B69C, SREG :3401E103, Cause :FFFFFFFF
Error EPC :FFFFFFFF, BadVaddr :FFFFFFFF

ROMMON Last Error Info:
count:19, reason:reset
pc:0x4020BFBC, error address:0x00000000
Stack Trace:
FP:0x00000000, PC:0x00000000
FP:0x00000000, PC:0x00000000
.
.
.

```

### Shared Port Adapters on the Cisco 7304 Router: Example

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 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 C8 09 00 00 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
0x150: CC A0 00 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 00
0x170: 00 00 D4 A0 00 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 00
0x190: 00 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 00
0x1B0: 00 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 00
0x1D0: 00 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 00
0x1F0: 00 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 00
Field Diagnostics Data : 00 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
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 C8 09 00 00 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
0x150: CC A0 00 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 00
0x170: 00 00 D4 A0 00 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 00
0x190: 00 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 00
0x1B0: 00 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 00
0x1D0: 00 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 00
0x1F0: 00 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

```

### Shared Port Adapter on a Cisco 12000 Series Router: Example

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 8-26 describes the significant fields shown in the display.

**Table 8-26** *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.                                                                                             |
| 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 00
Asset ID                :
Asset Alias             :
Insertion Time          : 00:00:10 (13:14:24 ago)
Operational Status      : ok

```

### SPA Interface Processor on a Cisco 12000 Series Router: Example

The following is sample output from the **show diag** command for a MSC 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

```

### ADSL HWICs: Example

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 02 07 C1 8B 46 48 48 30
0x20: 39 33 36 30 30 44 34 03 00 81 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
0x60: FF FF
0x70: 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
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 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
0x60: FF FF
0x70: 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 02 07 C1 8B 46 48 48 30
 0x20: 39 33 36 30 30 44 41 03 00 81 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
 0x60: FF FF
 0x70: 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 05 01 89 56 30 31 20 FF FF FF FF
 0x50: FF FF
 0x60: FF FF
 0x70: FF FF

```

**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 c7300</b>                       | Displays the types of hardware (processors, line cards, jacket cards, and so on) installed in the Cisco 7304 router slots, including the bundled, Flash, and current FPGA versions. |
| <b>show c7300 errorlog</b>              | Displays error information on a Cisco 7304 router.                                                                                                                                  |
| <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 environment

To display power supply, fan, voltage, and temperature information for the router, use the **show environment** command in privileged EXEC configuration mode.

**show environment** [**all** | **last** | **table**]

| Syntax Description | all          | (Optional) Displays a detailed listing of all environmental monitor parameters (for example, the power supplies, temperature readings, voltage readings, and blower speeds). This is the default. |
|--------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <b>last</b>  | (Optional) Displays information from the last measurement made before a reload of the system.                                                                                                     |
|                    | <b>table</b> | (Optional) Displays low and high values for warning, critical, and shutdown threshold settings for various voltages and temperature.                                                              |

**Defaults** all

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                                                                                                                                                                                     |
|-----------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 10.0       | This command was introduced.                                                                                                                                                                     |
|                 | 11.2 GS    | The <b>alarms</b> , <b>fans</b> , <b>hardware</b> , <b>leds</b> , <b>power-supply</b> , <b>table</b> , <b>temperature</b> , and <b>voltages</b> keywords were added for Cisco 12000 series GSRs. |
|                 | 11.3(6)AA  | This command was expanded to monitor the RPs and board temperature for the Cisco AS5300 platform, Cisco 3600 series routers, Cisco 7200 series routers, and the Cisco 12000 series GSRs.         |
|                 | 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                                                                       |
|                 | 12.2(20)S2 | This command was integrated into Cisco IOS Release 12.2(20)S2 to support MSCs and SPAs on the Cisco 7304 router using the <b>all</b> , <b>last</b> , and <b>table</b> keywords.                  |

## Usage Guidelines

For the chassis, NPEs, NSEs, line cards, and MSCs, a routine runs once a minute that reads environmental measurements from sensors and stores the output into a buffer. For SPAs, the temperature and voltage sensors are read every few seconds to get environmental data. The environmental buffer is displayed on the console when you use the **show environment** command.

If a measurement exceeds desired margins, but has not exceeded fatal margins, a warning message is written to the system console. The system software queries the sensors for measurements once a minute, but warnings for a given test point are written at most once every hour for sensor readings in the warning range and once every five minutes for sensor readings in the critical range. If a measurement is out of line within these time segments, an automatic warning message appears on the console. You can query the environmental status using the **show environment** command at any time to determine whether a measurement is at the warning or critical tolerance.

A SPA is shut down when any of the SPA environment readings exceed the shutdown threshold.

If a shutdown occurs because of detection of fatal environmental margins, the last measured value from each sensor is stored in internal nonvolatile memory.

For environmental specifications, refer to the hardware installation and configuration publication for your individual chassis.

For NPEs, NSEs, line cards, and MSCs, environmental information is recorded in the CISCO-ENVMON-MIB. SPAs are not supported by the CISCO-ENVMON-MIB. In Cisco IOS Release 12.2(20)S2 and later, the CISCO-ENTITY-SENSOR-MIB supports environmental information for SPAs, as well as NPEs, NSEs, line cards, and MSCs.

## Examples

### Cisco 7304 Router Example Using the all Keyword

The following is sample output from the **show environment all** command on a Cisco 7304 router with modular services cards (MSCs) and shared port adapters (SPAs) installed:

```
Router# show environment all
Power Supplies:
    Power supply 1 is AC power supply. Unit is on.
    Power supply 2 is empty.

Fans:
    Fan 1 is on.
    Fan 2 is on.

Temperature readings:
    Active RP (NPEG100, slot 0):
        npeg100 outlet      measured at 29C/84F
        npeg100 inlet       measured at 34C/93F
        npeg100 hotspot     measured at 35C/95F
    Line card (7304-MSC-100, slot 4):
        7304-MSC-100       measured at 32C/89F
    Card in subslot 4/0:
        SPA-4FE-7304 inlet  measured at 31C/87F
        SPA-4FE-7304 outlet measured at 32C/89F

Voltage readings:
    Active RP (NPEG100, slot 0):
        npe outlet 2.5 V measured at 2.496 V
        npe outlet 3.3 V measured at 3.302 V
        npe outlet 5.0 V measured at 4.992 V
        npe outlet 12.0 V measured at 11.812 V
        npe outlet 3.3c V measured at 3.199 V
        npe inlet 1.5 V measured at 1.494 V
        npe outlet 1.8 V measured at 1.790 V
        npe outlet 1.2 V measured at 1.198 V
        npe outlet 1.2c V measured at 1.198 V
    Line card (7304-MSC-100, slot 4):
        7304-MSC-100 0.75 V measured at 0.733 V
        7304-MSC-100 1.5 V measured at 1.494 V
        7304-MSC-100 2.5 V measured at 2.483 V
        7304-MSC-100 3.3 V measured at 3.250 V
        7304-MSC-100 12 V measured at 11.937 V
    Card in subslot 4/0:
        SPA-4FE-7304 1.8V measured at 1.802 V
        SPA-4FE-7304 1.5V measured at 1.503 V
        SPA-4FE-7304 2.5V measured at 2.474 V
        SPA-4FE-7304 3.3V measured at 3.252 V
        SPA-4FE-7304 1.0V measured at 1.015 V

Envm stats saved 13 time(s) since reload
```

**Cisco 7304 Router Example Using the last Keyword**

The following is sample output from the **show environment last** command on a Cisco 7304 router with MSCs and SPAs installed and an NSE-100:

```
Router# show environment last
Temperature information:
  NSE board:
    nse outlet          is unmeasured
    nse inlet           is unmeasured
    nse hotspot         is unmeasured
    nse db              is unmeasured
  Line card slot 4:
    7304-MSC-100       is unmeasured
  Card in subslot 4/1:
    SPA-4FE-7304 inlet  previously measured at 30C/86F
    SPA-4FE-7304 outlet  previously measured at 32C/89F
Voltage information:
  NSE board:
    nse outlet 1.8 V    is unmeasured
    nse outlet 2.5 V    is unmeasured
    nse outlet 3.3 V    is unmeasured
    nse outlet 5 V      is unmeasured
    nse outlet 12 V     is unmeasured
    nse inlet 1.8 V     is unmeasured
    nse inlet 3.3 V     is unmeasured
    nse inlet 1.5 V     is unmeasured
    nse hotspot 1.8 V   is unmeasured
    nse db 1.65 V       is unmeasured
    nse db 1.8 V        is unmeasured
  Line card slot 4:
    7304-MSC-100 0.75 V is unmeasured
    7304-MSC-100 1.5 V  is unmeasured
    7304-MSC-100 2.5 V  is unmeasured
    7304-MSC-100 3.3 V  is unmeasured
    7304-MSC-100 12 V   is unmeasured
  Card in subslot 4/1:
    SPA-4FE-7304 1.8V   previously measured at 1.823 V
    SPA-4FE-7304 1.5V   previously measured at 1.512 V
    SPA-4FE-7304 2.5V   previously measured at 2.504 V
    SPA-4FE-7304 3.3V   previously measured at 3.258 V
    SPA-4FE-7304 1.0V   previously measured at 1.014 V
Last shutdown reason: shutdown undefined
```

**Cisco 7304 Router Example Using the table Keyword**

The following is sample output from the **show environment table** command on a Cisco 7304 router with MSCs and SPAs installed:

```
Router# show environment table
Temperature tables:
  Active RP (NPEG100, slot 0):
    Sample Point      HighWarning      HighCritical      HighShutdown
    npeg100 outlet    53C/127F         68C/154F          73C/163F
    npeg100 inlet     53C/127F         68C/154F          73C/163F
    npeg100 hotspot   53C/127F         68C/154F          73C/163F
  Line card (7304-MSC-100, slot 4):
    Sample Point      HighWarning      HighCritical      HighShutdown
    7304-MSC-100     48C/118F         63C/145F          68C/154F
  Card in subslot 4/0:
    Sample Point      HighWarning      HighCritical      HighShutdown
    SPA-4FE-7304 inlet 52C/125F         67C/152F          72C/161F
    SPA-4FE-7304 outlet 52C/125F         67C/152F          72C/161F
Voltage tables:
  Active RP (NPEG100, slot 0):
```

```

Sample Point      LowShut  LowCrit  LowWarn  HighWarn  HighCrit  HighShut
npe outlet 2.5 V 2.275 V 2.375 V 2.400 V 2.600 V 2.625 V 2.725 V
npe outlet 3.3 V 3.003 V 3.135 V 3.185 V 3.415 V 3.465 V 3.597 V
npe outlet 5.0 V 4.500 V 4.750 V 4.800 V 5.200 V 5.250 V 5.500 V
npe outlet 12.0 V 9.960 V 10.440 V 10.800 V 13.200 V 13.560 V 14.040 V
npe outlet 3.3c V 3.003 V 3.135 V 3.185 V 3.415 V 3.465 V 3.597 V
npe inlet 1.5 V 1.350 V 1.425 V 1.455 V 1.545 V 1.575 V 1.650 V
npe outlet 1.8 V 1.620 V 1.710 V 1.728 V 1.872 V 1.890 V 1.980 V
npe outlet 1.2 V 1.128 V 1.164 V 1.167 V 1.233 V 1.236 V 1.272 V
npe outlet 1.2c V 1.128 V 1.164 V 1.167 V 1.233 V 1.236 V 1.272 V
Line card (7304-MSC-100, slot 4):
Sample Point      LowShut  LowCrit  LowWarn  HighWarn  HighCrit  HighShut
7304-MSC-100 0.75 V 0.559 V 0.600 V 0.600 V 0.900 V 0.900 V 0.941 V
7304-MSC-100 1.5 V 1.350 V 1.440 V 1.455 V 1.545 V 1.560 V 1.650 V
7304-MSC-100 2.5 V 2.250 V 2.375 V 2.400 V 2.600 V 2.625 V 2.750 V
7304-MSC-100 3.3 V 2.970 V 3.135 V 3.168 V 3.432 V 3.465 V 3.630 V
7304-MSC-100 12 V 9.960 V 10.440 V 10.800 V 13.200 V 13.560 V 14.040 V
Card in subslot 4/0:
Sample Point      LowShut  LowCrit  LowWarn  HighWarn  HighCrit  HighShut
SPA-4FE-7304 1.8V 1.620 V 1.710 V 1.728 V 1.872 V 1.890 V 1.980 V
SPA-4FE-7304 1.5V 1.350 V 1.425 V 1.440 V 1.560 V 1.575 V 1.650 V
SPA-4FE-7304 2.5V 2.250 V 2.375 V 2.400 V 2.600 V 2.625 V 2.750 V
SPA-4FE-7304 3.3V 2.970 V 3.135 V 3.168 V 3.432 V 3.465 V 3.630 V
SPA-4FE-7304 1.0V 0.900 V 0.950 V 0.960 V 1.040 V 1.050 V 1.100 V

```

Table 8-27 describes the significant fields show in the display.

**Table 8-27** *show environment table Field Descriptions for the Cisco 7304 Router*

| Field                 | Description                                                                                                                                                                                           |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sample Point          | Area for which measurements are taken.                                                                                                                                                                |
| LowShut               | Lowest level for an out-of-tolerance condition at which the system shuts itself down. For out-of-tolerance conditions with SPA environment variables, only the SPA is shut down.                      |
| LowCrit/LowCritical   | Level at which a critical message is issued for an out-of-tolerance voltage condition. The system continues to operate; however, the system is approaching shutdown.                                  |
| LowWarn/LowWarning    | Level at which a warning message is issued for an out-of-tolerance voltage condition. The system continues to operate, but operator action is recommended to bring the system back to a normal state. |
| HighWarn/HighWarning  | Level at which a warning message is issued for an out-of-tolerance voltage condition. The system continues to operate, but operator action is recommended to bring the system back to a normal state. |
| HighCrit/HighCritical | Level at which a critical message is issued for an out-of-tolerance voltage condition. The system continues to operate; however, the system is approaching shutdown.                                  |
| HighShut/HighShutdown | Highest level for an out-of-tolerance condition at which the system shuts itself down. For out-of-tolerance conditions with SPA environment variables, only the SPA is shut down.                     |

| Related Commands | Command                               | Description                          |
|------------------|---------------------------------------|--------------------------------------|
|                  | test hw-module subslot<br>temperature | Tests a temperature sensor on a SPA. |

# show hw-module subslot

To display diagnostic information about internal hardware devices for a SPA, use the **show hw-module subslot** command in privileged EXEC configuration mode.

```
show hw-module subslot slot/subslot {brief | config | counters | errors | registers | status} {fpga
| mac | optics | phy | spi4} port
```

## Syntax Description

|                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                                                                           | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                                                                                                                                                                                                                                                                                                                                       |
| <i>/subslot</i>                                                                                       | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                                                                                                                                                                                                                                                                                                                          |
| { <b>brief</b>   <b>config</b>   <b>counters</b>   <b>errors</b>   <b>registers</b>   <b>status</b> } | Specifies the display of diagnostic and register information related to the following areas: <ul style="list-style-type: none"> <li>• <b>brief</b>—Reserved for future.</li> <li>• <b>config</b>—Displays information related to configuration of the specified internal hardware device.</li> <li>• <b>counters</b>—Displays statistics related to the processing by the specified internal hardware device.</li> <li>• <b>errors</b>—Reserved for future.</li> <li>• <b>registers</b>—Displays register information for the specified internal hardware device.</li> <li>• <b>status</b>—Displays status information for the specified internal hardware device.</li> </ul> |
| { <b>fpga</b>   <b>mac</b>   <b>optics</b>   <b>phy</b>   <b>spi4</b> }                               | Specifies the internal hardware device or path on the SPA for which you want to display diagnostic information, including the field programmable gate array (FPGA) device, MAC device, small form-factor pluggable (SFP) optical transceiver, PHY device, or System Packet Interface Level 4 (SPI4) path from the MSC to the FPGA device.                                                                                                                                                                                                                                                                                                                                     |
| <i>port</i>                                                                                           | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                                                                                                                                                                                                                                                                                                                                                                                 |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

**Command History**

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

**Usage Guidelines**

Use the **show hw-module subslot** command to obtain diagnostic information about an interface on the SPA.

The **counters** keyword displays a subset of the statistics that are also provided by the **show controllers fastethernet** command and **show controllers gigabitethernet** command for the specified SPA device.

**Examples**

The following examples provide sample output for several versions of the **show hw-module subslot** command for a 4-Port 10/100 Fast Ethernet SPA located in the top subslot (0) of the MSC that is installed in slot 4 on a Cisco 7304 router:

- [show hw-module subslot config fpga Example, page 8-107](#)
- [show hw-module subslot config phy Example, page 8-107](#)
- [show hw-module subslot config phy on Gigabit Ethernet SPA Example, page 8-108](#)
- [show hw-module subslot counters fpga Example, page 8-108](#)
- [show hw-module subslot status mac Example, page 8-109](#)
- [show hw-module subslot status mac on Gigabit Ethernet SPA Example, page 8-109](#)
- [show hw-module subslot status phy Example, page 8-109](#)
- [show hw-module subslot status phy on Gigabit Ethernet SPA Example, page 8-110](#)

**show hw-module subslot config fpga Example**

The following shows sample output from the **show hw-module subslot config** command for the FPGA device on the first interface (port 0):

```
Router# show hw-module subslot 4/0 config fpga 0
FPGA RX Config
  RX FIFO parity select is even
  RX CRC check is enabled
  RX SHIM header insertion is disabled
  RX Flow control is enabled
  RX CRC strip is enabled
  RX TCAM LKUP is enabled
FPGA TX Config
  TX FIFO parity select is even
  TX CRC generation is enabled
  TX Padding is enabled
```

**show hw-module subslot config phy Example**

The following shows sample output from the **show hw-module subslot config** command for the PHY device on the first interface (port 0):

```
Router# show hw-module subslot 4/0 config phy 0
PHY version: identifier1 = 0x141, identifier2 = 0xCD2
PHY Configuration:
control (reg 0) = 0x3100
  PHY state: not in reset, not powered down, not isolated
  speed: 100 Mbps, duplex: full
  auto-negotiation enabled, loopback disabled, collision test disabled
phy specific control (reg 16) = 0x78
```

```

force link good: no
MDI cross-over mode: automatic crossover
Tx FIFO depth: +/- 16 bits, Rx FIFO depth: +/- 16 bits
never assert CRS on transmit, energy detect: off
enable extended distance: no, 125 clock: low
MAC interface power: always up, SQE test: disabled
polarity reversal: enabled, jabber function: enabled
extended phy specific control (reg 20) = 0xCE2
  line loopback: disabled, detect lost lock: no, enabled RCLK
  master downshift counter: 4, slave downshift counter: 0
  default MAC interface speed: 1000 Mbps
  fiber auto-negotiation disabled
  add delay to RX_CLK for RXD outputs: yes
  add delay to GTX_CLK for TXD latching: yes
auto-negotiation advertisement for 10/100 (reg 4) = 0xDE1
  10Base-Tx half-duplex: yes, full-duplex: yes
  100Base-Tx half-duplex: yes, full-duplex: yes
  pause frame support: yes, asymmetric pause: yes
  set remote fault bit: no, advertise next page: no

```

### show hw-module subslot config phy on Gigabit Ethernet SPA Example

The following shows sample output from the **show hw-module subslot config** command for the PHY device on the first interface (port 0) on a 2-Port 10/100/1000 Gigabit Ethernet SPA:

```

Router# show hw-module subslot 4/1 config phy 0
PHY version: identifier1 = 0x141, identifier2 = 0xCD2
PHY Configuration:
control (reg 0) = 0x1140
  PHY state: not in reset, not powered down, not isolated
  speed: 1000 Mbps, duplex: full
  auto-negotiation enabled, loopback disabled, collision test disable
phy specific control (reg 16) = 0x78
  force link good: no
  MDI cross-over mode: automatic crossover
  Tx FIFO depth: +/- 16 bits, Rx FIFO depth: +/- 16 bits
  never assert CRS on transmit, energy detect: off
  enable extended distance: no, 125 clock: low
  MAC interface power: always up, SQE test: disabled
  polarity reversal: enabled, jabber function: enabled
extended phy specific control (reg 20) = 0xCE2
  line loopback: disabled, detect lost lock: no, enabled RCLK
  master downshift counter: 4, slave downshift counter: 0
  default MAC interface speed: 1000 Mbps
  fiber auto-negotiation disabled
  add delay to RX_CLK for RXD outputs: yes
  add delay to GTX_CLK for TXD latching: yes
auto-negotiation advertisement for 10/100 (reg 4) = 0x1A0
  1000BaseX half-duplex: no, full-duplex: yes
  pause frame support: yes, asymmetric pause: yes
Extended PHY specific control 2 register(reg 26) = 0x6A
  Fiber signal detect input: forced to be good
  Fiber input impedance: 75 ohm, Fiber input impedance: 75 ohm
  Fiber mode clock disabled, Fiber output boost: 1000Base-X
  Fiber output amplitude: 0.7V

```

### show hw-module subslot counters fpga Example

The following shows sample output from the **show hw-module subslot counters** command for the FPGA device on the first interface (port 0):

**Note**

This information is also available using the **show controllers fastethernet** command and **show controllers gigabitethernet** command.

```
Router# show hw-module subslot 4/0 counters fpga 0
Input: Total (good & bad) packets: 5734
       TCAM drops: 4908
       Satisfy (host-backpressure) drops: 0
       CRC drops: 0
       PL3 RERRs: 0
Output: EOP (SPI4) errors: 0
```

**show hw-module subslot status mac Example**

The following shows sample output from the **show hw-module subslot** command for MAC device status on the first interface (port 0):

```
Router# show hw-module subslot 4/0 status mac 0
Status registers:
  speed = 100 Mbps, duplex = full, interface mode = copper
  spi3 side loopback is disabled, line side loopback is disabled
  padding is disabled, crc add is disabled
  force duplex is enabled
Rx FIFO status:
  Read pointer = 0xCDE, Write pointer = 0xCDE
  Occupancy of FIFO in 8 byte locations = 0
  Reset is not set
  Overflow event did not occur
Tx FIFO status:
  Read pointer = 0x498, Write pointer = 0x498
  Occupancy of FIFO in 8 byte locations = 0
  Overflow event did not occur
  Underflow event did not occur
  Out of sequence event did not occur
```

**show hw-module subslot status mac on Gigabit Ethernet SPA Example**

The following shows sample output from the **show hw-module subslot** command for MAC device status on the first interface (port 0) on a 2-Port 10/100/1000 Gigabit Ethernet SPA:

```
Router# show hw-module subslot 4/1 status mac 0
Status registers:
  speed = 1000 Mbps, RGMII, duplex = full, interface mode = copper
  spi3 side loopback is disabled, line side loopback is disabled
  padding is disabled, crc add is disabled
  force duplex is enabled
Rx FIFO status:
  Read pointer = 0x0, Write pointer = 0x0
  Occupancy of FIFO in 8 byte locations = 0
  Reset is not set
  Overflow event did not occur
Tx FIFO status:
  Read pointer = 0x328, Write pointer = 0x328
  Occupancy of FIFO in 8 byte locations = 0
  Overflow event did not occur
  Underflow event did not occur
  Out of sequence event did not occur
```

**show hw-module subslot status phy Example**

The following shows sample output from the **show hw-module subslot** command for PHY device status on the first interface (port 0):

```

Router# show hw-module subslot 4/0 status phy 0
PHY Status:
status (reg 1) = 0x7949
  link is down, auto-negotiation is not complete
  remote fault not detected, jabber not detected
phy specific status (reg 17) = 0x4100
  link is down (real-time), speed/duplex not resolved
  speed: 100 Mbps, duplex: half
  page not received, cable length is 80 - 110m
  MDI cross-over status: MDI, downshift status: no
  energy detect status: active
  transmit pause: disabled, receive pause: disabled
  polarity: normal, jabber: no
phy specific extended status (reg 27) = 0x848B
  Fiber/ copper auto selection disabled, copper link
  Serial interface auto-negotiation bypass disabled
  Serial interface auto-negotiation bypass status:
    Link came up because regular fiber autoneg completed
  Interrupt polarity is active low
  receive error count: 0x0

```

### show hw-module subslot status phy on Gigabit Ethernet SPA Example

The following shows sample output from the **show hw-module subslot** command for PHY device status on the first interface (port 0) on a 2-Port 10/100/1000 Gigabit Ethernet SPA:

```

Router# show hw-module subslot 4/1 status phy 0
PHY Status:
status (reg 1) = 0x149
  link is down, auto-negotiation is not complete
  remote fault not detected, jabber not detected
Extended status register (reg 15) = 0xC000
  1000BaseX full duplex capable   1000BaseX half duplex capable
  1000BaseT full duplex NOT capable  1000BaseT half duplex NOT capable
phy specific status (reg 17) = 0x8010
  link is down (real-time), speed/duplex not resolved
  speed: 1000 Mbps, duplex: half
  page not received, cable length is < 50m
  MDI cross-over status: MDI, downshift status: no
  energy detect status: sleep
  transmit pause: disabled, receive pause: disabled
  polarity: normal, jabber: no
phy specific extended status (reg 27) = 0xA483
  Fiber/ copper auto selection disabled, fiber link
  Serial interface auto-negotiation bypass disabled
  Serial interface auto-negotiation bypass status:
    Link came up because regular fiber autoneg completed
  Interrupt polarity is active low
  receive error count: 0x0

```

#### Related Commands

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 hw-module subslot fpd

To display all current versions of FPD image files for all of the active SPAs on a router, enter the **show hw-module subslot fpd** command in privileged EXEC configuration mode.

**show hw-module subslot** [*slot/subslot*] **fpd**

| Syntax Description |                                                                                                                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>        | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>    | (Optional) Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |

**Defaults** No default behavior or values. If no location is specified, the output for this command will show information for all SPAs in the router.

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S2 | This command was introduced. |

**Usage Guidelines** Entering the **show hw-module subslot fpd** command will show the FPD image information for all of the SPAs on the router.

Other than the FPD version information, the output for this command may also contain useful FPD-related notes.

**Examples** The output display in this example shows that FPD image file versions on the SPAs in the system do not meet the minimum FPD requirements:

```
Router# show hw-module subslot fpd
```

```
==== =====
Slot Card Description      H/W   Field Programmable   Current   Min. Required
Ver.   Device: "ID-Name"    Version  Version
==== =====
 2/0 SPA-2GE-7304          0.15  1-Data & I/O FPGA   4.12     4.17    *
-----
 2/1 SPA-4FE-7304          0.32  1-Data & I/O FPGA   4.13     4.17    *
==== =====
```

## NOTES:

- FPD images that are required to be upgraded are indicated with a '\*' character in the "Minimal Required Version" field.
- The following FPD image package file is required for the upgrade:  
"spa-fpd.122-20.S2.pkg"

This example shows the output when using the *slot#/subslot#* argument to identify a particular SPA card and that slot meets the minimum FPD requirements for that SPA on that particular Cisco IOS Release:

```
Router# show hw-module subslot 2/0 fpd
```

```
==== =====
Slot Card Description      H/W   Field Programmable   Current   Min. Required
                          Ver.   Device: "ID-Name"    Version   Version
==== =====
 2/0 SPA-2GE-7304          0.15  1-Data & I/O FPGA    4.17      4.17
==== =====
```

The output display in this example shows that the SPA in slot 2/0 is disabled because one of the programmable devices on the card does not meet the minimum version requirements. The output also contains a "NOTES" section that provides the name of the FPD image package file needed to upgrade the FPD image for that particular SPA.

```
Router# show hw-module subslot fpd
```

```
==== =====
Slot Card Description      H/W   Field Programmable   Current   Min. Required
                          Ver.   Device:"ID-Name"    Version   Version
==== =====
 2/0 SPA-4FE-... <DISABLED> 0.32  1-Data & I/O FPGA    4.12      4.13   *
-----
 2/1 SPA-2GE-7304          0.15  1-Data & I/O FPGA    4.13      4.13
==== =====
```

## NOTES:

- FPD images that are required to be upgraded are indicated with a '\*' character in the "Minimal Required Version" field.
- The following FPD image package files is required for the upgrade:  
"spa\_fpd.122-20.S2.pkg"

## Related Commands

| Command                                 | Description                                                                                                                        |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>        | Manually upgrades the current FPD image on the specified SPA.                                                                      |
| <b>upgrade fpd auto</b>                 | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
| <b>upgrade fpd path</b>                 | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
| <b>show upgrade fpd file</b>            | Displays the contents of an FPD image package file.                                                                                |
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                                            |
| <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |
| <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file.                                  |

# show hw-module subslot oir

To display the operational status of a shared port adapter (SPA), use the **show hw-module subslot oir** command in privileged EXEC configuration mode. The command does not have a **no** form.

**show hw-module subslot** [*slot/subslot*] **oir** [**internal**]

| Syntax Description | slot            | (Optional) Chassis slot number.                                                                                                                                                                                                                                                  |
|--------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                 | Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
|                    | <i>/subslot</i> | (Optional) Secondary slot number on a MSC where a SPA is installed.                                                                                                                                                                                                              |
|                    |                 | Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                        |
|                    | <b>internal</b> | (Optional) Displays detailed diagnostic information. This option is intended for internal diagnostic use with Cisco Systems technical support personnel.                                                                                                                         |

**Defaults** No default behavior or values. If no location is specified, the output for this command will show information for all SPAs in the router.

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(25)S3 | This command was introduced. |

**Usage Guidelines** Use the **show hw-module subslot oir** command to obtain operational status information about one or more SPAs. To display information for a specific SPA, specify the *slot* number of the SIP and the *subslot* number of the SPA that you want information about. To display information for all SPAs in the router, do not specify the *slot/subslot* arguments.

The optional **internal** keyword displays detailed diagnostic information that is recommended only for use with Cisco technical support personnel.



**Note** The following status descriptions are not applicable to every SPA and can be platform-specific.

Table 8-28 describes the possible values for the Operational Status field in the output.

**Table 8-28** Operational Status Field Descriptions

| Operational Status               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| admin down                       | SPA is administratively disabled by the <b>hw-module subslot shutdown</b> global configuration command.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| booting                          | SPA is initializing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| missing                          | SPA is not present in the MSC subslot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ok                               | SPA is operational.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| out of service ( <i>reason</i> ) | <p>The SPA is out of service for one of the following reasons:</p> <p><b>Note</b> The following reasons are not applicable to every SPA and can be platform-specific.</p> <ul style="list-style-type: none"> <li>Analyze failed—Failed to create a SPA data structure, most likely due to a memory allocation problem.</li> <li>Authentication failed—SPA has failed hardware validation.</li> <li>Data structure create error—Failed to create a SPA data structure, most likely due to a memory allocation problem.</li> <li>Event corrupt—A SPA online insertion and removal (OIR) event has been corrupted. This could be caused by a corrupted message between the MSC and the route processor (RP) or some other software or hardware problem.</li> <li>Event sequence error—A SPA OIR event was received out of sequence. This could be caused by a corrupted message between the MSC and the route processor (RP) or some other software or hardware problem.</li> <li>Fail code not set—Failure code could not be read from a SPA OIR event message. This could be caused by a corrupted message between the MSC and the RP or some other software or hardware problem.</li> <li>Failed too many times—SPA is disabled because it has failed more than the allowable limit on the platform.</li> <li>FPD upgrade failed—A field-programmable device, such as the Field-Programmable Gate Array (FPGA), failed to automatically upgrade.</li> <li>H/W signal deasserted—The SPA_OK or PWR_OK hardware signal indicating that the SPA is accessible are no longer asserted.</li> <li>Heartbeat failed—Occurs when intelligent SPAs encounter heartbeat failures.</li> <li>Incompatible FPD—An FPGA version mismatch with the Cisco IOS software has been detected for the SPA.</li> </ul> |

**Table 8-28** Operational Status Field Descriptions

| Operational Status                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| out of service<br>( <i>reason</i> )—CONTINUED | <ul style="list-style-type: none"> <li>• Init timeout—Time limit has been reached during initialization of a SPA.</li> <li>• Read SPA type failed—A read from the hardware for the SPA type failed.</li> <li>• Reload request—SPA reload is in progress from the <b>hw-module subslot reload</b> command.</li> <li>• SPA h/w error—The SPA software driver has detected a hardware error.</li> <li>• SPA ready timeout—A timeout occurred on the RP while waiting for the SPA to become operational.</li> <li>• SPA type mismatch—Occurs when you have pre-configured a SPA of one type, but have inserted a SPA of a different type.</li> </ul> <p><b>Note</b> This reason code only applies to those platforms that support pre-configuration. This is not applicable to a Cisco 7304 router.</p> <ul style="list-style-type: none"> <li>• SPA unrecognized—SPA is not supported by the Cisco IOS software release.</li> <li>• Start failed—Failed to start interfaces on SPA.</li> <li>• Unexpected inserted event—The SPA OIR software has received a SPA insertion event when the OIR software considered the SPA already present.</li> <li>• Wait h/w ok timeout—A timeout occurred while waiting for the SPA_OK and PWR_OK hardware signals to be asserted.</li> <li>• Wait start timeout—A timeout occurred on the MSC while waiting for permission from the RP to bring up the SPA.</li> </ul> |
| stopped                                       | SPA has been gracefully deactivated using the <b>hw-module subslot stop</b> privileged EXEC command on the Cisco 7304 router.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

**Examples**

The following example shows the operational status of all of the SPAs installed in the router:

```
Router# show hw-module subslot oir
Module           Model           Operational Status
-----
subslot 4/0     SPA-4XOC3-POS   booting
subslot 4/1     SPA-4XOC3-ATM   out of service(FPD upgrade failed)
subslot 4/2     SPA-4XOC3-POS   ok
subslot 4/3     SPA-1XTENGE-XFP out of service(SPA unrecognized)
```

The following example shows sample output when using the optional **internal** keyword:

```
Router# show hw-module subslot 4/0 oir internal
WARNING: This command is not intended for production use
and should only be used under the supervision of
Cisco Systems technical support personnel.
```

```

sm(spa_oir_tsm subslot 4/0 TSM), running yes, state ready
Admin Status: admin enabled, Operational Status: ok(1)
Last reset Reason: manual
TSM Context:
  configured_spa_type 0x483
  soft remove fail code 0x0(none)
  last_fail_code 0x110E(SPA unrecognized)
  fail_count 0
  timed_fail_count 0, failed_spa_type 0x483
  recovery_action 6
  associated_fail_code 0x110E(SPA unrecognized)
  sequence numbers: next from tsm 4, last to tsm 2
  flags 0x0
Subslot:
  spa type 0x483, active spa type 0x483
  subslot flags 0x0, plugin flags 0x0
TSM Parameters:
  wait_psm_ready_timeout 360000 ms, init_timeout 240000 ms
  short_recovery_delay 5000 ms, long_recovery_delay 120000 ms
  ok_up_time 1200000 ms, bad_fail_count 10
  fail_time_period 600000 ms, max_fail_count 5
  does not support pre-configuration
SPA OIR state machine audit statistics
      In-sync poll-count  qry-fail resp-fail  restarts fail-count
subslot 4/0           yes      1          0          0          0          0

```

**Related Commands**

| <b>Command</b>                    | <b>Description</b>                      |
|-----------------------------------|-----------------------------------------|
| <b>hw-module subslot reload</b>   | Restarts a SPA and its interfaces.      |
| <b>hw-module subslot shutdown</b> | Shuts down a SPA with or without power. |

# show interface sdcc

To display configuration information and statistics for a sections data communications channel (SDCC) interface, use the **show interface sdcc** command in privileged EXEC mode. The command does not have a **no** form.

**show interface sdcc** *slot/subslot/port*[*/sub\_int*]

| Syntax Description |                                                          |                                                                                                                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>        | Chassis slot number.                                     | Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>    | Secondary slot number on a MSC where a SPA is installed. | Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                        |
| <i>/port</i>       | (Optional) Port or interface number.                     | Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                                |
| <i>/sub_int</i>    | (Optional) Subinterface number.                          |                                                                                                                                                                                                                                                                                  |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release     | Modification                                                                                                |
|-----------------|-------------|-------------------------------------------------------------------------------------------------------------|
|                 | 12.2(11)BC3 | This command was introduced.                                                                                |
|                 | 12.2(25)S3  | This command was integrated into Cisco IOS release 12.2(25)S3 to support POS SPAs on the Cisco 7304 router. |

**Examples** The following command displays configuration information and statistics for SDCC interface 4/0/0:

```
Router# show interface sdcc 4/0/0
SDCC4/0/0 is up, line protocol is up
  Hardware is SDCC
  Internet address is 10.10.10.1/24
  MTU 1500 bytes, BW 192 Kbit, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Last input never, output 00:00:07, output hang never
  Last clearing of "show interface" counters 00:01:52
```

## ■ show interface sdcc

```
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  5 packets input, 520 bytes, 0 no buffer
  Received 0 broadcasts (0 IP multicast)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  5 packets output, 520 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions
```

# show interfaces fastethernet

To display information about the Fast Ethernet interfaces, use the **show interfaces fastethernet** command in privileged EXEC configuration mode.

**show interfaces fastethernet** *slot/subslot/port*

## Syntax Description

|                 |                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>     | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i> | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>/port</i>    | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release    | Modification                                                                                  |
|------------|-----------------------------------------------------------------------------------------------|
| 11.2       | This command was introduced.                                                                  |
| 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                    |
| 12.2(20)S2 | This command was implemented on the 4-Port 10/100 Fast Ethernet SPA on the Cisco 7304 router. |

## Examples

The following is sample output from the **show interfaces fastethernet** command for the second interface (port 1) in a 4-Port 10/100 Fast Ethernet SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 on a Cisco 7304 router:

```
Router# show interfaces fastethernet 2/1/1
FastEthernet2/1/1 is up, line protocol is up
  Hardware is SPA-4FE-7304, address is 00b0.64ff.5d80 (bia 00b0.64ff.5d80)
  Internet address is 192.168.50.1/24
  MTU 9216 bytes, BW 100000 Kbit, DLY 100 usec,
    reliability 255/255, txload 1/255, rxload 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 00:00:22, output 00:00:02, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   5 packets input, 320 bytes
   Received 1 broadcasts (0 IP multicast)
   0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
   0 watchdog
   0 input packets with dribble condition detected
8 packets output, 529 bytes, 0 underruns
0 output errors, 0 collisions, 2 interface resets
0 babbles, 0 late collision, 0 deferred
2 lost carrier, 0 no carrier
0 output buffer failures, 0 output buffers swapped out

```

**Note**

There are variations in the output for the **show interfaces** commands on Cisco Systems routers depending on the platform, type of interface, and also other features that you might have configured, such as Quality of Service (QoS). Therefore, some additional output fields might appear in your **show** command output. For more information about these fields, see the **show interfaces** command description in the *Cisco IOS Interface Command Reference*, Release 12.2.

Table 8-29 describes the fields shown in the display.

**Table 8-29** show interfaces fastethernet Field Descriptions—Fast Ethernet SPA

| Field                                                | Description                                                                                                                                                                           |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fast Ethernet...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, SPA-4FE-7304) and MAC address.                                                                                                                            |
| Description                                          | Alphanumeric string identifying the interface. This only appears if the <b>description</b> interface configuration command has been configured on the interface.                      |
| Internet address                                     | Internet address followed by subnet mask.                                                                                                                                             |
| MTU                                                  | Maximum transmission unit of the interface. The default is 1500 bytes for the 4-Port 10/100 Fast Ethernet SPA.                                                                        |
| BW                                                   | Bandwidth of the interface in kilobits per second.                                                                                                                                    |
| DLY                                                  | Delay of the interface in microseconds.                                                                                                                                               |
| reliability                                          | Reliability of the interface as a fraction of 255 (255/255 is 100 percent reliability), calculated as an exponential average over 5 minutes.                                          |
| txload, rxload                                       | Load on the interface (in the transmit “tx” and receive “rx” directions) as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes. |

**Table 8-29** *show interfaces fastethernet Field Descriptions—Fast Ethernet SPA (continued)*

| Field                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Encapsulation                           | Encapsulation method assigned to the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| loopback                                | Indicates whether or not loopback is set.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Keepalive                               | Indicates whether or not keepalives are set, and the time interval.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Half-duplex, Full-duplex                | Indicates the duplex mode for the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 100Mb/s, 10Mb/s                         | Speed of the interface in megabits per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 100BaseTX/FX                            | Media protocol standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ARP type:                               | Type of Address Resolution Protocol (ARP) assigned and the timeout period.                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 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.<br><br>This field is not updated by fast-switched traffic.                                                                                                                                                                                                                                                              |
| 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 displayed. If that field overflows, asterisks are printed.<br><br><b>Note</b> This field does not apply to SPA interfaces.                                                                                                                                                 |
| 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>A series of asterisks (***) 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. |
| Input queue<br>(size/max/drops/flushes) | Packet statistics on the input queue reported as: <ul style="list-style-type: none"> <li>• Size—Number of packets in the input queue.</li> <li>• Max—Maximum size of the queue.</li> <li>• Drops—Number of packets dropped because of a full input queue.</li> <li>• Flushes—Number of packets dropped as part of selective packet discard (SPD). SPD implements a selective packet drop policy on the router’s IP process queue. Therefore, it only applies to process-switched traffic.</li> </ul>                |
| Total output drops                      | Total number of packets dropped because of a full output queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Queueing strategy                       | Type of Layer 3 queueing active on this interface. The default is first-in, first-out (FIFO).                                                                                                                                                                                                                                                                                                                                                                                                                       |

**Table 8-29** *show interfaces fastethernet Field Descriptions—Fast Ethernet SPA (continued)*

| Field                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output queue (size/max)                      | Number of packets in the output queue (size), and the maximum size of the queue (max).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 5 minute input rate,<br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 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 smaller 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 larger than 1536 bytes is considered a giant.<br><br><b>Note</b> For the 4-Port 10/100 Fast Ethernet SPA, the default is that a giant is any packet greater than 1536 bytes. However, if you modify the maximum transmission unit (MTU) for the interface, this counter increments when you exceed the specified MTU for the interface.                                                                                                                                |
| 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 check 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.                                                                                                                                                                                                                                                                                                                                                                                                                            |

**Table 8-29** *show interfaces fastethernet Field Descriptions—Fast Ethernet SPA (continued)*

| Field                                              | Description                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. Broadcast storms and bursts of noise can cause the ignored count to be increased.                                                                               |
| watchdog                                           | Number of times the watchdog receive timer expired. Expiration happens when receiving a packet with a length greater than 2048 bytes.                                                                                                                                                                                                |
| 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 only; 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.                                                                                                                                                                                                                                             |
| 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. This is usually the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.                 |
| interface resets                                   | Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. Interface resets can 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.                                                                                                                                                                                                                           |
| deferred                                           | Number of times that the interface 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.<br><b>Note</b> This field does not apply to SPA interfaces.                                                                                                                                                                                                     |
| output buffer failures, output buffers swapped out | These counters are not used by the 4-Port 10/100 Fast Ethernet SPA on the Cisco 7304 router.                                                                                                                                                                                                                                         |

| Related Commands | Command                              | Description                                                                                                                                         |
|------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <b>show interfaces</b> <sup>1</sup>  | Displays statistics for the interfaces configured on a router or access server.                                                                     |
|                  | <b>show controllers fastethernet</b> | Displays Fast Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables. |

1. Refer to the Cisco IOS Release 12.2 command reference and master index publications.

# show interfaces gigabitethernet

To display information about the Gigabit Ethernet interfaces, use the **show interfaces gigabitethernet** command in privileged EXEC configuration mode.

**show interfaces gigabitethernet slot/subslot/port**

| Syntax Description | slot     | Chassis slot number.                                                                                                                                                                                                                                                             |
|--------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |          | Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
|                    | /subslot | Secondary slot number on a MSC where a SPA is installed.                                                                                                                                                                                                                         |
|                    |          | Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                        |
|                    | /port    | (Optional) Port or interface number.                                                                                                                                                                                                                                             |
|                    |          | Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                                |

**Defaults** No default behavior or values

**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.                                                                                                                                         |
|                 | 12.2(14)S  | This command was integrated into Cisco IOS Release 12.2(14)S.                                                                                                                                        |
|                 | 12.2(20)S2 | This command was integrated into Cisco IOS Release 12.2(20)S2 and introduced a new address format and output for interfaces on the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

## Examples

The following is sample output from the **show interfaces gigabitethernet** command for the first interface (port 0) in 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 interfaces gigabitethernet 4/0/0
GigabitEthernet4/0/0 is up, line protocol is down
  Hardware is SPA-2GE-7304, address is 00b0.64ff.5a80 (bia 00b0.64ff.5a80)
  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)
Half-duplex, 1000Mb/s, link type is auto, media type is RJ45
output flow-control is unsupported, input flow-control is unsupported
ARP type: ARPA, ARP Timeout 04:00:00
Last input never, output 00:00:09, output hang never
Last clearing of "show interface" counters never
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts (0 IP multicast)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
  0 watchdog, 0 multicast, 0 pause input
  109 packets output, 6540 bytes, 0 underruns
  0 output errors, 0 collisions, 2 interface resets
  0 babbles, 0 late collision, 0 deferred
  1 lost carrier, 0 no carrier, 0 PAUSE output
  0 output buffer failures, 0 output buffers swapped out

```

**Note**

There are variations in the output for the **show interfaces** commands on Cisco Systems routers depending on the platform, type of interface, and also other features that you might have configured, such as Quality of Service (QoS). Therefore, some additional output fields might appear in your **show** command output. For more information about these fields, see the **show interfaces** command description in the *Cisco IOS Interface Command Reference*, Release 12.2.

Table 8-30 describes the fields shown in the display.

**Table 8-30** *show interfaces gigabitethernet Field Descriptions—Gigabit Ethernet SPA*

| Field                                                  | Description                                                                                                                                                      |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GigabitEthernet...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, SPA-2GE-7304) and MAC address.                                                                                                       |
| Description                                            | Alphanumeric string identifying the interface. This only appears if the <b>description</b> interface configuration command has been configured on the interface. |
| Internet address                                       | Internet address followed by subnet mask.                                                                                                                        |
| MTU                                                    | Maximum transmission unit of the interface. The default is 1500 bytes for the 2-Port 10/100/1000 Gigabit Ethernet SPA.                                           |
| BW                                                     | Bandwidth of the interface in kilobits per second.                                                                                                               |
| DLY                                                    | Delay of the interface in microseconds.                                                                                                                          |
| reliability                                            | Reliability of the interface as a fraction of 255 (255/255 is 100 percent reliability), calculated as an exponential average over 5 minutes.                     |

**Table 8-30** *show interfaces gigabitethernet Field Descriptions—Gigabit Ethernet SPA (continued)*

| Field                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| txload, rxload            | Load on the interface (in the transmit “tx” and receive “rx” directions) as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.                                                                                                                                                                                                                                                                                                                 |
| Encapsulation             | Encapsulation method assigned to the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| loopback                  | Indicates whether or not loopback is set.                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Keepalive                 | Indicates whether or not keepalives are set, and the time interval.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Half-duplex, Full-duplex  | Indicates the duplex mode for the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1000Mb/s, 100Mb/s, 10Mb/s | Speed of the interface in megabits per second.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| link type                 | Specifies whether or not autonegotiation is being used on the link.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| media type                | Interface port media type: RJ45, SX, LX, or ZX.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 100BaseTX/FX              | Media protocol standard.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| ARP type:                 | Type of Address Resolution Protocol (ARP) assigned and the timeout period.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 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.<br><br>This field is not updated by fast-switched traffic.                                                                                                                                                                                                                                                |
| 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 displayed. If that field overflows, asterisks are printed.<br><br><b>Note</b> This field does not apply to SPA interfaces.                                                                                                                                   |
| 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>A series of asterisks (***) 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 8-30** *show interfaces gigabitethernet Field Descriptions—Gigabit Ethernet SPA (continued)*

| Field                                        | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input queue<br>(size/max/drops/flushes)      | Packet statistics on the input queue reported as: <ul style="list-style-type: none"> <li>• Size—Number of packets in the input queue.</li> <li>• Max—Maximum size of the queue.</li> <li>• Drops—Number of packets dropped because of a full input queue.</li> <li>• Flushes—Number of packets dropped as part of selective packet discard (SPD). SPD implements a selective packet drop policy on the router's IP process queue. Therefore, it only applies to process-switched traffic.</li> </ul>                                                                                                            |
| Total output drops                           | Total number of packets dropped because of a full output queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Queueing strategy                            | Type of Layer 3 queueing active on this interface. The default is first-in, first-out (FIFO).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Output queue (size/max)                      | Number of packets in the output queue (size), and the maximum size of the queue (max).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 5 minute input rate,<br>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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 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 smaller 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 larger than 1536 bytes is considered a giant.<br><br><b>Note</b> For the 2-Port 10/100/1000 Gigabit Ethernet SPA, the default is that a giant is any packet greater than 1536 bytes. However, if you modify the maximum transmission unit (MTU) for the interface, this counter increments when you exceed the specified MTU for the interface.                                                                                                                        |
| throttles                                    | Number of times the receiver on the port was disabled, possibly because of buffer or processor overload.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Table 8-30** *show interfaces gigabitethernet Field Descriptions—Gigabit Ethernet SPA (continued)*

| Field                                         | Description                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 check 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. Broadcast storms and bursts of noise can cause the ignored count to be increased.                                                                                                      |
| watchdog                                      | Number of times the watchdog receive timer expired. Expiration happens when receiving a packet with a length greater than 2048 bytes.                                                                                                                                                                                                                       |
| 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 only; 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.                                                                                                                                                                                                                                                                    |
| 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. This is usually the result of an overextended LAN (Ethernet or transceiver cable too long, more than two repeaters between stations, or too many cascaded multiport transceivers). A packet that collides is counted only once in output packets.                                        |
| interface resets                              | Number of times an interface has been completely reset. This can happen if packets queued for transmission were not sent within several seconds. Interface resets can occur when an interface is looped back or shut down.                                                                                                                                  |

**Table 8-30** *show interfaces gigabitethernet Field Descriptions—Gigabit Ethernet SPA (continued)*

| Field                                              | Description                                                                                                                      |
|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| babbles                                            | Transmit jabber timer expired.                                                                                                   |
| late collision                                     | Number of late collisions. Late collision happens when a collision occurs after transmitting the preamble.                       |
| deferred                                           | Number of times that the interface 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.<br><b>Note</b> This field does not apply to SPA interfaces. |
| output buffer failures, output buffers swapped out | These counters are not used by the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.                             |

**Related Commands**

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>show interfaces</b> <sup>1</sup>     | Displays statistics for the interfaces configured on a router or access server.                                                                        |
| <b>show controllers gigabitethernet</b> | Displays Gigabit Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables. |

1. Refer to the Cisco IOS Release 12.2 command reference and master index publications.

# show interfaces pos

To display configuration information and statistics for a Packet over SONET (POS) interface, use the **show interfaces pos** command in user EXEC or privileged EXEC mode.

## Cisco 7000 and Cisco 7500 Series with VIPs

```
show interfaces pos [slot/port-adapter/port]
```

## POS Shared Port Adapters

```
show interfaces pos [slot/subslot/port[/sub_int]]
```

### Syntax Description

|                      |                                                                                                                                                                                                                                                                                                              |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>          | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/port-adapter</i> | (Optional) Port adapter number. Refer to the appropriate hardware manual for information about port adapter compatibility.                                                                                                                                                                                   |
| <i>/subslot</i>      | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <i>/port</i>         | (Optional) Port or interface number.<br><br>Refer to the appropriate hardware manual for port information. For SPAs, refer to the corresponding “Specifying the Interface Address on a SPA” topics in the platform-specific SPA software configuration guide.                                                |
| <i>/sub_int</i>      | (Optional) Subinterface number.                                                                                                                                                                                                                                                                              |

### Command Modes

User EXEC  
Privileged 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 from <b>show interface posi</b> to <b>show interfaces pos</b> , and the sample output was updated.                                        |
| 12.2S       | This command was integrated into Cisco IOS release 12.2S.                                                                                                                      |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. The command was modified to support a new addressing format for SPAs. |

## Examples

**Cisco 7513 Example**

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 10.1.1.1/27
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
```

**POS Shared Port Adapter Example**

The following is sample output from the **show interfaces pos** command on a Cisco 7304 router for POS interface 2/1/1 (which is the interface for port 1 of the SPA in subslot 1 of the MSC in chassis slot 2):

```
Router# show interfaces pos 2/1/1
POS3/0/0 is up, line protocol is up
Hardware is Packet over Sonet
MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec,
  reliability 194/255, txload 1/255, rxload 1/255
Encapsulation FRAME-RELAY, crc 16, loopback not set
Keepalive set (10 sec)
Scramble disabled
LMI enq sent 18, LMI stat recvd 0, LMI upd recvd 0
LMI enq recvd 1473, LMI stat sent 1473, LMI upd sent 0, DCE LMI up
LMI DLCI 1023 LMI type is CISCO frame relay DCE
FR SVC disabled, LAPF state down
Broadcast queue 0/256, broadcasts sent/dropped 2223/1, interface
broadcasts 1977
Last input 00:00:05, output 00:00:05, output hang never
Last clearing of "show interface" counters 04:46:02
Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
Queueing strategy: fifo
Output queue: 0/40 (size/max)
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  47019 packets input, 163195100 bytes, 0 no buffer
  Received 0 broadcasts (0 IP multicast)
  14332 runts, 925 giants, 0 throttles
  0 parity
  17820 input errors, 1268 CRC, 0 frame, 0 overrun, 0 ignored, 10
  abort
  49252 packets output, 170900767 bytes, 0 underruns
  0 output errors, 0 applique, 2 interface resets
  0 output buffer failures, 0 output buffers swapped out
  3 carrier transitions.
```

Table 8-31 describes the significant fields shown in these displays.

**Table 8-31** *show interfaces pos Field Descriptions*

| Field                               | Description                                                                                                                                                                                                                                                                                       |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POSx/y/z 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. . .                    | Hardware type: <ul style="list-style-type: none"> <li>• For POSIP— cyBus Packet over Sonet</li> <li>• For POS SPAs—Packet over SONET</li> </ul>                                                                                                                                                   |
| 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.                                                                                                                                                                                                                                                             |
| Scramble                            | Indicates whether or not SONET payload scrambling is enabled. SONET scrambling is disabled by default.                                                                                                                                                                                            |
| 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. |

**Table 8-31** *show interfaces pos 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. 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 22 <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, 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.                                                                                                                                                                                                                                                                                                           |

**Table 8-31** *show interfaces pos Field Descriptions (continued)*

| Field               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Overrun             | Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.                                                                                                                                                                                                                                                                                             |
| Ignored             | Number of received packets ignored by the interface because the interface hardware ran low on internal buffers. These buffers are different than the system buffers mentioned previously in the buffer description. Broadcast storms and bursts of noise can cause the ignored count to be incremented.                                                                                                                                                                   |
| 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                                                           |
|------------------|-----------------------------------------------------------------------|
| <b>interface</b> | Configures an interface type and enters interface configuration mode. |

# 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
```

## T3/E3 Shared Port Adapters and 2-Port and 4-Port Channelized T3 SPA in Unchannelized Mode

```
show interfaces serial [slot/subslot/port]
```

## Channelized T3 Shared Port Adapters

```
show interfaces serial [slot/subslot/port/t1-num:channel-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.<br><br>For channelized T3 SPAs, number 0–23 of the DS0 link on the T1 channel. |
| <b>accounting</b>     | (Optional) Displays the number of packets of each protocol type that have been sent through the interface.                                                                                                                                                                                                                                                                         |

|                     |                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>         | (Optional) Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                   |
| <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>subslot</i>      | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                 |
| <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.                                                                                                                                                                                                                                                                                                                                 |

**Defaults**

No default behavior or values

**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.                                                                     |
| 11.1CA   | 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. 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.                                     |

| Release     | Modification                                                                                             |
|-------------|----------------------------------------------------------------------------------------------------------|
| 12.0(7)T    | This command was modified to include dialer as an interface type, and to reflect the default behavior.   |
| 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 queuing and fragmentation.  |
| 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                            |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                           |

### 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 8-32](#) describes significant fields shown in the display.

**Table 8-32** *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.                                                                                                                                                                                                                                                                                                                                 |
| 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.                                                                                                                                                                                                  |

**Table 8-32** *show interfaces serial Field Descriptions—Synchronous Serial Interface (continued)*

| Field                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                     |
| 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.                                                                                                                                                                                                                                                                                                                                                                                                                             |

**Table 8-32** *show interfaces serial Field Descriptions—Synchronous Serial Interface (continued)*

| Field                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 8-33 describes significant fields shown in the display that are different from the fields described in Table 8-32.

**Table 8-33** *show interfaces serial Field Descriptions—PA-2JT2 Serial Interface*

| 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.                                                                                                                                                                                                                                       |
| 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 8-34 describes significant fields shown in the display that are different from the fields described in Table 8-32 on page 8-139.

**Table 8-34** *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.                                                                                                                                                                                                                                                        |
| 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 8-35 describes significant fields shown in the display that are different from the fields described in Table 8-32 on page 8-139.

**Table 8-35** *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.                                                                                                                                                                                                                                    |
| 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 8-36 describes significant fields relevant to the CT3IP shown in the display that are different from the fields described in Table 8-32 on page 8-139.

**Table 8-36** *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 8-32 on page 8-139 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 8-32 on page 8-139 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 8-32 on page 8-139](#) 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 8-37 describes significant fields shown in the display that are different from the fields described in Table 8-32 on page 8-139.

**Table 8-37** *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            | Number of Layer 1 checksum errors during reception.         |
| 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.                                 |

**Table 8-37** *show interfaces serial Field Descriptions—Frame Relay Interface Queueing and Fragmentation (continued)*

| Field                      | Description                                                                                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                           |
| 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 8-38](#) describes the few differences that exist.

**Table 8-38** *show interfaces serial Field Descriptions—ANSI LMI*

| Field                    | Description                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------|
| LMI DLCI                 | Identifies the DLCI used by the LMI for this interface. The default is 1023.                              |
| LMI sent                 | 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 8-39](#) shows the fields relevant to all LAPB connections.

**Table 8-39** *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.                                                                           |

**Table 8-39** *show interfaces serial Field Descriptions—LAPB (continued)*

| Field            | Description                                                                                                                                |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                 |

```
Router# show interfaces serial 1
```

Table 8-40 show the fields relevant to PPP connections.

**Table 8-40** *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 8-41 shows the fields relevant to all SDLC connections.

**Table 8-41** *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 8-42 shows other data given for each SDLC secondary interface configured to be attached to the serial interface.

**Table 8-42** *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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Table 8-42 SDLC Secondary Interface Descriptions (continued)**

| Field                       | Description                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                     |
| 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 SDLLC-encapsulated interfaces and is described in the *Cisco IOS Bridging and IBM Networking Command Reference*, Volume 2 of 2: IBM Networking. [Table 8-43](#) shows the parameters specific to SDLLC.

**Table 8-43** 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.                                        |
| 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 8-44 describes significant fields shown in the display.

**Table 8-44** 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.                                                                                                                                                                                                                                             |

**Table 8-44** *show interfaces serial Field Descriptions—X.25 Enabled (continued)*

| Field                                           | Description                                                                                                                                                                                                                                |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                     |
| 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 8-45 describes the fields shown in the display.

**Table 8-45** *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 8-46 describes the significant fields shown in the display that are different from the fields described in Table 8-32 on page 8-139.

**Table 8-46** *show interfaces serial 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 8-46** show interfaces serial Field Descriptions—Cisco AS5800 (continued)

| Field                 | Description                                       |
|-----------------------|---------------------------------------------------|
| subrate               | Bandwidth of each time slot.                      |
| transmit delay is ... | Number of idle flags inserted between each frame. |

**Example with a T3/E3 Shared Port Adapter**

The following example shows the interface statistics on the first port of a T3/E3 SPA installed in subslot 0 of the SIP located in chassis slot 5.

```
Router# show interfaces serial

Serial5/0/0 is up, line protocol is up
  Hardware is SPA-4T3E3
  Internet address is 110.1.1.2/24
  MTU 4470 bytes, BW 44210 Kbit, DLY 200 usec,
    reliability 255/255, txload 234/255, rxload 234/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:05, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 40685000 bits/sec, 115624 packets/sec
  5 minute output rate 40685000 bits/sec, 115627 packets/sec
    4653081241 packets input, 204735493724 bytes, 0 no buffer
  Received 4044 broadcasts (0 IP multicast)
  0 runts, 0 giants, 0 throttles
    0 parity
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  4652915555 packets output, 204728203520 bytes, 0 underruns
  0 output errors, 0 applique, 4 interface resets
  0 output buffer failures, 0 output buffers swapped out
  2 carrier transitions
  rxLOS inactive, rxLOF inactive, rxAIS inactive
  txAIS inactive, rxRAI inactive, txRAI inactive
```

[Table 8-47](#) describes the fields shown in the **show interfaces serial** output.



**Note** The fields appearing in the output will vary depending on card type, interface configuration, and the status of the interface.

**Table 8-47** T3/E3 SPA—Command Field Descriptions

| Field               | Description                                                                                                                                                                                                   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial              | Name of the serial interface.                                                                                                                                                                                 |
| line protocol is    | If the line protocol is up, the local router has received keepalive packets from the remote router. If the line protocol is down, the local router has not received keepalive packets from the remote router. |
| Hardware is         | Designates the specific hardware type of the interface.                                                                                                                                                       |
| Internet address is | The IP address of the interface.                                                                                                                                                                              |

**Table 8-47 T3/E3 SPA—Command Field Descriptions (continued)**

| Field                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MTU                             | The maximum packet size set for the interface.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| BW                              | Bandwidth in kilobits per second.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| DLY                             | Interface delay in microseconds.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| reliability                     | Reliability of the interface as a fraction of 255 (255/255 is 100 percent reliability), calculated as an exponential average over 5 minutes.                                                                                                                                                                                                                                                                                                                        |
| txload                          | Transmit load on the interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over 5 minutes.                                                                                                                                                                                                                                                                                                                         |
| rxload                          | Receive 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.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| crc                             | CRC size in bits.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 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.                                                                                                                                                                     |
| Last 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 of show interface | 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 231 ms (and less than 232 ms) ago. |

**Table 8-47 T3/E3 SPA—Command Field Descriptions (continued)**

| <b>Field</b>         | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input queue          | <i>size</i> —Current size of the input queue.<br><i>max</i> —Maximum size of the input queue.<br><i>drops</i> —Packets dropped because the queue was full.<br><i>flushes</i> —Number of times that data on queue has been discarded.                                                                                                                                                                                                                                                                                                                                                                            |
| Total output drops   | Total number of dropped packets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Queueing strategy    | First-in, first-out queueing strategy (other queueing strategies you might see are priority-list, custom-list, and weighted fair).                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Output queue         | <i>size</i> —Current size of the output queue.<br><i>max</i> —Maximum size of the output queue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 5-minute input rate  | Average number of bits and packets received 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.    |
| 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. |
| rxLOS                | Receive loss of signal status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| rxLOF                | Receive loss of frame status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| rxAIS                | Receive alarm indication signal status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| txAIS                | Transmit alarm indication signal status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| rxRAI                | Receive remote alarm indication signal status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| txRAI                | Transmit remote alarm indication signal status. Values are inactive or active.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Related Commands | Command                 | Description                     |
|------------------|-------------------------|---------------------------------|
|                  | show controllers serial | Displays controller statistics. |

## show tcam-mgr subslot

To display ternary content addressable memory (TCAM) manager information for a SPA, use the **show tcam-mgr subslot** command in privileged EXEC configuration mode.

```
show tcam-mgr subslot slot/subslot inst-info
```

```
show tcam-mgr subslot slot/subslot region region-number [config | statistics]
```

```
show tcam-mgr subslot slot/subslot {rx-dest-mac | rx-vlan} {alloc-mbus [summary] | table}
```

```
show tcam-mgr subslot slot/subslot statistics
```

| Syntax Description |                                                                          |                                                                                                                                                                                                                                                                                  |
|--------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>        | Chassis slot number.                                                     | Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>    | Secondary slot number on a MSC where a SPA is installed.                 | Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                        |
| <b>inst-info</b>   | Specifies the display of Instance Control Block information for the SPA. |                                                                                                                                                                                                                                                                                  |

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>region</b> <i>region-number</i> [ <b>config</b>   <b>statistics</b> ]                        | <p>Specifies the display of region-related TCAM manager information, with the following options:</p> <ul style="list-style-type: none"> <li>• <b>region</b> <i>region-number</i>—Displays TCAM manager information, where: <ul style="list-style-type: none"> <li>– <b>region 0</b>—Specifies the destination MAC address TCAM region.</li> <li>– <b>region 1</b>—Specifies the VLAN ID TCAM region.</li> </ul> </li> <li>• <b>config</b>—(Optional) Displays TCAM manager configuration information.</li> <li>• <b>statistics</b>—(Optional) Displays TCAM manager statistical information.</li> </ul>                                                                                                                                                   |
| { <b>rx-dest-mac</b>   <b>rx-vlan</b> } { <b>alloc-mbus</b> [ <b>summary</b> ]   <b>table</b> } | <p>Specifies the display of TCAM manager information related to the following areas:</p> <ul style="list-style-type: none"> <li>• <b>rx-dest-mac</b>—Destination MAC address filtering for received frames.</li> <li>• <b>rx-vlan</b>—VLAN filtering for received frames.</li> <li>• <b>alloc-mbus</b> [<b>summary</b>]—Displays allocated Mask Block Unit (MBU) entry information related to the MAC or VLAN TCAM filters. There is no difference between the <b>alloc-mbus</b> and <b>alloc-mbus summary</b> form of the command.</li> <li>• <b>table</b>—Displays table entries for the MAC or VLAN TCAM filters.</li> </ul> <p><b>Note</b> The <b>label</b> and <b>free-mbus</b> [<b>summary</b>] forms of the command are not supported on SPAs.</p> |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| <b>Command History</b> | <b>Release</b> | <b>Modification</b>                                                                                                                                                                               |
|------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        | 12.0(19)S      | This command was introduced.                                                                                                                                                                      |
|                        | 12.2(20)S2     | This command was integrated into Cisco IOS Release 12.2(20)S2 and support for the <b>subslot</b> , <b>rx-dest-mac</b> , and <b>rx-vlan</b> keywords were added for SPAs on the Cisco 7304 router. |

**Usage Guidelines** Use the **show tcam-mgr subslot** command to display TCAM manager information for the destination MAC address and VLAN filter regions supported by the SPAs.

The TCAM manager allocates memory among the applications that it supports, in the form of regions. The SPAs support two TCAM regions, region 0 for destination MAC address filtering and region 1 for VLAN ID filtering of received frames.

**Examples**

The following examples provide sample output for several versions of the **show tcam-mgr subslot** command for a 4-Port 10/100 Fast Ethernet SPA located in the top subslot (0) of the MSC that is installed in slot 4 on a Cisco 7304 router:

- [show tcam-mgr subslot inst-info Example, page 8-162](#)
- [show tcam-mgr subslot region Example, page 8-162](#)
- [show tcam-mgr subslot region statistics Example, page 8-163](#)
- [show tcam-mgr subslot rx-dest-mac table Example, page 8-163](#)
- [show tcam-mgr subslot rx-vlan table Example, page 8-164](#)
- [show tcam-mgr subslot statistics Example, page 8-165](#)

**show tcam-mgr subslot inst-info Example**

The following shows sample output from the **show tcam-mgr subslot inst-info** command:

```
Router# show tcam-mgr subslot 4/0 inst-info
Instance Control Block Information :

CAM name                = SPA 4xFE/2xGE CAM2
Maximum key length      = 72 bits
TBU (TCAM Base Unit) length = 72 bits
V2M Ratio               = 8
TCAM Size               = 8192 TBUs
SRAM Size               = 0 words
Start index of first VC = 0
Label table size       = 0
```

**show tcam-mgr subslot region Example**

The following shows sample output from the **show tcam-mgr subslot region** command for the destination MAC address TCAM region (0) for the SPA:

```
Router# show tcam-mgr subslot 4/0 region 0

Region Configuration :

Region ID                = 0
Region name              = DA_FILTERING
Fixed size               = no
Region type (hash:mask  ) = Partial_Order_Indep_Order_Dep_At_Bottom
Application VMR V/M size = 12
Application VMR result size = 1
Vc region size (percentage) = 50

Region Information :

Region ID                = 0
Value cells size        = 4096
Mask cells size         = 512
MBUs size               = 512
Mask index start TBU    = 0
Mask index end TBU     = 511
First dynamic region    = yes
Last dynamic region     = yes
Size is fixed           = yes
Expansion unit MBUs     = 1
Lower Limit, llimit_p   = 450A6CF0
Upper Limit, ulimit_p   = 450AE4B4
Lower limit pointer index = 0
Upper limit pointer index = 511
```

```

Lower next pointer index = 0
Upper next pointer index = 4
Lower free entries      = 1
Upper free entries      = 507
Bottom pointer index    = 510
Free mask block units   = 508

Region ID                = 0
Region expansion count   = 0
Region Shifts            = 0
Region expansion failures = 0
Invalid direction hits   = 0
Invalid parameter hits   = 0
No free entry failures   = 0

```

### show tcam-mgr subslot region statistics Example

The following shows sample output from the **show tcam-mgr subslot region statistics** command for the destination MAC address TCAM region (0) for the SPA:

```
Router# show tcam-mgr subslot 4/0 region 0 statistics
```

```

Region ID                = 0
Region expansion count   = 0
Region Shifts            = 0
Region expansion failures = 0
Invalid direction hits   = 0
Invalid parameter hits   = 0
No free entry failures   = 0

```

### show tcam-mgr subslot rx-dest-mac table Example

The following shows partial output from the **show tcam-mgr subslot rx-dest-mac table** command:

```
Router# show tcam-mgr subslot 4/0 rx-dest-mac table
```

```
Dest mac filtering Table
```

```
-----
```

```
There are 15 entries in the table
```

```
Entry# 1:
```

```
Application ID          = 1
Value                  =
```

```
Mask                   =
                       0 0 0 0 0 4 0 0 0 0 0 0
```

```
Result                 =
                       0 0 0 0 0 C 0 0 0 0 0 0
```

```
Mask index             = 0
Mask Physical Address   = 511
Value cell index       = 4088
Value cell Physical address = 7
Allocation direction    = 4095
                       = bottom
```

```
Entry# 2:
```

```
Application ID          = 1
Value                  =
```

```
Mask                   =
                       0 0 0 0 0 4 0 B0 64 FF 44 80
```

```
                       0 0 0 0 0 F FF FF FF FF FF FF
```

## show tcam-mgr subslot

```

Result =

Mask index = 4
Mask Physical Address = 2
Mask Physical Address = 16
Value cell index = 1
Value cell Physical address = 17
Allocation direction = no direction

Entry# 3:
Application ID = 1
Value =

Mask = 0 0 0 0 0 4 FF FF FF FF FF FF

Result = 0 0 0 0 0 F FF FF FF FF FF FF

Mask index = 4
Mask Physical Address = 2
Mask Physical Address = 16
Value cell index = 2
Value cell Physical address = 18
Allocation direction = no direction
.
.
.

```

**show tcam-mgr subslot rx-vlan table Example**

The following shows partial output from the **show tcam-mgr subslot rx-vlan table** command:

```
Router# show tcam-mgr subslot 4/0 rx-vlan table
```

```
RX VLAN filtering Table
```

```
-----
```

```
There are 9 entries in the table
```

```

Entry# 1:
Application ID = 2
Value =

Mask = 0 0 0 0 0 8 0 0 0 0 0 0

Result = 0 0 0 0 0 C 0 0 0 0 0 0

Mask index = 0
Mask Physical Address = 1023
Mask Physical Address = 8184
Value cell index = 7
Value cell Physical address = 8191
Allocation direction = bottom

Entry# 2:
Application ID = 2
Value =

Mask = 0 0 0 0 0 0 0 0 0 0 0 0

0 0 0 0 0 F 0 0 0 0 0 0

```

```

Result =
      4
Mask index = 512
Mask Physical Address = 4096
Value cell index = 0
Value cell Physical address = 4096
Allocation direction = top
.
.
.

```

### show tcam-mgr subslot statistics Example

The following shows sample output from the **show tcam-mgr subslot statistics** command:

```
Router# show tcam-mgr subslot 4/0 statistics
```

```

Application entry alloc failures = 0
TCAM entry alloc failures = 0
TCAM driver failures = 0
TCAM API invalid parameters = 0
TCAM API application entry lookup failures = 0
TCAM API application entry mismatch failures = 0
TCAM API label table occupied failures = 0
TCAM MGR free mbu vc failures = 0
TCAM Mgr insertion/deletion time
  Insert time: total:0.0000 num:0 avg:0.0000
    check dupl: total:0.0000 num:0 avg:0.0000
    alloc mbu: total:0.0000 num:0 avg:0.0000
    queue appl: total:0.0000 num:0 avg:0.0000
    insert drv: total:0.0000 num:0 avg:0.0000
  Delete time: total:0.0000 num:0 avg:0.0000
    delete drv: total:0.0000 num:0 avg:0.0000
    delete mbu: total:0.0000 num:0 avg:0.0000
    delete appl: total:0.0000 num:0 avg:0.0000

Region ID = 0
Region name = DA_FILTERING
Fixed size = no
Region type (hash:mask ) = Partial_Order_Indep_Order_Dep_At_Bottom
Application VMR V/M size = 12
Application VMR result size = 1
Vc region size (percentage) = 50

```

### Related Commands

| Command                               | Description                                                                                                                                            |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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 gigabithernet</b> | Displays Gigabit Ethernet interface information, transmission statistics and errors, and applicable MAC destination address and VLAN filtering tables. |

## show upgrade file

The **show upgrade file** command is replaced by the **show upgrade fpd file** command. See the **show upgrade fpd file** command for more information.

# show upgrade fpd file

To display the contents of an FPD image package file, enter the **show upgrade fpd file** command in privileged EXEC configuration mode.

```
show upgrade fpd file file-url
```

|                           |                 |                                                                                                                                                                                                                                      |
|---------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax Description</b> | <i>file-url</i> | Specifies the location of the FPD image package file, beginning with the location or type of storage device (examples include <b>disk0</b> , <b>slot0</b> , <b>tftp</b> , or <b>ftp</b> ) and followed by the path to the FPD image. |
|---------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                 |                               |
|-----------------|-------------------------------|
| <b>Defaults</b> | No default behavior or values |
|-----------------|-------------------------------|

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

|                        |                |                              |
|------------------------|----------------|------------------------------|
| <b>Command History</b> | <b>Release</b> | <b>Modification</b>          |
|                        | 12.2(20)S6     | This command was introduced. |

**Usage Guidelines** This command provides information related to the FPD image package file. Most of the information in this command is useful for customer support purposes only.

In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the output generated by entering this command can be generated by entering the **show upgrade file** command.

**Examples** The output in the following example displays information about the FPD image package file stored in the disk0: Flash card memory:

```
Router# show upgrade fpd file disk0:spa-fpd.122-20.S6.pkg
```

```
% Extracting compressed bundle spa_4fe2ge-fpd.bndl.zip ...
```

```
Content for the "spa_4fe2ge-fpd.bndl" bundle file:
```

```

          Bundle Name:4xFE/2xGE SPA FPD Bundle
          Bundle Version:0.5
    Number of Supported Cards:2
      Supported Card Type(s):SPA-4FE-7304 (0x435)
                             SPA-2GE-7304 (0x436)
    Bundle Header Format Version:4
      Bundle Header Length:128 bytes
      Bundle Data Length:4951592 bytes
      Bundle Magic Number:0xC5C0FBC0
      Bundle 32-Bit CRC:0x3B53C5C0
      Bundle Build Date:10/12/2004 (MM/DD/YYYY)
    Number of Images Bundled:1
      Bundle Name Prefix:spa_4fe2ge
```

```
Image #1:
```

```

Name                :Data & I/O FPGA
ID                  :1
Version             :4.17
Minimal H/W Version :0.0
Order in Bundle     :1
Header Length       :128 bytes
Data Length         :4951464 bytes
Total Length        :4951464 bytes (Data + Padding)
Magic Number        :0xC5C0FDC0
32-Bit CRC          :0x14613280
Build Date          :10/12/2004 (MM/DD/YYYY)
Image Format         :XSVF
Upgrade Path        :By Host
Upgrade Path Info   :0
Control Flag Value  :0x1
Estimated Upgrade Time:420 seconds

```

The output in the following example displays information about the FPD image package file stored at a TFTP server location:

```

Router# show upgrade fpd file tftp://mytftpserver/myfpdpgkd/spa-fpd.122-20.S6.pkg
Loading myfpdpgkd/spa-fpd.122-20.S6.pkg from 223.255.254.254 (via FastEthernet0):!

% Extracting compressed bundle spa_4fe2ge-fpd.bndl.zip
...!!
!!

Content for the "spa_4fe2ge-fpd.bndl" bundle file:

          Bundle Name:4xFE/2xGE SPA FPD Bundle
          Bundle Version:0.5
Number of Supported Cards:2
          Supported Card Type(s):SPA-4FE-7304 (0x435)
                               SPA-2GE-7304 (0x436)
Bundle Header Format Version:4
          Bundle Header Length:128 bytes
          Bundle Data Length:4951592 bytes
          Bundle Magic Number:0xC5C0FBC0
          Bundle 32-Bit CRC:0x3B53C5C0
          Bundle Build Date:10/12/2004 (MM/DD/YYYY)
Number of Images Bundled:1
          Bundle Name Prefix:spa_4fe2ge

Image #1:
Name                :Data & I/O FPGA
ID                  :1
Version             :4.17
Minimal H/W Version :0.0
Order in Bundle     :1
Header Length       :128 bytes
Data Length         :4951464 bytes
Total Length        :4951464 bytes (Data + Padding)
Magic Number        :0xC5C0FDC0
32-Bit CRC          :0x14613280
Build Date          :10/12/2004 (MM/DD/YYYY)
Image Format         :XSVF
Upgrade Path        :By Host
Upgrade Path Info   :0
Control Flag Value  :0x1
Estimated Upgrade Time:420 seconds

```

[OK - 703488 bytes]

**Related Commands**

| <b>Command</b>                          | <b>Description</b>                                                                                                                 |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>        | Manually upgrades the current FPD image on the specified SPA.                                                                      |
| <b>upgrade fpd auto</b>                 | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
| <b>upgrade fpd path</b>                 | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
| <b>show hw-module subslot fpd</b>       | Displays the FPD version on each SPA in the router.                                                                                |
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                                            |
| <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |
| <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file.                                  |

# show upgrade fpd package default

To display which FPD image package is needed for the router to properly support the SPAs for the running Cisco IOS software release, enter the **show upgrade fpd package default** command in privileged EXEC configuration mode.

## show upgrade fpd package default

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

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S6 | This command was introduced. |

**Usage Guidelines** It is important to note that the output from this command is generated from the Cisco IOS image and provides information regarding the default FPD image package file that is needed for your particular Cisco IOS release. This command also lists the SPAs supported by the default FPD image package file for the running Cisco IOS image.

In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the output generated by entering this command can be generated by entering the **show upgrade package default** command.

**Examples** In the following example, the **show upgrade fpd package default** command output shows that the spa\_fpd.122-20-S6.pkg FPD image package file is required if you install the SPA-4FE-7304 or the SPA-2GE-7304 on this particular router with this particular Cisco IOS release:

```
Router# show upgrade fpd package default

*****
This IOS release supports the following default FPD Image Package(s) for
automatic upgrade:
*****

SPA FPD Image Package:spa_fpd.122-20.S6.pkg

List of SPAs supported in this package:

      No. SPA Name                Minimal
      -----
      1) SPA-4FE-7304             0.0
      2) SPA-2GE-7304             0.0
      -----
```

**Related Commands**

| <b>Command</b>                    | <b>Description</b>                                                                                                                 |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>  | Manually upgrades the current FPD image on the specified SPA.                                                                      |
| <b>upgrade fpd auto</b>           | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
| <b>upgrade fpd path</b>           | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
| <b>show hw-module subslot fpd</b> | Displays the FPD version on each SPA in the router.                                                                                |
| <b>show upgrade fpd file</b>      | Displays the contents of an FPD image package file.                                                                                |
| <b>show upgrade fpd progress</b>  | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |
| <b>show upgrade fpd table</b>     | Displays various information used by the Cisco IOS software to manage the FPD image package file.                                  |

# show upgrade fpd progress

To view the progress of an FPD upgrade while an FPD upgrade is taking place, enter the **show upgrade fpd progress** command in privileged EXEC configuration mode.

## show upgrade fpd progress

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

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S6 | This command was introduced. |

**Usage Guidelines** In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the output generated by entering this command can be generated by entering the **show upgrade progress** command.

**Examples** The following example shows the type of information this command displays:

```
Router# show upgrade fpd progress
```

```
FPD Image Upgrade Progress Table:
```

```
==== =====
Slot Card Description      Field Programmable      Time
                             Device : "ID-Name"      Needed   Time Left  State
==== =====
 2/0 SPA-2GE-7304          1-4FE/2GE FPGA         00:06:00  00:05:17  Updating...
-----
 2/1 SPA-4FE-7304          1-4FE/2GE FPGA         --:--:--  --:--:--  Waiting...
==== =====
```

| Related Commands | Command                           | Description                                                                                                                        |
|------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|                  | <b>upgrade hw-module subslot</b>  | Manually upgrades the current FPD image on the specified SPA.                                                                      |
|                  | <b>upgrade fpd auto</b>           | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
|                  | <b>upgrade fpd path</b>           | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
|                  | <b>show hw-module subslot fpd</b> | Displays the FPD version on each SPA in the router.                                                                                |
|                  | <b>show upgrade fpd file</b>      | Displays the contents of an FPD image package file.                                                                                |

| <b>Command</b>                          | <b>Description</b>                                                                                |
|-----------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.           |
| <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file. |

# show upgrade fpd table

To view various information used by the Cisco IOS software to manage the FPD image package file, enter the **show upgrade fpd table** command in privileged EXEC configuration mode.

## show upgrade fpd table

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

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S6 | This command was introduced. |

**Usage Guidelines** This command provides version information used by the Cisco IOS image to manage the FPD image package file and to locate the correct FPD image within the FPD image package file to perform an FPD upgrade. Most of the information provided by this command is useful for customer support purposes.

In Cisco IOS Releases 12.2(20)S2 through 12.2(20)S5, the output generated by entering this command can be generated by entering the **show upgrade table** command.

**Examples** The following example displays various FPD information for Cisco IOS Release 12.2(20)S6:

```
Router# show upgrade fpd table
```

```
Field Programmable Devices (FPD) Bundle Information Table:
=====
```

```
Table Entry #1:
```

```
Bundle Card Type:SPA-4FE-7304 (0x435)
Platform Family:0x0
Bundle Name Prefix:spa_4fe2ge
Bundle Version:0.5
Minimal H/W Version:0.0
FPD Image Count:1
FPD Image Required:
```

|  | FPD ID | FPD Name        | Min. Required<br>Version |
|--|--------|-----------------|--------------------------|
|  | 1      | Data & I/O FPGA | 4.17                     |

```
Table Entry #2:
```

```

Bundle Card Type:SPA-2GE-7304 (0x436)
Platform Family:0x0
Bundle Name Prefix:spa_4fe2ge
Bundle Version:0.5
Minimal H/W Version:0.0
FPD Image Count:1
FPD Image Required:

```

| FPD ID | FPD Name        | Min. Required<br>Version |
|--------|-----------------|--------------------------|
| 1      | Data & I/O FPGA | 4.17                     |

**Related Commands**

| Command                                 | Description                                                                                                                        |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>        | Manually upgrades the current FPD image on the specified SPA.                                                                      |
| <b>upgrade fpd auto</b>                 | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
| <b>upgrade fpd path</b>                 | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
| <b>show hw-module subslot fpd</b>       | Displays the FPD version on each SPA in the router.                                                                                |
| <b>show upgrade fpd file</b>            | Displays the contents of an FPD image package file.                                                                                |
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                                            |
| <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |

## show upgrade package default

The **show upgrade package default** command is replaced by the **show upgrade fpd package default** command. See the **show upgrade fpd package default** command for more information.

## show upgrade progress

The **show upgrade progress** command is replaced by the **show upgrade fpd progress** command. See the **show upgrade fpd progress** command for more information.

## show upgrade table

The **show upgrade table** command is replaced by the **show upgrade fpd table** command. See the **show upgrade fpd table** command for more information.

# speed

To configure the speed for a Fast Ethernet or Gigabit Ethernet interface, use the **speed** command in interface configuration mode. To return to the default setting, use the **no** form of this command.

```
speed {10 | 100 | 1000 | auto}
```

```
no speed
```

## Syntax Description

|             |                                                                                                                                                                                                                                                                                                      |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>10</b>   | Configures the interface to transmit at 10 Mbps.                                                                                                                                                                                                                                                     |
| <b>100</b>  | Configures the interface to transmit at 100 Mbps.                                                                                                                                                                                                                                                    |
| <b>1000</b> | Configures the interface to transmit at 1000 Mbps. This keyword is valid only for interfaces that support Gigabit Ethernet.                                                                                                                                                                          |
| <b>auto</b> | Enables Fast Ethernet autonegotiation. The interface automatically operates at 10 Mbps 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. Autonegotiation is the default. |

## Defaults

auto

## Command Modes

Interface configuration

## Command History

| Release    | Modification                                                                                                                                  |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 11.2(10)P  | This command was introduced.                                                                                                                  |
| 12.1(7)E   | The <b>1000</b> keyword was added for Gigabit Ethernet interfaces.                                                                            |
| 12.2 S     | This command was integrated into Cisco IOS Release 12.2 S.                                                                                    |
| 12.2(20)S2 | This command was implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router. |

## Usage Guidelines

The **speed** command applies to SPA interfaces that are using RJ-45 media. Gigabit Ethernet interfaces using fiber media support 1000-Mbps speed only, and use the **negotiation** command to enable and disable autonegotiation.

To enable the autonegotiation capability on an RJ-45 interface, you must set either the **speed** command or the **duplex** command to **auto**. The default configuration is that both commands are set to **auto**.

[Table 8-48](#) describes the interface behavior for different combinations of the **duplex** and **speed** command settings. The specified **duplex** command configured with the specified **speed** command produces the resulting system action.

If you specify both a **duplex** and **speed** setting other than **auto** on an RJ-45 interface, then autonegotiation is disabled for the interface.

**Note**

If you need to force an interface port to operate with certain settings and therefore disable autonegotiation, you must be sure that the remote link is configured for compatible link settings for proper transmission. This includes support of flow control on the link.

**Note**

Every interface on a 4-Port 10/100 Fast Ethernet SPA and 2-Port 10/100/1000 Gigabit Ethernet SPA supports transmission of pause frames to stop packet flow when the MSC is full. You cannot disable flow control for an interface on the 4-Port 10/100 Fast Ethernet SPA or 2-Port 10/100/1000 Gigabit Ethernet SPA. Therefore, flow control support is not configurable, but it is advertised during autonegotiation.

If you disable autonegotiation, then you must be sure that the remote device is configured to support flow control because flow control is automatically enabled for all interfaces on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA.

**Table 8-48 Relationship Between duplex and speed Commands**

| <b>duplex Command</b> | <b>speed Command</b>                       | <b>Resulting System Action</b>                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>duplex auto</b>    | <b>speed auto</b>                          | Autonegotiates both speed and duplex mode. The interface advertises capability for the following link settings: <ul style="list-style-type: none"> <li>• 10 Mbps and half duplex</li> <li>• 10 Mbps and full duplex</li> <li>• 100 Mbps and half duplex</li> <li>• 100 Mbps and full duplex</li> <li>• 1000 Mbps and half duplex (Gigabit Ethernet only)</li> <li>• 1000 Mbps and full duplex (Gigabit Ethernet only)</li> </ul> |
| <b>duplex auto</b>    | <b>speed 10 or speed 100 or speed 1000</b> | Autonegotiates the duplex mode. The interface advertises capability for the configured speed with capability for both half-duplex or full-duplex mode. <p>For example, if the <b>speed 100</b> command is configured with <b>duplex auto</b>, then the interface advertises the following capability:</p> <ul style="list-style-type: none"> <li>• 100 Mbps and half duplex</li> <li>• 100 Mbps and full duplex</li> </ul>       |

**Table 8-48 Relationship Between duplex and speed Commands (continued)**

| duplex Command                           | speed Command     | Resulting System Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>duplex half</b> or <b>duplex full</b> | <b>speed auto</b> | Autonegotiates the speed. The interface advertises capability for the configured duplex mode with capability for both 10-Mbps or 100-Mbps operation for Fast Ethernet interfaces, and 10-Mbps, 100-Mbps, and 1000-Mbps for Gigabit Ethernet interfaces.<br><br>For example, if the <b>duplex full</b> command is configured with the <b>speed auto</b> command, then the interface advertises the following capability: <ul style="list-style-type: none"> <li>• 10 Mbps and full duplex</li> <li>• 100 Mbps and full duplex</li> <li>• 1000 Mbps and full duplex (Gigabit Ethernet interfaces only)</li> </ul> |
| <b>duplex half</b>                       | <b>speed 10</b>   | Forces 10-Mbps and half-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>duplex full</b>                       | <b>speed 10</b>   | Forces 10-Mbps and full-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>duplex half</b>                       | <b>speed 100</b>  | Forces 100-Mbps and half-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>duplex full</b>                       | <b>speed 100</b>  | Forces 100-Mbps and full-duplex operation, and disables autonegotiation on the interface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>duplex half</b>                       | <b>speed 1000</b> | Forces 1000-Mbps and half-duplex operation, and disables autonegotiation on the interface (Gigabit Ethernet only).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>duplex full</b>                       | <b>speed 1000</b> | Forces 1000-Mbps and full-duplex operation, and disables autonegotiation on the interface (Gigabit Ethernet only).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

**Examples**

The following example specifies advertisement of 10 Mbps operation only, and either full-duplex or half-duplex capability during autonegotiation for the second interface (port 1) on the SPA located in the bottom subslot (1) of the MSC that is installed in slot 2 of the Cisco 7304 router:

```
Router# configure terminal
Router(config)# interface fastethernet 2/1/1
Router(config-if)# speed 10
Router(config-if)# duplex auto
```

With this configuration, the interface advertises the following capabilities during autonegotiation:

- 10 Mbps and half duplex
- 10 Mbps and full duplex

**Note**

Flow control support is always advertised when autonegotiation is enabled.

| Related Commands | Command                                 | Description                                                                                                                                            |
|------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | <b>duplex</b>                           | Configures the duplex operation on an interface.                                                                                                       |
|                  | <b>interface fastethernet</b>           | Selects a particular Fast Ethernet interface for configuration.                                                                                        |
|                  | <b>interface gigabitethernet</b>        | Selects a particular Gigabit Ethernet interface for configuration.                                                                                     |
|                  | <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. |
|                  | <b>show interfaces fastethernet</b>     | Displays information about the Fast Ethernet interfaces.                                                                                               |
|                  | <b>show interfaces gigabitethernet</b>  | Displays information about the Gigabit Ethernet interfaces.                                                                                            |

# t1 framing

To specify the type of framing used by T1 channels, use the **t1 framing** command in controller configuration mode.

## Cisco 7500 Series Routers with Channelized T3 Interface Processor

```
t1 channel framing {esf | sf}
```

## Channelized T3/E3 Shared Port Adapters

```
t1 channel framing {esf | sf [hdlc-idle {0x7e | 0xff}] [mode {j1}]}
```

```
no t1 channel framing {esf | sf [hdlc-idle {0x7e | 0xff}] [mode {j1}]}
```

| Syntax Description             |                                                                                                              |                                                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| <i>channel</i>                 | Number indicating the T1 channel.                                                                            | <ul style="list-style-type: none"> <li>On the CT3IP—1 to 28</li> <li>On the CT3 SPA—0 to 23</li> </ul> |
| <b>esf</b>                     | Specifies that Extended Super Frame (ESF) is used as the T1 framing type. This is the default for the CT3IP. |                                                                                                        |
| <b>sf</b>                      | Specifies that Super Frame (SF) is used as the T1 framing type. This is the default for the T3/E3 SPA.       |                                                                                                        |
| <b>hdlc-idle</b> {0x7e   0xff} | (Optional) Sets the idle pattern for the T1 interface to either <b>0x7e</b> (the default) or <b>0xff</b> .   |                                                                                                        |
| <b>mode</b> {j1}               | (Optional) Specifies the JT-G704 Japanese frame type.                                                        |                                                                                                        |

| Defaults                  |  |
|---------------------------|--|
| <b>esf</b> (for C3TIP)    |  |
| <b>sf</b> (for T3/E3 SPA) |  |

| Command Modes            |  |
|--------------------------|--|
| Controller configuration |  |

| Command History | Release     | Modification                                                                                                                                       |
|-----------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|                 | 11.3        | This command was introduced.                                                                                                                       |
|                 | 12.0(14)S   | This command was integrated into Cisco IOS Release 12.0(14)S. The <b>hdlc-idle</b> keyword option was added.                                       |
|                 | 12.2S       | This command was integrated into Cisco IOS Release 12.2S.                                                                                          |
|                 | 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE to support SPAs on the Cisco 7304 router. The <b>mode</b> keyword option was added. |
|                 | 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.                                                                                      |
|                 | 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.                                                                                     |

**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.

To return to the default mode, use the **no** form of this command. This command does not have a **no** form on the Cisco 7500 series router with the CT3IP.

**Examples**

The following example shows how to set 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
```

**Related Commands**

| Command                | Description                                                                     |
|------------------------|---------------------------------------------------------------------------------|
| <b>controller</b>      | Configures a T1, E1, or T3 controller and enters controller configuration mode. |
| <b>show controller</b> | Displays controller configuration.                                              |

# test hw-module subslot c2w

To test the Cisco 2 wire (c2w) device on a SPA, use the **test hw-module subslot c2w** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot c2w {read device-address port subaddress bytes | write
device-address port subaddress bytes}
```

| Syntax Description    |                                                                                                                                                                                                                                                                                                              |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>           | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>       | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <b>read</b>           | Reads from the specified c2w device.                                                                                                                                                                                                                                                                         |
| <b>write</b>          | Writes to the specified c2w device.                                                                                                                                                                                                                                                                          |
| <i>device-address</i> | Specifies the hexadecimal address (0–FF) of the c2w device.                                                                                                                                                                                                                                                  |
| <i>port</i>           | Specifies the hexadecimal address (0–FF) of the c2w port.                                                                                                                                                                                                                                                    |
| <i>subaddress</i>     | Specifies the hexadecimal subaddress (0–FF) of the c2w device.                                                                                                                                                                                                                                               |
| <i>bytes</i>          | Specifies the number of bytes (1–8) to read or write.                                                                                                                                                                                                                                                        |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S2 | This command was introduced. |

**Usage Guidelines** The **test hw-module subslot c2w** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



**Caution**

The **test hw-module subslot c2w** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot c2w** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

### Examples

The following output provides an example of the **test hw-module subslot c2w** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 c2w read 00 00 00 1
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

# test hw-module subslot failed

To send a failed event on a SPA, use the **test hw-module subslot failed** command in privileged EXEC configuration mode.

**test hw-module subslot** *slot/subslot* **failed** *failure-code*

| Syntax Description                |                                                                      |                                                                                                                                                                                                                                                                                  |
|-----------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                       | Chassis slot number.                                                 | Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>                   | Secondary slot number on a MSC where a SPA is installed.             | Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                        |
| <b>failed</b> <i>failure-code</i> | Tests the specified failure code in the hexadecimal range 0–FFFFFFF. |                                                                                                                                                                                                                                                                                  |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S2 | This command was introduced. |

**Usage Guidelines** The **test hw-module subslot failed** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



**Caution**

The **test hw-module subslot failed** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot failed** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

---

## Examples

The following output provides an example of the **test hw-module subslot failed** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 failed 00000000
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

## test hw-module subslot mac

To test the Media Access Control (MAC) device on a SPA, use the **test hw-module subslot mac** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot mac config port {1000mbps-gmii | 1000mbps-rgmii |
100mbps | 10mbps} {full | half} {copper | fiber}
```

```
test hw-module subslot slot/subslot mac crc port {enable | disable}
```

```
test hw-module subslot slot/subslot mac loopback port {line | none | spi3}
```

### Syntax Description

|                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                                | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                                                                                                                                                                                                                                                                          |
| <i>/subslot</i>                                            | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                                                                                                                                                                                                                                                             |
| <b>config port</b>                                         | Tests a configuration value on the MAC device, where <i>port</i> is the number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul>                                                                                                                                                                                                                                                                                             |
| <b>{1000mbps-gmii   1000mbps-rgmii   100mbps   10mbps}</b> | Specifies a speed value to test on the MAC device of the selected interface on the SPA, where: <ul style="list-style-type: none"> <li><b>1000mbps-gmii</b>—Specifies 1000-Mbps speed using the Gigabit Media Independent Interface (GMII). This option is only available for the Gigabit Ethernet SPAs.</li> <li><b>1000mbps-rgmii</b>—Specifies 1000-Mbps speed using the Reduced Gigabit Media Independent Interface (RGMII). This option is only available for Gigabit Ethernet SPAs.</li> <li><b>100mbps</b>—Specifies 100-Mbps speed.</li> <li><b>10mbps</b>—Specifies 10-Mbps speed.</li> </ul> |
| <b>{full   half}</b>                                       | Specifies the duplex mode to test on the MAC device of the selected interface on the SPA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>{copper   fiber}</b>                                    | Specifies the media type to test on the MAC device of the selected interface on the SPA, where: <ul style="list-style-type: none"> <li><b>copper</b>—Specifies the copper media type, which is used by the RJ-45 interface connector.</li> <li><b>fiber</b>—Specifies a fiber media type, which is used by the Gigabit Interface Converter (GBIC) interface connector.</li> </ul>                                                                                                                                                                                                                     |

|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>crc</b> <i>port</i> { <b>enable</b>   <b>disable</b> }               | <p>Enables or disables appending of a cyclic redundancy check (CRC) on frames for the MAC device, where <i>port</i> is the number of the interface that you want to select on the SPA:</p> <ul style="list-style-type: none"> <li>• On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>• On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>loopback</b> <i>port</i> { <b>line</b>   <b>none</b>   <b>spi3</b> } | <p>Specifies a loopback option on the MAC device of the selected interface, where:</p> <ul style="list-style-type: none"> <li>• <i>port</i>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>line</b>—Specifies a loopback at the MAC device toward the line on the selected interface.</li> <li>• <b>none</b>—Disables loopback at the MAC device on the selected interface.</li> <li>• <b>spi3</b>—Specifies a loopback at the MAC device on the System Packet Interface Level 3 (SPI3) path between the MAC device and field-programmable gate array (FPGA) device. This is sometimes referred to as an internal loopback.</li> </ul> |

**Defaults**

No default behavior or values

**Command Modes**

Privileged EXEC

**Command History**

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

**Usage Guidelines**

The **test hw-module subslot mac** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.

**Caution**

The **test hw-module subslot mac** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore the default SPA configuration on an interface and remove any changes to the SPA settings that you made using a **test hw-module subslot mac** command, perform the following steps:

1. Use the **shutdown** command to disable the affected interface.
2. Use the **no shutdown** command to reenble the interface.

### Examples

The following output provides an example of the **test hw-module subslot mac** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 mac config 0 10mbps full copper
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

### Related Commands

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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. |
| <b>show hw-module subslot</b>           | Displays diagnostic information about internal hardware devices for SPAs.                                                                              |
| <b>show interfaces fastethernet</b>     | Displays the status and configuration settings for the Fast Ethernet interfaces.                                                                       |
| <b>show interfaces gigabitethernet</b>  | Displays the status and configuration settings for Gigabit Ethernet interfaces.                                                                        |

# test hw-module subslot mdio

To read or write to the PHY device registers through the MAC MII data input/output (MDIO) interface on a SPA, use the **test hw-module subslot mdio** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot mdio {read phy-number phy-register-address | write
phy-number phy-register-address}
```

## Syntax Description

|                             |                                                                                                                                                                                                                                                                                                              |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                 | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>             | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <b>read</b>                 | Reads from the specified PHY device.                                                                                                                                                                                                                                                                         |
| <b>write</b>                | Writes to the specified PHY device.                                                                                                                                                                                                                                                                          |
| <i>phy-number</i>           | Number of the interface PHY device that you want to select on the SPA: <ul style="list-style-type: none"> <li>On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul>                                                                 |
| <i>phy-register-address</i> | Address of the register (0–31) on the selected PHY device.                                                                                                                                                                                                                                                   |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

## Usage Guidelines

The **test hw-module subslot mdio** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



### Caution

The **test hw-module subslot mdio** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore some of the default register values on a SPA interface that you made using a **test hw-module subslot mdio** command, perform the following steps:

1. Use the **shutdown** command to disable the affected interface.
2. Use the **no shutdown** command to reenabte the interface.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot mdio** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

### Examples

The following output provides an example of the **test hw-module subslot mdio** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 mdio read 0 31
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.

This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

### Related Commands

| Command                                       | Description                                                                    |
|-----------------------------------------------|--------------------------------------------------------------------------------|
| <b>show hw-module subslot</b>                 | Displays diagnostic information about internal hardware devices for SPAs.      |
| <b>show interfaces fastethernet detail</b>    | Displays low-level diagnostic information for the Fast Ethernet interfaces.    |
| <b>show interfaces gigabitethernet detail</b> | Displays low-level diagnostic information for the Gigabit Ethernet interfaces. |

# test hw-module subslot pause

To enable, disable, and set the pause frame-related configuration on a SPA, use the **test hw-module subslot pause** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot pause port { disable | enable | set { threshold { fpga
fpga-pause-threshold-value | mac mac-pause-threshold-value } timer pause-timer-value }
```

| Syntax Description                               |                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                      | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.          |
| <i>/subslot</i>                                  | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                             |
| <b>pause</b> <i>port</i>                         | Specifies pause frame-related configuration on the router, where <i>port</i> is the number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> |
| <b>disable</b>                                   | Disables pause frame flow control.                                                                                                                                                                                                                                                                                    |
| <b>enable</b>                                    | Enables pause frame flow control.                                                                                                                                                                                                                                                                                     |
| <b>set threshold</b>                             | Specifies that a threshold register (either FPGA or MAC, as specified in the command line) will be set.                                                                                                                                                                                                               |
| <b>fpga</b><br><i>fpga-pause-threshold-value</i> | Configures the pause threshold register value in the SPA FPGA. The <i>fpga-pause-threshold</i> is expressed in usecs.                                                                                                                                                                                                 |
| <b>mac</b><br><i>mac-pause-threshold-value</i>   | Configures the pause threshold register in the MAC. The <i>mac-pause-threshold-value</i> is expressed in bit times.                                                                                                                                                                                                   |
| <b>timer</b> <i>pause-timer-value</i>            | Configures the MAC pause timer value. The <i>pause-timer-value</i> is expressed in bit times.                                                                                                                                                                                                                         |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S5 | This command was introduced. |

**Usage Guidelines**

Issuing this command could result in unexpected behaviors. It should not be used by end users.

**Examples**

The following output shows how to enable pause frame flow control and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/1 pause 1 enable
WARNING: This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

This command can produce unexpected operation of the SPA.  
Are you sure you want to continue? [N]n

The following output shows how to set the pause threshold register value in the SPA FPGA and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/1 pause 1 set threshold fpga 4000
WARNING: This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

This command can produce unexpected operation of the SPA.  
Are you sure you want to continue? [N]n

**Related Commands**

| Command                | Description                                                               |
|------------------------|---------------------------------------------------------------------------|
| show hw-module subslot | Displays diagnostic information about internal hardware devices for SPAs. |

## test hw-module subslot phy

To test the physical interface (PHY) device on a SPA, use the **test hw-module subslot phy** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot phy config port {copper | fiber} {1000mbps | 100mbps |
10mbps | auto} {auto | full | half} {autoneg | force}
```

```
test hw-module subslot slot/subslot phy crossover port {auto | mdi | mdix}
```

```
test hw-module subslot slot/subslot phy loopback port {internal | line | none}
```

| Syntax Description                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                 | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <i>/subslot</i>                             | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>config port</b>                          | Tests a configuration value on the PHY device, where <i>port</i> is the number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>{copper   fiber}</b>                     | Specifies the media type to test on the PHY device of the selected interface on the SPA, where: <ul style="list-style-type: none"> <li><b>copper</b>—Specifies the copper media type, which is used by the RJ-45 interface connector.</li> <li><b>fiber</b>—Specifies a fiber media type, which is used by the Gigabit Interface Converter (GBIC) interface connector.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>{1000mbps   100mbps   10mbps   auto}</b> | Specifies a speed value to test on the PHY device of the selected interface on the SPA, where: <ul style="list-style-type: none"> <li><b>1000mbps</b>—Advertises 1000-Mbps speed only during autonegotiation when used with the <b>autoneg</b> keyword, or configures 1000 Mbps speed when used with the <b>force</b> keyword. This option is only supported for Gigabit Ethernet interfaces.</li> <li><b>100mbps</b>—Advertises 100-Mbps speed only during autonegotiation when used with the <b>autoneg</b> keyword, or configures 100 Mbps speed when used with the <b>force</b> keyword.</li> <li><b>10mbps</b>—Advertises 10-Mbps speed only during autonegotiation when used with the <b>autoneg</b> keyword, or configures 10 Mbps speed when used with the <b>force</b> keyword.</li> <li><b>auto</b>—Advertises all of the supported speeds for autonegotiation for the selected interface when used with the <b>autoneg</b> keyword.</li> </ul> |

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>{ auto   full   half }</b>                   | <p>Specifies the duplex mode to test on the PHY device of the selected interface on the SPA, where:</p> <ul style="list-style-type: none"> <li>• <b>auto</b>—Advertises both the full- and half-duplex modes during autonegotiation when used with the <b>autoneg</b> keyword.</li> <li>• <b>full</b>—Advertises full-duplex mode only during autonegotiation when used with the <b>autoneg</b> keyword, or configures full-duplex mode when used with the <b>force</b> keyword.</li> <li>• <b>half</b>—Advertises half-duplex mode only during autonegotiation when used with the <b>autoneg</b> keyword, or configures half-duplex mode when used with the <b>force</b> keyword.</li> </ul>                                                                                                                                                                       |
| <b>{ autoneg   force }</b>                      | <p>Specifies that the PHY device of the selected interface on the SPA is enabled overall for autonegotiation of transmission characteristics, or whether these values are forced to a particular value, where:</p> <ul style="list-style-type: none"> <li>• <b>autoneg</b>—Advertises the configured speed and duplex values.</li> <li>• <b>force</b>—Disables autonegotiation. Configures the PHY device for the specified speed and duplex values.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>crossover port { auto   mdi   mdix }</b>     | <p>Specifies the type of cable to test on the PHY device of the selected interface on the SPA, where:</p> <ul style="list-style-type: none"> <li>• <b>port</b>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>auto</b>—Specifies that the PHY device automatically detects the type of cable on the specified interface.</li> <li>• <b>mdi</b>—Specifies that the PHY device on the specified interface is configured for a media dependent interface (MDI) cable (a straight-through cable).</li> <li>• <b>mdix</b>—Specifies that the PHY device on the specified interface is configured for media dependent interface crossover (MDI-X) cable.</li> </ul> |
| <b>loopback port { internal   line   none }</b> | <p>Specifies a loopback option on the PHY device of the selected interface on the SPA, where:</p> <ul style="list-style-type: none"> <li>• <b>port</b>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>internal</b>—Specifies internal loopback on the PHY device toward the MAC device on the SPA.</li> <li>• <b>line</b>—Specifies a loopback at the PHY device toward the line on the selected interface.</li> <li>• <b>none</b>—Disables loopback at the PHY device on the selected interface.</li> </ul>                                                                                                                                                  |

**Defaults**

No default behavior or values

**Command Modes**

Privileged EXEC

**Command History**

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

**Usage Guidelines**

The **test hw-module subslot phy** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.

**Caution**

The **test hw-module subslot phy** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore some of the default values on a SPA interface that you made using a **test hw-module subslot phy** command, perform the following steps:

1. Use the **shutdown** command to disable the affected interface.
2. Use the **no shutdown** command to reenab the interface.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot phy** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

**Examples**

The following output provides an example of the **test hw-module subslot phy** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 phy crossover 0 mdix
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

**Related Commands**

| <b>Command</b>                          | <b>Description</b>                                                                                                                                     |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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. |
| <b>show hw-module subslot</b>           | Displays diagnostic information about internal hardware devices for SPAs.                                                                              |

# test hw-module subslot policyram

To test the policy table used by the field programmable gate array (FPGA) device for ternary content addressable memory (TCAM) lookup on a SPA, use the **test hw-module subslot policyram** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot policyram {read ram-virtual-address | write {ram-data |
  [{deny | permit} [tunnel [ignoreda]]]}
```

## Syntax Description

|                                        |                                                                                                                                                                                                                                                                                                              |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                            | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i>                        | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <b>read</b> <i>ram-virtual-address</i> | Reads from the specified RAM address.                                                                                                                                                                                                                                                                        |
| <b>write</b>                           | Writes to the specified RAM address.                                                                                                                                                                                                                                                                         |
| <i>ram-data</i>                        | Value (0–15) to be written in the policy table.                                                                                                                                                                                                                                                              |
| { <b>deny</b>   <b>permit</b> }        | Specifies the corresponding RAM data value to deny or permit traffic.                                                                                                                                                                                                                                        |
| <b>tunnel</b>                          | Specifies use of Layer 2 tunneling.                                                                                                                                                                                                                                                                          |
| <b>ignoreda</b>                        | Specifies that the destination MAC address is ignored.                                                                                                                                                                                                                                                       |

## Defaults

No default behavior or values

## Command Modes

Privileged EXEC

## Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

## Usage Guidelines

The **test hw-module subslot policyram** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



### Caution

The **test hw-module subslot policyram** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore some of the default values on a SPA interface that you made using a **test hw-module subslot policyram** command, perform the following steps:

1. Use the **shutdown** command to disable the affected interface.
2. Use the **no shutdown** command to reenabte the interface.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot policyram** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

## Examples

The following output provides an example of the **test hw-module subslot policyram** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 policyram read 101
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

## Related Commands

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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. |
| <b>show tcam-mgr subslot</b>            | Displays TCAM manager information for SPAs.                                                                                                            |
| <b>test hw-module subslot tcam</b>      | Tests the TCAM device on a SPA.                                                                                                                        |

## test hw-module subslot tcam

To test the ternary content addressable memory (TCAM) device on a SPA, use the **test hw-module subslot tcam** command in privileged EXEC configuration mode.

```
test hw-module subslot slot/subslot tcam insert port {dmac addr hex-mac-address mask
hex-mask | vlan vlan-id} {deny | permit}
```

```
test hw-module subslot slot/subslot tcam lookup port {dmac addr hex-mac-address mask
hex-mask | vlan vlan-id}
```

```
test hw-module subslot slot/subslot tcam read tcam-virtual-address
```

```
test hw-module subslot slot/subslot tcam remove {dmac addr hex-mac-address mask hex-mask |
vlan vlan-id}
```

```
test hw-module subslot slot/subslot tcam write {mask |value} tcam-virtual-address port
lookup-type {dmac hex-mac-address | vlan vlan-id}
```

| Syntax Description                                                                                                                                             |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                                                                                                                                    |  | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <i>lsubslot</i>                                                                                                                                                |  | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>insert</b> <i>port</i> { <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>   <b>vlan</b> <i>vlan-id</i> } { <b>deny</b>   <b>permit</b> } |  | Tests the addition of a TCAM table entry on a SPA, where: <ul style="list-style-type: none"> <li>• <i>port</i>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>—Specifies the addition of a 48-bit destination MAC address (in hexadecimal) and its hexadecimal mask value to the TCAM table.</li> <li>• <b>vlan</b> <i>vlan-id</i>—Specifies the addition of a virtual LAN (VLAN) identifier (0–4095) to the TCAM table.</li> <li>• <b>deny</b>—Configures the TCAM table entry to deny traffic to the specified destination MAC address or VLAN identifier on the selected interface.</li> <li>• <b>permit</b>—Configures the TCAM table entry to allow traffic to be passed to the specified destination MAC address or VLAN identifier on the selected interface.</li> </ul> |

|                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>lookup</b> <i>port</i> { <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>   <b>vlan</b> <i>vlan-id</i> }                                             | <p>Tests the reading of a TCAM table entry on a SPA, where:</p> <ul style="list-style-type: none"> <li>• <i>port</i>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>—Specifies the 48-bit destination MAC address (in hexadecimal) and its hexadecimal mask value that you want to read from the TCAM table.</li> <li>• <b>vlan</b> <i>vlan-id</i>—Specifies the virtual LAN (VLAN) identifier (0–4095) that you want to read from the TCAM table.</li> </ul>                                                                                   |
| <b>read</b> <i>tcam-virtual-address</i>                                                                                                                                    | <p>Tests the reading of a TCAM table entry, where <i>tcam-virtual-address</i> is an address in the range 0–4294967295.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>remove</b> { <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>   <b>vlan</b> <i>vlan-id</i> }                                                         | <p>Tests the deletion of a TCAM table entry on a SPA, where:</p> <ul style="list-style-type: none"> <li>• <i>port</i>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <b>dmac addr</b> <i>hex-mac-address</i> <b>mask</b> <i>hex-mask</i>—Specifies the deletion from the TCAM table of the specified 48-bit destination MAC address (in hexadecimal) and its hexadecimal mask value.</li> <li>• <b>vlan</b> <i>vlan-id</i>—Specifies the deletion from the TCAM table of a virtual LAN (VLAN) identifier in the range 0–4095.</li> </ul>                                                                           |
| <b>write</b> <i>tcam-virtual-address</i>                                                                                                                                   | <p>Tests writing to a TCAM table entry, where <i>tcam-virtual-address</i> is an address in the range 0–4294967295.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>write</b> { <b>mask</b>   <b>value</b> } <i>tcam-virtual-address</i> <i>port</i> <i>lookup-type</i> { <b>dmac</b> <i>hex-mac-address</i>   <b>vlan</b> <i>vlan-id</i> } | <p>Tests writing to a TCAM table entry, where:</p> <ul style="list-style-type: none"> <li>• <b>mask</b>—Specifies writing of a mask cell.</li> <li>• <b>value</b>—Specifies writing of a value cell.</li> <li>• <i>tcam-virtual-address</i>—Specifies the virtual address of the TCAM table entry in the range 0–65535.</li> <li>• <i>port</i>—Number of the interface that you want to select on the SPA: <ul style="list-style-type: none"> <li>– On the 4-Port 10/100 Fast Ethernet SPA—0, 1, 2, or 3</li> <li>– On the 2-Port 10/100/1000 Gigabit Ethernet SPA—0 or 1</li> </ul> </li> <li>• <i>lookup-type</i>—Specifies the type (1 or 2) of TCAM lookup for the write operation. A value of “1” designates a destination MAC address lookup type, and a value of “2” designates a VLAN lookup type.</li> </ul> |
| <p><b>Note</b></p>                                                                                                                                                         | <p>Values 0 and 3 are not supported on SPAs.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• <b>dmac</b> <i>hex-mac-address</i>—Writes the specified 48-bit destination MAC address (in hexadecimal) to the TCAM table.</li> <li>• <b>vlan</b> <i>vlan-id</i>—Writes the specified VLAN ID in the range 0–4095.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**Defaults**

No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S2 | This command was introduced. |

**Usage Guidelines** The **test hw-module subslot tcam** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



**Caution**

The **test hw-module subslot tcam** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

To restore some of the default values on a SPA interface that you made using a **test hw-module subslot tcam** command, perform the following steps:

1. Use the **shutdown** command to disable the affected interface.
2. Use the **no shutdown** command to reenale the interface.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test hw-module subslot tcam** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

**Examples** The following output provides an example of the **test hw-module subslot tcam** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 tcam remove 0 vlan 0
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

**Related Commands**

| <b>Command</b>                          | <b>Description</b>                                                                                                                                     |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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. |
| <b>show tcam-mgr subslot</b>            | Displays TCAM manager information for SPAs.                                                                                                            |
| <b>test hw-module subslot policyram</b> | Tests the policy RAM on a SPA.                                                                                                                         |

# test hw-module subslot temperature

To read temperature sensors on a SPA, use the **test hw-module subslot temperature** command in privileged EXEC configuration mode.

**test hw-module subslot** *slot/subslot* **temperature** *sensor-number*

| Syntax Description |                                            |                                                                                                                                                                                                                                                                                                              |
|--------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <i>slot</i>                                | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
|                    | <i>subslot</i>                             | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
|                    | <b>temperature</b><br><i>sensor-number</i> | Reads the specified sensor (1 or 2) on the SPA.                                                                                                                                                                                                                                                              |

**Defaults** No default behavior or values

**Command Modes** Privileged EXEC

| Command History | Release    | Modification                 |
|-----------------|------------|------------------------------|
|                 | 12.2(20)S2 | This command was introduced. |

**Usage Guidelines** The **test hw-module subslot temperature** command is implemented on the 4-Port 10/100 Fast Ethernet SPA and the 2-Port 10/100/1000 Gigabit Ethernet SPA on the Cisco 7304 router.



**Caution**

The **test hw-module subslot temperature** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

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

When you run any of the **test hw-module subslot** commands on a SPA, you will be warned that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

Because the **test hw-module subslot** commands can produce unexpected operation of your SPA, the system issues a confirmation prompt that defaults to “N” to deny execution of the command. The command is not executed if you press **Enter** or type “n.”

To run the command, type “y” at the confirmation prompt.

The **test hw-module subslot temperature** command does not modify any configuration settings. Therefore, you do not need to restore any default values after using the command.

---

**Examples**

The following output provides an example of the **test hw-module subslot temperature** command and the warning statement and confirmation prompt that appears with it:

```
Router# test hw-module subslot 4/0 temperature 1
This command is not intended for production use
and should be used only under the supervision of
Cisco Systems technical support personnel.
```

```
This command can produce unexpected operation of your SPA.
Are you sure you want to continue? [N]n
```

---

**Related Commands**

| Command                 | Description                                                                      |
|-------------------------|----------------------------------------------------------------------------------|
| <b>show environment</b> | Displays power supply, fan, voltage, and temperature information for the router. |

## test tcam-mgr subslot

To test the ternary content addressable memory (TCAM) manager for a SPA, use the **test tcam-mgr subslot** command in privileged EXEC configuration mode.

```
test tcam-mgr subslot slot/subslot {delete | empty | fill} {rx-dest-mac | rx-vlan} value
```

```
test tcam-mgr subslot slot/subslot insert [bottom | top] {rx-dest-mac | rx-vlan} value
```

```
test tcam-mgr subslot slot/subslot fulltcam {off | on}
```

```
test tcam-mgr subslot slot/subslot off
```

```
test tcam-mgr subslot slot/subslot read mc-index value vc-index value
```

### Syntax Description

|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>                                          | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide.                                                                                                             |
| <i>/subslot</i>                                      | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                                                                                                                                |
| { <b>delete</b>   <b>empty</b>   <b>fill</b> }       | Specifies one of the following operations on the destination MAC address or VLAN TCAM tables for filtering received frames: <ul style="list-style-type: none"> <li>• <b>delete</b>—Removes a TCAM region entry.</li> <li>• <b>empty</b>—Empties a TCAM region by deleting entries.</li> <li>• <b>fill</b>—Inserts entries into a TCAM region by replicating the value that you specify throughout the region.</li> </ul> |
| { <b>rx-dest-mac</b>   <b>rx-vlan</b> } <i>value</i> | Specifies which TCAM region upon which to perform the operation, where: <ul style="list-style-type: none"> <li>• <b>rx-dest-mac</b>—Destination MAC address region for filtering received frames.</li> <li>• <b>rx-vlan</b>—VLAN ID region for filtering received frames.</li> <li>• <i>value</i>—Hexadecimal value of the entry on which to perform the specified insertion or deletion operation.</li> </ul>           |

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>insert</b> [ <b>bottom</b>   <b>top</b> ]                   | <p>Specifies the addition of a single TCAM entry to the specified region, where:</p> <ul style="list-style-type: none"> <li>• <b>bottom</b>—(Optional) Inserts the specified value at the bottom of the selected TCAM region.</li> <li>• <b>top</b>—(Optional) Inserts the specified value at the top of the selected TCAM region.</li> </ul> <p>If you do not specify one of the optional keywords, then the entry is inserted anywhere in the middle of the TCAM region.</p> |
| <b>fulltcam</b> { <b>off</b>   <b>on</b> }                     | Turns TCAM simulation off or on for all TCAM regions.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>off</b>                                                     | Disables the TCAM manager.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>read mc-index</b> <i>value</i> <b>vc-index</b> <i>value</i> | <p>Reads the specified index <i>value</i>, where:</p> <ul style="list-style-type: none"> <li>• <b>mc-index</b>—Mask cell index.</li> <li>• <b>vc-index</b>—Value cell index, where <i>value</i> is in the range of 0 to 7.</li> </ul> <p>To find the range of mask indexes, use the <b>show tcam-mgr subslot region</b> command.</p> <p>To find the mask and value cell index values for a particular entry, use the <b>show tcam-mgr subslot table</b> command.</p>           |

**Defaults**

No default behavior or values

**Command Modes**

Privileged EXEC

**Command History**

| Release    | Modification                                                                                                                                                                                      |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12.0 S     | This command was introduced.                                                                                                                                                                      |
| 12.2(20)S2 | This command was integrated into Cisco IOS Release 12.2(20)S2 and support for the <b>subslot</b> , <b>rx-dest-mac</b> , and <b>rx-vlan</b> keywords were added for SPAs on the Cisco 7304 router. |

**Usage Guidelines**

Use the **test tcam-mgr subslot** command to test the TCAM manager for the destination MAC address and VLAN filter regions supported by the SPAs.

The TCAM manager allocates memory among the applications that it supports, in the form of regions. The SPAs support two TCAM regions, region 0 for destination MAC address filtering and region 1 for VLAN ID filtering of received frames.

**Caution**

The **test tcam-mgr subslot** command is not intended for production use and should be used only under the supervision of Cisco Systems technical support personnel. This command can produce unexpected operation of your SPA.

Unlike when you run the **test hw-module subslot** commands for a SPA, when you run the **test tcam-mgr**

**subslot** commands the SPA *does not* provide a warning that the command is not intended for use on a production network and that the command should be reserved for use only with Cisco Systems technical support personnel.

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

You can obtain information about the TCAM region entries using the **show tcam-mgr subslot** privileged EXEC command.

To restore the default SPA configuration and remove any changes to the SPA settings that you made using a **test tcam-mgr subslot** command, perform the following steps:

1. Use the **hw-module subslot stop** command to deactivate the SPA and all of its interfaces.
2. Use the **hw-module subslot start** command to reactivate the SPA and all of its interfaces.

### Examples

The following example removes the entry with the value 00112233 from the destination MAC address TCAM region for a SPA located in the top subslot (0) of the MSC that is installed in slot 4 on a Cisco 7304 router:

```
Router# test tcam-mgr subslot 4/0 delete rx-dest-mac 00112233
```

### Related Commands

| Command                                 | Description                                                                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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. |
| <b>show tcam-mgr subslot</b>            | Displays TCAM manager information for SPAs.                                                                                                            |
| <b>test hw-module subslot policyram</b> | Tests the policy table used by the FPGA device for TCAM lookup on a SPA.                                                                               |
| <b>test hw-module subslot tcam</b>      | Tests the TCAM device on a SPA.                                                                                                                        |

# ttb

To send a trace trail buffer in E3 g832 framing mode, use the **ttb** command in interface configuration mode. To disable the trace, use the **no** form of this command.

**ttb** {**country** | **rnode** | **serial** | **snode** | **soperator** | **x**} *line*

**no ttb** {**country** | **rnode** | **serial** | **snode** | **soperator** | **x**} *line*

## Syntax Description

|                              |                             |
|------------------------------|-----------------------------|
| <b>country</b> <i>line</i>   | Two-character country code. |
| <b>rnode</b> <i>line</i>     | Receive node code.          |
| <b>serial</b> <i>line</i>    | M.1400 Serial               |
| <b>snode</b> <i>line</i>     | Sending Town/Node ID code.  |
| <b>soperator</b> <i>line</i> | Sending Operator code.      |
| <b>x</b> <i>line</i>         | XO                          |

## Defaults

No default behavior or values

## Command Modes

Interface configuration

## Command History

| Release     | Modification                                                    |
|-------------|-----------------------------------------------------------------|
| 12.2S       | This command was introduced.                                    |
| 12.2(18)SXE | This command was integrated into Cisco IOS Release 12.2(18)SXE. |
| 12.0(31)S   | This command was integrated into Cisco IOS Release 12.0(31)S.   |
| 12.2(25)S3  | This command was integrated into Cisco IOS Release 12.2(25)S3.  |

## Usage Guidelines

Use the **ttb** command to attach a header that contains fields to send to a remote device.

## Examples

The following example starts a TTB message on the first port on slot 5.

```
Router# configure terminal
Router(config)# int serial 5/0/0
Router(config-if)# ttb country us
Router(config-if)# ttb snode 123
Router(config-if)# ttb rnode rn
Router(config-if)# ttb x 9
Router(config-if)# ttb serial 432
```

## Related Commands

| Command                       | Description                     |
|-------------------------------|---------------------------------|
| <b>show controller serial</b> | Displays controller statistics. |

# upgrade fpd auto

To configure the router to automatically upgrade the current FPD images on a SPA when an FPD version incompatibly is detected, enter the **upgrade fpd auto** global configuration command. To disable automatic FPD image upgrades, use the **no** form of this command.

**upgrade fpd auto**

**no upgrade fpd auto**

## Syntax Description

This command has no arguments or keywords.

## Defaults

This command is enabled by default if your router has any installed SPAs. The router will check the SPA FPD image during bootup or after an insertion of a SPA into an MSC subslot. If the router detects an incompatibility between an FPD image and a SPA, an automatic FPD upgrade attempt will occur unless the user has disabled automatic FPD upgrades by entering the **no upgrade fpd auto** command.

By default, the **upgrade fpd auto** will search the router's primary Flash file system for the FPD image package file. If you would like the router to search for the FPD image package file in a location other than the router's primary Flash file system when an FPD incompatibility is detected, enter the **upgrade fpd path** *fpd-pkg-dir-url* command to specify the location where the router should search for the FPD image package file. Once the FPD image package file is successfully located, the FPD upgrade process begins automatically.

## Command Modes

Global configuration

## Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

## Usage Guidelines

This command is enabled by default. In most cases, this default configuration should be retained.

By default, the **upgrade fpd auto** command instructs the router to search its primary Flash file system (for example, disk0:) for the FPD image package file. If you would like the router to search for the FPD image package file in a different location when an FPD incompatibility is detected, enter the **upgrade fpd path** command to have the router find the FPD image package file in a different location.

If this command is disabled but an FPD upgrade is required, the **upgrade hw-module subslot** command can be used to upgrade the SPA FPD image manually after the SPA is disabled because of the existing FPD incompatibility.

Upgrading the FPD image on a SPA places the SPA offline while the upgrade is taking place. The time required to complete an FPD image upgrade can be lengthy. The **show upgrade progress** command can be used to gather more information about estimated FPD download times for a particular SPA.

## Examples

The following example shows the output displayed when a SPA requires an FPD image upgrade and the **upgrade fpd auto** command is *enabled*. The incompatible FPD image is automatically upgraded.

```

% Uncompressing the bundle ... [OK]
*Jan 13 22:38:47:%FPD_MGMT-3-INCOMP_FPD_VER:Incompatible 4FE/2GE FPGA (FPD ID=1) image
version detected for SPA-4FE-7304 card in subslot 2/0. Detected version = 4.12, minimal
required version = 4.13. Current HW version = 0.32.
*Jan 13 22:38:47:%FPD_MGMT-5-FPD_UPGRADE_ATTEMPT:Attempting to automatically upgrade the
FPD image(s) for SPA-4FE-7304 card in subslot 2/0 ...

*Jan 13 22:38:47:%FPD_MGMT-6-BUNDLE_DOWNLOAD:Downloading FPD image bundle for SPA-4FE-7304
card in subslot 2/0 ...
*Jan 13 22:38:49:%FPD_MGMT-6-FPD_UPGRADE_TIME:Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 2/0 = 00:06:00.
*Jan 13 22:38:49:%FPD_MGMT-6-FPD_UPGRADE_START:4FE/2GE FPGA (FPD ID=1) image upgrade in
progress for SPA-4FE-7304 card in subslot 2/0. Updating to version 4.13. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:06:00)
...[.....]
(part of the output has been removed for brevity)
.....]
.....]
SUCCESS - Completed XSVF execution.

*Jan 13 22:44:33:%FPD_MGMT-6-FPD_UPGRADE_PASSED:4FE/2GE FPGA (FPD ID=1) image upgrade for
SPA-4FE-7304 card in subslot 2/0 has PASSED. Upgrading time = 00:05:44.108
*Jan 13 22:44:33:%FPD_MGMT-6-OVERALL_FPD_UPGRADE:All the attempts to upgrade the required
FPD images have been completed for SPA-4FE-7304 card in subslot 2/0. Number of
successful/failure upgrade(s):1/0.
*Jan 13 22:44:33:%FPD_MGMT-5-CARD_POWER_CYCLE:SPA-4FE-7304 card in subslot 2/0 is being
power cycled for the FPD image upgrade to take effect.

```

**Related Commands**

| Command                                 | Description                                                                                                                        |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>        | Manually upgrades the current FPD image on the specified SPA.                                                                      |
| <b>upgrade fpd path</b>                 | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
| <b>show hw-module subslot fpd</b>       | Displays the FPD version on each SPA in the router.                                                                                |
| <b>show upgrade fpd file</b>            | Displays the contents of an FPD image package file.                                                                                |
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                                            |
| <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |
| <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file.                                  |

## upgrade fpd path

To configure the router to search for an FPD image package file in a location other than the router's primary Flash file system during an automatic FPD upgrade, enter the **upgrade fpd path** global configuration command to specify the new location that should be searched for an FPD image package file when an automatic FPD upgrade occurs. To return to the default setting of the router searching for the FPD image package file in the router's primary Flash file system when an automatic FPD upgrade is triggered, use the **no** form of this command.

**upgrade fpd path** *fpd-pkg-dir-url*

**no upgrade fpd path** *fpd-pkg-dir-url*

### Syntax Description

|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>fpd-pkg-dir-url</i> | Specifies the location of the FPD image package file, beginning with the location or type of storage device (examples include disk0, slot0, tftp, or ftp) and followed by the path to the FPD image package file. It is important to note that the name of the FPD image package file should not be specified as part of <i>fpd-pkg-dir-url</i> ; the Cisco IOS will automatically download the correct FPD image package file once directed to the proper location. |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Defaults

By default, the router checks its primary Flash file system for an FPD image package file when an incompatibility between an FPD image on the SPA and the running Cisco IOS image is detected. The **upgrade fpd path** command is used to specify a new location for a router to locate the FPD image package file if you want to store the FPD image package file in a location other than the router's default Flash file system for automatic FPD upgrades.

### Command Modes

Global configuration

### Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

### Usage Guidelines

When specifying the path to the location of the new FPD image package file, do not include the filename in the path. The Cisco IOS will automatically download the correct FPD image package file once directed to the proper location, even if multiple FPD image package files of different versions are stored in the same location.

If the **upgrade fpd path** command is not entered, the router will search the default primary Flash file system for the FPD image.

### Examples

In the following example, the FPD image package file that is stored on the TFTP server using the path `johnstftpserver/fpdfiles` will now be scanned for the latest FPD image package file when an automatic FPD upgrade occurs.

```
upgrade fpd path tftp://johnstftpserver/fpdfiles/
```

In the following example, the FPD package file that is stored on the FTP server using the path johnsftpsrvr/fpdfiles will now be scanned for the latest FPD image package when an automatic FPD upgrade occurs. In this example, john is the username and XXXXXXXX is the FTP password.

```
upgrade fpd path ftp://john:XXXXXXX@johnsftpsrvr/fpdfiles/
```

### Related Commands

| Command                                 | Description                                                                                                   |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>upgrade hw-module subslot</b>        | Manually upgrades the current FPD image on the specified SPA.                                                 |
| <b>upgrade fpd auto</b>                 | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected. |
| <b>show hw-module subslot fpd</b>       | Displays the FPD version on each SPA in the router.                                                           |
| <b>show upgrade fpd file</b>            | Displays the contents of an FPD image package file.                                                           |
| <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                       |
| <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                |
| <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file.             |

# upgrade hw-module subslot

To manually upgrade the current FPD image package on a SPA, enter the **upgrade hw-module subslot** command in privileged EXEC configuration mode.

**upgrade hw-module subslot** *slot/subslot* **file** *file-url* [**force**]

## Syntax Description

|                 |                                                                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>slot</i>     | Chassis slot number.<br><br>Refer to the appropriate hardware manual for slot information. For MSCs, refer to the platform-specific SPA hardware installation guide or the corresponding “Identifying Slots and Subslots for MSCs and SPAs” topic in the platform-specific SPA software configuration guide. |
| <i>/subslot</i> | Secondary slot number on a MSC where a SPA is installed.<br><br>Refer to the platform-specific SPA hardware installation guide and the corresponding “Specifying the Interface Address on a SPA” topic in the platform-specific SPA software configuration guide for subslot information.                    |
| <b>file</b>     | Specifies that a file will be downloaded.                                                                                                                                                                                                                                                                    |
| <i>file-url</i> | Specifies the location of the FPD image package file, beginning with the location or type of storage device (examples include disk0, slot0, tftp, or ftp) and followed by the path to the FPD image package file.                                                                                            |
| <b>force</b>    | Forces the update of all compatible FPD images in the indicated FPD image package on the SPA that meet the minimal version requirements. Without this option, the manual upgrade will only upgrade incompatible FPD images.                                                                                  |

## Defaults

No default behavior or values, although it is important to note that the router containing the SPA is configured, by default, to upgrade the FPD images when it detects a version incompatibility between a the FPD image on the SPA and the FPD image required to run the SPA with the running Cisco IOS image. The **upgrade hw-module subslot** command is used to manually upgrade the FPD images; therefore, the **upgrade hw-module subslot** command should only be used when the automatic upgrade default configuration fails to find a compatible FPD image for one of the SPAs or when the automatic upgrade default configuration has been manually disabled. The **no upgrade fpd auto** command can be entered to disable automatic FPD upgrades.

If no FPD incompatibility is detected, this command will not upgrade SPA FPD images unless the **force** option is entered.

## Command Modes

Privileged EXEC

## Command History

| Release    | Modification                 |
|------------|------------------------------|
| 12.2(20)S2 | This command was introduced. |

**Usage Guidelines**

This command is used to manually upgrade the FPD images on a SPA. In most cases, the easiest and recommended method of upgrading FPD images is the automatic FPD upgrade, which is enabled by default. The automatic FPD upgrade will detect and automatically upgrade all FPD images when an FPD incompatibility is detected.

A manual FPD upgrade is usually used in the following situations:

- The target SPA was disabled by the system because of an incompatible FPD image (the system could not find the required FPD image package file).
- A recovery upgrade must be performed.
- A special bug fix to an FPD image is provided in the FPD image package file.

The FPD image upgrade process places the SPA offline. The time required to complete an FPD image upgrade can be lengthy. The **show upgrade progress** command can be used to gather more information about estimated FPD download times for a particular SPA.

**Examples**

The following example shows a sample manual FPD upgrade:

```
Router# upgrade hw-module subslot 2/0 file disk0:spa_fpd.122-20.S2.pkg
% Uncompressing the bundle ... [OK]

% The following FPD(s) will be upgraded for card in subslot 2/0 :

=====
Field Programmable   Current      Upgrade      Estimated
Device:"ID-Name"    Version      Version      Upgrade Time
=====
1-Data & I/O FPGA   4.12        4.13        00:06:00
=====

% Are you sure that you want to perform this operation? [no]:y
% Restarting the target card (subslot 2/0) for FPD image upgrade. Please wait ...

Router#
*Jan 14 00:37:17:%FPD_MGMT-6-FPD_UPGRADE_TIME:Estimated total FPD image upgrade time for
SPA-4FE-7304 card in subslot 2/0 = 00:06:00.
*Jan 14 00:37:17:%FPD_MGMT-6-FPD_UPGRADE_START:4FE/2GE FPGA (FPD ID=1) image upgrade in
progress for SPA-4FE-7304 card in subslot 2/0. Updating to version 4.13. PLEASE DO NOT
INTERRUPT DURING THE UPGRADE PROCESS (estimated upgrade completion time = 00:06:00)
...[.....(part of the output has been removed for brevity)....]
.....]
SUCCESS - Completed XSVF execution.

*Jan 14 00:42:59:%FPD_MGMT-6-FPD_UPGRADE_PASSED:4FE/2GE FPGA (FPD ID=1) image upgrade for
SPA-4FE-7304 card in subslot 2/0 has PASSED. Upgrading time = 00:05:42.596
*Jan 14 00:42:59:%FPD_MGMT-6-OVERALL_FPD_UPGRADE:All the attempts to upgrade the required
FPD images have been completed for SPA-4FE-7304 card in subslot 2/0. Number of
successful/failure upgrade(s):1/0.
*Jan 14 00:42:59:%FPD_MGMT-5-CARD_POWER_CYCLE:SPA-4FE-7304 card in subslot 2/0 is being
power cycled for the FPD image upgrade to take effect.
```

| Related Commands | Command                                 | Description                                                                                                                        |
|------------------|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|                  | <b>upgrade fpd auto</b>                 | Configures the router to automatically upgrade the FPD image when an FPD version incompatibility is detected.                      |
|                  | <b>upgrade fpd path</b>                 | Specifies the location from where the FPD image package should be loaded when an automatic FPD upgrade is initiated by the router. |
|                  | <b>show hw-module subslot fpd</b>       | Displays the FPD version on each SPA in the router.                                                                                |
|                  | <b>show upgrade fpd file</b>            | Displays the contents of an FPD image package file.                                                                                |
|                  | <b>show upgrade fpd package default</b> | Displays which FPD image package is needed for the router to properly support the SPAs.                                            |
|                  | <b>show upgrade fpd progress</b>        | Displays the progress of the FPD upgrade while an FPD upgrade is taking place.                                                     |
|                  | <b>show upgrade fpd table</b>           | Displays various information used by the Cisco IOS software to manage the FPD image package file.                                  |







## GLOSSARY

### B

**blank filler plate** An empty panel used to fill vacant subslots on a SIP. For proper operation, a SIP should be fully installed with either functional SPAs or blank filler plates.

### F

**full-height** Describes the dimension of a SPA that occupies two MSC subslots. The Cisco 7304 currently does not have any full-height SPAs.

**FPD** Field-programmable device. General term for any hardware component implemented on router cards that supports separate software upgrades. SPAs must have the right FPD version to function properly; an FPD incompatibility will disable all interfaces on the SPA.

**FPD image package** An FPD image package is used to upgrade FPD images. Whenever a Cisco IOS image is released that supports SPAs, a companion SPA FPD image package is also released for that Cisco IOS software release.

### H

**half-height** Describes the dimension of a SPA that occupies one of the two MSC subslots. The Cisco 7304 currently has only half-height SPAs.

### M

**MSC** Modular Services Card. An MSC is a platform-specific carrier card that inserts into a router slot like a line card. An MSC can hold SPAs in its subslots. The SPA provides the network interface.

The Cisco 7304 router is the only platform that uses the term “MSC” to refer to carrier cards that carry SPAs.

**O**

**OIR** Online insertion and removal. Feature supported by SIPs and SPAs allowing removal of the cards while the router and the cards are activated, without affecting the operation of other cards or the router. Although this removal can be done while the SIP or SPA is activated, it is generally recommended that you gracefully deactivate the hardware using the appropriate commands for your platform prior to removal of the hardware.

**S**

**SFP** Small form-factor pluggable optical transceiver. A type of fiber optic receptacle device that mounts flush with the front panel to provide network connectivity.

**SPA** Shared port adapter. A SPA is a modular, platform-independent port adapter that inserts into a subslot of a compatible SIP carrier card to provide network connectivity and increased interface port density. The SPA provides the interface between the network and the SIP.

**slot** Slot on the router where the carrier card or other hardware (such as a line card or another jacket card) is installed.

**subslot** Secondary slot on a carrier card where a SPA is installed. The primary slot is the chassis slot on the router.