Cisco ONS 15540 ESPx Troubleshooting Guide

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Cisco ONS 15540 ESPx Troubleshooting Guide

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Preface

This section explains the objectives, intended audience, and organization of this publication and describes the conventions that convey instructions and other information.

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Document Objectives

This guide describes how to identify and resolve problems with your Cisco ONS 15540 ESPx. Use this guide in conjunction with the appropriate publications listed in the Related Documentation section.

Audience

To use this publication, you should be familiar with Cisco or equivalent optical transmission hardware and cabling, telecommunications hardware and cabling, electronic circuitry and wiring practices, and preferably have experience as a telecommunications technician.

Document Organization

The *Cisco ONS 15540 Troubleshooting Guide* is organized into the following chapters:

- Chapter 1, "Troubleshooting Overview," provides an overview of the troubleshooting features and functions.
- Chapter 2, "Troubleshooting Processor Card Problems," describes the troubleshooting procedures used on the processor cards.
- Chapter 3, "Troubleshooting Mux/Demux Module Problems," describes the troubleshooting procedures used for mux/demux module problems.
- Chapter 4, "Troubleshooting PSM Problems," describes the troubleshooting procedures used for PSM problems.
- Chapter 5, "Troubleshooting 2.5-Gbps Transponder Module Problems," describes the troubleshooting procedures used for 2.5-Gbps transponder module problems.
- Chapter 6, "Troubleshooting 10-GE Transponder Module Problems," describes the troubleshooting procedures used for 10-GE transponder module problems.
- Chapter 7, "Troubleshooting Threshold Alarm Problems," describes the troubleshooting procedures used for threshold alarm problems.
- Chapter 8, "Troubleshooting Performance History Counter Problems," describes the troubleshooting procedures used for performance history counter problems.
- Chapter 9, "Troubleshooting APS Problems," describes the troubleshooting procedures used for APS problems.
- Appendix A, "Technical Support," describes the process used to contact and provide your technical support representative with the information to resolve your problem.

Related Documentation

Use the *Cisco ONS 15540 ESPx Troubleshooting Guide* in conjunction with the following referenced publications:

- *Cisco ONS 15540 ESPx Planning Guide*

  Provides detailed information on the Cisco ONS 15540 ESPx architecture and functionality.
- *Cisco ONS 15540 ESPx Hardware Installation Guide*

  Provides detailed information about installing the Cisco ONS 15540 ESPx.
- *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections*

  Provides processes and procedures for cleaning the fiber optic connectors and component interfaces of the Cisco ONS 15540 ESPx.
- *Cisco ONS 15540 ESPx Configuration Guide*

  Provides detailed information about configuring the Cisco ONS 15540 ESPx.
- *Cisco ONS 15540 ESPx Command Reference*

  Provides commands to configure and manage the Cisco ONS 15540 ESPx.
- *Cisco ONS 15540 ESPx System Alarms and Error Messages*

  Describes the system alarms and error messages for the Cisco ONS 15540 ESPx.

- *Network Management for the Cisco ONS 15540 ESPx*

  Provides information on the network management systems that support the Cisco ONS 15540 ESPx.
- Cisco ONS 15540 ESPx TL1 Command Reference

  Provides a full TL1 command and autonomous message set including parameters, AIDs, conditions and modifiers for the Cisco ONS 15540 ESPx.
- *Regulatory Compliance and Safety Information for the Cisco ONS 15500 Series*

  Provides the regulatory compliance and safety information for the Cisco ONS 15500 Series.
- *MIB Quick Reference for the Cisco ONS 15500 Series*

  Describes the Management Information Base (MIB) objects and explains how to access Cisco public MIBs for the Cisco ONS 15500 Series.
- *Cisco ONS 15540 ESPx Software Upgrade Guide*

  Describes how to upgrade system images and functional images on the Cisco ONS 15540 ESPx.
- Introduction to DWDM Technology

  Provides background information on the dense wavelength division multiplexing (DWDM) technology.
- Cisco IOS Configuration Fundamentals Configuration Guide

  Provides useful information on the CLI (command-line interface) and basic shelf management.

Document Conventions

This publication uses the following conventions:

Convention	Application
boldface	Commands and keywords in body text.
italic	Command input that is supplied by the user.
[ ]	Keywords or arguments that appear within square brackets are optional.
{ x | x | x }	A choice of keywords (represented by x) appears in braces separated by vertical bars. The user must select one.
Ctrl	The control key. For example, where Ctrl + D is written, hold down the Control key while pressing the D key.
`screen font`	Examples of information displayed on the screen.
`boldface screen font`	Examples of information that the user must enter.
< >	Command parameters that must be replaced by module-specific codes.

Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.

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

Warning **IMPORTANT SAFETY INSTRUCTIONS**

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. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Where to Find Safety and Warning Information

For safety and warning information, refer to the *Cisco Optical Transport Products Safety and Compliance Information* document that accompanied the product. This publication describes the international agency compliance and safety information for the Cisco ONS 15xxx systems. It also includes translations of the safety warnings that appear in the ONS 15xxx system documentation.

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/

Cisco Optical Networking Product Documentation CD-ROM

Optical networking-related documentation, including Cisco ONS 15xxx product documentation, is available in a CD-ROM package that ships with your product. The Optical Networking Product Documentation CD-ROM is updated periodically and may be more current than printed documentation.

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

Troubleshooting Overview

This chapter gives a brief overview of the *Cisco ONS 15540 ESPx Troubleshooting Guide* as well as a troubleshooting overview of the various areas that might require troubleshooting. This chapter includes the following sections:

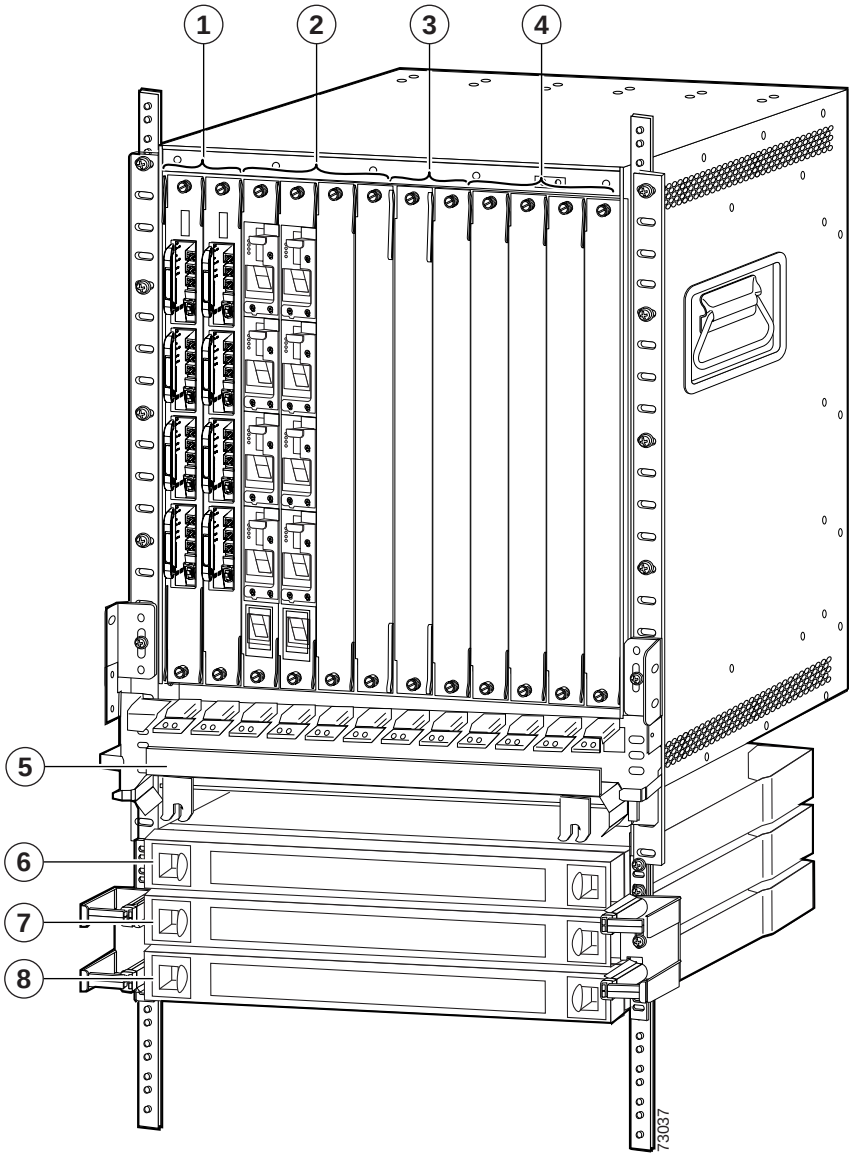
Basic troubleshooting processes, such as troubleshooting Ethernet connections, that are not specific to the Cisco ONS 15540 ESPx are not described in this document. This information is found online in other troubleshooting guides such as the *Cisco IOS Internetwork Troubleshooting Guide.*

1.1 Overview

The Cisco ONS 15540 ESPx is an optical transport platform that employs DWDM (dense wavelength division multiplexing) technology. With the Cisco ONS 15540 ESPx, users can take advantage of the availability of dark fiber to build a common infrastructure that supports data networking (Ethernet based as well as SONET/SDH based) and storage networking.

The Cisco ONS 15540 ESPx uses a 12-slot modular vertical chassis (see Figure 1-1). The system receives power through redundant –48 VDC inputs. A redundant external AC power supply is available, or DC power can be provided directly. As you face the chassis, the two leftmost slots (slots 0 and 1) hold the mux/demux motherboards. These slots, which are populated with optical mux/demux modules, correspond to the west and east directions, respectively. Slots 2–5 and 8–11 hold the line card motherboards, which are populated with transponder modules. Slots 6 and 7 hold the processor cards. Air inlet, fan tray, and cable management are located beneath the modular slots. The system has an electrical backplane for system control.

Figure 1-1 Cisco ONS 15540 ESPx Shelf Layout



1	Slots 0 and 1 hold the mux/demux motherboards	**5**	Cable management tray
2	Slots 2 to 5 hold the line card motherboards	**6**	Cable storage drawer
3	Slots 6 and 7 hold the processor cards	**7**	8-channel cross connect drawer
4	Slots 8 to 11 hold the line card motherboards	**8**	8-channel cross connect drawer

This guide provides information on basic troubleshooting, various troubleshooting tools and diagnostics available, and specific symptom-related troubleshooting procedures.

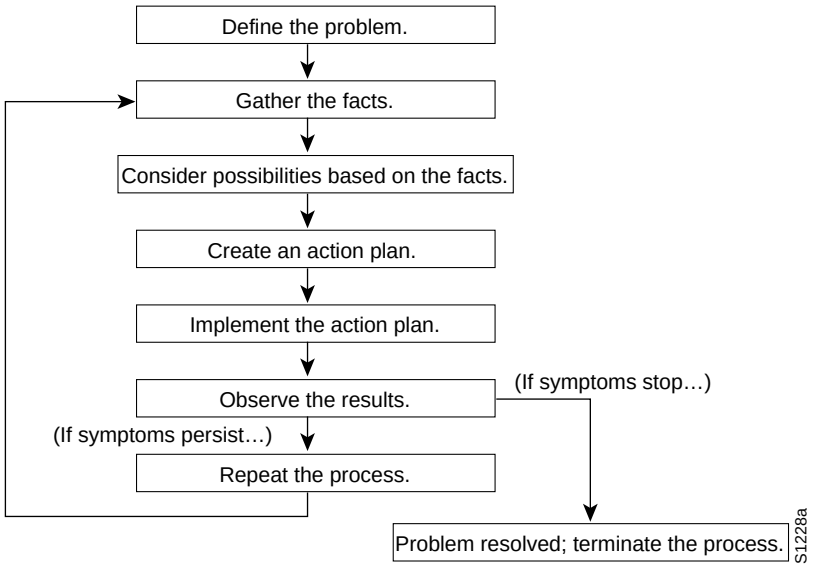
The general problem-solving model, your network and system information, along with the numerous troubleshooting tools presented in this chapter, take much of the difficulty out of troubleshooting the Cisco ONS 15540 ESPx.

1.2 General Model of Problem Solving

When troubleshooting the Cisco ONS 15540 ESPx in a network environment, define the specific symptoms, identify all potential problems that could be causing the symptoms, and then systematically eliminate each potential problem (from most likely to least likely) until the symptoms disappear.

Figure 1-2 illustrates the general problem-solving model. This process is not a rigid outline for troubleshooting. It is a foundation on which you can build a problem-solving process for your environment.

Figure 1-2 General Model of Problem Solving



The following steps detail the problem-solving process outlined in Figure 1-2:

Step 1 Analyze the problem and create a clear problem statement. Define symptoms and potential causes.

Step 2 Gather the facts you need to help isolate possible causes.

Step 3 Consider possible causes based on the facts you gathered.

Step 4 Create an action plan based on those causes. Begin with the most likely problem and devise a plan in which you manipulate only *one* variable.

Step 5 Implement the action plan, performing each step carefully while testing to see whether the symptom disappears.

Step 6 Analyze the results to determine whether the problem is resolved.

Step 7 Terminate the process if the process is resolved.

Step 8 Create an action plan based on the next most probable cause on your list if the problem is not resolved. Return to Step 4 and repeat the process until the problem is solved.

Make sure that you undo anything you changed while implementing your action plan. Remember that you want to change only one variable at a time.

Note If you exhaust all the common causes and actions (either those outlined in this publication or others that you have identified in your environment), contact customer service. See Appendix A, "Technical Support," for additional information.

1.3 Maintaining Network Information

Maintaining the following details about your system configuration and network helps with troubleshooting your system:

- Maintain an accurate physical and logical map of your internetwork that outlines the physical location of all of the devices on the network and how they are connected, as well as a logical map of network addresses, network numbers, and subnetworks.
- List all network protocols implemented in your network as well as a list of the network numbers, subnetworks, zones, and areas that are associated with them.
- Note which protocols are being routed and what the correct, up-to-date configuration information is for each protocol.
- Document all the points of contact to external networks, including any connections to the Internet. For each external network connection, note what routing protocol is being used.
- Document normal network behavior and performance so that you can compare current problems with a baseline.

1.4 Network and System Management

This section describes the network management toolss available for the Cisco ONS 15540 ESPx. CiscoWorks 2000 supports a suit of network management applications of which the following are supported on the Cisco ONS 15540 ESPx:

- 1.4.1 CiscoView
- 1.4.2 CTM
- 1.4.3 DFM

1.4.1 CiscoView

CiscoView is a device management application providing dynamic status, monitoring, and configuration information for a range of Cisco internetworking products including the Cisco ONS 15540 ESPx. CiscoView displays a physical view of a device chassis, with color-coding of modules and ports for at-a-glance status. Monitoring capabilities display performance and other statistics. Configuration capabilities allow changes to devices if security privileges are granted.

Cisco ONS 15540 ESPx is supported by Embedded CiscoView and server based CiscoView. Online help for CiscoView is available for the server based CiscoView.

1.4.2 CTM

CTM (Cisco Transport Manager) is the EMS (element management system) for the Cisco ONS 15540 ESPx. CTM provides standard fault, configuration, performance, and security management capabilities across the element and network management layers of the TMN (Telecommunications Management Network) reference architecture. The robust client/server-based platform easily scales to manage up to 100 simultaneous client (user) sessions and up to 1000 NEs (network elements).

1.4.3 DFM

DFM (Device Fault Manager) reports faults that occur on Cisco devices, often identifying fault conditions before users of network services realize that the condition exists. DFM analysis technology differs from the traditional rules-based approach to event analysis. DFM analysis uses a top-down approach that starts by identifying the fault conditions that affect managed systems. Because the event information necessary to diagnose fault conditions is present in the analysis model, DFM monitors only the events necessary to diagnose the condition. DFM can operate as an independent management system or can integrate with existing management applications to add fault management to the functionality already in place.

1.5 Third-Party Troubleshooting Tools

In many situations, third-party troubleshooting tools can be helpful. For example, attaching an optical analyzer to a network is less intrusive than using the **debug** commands, which are processor card intensive.

Here are some typical third-party tools used for troubleshooting internetworks:

- Optical cleaning kit—Keeps your optical cable connections clean. This should be in every tool kit that has anything to do with optical equipment. Several problems you encounter will typically be associated with dirty cables.
- Optical power meter—Measures the optical power coming from and going into a piece of equipment. This is the standard operating procedure for installing and troubleshooting optical equipment. Your optical power meter must be able to measure signals at 850 nm, 1310 nm, and 1550 nm.

  Note Optical power meters need to be recalibrated once per year.

- TDR (time domain reflectometer)—Locates open circuits, short circuits, crimps, kinks, sharp bends, impedance mismatches, and other defects in metallic cables. A TDR reflects a signal off the end of the cable. Opens, shorts, and other problems reflect back the signal at different amplitudes, depending on the problem. A TDR measures the time it takes for the signal to reflect and calculates the distance to a fault in the cable. TDRs can also measure the length of a cable, and some TDRs can calculate the rate of propagation based on a configured cable length.
- OTDR (optical time domain reflector/reflectometer)—Checks end-to-end loss and detects fiber breaks, splice points in the optical fiber, and fiber attenuation. This tool is essential for initial network startup and later troubleshooting fiber breaks.

- BERT (bit error rate tester)—Tests OC-3, OC-12, and OC-48 ports for end connectivity of the wavelength if the client equipment is not yet available. BERT usually has a built-in power meter to test optical power of the circuit.
- Fiber microscope—Checks the fiber interface for dirt or anything else that could degrade the optical connection.
- Patch cables— Loops back the trunk side. You should keep an assortment of multimode and single-mode patch cables with you, including 1550 nm SM trunk side cables with MU-to-SC interfaces and SC-to-SC coupler. Use attenuators as needed.
- Fixed attenuators—Adds fixed attenuation levels to connections. Five attenuators with 5 dB at 1310 nm and five with 10 dB at 1310 nm, are a good start.
- Spectrum analyzer—Views the channel spectrum or analyzes light according to wavelength. It is useful when you suspect channel cross talk and for certifying equipment and performing periodic laser tests for stability.
- Network monitors—Tracks packets crossing a network, providing an accurate picture of network activity. Network monitors do not decode the contents of frames. They are useful for creating a baseline of normal performance. Monitors collect information such as packet sizes, the number of packets, error packets, overall usage of a connection, the number of hosts and their MAC addresses, and details about communications between hosts and other devices. This data can be used to create profiles of LAN traffic and assist in locating traffic overloads, planning for network expansion, detecting intruders, and distributing traffic more efficiently.

1.6 Using General Diagnostic Commands

You can use the **show**, **debug**, **ping**, and **traceroute** commands to monitor and troubleshoot your internetwork.

1.6.1 show Commands

You can use the **show** commands to perform many functions such as the following:

- Monitors the behavior of your Cisco ONS 15540 ESPx during initial installation
- Monitors normal network operation
- Isolates problem interfaces, nodes, media, or applications
- Determines when a network is congested
- Determines the status of servers, clients, or other neighbors

Table 1-1 lists some of the most commonly used **show** commands:

Table 1-1 Useful Diagnostic Commands

Command	Purpose
show interfaces ***interface***	Displays statistics for the interfaces.
show controllers ***interface***	Displays statistics for processor card interface controllers.
show running-config	Displays the currently running configuration.
show startup-config	Displays the configuration stored in NVRAM (nonvolatile RAM).

Table 1-1 Useful Diagnostic Commands (continued)

Command	Purpose
show flash	Displays the layout and content of Flash memory.
show buffers	Displays statistics for the buffer pools on the Cisco ONS 15540 ESPx.
show memory	Shows statistics about the Cisco ONS 15540 ESPx memory, including free pool statistics.
show processes	Displays information about the active processes on the Cisco ONS 15540 ESPx.
show stacks	Displays information about the stack utilization of processes and interrupt routines, and the reason for the last system reboot.
show version	Displays the configuration of the system hardware, the software version, the names and sources of configuration files, and the boot images.

For more information about **show** commands, refer to the *Cisco ONS 15540 ESPx Command Reference* and the *Cisco IOS Configuration Fundamentals Command Reference*.

1.6.2 debug Commands

The **debug** privileged EXEC commands provide information about the traffic on (or *not* seen) on an interface, error messages generated by nodes on the network, protocol-specific diagnostic packets and cells, and other useful troubleshooting data.

Caution Be careful when using **debug** commands. Many of these commands are processor card intensive and can cause serious network problems (such as degraded performance or loss of connectivity) if they are enabled on an already heavily loaded system. When you finish using a **debug** command, remember to disable it with its specific **no debug** command (or use the **no debug all** command to turn off all debugging).

In many situations, third-party diagnostic tools can be more useful and less intrusive than using **debug** commands. See the "1.5 Third-Party Troubleshooting Tools" section on page 1-5.

1.6.3 ping Command

To check host reachability and network connectivity, use the **ping** user EXEC or privileged EXEC command. This command can be used to confirm basic network connectivity on IP networks.

For IP, the **ping** command sends ICMP (Internet Control Message Protocol) echo messages. If a station receives an ICMP echo message, it sends an ICMP echo reply message back to the source.

Using the extended command mode of the **ping** privileged EXEC command, you can specify the supported IP header options, which allow the Cisco ONS 15540 ESPx to perform a more extensive range of test options. To enter **ping** extended command mode, enter the **ping** command at the command prompt followed by a return.

To see how the command works under normal conditions, use the **ping** command when the network is functioning properly. When you are troubleshooting, you can then see the difference between normal and abnormal operation.

For detailed information about using the **ping** and extended **ping** commands, refer to the *Cisco IOS Configuration Fundamentals Command Reference* publication.

1.6.4 traceroute Command

The **traceroute** user EXEC command discovers the routes packets follow when traveling to their destinations. With the **traceroute** privileged EXEC command, the supported IP header options are specified, and the Cisco ONS 15540 ESPx can perform a more extensive range of test options.

The **traceroute** command works by using the error message generated by a Cisco ONS 15540 ESPx when a datagram exceeds its TTL (Time-To-Live) value. First, probe datagrams are sent with a TTL value of one. This causes the first Cisco ONS 15540 ESPx to discard the probe datagrams and send back `time exceeded` error messages. The **traceroute** command then sends several probes, and displays the round-trip time for each. After every third probe, the TTL increases by one.

Each outgoing packet can result in one of two error messages. A `time exceeded` error message indicates that an intermediate Cisco ONS 15540 ESPx has seen and discarded the probe. A `port unreachable` error message indicates that the destination node has received the probe and discarded it because it could not deliver the packet to an application. If the timer goes off before a response comes in, the **traceroute** command displays an asterisk (*).

The **traceroute** command terminates when the destination responds, when the maximum TTL is exceeded, or when the user interrupts the **traceroute** command with the escape sequence.

To see how the command works under normal conditions, use the **traceroute** command when the network is functioning properly. When you are troubleshooting, you can then see the difference between normal and abnormal operation.

For detailed information about using the **traceroute** command, refer to the *Cisco ONS 15540 ESPx Command Reference*. For additional information on using **debug** commands refer to the *Cisco IOS Debug Command Reference.*

1.7 Online Diagnostics

This section describes the online diagnostics available for troubleshooting your Cisco ONS 15540 ESPx. Online diagnostics provide the following types of tests:

- Accessibility tests between the processor card and the modules.
- OIR (online insertion and removal) diagnostic tests.

The Cisco ONS 15540 ESPx displays an error message on the console when it detects a hardware failure or problem.

Note Online diagnostic tests only run on the active processor card.

1.7.1 Accessibility Test

The accessibility tests ensure connectivity, at a configurable interval, between the following:

- OADM modules
- Mux/demux motherboards
- Transponder modules
- Line card motherboards
- Active processor card
- Standby processor card, if it is present

1.7.2 OIR Test

OIR tests check the functioning of the processor card and interfaces on a per-port basis. The processor card performs these tests when the system boots up and when you insert a module or motherboard into a slot. The OIR test sends a packet to the interface loopback and expects to receive it within a certain time period. If the packet does not reach the port within the expected time period, or the received packet is corrupted, an error is registered and the port is changed to an administratively down state. Packets that are 1000 bytes in size are used in the test.

1.8 Configuring Online Diagnostics

To configure online diagnostics, use the following global configuration commands:

Command	Purpose
[**no**] **diag online**	Enables or disables online diagnostic tests on all components on the shelf.
[**no**] **diag online slot** *slot*	Enables or disables online diagnostic tests only on the components in a chassis slot.
[**no**] **diag online subslot** *slot*/*subcard*	Enables or disables online diagnostic tests only on the components in a chassis subslot.
[**no**] **debug diag online** [**background** | **online-insertion-removal** | **redundancy**]	Enables debugging of online diagnostic tests.

Examples

The following example shows how to enable all online diagnostic tests:

```
Switch# diag online
```

The following example shows how to enable online diagnostic tests for the components in slot 3:

```
Switch# diag online slot 3
```

The following example shows how to enable debugging for online diagnostics:

```
Switch# debug diag online
```

1.8.1 Displaying the Online Diagnostics Configuration and Results

To display the online diagnostics configuration and results, use the following EXEC command:

Command	Purpose
show diag online [**detail** | **slot** *slot*]	Displays information about the online diagnostic tests and the test results.

Example

The following example shows how to display detailed access test information:

```
Switch# show diag online
-------------------------------------------------
Online Diagnostics Current Summary Information
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
On ACTIVE CPU card Slot: 6
CPU Uptime: 3d14h

 Slot       CardType          Enabled     Bootup/    Periodic     Previous
                                          Insertion  Background   Failures
                                          tests      tests
 ~~~~~~   ~~~~~~~~~~~~~~     ~~~~~~~   ~~~~~~~~~   ~~~~~~~~~~    ~~~~~~~~
 0/*/* 15540-LCMB-UNKNOWN       Yes      Pass          Pass           No
 0/ 0/*    15540-MDXA-32AD      Yes      Pass          Pass           No
 0/ 4/*                         Yes  Disabled     Disabled           No
 1/*/* 15540-LCMB-UNKNOWN       Yes      Pass          Pass           No
 1/ 0/*    15540-MDXD-32A0      Yes      Pass          Pass           No
 1/ 4/*                         Yes  Disabled     Disabled           No
 2/*/*   15540-LCMB-1400=       Yes      Pass          Pass           No
 2/ 1/*  15540-10GE-03B304      Yes      Pass          Pass           No
 3/*/*          15540-TBD       Yes      Pass          Pass           No
 3/ 0/*               N/A       Yes      Pass          Pass           No
 3/ 1/*               N/A       Yes      Pass          Pass           No
 4/*/*   15540-LCMB-1100=       Yes      Pass          Pass           No
 4/ 2/*   15540-TSP2-0300=      Yes      Pass          Pass           No
 4/ 3/*   15540-TSP2-0300=      Yes      Pass          Pass           No
 Slot       CardType          Enabled     Bootup/    Periodic     Previous
                                          Insertion  Background   Failures
                                          tests      tests
 ~~~~~~   ~~~~~~~~~~~~~~     ~~~~~~~   ~~~~~~~~~   ~~~~~~~~~~    ~~~~~~~~
 5/*/*    15540-LCMB-1100       Yes      Pass          Pass           No
 5/ 0/*   15540-TSP1-25B3=      Yes      Pass          Pass           No
 5/ 1/*   15540-TSP1-25A3=      Yes      Pass          Pass           No
 5/ 2/*   15540-TSP1-27A3=      Yes      Pass          Pass           No
 5/ 3/*   15540-TSP1-27A3=      Yes      Pass          Pass           No
 6/*/*               N/A       Yes      Pass          Pass           No
 8/*/*          15540-TBD       Yes      Pass          Pass           No
 9/*/*    15540-LCMB-1100       Yes      Pass          Pass           No
 9/ 0/*   15540-TSP1-21A3=      Yes      Pass          Pass           No
 9/ 1/*   15540-TSP1-19A3=      Yes      Pass          Pass           No
 9/ 2/*   15540-TSP1-23A3=      Yes      Pass          Pass           No
 9/ 3/*   15540-TSP1-19A3=      Yes      Pass          Pass           No
10/*/*          15540-TBD       Yes      Pass          Pass           No
11/*/*    15540-LCMB-1200       Yes      Pass          Pass           No
```

Example

The following example shows how to display diagnostic test status and details:

```
Switch# show diag online detail
```

```
Online Diagnostics Detailed Information
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
On ACTIVE CPU card Slot: 6
CPU Uptime:    3 days, 14 hours, 20 minutes

_____________________________________________________________________________
<Information deleted>

Slot[6]

Online Insertion Tests
 Slot         CardType       TestType    Status   LastRunTime   LastFailTime
 ~~~~~~   ~~~~~~~~~~~~~~    ~~~~~~~~~   ~~~~~~   ~~~~~~~~~~   ~~~~~~~~~~~~
 6/*/*               N/A    srcStatus      Pass     00:00:33         nev
                            PCIAccess      Pass
                            PCMCIAAcc      Pass
                            IdpromAcc      Pass

Online Background Tests
 Slot         CardType       TestType    Status   LastRunTime   LastFailTime
 ~~~~~~   ~~~~~~~~~~~~~~    ~~~~~~~~~   ~~~~~~   ~~~~~~~~~~   ~~~~~~~~~~~~
 6/*/*               N/A    srcStatus      Pass        3d15h         nev
                            PCIAccess      Pass
                            PCMCIAAcc      Pass
                            IdpromAcc      Pass
_____________________________________________________________________________
Slot[9]

Online Insertion Tests
 Slot         CardType       TestType    Status   LastRunTime   LastFailTime
 ~~~~~~   ~~~~~~~~~~~~~~    ~~~~~~~~~   ~~~~~~   ~~~~~~~~~~   ~~~~~~~~~~~~
 9/*/*    15540-LCMB-1100     lcAccess      Pass     00:01:08         nev
                            idpromAcc      Pass
 9/ 0/*   15540-TSP1-21A3=    scAccess      Pass     00:01:08         nev
                            idpromAcc      Pass
 9/ 1/*   15540-TSP1-19A3=    scAccess      Pass     00:01:08         nev
                            idpromAcc      Pass
 9/ 2/*   15540-TSP1-23A3=    scAccess      Pass     00:01:08         nev
 Slot         CardType       TestType    Status   LastRunTime   LastFailTime
 ~~~~~~   ~~~~~~~~~~~~~~    ~~~~~~~~~   ~~~~~~   ~~~~~~~~~~   ~~~~~~~~~~~~
                            idpromAcc      Pass
 9/ 3/*   15540-TSP1-19A3=    scAccess      Pass     00:01:08         nev
                            idpromAcc      Pass

Online Background Tests
 Slot         CardType       TestType    Status   LastRunTime   LastFailTime
 ~~~~~~   ~~~~~~~~~~~~~~    ~~~~~~~~~   ~~~~~~   ~~~~~~~~~~   ~~~~~~~~~~~~
 9/*/*    15540-LCMB-1100     lcAccess      Pass        3d14h         nev
                            idpromAcc      Pass
 9/ 0/*   15540-TSP1-21A3=    scAccess      Pass        3d14h         nev
                            idpromAcc      Pass
 9/ 1/*   15540-TSP1-19A3=    scAccess      Pass        3d14h         nev
                            idpromAcc      Pass
 9/ 2/*   15540-TSP1-23A3=    scAccess      Pass        3d14h         nev
                            idpromAcc      Pass
 9/ 3/*   15540-TSP1-19A3=    scAccess      Pass        3d14h         nev
                            idpromAcc      Pass
_____________________________________________________________________________
```

1.9 Checking Release Notes for Workarounds

There are two methods you can use to check for Cisco IOS software bugs (defect tracking tool numbers [DDTS]) in your version of the Cisco IOS software. You can use the Bug Navigator II or check the release notes. Often, your problems with the Cisco ONS 15540 ESPx have been fixed or a workaround has been determined in a more recent version of software.

1.9.1 Using Bug Navigator II

Bug Navigator II is a tool you can use to search the DDTS database and ask either of two types of questions:

- Symptom Diagnostics (for example, “What defect is causing my current symptoms?”)
- Upgrade Planning (for example, “What software release is best for the features I am interested in?”)

You can access Bug Navigator II on the World Wide Web at http://www.cisco.com/cgi-bin/Support/Bugtool/launch_bugtool.pl. Then follow these steps:

Step 1 Enter your user name and password at the login prompt if you are not already logged in to Cisco.com.

Step 2 Read the Bug Navigator II Help instructions.

Step 3 Select your hardware from the Cisco Hardware list. The Bug Navigator search tool replaces Bug Navigator II Help (in the right frame of the page).

Step 4 Select the following from the drop-down menus:

- Version
- Revision
- Severity

Note As an option, you can enter words or phrases (separated by commas) in the data entry field to limit your search.

Step 5 Click the Search button.

The entire window is replaced with a Bug Search Results window with a list of DDTS containing your search criteria. Look at the Bug reports listed in the titles column. An existing bug entry that describes the problem you are having may have been fixed in a more recent version of the Cisco IOS software. Look in the Fixed-in column for a later version of the Cisco IOS software. All you might have to do to solve your problem is upgrade your software.

If a software upgrade is not listed as a way to solve your problem, double-click on the bug title and read the DDTS details; a workaround might be listed there.

1.9.2 Checking Cisco IOS Release Notes

Release notes describe the features and caveats for Cisco IOS software releases. The release notes are listed by both product and Cisco IOS release number.

The “Caveats” section of the release notes lists known caveats by tracking the DDTS number and the release number, and indicates whether the caveat has been corrected.

The “Caveat Symptoms and Workarounds” section summarizes caveat symptoms and suggested workarounds. You can also search through this section online, using either a word string or the DDTS number.

Note After you have determined the hardware and software versions on the Cisco ONS 15540 ESPx, check the release notes and DDTS database for symptoms resembling those you are observing. Often, the problem has already been discovered and a workaround has been provided.

1.10 Initial Troubleshooting Checklist

Before you start the troubleshooting process, confirm that the network and client connections were designed correctly using the information in the *Cisco ONS 15540 ESPx Planning Guide* and the interfaces were configured correctly using the information in the *Cisco ONS 15540 ESPx Configuration Guide*.

Next confirm the integrity of the hardware and its installation by performing the following:

- Reseat the cable.
- Clean the cable, connectors, couplers, and attenuators.
- Confirm that the Tx and Rx fiber optic connections are not mixed.
- Confirm all modules and motherboards are completely seated and the captive screws are tightened securely to completely mate the optical fiber connectors to the backplane.
- Check the signal level at each input and output to check for too much or too little attenuation.
- Verify that all line cards, modules, and carrier motherboards are properly seated in the slots.

CHAPTER 2

Troubleshooting Processor Card Problems

This chapter describes how to troubleshoot processor card problems. The chapter includes the following sections:

2.1 Overview

The Cisco ONS 15540 ESPx includes two processor cards for redundancy. Each processor consists of a number of subsystems, including a CPU, a system clock, Ethernet switch for communicating between processors and with the LRC (line card redundancy controller) on the mux/demux motherboards and line card motherboards, and a processor redundancy controller. The active processor controls the node, and all cards in the system make use of the system clock and synchronization signals from the active processor.

The processor card is equipped with a console port, a Fast Ethernet interface for Telnet access and network management, and an auxiliary port. There are two slots for Flash PC Cards or Flash disks.

On the processor card front panel are LEDs that display the status of critical, major, and minor signals, as well as the status of alarm cutoff and history conditions. The alarm signals from the processor go to an alarm daughterboard on the backplane, which has a connector for central office alarm facilities.

Note For information on slot assignments, processor card LEDs, alarm condition clear and reset button, interrupt clear and reset button, NME LEDs, and cabling, refer to the *Cisco ONS 15540 ESPx Hardware Installation Guide*. For default configuration of the various modules, refer to the *Cisco ONS 15540 ESPx Configuration Guide*.

2.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Issue the **show running-config** command to check the running configuration.
- Ensure the LEDs on the processor cards show the proper state.
- Ensure the Ethernet and Console cables are connected properly.
- Issue the **show facility-alarm status** command to check for processor card, fan, or power supply alarms.
- Issue the **show hardware detail** command to verify the processor card functional image.
- Ensure online and power-on diagnostics do not report any alarms or failures for the processor card.
- Ensure the active and standby processor cards are compatible.
- Ensure the active and standby processor card have the same version of software installed.

2.3 Verifying Processor Card Configuration

To display the processor card configuration and status, use the **show running-config** command.

Command	Purpose
show running-config	Shows all components of the processor card running a configuration.

The following example shows the **show running-config** command, which displays all the components of the processor card configuration. For a detailed description of this command, refer to the *Cisco IOS Configuration Fundamentals Command Reference*.

```
Switch# show running-config
Building configuration...

Current configuration : 8344 bytes
!
version 12.2
no service pad
service timestamps debug uptime
service timestamps log datetime msec
no service password-encryption
!
hostname Switch
!
boot system bootflash:ons15540-i-mz.122-18.SV
logging snmp-authfail
enable password lab
!
no environment-monitor shutdown fan
diag online
ip subnet-zero
no ip domain-lookup
!
!
```

```
<Information deleted>
!
threshold-list sonet2
 threshold name sonet-sdh section cv degrade index 0
   value rate 7
 --More--
 threshold name sonet-sdh section cv failure index 1
!
threshold-list srik
 threshold name sonet-sdh section cv degrade index 0
   value rate 7
 threshold name sonet-sdh section cv failure index 1
   value rate 4
!
threshold-list temp
 threshold name cvrd degrade index 0
   value rate 5
   aps trigger
!
redundancy
 associate group spl
 associate group `
   aps working Wavepatch5/3/0
 standby privilege-mode enable
!
!
interface Loopback0
 ip address 2.2.2.2 255.255.255.0
!
interface FastEthernet0
 ip address 172.25.22.55 255.255.255.254
 duplex auto
 speed auto
!
interface Filter0/0/0
 no ip address
!
interface Oscfilter0/0
 no ip address
!
<Information deleted>

log-adjacency-changes
 network 20.1.1.0 0.0.0.255 area 0
 network 30.1.1.0 0.0.0.255 area 0
!
router bgp 1
 no synchronization
 bgp log-neighbor-changes
 no auto-summary
!
ip classless
ip route 0.0.0.0 0.0.0.0 FastEthernet0
no ip http server
!
!
access-list 100 deny   tcp any any eq 3082
snmp-server community public RW
snmp-server enable traps snmp authentication warmstart
snmp-server enable traps tty
snmp-server enable traps threshold min-severity degrade
snmp-server enable traps bgp
snmp-server enable traps config
snmp-server enable traps syslog
```

```
snmp-server enable traps entity
snmp-server enable traps fru-ctrl
snmp-server enable traps topology throttle-interval 60
snmp-server enable traps optical monitor min-severity minor
snmp-server enable traps rf
snmp-server enable traps aps
snmp-server enable traps patch
snmp-server enable traps alarms
snmp-server host 172.25.18.22 version 2c WORD
snmp-server host 1.1.1.1 version 2c public  alarms
snmp-server host 172.25.18.22 version 2c traps  syslog
!
control-plane
!
patch Oscfilter1/0 Wave1
patch Filter1/0/3 Wavepatch4/3/1
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
!
!
end
```

2.4 Recovering a Lost Password

This section describes the procedure to recover a lost login or to enable a password. The procedure differs depending on the platform and the software used, but in all cases, password recovery requires that the system be taken out of operation and powered down.

If you need to perform the following procedure, make certain that there are secondary systems that can temporarily serve the functions of the system undergoing the procedure. If this is not possible, advise all potential users and, if possible, perform the procedure during low-use hours.

Note Make a note of your password, and store it in a secure place.

All of the procedures for recovering lost passwords depend on changing the configuration register of the system. This is done by reconfiguring the system software.

More recent Cisco platforms run from Flash memory or are netbooted from a network server and can ignore the contents of NVRAM (nonvolatile random-access memory) when booting. By ignoring the contents of NVRAM, you can bypass the configuration file (which contains the passwords) and gain complete access to the system. You can then recover the lost password or configure a new one.

Note If your password is encrypted, you cannot recover it. You must configure a new password.

Follow these steps to recover a password:

Step 1 Enter the **show version** command and the configuration register value in the privileged EXEC mode. The default value is 0x2102.

Step 2 Power up the Cisco ONS 15540 ESPx.

Step 3 Press the **Break** key sequence or send a break signal, which is usually **^] w**ithin 60 seconds of turning the system on. If you do not see the `>` prompt with a system name, the terminal is not sending the correct break signal. In that case, check the terminal or terminal emulation setup.

Step 4 Enter the **confreg** command at the `>` prompt.

Step 5 Answer **yes** to the `Do you wish to change configuration [y/n]?` prompt.

Step 6 Answer **no** to all the questions that appear until you reach the `Ignore system config info [y/n]` prompt. Answer **yes**.

Step 7 Answer **no** to the remaining questions until you reach the `Change boot characteristics [y/n]?` prompt. Answer **yes**.

Step 8 Enter **2** at the `enter to boot:` prompt.

Step 9 Answer **no** to the `Do you wish to change configuration [y/n]?` prompt.

Step 10 Enter the **reset** command at the `rommon>` prompt.

Step 11 Enter the **enable** command at the `Switch>` prompt. You are in enable mode and see the `Switch#` prompt.

Step 12 Enter the **show startup-config** command to view your password.

Step 13 Proceed to Step 16 if your password is clear text. Or, continue with Step 14 if your password is encrypted.

Step 14 Enter the **configure memory** command to copy the NVRAM into memory if your password is encrypted.

Step 15 Enter the **copy running-config startup-config** command.

Step 16 Enter the **configure terminal** command.

Step 17 Enter the **enable secret** *password* command.

Step 18 Enter the **config-registe**r *value* command, where *value* is whatever value you entered in Step 1.

Step 19 Enter the **exit** command to exit configuration mode.

Step 20 Enter the **copy running-config startup-config** command.

Step 21 Enter the **reload** command at the prompt.

2.5 Verifying NME Interface Configurations

The administration interfaces provide simple command-line interfaces to all internal management and debugging facilities of the processor card. To manage and debug the processor card, you can use the NME (network management Ethernet) interface, the console port, and the auxiliary port.

For cable connection information for each of these interface ports, refer to the *Cisco ONS 15540 ESPx Hardware Installation Guide*. For initial configuration information, refer to the *Cisco ONS 15540 ESPx Configuration Guide*.

The NME interface has a full duplex, auto-sensing connection with troubleshooting LEDs on the processor card faceplate.

You can configure and monitor the NME connection using the CLI. The NME connection appears in the configuration as fastethernet 0 for the active processor and as fastethernet-sby 0 for the standby processor.

To display the NME fastethernet module configuration and status, use the following commands:

Command	Purpose
show interfaces fastethernet 0	Displays the status of the physical interface.
show controllers fastethernet 0	Displays the interface memory management and error counters on the fastethernet interface.

Follow these steps to verify the NME interface:

Step 1 Use the **show interfaces fastethernet 0** *slot/subcard/port* command to check the NME interface configuration.

```
Switch# show interfaces fastethernet 0
FastEthernet0 is up, line protocol is up
  Hardware is AmdFE, address is 0001.6445.b110 (bia 0001.6445.b110)
  Internet address is 172.25.22.55/31
  MTU 1500 bytes, BW 100000 Kbit, DLY 100 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 100Mb/s, 100BaseTX/FX
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     671414 packets input, 45594677 bytes
     Received 658232 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog
     0 input packets with dribble condition detected
     48004 packets output, 6459399 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

Step 2 Check the FastEthernet field to see whether the interface is up. If it is down, check for the following:

- Disconnected or faulty cabling. Check cables.
- Hardware failure. Swap hardware.

If administratively down, the interface has been administratively taken down. Use the **no shutdown** interface configuration command to reenable the interface.

Step 3 Check the line protocol field to see whether the status is up.

If the interface is down, the line protocol software processes might have determined that the line is unusable or the local or remote interface might be misconfigured. See if the interface can be brought up by following the recommendations in Step 2.

Step 4 Check the duplex mode field. It should match the speed of the interface and be configured as autonegotiation.

Step 5 Check the last input and last output fields. They show the number of hours, minutes, and seconds since the last packet was successfully received or transmitted by the interface.

Step 6 Check the output hang field. It shows the number of hours, minutes, and seconds since the last reset caused by a lengthy transmission.

Step 7 Check the CRC field. The presence of many CRC errors, but not many collisions, indicates excessive noise. If the number of errors is too high, check the cables for damage. If you are using UTP cable, make sure you are using Category 5 cables and not another type, such as Category 3.

Note Errors and the input and output difference should not exceed 0.5 to 2.0 percent of traffic on the interface.

Step 8 Check the collisions fields. These numbers indicate packet collisions and these numbers should be very low. The total number of collisions, with respect to the total number of output packets, should be 0.1 percent or less.

Step 9 Check the late collisions fields. Late collisions should never occur in a properly designed Ethernet network. They usually occur when Ethernet cables are too long or when there are too many repeaters in the network.

Step 10 Check the carrier fields. These numbers indicate a lost carrier detect signal and can be caused by a malfunctioning interface that is not supplying the transmit clock signal or by a cable problem. If the system notices that the carrier detect line of an interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when an interface is looped back or shut down.

Step 11 Check the buffer fields. These numbers indicate the number of received packets discarded because there was no buffer space. Broadcast storms on Ethernet networks, and bursts of noise on serial lines, are often responsible for no-input buffer events.

Step 12 Check the FastEthernet field to see whether the interface is up. If it is down, see if the interface can be brought up by following the recommendations in Step 2. If administratively down, the interface has been administratively taken down. Use the **no shutdown** interface configuration command to reenable the interface.

If you determine that the connection is configured incorrectly, refer to the *Cisco ONS 15540 ESPx Configuration Guide*.

In addition, you can use the **show controllers** command to troubleshoot the status of the NME interface configuration:

```
Switch# show controllers fastethernet 0
Interface FastEthernet0
Interface FastEthernet0
Hardware is AMD Unknown
ADDR: 615687C0, FASTSEND: 0, MCI_INDEX: 0
DIST ROUTE ENABLED: 0
Route Cache Flag: 1
 LADRF=0x0000 0x0100 0x0000 0x0000
 CSR0  =0x00000072, CSR3  =0x00001044, CSR4  =0x0000491D, CSR15 =0x00000180
```

```
CSR80 =0x00009900, CSR114=0x00000000, CRDA  =0x0658D3D0, CXDA  =0x0658D630
BCR9 =0x00000001
CSR5  =0x00000001, CSR7  =0x00000820, CSR100=0x0000F000, CSR125=0x00005C3C
BCR2  =0x00001000, BCR9  =0x00000001, BCR18 =0x00001981, BCR22 =0x0000FF06
BCR25 =0x00000017, BCR26 =0x0000000C, BCR27 =0x00000000, BCR32 =0x00004400
HW filtering information:
 Promiscuous Mode Disabled, PHY Addr Enabled, Broadcast Addr Enabled
 PHY Addr=0001.6445.B110, Multicast Filter=0x0000 0x0100 0x0000 0x0000
amdp2_instance=0x61563920, registers=0x46000000, ib=0x658D0C0
rx ring entries=64, tx ring entries=128
rxring=0x658D120, rxr shadow=0x61563BC0, rx_head=43, rx_tail=0
txring=0x658D560, txr shadow=0x6156A580, tx_head=13, tx_tail=13, tx_count=0
Software MAC address filter(hash:length/addr/mask/hits):
spurious_idon=0, filtered_pak=0, throttled=0, enabled=0, disabled=0
rx_framing_err=0, rx_overflow_err=0, rx_buffer_err=0, rx_bpe_err=0
rx_soft_overflow_err=0, rx_no_enp=0, rx_discard=0, rx_miss_count=0
tx_one_col_err=0, tx_more_col_err=0, tx_no_enp=0, tx_deferred_err=0
tx_underrun_err=0, tx_late_collision_err=0, tx_loss_carrier_err=0
tx_exc_collision_err=0, tx_buff_err=0, fatal_tx_err=0
hsrp_conf=0, need_af_check=0
tx_limited=0(128)
PHY registers:
 Register 0x00:   1000  786D  0000  6B60  01E1  41E1  0005  2801
 Register 0x08:   0000  0000  0000  0000  0000  0000  0000  0000
 Register 0x10:   001B  0004  186A  001E        2004  0000  0200
 Register 0x18:   000D  0000  0000  0000  8300
```

2.6 Troubleshooting Processor Memory

To troubleshoot the processor memory, use the following commands:

Command	Purpose
show memory	Shows statistics about the Cisco ONS 15540 ESPx memory, including free pool statistics.
show buffers	Displays statistics for the buffer pools on the Cisco ONS 15540 ESPx.

Troubleshooting Cisco ONS 15540 ESPx processor card memory is the same as troubleshooting any Cisco route processor. You can refer to the document *Troubleshooting Hardware and Booting Problems.*

If the Cisco ONS 15540 ESPx fails, it is sometimes useful to get a full copy of the memory image, called a *core dump*, to identify the cause of the failure. Core dumps are generally only useful to your technical support representative. For troubleshooting information relating to system management and information about creating core dumps, refer to the *Cisco IOS Configuration Fundamentals Command Reference*.

2.7 Verifying Hardware and Software Versions

A common problem is an incompatibility between a hardware module and the Cisco IOS software version needed to perform a particular function. This section describes how to troubleshoot that problem.

Display the hardware and software versions to ensure that they are the most recent. Very old hardware and software versions (two or three versions back) can have caveats that have been fixed in more recent versions. Use the following EXEC commands to display version information:

Command	Purpose
show version	Displays the software version information.
show hardware [**detail**]	Displays detailed hardware information including revision level and version.

To verify hardware and software versions, use the following steps:

Step 1 Use the **show version** command to display the system software version on the active processor card.

```
Switch# show version

Cisco IOS Software, ONS-15540 Software (ONS15540-I-M), Version 12.2(18)SV
TAC Support: http://www.cisco.com/tac
Copyright (c) 1986-2003 by Cisco Systems, Inc.
Compiled Fri 26-Sep-03 15:00 by hql

ROM: System Bootstrap, Version 12.1(10r)EV1, RELEASE SOFTWARE (fc1)

ESPx-BETA uptime is 3 days, 15 hours, 4 minutes
System returned to ROM by reload at 19:19:40 UTC Wed Oct 29 2003
System image file is "bootflash:ons15540-i-mz.122-18.SV"

Cisco ONS15540 (RM7000) processor with 98304K/32768K bytes of memory.
R7000 CPU at 234Mhz, Implementation 39, Rev 2.1, 256KB L2, 2048KB L3 Cache

Last reset from power-on
2 Ethernet interfaces
509K bytes of NVRAM.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
24576K bytes of Flash PCMCIA card at slot 1 (Sector size 128K).
16384K bytes of Flash internal SIMM (Sector size 256K).
Standby CPU is up
Standby CPU has 98304K/32768K bytes of memory.

Configuration register is 0x2102
```

Step 2 Verify the ROM field. It indicates the release of Cisco IOS software loaded and running on the active processor card.

Step 3 Use the **show hardware** command to display the hardware revision levels for the processor cards.

```
Switch# show hardware
-------------------------------------------------------------------------------
15540_Chassis_with_external_patch_support named Switch, Date: 11:48:03 UTC Sun
Nov 2 2003
-------------------------------------------------------------------------------

-------------------------------------------------------------------------------
Back-Plane Information
-------------------------------------------------------------------------------
Orderable Product No. MAC-Address       MAC-Size Serial No.   Mfg. Date  H/W Ver.
--------------------- ----------------- -------- ------------ ---------- ------
15540-CHSB=           00-0c-30-22-28-a0 16       TBC07392048  10/07/2003 3.2
```

```
-------------------------------------------------------------------------------
Slot Orderable Product No.     Part No.   Rev Serial No.   Mfg. Date  H/W Ver.
---- ------------------------- ---------- --- ------------ ---------- ---------
0/*  15540-LCMB-UNKNOWN       73-7793-02 11  CAB0604MD7C  01/29/2002 1.0
0/0  15540-MDXD-04A0=          74-2833-01 01  ANX0614000V  03/15/2002 1.0
0/1  15540-PSM-01              73-8207-01     PSM#1        01/01/2000 1.1
0/2                                       0   403011       11/08/3901 0.1
0/3  15540-MDXD-04G0=          74-2839-01 A0  ANX0629000C  07/16/2002 1.0
1/*  15540-LCMB-UNKNOWN       73-7793-01 11  CAB0543L1BY  10/26/2001 3.1
1/0                                       0   403698       01/23/2002 0.1
1/3                                       0   403015       11/08/2001 0.1
3/*  15540-LCMB-1400=          800-17218- A0  CNH0647006X  05/01/2003 4.1
3/0  15540-10GE-03B304         800-18905- 02  CAB0553M5WY  03/13/2002 5.0
3/1  15540-LCMB-TBD            800-xxxxx- 02  CAB061508J0  05/07/2003 5.60
6/*  N/A                       73-5621-03 03  CAB0517HL41  02/16/2001 3.5
7/*  N/A                       73-5621-02 03  SAK0447002V  02/16/2001 2.1
9/*  15540-TBD                 73-7789-01 03  CAB0605MF12  02/09/2002 1.0
9/3  15540-TSP1-03B3=          68-1423-01 B0  CAB0549LR2M  12/19/2001 4.5


-------------------------------------------------------------------------------
Power-Supply Module
-------------------------------------------------------------------------------
Power-Supply A is : OK
Power-Supply B is : Not working
```

Step 4 Verify that the hardware versions listed in the H/W Ver column for the processor cards in slots 6 and 7 are the same. If the hardware versions are not the same, continue with the "2.8 Verifying Hardware and Software Compatibility" section on page 2-10.

Step 5 Use the **show hardware detail linecard** command to display detailed information about the processor card hardware, including the functional image versions.

```
Switch# show hardware detail linecard 6

-------------------------------------------------------------------------------
Slot Number              : 6/*
Controller Type          : 0x1000
On-Board Description     : Queens_CPU_PHASE_0
Orderable Product Number: N/A
Board Part Number        : 73-5621-02
Board Revision           : 03
Serial Number            : CAB0505GZHA
Manufacturing Date       : 02/16/2001
Hardware Version         : 2.5
RMA Number               : 0x00
RMA Failure Code         : 0x00
Functional Image Version: 1.27
Function-ID              : 0
```

Step 6 Verify that the Hardware Version and Functional Image Version fields for the processor cards in slots 5 and 6 are the same. If they are not the same, refer to "2.8 Verifying Hardware and Software Compatibility" section on page 2-10 to confirm that they are compatible.

2.8 Verifying Hardware and Software Compatibility

You can verify your hardware and software version compatibility by using the following EXEC command to display processor card compatibility information:

Command	Purpose
show redundancy capability	Displays the software version compatibility information.

To verify hardware and software compatibility of the processor cards and modules, use the following steps:

Step 1 Use the **show redundancy capability** command to display the system software version compatibility with the various modules installed.

```
Switch# show redundancy capability

CPU capability support

 Active CPU  Sby CPU    Sby Compat        CPU capability description
 ---------- ---------- ----------- ---------------------------------------
    96 MB      96 MB   OK          CPU DRAM size
    32 MB      32 MB   OK          CPU PMEM size
   512 KB     512 KB   OK          CPU NVRAM size
    16 MB      16 MB   OK          CPU Bootflash size
    3.5        2.1     OK          CPU hardware major.minor version
    1.27       1.27    OK          CPU functional major.minor version

Linecard driver major.minor versions, (counts: Active=43, Standby=43)

 Active CPU  Sby CPU   Sby Compat  Drv/Ch/F ID  Driver description
 ---------- ---------- ----------- ----------- ------------------------------
    1.1        1.1     OK          0x1000/0/0  CPU w/o Switch Fabric
    1.1        1.1     OK          0x1001/1/0  Fixed Transponder, w/monitor
    1.1        1.1     OK          0x1002/0/0  Fixed Transponder, no monitor
    1.1        1.1     OK          0x1003/1/0  Pluggable Transponder, w/monit
    1.1        1.1     OK          0x1004/0/0  Pluggable Transponder, no moni
    2.1        2.1     OK          0x1005/0/0  Line Card Motherboard
    1.1        1.1     OK          0x1006/0/0  Backplane
    1.1        1.1     OK          0x1007/0/0  32-ch Mux/Demux
    1.1        1.1     OK          0x1008/0/0  Fixed 4-ch Mux/Demux, no OSC
    1.1        1.1     OK          0x1009/0/0  Fixed 8-ch Mux/Demux, no OSC
    1.1        1.1     OK          0x100A/0/0  Modular 4-ch Mux/Demux, no OSC
    1.1        1.1     OK          0x100B/0/0  Modular 8-ch Mux/Demux, no OSC
    1.1        1.1     OK          0x100C/0/0  32-ch Array Wave Guide
    2.1        2.1     OK          0x100D/0/0  Mux/Demux Motherboard
    1.1        1.1     OK          0x100E/0/0  Modular 4-ch Mux/Demux plus OS
    1.1        1.1     OK          0x100F/0/0  Modular 8-ch Mux/Demux plus OS
    2.1        2.1     OK          0x1010/0/0  Mux-Demux Motherboard, no OSC
    2.1        2.1     OK          0x1011/0/0  Line Card Motherboard, no prot
    3.1        3.1     OK          0x1012/0/0  Down Link Motherboard
    1.1        1.1     OK          0x1013/0/0  OC192 Down Link DaughterCard
    2.1        2.1     OK          0x1014/1/0  10G Down Link DaughterCard
    1.1        1.1     OK          0x1015/0/0  Modular 16-ch Mux/Demux, no OS
    1.1        1.1     OK          0x1016/0/0  Modular 16-ch Mux/Demux plus O
    2.1        2.1     OK          0x1017/0/0  Line Card Motherboard, no prot
    1.1        1.1     OK          0x1018/1/0  Low bit rate Type-1 transponde
    2.1        2.1     OK          0x1019/0/0  CN Tower Line Card Motherboard
    2.1        2.1     OK          0x101A/0/0  Mux/Demux Motherboard
    1.1        1.1     OK          0x101B/0/0  Modular 4-ch Mux/Demux no OSC
    1.1        1.1     OK          0x101C/0/0  Modular 4-ch Mux/Demux plus OS
    1.1        1.1     OK          0x101D/0/0  Modular 8-ch Mux/Demux no OSC
    1.1        1.1     OK          0x101E/0/0  Modular 8-ch Mux/Demux plus OS
    1.1        1.1     OK          0x101F/0/0  32-ch Array Wave Guide
```

```
    2.1        2.1     OK          0x1020/0/0  Mux/Demux Motherboard, no OSC
    1.1        1.1     OK          0x1021/0/0  POM Adapter
    2.1        2.1     OK          0x1022/0/0  Down Link Motherboard, no prot
    2.1        2.1     OK          0x1023/0/0  Down Link Motherboard, no prot
    2.1        2.1     OK          0x1024/0/0  Line Card Motherboard, no prot
    1.1        1.1     OK          0x1025/0/0  Modular 16-ch Mux/Demux, no OS
    1.1        1.1     OK          0x1026/0/0  Modular 16-ch Mux/Demux plus O
    1.1        1.1     OK          0x1027/0/0  PSM Trunk switch proctection m
    1.1        1.1     OK          0x1028/1/0  non-plug type1 xpder with cont
    1.1        1.1     OK          0x1029/1/0  Low bit rate type-1 xpdr w/con
    1.1        1.1     OK          0x1000/0/1  ONS15540 Rommon

Software sync client versions, listed as version range X-Y.
 X indicates the oldest peer version it can communicate with.
 Y indicates the current sync client version.
 Sync client counts: Active=6, Standby=6

 Active CPU  Sby CPU   Sby Compat  Cl ID  Redundancy Client description
 ---------- ---------- ----------- ----- -----------------------------------
 ver  1-2   ver  1-2   OK          17    CPU Redundancy
 ver  1-1   ver  1-1   OK          19    Interface Sync
 ver  1-1   ver  1-1   OK          36    MetOpt Password Sync
 ver  1-2   ver  1-2   OK          18    Online Diagnostics
 ver  1-2   ver  1-2   OK          6     OIR Client
 ver  1-1   ver  1-1   OK          27    metopt cm db sync


Backplane IDPROM comparison
 Backplane IDPROM field      Match Local CPU            Peer CPU
 --------------------------- ----- -------------------- --------------------
 idversion                   YES   1                    1
 magic                       YES   153                  153
 card_type                   YES   4102                 4102
 order_part_num_str          YES   15540-CHSB=          15540-CHSB=
 description_str             YES   15540_Chassis_with_external_patch_support
                                                        15540_Chassis_with_exter
nal_patch_support
 board_part_num_str          YES   73-5655-04           73-5655-04
 board_revision_str          YES   A0                   A0
 serial_number_str           YES   TBC07392048          TBC07392048
 date_of_manufacture_str     YES   10/07/2003           10/07/2003
 deviation_numbers_str       YES   0                    0
 manufacturing_use           YES   0                    0
 rma_number_str              YES   0x00                 0x00
 rma_failure_code_str        YES   0x00                 0x00
 oem_str                     YES   Cisco_Systems        Cisco_Systems
 clei_str                    YES   0                    0
 snmp_oid_substr             YES   0                    0
 schematic_num_str           YES   92-4113-03           92-4113-03
 hardware_major_version      YES   3                    3
 hardware_minor_version      YES   2                    2
 engineering_use_str         YES   0                    0
 crc16                       OK    46433                21421
 user_track_string           YES   0                    0
 diagst                      YES   ^A                    ^A
 board_specific_revision     YES   1                    1
 board_specific_magic_number YES   153                  153
 board_specific_length       YES   57                   57
 mac_address_block_size      YES   16                   16
 mac_address_base_str        YES   000c302228a0         000c302228a0
 cpu_number                  OK    0                    1
 optical_backplane_type      YES   2                    2
```

Step 2 Check the processor memory sizes and versions in the CPU capability description column. The numbers in the Active CPU and Sby CPU (Standby CPU) columns should match. If not, check the Sby Compat (Standby Compatibility) column. If this column indicates the values are OK, then these values will function as compatible redundant processor cards. If not, swap the processor cards with versions that are compatible.

Step 3 Check the CPU hardware major.minor versions and CPU functional major.minor versions in the CPU capability description column. The numbers in the Active CPU and Sby CPU (Standby CPU) columns should match. If not, check the Sby Compat (Standby Compatibility) columns. If this column indicates the values are OK, then these values will function as compatible redundant processor cards. If not, swap the processor cards with versions that are compatible.

Step 4 Check the information in the Linecard driver section of the display. This section shows the compatibility of the software versions installed on the active and standby processor cards with the various modules installed in the system.

Step 5 Check the Sby Compat (Standby Compatibility) and the Driver description columns. An OK in the Sby Compat column indicates the software version installed on the processor cards supports the drivers on the modules listed.

Step 6 Check the Software sync client version section of the display. The Active CPU, Sby CPU, and Redundancy Client description columns indicate the software versions the two processor cards can use to synchronize their configurations. The version range in the display, shown as X-Y, indicates oldest-current peer client versions. For example, if the version lists 1-2, that indicates version 1 is the oldest version that the current version 2 could synchronize with its configuration.

Step 7 Check the Backplane IDPROM comparison section of the display. Check the Match column. This indicates which elements match, are acceptable, or fail. Some elements do not match but the range is acceptable. For example, the crc16 elements fields never match because the information in the IDPROMs of the two processor cards are different so the checksums never match. But they do appear as OK or compatible.

If any of the drivers are not supported or appear as OK, try updating the images installed on the processor cards. Use the information in the "1.9 Checking Release Notes for Workarounds" section on page 1-12 to upgrade to a more recent version. That should solve a processor card image compatibility problem.

2.9 Troubleshooting Redundant Processor Cards

The Cisco ONS 15540 ESPx supports fault tolerance by allowing a standby processor card to take over if the active processor card fails. This standby, or redundant, processor card runs in hot-standby mode. In hot-standby mode, the standby processor card is partially booted with the Cisco IOS software; however, no configuration is loaded.

At the time of a switchover, the standby processor card takes over as the active processor card and loads the configuration as follows:

- If the running configurations on the active and standby processor card match, the new active processor card uses the running configuration file.
- If the running configurations on the active and standby processor cards do not match, the new active processor card uses the last saved configuration file in its NVRAM (not the NVRAM of the former active processor card).

The former active processor card then becomes the standby processor card.

Note If the standby processor card is unavailable, a major alarm is reported. Use the **show facility-alarm status** command to display the redundancy alarm status.

For redundant processor cards to function correctly, your Cisco ONS 15540 ESPx processor cards must meet the following requirements:

- Both processor cards must have compatible hardware configurations.
- ROMMON version 12.1(10r)EV.
- Both processor cards must have compatible releases of Cisco IOS software.

A common error you may encounter is the incompatibility of hardware modules and the Cisco IOS software version needed to perform a particular function.

2.9.1 Verifying Hardware and Software Versions of Redundant Processor Cards

To troubleshoot the processor card hardware and software versions for redundancy, use the following commands:

Command	Purpose
show version	Displays the processor card software version information.
show redundancy	Displays the hardware and software configurations of the active and standby processor cards.

To troubleshoot the hardware and software versions on the redundant processor card, use the following steps:

Step 1 Use the **show version** command to display the system software version on the active processor card as described in the "2.7 Verifying Hardware and Software Versions" section on page 2-8.

Step 2 Use the **show redundancy summary** command to check the configuration and status of the active and standby processor card.

```
Switch# show redundancy summary

Redundant system information
-----------------------------
Available Uptime:              3 days, 15 hours, 10 minutes
sysUpTime (switchover clears): 3 days, 15 hours, 10 minutes
Switchover Count:              0

Inter-CPU Communication State: UP
Last Restart Reason:           Normal boot

Last Running Config sync:      1 day, 16 hours, 56 minutes
Running Config sync status:    In Sync
Last Startup Config sync:      3 days, 15 hours, 9 minutes
Startup Config sync status:    In Sync

This CPU is the Active CPU.
-------------------------------
```

```
Slot:                          6
Time since CPU Initialized:    3 days, 15 hours, 10 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.2(1
8)SV, EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File:                    bootflash:ons15540-i-mz.122-18.SV
Software Redundancy State:     ACTIVE
Hardware State:                ACTIVE
Hardware Severity:             0

Peer CPU is the Standby CPU.
------------------------------
Slot:                          7
Time since CPU Initialized:    3 days, 14 hours, 46 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.2(1
8)SV, EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File (on sby-CPU):       bootflash:ons15540-i-mz.122-18.SV
Software Redundancy State:     STANDBY HOT
Hardware State:                STANDBY
Hardware Severity:             0
Privilege Mode:                Enabled
```

Step 3 Verify the Last Running Config sync and Last Startup Config sync fields. They indicate the last time the running configuration and startup configuration were synchronized between the processor cards.

Step 4 Verify the active, standby, and Slot fields. They indicate in which slot the active processor card is configured.

2.9.2 Verifying Redundant Processor Card Functions

To troubleshoot the processor card function capabilities and redundancy, use the following commands:

Command	Purpose
show redundancy capability	Displays capabilities for the active and standby processor cards.
show redundancy clients	Displays internal redundancy software client information, which can be used to debug redundancy software.
show redundancy counters	Displays internal redundancy software counter information, which can be used to debug redundancy software.
show redundancy events	Displays internal redundancy software event information, which can be used to debug redundancy software.
show redundancy history	Displays the internal redundancy software history log, which can be useful for debugging redundancy software.

Command	Purpose
show redundancy states	Displays internal redundancy software state information.
show redundancy summary	Displays a summary of internal redundancy software counter information.

Follow these steps to troubleshoot processor card and redundancy capabilities on the system:

Step 1 Use the **show redundancy capability** command to display capabilities of the active or standby processor cards described in the "2.7 Verifying Hardware and Software Versions" section on page 2-8.

Step 2 Use the **show redundancy clients** command to display a list of internal redundancy clients.

```
Switch# show redundancy clients

clientID = 0       clientSeq = 0        RF_INTERNAL_MSG
 clientID = 6       clientSeq = 180      OIR Client
 clientID = 7       clientSeq = 190      APS
 clientID = 17      clientSeq = 230      CPU Redundancy
 clientID = 18      clientSeq = 280      Online Diagnostics
 clientID = 19      clientSeq = 300      Interface Sync
 clientID = 27      clientSeq = 330      metopt cm db sync
 clientID = 35      clientSeq = 360      History RF Client
 clientID = 36      clientSeq = 370      MetOpt Password Sync
 clientID = 65000   clientSeq = 65000    RF_LAST_CLIENT
```

Step 3 Use the **show redundancy counters** command to display internal redundancy software counters.

```
Switch# show redundancy counters

Redundancy Facility OMs
               comm link up = 0
        comm link down down = 0

          invalid client tx = 1
          null tx by client = 0
                tx failures = 0
      tx msg length invalid = 0

      client not rxing msgs = 0
 rx peer msg routing errors = 0
           null peer msg rx = 0
         errored peer msg rx = 0

                 buffers tx = 1
     tx buffers unavailable = 0
                buffers rx = 1
      buffer release errors = 0

 duplicate client registers = 0
  failed to register client = 0
       Invalid client syncs = 0
```

Step 4 Use the **show redundancy events** command to display internal redundancy software events.

```
Switch# show redundancy events
Redundancy Facility Events :

RF_PROG_INITIALIZATION (100)
```

```
RF_PROG_STANDBY_COLD (101)
RF_PROG_STANDBY_CONFIG (102)
RF_PROG_STANDBY_FILESYS (103)
RF_PROG_STANDBY_BULK (104)
RF_PROG_STANDBY_HOT (105)
RF_PROG_ACTIVE_FAST (200)
RF_PROG_ACTIVE_DRAIN (201)
RF_PROG_ACTIVE_PRECONFIG (202)
RF_PROG_ACTIVE_POSTCONFIG (203)
RF_PROG_ACTIVE (204)
RF_PROG_PLATFORM_SYNC (300)
RF_PROG_EXTRALOAD (301)
RF_PROG_HANDBACK (302)
RF_STATUS_PEER_PRESENCE (400)
RF_STATUS_PEER_COMM (401)
RF_STATUS_SWACT_INHIBIT (402)
RF_STATUS_MAINTENANCE_ENABLE (403)
RF_STATUS_MANUAL_SWACT (404)
RF_STATUS_REDUNDANCY_MODE_CHANGE (405)
RF_STATUS_OPER_REDUNDANCY_MODE_CHANGE (406)
RF_REGISTRATION_STATUS (407)
RF_EVENT_NEGOTIATE (500)
RF_EVENT_START_PROGRESSION (501)
RF_EVENT_STANDBY_PROGRESSION (502)
RF_EVENT_CLIENT_PROGRESSION (503)
RF_EVENT_CONTINUE_PROGRESSION (504)
RF_EVENT_LOCAL_PROG_DONE (505)
RF_EVENT_PEER_PROG_DONE (506)
RF_EVENT_NOTIFICATION_TMO (507)
RF_EVENT_SWACT_INHIBIT_TMO (508)
RF_EVENT_KEEP_ALIVE (509)
RF_EVENT_KEEP_ALIVE_TMO (510)
RF_EVENT_GO_ACTIVE (511)
RF_EVENT_GO_STANDBY (512)
RF_EVENT_GO_ACTIVE_EXTRALOAD (513)
RF_EVENT_GO_ACTIVE_HANDBACK (514)
```

Step 5 Use the **show redundancy history** command to display internal redundancy software history.

```
Switch# show redundancy history

4w5d client added: RF_INTERNAL_MSG(0) seq=0
4w5d client added: RF_LAST_CLIENT(65000) seq=65000
00:00:00 client added: History RF Client(35) seq=360
00:00:16 client added: CPU Redundancy(17) seq=230
00:00:17 client added: Interface Sync(19) seq=300
00:00:17 client added: MetOpt Password Sync(36) seq=370
00:00:17 *my state = INITIALIZATION(2) *peer state = DISABLED(1)
00:00:17 RF_PROG_INITIALIZATION(100) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:17 RF_PROG_INITIALIZATION(100) CPU Redundancy(17) op=0 rc=11
00:00:17 RF_PROG_INITIALIZATION(100) Interface Sync(19) op=0 rc=11
00:00:17 RF_PROG_INITIALIZATION(100) History RF Client(35) op=0 rc=11
00:00:17 RF_PROG_INITIALIZATION(100) MetOpt Password Sync(36) op=0 rc=11
00:00:17 RF_PROG_INITIALIZATION(100) RF_LAST_CLIENT(65000) op=0 rc=11
00:00:17 *my state = NEGOTIATION(3) peer state = DISABLED(1)
00:00:17 RF_EVENT_GO_ACTIVE(511) op=0
00:00:17 *my state = ACTIVE-FAST(9) peer state = DISABLED(1)
00:00:17 RF_STATUS_MAINTENANCE_ENABLE(403) CPU Redundancy(17) op=0
00:00:17 RF_STATUS_MAINTENANCE_ENABLE(403) Interface Sync(19) op=0
00:00:17 RF_STATUS_MAINTENANCE_ENABLE(403) MetOpt Password Sync(36) op=0
00:00:17 RF_PROG_ACTIVE_FAST(200) RF_INTERNAL_MSG(0) op=0 rc=11
00:00:18 client added: APS(7) seq=190
00:00:18 client added: Online Diagnostics(18) seq=280
00:00:18 client added: OIR Client(6) seq=180
```

```
00:01:01 client added: metopt cm db sync(27) seq=330
00:01:02 RF_PROG_ACTIVE_FAST(200) CPU Redundancy(17) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_FAST(200) Interface Sync(19) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_FAST(200) metopt cm db sync(27) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_FAST(200) History RF Client(35) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_FAST(200) MetOpt Password Sync(36) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_FAST(200) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:02 *my state = ACTIVE-DRAIN(10) peer state = DISABLED(1)
00:01:02 RF_PROG_ACTIVE_DRAIN(201) RF_INTERNAL_MSG(0) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) OIR Client(6) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) APS(7) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) CPU Redundancy(17) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) Online Diagnostics(18) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) Interface Sync(19) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) metopt cm db sync(27) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) History RF Client(35) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) MetOpt Password Sync(36) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_DRAIN(201) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:02 *my state = ACTIVE_PRECONFIG(11) peer state = DISABLED(1)
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) RF_INTERNAL_MSG(0) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) OIR Client(6) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) APS(7) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) CPU Redundancy(17) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) Online Diagnostics(18) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) Interface Sync(19) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) metopt cm db sync(27) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) History RF Client(35) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) MetOpt Password Sync(36) op=0 rc=11
00:01:02 RF_PROG_ACTIVE_PRECONFIG(202) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:05 Configuration parsing complete
00:01:07 System initialization complete
00:01:07 *my state = ACTIVE_POSTCONFIG(12) peer state = DISABLED(1)
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) RF_INTERNAL_MSG(0) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) OIR Client(6) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) APS(7) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) CPU Redundancy(17) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) Online Diagnostics(18) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) Interface Sync(19) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) metopt cm db sync(27) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) History RF Client(35) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) MetOpt Password Sync(36) op=0 rc=11
00:01:07 RF_PROG_ACTIVE_POSTCONFIG(203) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:07 *my state = ACTIVE(13) peer state = DISABLED(1)
00:01:07 RF_PROG_ACTIVE(204) RF_INTERNAL_MSG(0) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) OIR Client(6) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) APS(7) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) CPU Redundancy(17) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) Online Diagnostics(18) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) Interface Sync(19) op=0 rc=11
00:01:07 RF_PROG_ACTIVE(204) metopt cm db sync(27) op=0 rc=11
00:01:08 RF_PROG_ACTIVE(204) History RF Client(35) op=0 rc=11
00:01:08 RF_PROG_ACTIVE(204) MetOpt Password Sync(36) op=0 rc=11
00:01:08 RF_PROG_ACTIVE(204) RF_LAST_CLIENT(65000) op=0 rc=11
00:01:08 RF_STATUS_PEER_PRESENCE(400) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) OIR Client(6) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) APS(7) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) CPU Redundancy(17) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) Online Diagnostics(18) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) Interface Sync(19) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) metopt cm db sync(27) op=1
00:01:08 RF_STATUS_PEER_PRESENCE(400) MetOpt Password Sync(36) op=1
23:13:35 RF_STATUS_PEER_PRESENCE(400) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) OIR Client(6) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) APS(7) op=0
```

```
23:13:35 RF_STATUS_PEER_PRESENCE(400) CPU Redundancy(17) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) Online Diagnostics(18) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) Interface Sync(19) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) metopt cm db sync(27) op=0
23:13:35 RF_STATUS_PEER_PRESENCE(400) MetOpt Password Sync(36) op=0
23:13:35 Reloading peer (peer presence lost)
23:13:35 RF_STATUS_PEER_COMM(401) op=0
23:13:35 RF_STATUS_PEER_COMM(401) op=0
```

Step 6 Use the **show redundancy states** command to display internal redundancy software state information.

```
Switch# show redundancy states
my state = 13 -ACTIVE
     peer state = 1  -DISABLED
           Mode = Simplex
        Unit ID = 6

     Split Mode = Disabled
   Manual Swact = Disabled  Reason: Simplex mode
 Communications = Down      Reason: Simplex mode

   client count = 10
 client_notification_TMR = 30000 milliseconds
          keep_alive TMR = 12000 milliseconds
        keep_alive count = 0
    keep_alive threshold = 17
           RF debug mask = 0x0
```

Step 7 Use the **show redundancy summary** command to display a summary of internal redundancy software information.

```
Switch# show redundancy summary

Redundant system information
-----------------------------
Available Uptime:              3 days, 14 hours, 48 minutes
sysUpTime (switchover clears): 3 days, 14 hours, 48 minutes
Switchover Count:              0

Inter-CPU Communication State: DOWN
Last Restart Reason:           Normal boot

Last Running Config sync:      never
Running Config sync status:    Out of Sync
Last Startup Config sync:      never
Startup Config sync status:    Out of Sync

This CPU is the Active CPU.
-------------------------------
Slot:                          6
Time since CPU Initialized:    3 days, 14 hours, 48 minutes
Image Version:                 ONS-15540 Software (ONS15540-I-M), Version 12.2(1
8)SV, EARLY DEPLOYMENT RELEASE SOFTWARE (fc1)
TAC Support: http://www.cisco.com/tac
Image File:                    bootflash:ons15540-i-mz.122-18.SV
Software Redundancy State:     ACTIVE
Hardware State:                ACTIVE
Hardware Severity:             0

Peer CPU is the Standby CPU.
-------------------------------
Slot:                          7
Time since CPU Initialized:    Unknown, peer CPU not responding
```

```
Image Version:                 Unknown, peer CPU not responding
Image File (on sby-CPU):       Unknown, peer CPU not responding
Software Redundancy State:     DISABLED
Hardware State:                NOT PLUGGED IN
Hardware Severity:             0
Privilege Mode:                Enabled
```

Refer to the *Cisco ONS 15540 ESPx Configuration Guide* for the following:

- Configuring processor card redundancy
- Upgrading the software image on the redundant processor card
- Downloading the system image on the processor cards

2.10 Troubleshooting Processor Cards

This section contains troubleshooting procedures for processor card problems.

2.10.1 Active Processor Card Boot Failure

Symptom The active processor card fails to boot.

Table 2-1 describes the potential causes of the symptom and the solutions.

Table 2-1 Active Processor Card Boot Failure

Possible Problem	Solution
Auto boot not configured	Manually boot the valid system image, and then use the **config reg 0x2102** command to configure auto boot.
Invalid boot configuration	Manually boot the valid system image and check the boot system configuration. Correct the configuration if necessary.

2.10.2 Standby Processor Card Boot Failure

Symptom The standby processor card fails to boot.

Table 2-2 describes the potential causes of the symptom and the solutions.

Table 2-2 Standby Processor Card Boot Failure

Possible Problem	Solution
Auto boot not configured	Manually boot the valid system image, and then use the **config reg 0x2102** command to configure auto boot.

Table 2-2 Standby Processor Card Boot Failure

Possible Problem	Solution
Invalid boot configuration	Manually boot the valid system image and check the boot system configuration. Correct the configuration if necessary.
Peer (active) processor card reset	Issue the **show redundancy history**, **show redundancy state**, **show redundancy events, show redundancy clients,** and **show buffers** commands and provide the outputs to Cisco technical support.

2.10.3 Unable to Access Processor Card Console

Symptom The processor card console cannot be accessed.

Table 2-3 describes the potential causes of the symptom and the solutions.

Table 2-3 Unable to Access Switch Module Console

Possible Problem	Solution
Console cable	Verify that the console cable is connected properly, and replace if necessary.
Incorrect serial port setting	Check the serial port configuration, and correct the settings if necessary.

2.10.4 Unable to Access Enable Mode on Active Processor Card

Symptom The system does not allow access to the enable mode.

Table 2-4 describes the potential causes of the symptom and the solution.

Table 2-4 Unable to Access Enable Mode

Possible Problem	Solution
Password incorrect	Perform the password recovery procedure. See the "2.4 Recovering a Lost Password" section on page 2-4.

2.10.5 Unable to Access Enable Mode on Standby Processor Card

Symptom The system does not allow access to the enable mode on the standby processor card.

Table 2-4 describes the potential causes of the symptom and the solutions.

Table 2-5 Unable to Access Enable Mode on Standby Processor Card

Possible Problem	Solution
Password incorrect	Perform the password recovery procedure. See the "2.4 Recovering a Lost Password" section on page 2-4.
Password synchronization	Check the image on the active and standby processor cards, and update to the latest image if necessary. If the images are the same, issue the **show tech** and the **show log** commands and provide the outputs to Cisco technical support.
Standby privilege-mode not enabled	Enable the standby privilege-mode under redundancy configuration.

CHAPTER 3

Troubleshooting Mux/Demux Module Problems

This chapter describes how to troubleshoot mux/demux module problems. This chapter contains the following sections:

3.1 Overview

The optical mux/demux motherboards occupy slots 0 and 1 of the Cisco ONS 15540 ESPx chassis. The chassis uses one optical mux/demux motherboard for unprotected operation or two per system for protected operation. The chassis supports the following mux/demux motherboards:

- Cisco ONS 15540 ESPx mux/demux motherboard with OSC
- Cisco ONS 15540 ESPx mux/demux motherboard without OSC

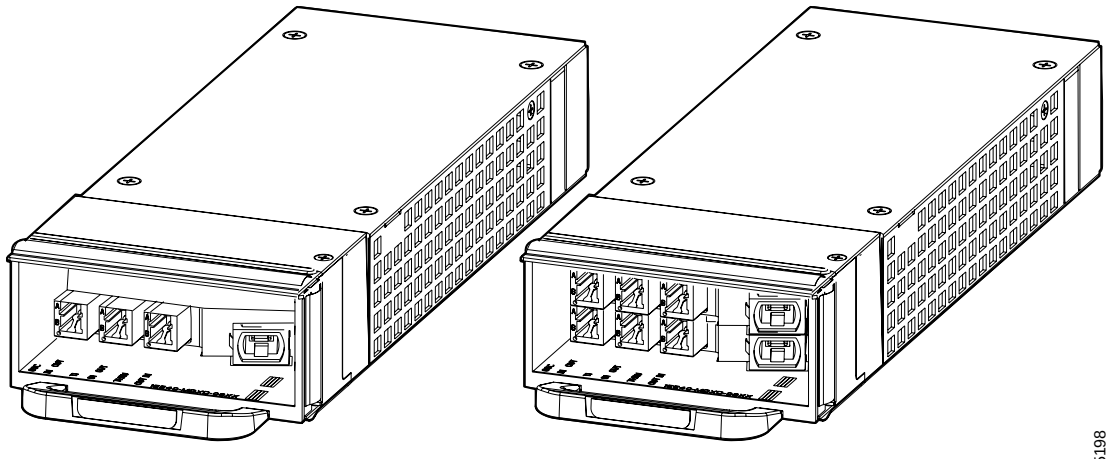
Each Cisco ONS 15540 ESPx mux/demux motherboard can accept up to four 4-channel or 8-channel mux/demux modules or one 32-channel mux/demux module. The modular mux/demux motherboards are available with or without OSC (optical supervisory channel) and can be populated according to user needs.

There are three types of mux/demux modules available:

- 4 channels
- 8 channels
- 32 channels

Channels not filtered are passed on to the next mux/demux module. (See Figure 3-1.)

Figure 3-1 4- and 8-Channel Mux/Demux Modules with OSC



One 32-channel terminal mux/demux module can be installed in slot 0 or 1 of the Cisco ONS 15540 ESPx chassis. The 32-channel terminal mux/demux module is equipped with OSC, input/output, and monitoring ports that use MU connectors. The remaining 8 ports that connect to the transponder modules use MTP connectors. The OSC is a dedicated, full duplex communication ITU-T DWDM channel for in-band management traffic. The input/output ports are trunk connections used to connect to the external fiber trunks. Monitoring ports use a one percent tap coupler (20 dB) for both the mux and demux sides and also allow you to non-obtrusively connect an OSA (optical spectrum analyzer) to monitor the incoming or outgoing DWDM signals.

3.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Check that the LEDs on the mux/demux motherboard show the proper state.
- Verify patch configuration.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

3.3 Troubleshooting Mux/Demux Module Interface Problems

This section contains troubleshooting procedures for mux/demux module interface problems.

3.3.1 OSC Wave Interface Down

Symptom The OSC wave interface is down.

Table 3-1 describes the potential causes of the symptom and the solutions.

Table 3-1 OSC Wave Interface Is Down

Possible Problem	Solution
Interface is administratively down.	Issue the **show interfaces wave** command to verify the OSC wave interface status. If it is administratively down, issue the **no shutdown** command.
Receive power level is low.	Check the receive power level from the mux/demux module. Ensure that it is between –19 dBm and –1.5 dBm.
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
The patch cables are faulty.	Check the patch cables between the OSC module and the mux/demux module for pinches or breaks. Correct any problems with the fiber.

3.3.2 Mux/Demux Module Is Not Recognized

Symptom The mux/demux module does not appear in the **show interfaces** or the **show running-config** command output.

Table 3-2 describes the potential cause of the symptom and the solution.

Table 3-2 Mux/Demux Module Not Recognized

Possible Problem	Solution
Mux/demux module is not inserted properly.	Remove and carefully reinsert the mux/demux module. Issue the **show interfaces** command, the **show hardware** command, or the **show running-config** command to ensure the mux/demux channel interfaces are up.

3.3.3 Mux/Demux Filter Interfaces Are Not Recognized After a Processor Card Switchover

Symptom Mux/demux filter interfaces are not recognized after a processor card switchover.

Table 3-3 describes the potential cause of the symptom and the solution.

Table 3-3 Mux/Demux Channel Interfaces Not Recognized After Switchover

Possible Problem	Solution
Mux/demux module IDPROM not programmed correctly.	Issue the **show running-config** command to verify mux/demux filter interfaces are present. Repeat on the standby side. If the interfaces are not present, call Cisco customer support.

3.3.4 Mux/Demux Traffic Degrades or Fails

Symptom Mux/demux traffic degrades or fails.

Table 3-4 describes the potential cause of the symptom and the solution.

Table 3-4 Mux/Demux Traffic Degrades or Fails

Possible Problem	Solution
CPU power loss. Both CPUs are down. A power failure significantly reduces the power at the receiver because the passband of the arrayed wavelength grating (AWG) filter is temperature sensitive.	Investigate the CPU power failure. For more information on CPU troubleshooting, see Chapter 2, “Troubleshooting Processor Card Problems.”

CHAPTER 4

Troubleshooting PSM Problems

This chapter describes how to troubleshoot PSM problems. This chapter contains the following sections:

4.1 Overview

The PSM (protection switch module) provides trunk fiber protection for Cisco ONS 15540 ESPx systems configured in point-to-point topologies. The PSM sends the signal from a mux/demux module or a transponder module to both the west and east directions. It receives both the west and east signals and selects one to send to the mux/demux module or the transponder module. When a trunk fiber cut occurs on the active path, the PSM switches the received signal to the standby path. The PSM can protect up to 32 data channels and the OSC.

The PSM also has an optical monitor port for testing the west and east receive signals. This port samples one percent of the receive signals that can be monitored with an optical power meter.

4.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Check that the LEDs on the cards show the proper state.
- Verify patch configuration.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

4.3 Troubleshooting PSM Interface Problems

This section contains troubleshooting procedures for PSM interface problems.

4.3.1 Wdmsplit Interface Down

Symptom The wdmsplit interface is down.

Table 4-1 describes the potential causes of the symptom and the solutions.

Table 4-1 Wdmsplit Interface Is Down

Possible Problem	Solution
Interface administratively shut down.	Issue the **show interfaces wdmsplit** command to ensure the interface is active. If necessary, issue the **no shutdown** command to activate the interface.
Incoming power level is out of range.	Use a power meter to check the receive power level from the remote node. Issue the **show interfaces wdmsplit** command to verify the power level is within range.
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

4.3.2 Wdmsplit Interface Power Level Indicates Loss of Light

Symptom The wdmsplit interface is down and shows Loss of Light.

Table 4-2 describes the potential causes of the symptom and the solutions.

Table 4-2 Wdmsplit Interface Power Level Indicates Loss of Light

Possible Problem	Solution
Incorrect cable connection.	Verify that the optical cables are connected correctly.
Incoming power level is low.	Issue the **show interfaces wdmsplit** command to verify the receive power level is within range.
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

4.3.3 Wdmsplit Interface Receives Light But End Wave Interface Shows Loss of Light

Symptom The wdmsplit interface receives light but the end wave interface shows Loss of Light.

Table 4-3 describes the potential causes of the symptom and the solutions.

Table 4-3 Wdmsplit Interface Receives Light But End Wave Interface Shows Loss of Light

Possible Problem	Solution
The patch between the wdmrelay interface and the wdm or wavepatch interface is incorrect.	Issue the **show patch** and **show interfaces wdm** commands to verify that the patch is correctly configured.
The patch between the mux/demux module and the line card motherboard of the transponder is incorrect.	Verify that the patch cables are connected correctly between the mux/demux module and the line card motherboard.
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

4.3.4 Wdm Interface Loses Topology Neighbor Learning Via CDP

Symptom The wdm interface loses topology neighbor learning through CDP after the patch between the wdmrelay and wdm interfaces is configured.

Table 4-4 describes the potential cause of the symptom and the solution.

Table 4-4 Wdm Interface Loses Topology Neighbor Learning Via CDP

Possible Problem	Solution
The patch between the wdmrelay interface and the wdm or wavepatch interface is incorrect.	Issue the **show patch** and **show interfaces wdm** commands to verify that the patch is correctly configured. Once this patch is configured, the trunk side interface is no longer an edge interface so topology learning through CDP is disabled.

4.3.5 Automatic CDP Learning Is Not Enabled on Wdmsplit Interface

Symptom Automatic CDP learning is not enabled on the wdmsplit interfaces after a patch between the wdmrelay and wdm interfaces is configured.

Table 4-5 describes the potential cause of the symptom and the solution.

Table 4-5 Automatic CDP Learning Is Not Enabled on Wdmsplit Interface

Possible Problem	Solution
N/A	Neighbor information must be manually configured. Topology learning through CDP is not supported on wdmsplit interfaces.

CHAPTER 5

Troubleshooting 2.5-Gbps Transponder Module Problems

This chapter describes how to troubleshoot 2.5-Gbps transponder module problems. This document contains the following sections:

5.1 Overview

The 2.5-Gbps transponder module on the Cisco ONS 15540 ESPx converts the client signal to an ITU-compliant wavelength, which is cross-connected over the optical backplane to the mux/demux modules. A single system can hold up to eight 2.5-Gbps line card motherboards, each of which accepts four 2.5-Gbps transponder modules.

There are two types of 2.5-Gbps line card motherboards, splitter and nonsplitter.

The 2.5-Gbps line card motherboards support three types of transponder modules: SM (single-mode), MM (multimode), and Type 2 extended range with SFP optics.

The client interfaces on the SM transponder modules and MM transponder modules are protocol transparent and bit-rate transparent, and accept either single-mode or multimode client signals on the 1310-nm wavelength through SC connectors. The multimode transponder module supports 62.5 µm MM, 50 µm MM, and 9 or 10 µm SM fiber; the single-mode transponder module supports 50 µm MM fiber and 9 or 10 µm SM fiber.

The Type 2 extended range transponder module accepts two types of SFP optics:

- Fixed rate
- Variable rate

Fixed rate SFP optics modules support specific protocols. Variable rate SPF optics modules support a range of clock rates. For detailed information about interface configuration, refer to the *Cisco ONS 15540 ESPx Configuration Guide.* For information on transceiver specifications, refer to the *Cisco ONS 15540 ESPx Hardware Installation Guide*.

5.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Ensure encapsulation is set correctly.
- Enable monitoring if needed or supported.
- Ensure transparent, wave, and wavepatch interfaces are administratively up.
- Check that the receive signal power level on the trunk side is between –28 dBm and –8 dBm.
- Check that the receive signal power level on the client side is between –19 dBm and 1.5 dBm for the SM transponder module, –25 dBm and –8 dBm for the MM transponder module, and –28 dBm and –8 dBm for Type 2 extended range transponder module.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
- Ensure that the MTP connectors are firmly connected to the mux/demux module and to the line card motherboard.
- If you are using the cross connect drawer, ensure that the MU connectors are firmly connected.
- Issue **show interfaces** commands to ensure that the transparent, wave, and wavepatch interfaces are administratively up, that there are no errors on the interfaces, and that the ITU laser is powered up.
- Issue the **show connect** command to verify the status of the cross connections to the aggregation cards.
- Check that the LEDs on the cards show the proper state.
- Issue the **show facility-alarm status** command to display the alarms on the interfaces.
- Check that the transponder modules are patched to the correct mux/demux module ports. Issue the **show patch** command to verify that there are no frequency mismatches.

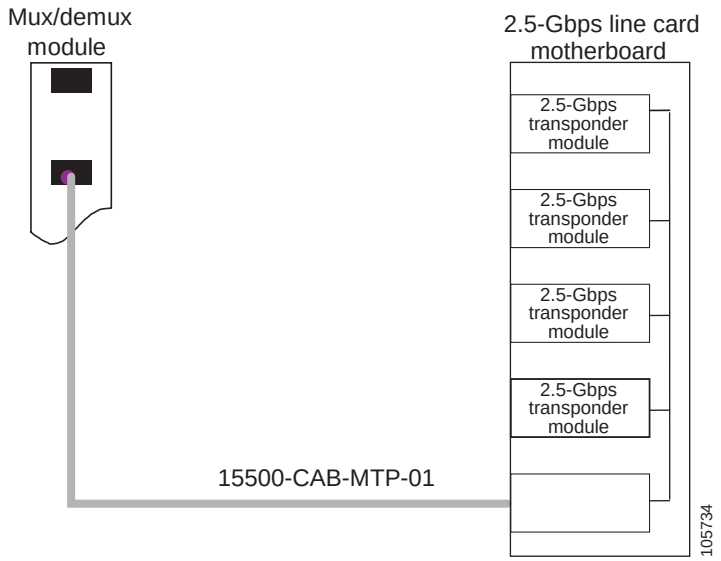
5.3 Cabling the 2.5-Gbps Transponder Module

Correctly connecting the 2.5-Gbps transponder module is very important to avoid problems. You can connect the 2.5-Gbps transponder module to a mux/demux module either directly using an MTP-to-MTP cable or through the cross connect drawer using MTP-to-8-MU cables.

5.3.1 Direct Cabling Using MTP-to-MTP Cables

The MTP-to-MTP cable for the 2.5-Gbps line card motherboard is the 15500-CAB-MTP-01 (blue) cable. Use it to directly connect the 2.5-Gbps transponder modules to the mux/demux module. See Figure 5-1.

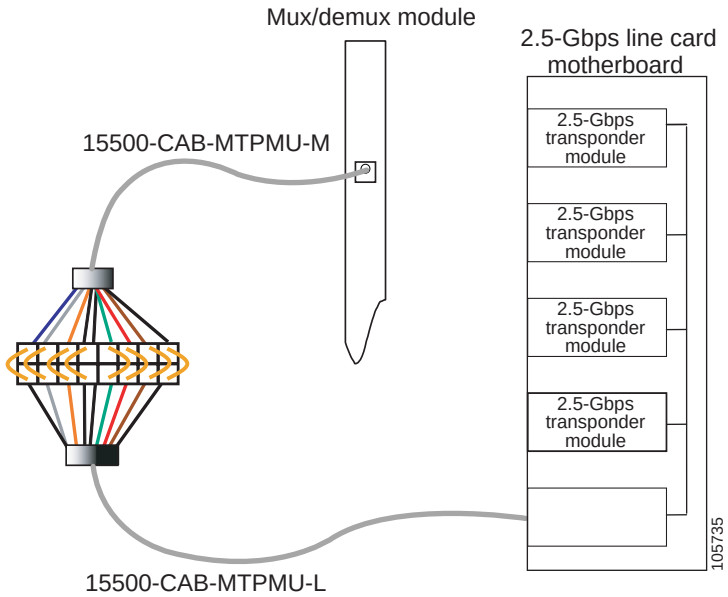
Figure 5-1 MTP-to-MTP Cabling Example



5.3.2 Cross Connect Drawer Cabling Using MTP-to-8-MU Cables

The MTP-to-8-MU cables for the 2.5-Gbps line card motherboard are the 15500-CAB-MTPMU-M (grey) and the 15500-CAB-MTPMU-L (green) cables. Figure 5-2 shows an example of how to connect the 2.5-Gbps line card motherboard to the cross connect drawer.

Figure 5-2 Cross Connect Drawer Cabling Using MTP-to-8-MU Cables



5.4 Troubleshooting 2.5-Gbps Transponder Module Interface Problems

This section contains troubleshooting procedures for 2.5-Gbps transponder module interface problems.

5.4.1 Transponder Module Not in show hardware Command Output

Symptom Transponder module is not listed in the **show hardware** command output.

Table 5-1 describes the potential causes of the symptom and the solutions.

Table 5-1 Transponder Module Not in show hardware Command Output

Possible Problem	Solution
Transponder module is not seated properly.	Reseat the transponder module. Issue the **show hardware detail** command to verify the SFP is recognized and the correct type.
Incompatible software.	Verify the software supports the hardware being used.
Bad transponder module.	Replace the transponder module.

5.4.2 Wave Interface Is Down and Shows Loss of Light

Symptom The wave interface is down and shows Loss of Light.

Table 5-2 describes the potential causes of the symptom and the solutions.

Table 5-2 Wave Interface Is Down and Shows Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces wave** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output. Verify that the cable connections are correct.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Incoming power level is low.	Inspect the receive cable and clean if necessary. Remove unnecessary attenuation between the two nodes.

5.4.3 Transparent Interface Is Down and Shows Loss of Light

Symptom The transparent interface is down and shows Loss of Light.

Table 5-3 describes the potential causes of the symptom and the solutions.

Table 5-3 Transparent Interface Down and Shows Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces transparent** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output. Verify that the correct cable type (SM/MM) is being used.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.4 Active Wavepatch Interfaces Down Due to Loss of Light

Symptom The active wavepatch interfaces are down due to Loss of Light.

Table 5-4 describes the potential causes of the symptom and the solutions.

Table 5-4 Wavepatch Interfaces Down Due to Loss of Light

Possible Problem	Solution
Incorrect cable connection or mismatch of laser frequency.	Issue the **show interfaces wave** command to ensure the laser frequency is as desired and verify that no mismatch is present in the **show patch** command output.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Incoming power level is low.	Use a power meter to check the power level from the client to the transponder module.

5.4.5 Wave Interface Shows Loss of Lock

Symptom The wave interface shows Loss of Lock.

Table 5-5 describes the potential causes of the symptom and the solutions.

Table 5-5 Wave Interface Shows Loss of Lock

Possible Problem	Solution
Incorrect encapsulation or clock rate.	Issue the **show interfaces wave** command to verify that the correct encapsulation and clock rate are configured and monitoring is enabled if needed.
Remote client reporting errors.	Issue the **show interfaces transparent** command on the remote system to verify that the remote client interface is not reporting errors.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.6 Transparent Interface Shows Loss of Lock

Symptom The transparent interface shows Loss of Lock.

Table 5-6 describes the potential causes of the symptom and the solutions.

Table 5-6 Wave Interface Shows Loss of Lock

Possible Problem	Solution
Incorrect encapsulation or clock rate.	Issue the **show interfaces transparent** command to verify that the correct encapsulation and clock rate are configured and monitoring is enabled if needed.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.7 Interface Shows Loss of Sync

Symptom The wave or transparent interface shows Loss of Sync.

Table 5-7 describes the potential causes of the symptom and the solutions.

Table 5-7 Interface Shows Loss of Sync

Possible Problem	Solution
Remote client reporting errors.	Issue the **show interfaces transparent** command on the remote system to verify that the remote client interface is not reporting errors.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.8 Interface Shows Loss of Frame

Symptom The wave or transparent interface shows Loss of Frame (applies to SONET/SDH encapsulations only).

Table 5-8 describes the potential causes of the symptom and the solutions.

Table 5-8 Interface Shows Loss of Frame

Possible Problem	Solution
Incorrect encapsulation.	Issue the **show interfaces** command to verify that the correct encapsulation is configured and monitoring is enabled if needed.
Excessive attenuation.	Use a power meter to ensure that the receive power level is within specifications for that interface. Reduce the attenuation as needed.

Table 5-8 Interface Shows Loss of Frame

Possible Problem	Solution
Overload (high receive power).	Use a power meter to ensure that the receive power level is within specifications for that interface. Attenuate the receive path as needed.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*

5.4.9 Active Wavepatch Interfaces Down Due to Low Alarm

Symptom The active wavepatch interfaces are down due to low alarm.

Table 5-9 describes the potential causes of the symptom and the solutions.

Table 5-9 Active and Standby Wavepatch Interfaces Down Due to Low Alarm

Possible Problem	Solution
Excessive attenuation.	Use a power meter to ensure that the receive power level is within specifications for that interface.
Optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document.*
Optical threshold is exceeded.	Issue the **show interfaces wavepatch** command to verify that the receive power is within the threshold range.

5.4.10 Unable to Configure Protocol Encapsulation or Clock Rate

Symptom The CLI (command-line interface) rejects the protocol encapsulation or clock rate for the transparent interface.

Table 5-10 describes the potential cause of the symptom and the solution.

Table 5-10 Protocol Encapsulation or Clock Rate Not Configurable for the Wave Interface

Possible Problem	Solution
Incorrect transponder module.	Verify that you have the correct type of transponder module, either SM or MM. If not, replace it with the correct transponder module.
Incorrect SFP.	Verify that the correct SFP is installed in the transponder module.

5.5 Troubleshooting 2.5-Gbps Transponder Module Problems Using Loopbacks

This section describes how to perform fault isolation on 2.5-Gbps transponder modules using the following types of loopbacks:

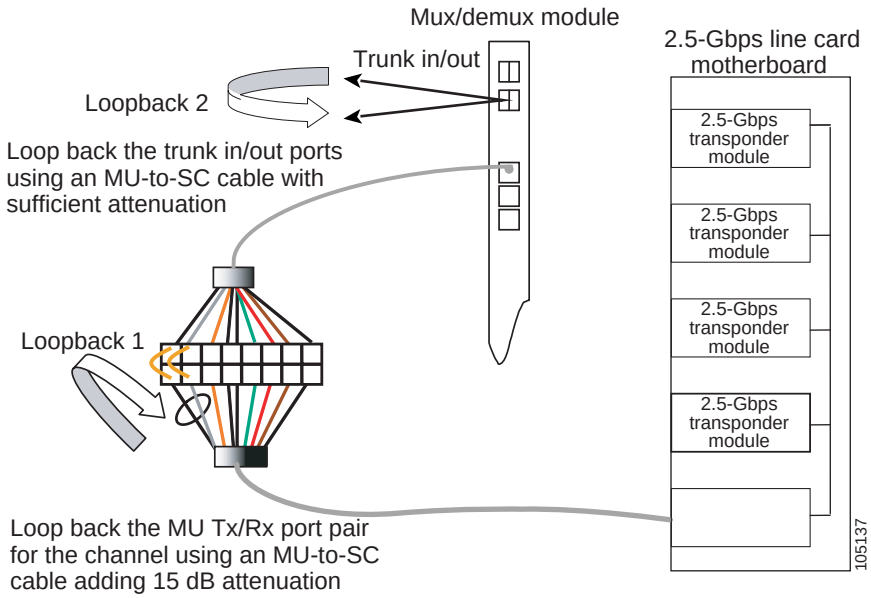
- Physical fiber loopbacks

- Client signal software loopbacks
- Trunk software loopbacks

5.5.1 Physical Fiber Loopbacks

You can use physical fiber loopbacks at various places to check the connectivity and isolate a bad or dirty fiber. Using an SC-to-MU cable with a 15 dB attenuator, you can set up a loopback in the cross connect drawer for the MU pair of the channel being verified. This ensures that the connectivity between the 2.5-Gbps transponder module through the 2.5-Gbps line card motherboard onto the MTP-to-8-MU fiber is good (see Loopback 1 in the example in Figure 5-3). You can also loop back the multiplexed trunk fiber coming out of the trunk port in/out interfaces of the mux/demux module. This loopback verifies the connectivity from the 2.5-Gbps transponder module through the cross connect drawer and the mux/demux module (see Loopback 2 in the example in Figure 5-3).

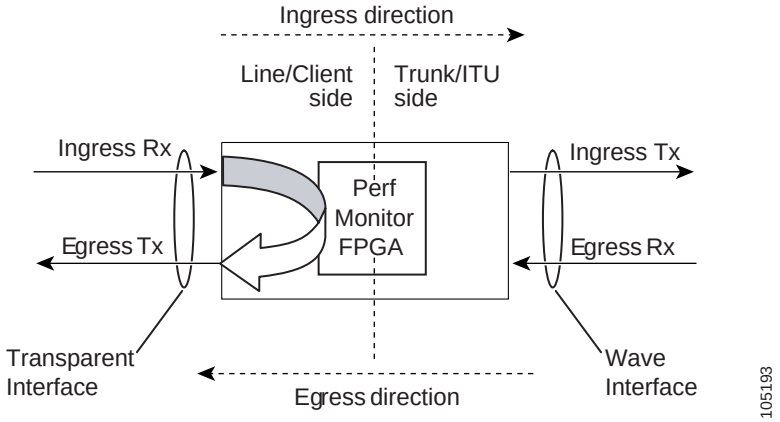
Figure 5-3 Physical Fiber Loopback Examples



5.5.2 Client Signal Software Loopbacks

A client signal software loopback verifies the functioning between the client equipment and the 2.5-Gbps transponder module (see Figure 5-4).

Figure 5-4 Client Signal Loopback Example on a 2.5-Gbps Transponder Module



Procedure: Create a Client Signal Software Loopback

Step 1 Issue a **loopback** command on the transparent interface.

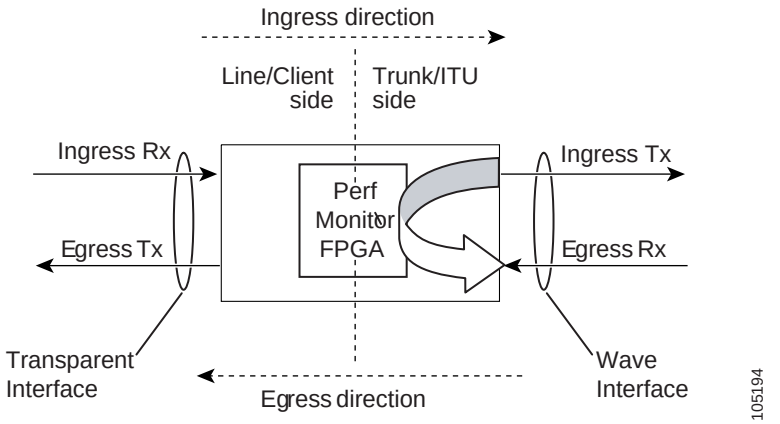
Step 2 Check that the signal reaches the local client equipment.

Step 3 If the signal does not reach the local client equipment, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.

5.5.3 Trunk Software Loopbacks

A trunk software loopback verifies the functioning of the 2.5-Gbps transponder module on the trunk side (see Figure 5-5). With this feature, you can verify the communication between two 2.5-Gbps transponder modules.

Figure 5-5 Trunk Side Loopback Example on a 2.5-Gbps Transponder Module



Procedure: Create a Trunk Software Loopback

Step 1 Issue a **loopback** command on the wave interface.

Step 2 Check that the signal reaches the system at the far end.

Step 3 If the signal does not reach the far end, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.

CHAPTER 6

Troubleshooting 10-GE Transponder Module Problems

This chapter describes how to troubleshoot 10-GE transponder module problems. This document contains the following sections:

6.1 Overview

The 10-GE transponder module on the Cisco ONS 15540 ESPx implements the 10GBASE-LR IEEE 802.3ae standard. It supports connections to a Cisco ONS 15530 1310-nm 10-Gbps uplink card acting as a downlink and connections to a native 10GBASE-LR or a 10GBASE-ER IEEE 802.3ae MAC implementation. The 10-GE transponder module has one short reach 1310-nm laser on the client side and an ITU DWDM 1550-nm laser at the trunk side.

The 10-Gbps line card motherboard has two half-sized subslots that can accommodate two 10-GE transponder modules. There are two types of 10-Gbps line card motherboards, splitter and nonsplitter.

Figure 6-1 shows the architecture of the 10-GE transponder module.

Figure 6-1 10-GE Transponder Module Architecture

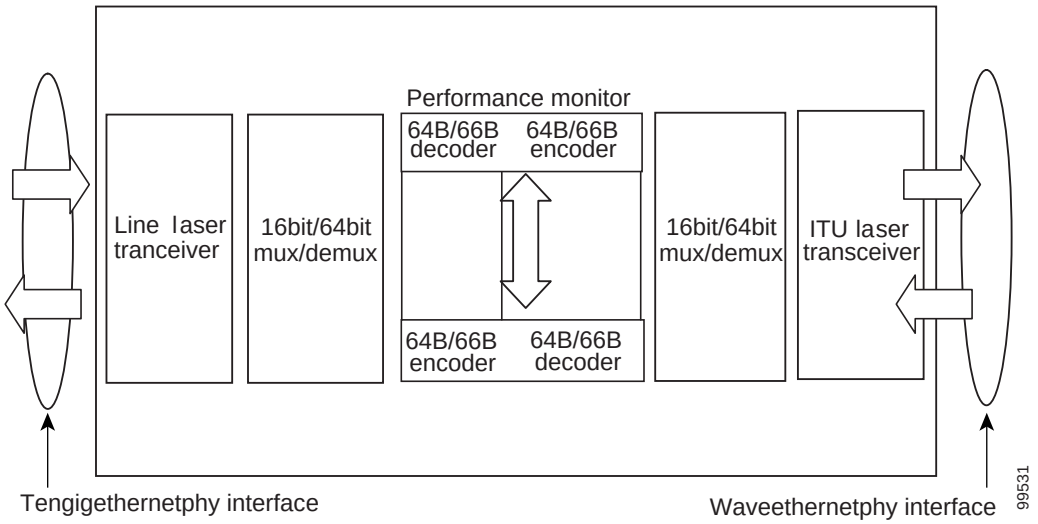
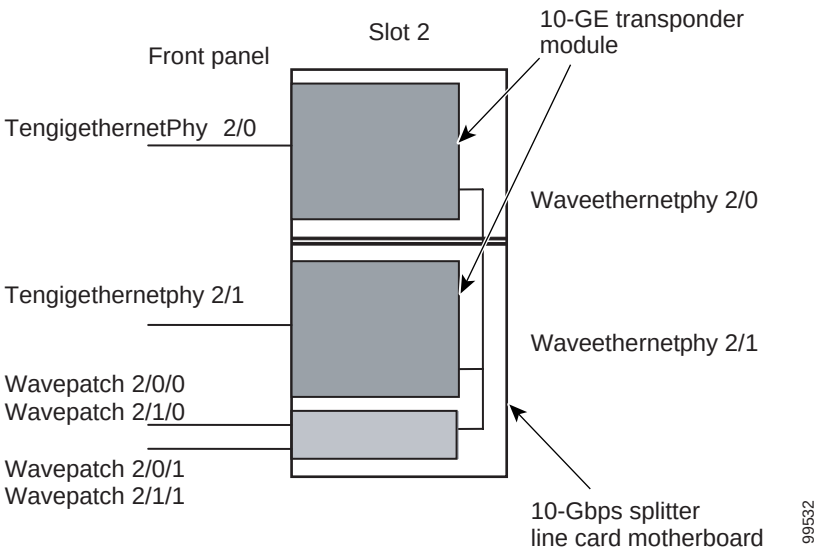


Figure 6-2 shows an example of the interfaces for the 10-GE transponder module and the splitter 10-Gbps line card motherboard.

Figure 6-2 10-GE Transponder Module and 10-Gbps Splitter Line Card Motherboard Interfaces



Note The 10-Gbps nonsplitter line card motherboard has only two wavepatch interfaces, wavepatch *slot*/0/0 and wavepatch *slot*/1/0.

6.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Check that the receive signal power level on the trunk side is between –22 dBm and –8 dBm.
- Check that the receive signal power level on the client side is between –13.23 dBm and 0.5 dBm.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
- Ensure that the MTP connectors are firmly connected to the mux/demux module and to the 10-Gbps line card motherboard.
- If you are using the cross connect drawer, ensure that the MU connectors are firmly connected.
- Issue **show interfaces** commands to ensure that the tengigethernetphy, waveethernetphy, and wavepatch interfaces are administratively up, that there are no errors on the interfaces, and that the ITU laser is powered up.
- Issue the **show connect** command to verify the status of the cross connections to the aggregation cards.
- Check that the LEDs on the cards show the proper state.
- Issue the **show facility-alarm status** command to display the alarms on the interfaces.
- Check that the 10-GE transponder modules are patched to the correct mux/demux module ports. Issue the **show patch** command to verify that there are no frequency mismatches.

6.3 Cabling the 10-GE Transponder Module

Correctly connecting the 10-GE transponder module is very important to avoid problems. You can connect the 10-GE transponder module to a mux/demux module either directly using an MTP-to-MTP cable or through the cross connect drawer using an MTP-to-4-MU cable.

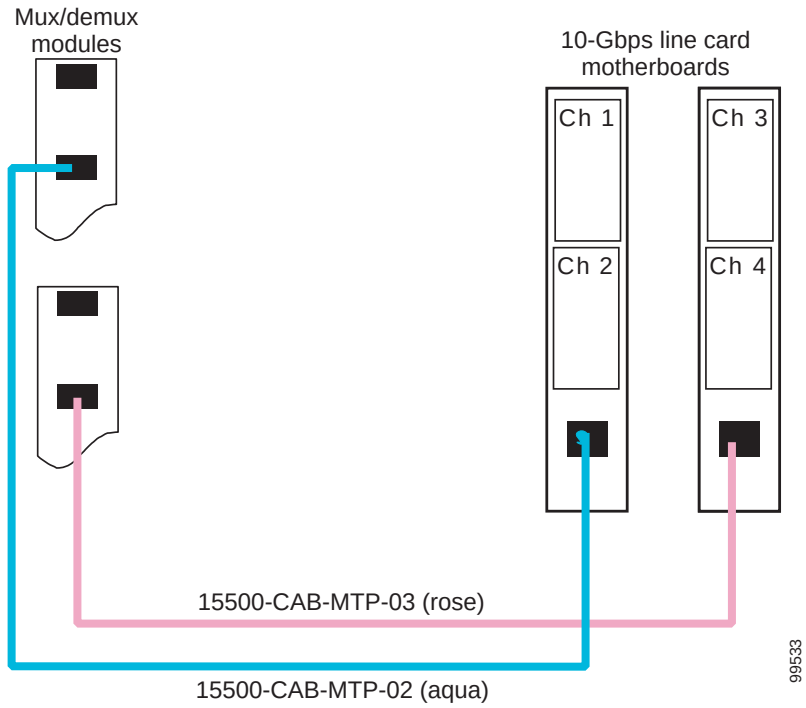
Unlike the 2.5-Gbps line card motherboard, which can accommodate four 2.5-Gbps transponder modules, the 10-Gbps line card motherboard accommodates only two 10-GE transponder modules. To support the10-Gbps line card motherboards, there are two versions of each type of cable, one for the first two channels (lower channels) in the band and one for the last two channels (higher channels) in the band.

6.3.1 Direct Cabling Using MTP-to-MTP Cables

The MTP-to-MTP cables for the 10-Gbps line card motherboard are the 15500-CAB-MTP-02 (aqua) and the 15500-CAB-MTP-03 (rose) cables. Use the aqua colored cable to directly connect the lower channel 10-GE transponder modules to the mux/demux module. Use the rose colored cable to directly connect a higher channel 10-GE transponder module to the mux/demux module.

Figure 6-3 shows the aqua colored cable connecting a lower channel 10-GE transponder module (for example, channels 1/2, 5/6, 9/10, 13/14, 17/18, 21/22, 25/26, or 29/30) and the rose colored cable connecting a higher channel 10-GE transponder module (for example, channels 3/4, 7/8, 11/12, 15/16, 19/20, 23/24, 27/28, or 31/32).

Figure 6-3 MTP-to-MTP Cabling Example

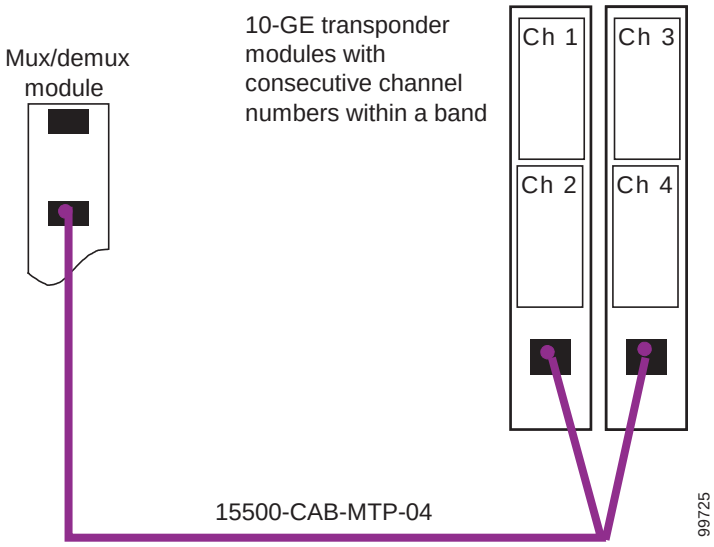


Note The 10-GE transponder modules must be in increasing order in the 10-Gbps line card motherboard for these connections to function correctly. Be sure that the modules supporting the first channel in the channel pair is in the top subslot and the module supporting the second channel in the channel pair is in the bottom subslot.

6.3.2 Direct Cabling Using MTP-to-2-MTP Cables

The MTP-to-2-MTP cable can be used to directly connect two 10-Gbps line card motherboards to a mux/demux module. Use this cable when you want to connect two 10-Gbps line card motherboards, containing four transponder modules supporting consecutive channels in the band, to a mux/demux module. Figure 6-5 shows an example of how you can connect two 10-Gbps line card motherboard to one mux/demux module with an MTP-to-2-MTP cable.

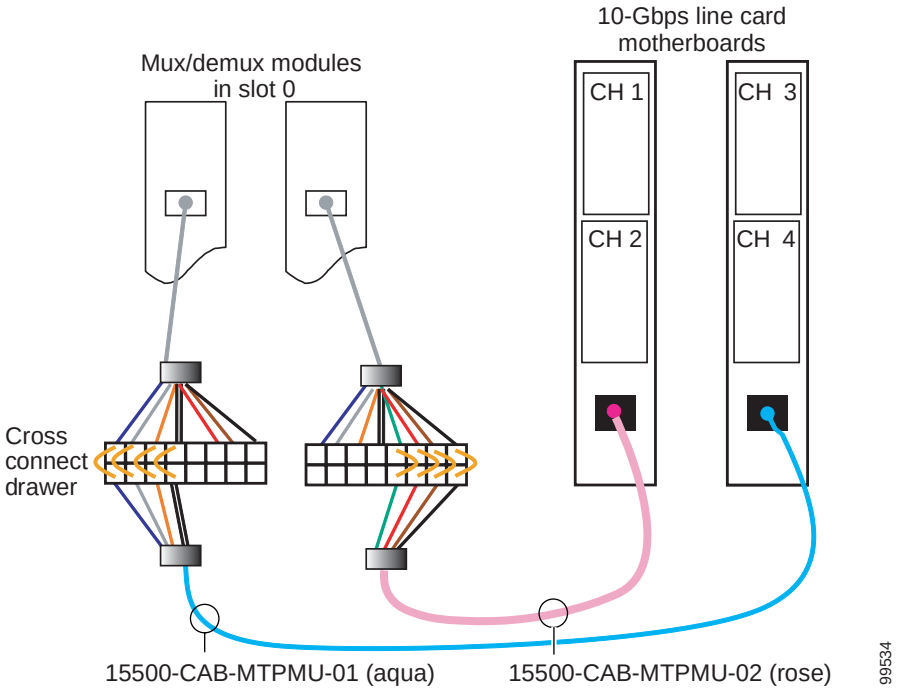
Figure 6-4 MTP-to-2-MTP Cabling Example



6.3.3 Cross Connect Drawer Cabling Using MTP-to-4-MU Cables

The MTP-to-4-MU cables for the 10-Gbps line card motherboard are the 15500-CAB-MTPMU-1 (aqua) and the 15500-CAB-MTPMU-2 (rose) cables. Figure 6-5 shows an example of how you can connect the 10-Gbps line card motherboard to the cross connect drawer.

Figure 6-5 Connecting 10-Gbps Line Card Motherboard to the Cross Connect Drawer



6.4 Troubleshooting 10-GE Transponder Module Interface Problems

This section contains troubleshooting procedures for 10-GE transponder module interface problems.

You can use the 10-GE transponder module on the Cisco ONS 15540 ESPx to connect to native IEEE 802.3ae 10-GE interfaces on the Catalyst 6500, the Catalyst 7600, or the Cisco Gigabit Switch Routers. You can also connect to a 1310-nm 10-Gbps uplink card on a Cisco ONS 15530. The CDL channel should be disabled on the tengigethernetphy interfaces on the 10-GE transponder module while connecting to the native IEEE 802.3ae interfaces and then enabled while connecting to the 10-Gbps uplink card (see Figure 6-6 and Figure 6-7).

Figure 6-6 Connecting to Native IEEE 802.3ae 10-GE Interfaces

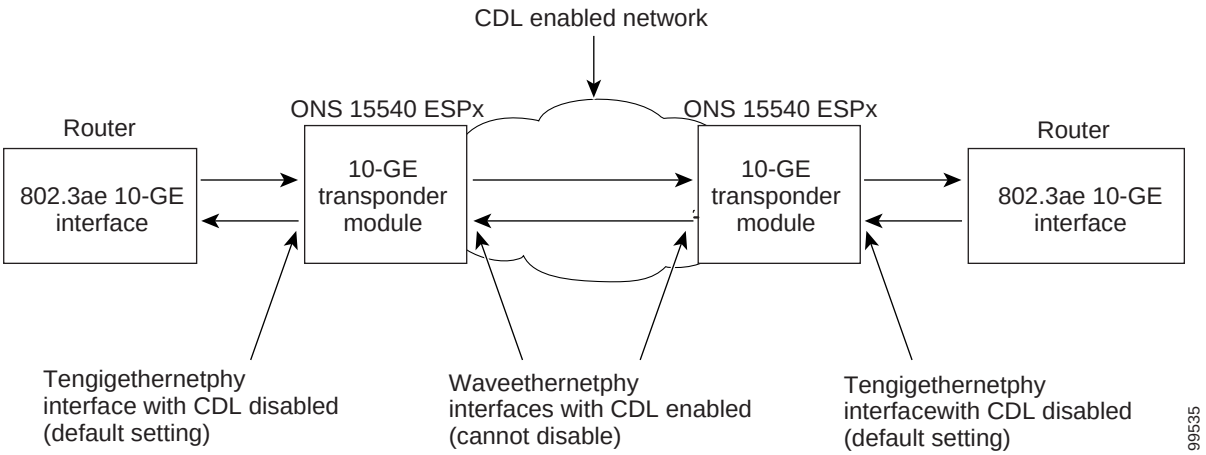
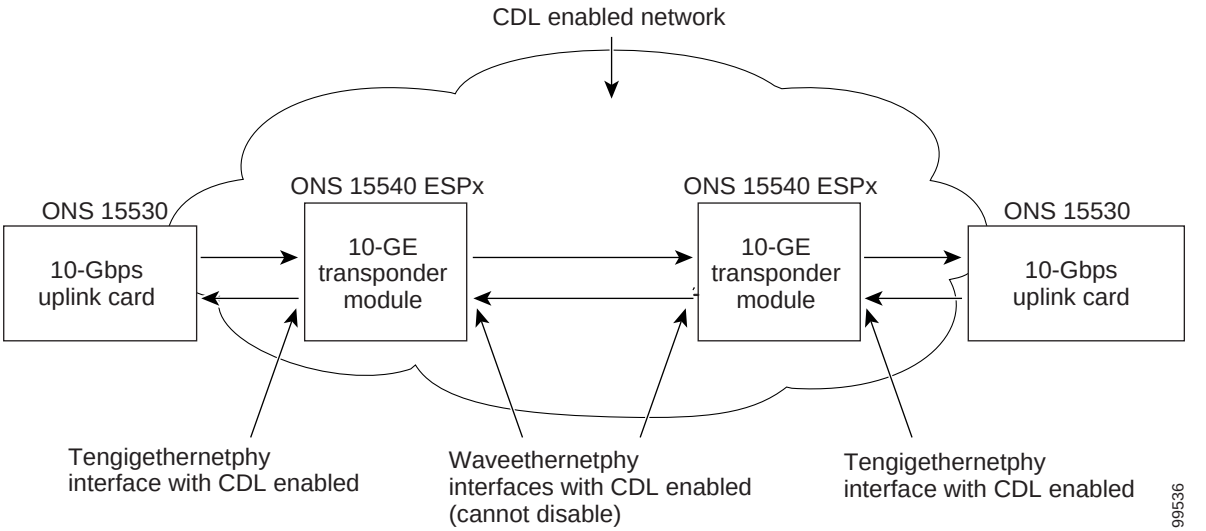


Figure 6-7 Connecting to Cisco ONS 15530 Systems



Make sure the tengigethernetphy and waveethernetphy interfaces are not administratively shut down and that the laser is turned on. Use the **no shutdown** and **no laser shutdown** commands in interface configuration mode to enable the interface and turn on the laser before troubleshooting any problems.

6.4.1 Tengigethernetphy Interface Down and Shows Loss of Lock

Symptom A tengigethernetphy interface is down and signal quality status shows Loss of Lock.

Table 6-1 describes the potential causes of the symptom and the solutions.

Table 6-1 Waveethernetphy Interface Down and Shows Loss of Lock

Possible Problem	Solution
The optical connectors connecting the 10-GE transponder module and the client equipment are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
The client signal power is too low or too high.	Check the signal power received from the client equipment. Ensure that it is between –13.23 dBm and 0.5 dBm. If not, adjust the attenuation as follows: • Using an SC-to-SC single mode fiber with a 5 dB attenuator, connect the Tx of the 10-GE transponder module to the Rx of the client equipment. • Check that the interface comes up with a good signal quality. • Verify that the client Tx and Rx LEDs are on.
The remote peer is not transmitting a signal.	Ensure that the remote peer signal is enabled and is transmitting light.

6.4.2 Waveethernetphy Interface Down and Shows Loss of Lock

Symptom A waveethernetphy interface is down and signal quality status shows Loss of Lock.

Table 6-2 describes the potential causes of the symptom and the solutions.

Table 6-2 Waveethernetphy Interface Down and Shows Loss of Lock

Possible Problem	Solution
The patch cables are incorrectly connected to the mux/demux module.	Check the patch error status in the **show patch** command output. If it shows a mismatch, correct the patch on the 10-GE transponder module to the correct ports on the mux/demux module.
The optical connectors connecting the mux/demux modules and the line card motherboards are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
The ITU signal power is too low or too high.	Check the signal power received from the mux/demux module. Ensure that it is between –22 dBm and –6 dBm. If not, adjust the attenuation.
The trunk fiber is broken.	Check the signal power received from the trunk. If it is below –22 dBm, check for trunk fiber breaks.
The remote peer is not transmitting a signal.	Ensure that the remote peer signal is enabled and is transmitting light.

6.4.3 Waveethernetphy Interface Down and Shows Loss of Sync

Symptom A waveethernetphy interface is down and signal quality status shows Loss of Sync.

Table 6-3 describes the potential causes of the symptom and the solutions.

Table 6-3 Waveethernetphy Interface Down and Shows Loss of Sync

Possible Problem	Solution
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
The ITU signal power is too low.	Check the signal power received from the mux/demux module. Ensure that it is between –22 dBm and –6 dBm. If not, adjust the attenuation.

6.4.4 Ethernetdcc Interface Down

Symptom The ethernetdcc interface is down and pings across the interface fail.

Table 6-4 describes the potential causes of the symptom and the solutions.

Table 6-4 Ethernetdcc Interface Down

Possible Problem	Solution
The local ethernetdcc interface is administratively shut down.	Use the **show interfaces** command to determine the administrative status of the local ethernetdcc interface. If it is administratively shut down, use the **no shutdown** command to bring it up.
The remote peer ethernetdcc interface is administratively shut down.	Use the **show interfaces** command to determine the administrative status of the remote ethernetdcc interface. If it is administratively shut down, use the **no shutdown** command to bring it up.

6.4.5 Tengigethernetphy Interface Shows CVRD Errors

Symptom A tengigethernetphy interface shows code violation and running disparity (CVRD) errors.

Note Errors on the tengigethernetphy interface propagate to the remote waveethernetphy interface.

Table 6-5 describes the potential causes of the symptom and the solutions.

Table 6-5 Tengigethernetphy Interface Shows CVRD Errors

Possible Problem	Solution
The optical connectors connecting the 10-GE transponder module and the client equipment are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
The client signal power is too low or too high.	Check the signal power received from the client equipment. Ensure that it is between –13.23 dBm and 0.5 dBm. If not, adjust the attenuation as follows: • Using an SC-to-SC single mode fiber with a 5 dB attenuator, connect the Tx of the 10-GE transponder module to the Rx of the client equipment. • Check that the interface comes up with a good signal quality. • Verify that the client Tx and Rx LEDs are on.

6.4.6 Waveethernetphy Interface Shows CVRD Errors

Symptom A waveethernetphy interface shows CVRD errors.

Table 6-6 describes the potential cause of the symptom and the solution.

Table 6-6 Waveethernetphy Interface Shows CVRD Errors

Possible Problem	Solution
The optical connectors connecting the mux/demux modules and the line card motherboards are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

6.5 Troubleshooting 10-GE Transponder Module Problems Using Loopbacks

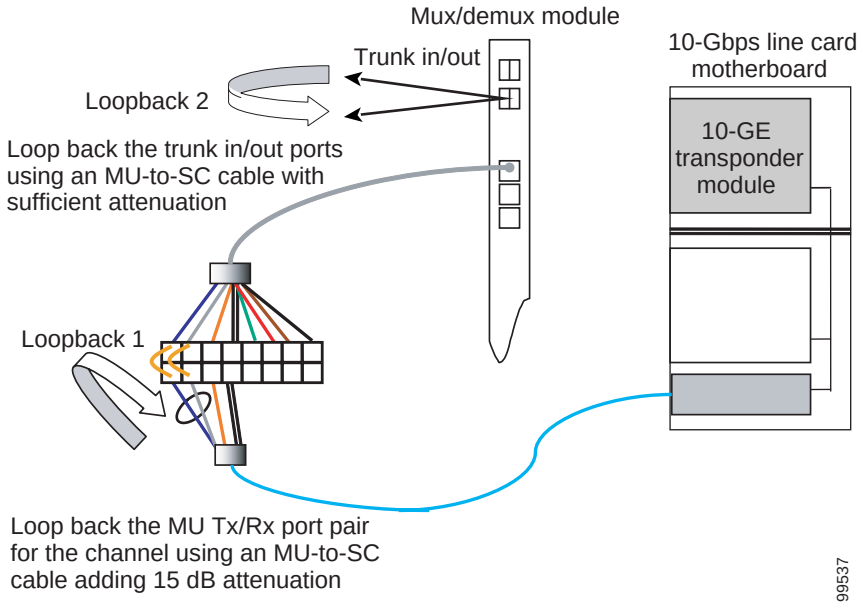
This section describes how to perform fault isolation on 10-GE transponder modules using the following types of loopbacks:

- Physical fiber loopbacks
- Client signal software loopbacks
- Trunk software loopbacks

6.5.1 Physical Fiber Loopbacks

You can use physical fiber loopbacks at various places to check the connectivity and isolate a bad or dirty fiber. Using an SC-to-MU cable with a 15 dB attenuator, you can set up a loopback in the cross connect drawer for the MU pair of the channel being verified. This ensures that the connectivity between the 10-GE transponder module through the 10-Gbps line card motherboard onto the MTP-to-4-MU fiber is good (see Loopback 1 in the example in Figure 6-8). You can also loop back the multiplexed trunk fiber coming out of the trunk port in/out interfaces of the mux/demux module. This loopback verifies the connectivity from the 10-GE transponder module through the cross connect drawer and the mux/demux module (see Loopback 2 in the example in Figure 6-8).

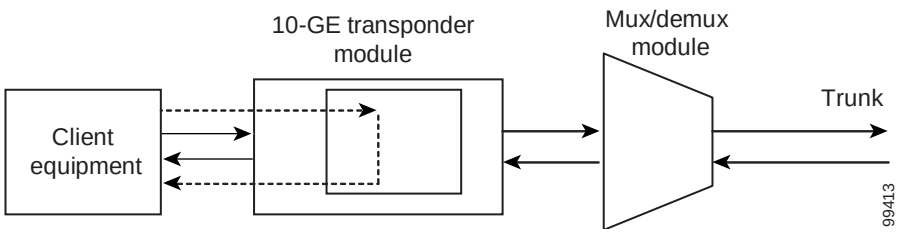
Figure 6-8 Physical Fiber Loopback Examples



6.5.2 Client Signal Software Loopbacks

A client signal software loopback verifies the functioning between the client equipment and the 10-GE transponder module (see Figure 6-9).

Figure 6-9 Client Signal Loopback Example on a 10-GE Transponder Module



Procedure: Create a Client Signal Software Loopback

Step 1 Issue a **loopback** command on the tengigethernetphy interface.

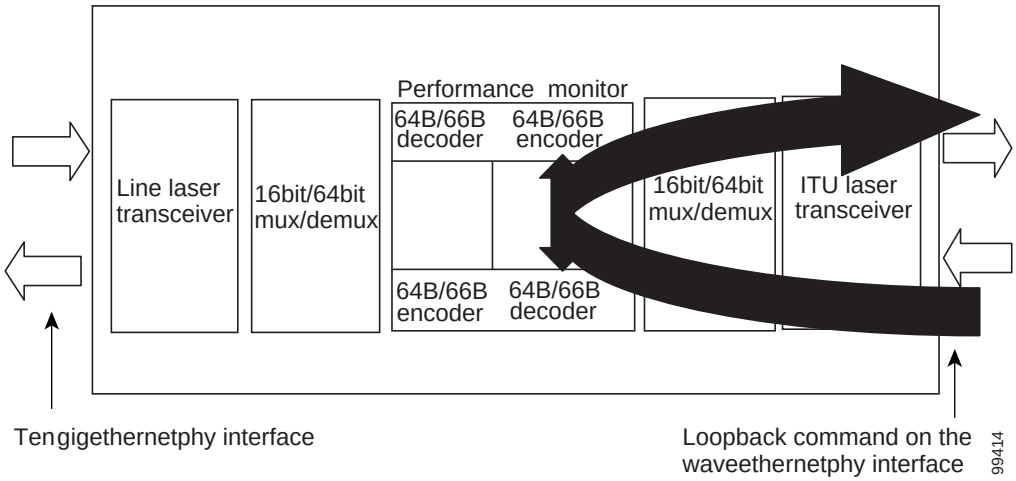
Step 2 Check that the signal reaches the local client equipment.

Step 3 If the signal does not reach the local client equipment, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.

6.5.3 Trunk Software Loopbacks

A trunk software loopback verifies the functioning of the 10-GE transponder module on the trunk side (see Figure 6-10). With this feature, you can verify the communication between two 10-GE transponder modules.

Figure 6-10 Trunk Side Loopback Example on a 10-GE Transponder Module



Procedure: Create a Trunk Software Loopback

Step 1 Issue a **loopback** command on the waveethernetphy interface.

Step 2 Check that the signal reaches the system at the far end.

Step 3 If the signal does not reach the far end, check the trunk fiber and the interfaces along the signal path. If the fiber is intact, contact Cisco Systems technical support.

Troubleshooting Threshold Alarm Problems

This chapter describes how to troubleshoot threshold alarm problems. This chapter contains the following sections:

7.1 Overview

Threshold alarms indicate that a configured range is exceeded.

7.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Issue **show interfaces** commands to ensure that all interfaces are administratively up and that there are no reported errors.
- Issue the **show facility-alarm status** command to display the alarms on the interfaces.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections document*.

7.3 Troubleshooting Threshold Alarms

This section contains troubleshooting procedures for threshold alarm problems.

7.3.1 8b10b CVRD Alarm Indicates Signal Fail or Signal Degrade

Symptom An 8b10b CVRD alarm indicates signal fail or signal degrade.

Table 7-1 describes the potential causes of the symptom and the solutions.

Table 7-1 8b10b CVRD Alarm Indicates Signal Fail or Signal Degrade

Possible Problem	Solution
Excessive attenuation or overloading on a 2.5-Gbps transponder interface.	1. Measure the receive power level. Ensure that it is within –28 dBm and –8 dBm. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.
Excessive attenuation or overloading on a 10-GE transponder interface.	1. Measure the receive power level. Ensure that it is within –22 dBm and –8 dBm. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

7.3.2 CDL-HEC Alarm Indicates Signal Fail or Signal Degrade

Symptom A CDL-HEC alarm indicates signal fail or signal degrade.

Table 7-2 describes the potential causes of the symptom and the solutions.

Table 7-2 CDL-HEC Alarm Indicates Signal Fail or Signal Degrade

Possible Problem	Solution
Excessive attenuation or overloading on a 10-GE transponder interface.	1. Measure the receive power level. Ensure that it is within –22 dBm and –8 dBm. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

7.3.3 64b66b CVRD Alarm Indicates Signal Fail or Signal Degrade

Symptom A 64b66b CVRD alarm indicates signal fail or signal degrade.

Table 7-3 describes the potential causes of the symptom and the solutions.

Table 7-3 64b66b CVRD Alarm Indicates Signal Fail or Signal Degrade

Possible Problem	Solution
Excessive attenuation or overloading on a 10-GE transponder interface.	1. Measure the receive power level. Ensure that it is within –22 dBm and –8 dBm. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

7.3.4 B1 CVRD Alarm Indicates Signal Fail or Signal Degrade

Symptom A B1 CVRD alarm indicates signal fail or signal degrade.

Table 7-4 describes the potential causes of the symptom and the solutions.

Table 7-4 B1 CVRD Alarm Indicates Signal Fail or Signal Degrade

Possible Problem	Solution
Excessive attenuation or overloading on a SONET/SDH interface.	1. Measure the receive power level. Ensure that it is within –25 dBm and –8 dBm for a multimode interface and within –19 dBm and –1.5 dBm for a single mode interface. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

7.3.5 Threshold Exceeded Messages Continuously Hitting the Console

Symptom Threshold exceeded messages continuously hitting the console.

Table 7-5 describes the potential cause of the symptom and the solution.

Table 7-5 Threshold Exceeded Messages Continuously Hitting the Console

Possible Problem	Solution
Receive signal is fluctuating on the edge of the configured threshold.	1. Measure the interface receive power level. Ensure that it is within specifications. Adjust the attenuation if necessary. 2. Check the network cable for sharp bends and ensure the connectors are clean and connected properly. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

7.3.6 SNMP Traps Are Not Generated

Symptom SNMP traps are not generated.

Table 7-6 describes the potential cause of the symptom and the solution.

Table 7-6 SNMP Traps Are Not Generated

Possible Problem	Solution
SNMP configuration is incorrect.	Issue the **show running-config** command to verify the SNMP configuration and correct if necessary.

CHAPTER 8

Troubleshooting Performance History Counter Problems

This chapter describes how to troubleshoot performance history counter problems. This chapter contains the following sections:

8.1 Overview

Cisco ONS 15540 ESPx supports 15 minute based performance history counters. You can use the performance history counters to track the performance of the Cisco ONS 15540 ESPx interfaces.

There are three types of performance history counters: current, 15-minute history, and 24-hour. Cisco ONS 15540 ESPx uses these counters to store the performance data for the following time periods:

- The current 15 minutes (using the current counter).
- The last 24 hours (using ninety six 15-minute history counters).
- The previous 1 day (using the 24-hour counter).

For more information on performance history counters, refer to the *Cisco ONS 15540 ESPx Configuration Guide.*

8.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Issue the **show version** command to ensure that the IOS version is 12.2(29)SV or later.
- Issue **show interfaces** commands to ensure that the interface for which the performance history counters are being monitored is administratively up.
- Ensure that the encapsulation configured on the interface supports performance history counters.

- To preserve the performance history counters across a CPU switch module switchover, ensure that the `auto-sync counter interfaces` configuration is present in the running configuration.

8.3 Interpreting Performance History Messages

This section explains the informational messages that may be displayed on the command line interface (CLI) while you are working with the performance history counters.

Message	Description
Sorry! Current 15 minute interval [dec] on [interface] just started. Please try again.	This message indicates that the elapsed time and the valid time are equal to zero. This message is displayed if you issue the **show performance** command immediately after the current counter completes its 15 minute interval.
Sorry! No counters for this interface/encapsulation combination.	This message indicates that the encapsulation configured on the interface does not support performance history counters.
Sorry! No valid current 15 minute data for interval [dec] on [interface].	This message indicates that the specified interface was down during the 15 minute interval of the current counter.
Sorry! No valid performance data for interval [dec] on [interface].	This message indicates that the specified interface was down during the entire interval of the performance history counter.
Sorry! No valid 24 hour performance data for [interface].	This message indicates that the interface was down during the 24 hour interval of the 24-hour counter.
Sorry! 15 minute performance history register [dec] not available for [interface].	This message is displayed if the 15-minute history counter is yet to be created.
Sorry! 24 hour performance register not available for [interface].	This message is displayed if the 24-hour counter is yet to be created
Sorry! Current 15 minute register not available for [interface].	This message indicates that the specified interface does not support performance history counters.

8.4 Troubleshooting Performance History Counters

This section contains troubleshooting procedures for performance history counter problems.

8.4.1 Some Counters Are Not Displayed

Symptom Some interface counters are not displayed in the output of the **show performance** command.

Table 8-1 describes the potential causes of the symptom and the solutions.

Table 8-1 Some Counters Are Not Displayed

Possible Problem	Solution
Monitoring of the transparent interface of the transponder is disabled.	Issue the **monitor enable** command to enable monitoring of the transparent interface.
The missing interface counters are not supported by the performance history feature.	Refer to the *Cisco ONS 15540 ESPx Configuration Guide* for the list of interface counters that are supported by the performance history feature.

8.4.2 Performance History Counters Are Not Preserved Across CPU Switch Module Switchovers

Symptom The performance history counters are not preserved across a CPU switch module switchover.

Table 8-2 describes the potential causes of the symptom and the solutions.

Table 8-2 Performance History Counters Are Not Preserved Across CPU Switch Module Switchovers

Possible Problem	Solution
Automatic synchronization of performance history counters is not enabled.	Issue the **auto-sync counter interfaces** command to enable the automatic syncing of the performance history counters to the standby CPU switch module.

Troubleshooting APS Problems

This chapter describes how to troubleshoot APS (Automatic Protection Switching) problems. This chapter contains the following sections:

9.1 Overview

APS provides protection against signal transmission failure. The Cisco ONS 15540 ESPx supports the following APS features:

- 1+1 path protection
- Splitter protection
- Line card protection
  - Client based
  - Y-cable based
  - Switch fabric based
- Trunk fiber protection
- Redundant switch fabric protection
- Bidirectional and unidirectional path switching

For more information on APS support on the Cisco ONS 15540 ESPx, refer to the *Cisco ONS 15540 ESPx Configuration Guide*.

9.2 Initial Troubleshooting Checklist

Follow this initial checklist before proceeding with the troubleshooting procedures:

- Issue **show interfaces** commands to ensure that the interfaces along the signal paths are administratively up and that there are no errors on the interfaces.
- Issue the **show connect** command to verify the status of the cross connections.
- Issue the **show aps detail** command on both nodes to verify the following:

  - The working and protection interfaces are correct.
  - The aps state field shows “enabled (associated).”
  - The msg-channel field shows “Up” on the desired message channel.
  - The direction field shows the same expected values (either “uni” or “bi”) on both nodes.
  - AFOV (auto-failover) is enabled.
- Check that the LEDs on the cards show the proper state.
- Issue the **show facility-alarm status** command to display the alarms on the interfaces.
- If ITU cards are present, check that the ITU cards are patched to the correct mux/demux module ports. Issue a **show patch detail** command to verify that there are no frequency mismatches.
- Verify that all required patches are configured.
- Ensure that all optical connectors are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

9.3 Troubleshooting Specific APS Problems

This section contains troubleshooting information for specific APS problems.

9.3.1 APS Group State Enabled But Not Associated

Symptom The **show aps group** command or **show aps detail** command outputs show an APS group state is enabled but the group is not associated.

Table 9-1 describes the potential causes of the symptoms and the solutions.

Table 9-1 APS Group State Enabled But Not Associated

Possible Problem	Solution
Either the working or protection channel is not present.	Verify that the channel is not administratively down. Then make sure that all of the cards are properly seated and that the LEDs are showing the proper state. Verify that all of the interfaces of the APS group are in the up/up state.
For switch fabric based line card protection, the cross connections through the switch fabric are not configured correctly.	1. Issue the **show connect** command to verify that the working and protection cross connections are correctly configured. 2. Use the **connect** command to correct any problems.

9.3.2 Bidirectional APS Configured But Remote Node Direction, Architecture, and Receive k1/k2 Are Unknown

Symptom The **show aps group** command or the **show aps detail** command output shows an APS group state is configured for bidirectional switching but the remote node direction, remote node architecture, and receive k1/k2 are unknown.

Table 9-2 describes the potential causes of the symptoms and the solutions.

Table 9-2 Bidirectional APS Configured But Remote Node Direction, Architecture, and Receive k1/k2 Are Unknown

Possible Problem	Solution
The configured message channel is not up.	1. Verify that the ethernetdcc, OSC, and fastethernet interfaces are up. 2. Verify that all required patches are configured. 3. Verify that bidirectional APS, message-channel, APS group name, and the far end IP address are configured correctly.
The client signal has errors.	Use the **show interfaces** command to check the error counters on the active interface. If they are increasing, the line could be bad.

9.3.3 Message Channel Interface Up But APS Msg-Channel Status Down

Symptom The configured message channel interface is up but the msg-channel status in the **show aps group** or **show aps detail command** output is down.

Table 9-3 describes the potential causes of the symptoms and the solutions.

Note Check both the local and remote systems for message channel problems.

Table 9-3 Message Channel Interface Up But APS msg-channel Status Down

Possible Problem	Solution
The line cards are not correctly patched to the mux/demux modules.	Check the patch connections on the shelf. Ensure that ITU trunk cards are connected to the correct filter ports on the mux/demux module.
The OSC interfaces are not correctly patched to the mux/demux modules.	Check that the OSC interfaces are correctly patched to the mux/demux module.
The patches between the line cards or the OSC interfaces and the mux/demux modules are not configured in the CLI.	Issue the **show patch** command to verify the patch connections are correctly configured. If not, issue the **patch** command to correct the configuration.

Table 9-3 Message Channel Interface Up But APS msg-channel Status Down (continued)

Possible Problem	Solution
The unused wavepatch on a splitter line card in a line card protected configuration is not disabled.	Use the **shutdown** command to disable the unused wavepatch interfaces.
If far-end group names are used in the APS message channel configuration, the names are not configured correctly.	1. Use the **show aps group** command or the **show aps detail** command to verify the far-end group name configuration. 2. Use the **aps message-channel** command to correct the far-end group name configuration. 3. Use the **show aps detail** command determine the current message channel.
The message channel is IP and the NME[1] connection is down.	Use the **show interfaces fastethernet 0** command to verify the status of the NME. If the line or the protocol is down, see Chapter 2, "Troubleshooting Processor Card Problems."
The optical connectors are dirty.	Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document.

1. NME = network management Ethernet

9.3.4 APS Does Not Switch to Protection Signal When the Working Signal Fails

Symptom When the working signal fails, APS does not switch over to the protection signal.

Table 9-4 describes the potential causes of the symptoms and the solutions.

Table 9-4 APS Does Not Switch to Protection Signal When the Working Signal Fails

Possible Problem	Solution
An APS switchover request is pending.	1. Use the **show aps detail** command to verify that auto-failover is enabled. 2. Use the **show aps group** command or the **show aps detail** command to determine the pending APS switchover request. 3. Use the **aps clear** command to remove the APS request.
A trunk failure occurred on the protection signal.	Correct the failure on the protection signal.

9.3.5 Lockout from Protection Request Fails

Symptom A request to lock out an APS switchover to the protection path made with an **aps lockout** command failed.

Table 9-5 describes the potential cause of the symptom and the solution.

Table 9-5 Lockout from Protection Request Fails

Possible Problem	Solution
The active signal is already switched to the protection path.	1. Use the **aps switch** *group-name* **force protection-to-working** command to ensure that the active signal is on the working path and then use the **aps lockout** command. 2. If the **aps switch** *group-name* **force protection-to-working** command fails, check the status of the working path using the **show interfaces** command and resolve the signal failure.

9.3.6 Remote Switchover Does Not Occur After Local Switchover

Symptom The remote system does not switch over after the local system switches over.

Table 9-6 describes the potential causes of the symptoms and the solutions.

Table 9-6 Remote Switchover Does Not Occur After Local Switchover

Possible Problem	Solution
Message channel is down.	1. Issue **show aps detail** commands on both systems to verify the APS direction configuration. 2. Issue **aps direction** commands to correct the APS direction configuration, if necessary.
The protection path on the remote system has failed.	1. Issue the **show interfaces** command for the protection interface on the remote system. 2. Resolve any problems on the interface.

9.3.7 Manual or Forced Switchover Fails

Symptom A request for a manual or forced APS switchover fails.

Table 9-7 describes the potential cause of the symptom and the solution.

Table 9-7 Manual or Forced Switchover Fails

Possible Problem	Solution
A higher priority request is in effect. For bidirectional APS, the higher priority request might originate from the remote node.	1. Use the **show aps group** command or the **show aps detail** command to determine if the request is user generated or system generated. 2. For user generated requests, use the **aps clear** command to remove the higher priority request. 3. For system generated requests, correct the failure that is preventing the switchover.

9.3.8 APS Group Transmitting k1k2 sf-lp to Peer APS Group

Symptom The transmit k1k2 field in the **show aps group** or **show aps detail** command output indicates sf-lp is sent to the peer APS group in a y-cable configuration.

Table 9-8 describes the potential cause of the symptoms and the solution.

Table 9-8 APS Group Transmitting k1k2 sf-lp to Peer APS Group

Possible Problem	Solution
A failure occurred on the client receive signal.	1. Check the **show facility status** command output for Loss of Signal and Loss of Sync alarms on the active interface. 2. Verify that there are no breaks on the client fiber and that the connector are clean. Refer to the *Cisco ONS 15540 ESPx Cleaning Procedures for Fiber Optic Connections* document. 3. Ensure that the SFP optics are properly seated and that the LEDs are on. 4. Issue the **show interfaces** command to verify the protocol encapsulation. Use the **encapsulation** command to correct any misconfiguration.

Technical Support

When you have a problem that you cannot resolve, contact customer service. To help resolve these problems, gather relevant information about your network prior to calling. This appendix includes the following sections:

A.1 Gathering Information About Your Internetwork

Before gathering any specific data, compile a list of all symptoms users have reported on the internetwork (such as connections dropping or slow host response).

The next step is to gather specific information. Typical information needed to troubleshoot internetworking problems fall into two general categories: information required for any situation and information specific to the topology, technology, protocol, or problem.

Information that is always required by technical support engineers includes the following:

- Configuration listing of all systems involved
- Complete specifications of all systems involved
- Version numbers of software (obtained by using the **show version** command) and Flash code (obtained by using the **show controllers** command) on all relevant systems
- Network topology map
- List of hosts and servers (host and server type, number on network, description of host operating systems that are implemented)
- List of network layer protocols, versions, and vendors

To assist you in gathering this required data, the **show tech-support** EXEC command has been added in Cisco IOS Release 11.1(4) and later. This command provides general information about the system that you can provide to your technical support representative when you are reporting a problem.

The **show tech-support** command display includes outputs from the **show version**, **show hardware**, **show diag power-on**, **show running-config**, **show controllers**, **show stacks**, **show interfaces**, **show buffers**, **show process memory**, and **show process** EXEC commands.

Specific information that might be needed by technical support varies, depending on the situation, and include the following:

- Output from the following general **show** commands:

show interfaces

show controllers [**atm** | **serial** | **e1** | **ethernet**]

show processes [**cpu** | **mem**]

show buffers

show memory summary

- Output from the following protocol-specific **show** commands:

  show *protocol* **route**

  show *protocol* **traffic**

  show *protocol* **interface**

  show *protocol* **arp**
- Output from relevant **debug** privileged EXEC commands
- Output from protocol-specific **ping** and **trace** command diagnostic tests, as applicable
- Network analyzer traces, as applicable
- Core dumps obtained by using the **exception dump** switch configuration command, or by using the **write core** switch configuration command if the system is operational, as appropriate

A.1.1 Getting the Data from Your System

When obtaining information from your system, tailor your method to the system that you are using to retrieve the information. Following are some hints for different platforms:

- PC and Macintosh—Connect a PC or Macintosh to the console port of the system and log all output to a disk file (using a terminal emulation program). The exact procedure varies depending on the communication package used with the system.
- Terminal connected to console port or remote terminal—The only way to get information with a terminal connected to the console port or with a remote terminal is to attach a printer to the Aux port on the terminal (if one exists) and to force all screen output to go to the printer. Using a terminal is undesirable because there is no way to capture the data to a file.
- UNIX workstation—At the UNIX prompt, enter the **script** *filename* command, then use Telnet to connect to the system. The UNIX **script** command captures all screen output to the specified filename. To stop capturing output and close the file, enter the end-of-file character (typically **^D**) for your UNIX system.

Note To get your system to automatically log specific error messages or operational information to a UNIX syslog server, use the **logging** *internet-address* switch configuration command. For more information about using the **logging** command and setting up a syslog server, refer to the Cisco IOS configuration guides and command reference publications.

A.2 Providing Data to Customer Service

If you need technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact TAC (Cisco's Technical Assistance Center) to open a case. Refer to the "Obtaining Technical Assistance" section on page xix for information.

When submitting information to your technical support representative, electronic data is preferred. Electronic data significantly eases the transfer of information between technical support personnel and development staff. Common electronic formats include data sent via e-mail and files sent using FTP (File Transfer Protocol).

If you are submitting data to your technical support representative, use the following list to determine the preferred method for submission:

1. The preferred method of information submission is through FTP service over the Internet. If your environment supports FTP, you can place your file in the incoming directory on the host cco.cisco.com.
2. The next best method is to send data by electronic mail. Before using this method, be sure to contact your technical support representative, especially when transferring binary core dumps or other large files.

   If you use e-mail, do not use encoding methods such as binhex or zip. Only MIME-compliant mail should be used.
3. Use a PC-based communications protocol, such as Kermit, to upload files to Cisco.com. Again, be sure to contact your technical support representative before attempting any transfer.
4. Transfer by disk or tape.
5. The least favorable method is hard-copy transfer by fax or physical mail.

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