



OC-12c Dynamic Packet Transport Port Adapter Installation and Configuration

Product Number: PA-SRP-OC12MM(=), PA-SRP-OC12SMI(=),
PA-SRP-OC12SML(=), PA-SRP-OC12SMX(=)

Platforms Supported: Cisco 7200 Series, Cisco 7200 VXR, Cisco uBR7200 Series, Cisco 7500 Series with VIP

Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100



THE SPECIFICATIONS AND INFORMATION REGARDING THE PRODUCTS IN THIS MANUAL ARE SUBJECT TO CHANGE WITHOUT NOTICE. ALL STATEMENTS, INFORMATION, AND RECOMMENDATIONS IN THIS MANUAL ARE BELIEVED TO BE ACCURATE BUT ARE PRESENTED WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED. USERS MUST TAKE FULL RESPONSIBILITY FOR THEIR APPLICATION OF ANY PRODUCTS.

THE SOFTWARE LICENSE AND LIMITED WARRANTY FOR THE ACCOMPANYING PRODUCT ARE SET FORTH IN THE INFORMATION PACKET THAT SHIPPED WITH THE PRODUCT AND ARE INCORPORATED HEREIN BY THIS REFERENCE. IF YOU ARE UNABLE TO LOCATE THE SOFTWARE LICENSE OR LIMITED WARRANTY, CONTACT YOUR CISCO REPRESENTATIVE FOR A COPY.

The following information is for FCC compliance of Class A devices: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

The following information is for FCC compliance of Class B devices: The equipment described in this manual generates and may radiate radio-frequency energy. If it is not installed in accordance with Cisco's installation instructions, it may cause interference with radio and television reception. This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in part 15 of the FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

Modifying the equipment without Cisco's written authorization may result in the equipment no longer complying with FCC requirements for Class A or Class B digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

Modifications to this product not authorized by Cisco Systems, Inc. could void the FCC approval and negate your authority to operate the product.

The Cisco implementation of TCP header compression is an adaptation of a program developed by the University of California, Berkeley (UCB) as part of UCB's public domain version of the UNIX operating system. All rights reserved. Copyright © 1981, Regents of the University of California.

NOTWITHSTANDING ANY OTHER WARRANTY HEREIN, ALL DOCUMENT FILES AND SOFTWARE OF THESE SUPPLIERS ARE PROVIDED "AS IS" WITH ALL FAULTS. CISCO AND THE ABOVE-NAMED SUPPLIERS DISCLAIM ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THOSE OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OR ARISING FROM A COURSE OF DEALING, USAGE, OR TRADE PRACTICE.

IN NO EVENT SHALL CISCO OR ITS SUPPLIERS BE LIABLE FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR LOSS OR DAMAGE TO DATA ARISING OUT OF THE USE OR INABILITY TO USE THIS MANUAL, EVEN IF CISCO OR ITS SUPPLIERS HAVE BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

CCIP, the Cisco Arrow logo, the Cisco *Powered* Network mark, the Cisco Systems Verified logo, Cisco Unity, Follow Me Browsing, FormShare, Internet Quotient, iQ Breakthrough, iQ Expertise, iQ FastTrack, the iQ Logo, iQ Net Readiness Scorecard, Networking Academy, ScriptShare, SMARTnet, TransPath, and Voice LAN are trademarks of Cisco Systems, Inc.; Changing the Way We Work, Live, Play, and Learn, Discover All That's Possible, The Fastest Way to Increase Your Internet Quotient, and iQuick Study are service marks of Cisco Systems, Inc.; and Aironet, ASIST, BPX, Catalyst, CCDA, CCDP, CCIE, CCNA, CCNP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, the Cisco IOS logo, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Empowering the Internet Generation, Enterprise/Solver, EtherChannel, EtherSwitch, Fast Step, GigaStack, IOS, IP/TV, LightStream, MGX, MICA, the Networkers logo, Network Registrar, *Packet*, PIX, Post-Routing, Pre-Routing, RateMUX, Registrar, SlideCast, StrataView Plus, Stratm, SwitchProbe, TeleRouter, and VCO are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and certain other countries.

All other trademarks mentioned in this document or Web site are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0206R)

OC-12c Dynamic Packet Transport Port Adapter Installation and Configuration

Copyright © 2000–2002, Cisco Systems, Inc.

All rights reserved.



Preface vii

Objectives	vii
Organization	viii
Related Documentation	viii
Obtaining Documentation	ix
World Wide Web	ix
Documentation CD-ROM	ix
Ordering Documentation	x
Documentation Feedback	x
Obtaining Technical Assistance	x
Cisco.com	x
Technical Assistance Center	xi
Cisco TAC Web Site	xi
Cisco TAC Escalation Center	xii

CHAPTER 1

Overview 1-1

Port Adapter Overview	1-1
Functions	1-1
DPT Port Adapter Terms and Acronyms	1-2
Spatial Reuse Protocol Overview	1-3
SONET Distance Limitations	1-5
LEDs	1-5
Cables, Connectors, and Pinouts	1-6
Port Adapter Slot Locations on the Supported Platforms	1-7
Cisco 7200 Series, Cisco 7200 VXR, and Cisco uBR7246 Router Slot Numbering	1-7
Cisco 7500 Series Router with VIP Slot Numbering	1-9
Identifying Interface Addresses	1-10
Cisco 7200 Series, Cisco 7200 VXR, and Cisco uBR7246 Router Interface Addresses	1-10
Cisco 7500 Series Router with VIP Interface Addresses	1-11

CHAPTER 2

Preparing for Installation 2-1

Required Tools and Equipment	2-1
Software and Hardware Requirements	2-2

- Checking Hardware and Software Compatibility 2-3
- Safety Guidelines 2-3
 - Safety Warnings 2-3
 - Laser/LED Safety 2-5
 - Electrical Equipment Guidelines 2-5
 - Telephone Wiring Guidelines 2-6
 - Preventing Electrostatic Discharge Damage 2-6
- FCC Class A Compliance 2-7

CHAPTER 3

Removing and Installing Port Adapters 3-1

- Installation Overview 3-1
- Handling Port Adapters 3-1
- Online Insertion and Removal 3-2
- Warnings and Cautions 3-2
- Port Adapter Slot Divider 3-3
 - Cisco 7200 Series—Removing the Slot Divider 3-4
 - Cisco uBR7200 Series—Removing the Slot Divider 3-5
 - VIP—Removing the Slot Divider 3-6
- Port Adapter Removal and Installation 3-7
 - Cisco 7200 Series—Removing and Installing a Port Adapter 3-8
 - Cisco uBR7200 Series—Removing a Port Adapter 3-9
 - Cisco uBR7200 Series—Installing a Port Adapter 3-10
 - Cisco 7500 Series Routers with VIP—Removing and Installing a Port Adapter 3-11

CHAPTER 4

Configuring the DPT Port Adapter 4-1

- Using the EXEC Command Interpreter 4-1
- Configuring the DPT Interface 4-2
 - Shutting Down the Interface 4-2
 - Performing a Basic Configuration 4-4
 - Configuring the Intelligent Protection Switch Feature 4-6
 - Configuring the DPT Topology Feature 4-7
 - Changing the Default Values of Configuration Parameters 4-7
 - Using show Commands to Check System Status 4-8
- Creating a DPT Ring 4-13
- Adding or Removing Nodes in a DPT Ring 4-15
 - Adding a Node to a DPT Ring 4-15
 - Removing a Node from a DPT Ring 4-18
- Checking the Configuration 4-18

Using show Commands to Verify the New Interface Status	4-18
Using the show version or show hardware Commands	4-19
Using the show diag Command	4-20
Using the show interfaces Command	4-21
Using the ping Command to Verify Network Connectivity	4-22



Preface

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 vii
- Organization, page viii
- Related Documentation, page viii
- Obtaining Documentation, page ix
- Obtaining Technical Assistance, page x

Objectives

This publication contains instructions for installing and configuring the dual-width OC-12c Dynamic Packet Transport (DPT) port adapter, an OC-12c interface used in Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7200 series, and Cisco 7500 series routers with VIP to provide a shared IP over SONET capability.



Note

The PA-OC-12c is a dual-wide port adapter and is, therefore, unavailable for use in a Cisco uBR7223 router.

This publication contains basic configuration steps with examples. The DPT port adapter is compatible with any Cisco 7200 series router with a 200-MHz or 225-MHz network processing engine (NPE-200 or NPE-225) installed, any Cisco 7200 VXR router with an NPE-300 installed, a Cisco uBR7246 router with an NPE-200 or NPE-300 installed, and any Cisco 7500 series router with a Versatile Interface Processor (VIP) installed.



Note

Cisco 7500 series routers will work with the VIP4 or a later version of the VIP.

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the DPT port adapter and its LED displays, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	Removing and Installing Port Adapters	Describes the procedures for installing and removing DPT port adapters in the supported platforms.
Chapter 4	Configuring the DPT Port Adapter	Provides instructions for configuring the DPT port adapter on the supported platforms.

Related Documentation

Your router or switch and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- Cisco IOS software:

For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.



Note You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at <http://www.cisco.com>. Translated documentation is available at this URL: http://www.cisco.com/public/countries_languages.shtml.

- Cisco 7200 series routers:
 - For port adapter hardware and memory configuration guidelines, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.
 - For hardware installation and maintenance information (including the Cisco 7206 or Cisco 7206VXR as a router shelf in a Cisco AS5800 Universal Access Server), refer to the installation and configuration guide that shipped with your Cisco 7200 series router.
- Cisco 7200 VXR routers:

For hardware installation and maintenance information, refer to the *Cisco 7200 VXR Installation and Configuration Guide* that shipped with your Cisco 7200 VXR router.
- Cisco uBR7200 series routers:

For installation and maintenance information, refer to the hardware installation and software configuration guide that shipped with your Cisco uBR7200 series router.

- Cisco 7500 series routers:

For hardware installation and maintenance information, refer to the following publications:

- *Cisco 7500 Series Installation and Configuration Guide* or the quick start guide that shipped with your router
 - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration Guide*
 - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- For international agency compliance, safety, and statutory information for WAN interfaces:
 - *Site Preparation and Safety Guide*
 - *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers*
 - “Regulatory Compliance and Safety Information” appendix in the *Cisco uBR7200 Series Universal Broadband Router Hardware Installation Guide*
 - *Regulatory Compliance and Safety Information for the Cisco 7500 Series Routers*
 - To view Cisco documentation or obtain general information about the documentation, refer to the following sources:
 - “Obtaining Documentation” section on page ix.
 - “Obtaining Technical Assistance” section on page x.
 - Customer service at 800 553-6387 or 408 526-7208. Customer service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding Cisco-observed holidays). You can also send e-mail to cs-rep@cisco.com.
 - *Cisco Information Packet* that shipped with your router or switch.

Obtaining Documentation

These sections explain how to obtain documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at this URL:

<http://www.cisco.com>

Translated documentation is available at this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation CD-ROM

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

Ordering Documentation

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:
http://www.cisco.com/cgi-bin/order/order_root.pl
- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:
<http://www.cisco.com/go/subscription>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, U.S.A.) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

Documentation Feedback

You can submit comments electronically on Cisco.com. In the Cisco Documentation home page, click the **Fax** or **Email** option in the “Leave Feedback” section at the bottom of the page.

You can e-mail your comments to bug-doc@cisco.com.

You can submit your comments by mail by using the response card behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Document Resource Connection
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain online documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

Cisco.com

Cisco.com is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information, networking solutions, services, programs, and resources at any time, from anywhere in the world.

Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you with these tasks:

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages

- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

If you want to obtain customized information and service, you can self-register on Cisco.com. To access Cisco.com, go to this URL:

<http://www.cisco.com>

Technical Assistance Center

The Cisco Technical Assistance Center (TAC) is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two levels of support are available: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Cisco TAC inquiries are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

The Cisco TAC resource that you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

You can use the Cisco TAC Web Site to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to this URL:

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

All customers, partners, and resellers who have a valid Cisco service contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to this URL to register:

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

If you are a Cisco.com registered user, and you cannot resolve your technical issues by using the Cisco TAC Web Site, you can open a case online by using the TAC Case Open tool at this URL:

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

If you have Internet access, we recommend that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses priority level 1 or priority level 2 issues. These classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer automatically opens a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to this URL:

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

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled: for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). When you call the center, please have available your service agreement number and your product serial number.



Overview

This chapter describes the DPT port adapter and contains the following sections:

- Port Adapter Overview, page 1-1
- DPT Port Adapter Terms and Acronyms, page 1-2
- Spatial Reuse Protocol Overview, page 1-3
- LEDs, page 1-5
- Cables, Connectors, and Pinouts, page 1-6
- Port Adapter Slot Locations on the Supported Platforms, page 1-7
- Identifying Interface Addresses, page 1-10

Port Adapter Overview

The DPT port adapter shown in Figure 1-1 is a dual-width OC-12c port adapter that provides a shared IP over SONET capability in a Cisco 7200 series router, Cisco uBR7246 router, Cisco 7200 VXR router, or Cisco 7500 series router with VIP4 or later. The DPT port adapter is available in four models:

- PA-SRP-OC12MM (multimode fiber)
- PA-SRP-OC12SMI (single-mode fiber, intermediate reach)
- PA-SRP-OC12SML (single-mode fiber, long reach)
- PA-SRP-OC12SMX (single-mode fiber, extended reach)

The DPT port adapter provides Cisco 7200 series, Cisco uBR7246, Cisco 7200 VXR routers, or Cisco 7500 series routers with two SC duplex ports. Each SC duplex port provides the physical connection to an adjacent device in a DPT ring.

The DPT port adapter is designed to be deployed in SONET OC-12c DPT rings. DPT rings can also be connected to SONET Add Drop Multiplexers (ADMs), thus allowing for the creation of small or very large DPT rings.

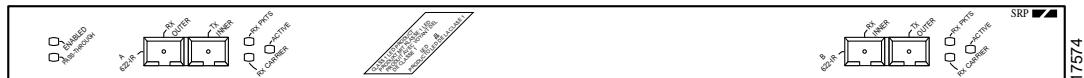
Functions

The DPT port adapter supports the following functions:

- Accommodates large-scale network topology
- Leverages fiber-optic capacity at OC-12c line rates

- Controls the rate at which new packets are inserted on the media
- Allows data to obtain fair-shared access to the OC-12c rings
- Implements protection mechanisms, including wrap and unwrap in the event of fiber or node failure
- Supports both single-mode and multimode fiber transmissions
- Supports access to the SONET DCC channel

Figure 1-1 DPT Port Adapter—Faceplate View



DPT Port Adapter Terms and Acronyms

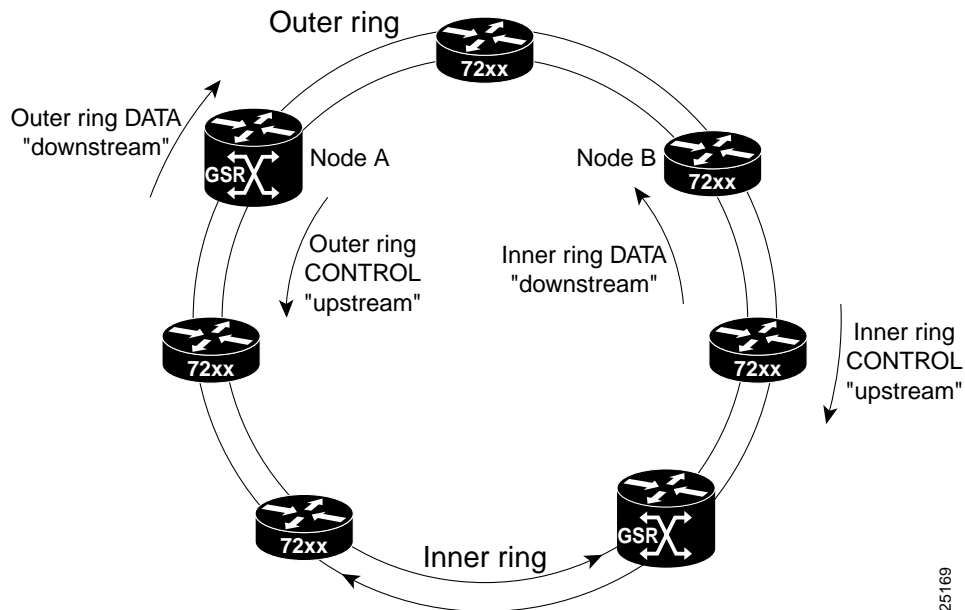
The following terms and acronyms are used in this publication:

- ADM—Add Drop Multiplexer. Device used to add or drop virtual channels from SONET/SDH into physical tributaries that connect across the ring.
- DCC—Data Country Code.
- IPS—Intelligent Protection Switch.
- ITU-T—International Telecommunication Union Telecommunication Standardization Sector (formerly the Consultative Committee for International Telegraph and Telephone [CCITT]).
- MAC—Media Access Control.
- MIB—Management Information Base.
- OC-3/STM-1, OC-12c/STM-4c, OC-48c/STM-16c, and so on—Optical Carrier specifications for SONET OC and SDH STM transmission rates.
- OC-N—SONET multiplexing measure: Optical Carrier Level N, where N indicates the number of 51.84 megabit per second (Mbps) channels.
- OC-Nc/STM-Nc—Designation in which a lowercase c after N indicates that N channels are concatenated into one logical channel having a bandwidth of N multiplied by the appropriate rate for SONET and SDH. For SONET, N is defined as having the values 3, 12, 48, and 192; for SDH, the legal values are 1, 4, and 16.
- SDH—Synchronous Digital Hierarchy. International standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.488 gigabits per second (Gbps) (STM-16) and higher.
- SONET—Synchronous Optical Network. An American National Standards Institute (ANSI) standard (T1.1051988) for optical digital transmission at hierarchical rates from 51.840 Mbps (OC-1) to 2.488 Gbps (OC-48) and higher.
- SRP—Spatial Reuse Protocol. A Layer 2 MAC protocol for use with SONET and SDH rings that runs over a dual-ring network topology and is characterized by shared media, statistical multiplexing, global fairness, and spatial reuse.
- STM-N—Synchronous Transport Port Adapter Level N. SDH multiplexing measure, where N indicates the number of 155.52 Mbps channels.

Spatial Reuse Protocol Overview

Spatial Reuse Protocol (SRP) is a media-independent MAC layer protocol that operates over two counterrotating fiber-optic rings. The dual rings provide survivability of data in case of a failed node or a break in connecting cables by rerouting the data path over the alternate ring. SRP provides a more efficient use of bandwidth by having packets traverse only the part of the ring necessary to get to the destination node. Once the packet has reached the destination node, it is removed from the ring, allowing other parts of the ring to reuse the bandwidth. Data packets travel on one ring, while associated control packets travel in the opposite direction on the alternate ring, ensuring that the data takes the shortest path to its destination. (See Figure 1-2.)

Figure 1-2 DPT Ring



Each node on a DPT ring represents a Cisco 7200 series router, Cisco uBR7246, Cisco 7200 VXR, Cisco 7500 series router, or a Cisco 12000 series Gigabit Switch Router (GSR). A Cisco 7200 series, Cisco uBR7246, Cisco 7200 VXR, or Cisco 7500 series router can be used as an aggregation device for the Cisco 12000 series GSR. The Cisco 7200 series, Cisco uBR7246, Cisco 7200 VXR, or Cisco 7500 series router collects data from lower-speed interfaces and passes it to the Cisco 12000 series GSR. Typically, more Cisco 7200 series, Cisco uBR7246, Cisco 7200 VXR, or Cisco 7500 series routers aggregate traffic toward fewer Cisco 12000 series GSRs.

A DPT ring can contain up to 32 nodes at one time, with each node holding a map of the ring topology that it continually updates to ensure that data takes the shortest path to its destination. The frequency of the updating can be manually configured. See the “Configuring the DPT Topology Feature” section on page 4-7.

The DPT interface uses the SONET ring architecture, which provides redundancy and protection from a failed node or fiber cut through the use of the Intelligent Protection Switch (IPS). When the DPT ring topology changes because of a node failure, as shown in Figure 1-3, the system software automatically puts the node into pass-through mode, where data continues to pass through the node, but the node is no longer seen on the ring topology map. In the event of a fiber cut, ring wraps are created to redirect data traffic over the alternate ring. (See Figure 1-4.)

In both pass-through mode and wrap mode, data packets not destined for the affected node still reach their destination.

Figure 1-3 DPT Ring with a Node in Pass-Through Mode

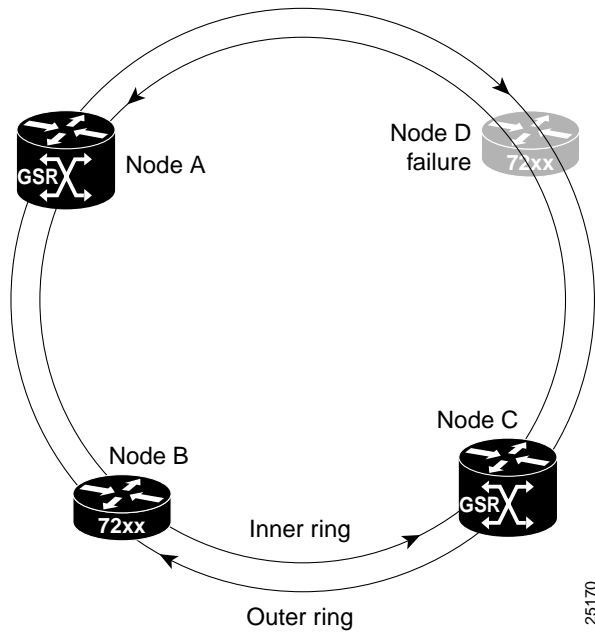
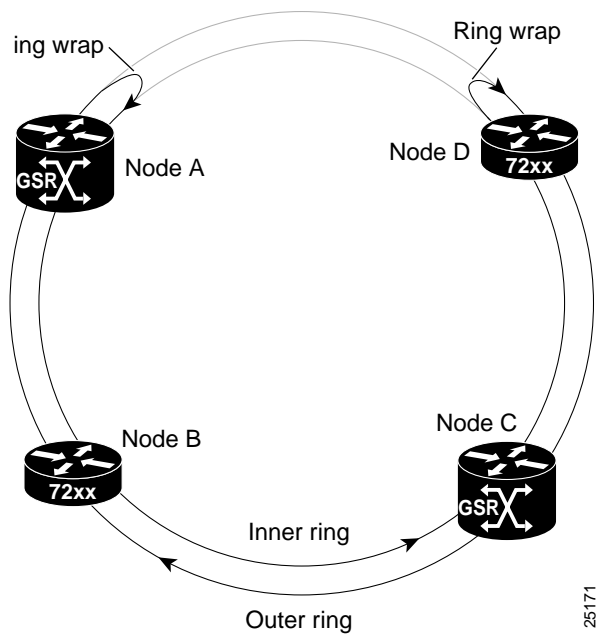


Figure 1-4 DPT Ring in Wrap Mode



SONET Distance Limitations

The SONET specification for fiber-optic transmission defines two types of fiber: single-mode and multimode. Signals travel farther through single-mode fiber than through multimode fiber.

The maximum distance for single-mode installations is determined by the amount of light loss in the fiber path. Good-quality single-mode fiber with very few splices can carry an OC-12c/STM-4 signal 50 miles (80 kilometers) or more. Good-quality multimode fiber can carry the signal up to 1640 feet (500 meters). If your environment requires the signal to travel close to the typical maximum distance (as listed in Table 1-1), use an optical time-domain reflectometer (OTDR) to measure the power loss.

Table 1-1 Power Budget and Signal Requirements

Cable	Power Budget	Transmit Power	Receive Power	Typical Maximum Distance
Single-mode intermediate range	12 dB	-15 to -8 dBm ¹ at 1270 to 1380 nm ²	-28 to -8 dBm	9.3 miles (15 km)
Single-mode long range	25 dB	-3 to 2 dBm at 1270 to 1380 nm	-28 to -8 dBm	24.8 miles (40 km)
Single-mode extended reach	25 dB	-2 to 3 dBm at 1550 nm	-28 to -7 dBm	50 miles (80 km)
Multimode	6 dB	-20 to -14 dBm at 1270 to 1380 nm	-26 to -14 dBm	1640.4 feet (500 m)

1. dBm = decibels per milliwatt
2. nm = nanometer

LEDs

The eight LEDs on the faceplate of the DPT port adapter (see Figure 1-5), show the DPT port adapter status, as well as the status of the individual ports. Table 1-2 explains the DPT port adapter LEDs.

Figure 1-5 DPT Port Adapter LEDs—Single-Mode Shown

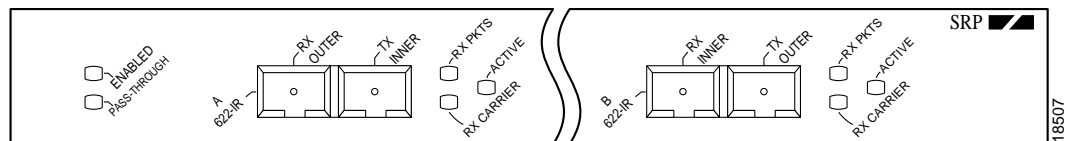


Table 1-2 DPT Port Adapter LEDs

LED Label	Color	State	Function
ENABLED	Green	On	Indicates that the DPT port adapter is enabled for operation; however, the interface port might be in the shutdown state.
PASS-THROUGH	Amber	On	Indicates the DPT port adapter is in a pass-through state.

Table 1-2 DPT Port Adapter LEDs (continued)

RX PKTS	Green	On	Indicates the DPT port adapter has received a packet. This LED flickers in normal operation, indicating traffic.
RX CARRIER	Green	On	Indicates the DPT port adapter has detected valid SONET or SDH framing on the received carrier.
ACTIVE	Green	On	Indicates that side A or B of the DPT port adapter is functioning.

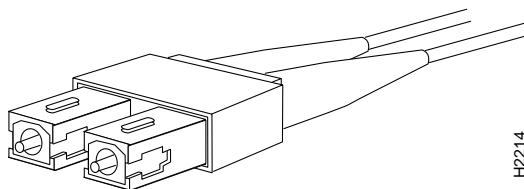
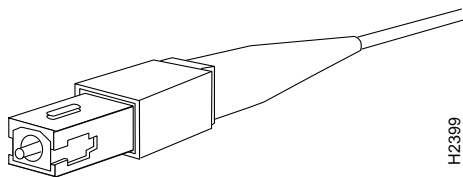
Cables, Connectors, and Pinouts

Use a single-mode or multimode fiber-optic interface cable to connect your Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7246, or Cisco 7500 series router with VIP to another router or switch. In general, multimode cables are gray or orange, and single-mode cables are yellow.

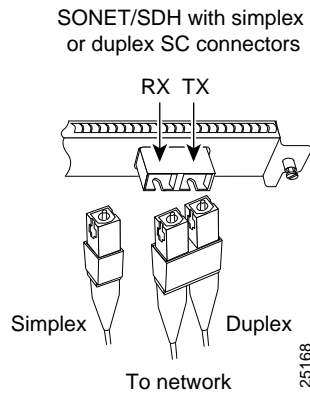

Note

Single-mode and multimode fiber-optic cables are not available from Cisco Systems.

For SONET or SDH single-mode and multimode fiber-optic connections, use one duplex SC-type connector (see Figure 1-6) or two simplex SC-type connectors. (See Figure 1-7.)

Figure 1-6 Duplex SC Cable Connector**Figure 1-7 Simplex SC Cable Connector**

Attach either one duplex fiber cable or two simplex fiber cables between the DPT port adapter and the device to which the DPT port adapter is connected. Observe the receive (RX) and transmit (TX) cable relationship shown in Figure 1-8.

Figure 1-8 Attaching Simplex or Duplex Fiber-Optic Cables

The following warnings apply when you work with fiber-optic cable ports.



Warning

Because invisible radiation may be emitted from the aperture of the port when no fiber cable is connected, *avoid exposure to radiation and do not stare into open apertures.*



Warning

Class 1 laser product (single-mode).



Warning

Class 1 LED product (multimode).

Port Adapter Slot Locations on the Supported Platforms

This section discusses port adapter slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform.

Cisco 7200 Series, Cisco 7200 VXR, and Cisco uBR7246 Router Slot Numbering

Figure 1-9 shows a Cisco 7206VXR with a DPT port adapter installed in port adapter slots 3 and 4. In the Cisco 7206 and Cisco 7206VXR port adapter slot 1 is in the lower left position, and port adapter slot 6 is in the upper right position. (The Cisco 7202 and Cisco 7204 are not shown; however, the DPT port adapter can be installed in any two horizontally aligned port adapter slots.)

Figure 1-9 Port Adapter Slots in the Cisco 7206VXR

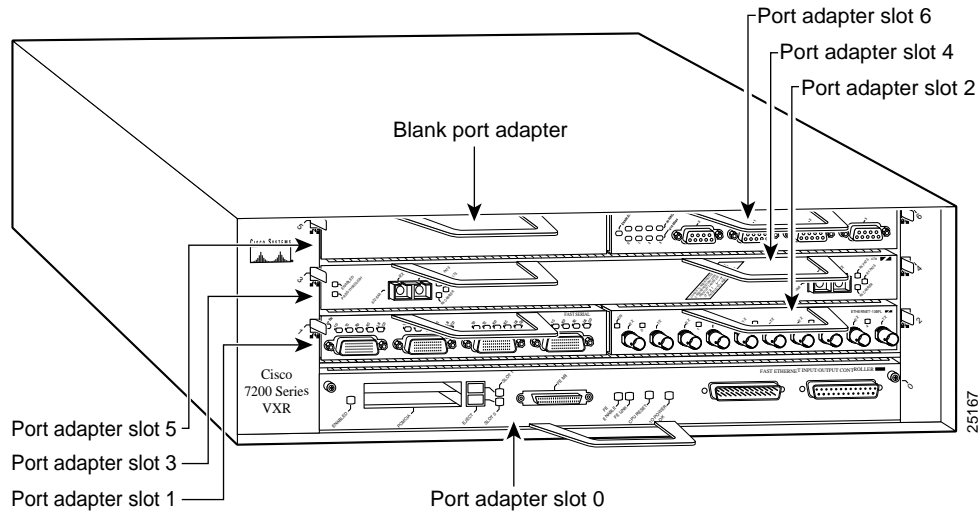
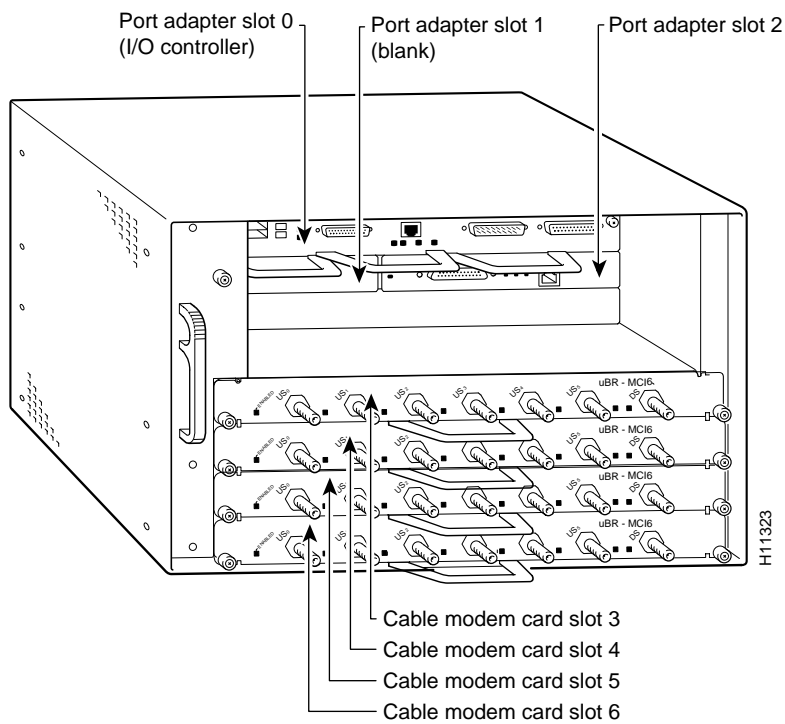


Figure 1-10 shows the slot numbering of port adapters in a Cisco uBR7246 router. The port adapter slots are numbered slot 1 and slot 2 for the Cisco uBR7246. (Slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present.)

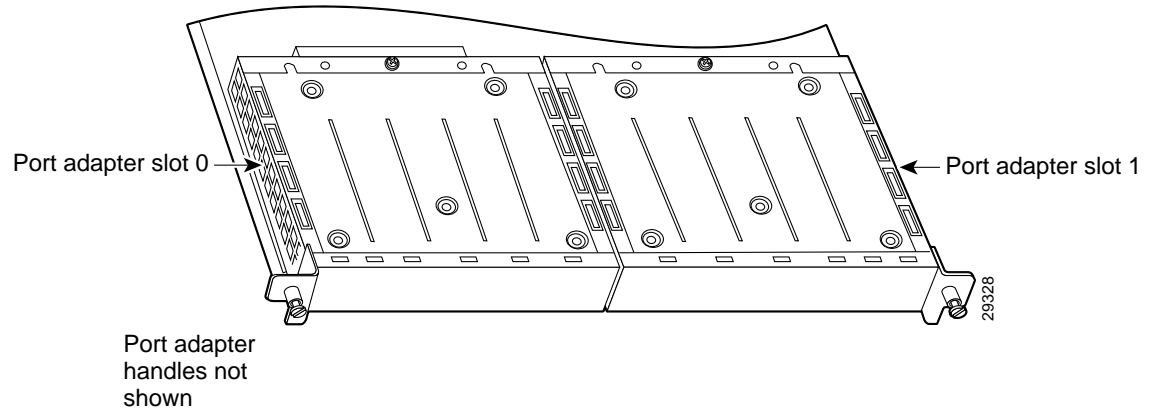
Figure 1-10 Port Adapter Slots in the Cisco uBR7246



Cisco 7500 Series Router with VIP Slot Numbering

Figure 1-11 shows a partial view of a VIP motherboard with installed port adapters. With the motherboard oriented as shown in Figure 1-11, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. The slots are always numbered 0 and 1.

Figure 1-11 VIP Motherboard with Two port adapters Installed—Horizontal Orientation

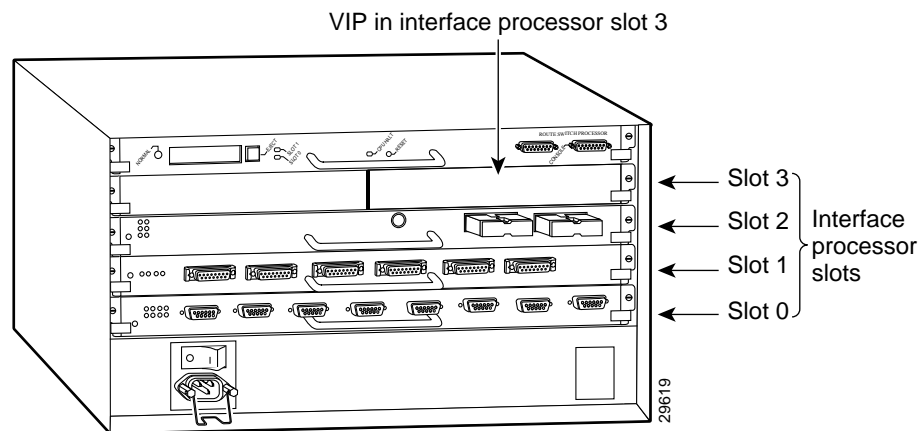


Note

In the Cisco 7507 and Cisco 7513 chassis, the VIP motherboard is installed vertically.
In the Cisco 7505 chassis, the VIP motherboard is installed horizontally.

Interface processor slots in the Cisco 7500 series routers are numbered as shown in Figure 1-12.

Figure 1-12 Interface Slot Numbers—Cisco 7505 Shown



Identifying Interface Addresses

This section describes how to identify interface addresses for the DPT port adapter in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on the DPT port adapter installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Table 1-3 explains how to identify interface addresses of a DPT port adapter.

Table 1-3 Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7200 series and Cisco 7200 VXR routers	Port-adapter-slot-number/interface-port-number	Port adapter slot—1, 3, or 5 for the DPT port adapter (depends on the number of slots in the router) ¹ Interface port—always 0	1/0
Cisco uBR7246 router	Port-adapter-slot-number/interface-port-number	Port adapter slot—always 1 ¹ for the DPT port adapter Interface port—always 0	1/0
Cisco 7500 series routers with VIP4	Port-adapter-slot-number/VIP-bay-number/ interface-port-number	Port adapter slot—always 1 ¹ for the DPT port adapter VIP bay—always 0 or 1 Interface port—always 0	1/0/0

1. Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Cisco 7200 Series, Cisco 7200 VXR, and Cisco uBR7246 Router Interface Addresses

This section describes how to identify the interface addresses used for the DPT port adapter in Cisco 7200 series, Cisco 7200 VXR, or Cisco uBR7246 routers. The interface address is composed of a two-part number in the format *port-adapter-slot-number/interface-port-number*. See Table 1-3 for the interface address format.

In Cisco 7200 series and Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with port adapter slot 1 and continuing through slot 4 for the Cisco 7204 and Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. (Port adapter slot 0 is reserved for the optional Fast Ethernet port on the I/O controller—if present.)

The interface address of the DPT port adapter in slots 1 and 2 is 1/0 (port adapter slot 1 and interface 0). If the DPT port adapter was in port adapter slots 3 and 4 this same interface would be numbered 3/0 (port adapter slot 3 and interface 0).

In Cisco uBR7246 router, port adapter slots are numbered slot 1 and slot 2 for the Cisco uBR7246 and Cisco uBR7246VXR. (Slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present.) The individual interfaces always begin with 0. The number of additional interfaces depends on the number of interface ports on a port adapter.

The interface addresses of the interfaces on a DPT port adapter are 1/0 and 1/1 (port adapter slot 1 and interfaces 0 and 1).

Cisco 7500 Series Router with VIP Interface Addresses

The Cisco 7500 series routers accept port adapters installed with a Versatile Interface Processor (VIP). The interface address of the port adapters is composed of a three-part number in the format *slot/bay/port-number*. The first number identifies the slot of the router in which the VIP is installed (slot 0 through 12, depending on the number of slots in the router). These port adapter slots are numbered from bottom to top starting with 0.

The second number identifies the bay of the VIP in which the additional port adapter is installed (0 or 1). The bays are numbered from left to right on the VIP. (See Figure 1-11.)

The third number identifies the physical port number on the port adapter. The port numbers always begin at 1 and are numbered from left to right. The number of additional ports (n/1, n/2, and so on) depends on the number of ports on the port adapter.



Note

Although the processor slots in the 7-slot Cisco 7507 and the 13-slot Cisco 7513 and Cisco 7576 are vertically oriented and those in the 5-slot Cisco 7505 are horizontally oriented, all Cisco 7500 series routers use the same method for slot and interface port numbering.

If the VIP is installed in slot 3, and the port adapter is installed in bay 1 of the VIP and has a total of 8 ports, the interface addresses of the port adapter are 3/1/0 through 3/1/7 (slot 3, bay 1, ports 0 through 7). If you remove the VIP with the port adapter (see Figure 1-11) from slot 3 and install it in slot 2, the interface addresses become 2/1/0 through 2/1/7. If the port adapter was in bay 0 of the VIP, these same interface addresses would be numbered 2/0/0 through 2/0/7.



Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the DPT port adapter. This chapter contains the following sections:

- Required Tools and Equipment, page 2-1
- Software and Hardware Requirements, page 2-2
- Checking Hardware and Software Compatibility, page 2-3
- Safety Guidelines, page 2-3
- FCC Class A Compliance, page 2-7

Required Tools and Equipment

You need the following tools and parts to install a DPT port adapter. If you need additional equipment, contact a service representative for ordering information.

- PA-SRP-OC12MM(=), PA-SRP-OC12SMI(=), PA-SRP-OC12SML(=), or PA-SRP-OC12SMX(=) port adapter
- One SC-type duplex or two SC-type simplex multimode or single-mode fiber-optic interface cables to connect the DPT port adapter to the network



Note Single-mode and multimode fiber-optic cables for the DPT port adapter are not available from Cisco Systems but are available from commercial cable vendors.

- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat
- Antistatic container

Software and Hardware Requirements

Table 2-1 lists the recommended minimum Cisco IOS software release required to use the DPT port adapter in supported router or switch platforms.

Table 2-1 DPT Port Adapter Software Requirements

Platform	Recommended Minimum Cisco IOS Release
Cisco 7200 and Cisco 7200 VXR	
<ul style="list-style-type: none"> • PA-SRP-OC12MM(=) • PA-SRP-OC12SMI(=) • PA-SRP-OC12SML(=) 	Cisco IOS Release 12.0(6)S or a later release of Cisco IOS Release 12.0 S Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2 B
<ul style="list-style-type: none"> • PA-SRP-OC12SMX(=) 	Cisco IOS Release 12.0(9)S or a later release of Cisco IOS Release 12.0 S Cisco IOS Release 12.2(4)B or a later release of Cisco IOS Release 12.2 B
Cisco uBR7246 and Cisco uBR7246VXR	
<ul style="list-style-type: none"> • PA-SRP-OC12MM(=) • PA-SRP-OC12SMI(=) • PA-SRP-OC12SML(=) 	Cisco IOS Release 12.0(7)SC or a later release of Cisco IOS Release 12.0 SC
<ul style="list-style-type: none"> • PA-SRP-OC12SMX(=) 	Cisco IOS Release 12.0(9)SC or a later release of Cisco IOS Release 12.0 SC
Cisco 7500 with VIP	
<ul style="list-style-type: none"> • PA-SRP-OC12MM(=) • PA-SRP-OC12SMI(=) • PA-SRP-OC12SML(=) • PA-SRP-OC12SMX(=) 	Cisco IOS Release 12.0(21)S or a later release of Cisco IOS Release 12.0 S

The DPT port adapter and Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7200 series, or Cisco 7500 series routers with VIP network processor memory configurations include the following:

- NPE-200 (200-MHz network processor)—1 MB of SRAM and up to 128 MB of DRAM
- NPE-225 (225-MHz network processor)—1 MB of SRAM and up to 128 MB of DRAM
- NPE-300 (300-MHz network processor)—4 MB of SRAM and up to 128 MB of DRAM



Note

For specific software features and commands available for the DPT port adapter and the Cisco IOS release in which they are supported, refer to the Cisco IOS release note specific to your Cisco IOS release.

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 modules within a system are compatible, but it does provide the minimum 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 and go to **Technical Support Help—Cisco TAC: Tool Index: Software Advisor**. You can also access the tool by pointing your browser directly to <http://www.cisco.com/cgi-bin/support/CompNav/Index.pl>.

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

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.



Warning

This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Waarschuwing

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

Varoitus

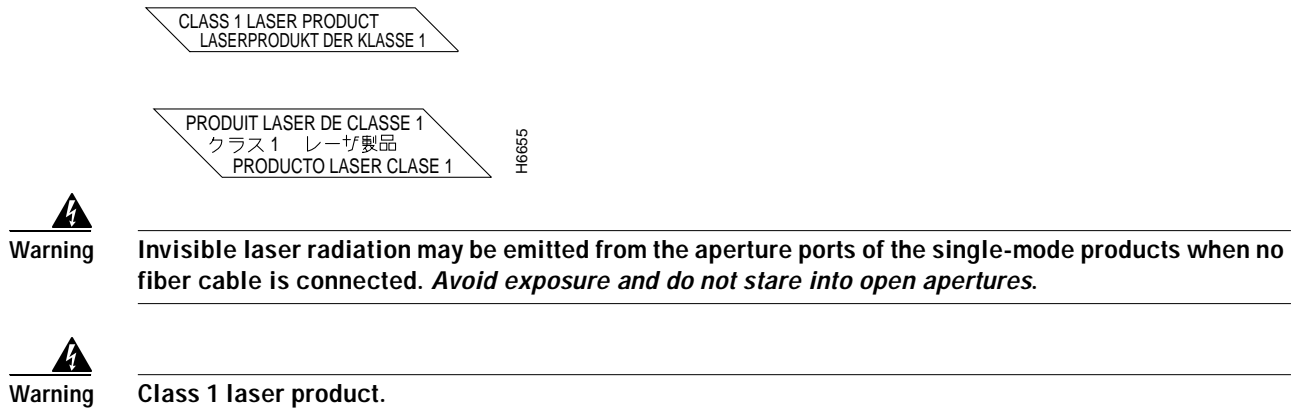
Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasta (määräysten noudattaminen ja tietoa turvallisuudesta).

Attention	Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document <i>Regulatory Compliance and Safety Information</i> (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.
Warnung	Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument <i>Regulatory Compliance and Safety Information</i> (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.
Avvertenza	Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento <i>Regulatory Compliance and Safety Information</i> (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.
Advarsel	Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet <i>Regulatory Compliance and Safety Information</i> (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.
Aviso	Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento <i>Regulatory Compliance and Safety Information</i> (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.
¡Advertencia!	Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado <i>Regulatory Compliance and Safety Information</i> (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.
Varning!	Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet <i>Regulatory Compliance and Safety Information</i> (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

Laser/LED Safety

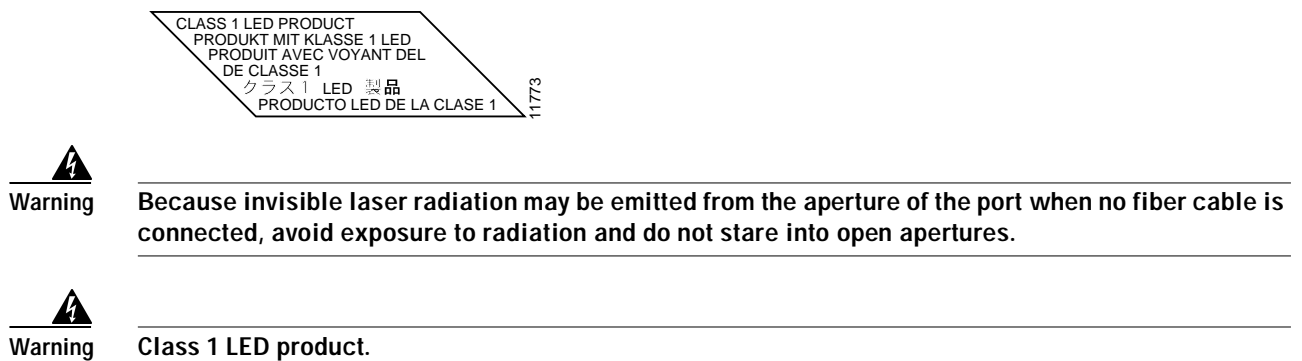
The single-mode transmitter in the DPT port adapter uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in Figure 2-1.

Figure 2-1 Class 1 Laser Warning Labels on DPT Port Adapter for Single-Mode Port



The multimode aperture contains a Class 1 LED warning label, as shown in Figure 2-2.

Figure 2-2 Class 1 LED Warning Label on DPT Port Adapter for Multimode Port



Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis
- Do not work alone when potentially hazardous conditions exist.

- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.



Caution

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

FCC Class A Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side or the other of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

**Note**

The DPT port adapter has been designed to meet these requirements. Modifications to this product that are not authorized by Cisco Systems, Inc., could void the various approvals and negate your authority to operate the product.



Removing and Installing Port Adapters

This chapter describes how to remove the DPT port adapter port adapter from supported platforms and also how to install a new or replacement port adapter. This chapter contains the following sections:

- Installation Overview, page 3-1
- Handling Port Adapters, page 3-1
- Online Insertion and Removal, page 3-2
- Warnings and Cautions, page 3-2
- Port Adapter Slot Divider, page 3-3
- Port Adapter Removal and Installation, page 3-7

Installation Overview

Each port adapter circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.



Note

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the port adapters. If you plan to install a new port adapter in a slot that is not in use, you must first remove the blank port adapter.

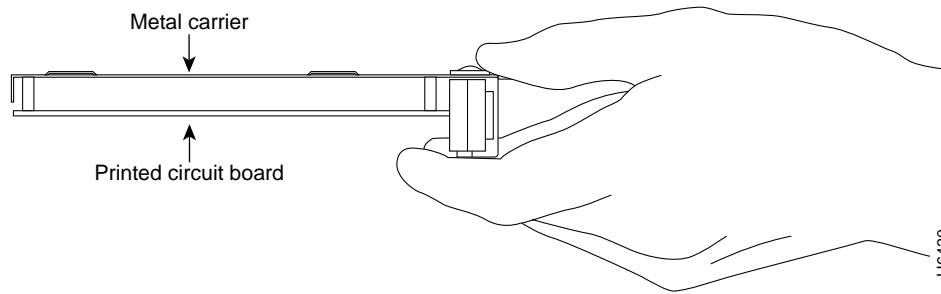
Handling Port Adapters



Caution

Always handle the port adapter by the carrier edges and handle; never touch the port adapter components or connector pins. (See Figure 3-1.)

Figure 3-1 Handling a Port Adapter



Online Insertion and Removal

Several platforms support online insertion and removal (OIR) of port adapters; therefore, you do not have to power down routers when removing and replacing a DPT port adapter on Cisco 7200 series, Cisco 7200 VXR, or Cisco uBR7246 routers.

Although Cisco 7500 series routers do support OIR, VIPs do not. To remove or install a port adapter on the VIP, first remove the VIP from the chassis, and then remove or install the port adapter.



Note

As you disengage the port adapter from the router or switch, OIR administratively shuts down all active interfaces in the port adapter.



Note

Before you begin installation, read Chapter 2, “Preparing for Installation,” for a list of parts and tools required for installation.

Warnings and Cautions

Observe the following warnings and cautions when installing or removing port adapters.



Caution

Do not slide a port adapter all the way into the slot until you have connected all required cables. Trying to do so disrupts normal operation of the router or switch.



Note

If a port adapter lever or other retaining mechanism does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter halfway out of the slot, reinsert it, and move the port adapter lever or other mechanism to the locked position.



Caution

To prevent jamming the carrier between the upper and the lower edges of the port adapter slot, and to ensure that the edge connector at the rear of the port adapter mates with the connection at the rear of the port adapter slot, make certain that the carrier is positioned correctly, as shown in the cutaway in the following illustrations.

**Warning**

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the card. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool, or you could shock yourself.

Port Adapter Slot Divider

If you are installing a DPT port adapter in a Cisco 7200 series or Cisco 7200 VXR router that has two single-width port adapters installed, you need to perform the procedure shown in the “Cisco 7200 Series—Removing the Slot Divider” section on page 3-4. If you are installing a DPT port adapter in a Cisco uBR7246 router that has two single-width port adapters installed, you need to perform the procedure shown in the “Cisco uBR7200 Series—Removing the Slot Divider” section on page 3-5. If you are installing a DPT port adapter in a Cisco 7500 series router with a VIP that has two single-width port adapters installed, you need to perform the procedure shown in the “VIP—Removing the Slot Divider” section on page 3-6.

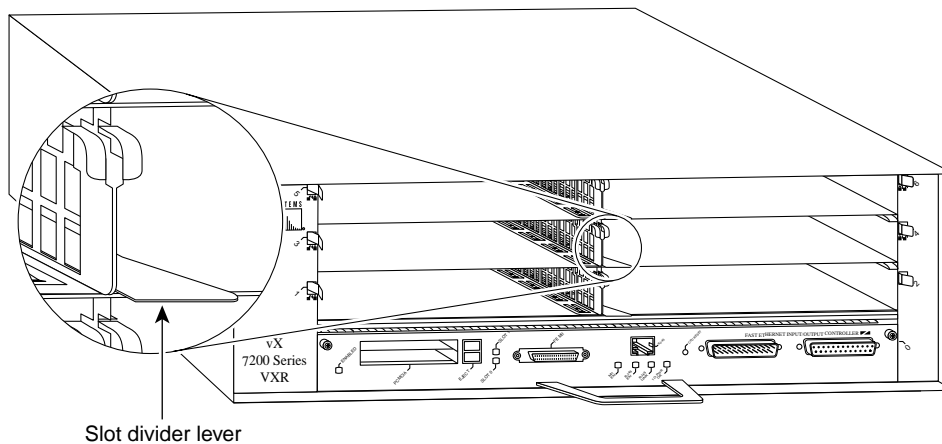
Cisco 7200 Series—Removing the Slot Divider

Step 1

Remove installed single-width port adapters from the slots on both sides of the port adapter slot divider.

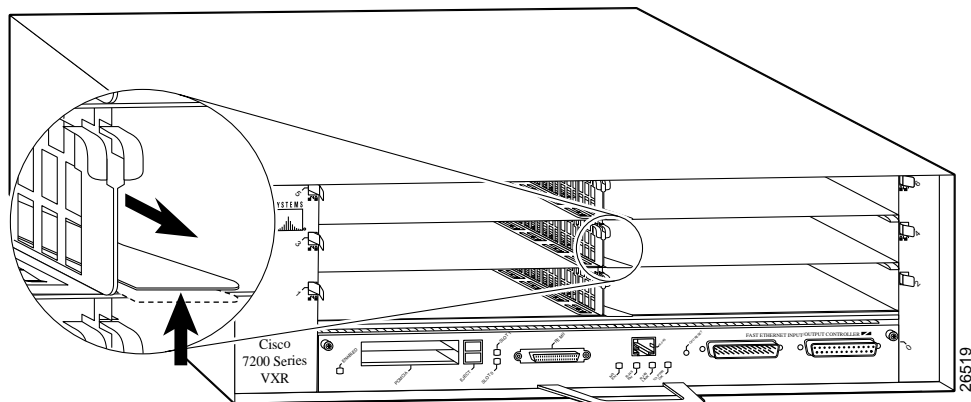
Step 2

With one hand, raise the slot divider lever to unlock the slot divider from the chassis.



Step 3

With the slot divider lever still raised, use your other hand to pull the slot divider from the chassis.



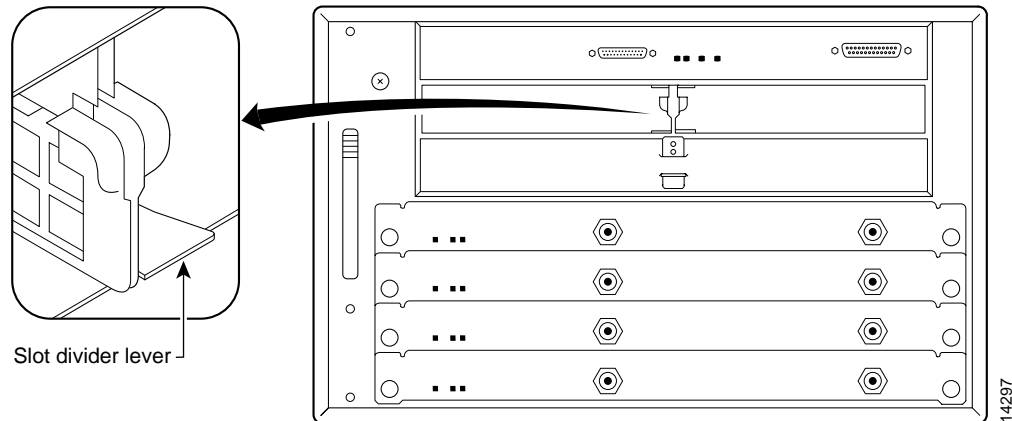
Step 4

Store the slot divider in a location where you can retrieve it for use later.

Cisco uBR7200 Series—Removing the Slot Divider

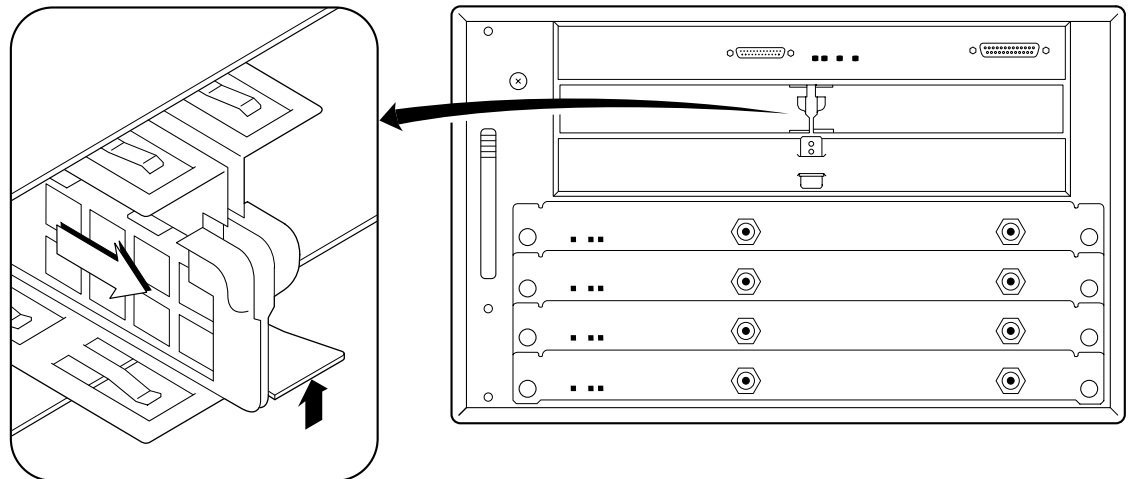
- Step 1** Remove installed single-width port adapters from the slots on both sides of the port adapter slot divider.
- Step 2** With one hand, raise the slot divider lever to unlock the slot divider from the chassis. (See Figure 3-2.)

Figure 3-2 Slot Divider Lever—Cisco uBR7246 Shown



- Step 3** With the slot divider lever still raised, use your other hand to pull the slot divider from the chassis. (See Figure 3-3.)

Figure 3-3 Removing the Slot Divider from the Chassis—Cisco uBR7246 Shown



- Step 4** Store the slot divider in a location where you can retrieve it for use later.

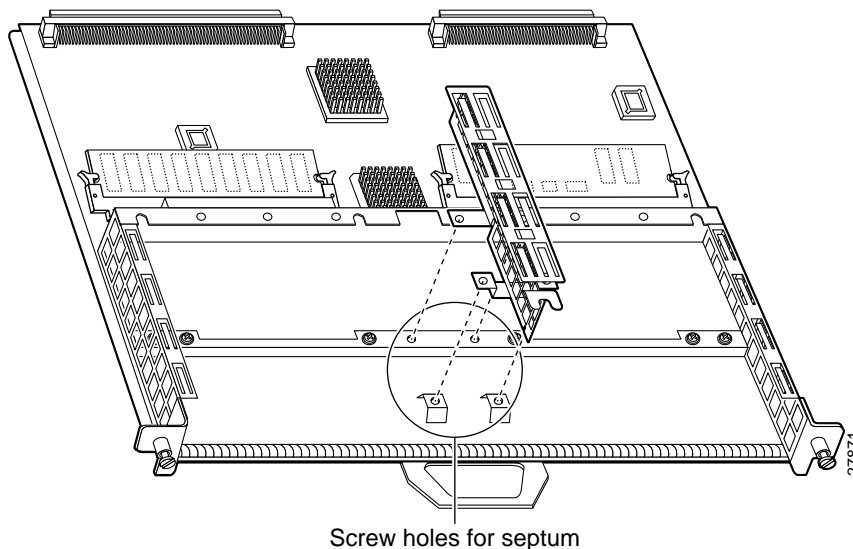


Note The port adapter slot divider is available from Cisco Systems as a spare. Use Product Number MAS-72KSLOTDIV= when ordering a spare port adapter slot divider.

VIP—Removing the Slot Divider

Dual-width port adapters occupy both slots on a VIP. Before you can install a dual-width port adapter, you must first remove the slot divider that is located between the two slots. (See Figure 3-4.)

Figure 3-4 Location of VIP Slot Divider and Screws



Use the following procedure to remove the slot divider from a VIP:

-
- Step 1** Attach an ESD-preventive wrist strap between you and an unpainted chassis surface.
 - Step 2** Remove the VIP from the router.
 - Step 3** Place the removed VIP on an antistatic mat or foam pad.
 - Step 4** Remove any installed modules or blanks from the slots on the VIP. To do this, use a number 1 Phillips screwdriver to remove the screw located at the rear of each slot.
 - To locate this screw on dual-width modules, see the “Cisco 7500 Series Routers with VIP—Removing and Installing a Port Adapter” section on page 3-11.
 - Use a number 1 Phillips screwdriver to remove the four slot divider screws that secure the slot divider to the VIP motherboard. (See Figure 3-4.)
 - Step 5** Remove the slot divider and store it (and the screws) in a location where you can retrieve it for use later.
-



Note

If you need to reinstall the slot divider, place the slot divider in position on the VIP and secure it with the four Phillips screws.

Once the slot divider is removed, refer to the “Cisco 7500 Series Routers with VIP—Removing and Installing a Port Adapter” section on page 3-11, which describes the steps required to install or remove a dual-width module.

This completes the procedure for removing a port adapter slot divider from a Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7200 series, or Cisco 7500 series router with VIP.

Port Adapter Removal and Installation

In this section, the illustrations that follow give step-by-step instructions on how to remove and install port adapters. This section contains the following illustrations:

- Cisco 7200 Series—Removing and Installing a Port Adapter, page 3-8
- Cisco uBR7200 Series—Removing a Port Adapter, page 3-9
- Cisco uBR7200 Series—Installing a Port Adapter, page 3-10
- Cisco 7500 Series Routers with VIP—Removing and Installing a Port Adapter, page 3-11

Cisco 7200 Series—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, place the port adapter lever in the unlocked position. (See A.) The port adapter lever remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Step 4

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

Step 5

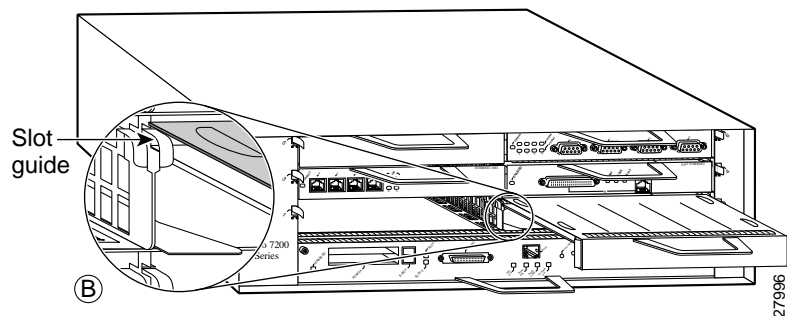
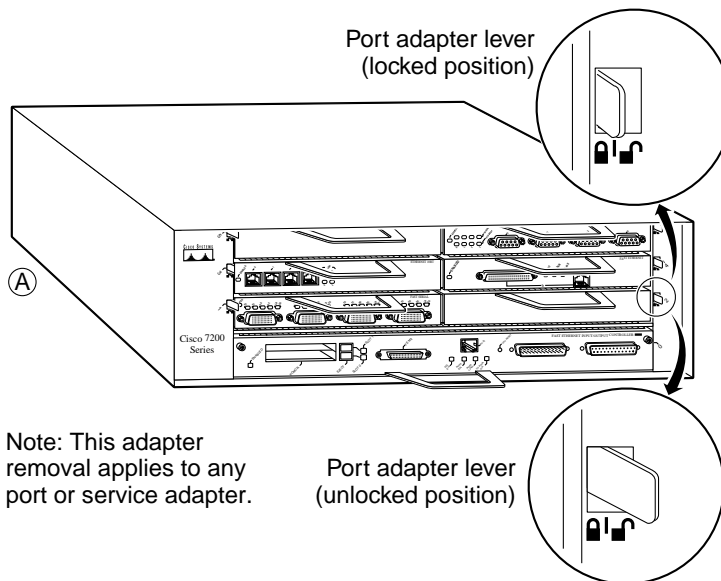
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 7

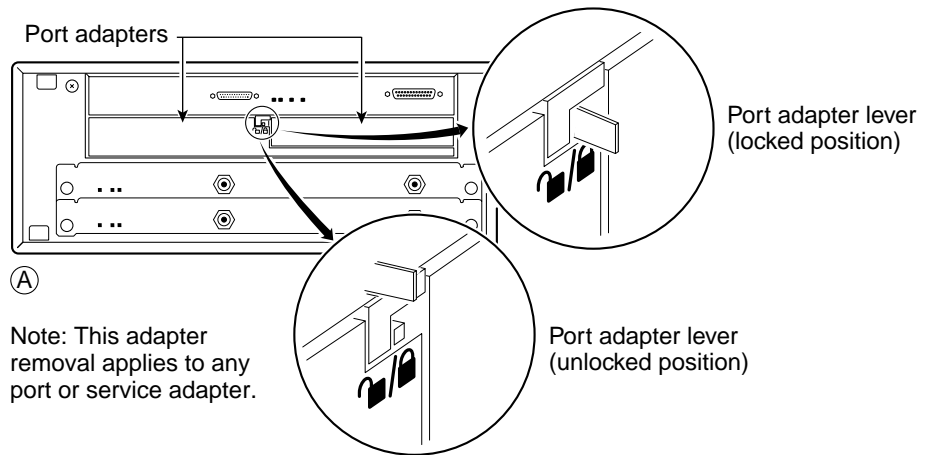
After the port adapter is properly seated, lock the port adapter lever. (See A.)



Cisco uBR7200 Series—Removing a Port Adapter

Step 1

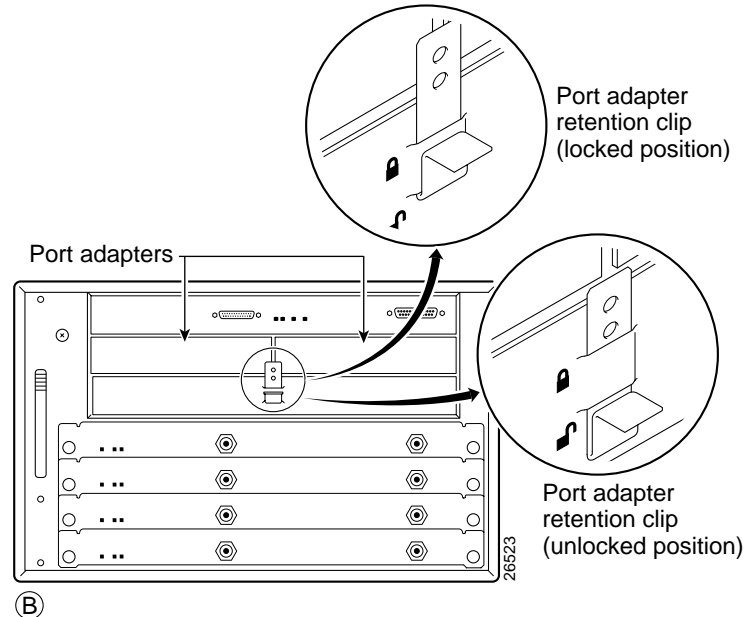
To remove the port adapter, unlock the port adapter retaining mechanism. The port adapter lever remains in the unlocked position.



Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.



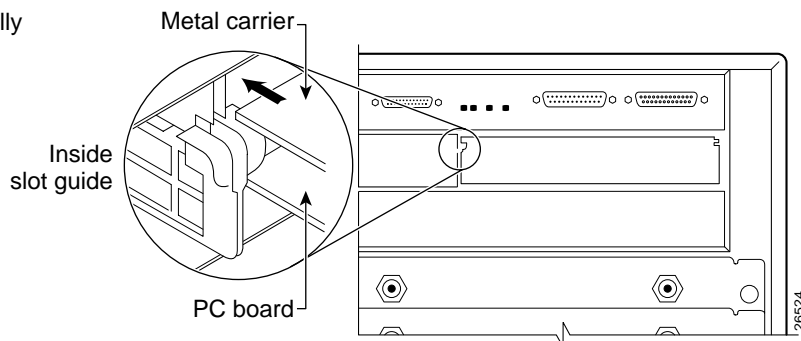
Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Cisco uBR7200 Series—Installing a Port Adapter

Step 1

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot.



Step 2

Carefully slide the new port adapter halfway into the port adapter slot.

Step 3

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 4

After the port adapter is properly seated, lock the port adapter lever or retention clip, depending on your system. (See illustration on preceding page.)

Cisco 7500 Series Routers with VIP—Removing and Installing a Port Adapter

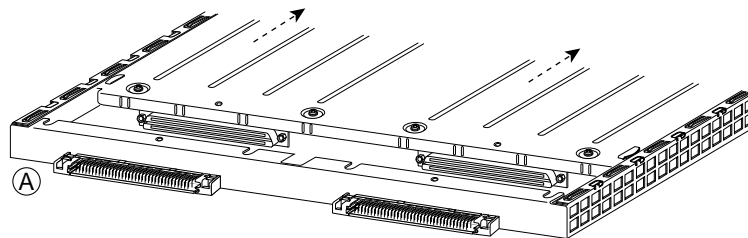
Note: You must first remove the VIP from the chassis before removing the dual-width port adapter from the VIP.

Step 1

To remove the port adapter, remove the screws that secure the port adapter to the VIP.

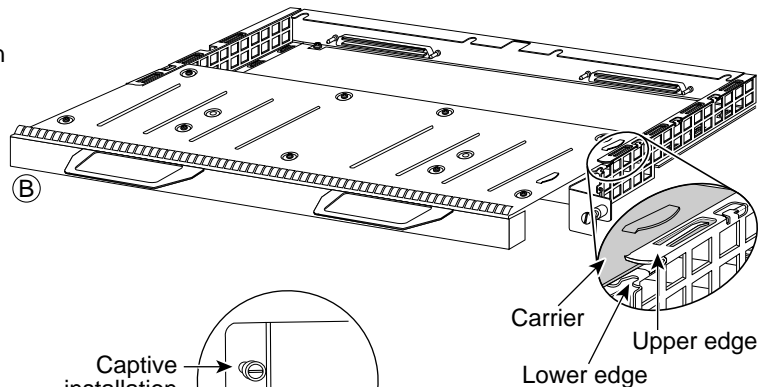
Step 2

With the screws removed, grasp the handles on the front of the port adapter and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)



Step 3

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot on the VIP. (See B.) Carefully slide the port adapter into the port adapter slot until the connectors at the rear of the port adapter are completely seated in the connectors at the rear of the port adapter slot.

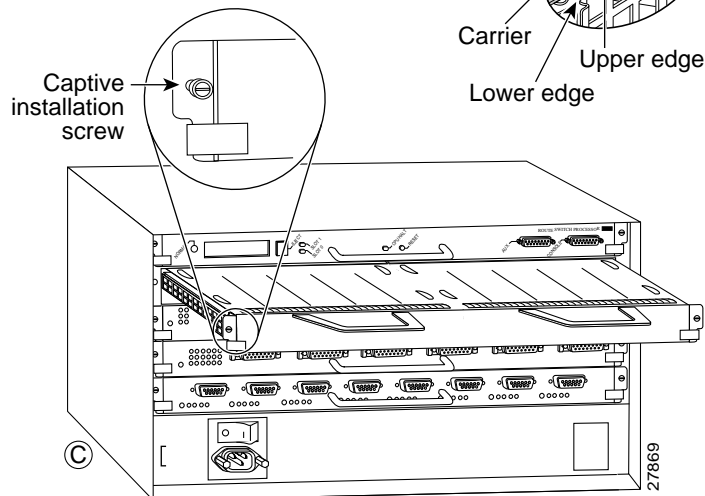


Step 4

Install the screws in the rear of the port adapter slot. Do not overtighten the screws.

Step 5

Carefully slide the VIP into the interface processor slot until the connectors at the rear of the VIP are completely seated in the connectors at the rear of the interface processor slot. Use the ejector levers to seat the VIP in the interface processor slot. Tighten the captive installation screws on the VIP. (See C.)





Configuring the DPT Port Adapter

To continue your DPT port adapter installation, you must configure the DPT port adapter. The instructions that follow apply to all supported platforms. Minor differences between the platforms—with Cisco IOS software commands—are noted.

This chapter contains the following sections:

- Using the EXEC Command Interpreter, page 4-1
- Configuring the DPT Interface, page 4-2
- Creating a DPT Ring, page 4-13
- Adding or Removing Nodes in a DPT Ring, page 4-15
- Checking the Configuration, page 4-18

Using the EXEC Command Interpreter

You modify the configuration of your router through the software command interpreter called the *EXEC* (also called enable mode). You must enter the privileged level of the EXEC command interpreter with the **enable** command before you can use the **configure** command to configure a new interface or change the existing configuration of an interface. The system prompts you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, use the following procedure to enter the privileged level:

-
- Step 1** At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password as follows:

```
Router> enable
```

```
Password:
```

- Step 2** Enter the password (the password is case sensitive). For security purposes, the password is not displayed. When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

To configure the new interface, proceed to the “Configuring the DPT Interface” section on page 4-2.

Configuring the DPT Interface

After you verify that the new DPT port adapter is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interface. Have the following information available:

- IP addresses, if you plan to configure the interface for IP routing
- Bridging protocols you plan to use

If you installed a new DPT port adapter or if you want to change the configuration of the existing interface, you must enter configuration mode to configure the new interface. If you replaced a DPT port adapter that was previously configured, the system recognizes the new interfaces and brings each of them up in their existing configuration.

For a summary of the configuration options available and instructions for configuring a DPT port adapter, refer to the appropriate configuration publications listed in the “Related Documentation” section on page viii.

You execute configuration commands from the privileged level of the EXEC command interpreter, which usually requires password access. Contact your system administrator, if necessary, to obtain password access. (See the “Using the EXEC Command Interpreter” section on page 4-1 for an explanation of the privileged level of the EXEC.)

This section contains the following subsections:

- Shutting Down the Interface, page 4-2
- Performing a Basic Configuration, page 4-4
- Configuring the Intelligent Protection Switch Feature, page 4-6
- Configuring the DPT Topology Feature, page 4-7
- Changing the Default Values of Configuration Parameters, page 4-7
- Using show Commands to Check System Status, page 4-8

Shutting Down the Interface

Before you remove an interface that you will not replace, use the **shutdown** command to shut down (disable) the interface to prevent anomalies when you reinstall the new or reconfigured interface. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

Follow these steps to shut down an interface:

-
- Step 1** Enter the privileged level of the EXEC command interpreter (also called enable mode). (See the “Using the EXEC Command Interpreter” section on page 4-1 for instructions.)
- Step 2** At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:
- ```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```
- Step 3** Shut down the interface by entering the **interface srp** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command. Table 4-1 shows the command syntax.



**Note** The interface *type* of the DPT port adapter is **srp**.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter.

**Table 4-1** Syntax of the shutdown Command

| Platform                                     | Command                                                                                                                                                | Example                                                                                                                                                                                        |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7200 series and Cisco 7200 VXR routers | <b>interface</b> , followed by the <i>type</i> ( <b>srp</b> ) and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)                    | The example shows the DPT interface in port adapter slot 1 being shut down.<br>Router(config-if)# <b>interface srp 1/0</b><br>Router(config-if)# <b>shutdown</b><br><b>Ctrl-Z</b><br>Router#   |
| Cisco uBR7246 router                         | <b>interface</b> , followed by the <i>type</i> ( <b>srp</b> ) and <i>slot/port</i> (port-adapter-slot-number/interface-port-number)                    | The example shows the DPT interface in port adapter slot 1 being shut down.<br>Router(config-if)# <b>interface srp 1/0</b><br>Router(config-if)# <b>shutdown</b><br><b>Ctrl-Z</b><br>Router#   |
| Cisco 7500 series router with VIP            | <b>interface</b> , followed by the <i>type</i> ( <b>srp</b> ) and <i>slot/bay/port</i> (port-adapter-slot-number/VIP-bay-number/interface-port-number) | The example shows the DPT interface in port adapter slot 1 being shut down.<br>Router(config-if)# <b>interface srp 1/0/0</b><br>Router(config-if)# <b>shutdown</b><br><b>Ctrl-Z</b><br>Router# |

**Step 4** Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored in NVRAM.

**Step 5** Verify that new interfaces are now in the correct state (shut down) using the **show interfaces** command (followed by the interface type and interface address of the interface) to display the specific interface. Table 4-2 provides examples.

Table 4-2 Example of the show interfaces Command

| Platform                                     | Command                                                                                                                       | Example                                                                                                                                                                                                                                        |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7200 series and Cisco 7200 VXR routers | <b>show interfaces srp</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)                    | The example is for interface 0 on a port adapter in port adapter slot 1.<br>Router# <b>show interfaces srp 1/0</b><br><br>srp 1/0 is administratively down, line protocol is down<br><br>[Additional display text omitted from this example]   |
| Cisco uBR7246 router                         | <b>show interfaces srp</b> , followed by <i>slot/port</i> (port-adapter-slot-number/interface-port-number)                    | The example is for interface 0 on a port adapter in port adapter slot 1.<br>Router# <b>show interfaces srp 1/0</b><br><br>srp 1/0 is administratively down, line protocol is down<br><br>[Additional display text omitted from this example]   |
| Cisco 7500 series router with VIP            | <b>show interfaces srp</b> , followed by <i>slot/bay/port</i> (port-adapter-slot-number/VIP-bay-number/interface-port-number) | The example is for interface 0 on a port adapter in port adapter slot 1.<br>Router# <b>show interfaces srp 1/0/0</b><br><br>srp 1/0 is administratively down, line protocol is down<br><br>[Additional display text omitted from this example] |

**Step 6** Reenable interfaces by doing the following:

- a. Repeat Step 3 to reenable an interface. Substitute the **no shutdown** command for the **shutdown** command.
- b. Repeat Step 4 to write the new configuration to memory. Use the **copy running-config startup-config** command.
- c. Repeat Step 5 to verify that the interfaces are in the correct state. Use the **show interfaces** command followed by the interface type and interface address of the interface.

For complete descriptions of software configuration commands, refer to the publications listed in the “Related Documentation” section on page viii.

## Performing a Basic Configuration

This section describes guidelines for performing a basic configuration: enabling the DPT port adapter and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.



After configuring the DPT port adapter in a Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7246, or Cisco 7500 series router with VIP, see the “Adding a Node to a DPT Ring” section on page 4-15 for adding the router to a DPT ring.

Before using the **configure** command, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system prompts you for a password if one has been set.

Use the following procedure to configure the DPT port adapter. Press the **Return** key after each configuration step, unless otherwise noted.

- Step 1** Confirm that the system recognizes the DPT port adapter by entering the **show running-config** command:

```
Router# show running-config
```

For an example of output from the **show running-config** command, see the “Using show Commands to Check System Status” section on page 4-8.

- Step 2** Enter configuration mode and specify that the console terminal is the source of the configuration subcommands:

```
Router# configure terminal
```

- Step 3** Enable IP routing by entering the **ip routing** command:

```
Router(config)# ip routing
```

- Step 4** At the prompt, specify the new interface to configure by entering the **interface** command, followed by the *type (srp)* and *slot/port*. The example that follows is for a DPT port adapter in slot 1:

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



**Note** The interface *type* of the DPT port adapter is **srp**.

- Step 5** Assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config)# interface srp 1/0
Router(config-if)# ip address 192.168.2.3 255.0.0.0
```

- Step 6** Use the **srp framing** command to verify that the framing is set to SONET for both side A and side B. The example below shows framing being set to SONET on side B of the DPT port adapter in slot 1:

```
Router(config)# interface srp 1/0
Router(config-if)# srp framing sonet side b
```

- Step 7** Use the **srp internal clock** command to set the clock source to *internal* for both sides of the DPT port adapter. The example below shows side A being set to *internal*:

```
Router(config)# interface srp 1/0
Router(config-if)# srp internal clock side a
```

- Step 8** Change the shutdown state to up and enable the interface:

```
Router(config)# interface srp 1/0
Router(config-if)# no shutdown
```

The **no shutdown** command passes an **enable** command to the DPT port adapter. It also causes the DPT port adapter to configure itself based on the previous configuration commands sent.

- Step 9** Add any other configuration subcommands required to enable routing protocols and adjust the interface characteristics.
- Step 10** When you have included all of the configuration subcommands to complete the configuration, enter **^Z** (press the **Control** key while you press **Z**) to exit configuration mode.
- Step 11** Write the new configuration to memory:

```
Router# copy running-config startup-config
```

The system displays an OK message when the configuration has been stored.

After you have completed your configuration, you can check it using **show** commands. For an explanation of **show** commands, see the “Using show Commands to Check System Status” section on page 4-8.

## Configuring the Intelligent Protection Switch Feature

Intelligent Protection Switch (IPS) ensures that ring traffic flow continues uninterrupted even if device or ring failures occur. IPS protects the DPT ring by initiating ring wraps that route traffic in the opposite direction over the alternate ring. The system software creates ring wraps by issuing an IPS request when failures are detected. The five types of IPS requests are hierarchical, with higher-priority requests taking precedence over lower-priority requests. For example, if a signal failure was detected at the same time that an operator entered a manual switch request, the system would create the ring wrap at the point of signal failure and the manual switch would be ignored. Table 4-2 lists the types of IPS requests in order of priority.

**Table 4-3** *IPS Request Hierarchy*

| Request Type      | Originator |
|-------------------|------------|
| 1 Forced switch   | Operator   |
| 2 Signal fail     | Software   |
| 3 Signal degrade  | Software   |
| 4 Manual switch   | Operator   |
| 5 Wait to restore | Software   |

When you add a node to a DPT ring, you must create a break in the ring. You can create the break by initiating a forced switch request using the **srp ips request** command. See the “Adding a Node to a DPT Ring” section on page 4-15. The following example shows a forced switch request on side A of the DPT port adapter:

```
Router(config)# interface srp 2/0
Router(config-if)# srp ips request fs side A
```

If you need more detailed information about IPS commands, refer to publications listed in the “Related Documentation” section on page viii.

## Configuring the DPT Topology Feature

Every node on a DPT ring maintains a topology map of the ring so that it knows where to route traffic. It updates the topology map by periodically sending out a query, called a topology discovery packet, out onto the ring. Each node on the ring adds its own MAC address to the packet. When the discovery packet returns to the originating node, the contents of the packet are used to update the node topology map. You use the **srp topology-timer** command to set the frequency with which the node sends out topology discovery packets.

The **show srp topology** command is used to display the MAC addresses of each node on a DPT ring. See the “Using show Commands to Check System Status” section on page 4-8.

If you need more detailed information about DPT topology commands, see the “Related Documentation” section on page viii.

## Changing the Default Values of Configuration Parameters

The default values of the DPT port adapter configuration parameters can be changed to match your network requirements. Table 4-4 lists the configuration parameter, the command used to alter it, and the default value of the parameter. If you need more detailed configuration information, refer to the publications listed in the “Related Documentation” section on page viii.

**Table 4-4 DPT Port Adapter Configuration Default Values**

| Parameter                       | Configuration Command                                                | Default Value                                     |
|---------------------------------|----------------------------------------------------------------------|---------------------------------------------------|
| Maximum transmission unit (MTU) | <b>mtu bytes</b>                                                     | 9000 bytes                                        |
| Buffer size                     | <b>srp buffer-size bytes</b>                                         | h = 4096 kbytes, m = 4096 kbytes, l = 8192 kbytes |
| Count                           | <b>srp count</b> 48-bit source address in hexadecimal format H.H.H.  | —                                                 |
| Deficit round robin             | <b>srp deficit-round-robin</b>                                       | quantum = 9216, deficit = 16384                   |
| Flag                            | <b>srp flag [c2 value] [j0 value] [s1s0 value]</b>                   | c2 set to 0x16; j0 set to 0xcc; s1s0 set to 0     |
| Framing                         | <b>srp framing [sdh   sonet]</b>                                     | SONET OC-12c                                      |
| Internal-clock                  | <b>srp clock-source [internal   line] [a   b]</b>                    | Internal                                          |
| IPS                             | <b>srp ips [request   timer   wtr-timer]</b>                         | timer = 1 sec, wtr-timer = 60 sec                 |
| Loopback                        | <b>srp loopback [internal   line] [a   b]</b>                        | —                                                 |
| Priority map                    | <b>srp priority-map [receive   transmit]</b>                         | receive high = 5, receive med = 3, transmit = 7   |
| Random detect                   | <b>srp random-detect [compute-interval   input   precedence]</b>     | compute interval = 128 sec                        |
| Reject                          | <b>srp reject</b> 48-bit source address in hexadecimal format H.H.H. | —                                                 |
| Shutdown                        | <b>srp shutdown [a   b]</b>                                          | —                                                 |

Table 4-4 DPT Port Adapter Configuration Default Values (continued)

| Parameter       | Configuration Command                             | Default Value |
|-----------------|---------------------------------------------------|---------------|
| Topology timer  | <b>srp topology-timer</b> <i>value in seconds</i> | 5 sec         |
| TX traffic rate | <b>srp tx-traffic-rate</b> <i>rate in kbps</i>    | 10,000 kbps   |

## Using show Commands to Check System Status

The system maintains different kinds of information about its configuration and system status. This information can be accessed by using the **show** commands. This section contains **show** command information relevant to the installation and configuration of the DPT port adapter. See the “Related Documentation” section on page viii to locate more detailed information on **show** commands.

This section contains examples of the following commands:

- **show running-config**
- **show version**
- **show protocols**
- **show diag**
- **show controllers srp**
- **show interfaces srp**
- **show srp ips**
- **show srp topology**
- **show srp source-counters**

Use the **show running-config** command to display the currently running configuration. The example below shows that the current software version is Cisco IOS Release 12.0(6)S, a DPT port adapter is installed (the DPT port adapter is shown as interface SRP1/0), and the IP address of the DPT port adapter is 192.168.0.20 255.255.255.0:

```
Router# show running-config
Building configuration...
Current configuration:
version 12.0(6)S
service timestamps debug uptime
service timestamps log datetime
no service password-encryption
service udp-small-servers
service tcp-small-servers
!
hostname uut2
!
ip subnet-zero
ip host abrick 192.168.254.254
ip host curly 192.168.1.20
ip host sink 192.168.1.30
ip host sneha 192.168.1.40
ip name-server 192.168.2.132
!
!
!
interface SRP1/0
 mac-address 0010.5555.6666
 ip address 192.168.0.20 255.255.255.0
```

```

no ip directed-broadcast
no ip route-cache cef
no ip route-cache distributed
no keepalive
no srp random-detect input high
no srp random-detect input medium
no srp random-detect input low

```

Use the **show version** command to display the configuration of the system hardware, and Cisco IOS software information. The following example shows that the Cisco IOS Release 12.0(6)S is used, and that a DPT port adapter is installed:

```

Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-JS-M), Version 12.0(6)S(19990617:032053)
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Thu 17-Jun-99 09:32 by iks
Image text-base: 0x600088F8, data-base: 0x611F2000

ROM: System Bootstrap, Version 11.1(13)CA,(f)
BOOTFLASH: 7200 Software (C7200-BOOT-M), Version 11.3(2)AA, R)

router uptime is 4 days, 16 minutes
System returned to ROM by reload
System image file is "tftp://223.255.254.254/c7200-js-mz.Jun17"

cisco 7206 (NPE200) processor with 122880K/8192K bytes of memory.
R5000 CPU at 200Mhz, Implementation 35, Rev 2.1, 512KB L2 Cache
6 slot midplane, Version 1.3

Last reset from power-on
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
8 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
1 FDDI network interface(s)
1 SRP network interface(s)
125K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0

```

Use the **show protocols** command to show whether a DPT port adapter is up, as shown in the following example:

```

Router# show protocols
Global values:
 Internet Protocol routing is enabled
FastEthernet0/0 is up, line protocol is up
Ethernet1/0 is up, line protocol is up
 Internet address is 10.1.1.41/24
Ethernet1/1 is up, line protocol is down
 Internet address is 10.9.9.7/24
Ethernet1/2 is administratively down, line protocol is down
Ethernet1/3 is up, line protocol is down
Ethernet1/4 is up, line protocol is up
Ethernet1/5 is administratively down, line protocol is down
Ethernet1/6 is administratively down, line protocol is down
Ethernet1/7 is administratively down, line protocol is down
Fddi2/0 is down, line protocol is down

```

```

Internet address is 10.4.4.3/24
SRP5/0 is up, line protocol is up
Internet address is 10.2.2.3/24

```

Use the **show diag** command to view system hardware information. The following example shows a DPT port adapter installed in slot 5 and slot 6:

```

Router# show diag 5
Slot 5/6:
 SRP Double Width, Multi Mode port adapter, 1 port
 Port adapter is analyzed
 Port adapter insertion time 1w3d ago
 EEPROM contents at hardware discovery:
 Hardware revision 1.0 Board revision UNKNOWN
 Serial number 0 Part number 73-3250-02
 Test history 0x0 RMA number 00-00-00
 EEPROM format version 1
 EEPROM contents (hex):
 0x20: 01 A7 01 00 00 00 00 00 49 0C B2 02 00 00 00 00
 0x30: 03 00 00 00 00 00 00 00 FF FF FF FF FF FF FF FF

```

**Note**

If you do not designate the slot number with the **show diag** command, hardware information for all slots is displayed.

Use the **show controllers srp** command to display the location of the DPT port adapter and other configuration information specific to the DPT port adapter, as shown in the following example:

```

Router# show controllers srp
SRP5/0

SRP5/0 - Side A (Outer RX, Inner TX)
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

IPS
Rx(K1/K2) = 00/00 Rx(S1S0) = 02, Rx(C2) = CF
CLOCK SOURCE
 Internal
PATH TRACE BUFFER: STABLE
 Remote hostname : stingray
 Remote interface: srp1/0/0
 Remote IP addr : 10.2.2.5
 Remote Ring id : Outer Ring

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

```

```

SRP5/0 - Side B (Inner RX, Outer TX)
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

IPS
Rx(K1/K2) = 00/00 Rx(S1S0) = 02, Rx(C2) = 06
CLOCK SOURCE
 Internal
PATH TRACE BUFFER: STABLE
 Remote hostname : manofwar
 Remote interface: srp3/0/0
 Remote IP addr : 10.2.2.6
 Remote Ring id : Inner Ring

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

```

**Note**


---

The DPT port adapter interface *type* and controller *type* are **srp**.

---

Use the **show interfaces srp** command to show statistics for the DPT port adapter interfaces, as shown in the following example:

```

Router# show interfaces srp 5/0
SRP5/0 is up, line protocol is up
Hardware is SRP, address is 0010.0ba6.408c (bia 0010.0ba6.408c)
Internet address is 10.2.2.3/24
MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec, rely 255/255, load 1/255
Encapsulation SRP, loopback not set
Last input 00:00:00, output 00:00:00, output hang never
Last clearing of "show interface" counters lw3d
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 2 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
 2369845 packets input, 158630960 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
2369516 packets output, 158542697 bytes, 0 underruns
 0 output errors, 0 collisions, 1 interface resets
 0 output buffer failures, 0 output buffers swapped out
Side A received errors:
 0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort
Side B received errors:
 0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort

```

Use the **show srp ips** command to show IPS information for a specific interface. The following example shows the MAC addresses of the two nodes that are connected to the interface, and information about the state of the connections:

```

router# show srp ips 2/0

IPS Information for Interface SRP2/0
MAC Addresses
 Side A (Outer ring RX) neighbour 0000.0000.0002
 Side B (Inner ring RX) neighbour 0000.0000.0001

```

```

Node MAC address 0000.0000.0003
IPS State
 Side A not wrapped
 Side B wrapped
 Side A (Inner ring TX) IPS pkt. sent every 10 sec. (next pkt. after 6 sec.)
 Side B (Outer ring TX) IPS pkt. sent every 10 sec. (next pkt. after 6 sec.)
 IPS WTR period is 60 sec. (timer is inactive)
Node IPS State WRAPPED
IPS Self Detected Requests
 Side A IDLE
 Side B SF
IPS messages received
 Side A (Outer ring RX) {0000.0000.0002,SF ,L,1024}
 Side B (Inner ring RX) {0000.0000.0001,IDLE,S,1024}
IPS messages transmitted
 Side A (Inner ring TX) {0000.0000.0003,SF ,L,1024}
 Side B (Outer ring TX) {0000.0000.0003,SF ,S,1024}

Source Address Information for Interface SRP2/0
 000a.1234.bcde, reject
 000b.1234.bcde, pkt. count 0

Topology Map for Interface SRP2/0
 Topology pkt. sent every 20 sec. (next pkt. after 1 sec.)
 Last received topology pkt. 00:00:18
 Nodes on the ring:2
 Hops (outer ring) Address
 0 0000.0000.0003 Wrapped
 1 0000.0000.0002 Wrapped

```

Use the **show srp topology** command to show the identity of the nodes on the DPT ring according to their MAC addresses. The following examples show a three-node DPT ring. In the second example, nodes 0 and 2 are wrapped:

```
Router# show srp topology
```

```

Topology Map for Interface SRP5/0
 Topology pkt. sent every 61 sec. (next pkt. after 16 sec.)
 Last received topology pkt. 00:00:45
 Nodes on the ring:3
 Hops (outer ring) Address
 0 0000.0000.0001
 1 0000.0000.0002
 2 0000.0000.0003

```

```
Router# show srp topology
```

```

Topology Map for Interface SRP5/0
 Topology pkt. sent every 61 sec. (next pkt. after 54 sec.)
 Last received topology pkt. 00:00:07
 Nodes on the ring:3
 Hops (Outer ring) Address
 0 0000.0000.0001 Wrapped
 1 0000.0000.0002
 2 0000.0000.0003 Wrapped

```

Use the **show srp source-counters** command to show the number of packets received or rejected when SRP count and reject have been configured. The following example shows 1201 packets have come from another node, and 400 have been rejected:



```
Router# show srp source-counters

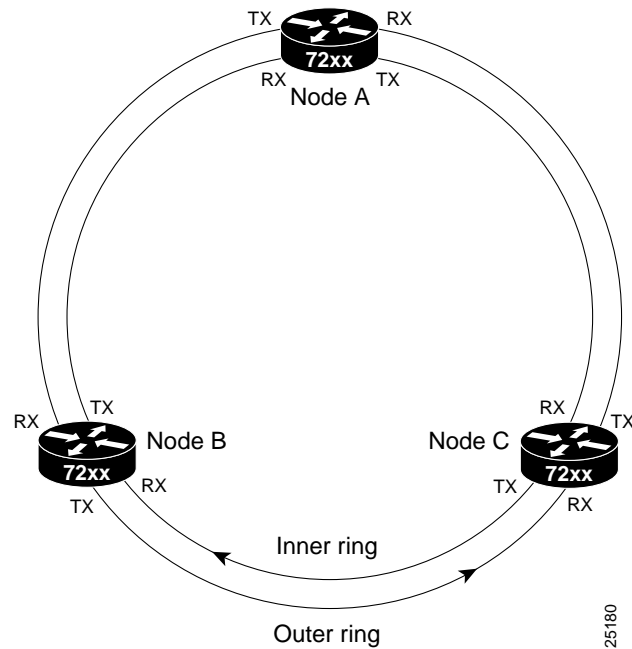
Source Address Information for Interface SRP5/0
000a.1234.5678, index 1, pkt. count 1201
000b.1234.5678, reject, pkt. count 400
```

## Creating a DPT Ring

A DPT ring may contain as many as 32 nodes, or as few as 2 nodes. This section documents the layout and configuration of a three-node DPT ring. It is assumed that the actual physical installation of the Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7246, or Cisco 7500 series router with VIP has already been accomplished.

Before the DPT ring can be created, each router (node) must have a DPT port adapter installed and configured. See the “Port Adapter Removal and Installation” section on page 3-7, and the “Configuring the DPT Interface” section on page 4-2. Once the individual nodes are configured, the inner and outer rings of the DPT ring must be connected as shown in Figure 4-1, and the DPT port adapters must be enabled. The following procedure describes the internodal connections of the DPT ring and the configuration commands used to create the ring.

**Figure 4-1** Three-Node DPT Ring



- Step 1** While in configuration mode, use the **shutdown** command to disable the DPT port adapter on each node, as shown below:

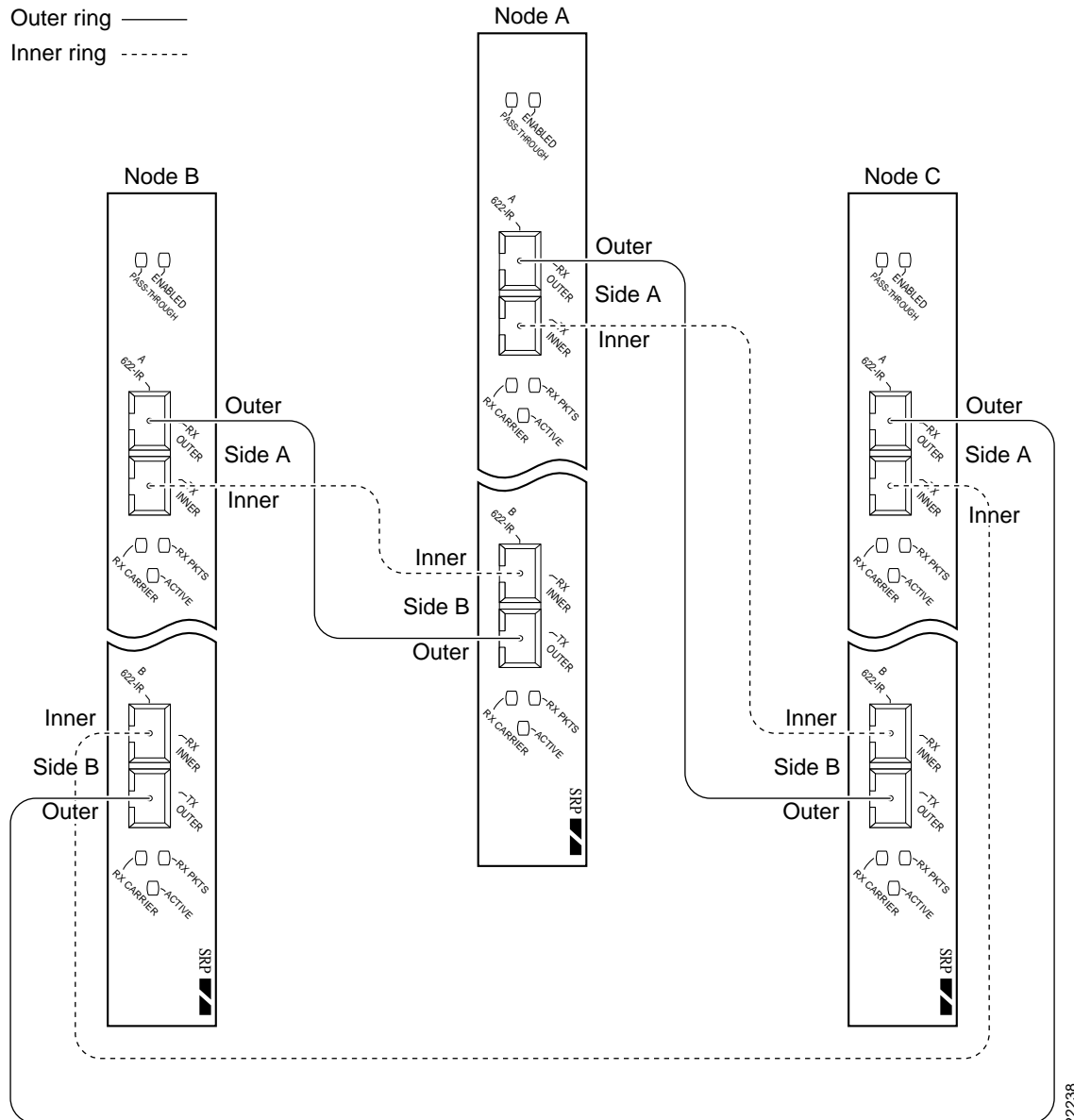
```
Router(config)# interface srp 1/0
Router(config-if)# shutdown
```

- Step 2** Connect the nodes as shown in Figure 4-2, being careful to observe the receive (RX) and transmit (TX) cable relationship. Table 4-5 lists the internodal cable connections for a three-node DPT ring.



**Note** Side A (RX outer/TX inner) of the DPT port adapter must be connected to side B (TX outer/RX inner) of the DPT port adapter in the next node in the ring. See Figure 4-2 for the correct orientation of side A and side B.

**Figure 4-2 Internodal Connections of a Three-Node DPT Ring**



- Step 3** Use the **no shutdown** command to enable the DPT port adapter of each node, as shown below:

```
Router(config)# interface srp 1/0
Router(config-if)# no shutdown
```

- Step 4** Use the **show srp topology** command to verify that all three nodes are recognized as part of the DPT ring. The output shows the number of nodes on the ring and their MAC addresses. See the “Using show Commands to Check System Status” section on page 4-8.

**Table 4-5** Three-Node DPT Ring Cable Connections

| Internodal Cable Connections |                   |
|------------------------------|-------------------|
| From Node/Connector          | To Node/Connector |
| Node A/RX outer              | Node C/TX outer   |
| Node A/TX inner              | Node C/RX inner   |
| Node A/TX outer              | Node B/RX outer   |
| Node A/RX inner              | Node B/TX inner   |
| Node B/RX outer              | Node A/TX outer   |
| Node B/TX inner              | Node A/RX inner   |
| Node B/TX outer              | Node C/RX outer   |
| Node B/RX inner              | Node C/TX inner   |
| Node C/RX outer              | Node B/TX outer   |
| Node C/TX inner              | Node B/RX inner   |
| Node C/TX outer              | Node A/RX outer   |
| Node C/RX inner              | Node A/TX inner   |

## Adding or Removing Nodes in a DPT Ring

The following sections describe the procedures for adding or removing a node in a DPT ring:

- Adding a Node to a DPT Ring, page 4-15
- Removing a Node from a DPT Ring, page 4-18

### Adding a Node to a DPT Ring

When you want to install a new node in a DPT ring, you must first install and configure a DPT port adapter in the Cisco 7200 series, Cisco 7200 VXR, Cisco uBR7246, or Cisco 7500 series router with VIP, and then install and configure the router as a node in the DPT ring. This section describes the procedure for adding a node to a DPT ring.

To add a node to a DPT ring, you must first reroute the traffic flow over the ring through an alternate path by creating a ring wrap where the new node is to be installed. Figure 4-3 shows a four-node DPT ring. Use the following procedure to add a node between nodes A and D on the ring:

- Step 1** While in global configuration mode, stop data traffic between nodes A and D on the DPT ring by entering the forced-switch command **srp ips request forced-switch a** on the node A router. See the “Configuring the Intelligent Protection Switch Feature” section on page 4-6. This creates two ring wraps between the two nodes. (See Figure 4-4.)

Figure 4-3 DPT Ring Topology with Four Nodes

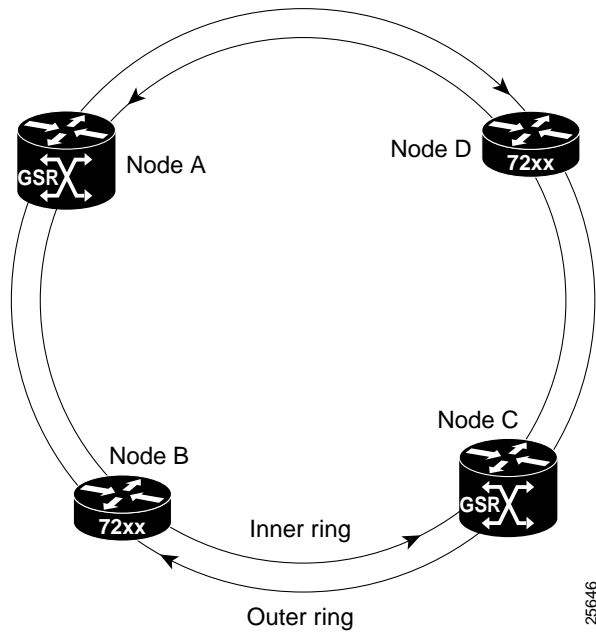
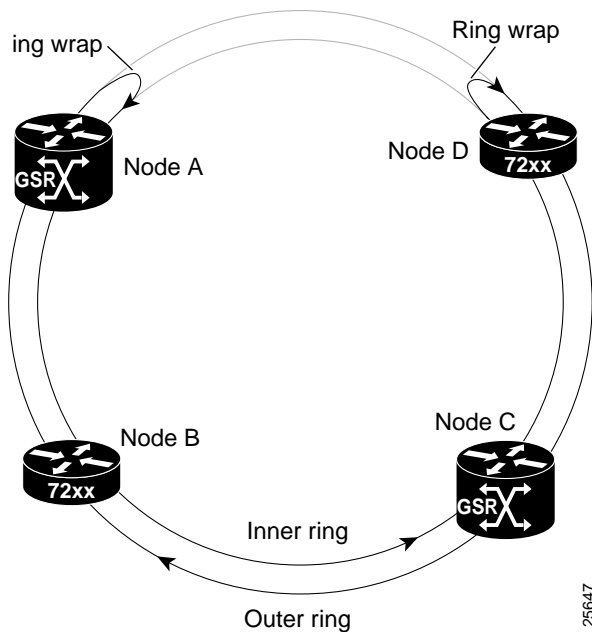


Figure 4-4 DPT Ring with Ring Wraps Created by a Forced Switch



- Step 2 From the configuration mode, enter the command **show srp topology** to verify that the ring wraps are in place. See the “Using show Commands to Check System Status” section on page 4-8.
- Step 3 Disconnect the fiber-optic cables connecting side A of node A to side B of node D. (See Figure 4-4).

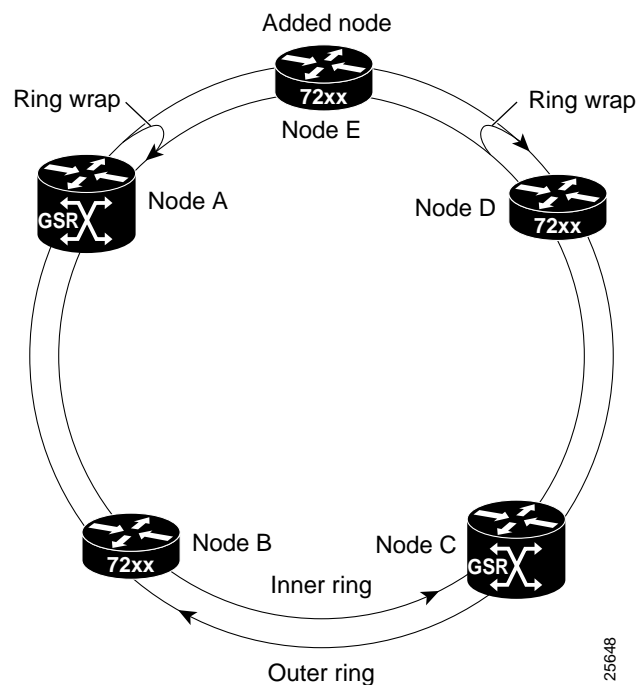
- Step 4** Connect side A of node A to side B of the new node (node E), using two simplex or one duplex fiber-optic cable. See the “Cables, Connectors, and Pinouts” section on page 1-6. Connect side A of the new node to side B of node D. (See Figure 4-5).



**Note** Be careful to observe the proper cable orientation. When using duplex cables, you must reverse one of the cable ends for correct orientation.

- Step 5** If the DPT port adapter in the new router (node E) has not been configured, do so at this time. See the “Configuring the DPT Interface” section on page 4-2.
- Step 6** Enter the **no shutdown** command to bring up the node E router.
- Step 7** Confirm that the system recognizes the new node by entering the **show srp topology** command. The output shows the number of nodes on the ring, their MAC addresses, and the state of the nodes (wrapped or not).
- Step 8** Remove the two ring wraps created by the forced switch on nodes A and D by entering the **no srp ips request forced-switch a** command on the node A router.
- Step 9** Confirm that the ring wraps are no longer in place by entering the **show srp topology** command. The output shows the number of nodes on the ring, their MAC addresses, and the state of the nodes (wrapped or not).

**Figure 4-5** DPT Ring Topology with an Added Node



**Note** You can add a node to a DPT ring without entering the **srp ips forced-switch** command, but you then cannot control when the traffic is rerouted and restored; the system determines the time instead.

## Removing a Node from a DPT Ring

This section describes the procedure for removing a node from a DPT ring. The following steps describe how to remove node D from a four-node DPT ring, similar to that shown in Figure 4-3.

- 
- Step 1 Isolate node D by entering the forced-switch command **srp ips request forced-switch a** on the node A router, and **srp ips request forced-switch b** on the node C router.
  - Step 2 Enter the **show srp topology** command on either router to verify that the ring wraps are in place and that node D no longer exists on the ring.
  - Step 3 Disconnect both ends of the cable connecting side A of node D to side B of node C.
  - Step 4 Disconnect the cable connected to side B of node D and connect it to side B of node C.
  - Step 5 Remove the two ring wraps created by the forced switch on nodes A and C by entering the **no srp ips request forced-switch a** command on node A, and **no srp ips request forced-switch b** command on node C.
  - Step 6 Enable IP routing by entering the **ip routing** command to restart data traffic.
- 

This completes the procedure for removing a node from a DPT ring.

## Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** and **loopback** commands to check connectivity. This section includes the following subsections:

- Using show Commands to Verify the New Interface Status, page 4-18
- Using the ping Command to Verify Network Connectivity, page 4-22

## Using show Commands to Verify the New Interface Status

Table 4-6 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the DPT port adapter appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the “Related Documentation” section on page viii.



### Note

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Table 4-6 Using show Commands

| Command <sup>1</sup>                                                                      | Function                                                                                                                                                                   | Example                                |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>show version</b> or<br><b>show hardware</b>                                            | Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images | Router# <b>show version</b>            |
| <b>show controllers</b>                                                                   | Displays all the current interface processors and their interfaces                                                                                                         | Router# <b>show controllers</b>        |
| <b>show diag slot</b>                                                                     | Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot                     | Router# <b>show diag 2</b>             |
| <b>show interfaces type</b><br><i>port-adapter-slot-number/<br/>interface-port-number</i> | Displays status information about a specific type of interface (for example, <b>srp</b> ) in a Cisco 7200 series router                                                    | Router# <b>show interfaces srp 1/0</b> |
| <b>show interfaces type 1</b><br><i>interface-port-number</i>                             | Displays status information about a specific type of interface (for example, <b>srp</b> ) in a Cisco uBR7246 router                                                        | Router# <b>show interfaces srp 1/0</b> |
| <b>show protocols</b>                                                                     | Displays protocols configured for the entire system and for specific interfaces                                                                                            | Router# <b>show protocols</b>          |
| <b>show running-config</b>                                                                | Displays the running configuration file                                                                                                                                    | Router# <b>show running-config</b>     |
| <b>show startup-config</b>                                                                | Displays the configuration stored in NVRAM                                                                                                                                 | Router# <b>show startup-config</b>     |

1. Refer to “Identifying Interface Addresses” section on page 1-10 for interface addresses on the Cisco 7500 series routers with VIP.

If an interface is shut down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the interface is properly connected and terminated. If you still have problems bringing up the interface, contact a service representative for assistance. This section includes the following subsections:

- Using the show version or show hardware Commands, page 4-19
- Using the show diag Command, page 4-20
- Using the show interfaces Command, page 4-21

Choose the subsection appropriate for your system. Proceed to the “Using the ping Command to Verify Network Connectivity” section on page 4-22 when you have finished using the **show** commands.

## Using the show version or show hardware Commands

Display 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, using the **show version** (or **show hardware**) command.

**Note**


---

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

---

## Cisco 7200 Series and Cisco uBR7200 Series Routers

Following is an example of the **show version** command from a Cisco 7200 series router with the DPT port adapter:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(7)CA [biff 105]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 04-Aug-96 06:00 by biff
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 11.1(7)CA RELEASED SOFTWARE

Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "c7200-j-mz", booted via slot0

cisco 7206 (NPE150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV INC).
Chassis Interface.
 4 Ethernet/IEEE 802.3 interfaces.
 2 FastEthernet/IEEE 802.3 interfaces.
 4 Token Ring /IEEE802.5 interfaces.
12 Serial network interfaces.
 1 Compression port adapter.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

## Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag slot** command, where *slot* is the port adapter slot in a Cisco 7200 series, Cisco uBR7200, and Cisco 7500 series routers with VIP.

**Note**


---

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

---



## Cisco 7200 Series and Cisco uBR7200 Series Routers

Following is an example of the **show diag slot** command that shows a DPT port adapter in port adapter slot 1 of a Cisco 7200 series router:

```
Router# show diag 1
Slot 1:
Mueslix serial (RS232) port adapter, 8 ports
Port adapter is analyzed
Port adapter insertion time 2d09h ago
Hardware revision 255.255 Board revision UNKNOWN
Serial number 4294967295 Part number 255-65535-255
Test history 0xFF RMA number 255-255-255
EEPROM format version 1
EEPROM contents (hex):
0x20: 01 0D FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```



### Note

Port adapters used with Cisco 7200 VXR routers require the correct base hardware revision in order to function. The following error message occurs on bootup if the incorrect hardware revision is used:

```
> PA-3-REVNOTSUPPORTED:PA in slot 1 (Ethernet) requires base h/w revision of (1.14) for this chassis
```

Use the **show diag** command to display the hardware revision.

## Using the show interfaces Command

The **show interfaces** command displays status information (including the physical slot and interface address) for the interfaces you specify. All of the examples that follow specify **srp** interfaces.

For complete descriptions of interface subcommands and the configuration options available for Cisco 7200, Cisco uBR7200, and Cisco 7500 series routers, refer to the publications listed in the “Related Documentation” section on page viii.



### Note

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

## Cisco 7200 Series and Cisco uBR7200 Series Routers

Following is an example of the **show interfaces** command for Cisco 7200 series and Cisco uBR7200 series routers. Following is an example of the **show interfaces srp** command, which shows all of the information specific to interface port 0 on a DPT port adapter installed in port adapter slot 1:

```
Router# show interfaces srp 1/0
SRP1/0 is up, line protocol is up
 Hardware is SRP, address is 0010.0ba6.408c (bia 0010.0ba6.408c)
 Internet address is 10.2.2.3/24
 MTU 4470 bytes, BW 622000 Kbit, DLY 100 usec, rely 255/255, load 1/255
 Encapsulation SRP, loopback not set
 Last input 00:00:00, output 00:00:00, output hang never
 Last clearing of "show interface" counters lw3d
 Queueing strategy: fifo
 Output queue 0/40, 0 drops; input queue 0/75, 0 drops
 5 minute input rate 0 bits/sec, 2 packets/sec
 5 minute output rate 0 bits/sec, 0 packets/sec
 2369845 packets input, 158630960 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
2369516 packets output, 158542697 bytes, 0 underruns
0 output errors, 0 collisions, 1 interface resets
0 output buffer failures, 0 output buffers swapped out
Side A received errors:
0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort
Side B received errors:
0 input errors, 0 CRC, 0 runts, 0 giants, 0 ignored, 0 abort

```

## Using the ping Command to Verify Network Connectivity

Using the **ping** command, you can verify that an interface port is functioning properly. This section provides a brief description of this command. Refer to the publications listed in the “Related Documentation” section on page viii for detailed command descriptions and examples.

The **ping** command sends echo request packets out to a remote device at an IP address that you specify. After sending an echo request, the system waits a specified time for the remote device to reply. Each echo reply is displayed as an exclamation point (!) on the console terminal; each request that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate a bad connection.

Following is an example of a successful **ping** command to a remote server with the address 10.0.0.10:

```

Router# ping 10.0.0.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.0.0.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#

```

If the connection fails, verify that you have the correct IP address for the destination and that the device is active (powered on), and repeat the **ping** command.