CISCO SYSTEMS

Cisco 10720 Internet Router Uplink Cards Installation and Configuration

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Cisco 10720 Internet Router Uplink Cards Installation and Configuration

CONTENTS

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:

Document Revision History

The document revision history is in Table 1.

Document Version	Date	Notes
78-13113-06 B0	January, 2006	This revision contains a .change to the SFP-OC48-SR= power budget listed in Table 1-6.

Objectives

This document describes how to install and troubleshoot the Cisco 10720 Internet Router uplink cards For complete descriptions of interface subcommands and the configuration options that support the Cisco 10720 Internet Router uplink cards functionality, refer to the publications listed in the "Related Documentation" section on page xii.

This publication uses the following terminology to refer to the router and the uplink cards:

Product Name	Reference
Cisco 10720 Internet Router	router
OC-48/STM-16c SRP Uplink Module —Short Reach (SR) 2 km —Intermediate Reach (IR) 15 km —Long Reach 1 (LR1) 40 km —Long Reach 2 (LR2) 80 km	uplink card or DPT uplink card
OC-48/STM-16c POS/SRP Uplink Module —Short Reach (SR) 2 km —Intermediate Reach (IR) 15 km —Long Reach 1 (LR1) 40 km —Long Reach 2 (LR2) 80 km	uplink card or POS/DPT uplink card
OC-48 RPR/SRP Uplink Module —Short Reach (SR) 2 km —Intermediate Reach (IR) 15 km —Long Reach 2 (LR2) 80 km	uplink card or RPR/SRP uplink card
Console/auxiliary module	uplink card[1] or console/auxiliary card

1. "Uplink card" is used to refer to the DPT and POS uplink cards and the console/auxiliary card where differences between them are not relevant.

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview and Specifications	Provides an overview and specifications for the uplink cards. It also provides translated safety warnings.
Chapter 2	Preparing for Installation	Provides information for preparing to install an uplink card.
Chapter 3	Installing and Removing the Uplink Cards	Provides installation and removal instructions for the uplink card and cable-management system. It also provides information and links to documents containing configuration information for the uplink cards.

Section	Title	Description
Chapter 4	Creating a Four-Node Ring Using the Uplink Cards	Provides information for creating a four-node DPT ring using the DPT uplink card or IEEE 802.17 ring using the RPR/SRP uplink card.
Chapter 5	Troubleshooting the Uplink Cards	Provides troubleshooting information for checking the uplink card installation, as well as alarm message information and solutions to the problems.

Electromagnetic Compliance

Electromagnetic compliance information is presented in the following sections:

- Electromagnetic Compatibility Regulatory Statements, page ix
- Site Wiring Distance and Interference Guidelines, page ix

Electromagnetic Compatibility Regulatory Statements

For regulatory, compliance and safety information, see the *Regulatory Compliance and Safety inforamtion for the Cisco 10720 Internet Router* document.

Site Wiring Distance and Interference Guidelines

This section offers site wiring guidelines for setting up the site plant wiring and cabling. When planning the location of the new system, consider the following:

- Electromagnetic Interference, page ix
- Distance Limitations for Signaling and Unshielded Conductors, page x

Electromagnetic Interference

Electromagnetic interference can occur between the field and the signals on the wires when the wires are run for any significant distance. This fact has two implications for the construction of plant wiring:

- Poor wiring practice can result in radio interference emanating from the plant wiring.
- Strong EMI, especially when it is caused by lightning or radio transmitters, can destroy and/or cause interference with the signal drivers and receivers in the Cisco 10720 Internet Router, and can create an electrical hazard by conducting power surges through lines and into equipment.

Note   To predict and remedy strong EMI, consult experts in radio frequency interference (RFI).

A good quality twisted pair cable or shielded twisted pair cable helps limit radiation and noise induced into the cable minimizing:

- Potential for radio interference
- Potential for interference with the data transmission.

Distance Limitations for Signaling and Unshielded Conductors

Give special consideration to the effect of a lightning strike in the site vicinity if wires exceed recommended distances, or if wires pass between buildings. The electromagnetic pulse (EMP) caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices.

Provide a properly grounded and shielded environment. Consider electrical surge suppression issues by addressing the following items:

- Potential surge sources
- Distance

⚠ **Caution** Splicing can degrade cable performance.

Translated Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, may harm you. A warning symbol precedes each warning statement. The following paragraph is an example of a safety warning. It identifies the warning symbol and associates it with a bodily injury hazard. The remaining paragraphs in this section are translations of the initial safety warning.

Note For a complete list of translated safety warnings, read the *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router* publication that accompanies your Cisco 10720 Internet Router. We recommend you read and understand the safety warnings and guidelines before installing, configuring, or maintaining the router.

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 appendix "Translated Safety Warnings" in the installation guide 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 aanhangsel "Translated Safety Warnings" (Vertalingen van veiligheidsvoorschriften) in de installatiegids die bij dit toestel is ingesloten, raadplegen.

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 tämän laitteen mukana olevan asennusoppaan liitteestä "Translated Safety Warnings" (käännetyt turvallisuutta koskevat varoitukset).)

Attention Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures. Avant d'accéder à cet équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures courantes de prévention des accidents. Pour obtenir les traductions des mises en garde figurant dans cette publication, veuillez consulter l'annexe intitulée « Translated Safety Warnings » (Traduction des avis de sécurité) dans le guide d'installation 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 Anhang mit dem Titel "Translated Safety Warnings" (Übersetzung der Warnhinweise) in der diesem Gerät beiliegenden Installationsanleitung.)

Avvertenza Questo simbolo di avvertenza indica un pericolo. Si è in una situazione che può causare infortuni. 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 nell'appendice, "Translated Safety Warnings" (Traduzione delle avvertenze di sicurezza), del manuale d'installazione 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 vedlegget "Translated Safety Warnings" [Oversatte sikkerhetsadvarsler] i installasjonsveiledningen som ble levert med denne enheten.)

Aviso Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos fisicos. 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 apêndice "Translated Safety Warnings" - "Traduções dos Avisos de Segurança", no guia de instalação 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 traducciones de las advertencias que aparecen en esta publicación, consultar el apéndice titulado "Translated Safety Warnings," en la guía de instalación 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 appendix "Translated Safety Warnings" [Översatta säkerhetsvarningar] i den installationshandbok som medföljer denna anordning.)

警告使用者 這是甲類資訊產品，在居住環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。注意：產品的度量和檢驗標準局 (BSMI) 核准授權號碼在系統外殼的產品標籤上。

Related Documentation

The following section lists some reference material out of the Cisco.com library that may be useful for configuring and maintaining the Cisco 10720 Internet Router:

- *Cisco 10720 Internet Router Installation and Configuration Guide*
- *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router*
- *Cisco IOS Software Configuration for the Cisco 10720 Internet Router*
- *IEEE 802.17 Resilient Packet Ring Feature Guide*
- *Release Notes for Cisco IOS Release 12.0 SP*
- *Cisco IOS Release 12.0 Command Reference*
- *Inspection and Cleaning Procedures for Fiber-Optic Connections*
- *Compressed Air Cleaning Issues for Fiber-Optic Connections*

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/techsupport

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

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

Product Documentation DVD

The Product Documentation DVD is a comprehensive library of technical product documentation on a portable medium. The DVD enables you to access multiple versions of installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the same HTML documentation that is found on the Cisco website without being connected to the Internet. Certain products also have .PDF versions of the documentation available.

The Product Documentation DVD is available as a single unit or as a subscription. Registered Cisco.com users (Cisco direct customers) can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Ordering Documentation

Registered Cisco.com users may order Cisco documentation at the Product Documentation Store in the Cisco Marketplace at this URL:

http://www.cisco.com/go/marketplace/

Nonregistered Cisco.com users can order technical documentation from 8:00 a.m. to 5:00 p.m. (0800 to 1700) PDT by calling 1 866 463-3487 in the United States and Canada, or elsewhere by calling 011 408 519-5055. You can also order documentation by e-mail at tech-doc-store-mkpl@external.cisco.com or by fax at 1 408 519-5001 in the United States and Canada, or elsewhere at 011 408 519-5001.

Documentation Feedback

You can rate and provide feedback about Cisco technical documents by completing the online feedback form that appears with the technical documents on Cisco.com.

You can submit comments about Cisco documentation by using the response card (if present) behind the front cover of your document or by writing to the following address:

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

We appreciate your comments.

Cisco Product Security Overview

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

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to:

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

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

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

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

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

- For Emergencies only—security-alert@cisco.com

  An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

- For Nonemergencies—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Tip   We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.*x* through 9.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT at the aforementioned e-mail addresses or phone numbers before sending any sensitive material to find other means of encrypting the data.

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Technical Support & Documentation website on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support & Documentation Website

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

http://www.cisco.com/techsupport

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

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

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

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—An existing network is down, or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of the network is impaired, while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The *Cisco Product Quick Reference Guide* is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:

  http://www.cisco.com/go/guide

- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

  or view the digital edition at this URL:

  http://ciscoiq.texterity.com/ciscoiq/sample/

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- Networking products offered by Cisco Systems, as well as customer support services, can be obtained at this URL:

  http://www.cisco.com/en/US/products/index.html

- Networking Professionals Connection is an interactive website for networking professionals to share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at this URL:

  http://www.cisco.com/discuss/networking

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

C H A P T E R 1

Overview and Specifications

This publication contains instructions for installing and configuring the OC-48 RPR/SRP, OC-48/STM-16c DPT, and OC-48/STM-16c POS uplink cards as well as the console/auxiliary card on the Cisco 10720 Internet Router.

Refer to the *Cisco 10720 Internet Router Installation and Configuration Guide* for more information about this product line, and the *Cisco IOS Software Configuration Guide for the Cisco 10720 Internet Router*

For the software information about the OC-48 RPR/SRP uplink card, refer to the *IEEE 802.17 Resilient Packet Ring Feature Guide*.

The following information is found in this chapter:

Product Number and Product Names

The following table provides product numbers and product names.

Product Number	Product Name
10720-RPR-SFP=	OC-48 RPR/SRP Uplink Module
10720-SR-LC=	OC-48 SRP Short Reach 2-km Uplink Module
10720-IR-LC=	OC-48 SRP Intermediate Reach 15-km Uplink Module
10720-LR1-LC=	OC-48 SRP Long Reach 40-km Uplink Module
10720-LR2-LC=	OC-48 SRP Long Reach 80-km Uplink Module
10720-SR-LC-POS=	OC-48 POS Short Reach 2-km Uplink Module
10720-IR-LC-POS=	OC-48 POS Intermediate Reach 15-km Uplink Module

Product Number	Product Name
10720-LR1-LC-POS=	OC-48 POS Long Reach 40-km Uplink Module
10720-LR2-LC-POS=	OC-48 POS Long Reach 80-km Uplink Module
10720-CON-AUX=	Console/Auxiliary Module

The Cisco 10720 Internet Router provides network access using Ethernet and optional Dynamic Packet Transport (DPT), Packet over SONET (POS), or IEEE 802.17 RPR technology for optical connectivity. Each router is equipped with one uplink card located in the upper card slot. The OC-48 RPR/SRP, OC-48/STM-16c DPT, and POS/DPT uplink cards are equipped with dual OC-48c/STM-16c optical uplink network ports with an aggregate bandwidth of 5 Gbps. The console/auxiliary card provides console and serial (AUX) ports only.

Although the console/auxiliary card does not provide uplink capabilities, it is described here because it is installed the same as the DPT and POS/DPT uplink cards. You can use the Cisco 10720 Internet Router console/auxiliary card with either a 24-Port 10/100 Ethernet TX access card or a Combined 4-Port Gigabit Ethernet 8-Port 10/100 Ethernet TX access card to customize the Cisco 10720 Internet Router as an Ethernet-only router.

For DPT and POS/DPT uplink cards, the cable connector is LC fiber-optic connector. For the RPR/SRP uplink card, the fiber-optic cable connects to an LC connector in a small form-factor pluggable (SFP) optical connector. When connecting to DPT networks, the left port is the Spatial Reuse Protocol (SRP) side A, and the right port is side B. (See Figure 1-1.) When connecting to POS networks, there are two individual ports. Each port consists of transmit (TX) and receive (RX). (See Figure 1-2.) When connecting to DPT networks in Resilient Pack Rings (IEEE 802.17 RPR) mode, the left port is span West, and the right port is span East. When in the Spatial Reuse Protocol (SRP) mode, the left port is side A, and the right port is side B. (See Figure 1-3.)

For information and instructions on connecting the optical cables to the DPT uplink card or to the RPR/SRP uplink card and for setting up four-node rings, see Chapter 1, "Overview and Specifications" and Chapter 4, "Creating a Four-Node Ring Using the Uplink Cards."

DPT Uplink Card Faceplate and Specifications

This section provides faceplate identification and specifications for the DPT uplink card.

Figure 1-1   Cisco 10720 Internet Router DPT Uplink Card
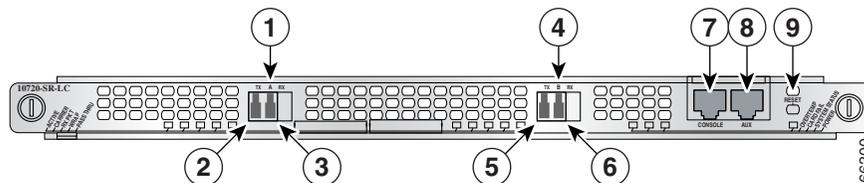
1	Side A	6	Side B RX
2	Side A TX	7	Console port
3	Side A RX	8	Auxiliary port
4	Side B	9	Reset switch
5	Side B TX		

Table 1-1   *DPT Uplink Card Specifications*

Product ID	Description
10720-SR-LC=	2 OC-48c/STM16c DPT short-reach (SR) • Distance—1.2 miles (2 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-IR-LC=	2 OC-48c/STM16c DPT intermediate-reach (IR) • Distance—9.3 miles (15 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-LR1-LC=	2 OC-48c/STM16c DPT long-reach 1 (LR1) • Distance—25 miles (40 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-LR2-LC=	2 OC-48c/STM16c DPT long-reach 2 (LR2) • Distance—50 miles (80 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D

POS/DPT Uplink Card Faceplate and Specifications

This section provides faceplate identification and specifications for the POS/DPT uplink card.

Figure 1-2   *Cisco 10720 Internet Router POS/DPT Uplink Card*
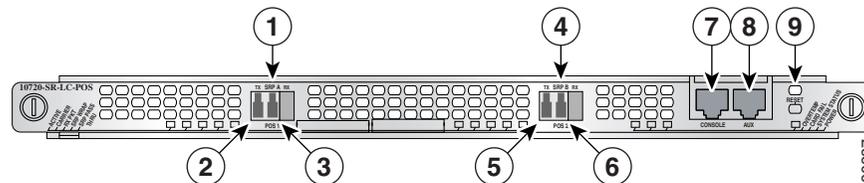
1	Side A for DPT; port 1 for POS	6	Side B/port 2 RX
2	Side A/port 1 TX	7	Console port
3	Side A/port 1 RX	8	Auxiliary port
4	Side B for DPT; port 2 for POS	9	Reset switch
5	Side B/port 2 TX		

Table 1-2   *POS /DPT Uplink Card Specifications*

Product ID	Description
10720-SR-LC-POS=	2 OC-48c/STM16c POS/DPT short-reach (SR) • Distance—1.2 miles (2 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-IR-LC-POS=	2 OC-48c/STM16c POS/DPT intermediate-reach (IR) • Distance—9.3 miles (15 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-LR1-LC-POS=	2 OC-48c/STM16c POS/DPT long-reach 1 (LR1) • Distance—25 miles (40 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D
10720-LR2-LC-POS=	2 OC-48c/STM16c POS/DPT long-reach 2 (LR2) • Distance—50 miles (80 km) • Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D

RPR/SRP Uplink Card Faceplate and Specifications

This section provides faceplate identification and specifications for the RPR/SRP uplink card.

Figure 1-3   *Cisco 10720 Internet Router RPR/SRP Uplink Card*
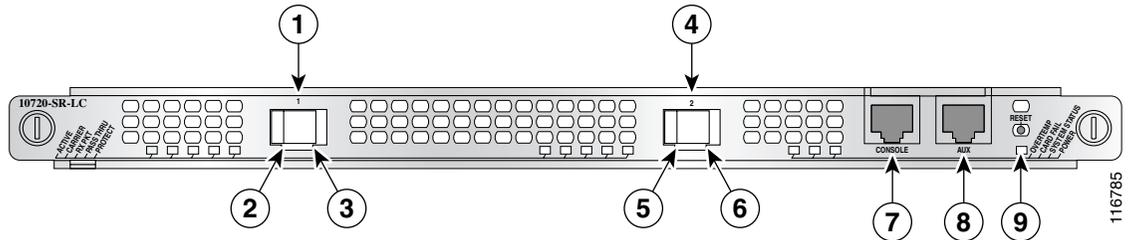
1	Span West for RPR mode Side A for SRP mode	**6**	Span East/Side B RX
2	Span West/Side A TX	**7**	Console port
3	Span West/Side A RX	**8**	Auxiliary port
4	Span East for RPR mode Side B for SRP mode	**9**	Reset switch
5	Span East/Side B TX		

The RPR/SRP uplink card supports small form-factor pluggable (SFP modules) optics. See Table 1-4 for the SFP modules available and supported.

Table 1-3   *RPR/SRP Uplink Card Specifications*

Product ID	Description
10720-RPR-SFP=	• Weight—3.0 lb (1.35 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D

OC48 SFP Module Specifications

Table 1-4, Table 1-6, and Table 1-5 provide specifications for the RPR/SRP SFP modules..

Table 1-4   *Small Form-Factor Pluggable (SFP) Modules for the RPR/SRP Uplink Card*

Optical Cable	Distance	SFP Product ID
Short Reach (SR)	1.2 miles (2 km)	SFP-OC48-SR=
Intermediate Reach (IR)	9.3 miles (15 km)	SFP-OC48-IR1=
Long Reach 2 (LR2)	50 miles (80 km)	OC48-SFP-LR2=

Table 1-5   OC48 SFP Module Specifications for the RPR/SRP Uplink Card

Specification	Description
Dimensions (H x W x D)	0.34 in. x 0.54 in. x 2.2 in. (8.6 mm x 13.7 mm x 56.5 mm)
Connectors	LC-type connector
Wavelength	SFP-OC48-SR—1310 nm SFP-OC48-IR1—1310 nm OC48-SFP-LR2—1550 nm
Cabling Distance (maximum)[1]	SFP-OC48-SR—1.2 miles (2 km) SFP-OC48-IR1—9.3 miles (15 km) OC48-SFP-LR2—50 miles (80 km)
Operating temperature range	22.9^o F to 185° F (-5° C to 85° C)
Storage temperature range	-40° F to 185° F (-40° to 85° C)

1. Optical distances are only for reference in a typical application, actual distance will vary depending on the number of splices, quality of fibres, and other significant factors.

Table 1-6   OC48 SFP Power Specificiations for the RPR/SRP Line Card

SFP Module	Transmit Power		Receive Power		Power Budget
	Maximum	Minimum	Maximum	Minimum	
SFP-OC48-SR=	-3 dBm	-10 dBm	-3 dBm	-18 dBm	8.0 dBm
SFP-OC48-IR1=	0 dBm	-5 dBm	0 dBm	-18 dBm	13 dBm
OC48-SFP-LR2=	3 dBm	-2 dBm	-9 dBm	-28 dBm	26 dBm

Optical Cable Specifications

Table 1-7 provides optical cable specifications for the uplink cards.

Table 1-7   Uplink Card s Optical Cable Specifications

Uplink Card Type	Connector Type	Operating Wavelength	Transmit Power[1][2]	Receive Sensitivity	Minimum Distance
Single-Mode Short-Reach	LC Duplex	1310 nm	–3 dBm (max) –10 dBm (min)	–3 dBm (max) –18 dBm (min)	1.2 miles (2 km)
Single-Mode Intermediate-Reach	LC Duplex	1310 nm	0 dBm (max) –5 dBm (min)	0 dBm (max) –18 dBm (min)	9.3 miles (15 km)
Single-Mode Long-Reach 1	LC Duplex	1310 nm	3 dBm (max) –2 dBm (min)	–9 dBm (max) –27 dBm (min)	25 miles (40 km)
Single-Mode Long-Reach 2	LC Duplex	1550 nm	3 dBm (max) –2 dBm (min)	–9 dBm (max) –28 dBm (min)	50 miles (80 km)

1. If dBm levels are lower than specification requirements (too much power), add attenuation until correct readings apply. Attenuation should be added in –5, –10, or –25 dBm increments.

2. If dBm levels are higher than specification requirements (not enough power), clean all optics and reduce number of fiber splices/connections. Verify the integrity of the fiber cable, and make sure there are no kinks, breaks, tight coils, or bends.

Additional feature information is available online in the *Cisco IOS Software Configuration for the Cisco 10720 Internet Router* document and in the *Cisco 10720 Internet Router Installation and Configuration Guide*, and the *IEEE 802.17 Resilient Packet Ring Feature Guide* located on Cisco.com. Also see the the *Cisco 10720 Internet Router Installation and Configuration Guide* that accompanies other marketing materials related to the Cisco 10720 Internet Router.

Console/Auxiliary Card Faceplate and Specifications

The console/auxiliary card contains a console and serial (AUX) port, as shown in Figure 1-4.

Figure 1-4   Cisco 10720 Internet Router Console/Auxiliary Card
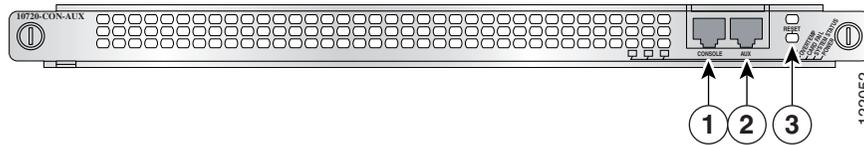
1	Console port	**3**	Reset switch
2	Auxiliary port		

A reset switch is located on the right side of the front panel above the system LEDs. To reset the Cisco 10720 Internet Router, use a sharp, pointed instrument to push the switch that is located behind the panel.

Table 1-8   Console/Auxiliary Card Specifications

Product ID	
10720-CON-AUX=	Console/auxiliary card • Weight—2.4 lb (1.09 kg) • Dimensions—0.38 x 5.25 x 3.42 inches (0.97 x 13.33 x 8.69 cm) H x W x D

C H A P T E R **2**

Preparing for Installation

Installation prerequisites and preparation information for installing an uplink card in a Cisco 10720 router are in the following sections:

- Hardware Requirements, page 2-1
- Software Requirements, page 2-2
- Safety and Compliance, page 2-3

Hardware Requirements

Ensure that your equipment configuration meets the minimum requirements for the uplink card installation and that you have all the parts and tools you need.

To ensure compatibility with the Cisco IOS software, your DPT or POS/DPT uplink card should have a hardware revision level of 73-05345-03 Rev. A0 or higher. Your RPR/SRP uplink card should have a hardware revision level of 73-9006-02 Rev. A0 or higher. Determine the hardware revision number by using the following method:

- Hardware label

    Read the hardware revision number printed on a label affixed to the component side of the uninstalled card.

- **show diags 1** *slot* command

    Use the **show diags 1** *slot* command to identify an installed uplink card. See the following example to locate the hardware revision for the uplink card. In the example below, see the lines called out in italic print to indicate where the hardware revision number is located.

```
Router# show diags 1
SLOT 1:1 one-port OC48 SONET based SRP controller.
  TX FPGA ver.:0x0012
  RX FPGA ver.:0x0012
  RAC A ver...:0x0004
  RAC B ver...:0x0004
  Framer A ver:0x0006
  Framer B ver:0x0006
  PCA (73) Item Num:73-05345-03
  PCA (73) Item Num - Rev:A0
  Fab (28) Ver:3
  Unit (800) Item Num:800-09017-02
  Unit (800) Item Num - Rev:A0
  Serial Number:CAT0532000T
  Optical Hardware Configuration:Short Reach (SR)
```

Software Requirements

The DPT uplink card is compatible with the following router system software:

- Cisco IOS Release 12.0(19)SP or later releases of Cisco IOS 12.0 SP
- Cisco IOS Release 12.0(22)S or later releases of Cisco IOS 12.0 S

The POS/DPT uplink card is compatible with the following router system software:

- Cisco IOS Release 12.0(21)SP or later releases of Cisco IOS 12.0 SP
- Cisco IOS Release 12.0(23)S or later releases of Cisco IOS 12.0 S

The RPR/SRP uplink card is compatible with the following router system software:

- Cisco IOS Release 12.0(29)S1 or later releases of Cisco IOS 12.0 S

The console/auxiliary card is compatible with the following router system software:

- Cisco IOS Release 12.0(21)SP or later releases of Cisco IOS 12.0 SP
- Cisco IOS Release 12.0(22)S or later releases of Cisco IOS 12.0 S

Use the **show version** command to display the system software release that is currently loaded and running.

In the following example of the **show version** command, the running system software is Cisco IOS Release 12.0(19)SP, as displayed in italic print:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 10700 Software (C10700-P-M), Version 12.0(19)SP, EARLY DEPLOYMENT RELEASE
SOFTWARE (fc1)
TAC Support:http://www.cisco.com/tac
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Fri 28-Sep-01 11:44 by srani
Image text-base:0x50010960, data-base:0x50660000

ROM:System Bootstrap, Version 12.0(20010529:144545) [yuwang-rommon1 149], DEVELOPMENT
SOFTWARE
BOOTLDR:10700 Software (C10700-P-M), Version 12.0(19)SP, EARLY DEPLOYMENT RELEASE SOFTWARE
(fc1)

Router uptime is 10 minutes
System returned to ROM by power-on
Running default software

cisco C10720 (R5000) processor (revision 0xFF) with 256000K/6144K bytes of memory.
R527x CPU at 200Mhz, Implementation 40, Rev 10.0
Last reset from power-on
Toaster processor tmc0 is running.
Toaster processor tmc1 is running.
1 one-port OC48 SONET based SRP controller.
1 24 Port 100 Mbps Fast Ethernet TX controller.
24 FastEthernet/IEEE 802.3 interface(s)
1 SRP network interface(s)
509K bytes of non-volatile configuration memory.

16384K bytes of Flash internal SIMM (Sector size 512KB).
49152K bytes of Flash internal SIMM (Sector size 512KB).
Configuration register is 0x2102
```

Safety and Compliance

Before you begin any of the procedures in this publication, review the safety and compliance guidelines in the following sections to avoid injuring yourself or damaging the equipment:

- Safety Information and Electromagnetic Compliance, page 2-3
- Safety Warnings, page 2-3
- Disconnect Device Warning, page 2-3
- Laser Safety, page 2-4
- Preventing Electrostatic Discharge, page 2-4

Safety Information and Electromagnetic Compliance

For information about regulatory compliance and safety, refer to the *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router* publication that is shipped with your device, and information in the "Electromagnetic Compliance" section on page ix of this document. This publication contains important safety information that you must read and understand before attempting to install, remove, or modify any hardware in your router.

For more information about safety and electromagnetic compliance, see the "Translated Safety Warnings" section on page x and the "Electromagnetic Compliance" section on page ix.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, can harm you. A warning symbol precedes each warning statement. The following paragraph is an example of a safety warning:

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 for the Cisco 10720 Internet Router* document that accompanied this device.**

For safety warning translations, see the "Translated Safety Warnings" section on page x.

Disconnect Device Warning

Disconnect the Cisco 10720 Internet Router power source before performing any maintenance task on the hardware modules.

Warning **Only trained and qualified personnel should be allowed to install or replace this equipment.**

Warning **The plug-socket combination must be accessible at all times because it serves as the main disconnecting device.**

⚠ Warning	This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit

⚠ Warning	Incorporate a readily accessible two-poled disconnect device into the fixed wiring.

⚠ Warning	An on or off switch or a disconnect device is not provided on this product with direct current (DC) power. A readily accessible disconnect device, such as a circuit breaker, shall be incorporated into the fixed wiring.

Laser Safety

The RPR/SRP, DPT, and POS/DPT uplink cards are equipped with a Class 1 laser that emits invisible radiation. Do not stare into open ports on the uplink card. Laser safety includes the following warnings:

- Class 1 Laser Product Warning
- Class 1 LED Product Warning

⚠ Warning	Avoid exposure to laser radiation. Do not stare into an open apertures, because invisible laser radiation may be emitted from the aperture when a cable is not inserted in the port.

Class 1 Laser Product Warning

⚠ Warning	Class 1 laser product.

For translated Class 1 laser warnings, refer to the *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router* publication.

Class 1 LED Product Warning

⚠ Warning	Class 1 LED product.

For translated Class 1 LED warnings, refer to the *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router* publication.

Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage can occur when electronic cards or components are improperly handled. This will cause complete or intermittent failures. We recommend using an ESD-preventive strap when you handle a router or one of its components. Electromagnetic interference (EMI) shielding is an integral component of the router.

Following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Connect the equipment end of the connection cord to bare metal on the router chassis. (See Figure 2-1.)

- Attach an ESD-preventive wrist strap to your wrist, and to the chassis or to a bare metal surface. (See Figure 2-1.)

- The wrist strap protects equipment from ESD voltages on the body only; ESD voltages on clothing can still cause damage to electronic components.

⚠ **Caution**   To avoid ESD damage to the equipment, periodically check the resistance value of the ESD-preventive wrist strap. The resistance measurement should be between 1 and 10 megohms (Mohms).

Figure 2-1   Attaching an ESD-Preventive Strap
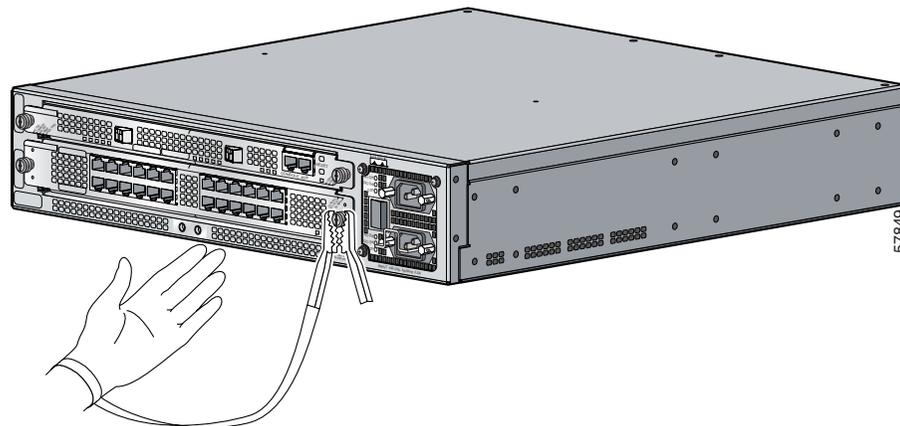
- When installing the card, confirm that the card is fully seated in the midplane and tighten the spring-loaded screws. These screws prevent accidental removal, provide proper grounding for the system, and help ensure that the connectors are seated in the midplane. (See Figure 2-1 and the "Figure 3-6Disconnecting the Optical Interface Cable" section on page 3-6.)

- When removing the card, use the spring-loaded screws to unseat the card connector from the midplane. (See Figure 3-10 and the "Figure 3-6Disconnecting the Optical Interface Cable" section on page 3-6.)

- Handle the card by the spring-loaded screws only; avoid touching the board or connector pins.

- Place the card board-side-up on an antistatic surface or in a static shielding bag. If you plan to return the card to the factory, immediately place it in a static shielding bag.

- Avoid contact between the card and clothing. The wrist strap protects the board only from ESD voltages on the body; ESD voltages on clothing can still cause damage.

Installing and Removing the Uplink Cards

This chapter provides information about installing and removing the uplink cards. The following sections are in this chapter:

Tools and Equipment Required

The following tools are required to install or remove an uplink card on the Cisco 10720 Internet Router:

- ESD-preventive wrist strap
- 1/8-inch flat-blade screwdriver
- Number 1 Phillips screwdriver
- Antistatic bag
- Cable ties
- Antistatic mat (optional)
- Uplink card

Preparing for Installation

Please read the following instructions when preparing to remove an uplink card from the Cisco 10720 Internet Router:

- Powering Down the Router, page 3-2
- Verifying That the Router Is Powered Down, page 3-4
- Removing the Cable-Management System, page 3-4
- Removing the Cable-Management System, page 3-4

Go to the "Powering Down the Router" section on page 3-2 to continue the uplink card removal procedure.

Powering Down the Router

Follow the steps in this section to power down the router and disconnect the site power.

Step 1 If the cable-management cover is installed on the router, it must be removed in order to access the power switch. (See the " •Removing the Cable-Management System, page 3-4" section on page 3-2.) *Do not* remove the cable-management tray until all cables are removed from the cards and power supply.

Figure 3-1   AC and DC Power Supplies in the Off Position
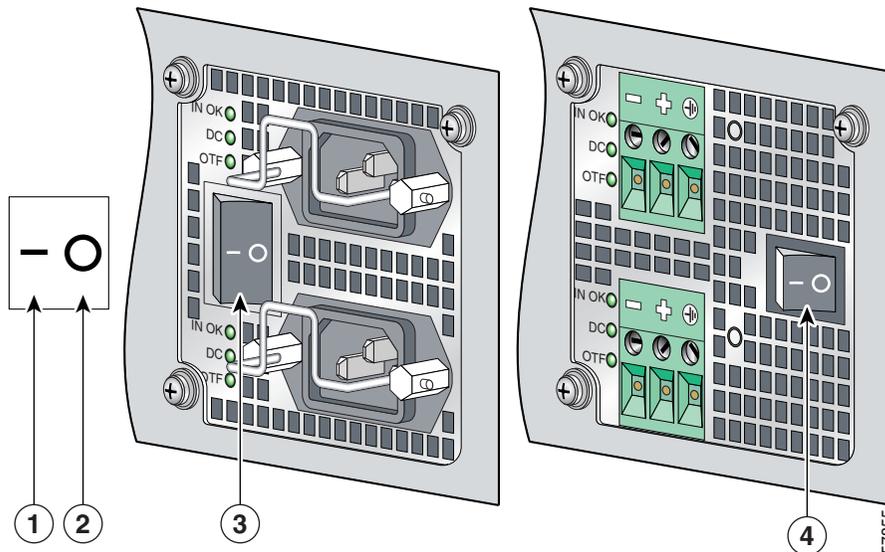
1	Power on symbol (–)	3	AC power switch
2	Power off symbol (O)	4	DC power switch

⚠ **Caution**   Use an ESD-preventive strap when disconnecting power leads on the router. See the "Preventing Electrostatic Discharge" section on page 2-4.

Step 2   Attach an ESD-preventive strap to your wrist, and to the router or to a bare metal surface.

Step 3   Press the power switch on the router to the off position (O). (See Figure 3-1.)

Figure 3-2   ***Removing the Router from the Power Source***
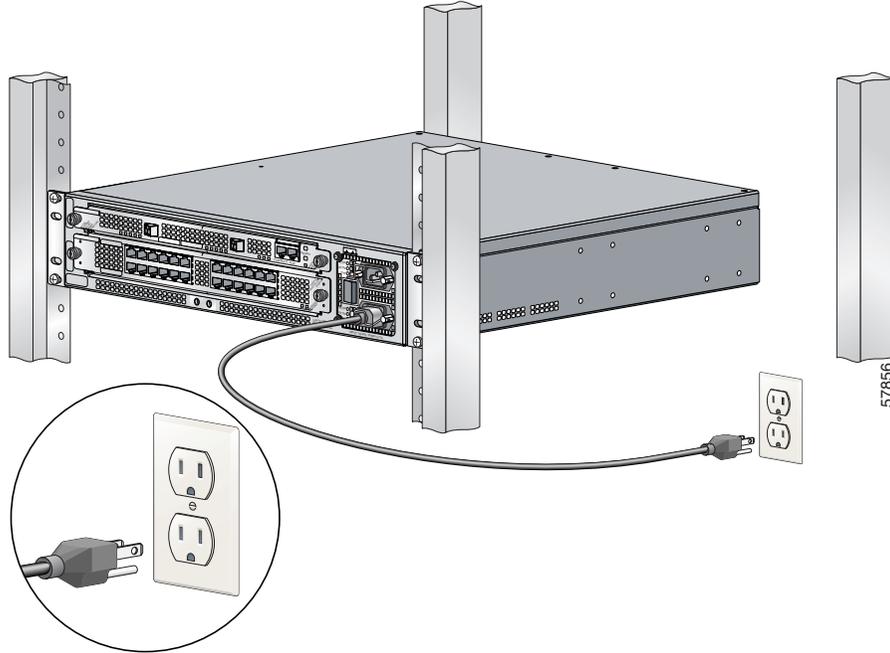
Step 4   Disconnect the power source from the router as described below for each power input type:

- AC—Disconnect the wall plug. (See Figure 3-2.)
- DC—Disconnect the power source to the router, *then* disconnect the DC power leads on the router. (See Figure 3-3.)

Warning   **Before performing any of the following procedures, ensure that the power is removed from the DC circuit. Ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit. Switch the circuit breaker to the off (O) position, and tape the switch handle of the circuit breaker in the off (O) position.**

Figure 3-3   Removing the DC Power Leads from the Terminal Block
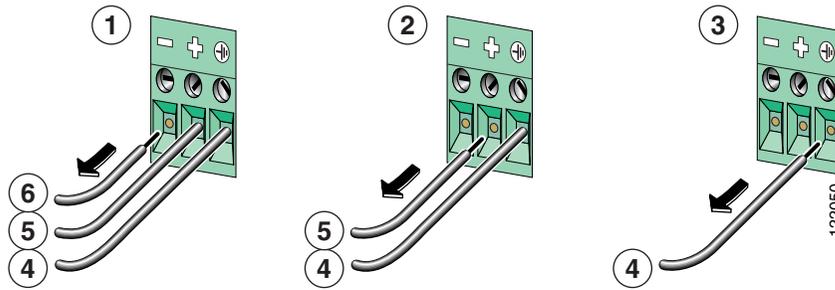
1	Negative lead disconnected	4	Ground lead
2	Positive lead disconnected	5	Positive lead
3	Ground lead disconnected	6	Negative lead

Note   The DC site power source must be disconnected to ensure proper safety is maintained.

Step 5   Loosen the three locking screws for the negative, positive, and ground screw connectors on the DC power supply terminal block as follows:

a. Remove the –48 VDC lead (black) from the terminal block negative connector (–). (See 1 in Figure 3-3.)

b. Remove the +48 VDC lead (white wire) from the terminal block positive connector (+). (See 2 in Figure 3-3.)

c. Remove the safety ground lead (green wire) from the terminal block ground connector. (See 3 in Figure 3-3.)

Verifying That the Router Is Powered Down

Check the following to ensure that your router is properly powered down:

- LED lights are off.
- Fans are not running.
- Power switch indicates the power supply is turned to the off position (O).
- Power is disconnected at the source.

Removing the Cable-Management System

The cable-management system, located on the front of the Cisco 10720 Internet Router, organizes the interface cables that lead into and away from the router. To keep the cables free of sharp bends, extend the cables from the center out both sides of the cable-management tray. Excessive bending of an interface cable can degrade performance and possibly harm the cable. The cable-management system consists of the cable-management tray and the cable-management cover.

Note   It is not necessary to remove the cable-management tray in order to install or remove an uplink card. Only the cable-management cover must be removed in order to install or remove an uplink card.

If the cable-management cover is not installed, go to the "Powering Down the Router" section on page 3-2.

Perform the following steps to remove the cable-management cover:

Figure 3-4   Removing the Cable-Management Cover
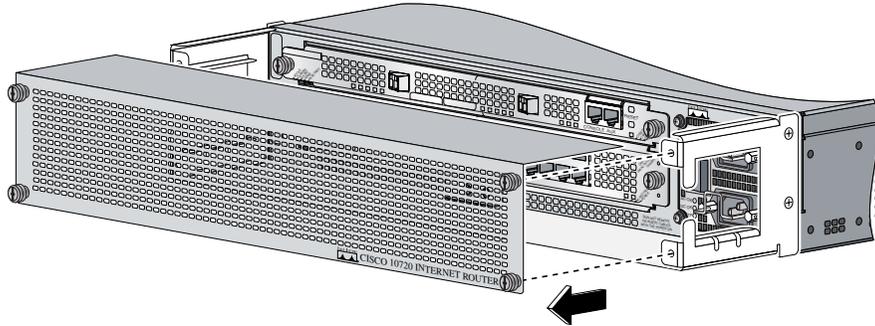
Step 1   Verify that all cables are safely secured before detaching the cable-management cover.

Step 2   Use a Number 1 Phillips screwdriver to loosen and unscrew the captive installation screws holding the cable-management cover to the router.

Step 3   Remove the cable-management cover from the router. (See Figure 3-4.)

Figure 3-5   Removing the Cable-Management Tray
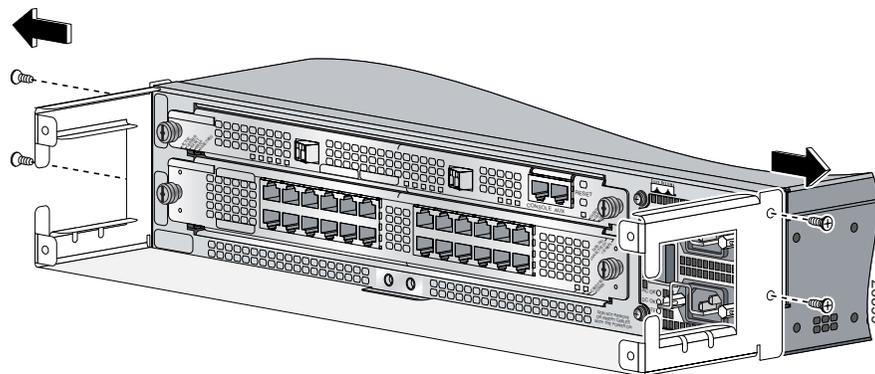
Caution   To avoid accidental damage to router cables or card ports, remove all cables before removing the cable-management tray.

Step 1   Use a Number 1 Phillips screwdriver to remove the screws holding the cable-management tray to the router. (See Figure 3-5.)

Step 2   Lift the cable-management tray from the router.

Figure 3-6   Disconnecting the Optical Interface Cable
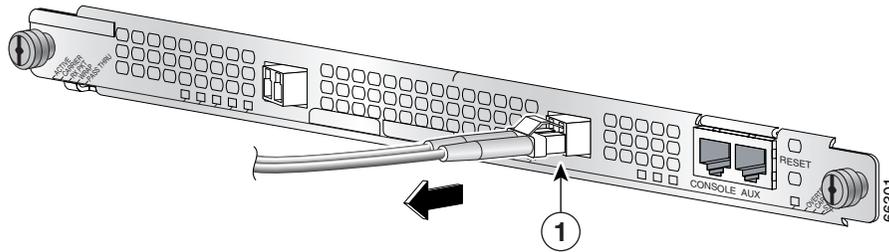
1	Optical interface cable connector		

Step 3   Remove the optical interface cables.

To remove the RPR/SRP uplink card SFP modules, go to the "Removing the RPR/SRP Uplink Card SFP Modules" section on page 3-6.

To remove the optical cables from the DPT or POS/DPT uplink cards, go to the "Removing the Uplink Card" section on page 3-8.

Removing the RPR/SRP Uplink Card SFP Modules

Before removing the optical cables from the RPR/SRP uplink card, first remove any SFP modules.

Warning   **Avoid exposure to laser radiation. Do not star into an open aperture, because invisible laser radiation may be emitted from the aperature when a cable is not inserted in the port.**

Warning   **Class 1 single-mode laser product.**

Warning   **Class 1 LED product.**

Note   You do not need to power down the router before you remove an SFP module. The router may remain powered up during this procedure.

To remove a bale clasp SFP module from the uplink card, perform the following steps:

Step 1   Attach an ESD-preventive strap to your wrist, and to the router or to a bare metal surface. (See the "Preventing Electrostatic Discharge" section on page 2-4.)

Step 2   Remove all optical interface cables from the SFP ports on the RPR/SRP uplink card.

Figure 3-7   *Removing a Bale Clasp SFP Module*
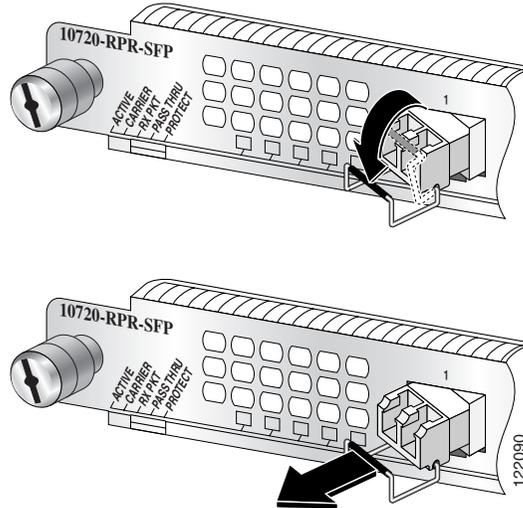
Step 3   Open the bale clasp on the SFP module by pressing the clasp downward until it is in a horizontal position as shown in Figure 3-7.

Step 4   Grasp the SFP module by the bale clasp and gently pull it out of the RPR/SRP uplink card slot as shown in Figure 3-7.

Figure 3-8   *Installing an SFP Module Cage Cover*

1	SFP cage cover		

Step 5   Protect your uplink card by inserting clean SFP cage covers into the SFP cage when there is no SFP module installed, as shown in Figure 3-8.

Removing the Uplink Card

Use the instructions in this section to remove an uplink card.

Step 1 Remove any console port cable or auxiliary port cable from the card.

Figure 3-9   Spring-Loaded Screws on the Uplink Card
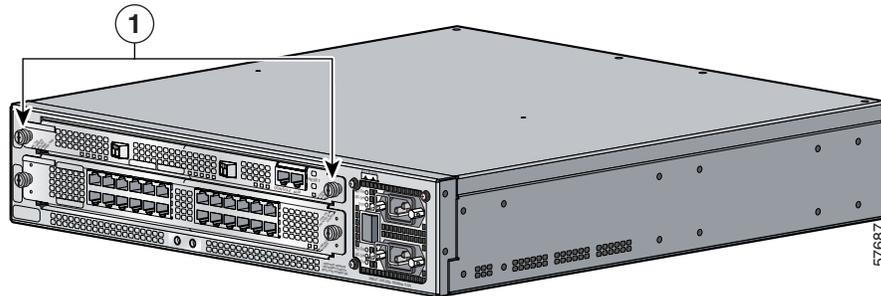
1	Uplink card spring-loaded screws		

Step 2 Locate the spring-loaded screws on the front of the uplink card. (See Figure 3-9.)

Step 3 Using the Number 1 Phillips screwdriver, unscrew the spring-loaded screws by turning them counterclockwise.

Figure 3-10   Removing Uplink Card from Router Chassis
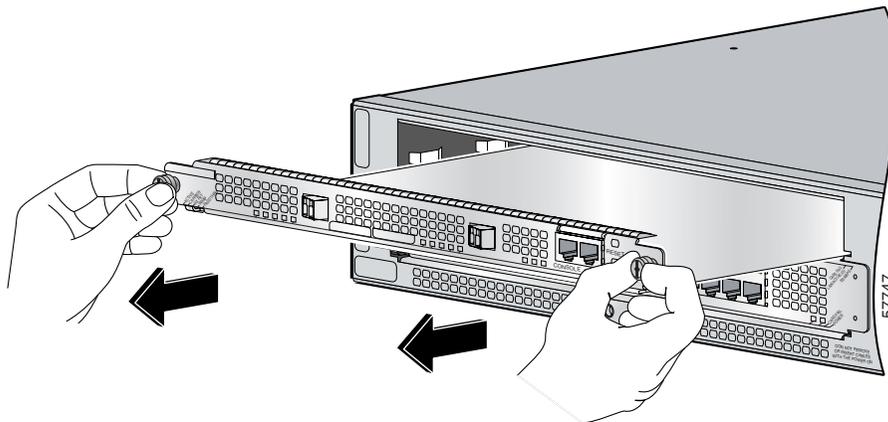
Step 4 Grasp the spring-loaded screws and gently move the card back and forth until it disengages from the midplane.

Step 5 When the card disengages from the midplane, pull the card straight out. (See Figure 3-10.)

Installing an Uplink Card

Perform the following steps to safely install an uplink card into the router:

Step 1 Confirm that the cable-management cover is removed, the router is powered down, and the cable-management tray is removed before installing the card. (See the " •Removing the Cable-Management System, page 3-4" section on page 3-2, the "Powering Down the Router" section on page 3-2, and the "Removing the Cable-Management System" section on page 3-4.)

Step 2 Attach an ESD-preventive strap to your wrist, and to the router or to a bare metal surface. (See the "Preventing Electrostatic Discharge" section on page 2-4.)

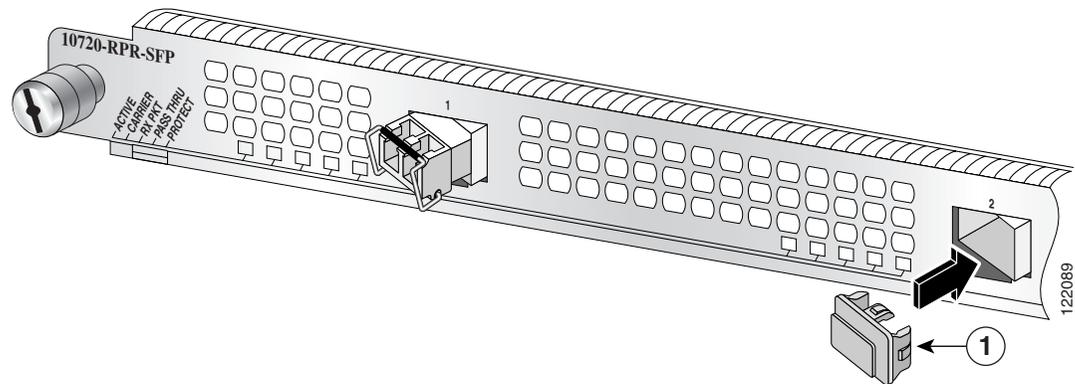*Figure 3-11*   *Inserting the Uplink Card in the Router Chassis*
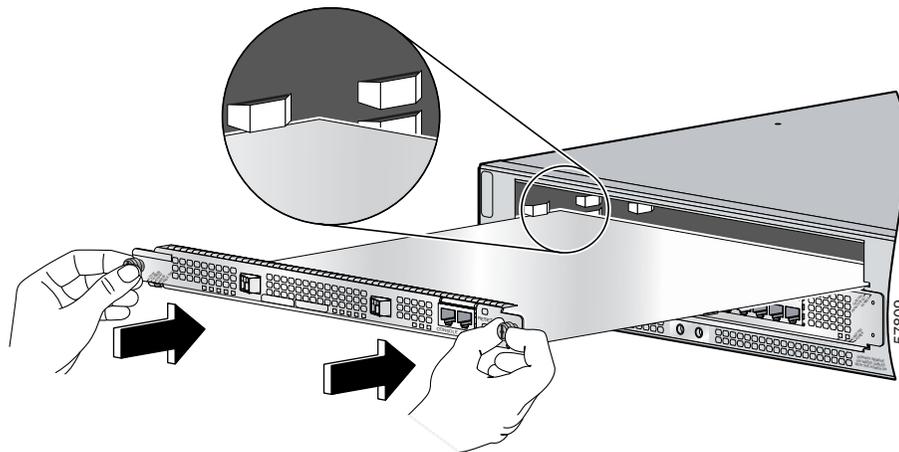
Step 3 Grasp the uplink card and use the slot guides located inside the uplink card slot as a guide to insert the card into the router. (See Figure 3-11.)

Step 4 Holding the spring-loaded screws located on the front of the uplink card, insert the card into the upper card slot of the router chassis. (See Figure 3-11.)

Step 5 Gently slide the card into the router chassis until the card seats into the midplane.

Step 6 Tighten the spring-loaded screws by turning them clockwise until the card is completely secure.

For the DPT or POS/DPT uplink cards, go to the "SONET Distance Information for RPR/SRP, DPT, and POS/DPT Uplink Cards" section on page 3-11 and then "Connecting the Ports on the RPR/SRP, DPT, and POS/DPT Uplink Cards" section on page 3-12.

For the RPR/SRP uplink card, go to the "Installing the OC48 SFP Modules in the RPR/SRP Uplink Card" section on page 3-10.

Installing the OC48 SFP Modules in the RPR/SRP Uplink Card

Use the information in this section to install OC48 SFP modules in the RPR/SRP uplink card.

Note   Use only OC48 SFP modules purchased from Cisco Systems.

To install a bale clasp OC48 SFP module in the uplink card, perform the following steps:

Step 1   Attach an ESD-preventive strap to your wrist, and to the router or to a bare metal surface. (See the "Preventing Electrostatic Discharge" section on page 2-4.)

Step 2   Remove any SFP cage covers by pulling the cage cover from the SFP cage.

Step 3   Hold the SFP module with the hardware label facing up, as illustrated in Figure 3-1.

Caution   The SFP module must be inserted with the hardware label facing up to avoid damaging the SFP module or uplink card.

Figure 3-12   Installing the Bale Clasp SFP Module in the RPR/SRP Uplink Card
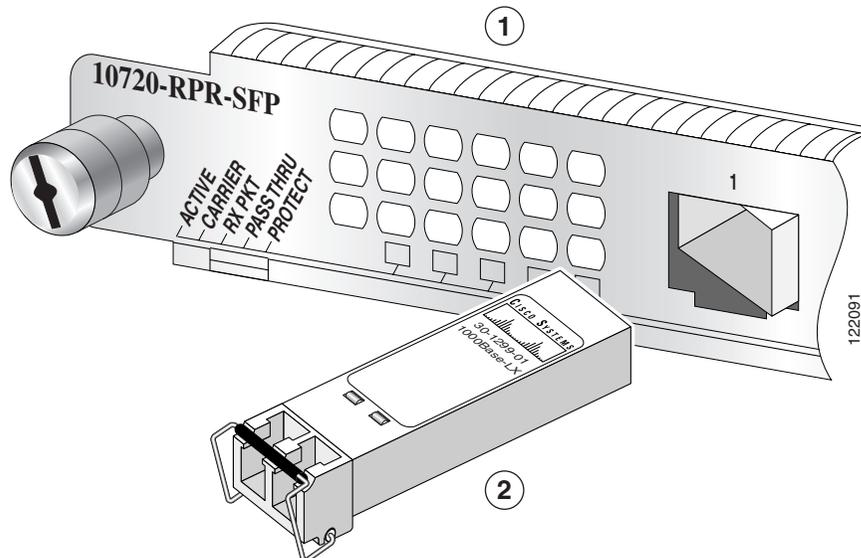
1	RPR/SRP uplink card	**2**	OC48 SFP module

Step 4   Close the bale clasp on the SFP module by pushing the clasp in the upward direction before inserting the SFP module.

Step 5   Insert the SFP into the appropriate OC48 port and gently push on it until the SFP module snaps into the slot. (See Figure 3-12.)

Go to "SONET Distance Information for RPR/SRP, DPT, and POS/DPT Uplink Cards" section on page 3-11.

SONET Distance Information for RPR/SRP, DPT, and POS/DPT Uplink Cards

The maximum distance for single-mode installations is determined by the amount of light loss in the fiber path. Good quality single-mode, short-reach fiber with very few splices can carry an uplink card signal two kilometers.

If your environment requires the signal to travel close to the typical maximum distance (see Chapter 1, "Overview and Specifications"), use an optical time domain reflectometer (OTDR) to measure the power loss.

Figure 3-13   Simplex Optical Cable
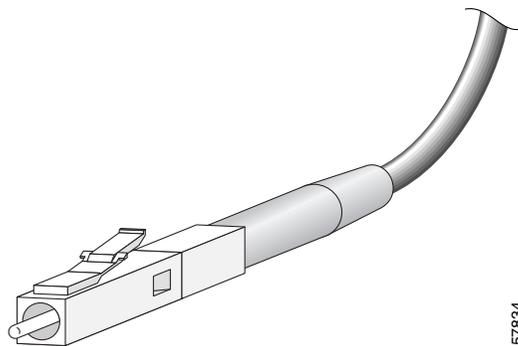
Figure 3-14   Duplex Optical Cable
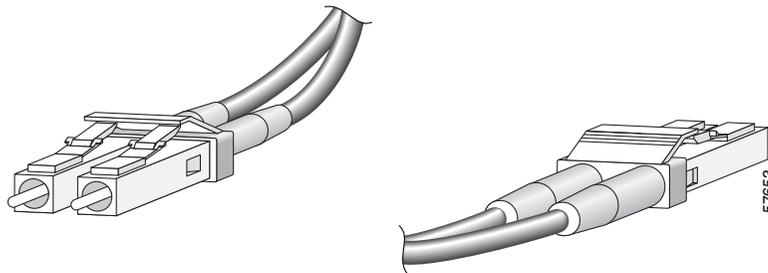
For SONET/SDH single-mode fiber-optic connections, use one duplex LC small form-factor pluggable(SFP) optical cable (see Figure 3-14) or two simplex optical cables (See Figure 3-13.)

Caution   Splicing can degrade cable performance.

Note   Single-mode fiber-optic cables are available from various vendors. These cables are not available from Cisco Systems.

Warning   **Class 1 laser product.**

Warning   **Class 1 LED product.**

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.**

Note   The fiber-optic connectors must be free of dust, oil, and other contaminants. Carefully clean the fiber-optic connectors using a fiber cleaning kit. For information about cleaning, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document.Four-Node DPT Ring Using the DPT Uplink Card—RX and TX Connections

Connecting the Ports on the RPR/SRP, DPT, and POS/DPT Uplink Cards

Before connecting the ports on a RPR/SRP, DPT, or POS/DPT uplink card, install the cable-management system. For more information, see the "Installing the Cable-Management System" section on page 3-15.

The cable and connection specifications are located in Chapter 1, "Overview and Specifications."

Figure 3-15   *Attaching the Optical Interface Cable*
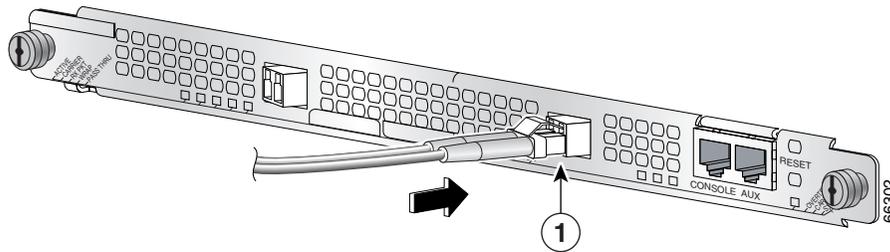
1	Optical interface cable connector[1]		

1. The left side of the port is TX, and the right side of the port is RX. Each card contains two ports. In this example, a duplex cable is shown.

Step 1   Attach optical interface cables to the uplink card. (See Figure 3-15.)

Use a single-mode interface cable to connect the router to another router or switch. If you are connecting to a DPT network, the two ports represent the two sides of a single SRP connection:

Figure 3-16   DPT Uplink Card Ports
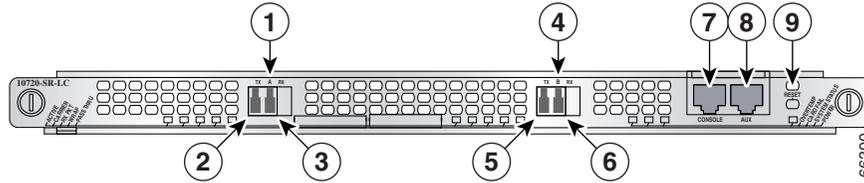
1	Side A	**6**	Side B RX
2	Side A TX	**7**	Console port
3	Side A RX	**8**	Auxiliary port
4	Side B	**9**	Reset switch
5	Side B TX		

- Side A (see Figure 3-16)
- Side B (see Figure 3-16)

Figure 3-17   POS/DPT Uplink Card Ports
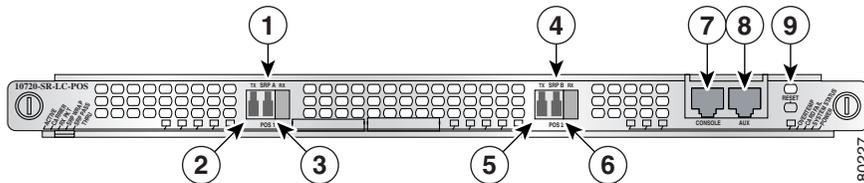
1	Side A for DPT; port 1 for POS	**6**	Side B/port 2 RX
2	Side A/port 1 TX	**7**	Console port
3	Side A/port 1 RX	**8**	Auxiliary port
4	Side B for DPT; port 2 for POS	**9**	Reset switch
5	Side B/port 2 TX		

If you are connecting to a POS network, these are two independent ports:

- Port 1 (see Figure 3-17)
- Port 2 (see Figure 3-17)

Figure 3-18   RPR/SRP Uplink Card Ports
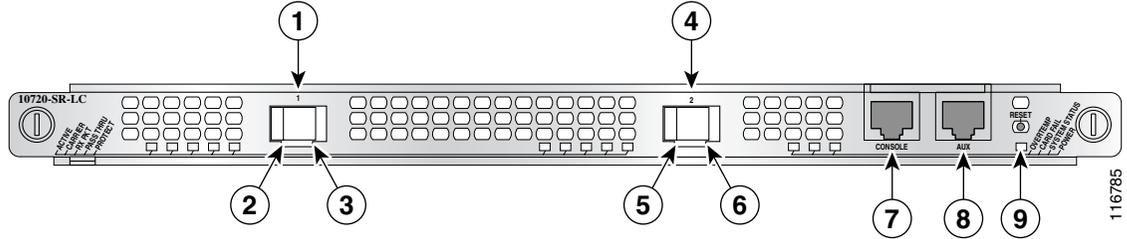
1	Span West for RPR mode Side A for SRP mode	6	Span East/Side B RX
2	Span West/Side A TX	7	Console port
3	Span West/Side A RX	8	Auxiliary port
4	Span East for RPR mode Side B for SRP mode	9	Reset switch
5	Span East/Side B TX		

If you are connecting to an RPR/SRP network, the two ports represent the two sides of a single RPR or SRP connection:

- Span West in RPR mode, side A in SRP mode (see Figure 3-18)
- Span East in RPR mode, side B in SRP mode (see Figure 3-18)

The left side of each port is TX and the right side of each port is RX.

Step 2   Add attenuators to keep signal power within specifications for short distances.

Step 3   Install any console port cable or auxiliary port cable.

For basic troubleshooting tips, see the "Troubleshooting the Uplink Cards Installation" section on page 5-6.

Installing the Cable-Management System

The cable-management system, located on the front of the router, organizes the interface cables. To keep the cables free of sharp bends, extend the cables from the center out both sides of the cable-management system. Excessive bending of an interface cable can degrade performance and possibly harm the cable.

Perform the following steps to install the cable-management system:

Step 1   Power down your router. (See the "Powering Down the Router" section on page 3-2.)

Step 2   Attach an ESD-preventive wrist strap to your wrist, and to the router or to a bare metal surface. (See the "Preventing Electrostatic Discharge" section on page 2-4.)

Figure 3-19   ***Attaching Cable-Management Tray***
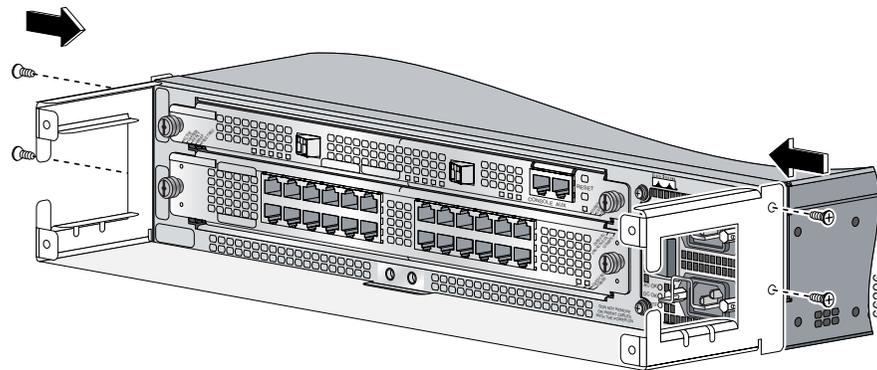
Step 3   Attach the cable-management tray to the router using four of the 3.5-mm x 6-mm screws that are shipped with the router. Secure the tray with two screws on each side of the router chassis using a Number 1 Phillips screwdriver. (See Figure 3-19.)

Figure 3-20   ***Managing Router Cables with the Cable-Management Tray***
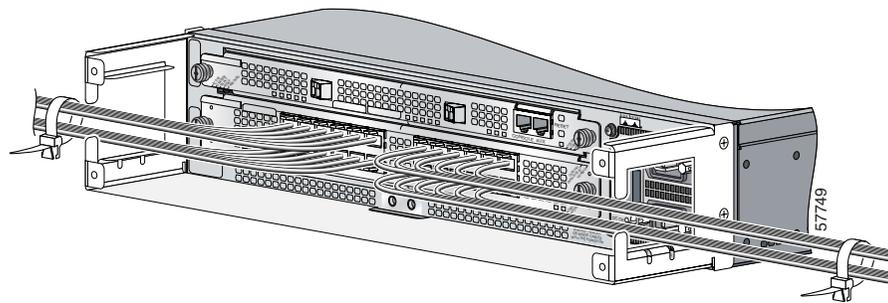
Step 4   Separate cables and lead them out the sides of the cable-management tray. Use a cable tie to keep the cables together. (See Figure 3-20.)

⚠

Caution   To avoid damage to the cables, avoid excessive bending.

Figure 3-21   Installing Cable-Management Cover
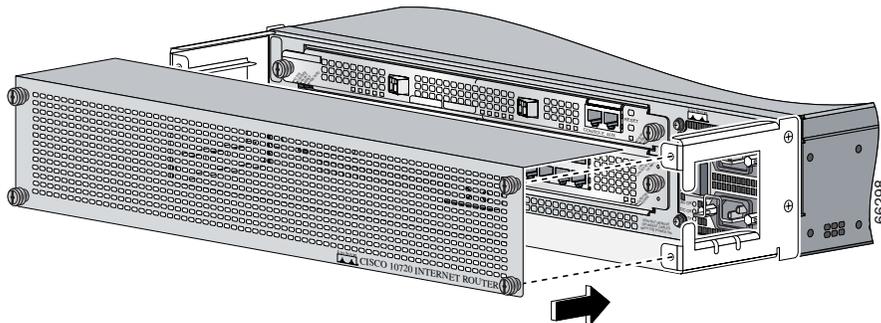
Step 5   Using a Number 1 Phillips screwdriver, attach the cable-management cover to the cable-management tray. (See Figure 3-21.)

Figure 3-22   Cable-Management Tray and Router Installed in a Rack
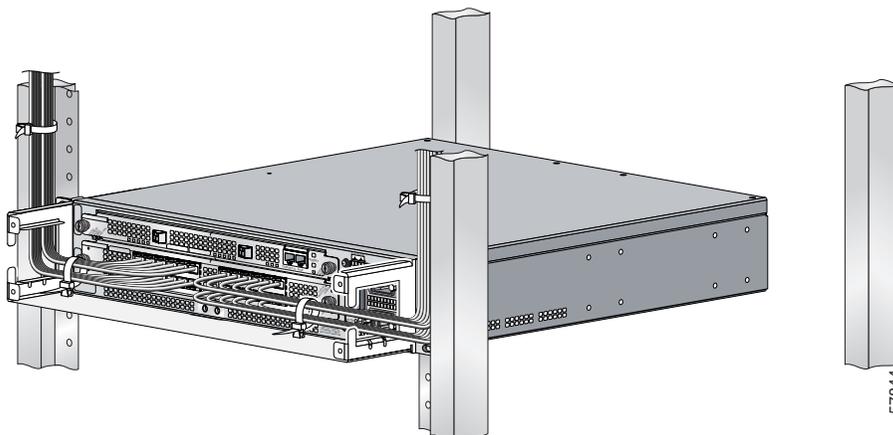
Step 6   Use cable ties to secure the cables to the equipment mounting rack to keep the wires from accidental bends or breaks. (See Figure 3-22.)

Go to the "Turning On Power to the Router" section on page 3-16 for instructions on powering on the router.

Turning On Power to the Router

Perform the following steps to restore power to the router:

- Connecting the AC Power Supply, page 3-17
- Connecting the DC Power Supply, page 3-19

Connecting the AC Power Supply

Warning   **Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for the Cisco 10720 Internet Router* publication. This publication contains important safety information you should know before working with the system.**

Warning   **Read the installation instructions before you connect the system to its power source.**

Note   For additional information, refer to the *Cisco 10720 Internet Router AC and DC Power Supply Replacement Instructions*. This configuration note is available on Cisco.com or ordered as a printed document. Field replacement documentation is available electronically, by default. If you prefer printed documentation, order it online.

Note   We recommend that you attach each AC-input power supply to a dedicated power source for redundancy and use an uninterruptable power supply (UPS) to protect against power failures. Each AC power supply operating between 100 and 240 VAC requires a dedicated 15 A electrical power service for North America, 10 A electrical power service for international specifications.

Perform the following steps to connect the AC power supply:

Step 1   Confirm that the power switch on the router is in the off (O) position. (See Figure 3-1.)

Figure 3-23   ***AC Power Cord Connected to Router***
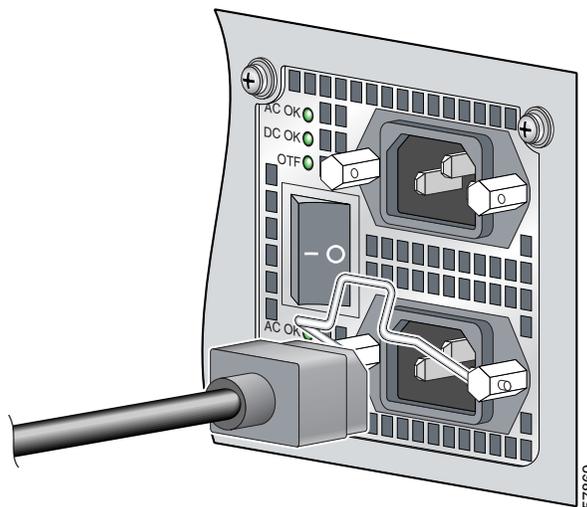
Step 2   Connect the AC power cord to the AC power supply receptacle on the router. (See Figure 3-23.)

Figure 3-24   Power Cord Secured with Wire Bracket
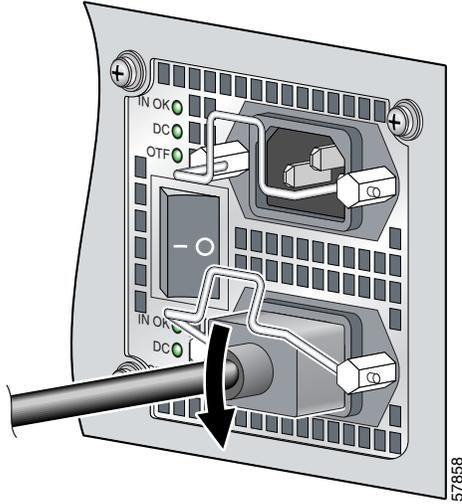
Step 3   Close the wire bracket over the power cord plug. (See Figure 3-24.)

Figure 3-25   Router Connected to Power Source
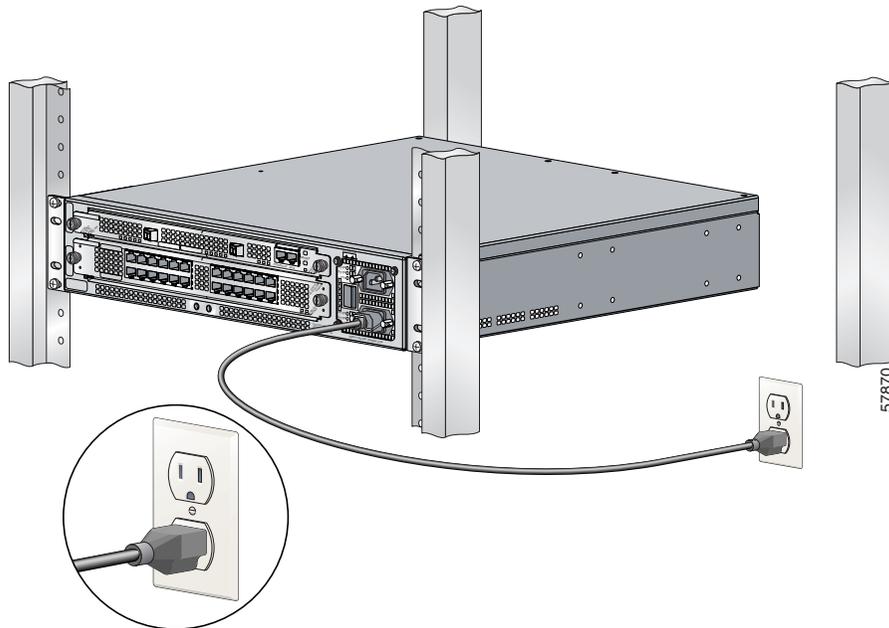
Step 4   Connect the other end of the AC power cord to the AC power source outlet. (See Figure 3-25.)

Figure 3-26   Power Switch in the On Position
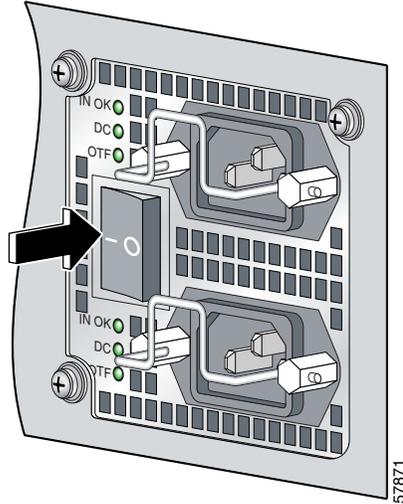
Step 5 Press the power switch to on the (–) position. (See Figure 3-26.)

Connecting the DC Power Supply

Warning **When you install the unit, the ground connection must always be made first and disconnected last.**

Warning **Before performing any of the following procedures, ensure that the power is removed from the DC circuit. Ensure that power is removed from the DC circuit. To ensure that all power is off, locate the circuit breaker on the panel board that services the DC circuit. Switch the circuit breaker to the off (O) position, and tape the switch handle of the circuit breaker in the off (O) position.**

Connect the DC power supply by performing the following steps:

Step 1 Verify that the –48V and +48V leads are disconnected from the power source.

Step 2 Attach an ESD-preventive strap to your wrist, and to the router or to a bare metal surface. (See the "Preventing Electrostatic Discharge" section on page 2-4.)

Figure 3-27   Power Switch in the Off Position
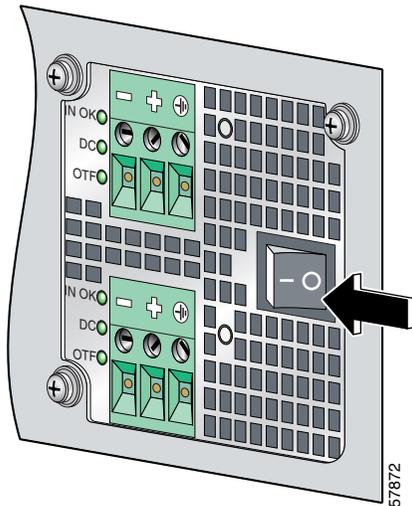
Step 3   Verify that the power switch located on the front of the power supply is in the off (O) position. (See Figure 3-27.)

Figure 3-28   Tightening the DC Lead Receptacle
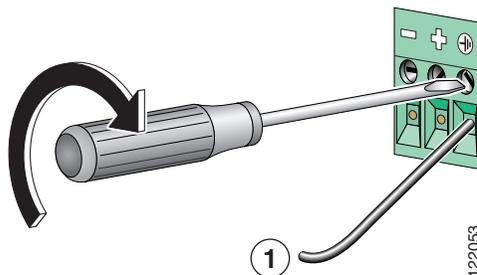
1	Ground lead		

Step 4   Insert the stripped end of the ground lead all the way into the ground lead receptacle on the DC-input power supply and tighten the receptacle screw using a 1/8-inch flat-blade screwdriver. (See Figure 3-28.)

Note   Make sure the entire stripped end of each lead is inserted all the way into its receptacle. If any exposed wire at the stripped end of a lead is visible after inserting the lead into its receptacle, remove the lead from the receptacle. Use a wire cutter to cut the stripped end of the lead to fit the receptacle.

Figure 3-29   Connecting the DC Power Leads
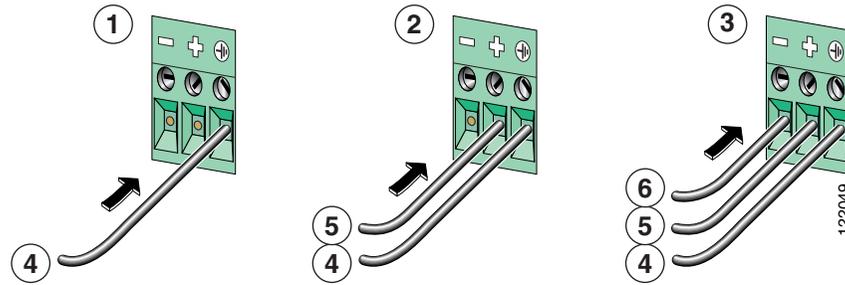
1	Ground lead connected	**4**	Ground lead
2	Positive lead connected	**5**	Positive lead
3	Negative lead connected	**6**	Negative lead

Step 5   Connect the power leads in the following order:

   a. Ground (green wire) (See 4 in Figure 3-29.)

   b. Positive (white wire) (See 5 in Figure 3-29.)

   c. Negative (black wire) (See 6 in Figure 3-29.)

Figure 3-30   DC Power Leads Secured with Cable Tie
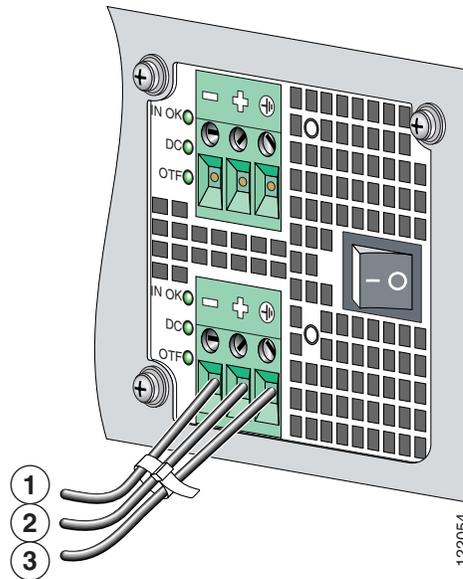
1	Negative lead	**3**	Ground lead
2	Positivelead		

Step 6   After tightening the receptacle screw for the ground, +48V, and –48V DC-input leads, use cable ties to secure the three leads. (See Figure 3-30.)

Note   Leave a small service loop in the ground lead to ensure that the ground lead is the last lead to disconnect from the power supply if a great deal of strain is placed on the DC-input leads. It is important that the ground power lead is the last to disconnect from the power supply terminal.

Note   Allow sufficient slack in the power cable leads for strain relief. The power cable leads should be adequately secured to prevent the power supply terminal connections from being subjected to strain.

Step 7   After wiring the DC power supply, remove the tape from the circuit breaker switch handle and turn on power by moving the handle of the circuit breaker to the on position.

If you are installing the cable-management system, go to the "Installing the Cable-Management System" section on page 3-15. If not, install the cables, and then power up the router.

Verifying Uplink Card Functionality

Observe the LEDs card is initialized (see Figure 3-31) and consult the LED tables in Chapter 5, "Troubleshooting the Uplink Cards," to verify the status of the card. The console/auxiliary card contains only the four system LEDs on the right side of the card.

Figure 3-31 DPT and POS/DPT Uplink Card LEDs (Left) and System LEDs (Right)
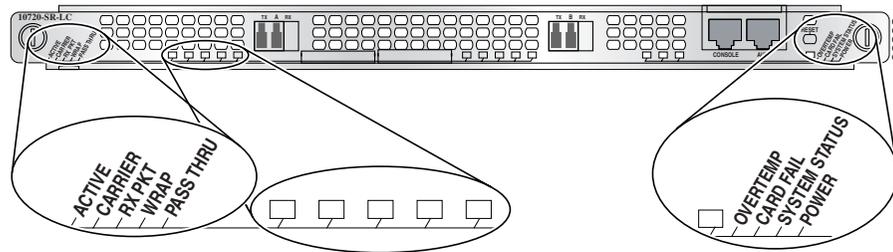
Figure 3-32 RPR/SRP Uplink Card LEDs (Left) and System LEDs (Right)
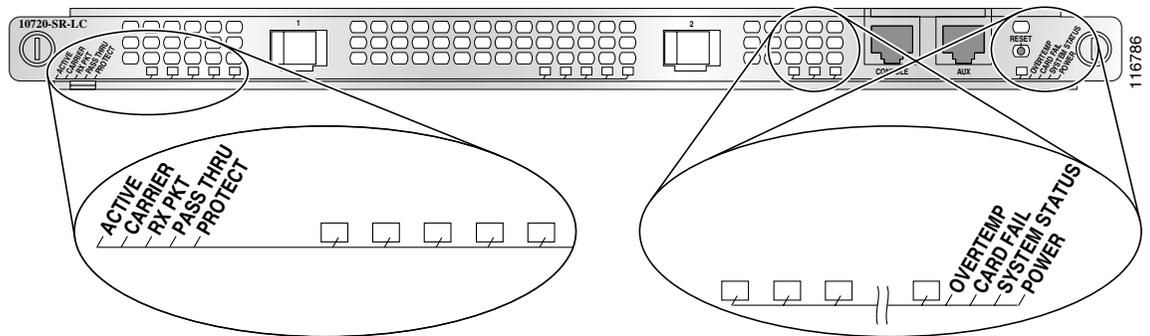
The configuration of the router will affect the RPR/SRP, DPT, and POS/DPT uplink LEDs. Possible variations include optical cable connections, temperature, and so on.

Configuring the RPR/SRP, DPT, and POS/DPT Uplink Card Interfaces

The following sections will help you to configure the interface of the RPR/SRP, DPT, and POS/DPT uplink cards in the Cisco 10720 Internet Router:

- Configuring Basic POS Functionality, page 3-24
- Configuring Basic IEEE 802.17 RPR Functionality, page 3-24

Configuring Basic POS Functionality

The basic POS configuration task for the router is explained in the *Cisco IOS Software Configuration for the Cisco 10720 Internet Router* publication.

Configuring Basic IEEE 802.17 RPR Functionality

The basic RPR configuration task for the router is explained in the Cisco IOS Software Configuration for the Cisco 10720 Internet Router publication under the sections, "Configuring an RPR-IEEE Interface," and "Configuring RPR-IEEE Mode on and SRP Interface." Also see the IEEE 802.17 Resilient Packet Ring Feature Guide.

Configuring Basic SRP Functionality

The basic SRP configuration task for the router is explained in the *Cisco IOS Software Configuration for the Cisco 10720 Internet Router* publication under the section "Configuring an SRP Interface."

4

Creating a Four-Node Ring Using the Uplink Cards

This chapter provides information for creating a four-node ring, either DPT or IEEE 802.17 RPR, using the DPT or RPR/SRP uplink cards.

DPT Uplink Card

Use Figure 4-1 and Table 4-1 to help organize the cable connections for a four-node DPT ring.

Create a four-node DPT ring by connecting the fiber-optic cables to DPT uplink cards that are installed in routers on the network.

Figure 4-1   Creating a Four-Node DPT Ring Using DPT Uplink Cards
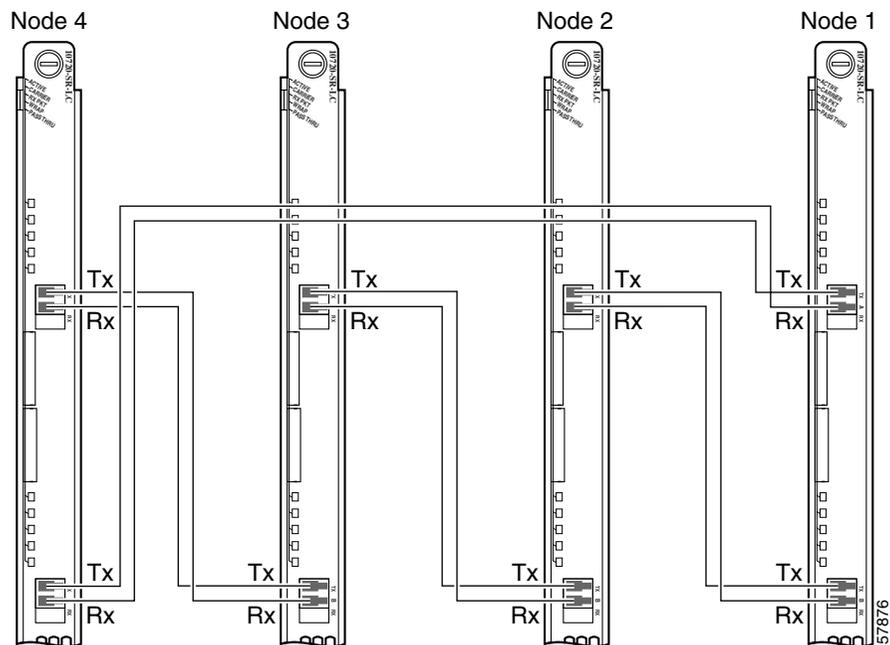
The TX side B port on Node 1 goes to the RX side A port on the next router, which will become Node 2. The labels above the fiber connectors identify side A (left port) TX and RX, and side B (right port) TX and RX. (See Figure 4-1 and Table 4-1.)

To create a four-node DPT ring, perform the following steps:

Step 1   Install a DPT uplink card in a Cisco 10720 Internet Router on the network.

Step 2   Choose a router with a DPT uplink card to become Node 1 in the four-node DPT ring.

Step 3   Add nodes to the ring by connecting the receive (RX) and transmit (TX) cables. The RX port on one DPT uplink card must be connected to a TX port on the next DPT uplink card.

Table 4-1   Cable Connections for an Four-Node SRP Ring

Cable Connections

From Node / Connector	To Node / Connector
Node 1 / TX side B	Node 2 / RX side A
Node 2 / TX side B	Node 3 / RX side A
Node 3 / TX side B	Node 4 / RX side A
Node 4 / TX side B	Node 1 / RX side A
Node 1 / TX side A	Node 4 / RX side B
Node 4 / TX side A	Node 3 / RX side B
Node 3 / TX side A	Node 2 / RX side B
Node 2 / TX side A	Node 1 / RX side B

Figure 4-2 provides a view of the network when a four-node DPT ring is created.

Figure 4-2   Four-Node DPT Ring
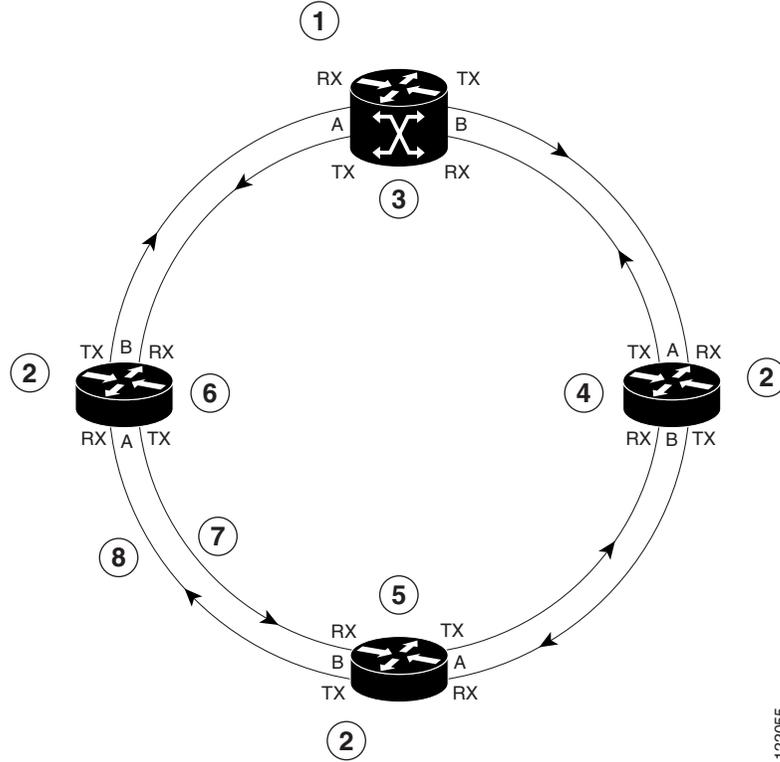
1	Cisco 12000 Series Internet Router	5	Node 3
2	Cisco 10720 Internet Router	6	Node 4
3	Node 1	7	Inner ring
4	Node 2	8	Outer ring

RPR/SRP Uplink Card—IEEE 802.17 RPR Mode

Use Figure 4-3 and Table 4-2 to help organize the cable connections for a four-node IEEE 802.17 ring.

Figure 4-3   Creating an IEEE 802.17 Mode Ring Using RPR/SRP Uplink Cards
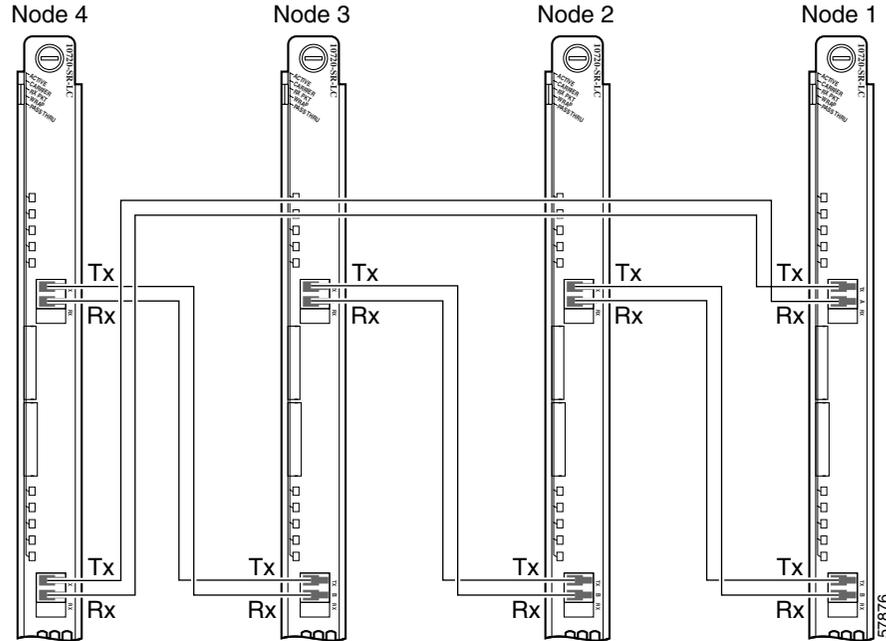
The TX span East port on Node 1 goes to the RX span West port on the next router, which will become Node 2. The labels above the fiber connectors identify span West (left port) TX and RX, and span East (right port) TX and RX. (See Figure 4-1.)

Create a four-node IEEE 802.17 ring by connecting the fiber-optic cables to RPR/SRP uplink cards that are installed in routers on the network. To create a four-node IEEE 802.17 ring, perform the following steps:

Step 1   Install an RPR/SRP uplink card in a Cisco 10720 Internet Router on the network.

Step 2   Choose a router with an RPR/SRP uplink card to become Node 1 in the four-node IEEE 802.17 ring.

Step 3   Add nodes to the ring by connecting the receive (RX) and transmit (TX) cables. The RX port on one RPR/SRP uplink card must be connected to a TX port on the next RPR/SRP uplink card.

Table 4-2   Cable Connections for a Four-Node IEEE 802.17 Mode Ring

Cable Connections

From Node / Connector	To Node / Connector
Node 1 / TX span East	Node 2 / RX span West
Node 2 / TX span East	Node 3 / RX spanWest
Node 3 / TX span East	Node 4 / RX span West
Node 4 / TX span East	Node 1 / RX span West
Node 1 / TX span West	Node 4 / RX span East
Node 4 / TX span West	Node 3 / RX span East

Table 4-2   Cable Connections for a Four-Node IEEE 802.17 Mode Ring (continued)

Cable Connections	
Node 3 / TX span West	Node 2 / RX span East
Node 2 / TX span West	Node 1 / RX span East

Figure 4-4 provides a view of the network when a four-node IEEE 802.17 mode ring is created.

Figure 4-4   Four Node IEEE 802.17 Mode Ring
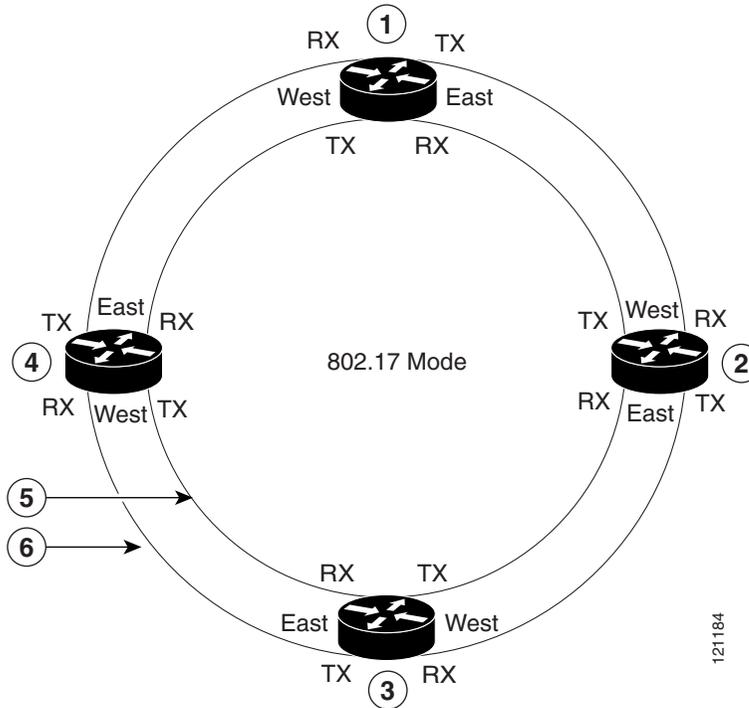
1	Node 1	**4**	Node 4
2	Node 2	**5**	Inner Ring—Ringlet 1
3	Node 3	**6**	Outer Ring—Ringlet 0

C H A P T E R 5

Troubleshooting the Uplink Cards

This chapter contains the following sections:

- Verifying the Uplink Card Connection, page 5-1
- LEDs, page 5-2
- Troubleshooting the Uplink Cards Installation, page 5-6
- Troubleshooting the RPR/SRP Uplink Card Installation, page 5-14
- Troubleshooting the RPR/SRP Uplink Card Installation, page 5-14
- Additional Troubleshooting Resources, page 5-17
- Cleaning the Fiber-Optic Connections, page 5-17

Verifying the Uplink Card Connection

Read the following troubleshooting tips to help verify a successful uplink card connection with the system:

- Verify LED status by checking uplink card LED color. (See all the tables in the "LEDs" section on page 5-2.)
- Verify that the card is fully seated against the midplane.
- Verify that all cables are properly connected.
- Verify that the cable types are correct (RPR card cables, for example, are all single-mode).
- Verify that RX and TX are properly connected.
- Verify that side A and side B are properly connected for SRP.
- Verify that span East and span West are properly connected for the RPR/SRP card.
- Verify that there are no duplicate MAC addresses.
- Check the power source:
  - Power switch is turned to the on (–) position.
  - Power supply connection is secure.
  - DC power is turned on at the circuit breaker.

LEDs

The following LED information is found in this section:

DPT and POS/DPT Uplink Card LEDs

Information on both uplink card specific LEDs and system LEDs for the DPT and POS/DPT uplink cards is in this section.

The LEDs located on the left side of the DPT and POS/DPT uplink card provide DPT and POS uplink status information. (See Figure 5-1.) For POS/DPT uplink cards, the LED information is dependent on whether the card is configured as POS or DPT. (See Table 5-1 and Table 5-2.)

See Table 5-3 for system LED information for the DPT and POS/DPT cards.

Figure 5-1   DPT and POS/DPT Uplink Card LEDs
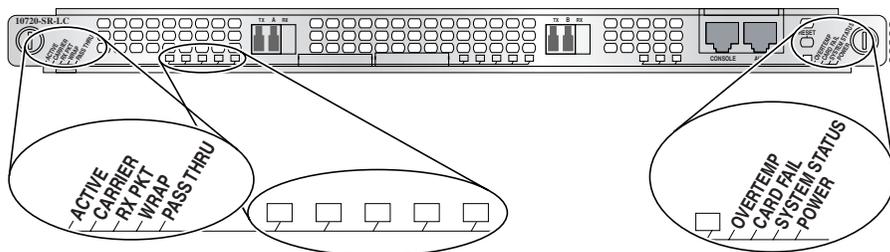
Table 5-1   DPT Uplink Status LEDs

LED	Activity	Description
ACTIVE	Green	Port is active.
	Blinking red	Fiber misconnect is detected (that is, side A connected to neighbor side A). There is no TX optical power.
	Off	Port is not active.
CARRIER	Green	Framer has locked onto the SONET frames.
	Off	Framer has not achieved lock.
RX PACKET	Green	Packets are being received on the port.[1]
	Off	No packets are being received on the port.
WRAP or SRP WRAP	Green	Wrap in system (for example, another station on the ring is wrapped).
	Red	Port is in local wrap.
	Off	No wrap (for example, port is operating normally).
PASSTHRU or SRP PASS THRU	Green	Port is in passthru mode.
	Off	Port is operating normally.

1. Note that because of the SRP usage packets, this LED will remain permanently lit during normal SRP operation.

Table 5-2   POS/DPT Uplink Status LEDs

LED	Activity	Description
ACTIVE	Green	Port is active.
	Off	Port is not active.
CARRIER	Green	Framer has locked onto the SONET frames.
	Off	Framer has not achieved lock.
RX PACKET	Green	Packets are being received on the port.
	Off	No packets are being received on the port.
SRP WRAP	Off	Not applicable to POS.
SRP PASS THRU	Off	Not applicable to POS.

The LEDs located on the right side of the uplink card provide system status information.

Note   Table 5-3 also indicates the system status of the card as it initializes.

Table 5-3   DPT and POS/DPT System LEDs

LED	Activity	Description
OVERTEMP	Green (default status when initialized)	System is operating within the proper temperature range. (inlet <104°F [40°C]; outlet <109°F [43°C])
	Red/green	Both LEDs are on, (appears orange). System is working on warning temperature range. (104°F [40°C] <= inlet < 122°F [50°C], 109°F [43°C] <= outlet < 127°F [53°C])
	Red	System is working on critical temperature state. (122°F [50°C] <= inlet < 149°F [65°C], 127°F [53°C] <= outlet < 167°F [75°C])
CARD FAIL	Red	A hardware failure is detected on the uplink card. During power up, the LED will be red even when the uplink card is powered down.
	Off (default status when initialized)	Card is operational. The LED is turned off after hardware initialization.
SYSTEM STATUS	Red	Not applicable.
	Red/green	Both LEDs are on (appears orange). This is the normal configuration during power up. Once the software loads successfully, the red LED will turn off.
	Green (default status when initialized)	System is operational.
POWER	Green (default status when initialized)	Uplink card is receiving power from the system.[1]
	Off	Uplink card is not receiving power from the system.

1. System power up is not an indication that the uplink card is powered up. Check the card status LEDs to ensure the card is functioning properly and is receiving power from the system.

RPR/SRP Uplink Card LEDs

Information on both uplink card specific LEDs and system LEDs for the RPR/SRP uplink cards is located in this section.

The LEDs located on the left side of the RPR/SRP uplink card provide RPR and SRP uplink status information. See Figure 5-2 and Table 5-4. The system LEDs are located on the right side of the RPR/SRP uplink card. See Table 5-5.

Figure 5-2   RPR/SRP Uplink Status LEDs

Note   Note that the RPR/SRP uplink card uses the label "PROTECT" instead of "WRAP", and the positions of these two LEDs are different from that on the DPT or POS/DPT uplink card.

Table 5-4   RPR/SRP Uplink Status LEDs

LED	Activity	Description
ACTIVE	Green	Port is enabled by software. There is no side mismatch or loopback.
	Amber	Loopback is on.
	Blinking amber	Port is enabled by software and there is a side mismatch. There is no loopback.
	Off	Port is not enabled by software
CARRIER	Green	Port is up and there is a valid SONET signal without any alarms.
	Amber	Port is up and there is at least one alarm (LOS, LOF, RDI, and so on.)
	Off	Off.
RX PKT	Green	Framer is receiving packets.
	Off	Framer is not receiving packets.
PASSTHRU	Green	Port is in passthrough mode.
	Off	Port is operating normally.

Table 5-4   RPR/SRP Uplink Status LEDs (continued)

LED	Activity	Description
PROTECT	Green	Remote wrap.
	Off	No wrap.
	Amber	Local wrap.
	Blinking green	Remote steer.
	Blinking amber	Local steer.

The LEDs located on the right side of the uplink card provide system status information.

Note   Table 5-5 also indicates the system status of the card as it initializes.

Table 5-5   RPR/SRP Uplink Card System LEDs

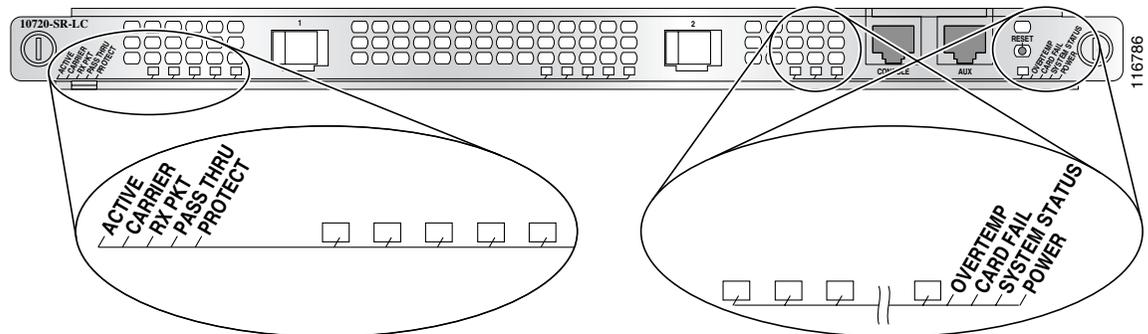| LED	Activity	Description
OVERTEMP	Green (default status when initialized)	System is operating within the proper temperature range. (inlet <104°F [40°C]; outlet <109°F [43°C])
	Amber/green	Both LEDs are on, (appears orange*)*. System is working on warning temperature range. (104°F [40°C] <= inlet < 122°F [50°C], 109°F [43°C] <= outlet < 127°F [53°C])
	Amber	System is working on critical temperature state. (122°F [50°C] <= inlet < 149°F [65°C], 127°F [53°C] <= outlet < 167°F [75°C])
CARD FAIL	Amber	A hardware failure is detected on the uplink card. During power up, the LED will be amber even when the uplink card is powered down.
	Off (default status when initialized)	Card is operational. The LED is turned off after hardware initialization.
SYSTEM STATUS	Amber	Not applicable.
	Amber/green	Both LEDs are on (appears orange). This is the normal configuration during power up. Once the software loads successfully, the amber LED will turn off.
	Green (default status when initialized)	System is operational.
POWER	Green (default status when initialized)	Uplink card is receiving power from the system.[1]
	Off	Uplink card is not receiving power from the system.

1. System power up is not an indication that the uplink card is powered up. Check the card status LEDs to ensure the card is functioning properly and is receiving power from the system.

Troubleshooting the Uplink Cards Installation

Read the following troubleshooting tips to help verify a successful installation of the uplink cards:

Fiber Misconnection—DPT Uplink Cards

Check for misconnected fiber cables (Side A to side A, TX to TX, span East to span East, and so forth) using the **show srp** command. *Misconnection Alarm* appears at the top of the **show srp** command output.

- One alarm—Problem is with another node on the ring; for example, side A connected to side A.
- Two alarms—Problem is your node.; for example, side A to side A and side B to side B.
- Ensure that the duplex cables are not misconnected.

Fiber Misconnection—RPR/SRP Uplink Card

Check for misconnected fiber cables (span West to span West or TX to TX, and so forth) using the **show rpr-ieee protection** command. *Misconnection Alarm* appears at the bottom of the **show rpr-ieee protection** command output.

- One alarm—Problem is with another node on the ring; for example, side West connected to side West.
- Two alarms—Problem is your node; for example, span West to span West and span Eastto apan East
- Ensure that the duplex cables are not misconnected.

Alarm Messages

The following alarm messages report to the console. See Table 5-6 through Table 5-13 for specific alarms and solutions.

The suggested solutions listed below are to the most commonly observed errors:

Table 5-6   *Keepalive Alarm Messages for All Uplink Cards*

Alarm	Description	Solution
SRP1/1 Side A Keepalive Failure (MAC)	MAC failure is detected	Check transport span for problems. Typically SRP ring traverses a SONET layer connection, creating this error.
SRP1/1 Side A Keepalive Failure (SLOS)	SONET section loss of signal	Check fiber for breaks, power level, and connectivity. This is a SONET Layer 1 issue with fiber.
SRP1/1 Side A Keepalive Failure (SLOF)	SONET section loss of frame	Check the fiber for degradation in (power level) or clocking (internal versus line).
SRP1/1 Side A Keepalive Failure (LSD)	SONET line signal degrade	Check the affected fiber, transmit and receive ports. Check power level. This is a SONET Layer 1 issue with signal degrade.
SRP1/1 Side A Keepalive Failure (LSD)	SONET line signal degrade	Check the neighbor node/transport/regenerator for SONET Layer 1 issues (LOS, LSF). This is a SONET Layer 1 issue with an intermediate unit (usually transport connection or regenerator) forwarding an AIS.
SRP1/1 Side A Keepalive OK	Keepalive failure removed; Layer 2 Keepalive receiving correctly	None.
RPR-IEEE1/1 span WEST Keepalive Failure (MAC)	MAC failure is detected	Check transport span for problems. Typically RPR ring traverses a SONET layer connection, creating this error.
RPR-IEEE1/1 span WEST Keepalive Failure (SLOS)	SONET section loss of signal	Check fiber for breaks, power level, and connectivity. This is a SONET Layer 1 issue with fiber.
RPR-IEEE1/1 span WEST Keepalive Failure (SLOF)	SONET section loss of frame	Check the fiber for degredation in (power level) or clocking (interval versus line).
RPR-IEEE1/1 span WEST Keepalive Failure (LSD)	SONET line signal degrade	Check the affected fiber transmit (TX) and receive (RX) ports. Check the power level. This is a SONET Layer 1 issue with signal degradation.

Table 5-6   Keepalive Alarm Messages for All Uplink Cards (continued)

Alarm	Description	Solution
RPR-IEEE1/1 span WEST Keepalive Failure (LSF)	SONET line signal failure	Check the neighboring node/transport/regenerator for SONET Layer 1 issues (LOS, LSF). This is a SONET Layer 1 issue with an intermediate unit (usually transport connection or regenerator) forwarding an AIS.
RPR-IEEE1/1 span WEST Keepalive Failure OK	Keepalive signal removed, Layer 2 Keepalive receiving correctly	None.

Table 5-7   IEEE 802.17 RPR Wrap Messages

Alarm	Description	Solution
RPR-IEEE1/1 wrapped on span East (span WEST User Request Forced Switch)	User initiated forced switch on span WEST on node	User initiated, none.
RPR-IEEE1/1 wrapped on span EAST (span WEST User Request Manual Switch)	User initiated manual switch on span WEST on node	User initiated, none.
RPR-IEEE1/1 wrapped on span EAST (span WEST Self Detect Signal Fail)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—SLOS, SLOF, LSF, or LAIS.
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor Signal Degrade)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—LSD.
RPR-IEEE1/1 wrapped on span EAST (span WEST Self Detect Wait to Restore [WTR])	Wrap cleared, node initiated; Wait to Restore (WTR) state	WTR period is 10 to 360 seconds (user configured), node will unwrap at end of WTR. None.
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor Forced Switch)	Neighbor node Forced Switch initiated by user. Node wrap to protect failed span	User initiated, none.
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor Manual Switch)	Neighbor node Manual Switch initiated by user. Node wrap	User initiated, none.

Table 5-7   *IEEE 802.17 RPR Wrap Messages (continued)*

Alarm	Description	Solution
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor Signal Fail)	Neighbor node wrapped due to signal fail	Investigate the signal degrade on neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor Signal Degrade)	Neighbor node wrapped due to signal degrade	Investigate the signal degrade on neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Span Neighbor WTR)	Wrap cleared, node initiated; Wait to Restore state	WTR period is 0 to 1440, or never (user configured), node will unwrap at end of WTR. None. Setting WTR to never will prevent the node from unwrapping.
RPR-IEEE1/1 wrapped on span EAST (span WEST Long Request Forced Switch)	Neighbor node Forced Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Long Request Manual Switch)	Neighbor node Manual Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Long Request Signal Fail)	Neighbor node wrapped due to signal fail	Investigate signal fail on neighbor node. Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Long Request Signal Degrade)	Neighbor node wrapped due to signal degrade	Investigate signal degrade on neighbor node. Investigate why short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 wrapped on span EAST (span WEST Long Request WTR)	Wrap cleared; Wait to Restore timer expired	None.

Table 5-8   *IEEE 802.17 RPR Unwrap Message*

Alarm	Description	Solution
RPR-IEEE1/1 unwrapped on span EAST (wrap cause cleared)	Wrap cleared; Wait to Restore timer expired.	None.

Table 5-9   *IEEE 802.17 RPR Steer Messages*

Alarm	Description	Solution
RPR-IEEE1/1 protected on span East (span WEST User Request Forced Switch)	User initiated forced switch on span WEST on node	User initiated, none.
RPR-IEEE1/1 protected on span EAST (span WEST User Request Manual Switch)	User initiated manual switch on span WEST on node	User initiated, none.
RPR-IEEE1/1 protected on span EAST (span WEST Self Detect Signal Fail)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—SLOS, SLOF, LSF, or LAIS.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor Signal Degrade)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—LSD.
RPR-IEEE1/1 protected on span EAST (span WEST Self Detect Wait to Restore [WTR])	Wrap cleared, node initiated; Wait to Restore (WTR) state	WTR period is 10 to 360 seconds (user configured), node will unwrap at end of WTR. None.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor Forced Switch)	Neighbor node Forced Switch initiated by user. Node wrap to protect failed span	User initiated, none.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor Manual Switch)	Neighbor node Manual Switch initiated by user. Node wrap	User initiated, none.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor Signal Fail)	Neighbor node protected due to signal fail	Investigate the signal degrade on neighbor node.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor Signal Degrade)	Neighbor node protected due to signal degrade	Investigate the signal degrade on neighbor node.
RPR-IEEE1/1 protected on span EAST (span WEST Span Neighbor WTR)	Wrap cleared, node initiated; Wait to Restore state	WTR period is 0 to 1440, or never (user configured), node will unwrap at end of WTR. None. Setting WTR to never will prevent the node from unwrapping.
RPR-IEEE1/1 protected on span EAST (span WEST Long Request Forced Switch)	Neighbor node Forced Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.

Table 5-9   IEEE 802.17 RPR Steer Messages (continued)

RPR-IEEE1/1 protected on span EAST (span WEST Long Request Manual Switch)	Neighbor node Manual Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 protected on span EAST (span WEST Long Request Signal Fail)	Neighbor node protected due to signal fail	Investigate signal fail on neighbor node. Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
RPR-IEEE1/1 protected on span EAST (span WEST Long Request Signal Degrade)	Neighbor node protected due to signal degrade	Investigate signal degrade on neighbor node. Investigate why short path request was not received. Check other problems on the short span as indicated on the neighbor node.

Table 5-10   IEEE 802.17 Un-Steer Messages

Alarm	Description	Solution
RPR-IEEE1/1 unprotected on span EAST (protection cause cleared)	Protection cleared; Wait to Restore timer expired.	None.

Table 5-11   Other IEEE 802.17 RPR Alarm Messages

Alarm	Description	Solution
RPR-IEEE1/1 Ringlet1 reserved A0 bandwidth has exceeded line rate	The amount of total A0 bandwidth on Ringlet1 reserved by all nodes on the ring exceeds the line rate	Check current A0 allocations on each station using the **show rpr-ieee rate-limit** command. Change the A0 allocation on the ring by using the **rpr-ieee tx-traffic reserved** CLI command.
RPR-IEEE1/1 Ringtlet0 reserved A0 bandwidth has exceeded line rate	The amount of total A0 bandwidth on Ringlet0 reserved by all nodes on the ring exceeds the line rate	Check current A0 allocation on each station using the **show rpr-ieee rate-limit** command. Change the A0 allocation on the ring by using the **rpr-ieee tx-traffic reserved** CLI command.
RPR-IEEE1/1 MAX Stations Exceeded	Too many stations have been discovered in the topology (maximum number of ring stations is 255)	Execute the **show rpr-ieee topology** commandto verify stations. Reduce the numer of stations in the ring.

Table 5-11   Other IEEE 802.17 RPR Alarm Messages (continued)

Alarm	Description	Solution
RPR-IEEE1/1 Effective jumbo pref on ring is set for jumbo frames	All stations on the ring now support jumbo frame preference, MTU for the ring has been changed to JUMBO MTU (9100 bytes).	None. Remove jumbo preference on stations to revert to REGULAR MTU (1500 bytes)
RPR-IEEE1/1 Effective jumbo pref on ring is set for regular frame	At least one station on the ring does not support jumbo frame preference, MTU for the ring has been changed to REGULAR MTU (1500 bytes).	None. Configure jumbo preference on all stations to change support to JUMBO MTU (9100 bytes).
RPR-IEEE1/1 Effective protection mode on station is now steering	Protection preference has been changed. Protection mode for this station is now steering.	None.
RPR-IEEE1/1 Effective protection mode on station is now wrapping	Protection preference has been changed. Protection mode for this station is now wrapping.	None.
Configured protection mode is inconsistent with other stations on ring	Not all stations in the ring support the same protection preference (wrapping or steering). This inconsistency will create failures in a protection event.	Change all stations to support the same protection preference, all stations must support wrapping or steering. Use the **show rpr-iee topology** command to verify protection preference. Use the **rpr protection preference wrap** or **no rpr protection preference wrap** configuration command to change the preference.

Table 5-12   SRP Wrap Messages

Alarm	Description	Solution
SRP1/1 wrapped on side B (side A User Request Forced Switch)	User-initiated forced switch on side A on node	User initiated, none.
SRP1/1 wrapped on side B (side A User Request Manual Switch)	User-initiated manual switch on side A on node	User initiated, none.
SRP1/1 wrapped on side B (side A Self Detect Signal Fail)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—SLOS, SLOF, LSF, or LAIS.
SRP1/1 wrapped on side B (side A Span Neighbor Signal Degrade)	SONET Layer 1 signal fail detected	Investigate Keepalive failure. Wrap occurred. Keepalive failure—LSD.

Table 5-12   *SRP Wrap Messages (continued)*

Alarm	Description	Solution
SRP1/1 wrapped on side B (side A Self Detect Wait to Restore [WTR])	Wrap cleared, node initiated Wait to Restore (WTR) state	WTR period is 10 to 360 seconds (user configured), node will unwrap at end of WTR. None.
SRP1/1 wrapped on side B (side A Span Neighbor Forced Switch)	Neighbor node Forced Switch initiated by user; Node wrap to protect failed span	User initiated, none.
SRP1/1 wrapped on side B (side A Span Neighbor Manual Switch)	Neighbor node Manual Switch initiated by user; Node wrap	User initiated, none.
SRP1/1 wrapped on side B (side A Span Neighbor Signal Fail)	Neighbor node wrapped due to signal fail	Investigate the signal fail on neighbor node.
SRP1/1 wrapped on side B (side A Span Neighbor Signal Degrade)	Neighbor node wrapped due to signal degrade	Investigate the signal degrade on neighbor node.
SRP1/1 wrapped on side B (side A Span Neighbor WTR)	Wrap cleared, node initiated Wait to Restore state	WTR period is 10 to 360 seconds (user configured), node will unwrap at end of WTR. None.
SRP1/1 wrapped on side B (side A Long Request Forced Switch)	Neighbor node Forced Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
SRP1/1 wrapped on side B (side A Long Request Manual Switch)	Neighbor node Manual Switch initiated by user; Node wrap to protect failed span; Secondary problem on the short path	Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
SRP1/1 wrapped on side B (side A Long Request Signal Fail)	Neighbor node wrapped due to signal fail	Investigate signal fail on neighbor node. Investigate why the short path request was not received. Check other problems on the short span as indicated on the neighbor node.
SRP1/1 wrapped on side B (side A Long Request Signal Degrade)	Neighbor node wrapped due to signal degrade	Investigate signal degrade on neighbor node. Investigate why short path request was not received. Check other problems on the short span as indicated on the neighbor node.
SRP1/1 wrapped on side B (side A Long Request WTR)	Wrap cleared, Wait to Restore timer expired	None.

Table 5-13   SRP Unwrap Message

Alarm	Description	Solution
SRP1/1 unwrapped on side B (side A Wrap cause cleared)	Wrap cleared, Wait to Restore timer expired	None.

Troubleshooting the RPR/SRP Uplink Card Installation

Use the transceiver keyword to display additional information about the status of the small form-factor pluggable (SFP) module used in an RPR port.

```
Router# show controllers rpr-ieee 1/1 transceiver

Show Transceiver: West Span
Static information
    ID: SFP transceiver
    Extended ID: 4
    Connector: LC
    SONET compliance: OC48SR
    Gigabit Ethernet compliance: unspecified
    Fibre Channel link length: unspecified
    Fibre Channel transmitter technology: unspecified
    Fibre Channel transmission media: unspecified
    Fibre Channel speed: unspecified
    Encoding: reserved
    Bit Rate: 2500 Mbps
    Single mode fiber supported length: 2 km
    Upper bit rate limit: unspecified
    Lower bit rate limit: unspecified
    Date code (yyyy/mm/dd): 2004/04/21
    Vendor PN: SCP6828-C5-BNE
    Vendor revision number: D
    Vendor serial number: ECL0817001L
Transceiver status information
Diagnostics calibration is external
Temperature 39 (+/-3 Celsius)
Voltage in transceiver 3232600 uV (+/- 10 mV)
TX bias 8940 uA (+/- 100uA)
TX power 316000 nW / -5 dBm (+/- 3dBm)RX power 300200 nW / -5 dBm (+/- 3dBm)
No Active Alarms
No Active Warnings

Alarm Thresholds:
                    high                        low
Temperature           96 C                      -44 C
Voltage          4000000 uV                       0 uV
TX bias            70000 uA                       0 uA
TX power          1000000 nW / 0    dBm      50100 nW / -13 dBm
RX power          1008300 nW / 0    dBm   unspecified


Warning Thresholds:
                    high                        low
Temperature           91 C                      - 9 C
Voltage          3600000 uV                 3000000 uV
TX bias            60000 uA                       0 uA
TX power           630900 nW / -2   dBm      79400 nW / -11 dBm
RX power          1008300 nW / 0    dBm   unspecified
Show Transceiver: East Span
```

```
Static information
    ID: SFP transceiver
    Extended ID: 4
    Connector: LC
    SONET compliance: OC48SR
    Gigabit Ethernet compliance: unspecified
    Fibre Channel link length: unspecified
    Fibre Channel transmitter technology: unspecified
    Fibre Channel transmission media: unspecified
    Fibre Channel speed: unspecified
    Encoding: reserved
    Bit Rate: 2500 Mbps
    Single mode fiber supported length: 2 km
    Upper bit rate limit: unspecified
    Lower bit rate limit: unspecified
    Date code (yyyy/mm/dd): 2004/04/21
    Vendor PN: SCP6828-C5-BNE
    Vendor revision number: D
    Vendor serial number: ECL0817001M
Transceiver status information
Diagnostics calibration is external
Temperature 38 (+/-3 Celsius)
    Voltage in transceiver 3230800 uV (+/- 10 mV)
    TX bias 8724 uA (+/- 100uA)
    TX power 285600 nW / -5 dBm (+/- 3dBm)
    RX power 309900 nW / -5 dBm (+/- 3dBm)
No Active Alarms
No Active Warnings

Alarm Thresholds:
                        high                        low
Temperature             96 C                        -44 C
Voltage                 4000000 uV                    0 uV
TX bias                 70000 uA                      0 uA
TX power                1000000 nW / 0    dBm      50100 nW / -13 dBm
RX power                1008300 nW / 0    dBm    unspecified

Warning Thresholds:
                        high                        low
Temperature             91 C                        - 9 C
Voltage                 3600000 uV                3000000 uV
TX bias                 60000 uA                      0 uA
TX power                 630900 nW / -2    dBm      79400 nW / -11 dBm
RX power                1008300 nW / 0    dBm    unspecified
```

Troubleshooting the POS Uplink Card Installation

This section provides information for troubleshooting the POS/DPT uplink card installation.

Alarm Processing

The following system alarms are monitored by the POS uplink card and reported to the console port:

- Loss-of-Signal (LOS)
- Loss-of-Frame (LOF)
- Line Alarm Indication Signal (LAIS)
- Line Remote Defect Indication (RDI)

- STS Path Loss-of-Pointer (LOP)

- STS Path Alarm Indication Signal (AIS)

- STS Path Remote Defect Indication (RDI)

- B1 Bit Error Rate (BER) threshold crossing alarm (b1-tca)

- B2 BER threshold crossing alarm (b2-tca)

- B3 BER threshold crossing alarm (b3-tca)

- Line Bit Interleave Parity (LBIP) BER in excess of signal degrade threshold (sd-ber)

- LBIP BER in excess of signal failure threshold (sf-ber)

At any time the status of the SONET/SDH alarm and signal events can be examined using the **show controllers** command, as shown in the following example:

```
Router# show controllers pos1/1
Interface POS1/1
Hardware is OC48 POS
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


Framing: SONET
APS


  COAPS = 0            PSBF = 0
  State: PSBF_state = FALSE
  ais_shut = FALSE
  Rx(K1/K2): 00/00  S1S0 = 00, C2 = CF
  Remote aps status non-aps; Reflected local aps status non-aps
CLOCK RECOVERY
  RDOOL = 0
  State: RDOOL_state = FALSE
PATH TRACE BUFFER : STABLE
  Remote hostname : RouterB
  Remote interface: POS1/0
  Remote IP addr  : 2.2.2.1
  Remote Rx(K1/K2): 00/00  Tx(K1/K2): 00/00


BER thresholds:  SF = 10e-4  SD = 10e-6
TCA thresholds:  B1 = 10e-6  B2 = 10e-6  B3 = 10e-6


OPTICS
RX readout values: -6 dBm
```

Loopback Testing

The POS uplink card supports two loopback modes for network testing, fault isolation, and agency compliance. The uplink card loopback modes are:

Internal loopback mode—Packets sent from the Cisco 10720 Internet Router out of the uplink card POS port TX optics are also looped back into the Cisco 10720 Internet Router.

Line loopback mode—Packets received by the POS uplink card port RX optics and sent into the Cisco 10720 Internet Router are also looped back out of the uplink card port TX optics.

Loopback testing is enabled through software. See the *Cisco IOS Software Configuration for the Cisco 10720 Internet Router*.

Additional Troubleshooting Resources

For more troubleshooting information for the uplink card, refer to the following publications:

- Chapter 4, "Troubleshooting", in the *Cisco 10720 Internet Router Installation and Configuration Guide*
- *Cisco IOS Software Configuration for the Cisco 10720 Internet Router* document

Cleaning the Fiber-Optic Connections

For information about cleaning fiber-optic cable connectors and receptacles, see the *Inspection and Cleaning Procedures for Fiber-Optic Connections* document. It provides detailed illustrations and photos of procedures and equipment required to properly clean fiber-optic connections.

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