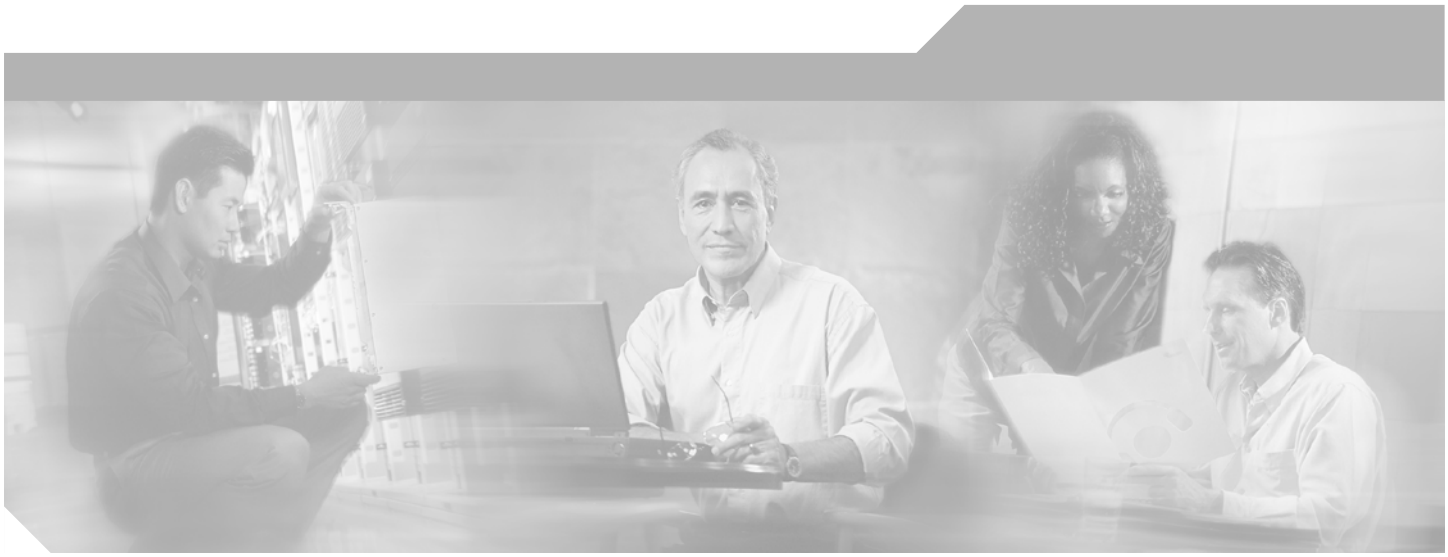

Cisco ONS 15530 Optical Transport Turn-Up and Test Guide

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Cisco ONS 15530 Optical Transport Turn-Up and Test Guide

Preface

This preface describes the purpose, intended audience, organization, and conventions for the *Cisco ONS 15530 Optical Transport Turn-Up and Test Guide*.

Purpose

The *Cisco ONS 15530 Optical Transport Turn-Up and Test Guide* describes acceptance testing procedures for nodes and networks. These procedures allow an installer to verify the installation of a network of Cisco ONS 15530 nodes.

These procedures are performed following hardware installation and initial software configuration, as described in this guide.

For more detailed hardware installation information, refer to the *Cisco ONS 15530 Hardware Installation Guide*. For more detailed software configuration information, refer to the *Cisco ONS 15530 Configuration Guide* and the *Cisco ONS 15530 Command Reference*.

Audience

This guide is intended for experienced network administrators who are responsible for installing Cisco ONS 15530.

Organization

The chapters of this guide are as follows:

Chapter	Title	Description
Chapter 1	Safety Information and Preinstallation Tasks	Describes safety considerations for operating the Cisco ONS 15530. Describes procedures that should be performed prior to installation of hardware.
Chapter 2	Basic Hardware Installation Procedures	Describes procedures for installing essential hardware components.
Chapter 3	Software Setup Procedures	Describes basic software configuration tasks.

Chapter	Title	Description
Chapter 4	Basic Node Verification Procedures	Describes procedures for verification of each node in the network.
Chapter 5	Basic Network Verification Procedures	Describes procedures for network-level verification. Perform these procedures after completing the node verification procedures.
Chapter 6	Network Turn Up of Amplified Ring Topologies with Per-Channel Equalization	Describes procedures for the initial turn up of an amplified ring topology that has per-channel equalization.
Appendix A	Node Data Checklist	Provides tables for keeping track of essential data for each node.
Appendix B	Test Results Tables	Provides tables for recording test results and verifying that tests are completed successfully.

Related Documentation

This guide is part of a documentation set that supports the Cisco ONS 15530. The other documents in the set are as follows:

- *Regulatory Compliance and Safety Information for the Cisco ONS 15500 Series*
- *Cisco ONS 15530 Planning Guide*
- *Cisco ONS 15530 Hardware Installation Guide*
- *Cisco ONS 15530 Cleaning Procedures for Fiber Optic Connections*
- *Cisco ONS 15530 Configuration Guide*
- *Cisco ONS 15530 Command Reference*
- *Quick Reference for the Cisco ONS 15530 TL1 Commands*
- *Cisco ONS 15530 System Alarms and Error Messages*
- *Cisco ONS 15530 Troubleshooting Guide*
- *Network Management for the Cisco ONS 15530*
- *MIB Quick Reference for the Cisco ONS 15500 Series*
- *Cisco ONS 15530 Software Upgrade Guide*

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/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

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170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

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Cisco Technical Support Website

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

http://www.cisco.com/techsupport

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

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

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

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 TAC 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 TAC 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)—Your 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 operation 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 your network is impaired, but 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.

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

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

- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *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

- *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

- 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

Safety Information and Preinstallation Tasks

This chapter describes safety information and procedures that should be performed prior to installation of hardware.

This chapter contains the following major sections:

Note Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for the Cisco ONS 15500 Series* for important safety information you should know before working with the system.

For more information on hardware, refer to the *Cisco ONS 15530 Hardware Installation Guide.*

For more information on software, refer to the *Cisco ONS 15530 Configuration Guide* and the *Cisco ONS 15530 Command Reference.*

Safety Information

This section describes safety considerations for operating the Cisco ONS 15530. This section includes critical safety warnings, precautions, and ESD guidelines.

Critical Safety Warnings

This section includes warnings that may appear in the Cisco ONS 15530 product documents.

Wrist Strap Warning

Warning **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.**

Restricted Area Warning

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.**

Qualified Personnel Warning

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

Card Handling Warning

Warning **High-performance devices on this card can get hot during operation. To remove the card, hold it by the faceplate and bottom edge. Allow the card to cool before touching any other part of it or before placing it in an antistatic bag.**

Warning Definition

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

Disconnect Device Warning

Warning **A readily accessible disconnect device must be incorporated in the building's installation wiring.**

DC Protection

Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a Listed and Certified fuse or circuit breaker 25A, minimum 60VDC, is used on all current-carrying conductors.**

Laser Radiation Warning

Warning **Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.**

General Safety Precautions

General safety precautions are not related to any specific procedures and do not appear elsewhere in this publication. Personnel must understand and apply the following precautions during installation and testing of the Cisco ONS 15530.

- Know standard electrical safety and electrical wiring and connection practices.
- Be familiar with cardio-pulmonary resuscitation (CPR). Obtain this information through the appropriate national authority (such as the Red Cross or the local equivalent). This knowledge is imperative for personnel working with or near voltages with levels capable of causing injury or death.

Recommended Safety Precautions

We recommend the following precautions when working on the Cisco ONS 15530:

- Do not lift an object alone that could be too heavy for one individual.
- Keep your work area tidy and free of obstructing objects at all times.
- Do not wear loose clothing, jewelry, or other items that could be caught in the components during installation or use.
- Use the equipment only in accordance with the electrical power rating.
- Do not work alone if hazardous conditions may exist in your workplace.
- Install the Cisco ONS 15530 components in compliance with the following local and national electrical codes:
  - In the United States: National Fire Protection Association (NFPA) 70; US National Electrical Code
  - In Canada: Canadian Electrical Code, part I, CSA C22.1
  - In other countries: International Electrotechnical Commission (IEC) 364, part 1-7
- Properly ground the equipment.
- Connect only a DC power source that complies with the safety extra-low voltage (SELV) requirements in UL60950, CSA 60950, EN 60950, and IEC60950 to Cisco ONS 15530 DC power supply input.
- Terminate all laser outputs properly before connecting laser inputs.
- Disconnect the input end of an optical fiber jumper cable before disconnecting the output end.
- Handle glass fiber with care. Glass fiber can be broken if mishandled. Using broken fiber can result in permanent equipment damage.
- Protect skin from exposed glass fiber. It can penetrate the skin.
- Limit the number of personnel that have access to lightwave transmission systems. Personnel should be authorized and properly trained if access to laser emissions is required.
- Limit the use of laser test equipment to authorized, trained personnel during installation and service. This precaution includes using optical loss test (OLT) set, optical spectrum analyzer, and optical time domain reflectometer (OTDR) equipment.

- Exclude any unauthorized personnel from the immediate laser radiation area during service and installation when there is a possibility that the system may become energized. Consider the immediate service area to be a temporary laser-controlled area.
- The Cisco ONS 15530 operates in the 1310 to 1550 nm window, which is considered invisible radiation. You cannot see the laser light being emitted by a fiber, a pigtail, or a bulkhead connector. Use appropriate eye protection during fiber-optic system installation or maintenance whenever there is potential for laser radiation exposure, as recommended by the company's health and safety procedures. Observe this precaution whether or not warning labels have been posted.

Preventing ESD Damage

Electrostatic discharge (ESD) damage occurs when electronic cards or components are mishandled and can result in complete or intermittent failures. Note the following guidelines before you install or service the system:

- Always wear an ESD-preventive wrist or ankle strap when handling electronic components. Connect one end of the strap to an ESD jack or an unpainted metal component on the system (such as a captive installation screw).
- Handle cards by the faceplates and edges only; avoid touching the printed circuit board and connector pins.
- Place any removed component on an antistatic surface or in a static shielding bag.
- Avoid contact between the cards and clothing. The wrist strap only protects the card from ESD voltages on the body; ESD voltages on clothing can still cause damage.

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

Required Equipment

This section lists the required system equipment, cable, and test equipment.

System Requirements

The following equipment is assumed to be present and installed:

- Cisco ONS 15530 chassis and external AC power supply if needed
- Processor cards (1 or 2)
- Air Inlet
- Fan Tray

Cable Requirements

This section lists the optical cable requirements for the Cisco ONS 15530.

The Cisco ONS 15530 chassis requires the following optical cables:

- OADM cabling: MU-to-MU cables
  - OADM module to transponder line card or ITU trunk card
  - OADM module to OSC module
  - OADM module to OADM module
  - OADM module to PB-OE module or WB-VOA module, for trunk signal attenuation or per-band attenuation
- Transponder line card to client cables: medium size cable with SC connectors
  - SM transponder line card: SC to SC SM cable or SC to ST SM cable, 1.0 m or 3.0 m
  - MM transponder line card: SC to SC MM cable or SC to ST MM cable, 1.0 m or 3.0 m
  - Y-cables: Multimode or single mode y cable
- Transponder line card or OSC module to WB-VOA module for per-channel attenuation: MU-to-MU cables
- Trunk cables: MU to SC patch cable or MU to ST patch cable, 1.0 m or 3.0 m

Test Equipment Requirements

The following test equipment is required:

- Optical spectrum analyzer (OSA) capable of reading wavelengths between 1530 nm and 1563 nm
- Optical power meter (OPM)
- Optical time domain reflectometer (OTDR)
- Hand-held optical power meter
- Data test set (Ethernet packet generator or analyzer, BERT)
- Fiber cleaning kit
- Optical fiber scope
- Cable installation tool

Before Installing

Before you install the shelf, you must complete the following tasks:

- Unpack and inspect the shelf.
- Maintain a network record.

Caution Use extreme care when removing or installing connectors so you do not damage the connector housing or scratch the end-face surface of the fiber. Always install protective covers on unused or disconnected components to prevent contamination. Always clean fiber connectors before installing them.

Warning **During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself.**

NTP-1 Unpacking and Inspecting the Shelf

Purpose	This procedure describes how to unpack and inspect the Cisco ONS 15530 and verify the contents.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Take inventory. Compare the equipment inside with the packing slip and the equipment list provided by customer service. If there are any discrepancies, notify the Customer Service Center.

Step 2 Check for external damage. Visually check all components and immediately report any shipping damage to your customer service representative. Have the following information ready:

- Invoice number of shipper (see packing slip)
- Model and serial number of the damaged unit
- Description of damage
- Effect of damage on the installation

Cleaning the Shelf

Be careful with the airflow system when you clean the chassis. If the cleaning process must be done while the system is running, be aware that the airflow system is in operation. Clean the chassis with a damp cloth only and be careful of the following:

- Do not touch the airflow system while fans are operating.
- Do not use wet tissues for cleaning the chassis.
- Do not use any harsh or abrasive cleaning agents.

Warning **Invisible laser radiation might be emitted from the end of the fiber or connector. Do not stare into the beam or view directly with optical instruments.**

When installing your optical connectors, consider the following issues:

- Dirty optical connectors are a common source of light loss. Keep the connectors clean at all times and keep the dust cover installed when not in use.

- Before installing any type of cable or connector, use a lint-free alcohol pad from a cleaning kit to clean the ferrule, the protective white tube around the fiber, and the end-face surface of the fiber.
- As a general rule, whenever there is a significant, unexplained loss of light, clean the connectors.

Caution Use extreme care when removing or installing connectors so you do not damage the connector housing or scratch the end-face surface of the fiber. Always install filler modules on unused or disconnected components to prevent contamination. Always clean fiber connectors before installing them.

Use a swab saturated with isopropyl alcohol to clean the end-surfaces. Use dry, oil-free compressed air after applying the isopropyl alcohol.

Performing Fiber Plant Characterization

To verify fiber characteristics to qualify the fiber in the network, proper testing is required.

The test measurement results must be documented and will be referred to during acceptance testing of a network, as described in this guide.

This test measurement data can also be used to determine whether your network can support higher bandwidth services such as OC-192, and can help determine network requirements for dispersion compensator modules or amplifiers.

Fiber-optic testing procedures must be performed to measure the following parameters:

- Link loss (attenuation)
- Optical return loss (ORL)
- Polarization mode dispersion (PMD)
- Chromatic dispersion
- Fiber length

For more information on fiber plant characterization, refer to the *Cisco ONS 15530 Planning Guide*.

Basic Hardware Installation Procedures

This chapter describes procedures for installing essential hardware components. Refer to the *Cisco ONS 15530 Hardware Installation Guide* for complete hardware installation instructions.

Before You Begin

This section lists the chapter non-trouble procedures (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

1. NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1—Complete to install the chassis in the rack.
2. NTP-3 Install the Fiber Routing Management System, page 2-8—Complete this procedure to install the optional fiber routing management system.
3. NTP-4 Install Line Cards, Modules, and Motherboards, page 2-10—Complete this procedure to install all line cards, modules, and motherboards in the shelf.
4. NTP-5 Connect the Hardware, page 2-25—Complete this procedure to make the network and fiber optic connections on the shelf.
5. NTP-6 Ground the Shelf, page 2-72—Complete this procedure before continuing with the "NTP-7 Power Up the Shelf" procedure on page 2-73.
6. NTP-7 Power Up the Shelf, page 2-73—Complete this procedure to install the power supplies, connect the power, and power up the shelf.
7. NTP-8 Verify Installation of Hardware, page 2-79—Complete this procedure to verify that the hardware is properly installed.

NTP-2 Install the Cisco ONS 15530 Chassis

Purpose	This procedure describes how to install the Cisco ONS 15530 chassis and air ramp baffle, if required.
Tools/Equipment	NEBS 19-inch rack-mounting kit or NEBS 23-inch rack-mounting kit or ETSI rack-mounting kit, depending on the shelf type and rack dimensions. Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-1 Unpacking and Inspecting the Shelf, page 1-6
Required/As Needed	Required

Onsite/Remote	Onsite
Security Level	None

Step 1 Complete the "DLP-1 Flush-Mount the Cisco ONS 15530 CHAS-N in a 19-Inch or 23-Inch Rack" task on page 2-2 to install the Cisco ONS 15530 CHAS-N.

Complete the "DLP-2 Flush-Mount the Cisco ONS 15530 CHAS-E in a 21-Inch Rack" task on page 2-4 to install the Cisco ONS 15530 CHAS-E.

Step 2 Complete the "DLP-3 Attach the Air Ramp Baffle" task on page 2-6 to install the air baffles for the Cisco ONS 15530 CHAS-E.

Step 3 Continue with the "NTP-3 Install the Fiber Routing Management System" procedure on page 2-8.

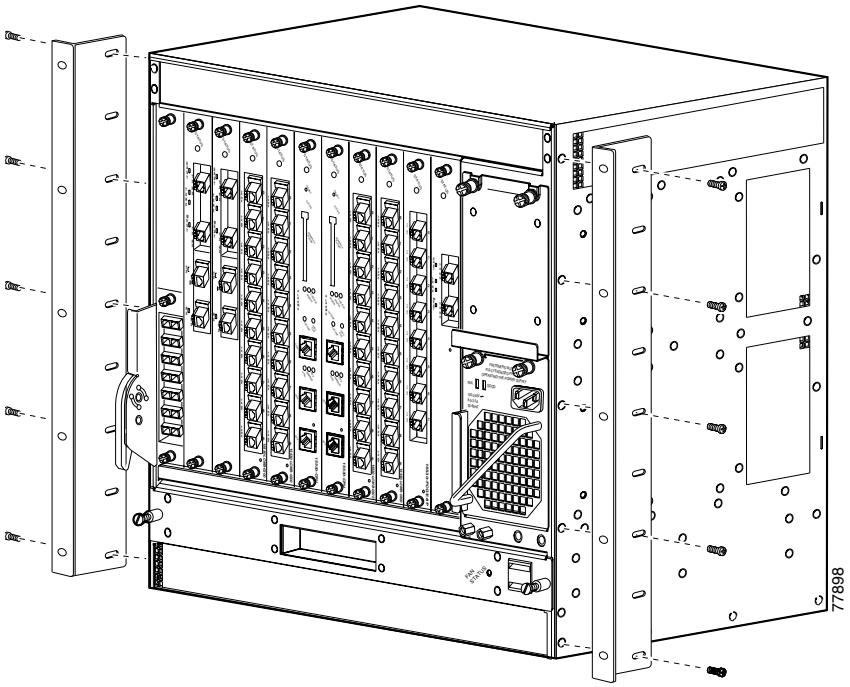
DLP-1 Flush-Mount the Cisco ONS 15530 CHAS-N in a 19-Inch or 23-Inch Rack

Purpose	This task installs the Cisco ONS 15530 CHAS-N in a 19-inch or 23-inch rack.
Tools/Equipment	NEBS 19-inch rack-mounting kit or NEBS 23-inch rack-mounting kit Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-1 Unpacking and Inspecting the Shelf, page 1-6
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Warning **At least three people are required to mount the chassis in the equipment rack: two people are needed to hold the chassis in place while a third person tightens the mounting screws. When handling the chassis, always follow proper lifting practices as outlined in the *Cisco ONS 15530 Hardware Installation Guide*.**

Step 1 Attach the mounting brackets to the shelf (see Figure 2-1).

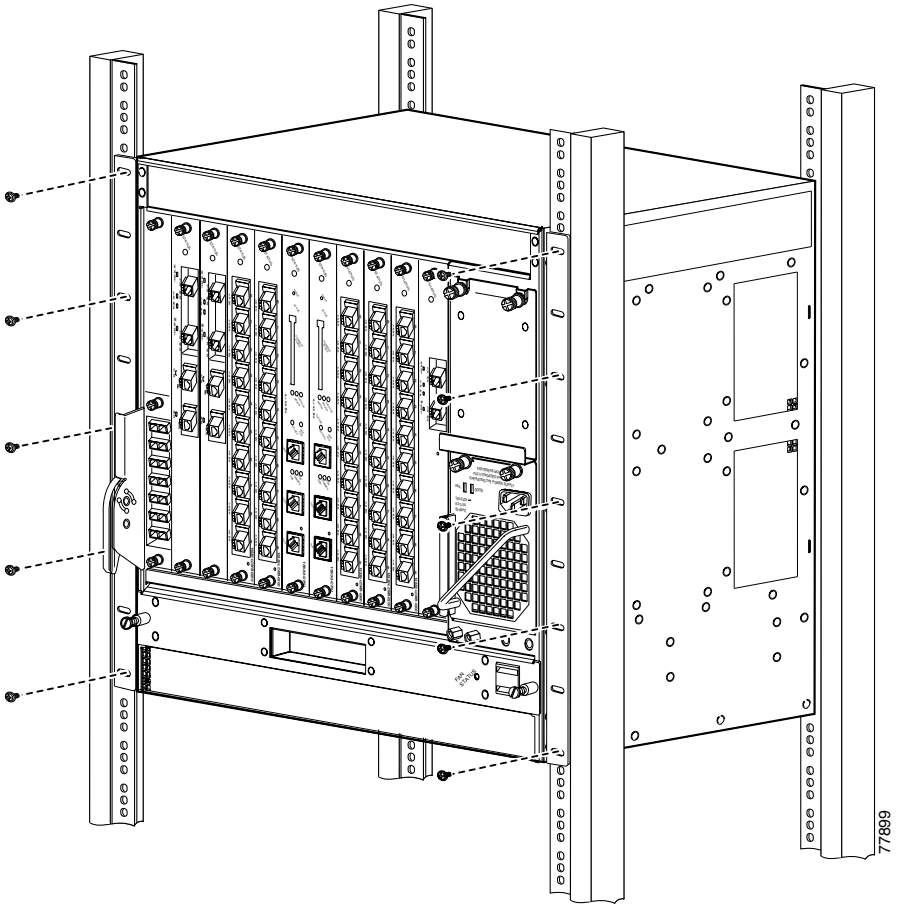
Figure 2-1 Attaching Mounting Brackets to Shelf



Step 2 Lift the shelf into position between the rack posts (requires two people).

Step 3 Align the mounting bracket holes with the rack post holes (see Figure 2-2) and attach the shelf to the rack (performed by the third person).

Figure 2-2 Attaching Shelf to Equipment Rack



Step 4 Check that all release levers are in the closed position, the chassis mounting screws are tight, and, if the slots are populated, all CPU switch module and line card captive screws are tight.

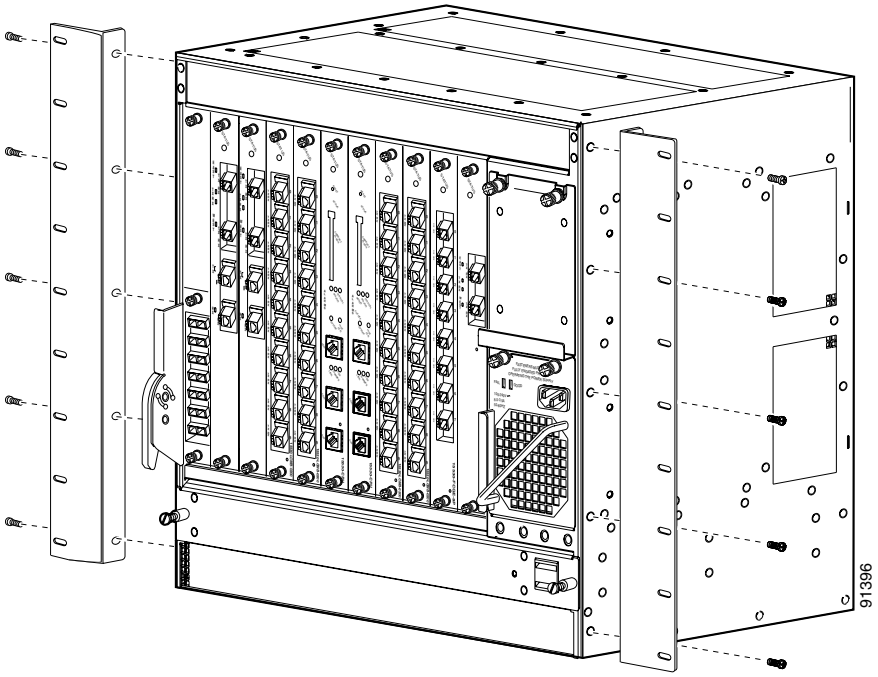
DLP-2 Flush-Mount the Cisco ONS 15530 CHAS-E in a 21-Inch Rack

Purpose	This task installs the Cisco ONS 15530 CHAS-E in a 21-inch rack.
Tools/Equipment	ETSI rack-mounting kit Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-1 Unpacking and Inspecting the Shelf, page 1-6
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Warning **At least three people are required to mount the chassis in the equipment rack: two people are needed to hold the chassis in place while a third person tightens the mounting screws. When handling the chassis, always follow proper lifting practices as outlined in the *Cisco ONS 15530 Hardware Installation Guide*.**

Step 1 Attach the mounting brackets to the shelf (see Figure 2-3).

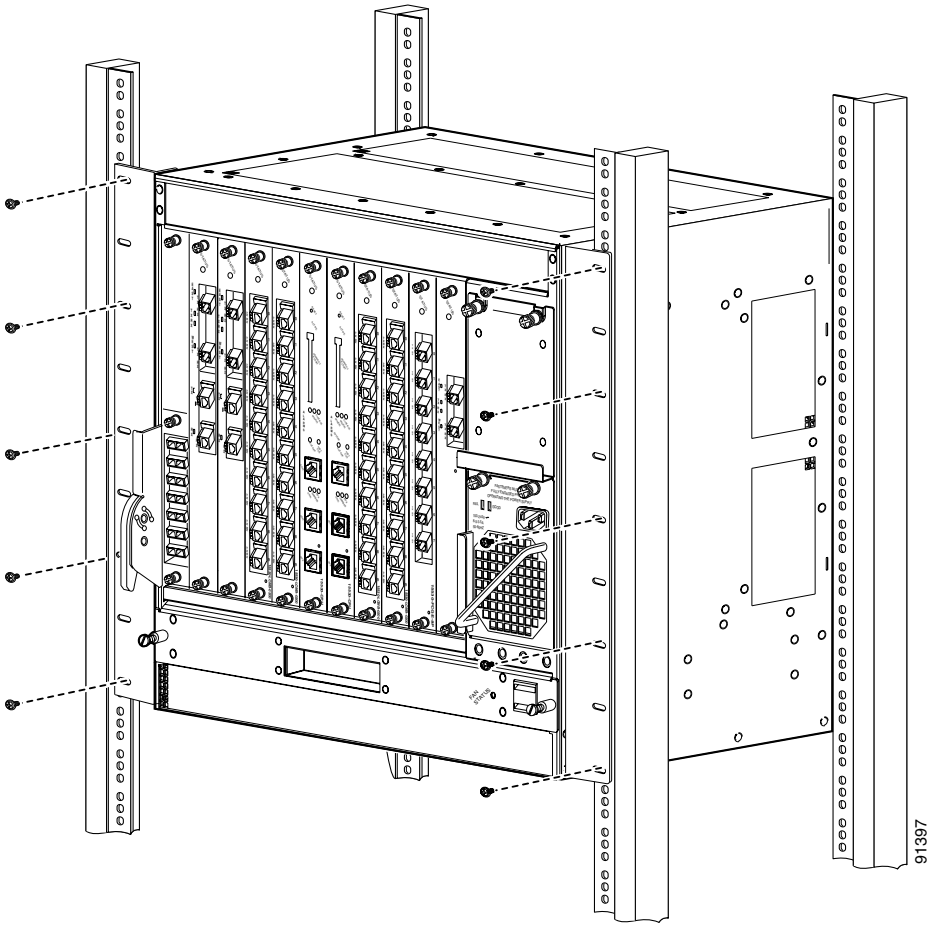
Figure 2-3 Attaching Mounting Brackets to Shelf



Step 2 Lift the shelf into position between the rack posts (requires two people).

Step 3 Align the mounting bracket holes with the rack post holes (see Figure 2-4) and attach the shelf to the rack (performed by the third person).

Figure 2-4 Attaching Shelf to Equipment Rack



Step 4 Check that all release levers are in the closed position, the chassis mounting screws are tight, and, if the slots are populated, all CPU switch module and line card captive screws are tight.

DLP-3 Attach the Air Ramp Baffle

Purpose	This task attaches the air ramp baffle to the Cisco ONS 15530 CHAS-E chassis.
Tools/Equipment	Number 1 Phillips screwdriver Eight 12-24 screws
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	Required for Cisco ONS 15530 CHAS-E chassis
Onsite/Remote	Onsite
Security Level	None

Step 1 Attach the mounting brackets to the air ramp baffle. See Figure 2-5.

Step 2 Position the air ramp baffle directly under the Cisco ONS 15530 CHAS-E chassis.

Step 3 Use a number 1 Phillips screwdriver and 12-24 screws to attach the air ramp baffle to the equipment rack. See Figure 2-6.

Figure 2-5 Air Ramp Baffle Mounting Brackets

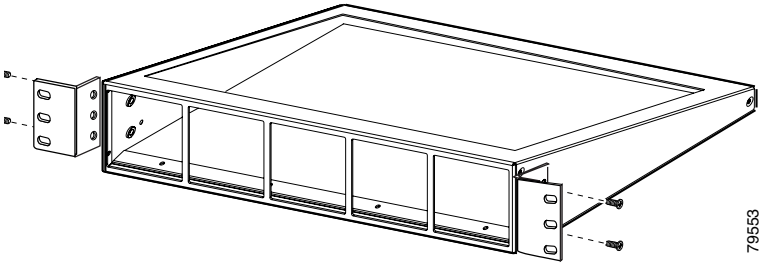
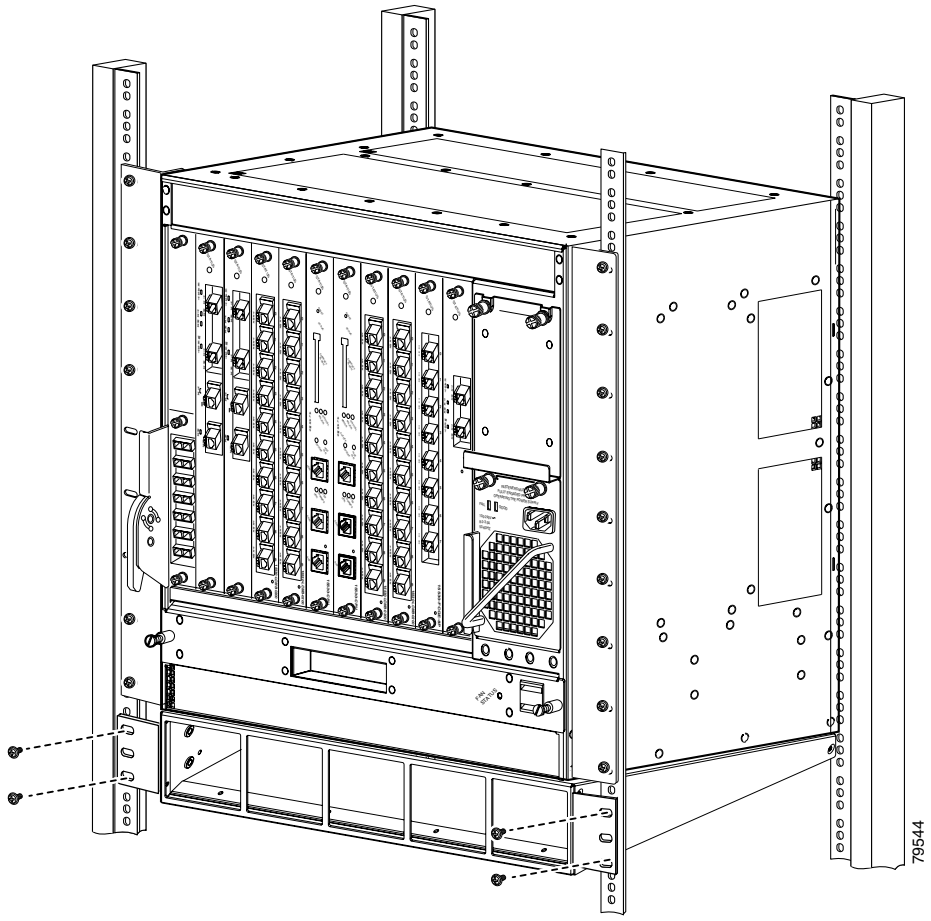


Figure 2-6 Installing the Air Ramp Baffle



NTP-3 Install the Fiber Routing Management System

Purpose	This procedure describes how to install the fiber routing management system.
Tools/Equipment	Number 1 Phillips screwdriver 12-24 screws
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Complete the "DLP-4 Install the Fiber Routing Tray" task on page 2-8 to install the fiber routing tray.

Step 2 Complete the "DLP-5 Install the Fiber Routing Drawer" task on page 2-9 to install the air filter in an alternative location.

Step 3 Continue with the "NTP-4 Install Line Cards, Modules, and Motherboards" procedure on page 2-10.

DLP-4 Install the Fiber Routing Tray

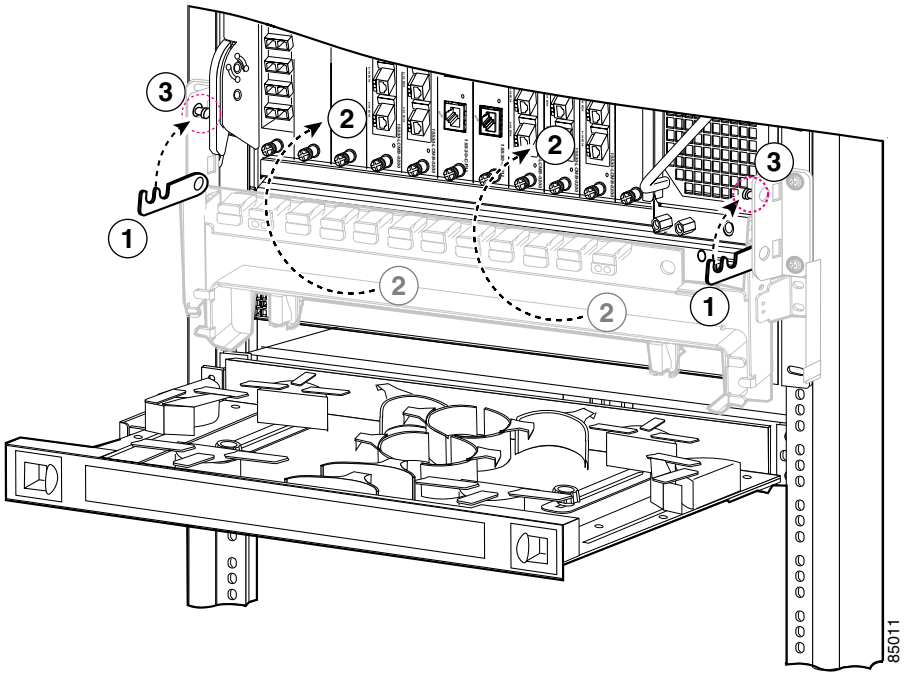
Purpose	This task installs the fiber routing tray.
Tools/Equipment	Number 1 Phillips screwdriver Four 12-24 screws
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 See Figure 2-7. Place the fiber routing tray (2) over the fan assembly, ensuring that the fan assembly can be accessed when the fiber routing tray is locked (1 and 2) in the raised position.

Step 2 Secure the fiber routing tray to the rack using a number 1 Phillips screwdriver and four 12-24 screws, two on each side.

Step 3 Hold the fiber routing drawer with both hands and position it in the rack beneath the chassis. (See Figure 2-7.)

Figure 2-7 Raising the Fiber Routing Tray



Step 4 Align the mounting holes on the bracket with the mounting holes in the equipment rack.

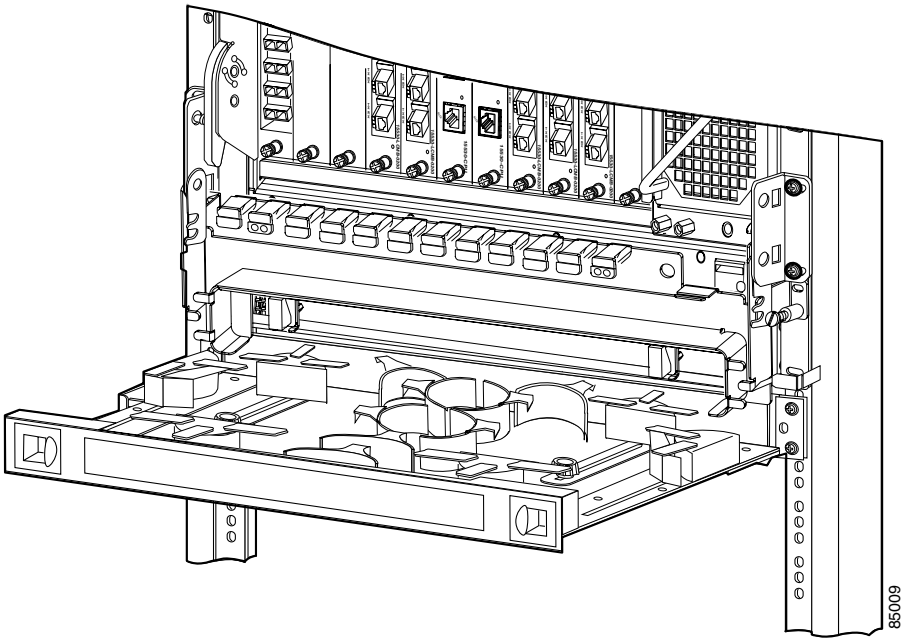
Step 5 Install the 12-24 screws through the elongated holes in the brackets and into the threaded holes in the mounting post. Repeat this step for the other side.

DLP-5 Install the Fiber Routing Drawer

Purpose	This task installs the fiber routing drawer.
Tools/Equipment	Number 1 Phillips screwdriver Four 12-24 screws
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Hold the drawer with both hands and position the drawer in the rack beneath the chassis. See Figure 2-8.

Figure 2-8 Installing the Fiber Routing Drawer



Step 2 Align the mounting holes on the bracket with the mounting holes in the equipment rack.

Step 3 Use a number 1 Phillips screwdriver to install the 12-24 screws through the elongated holes in the brackets and into the threaded holes in the mounting post. Repeat this step for the other side.

NTP-4 Install Line Cards, Modules, and Motherboards

Purpose	This procedure describes how to install the line cards, modules, and motherboards supported by the Cisco ONS 15530.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Complete the "DLP-6 Install the CPU Switch Module" task on page 2-11 to install the CPU switch module in the shelf.

Step 2 Complete the "DLP-7 Install the Redundant CPU Switch Module" task on page 2-12 as needed to install the optional redundant CPU switch module in the shelf.

Step 3 As needed, complete the "DLP-8 Install the OADM Module" task on page 2-13.

Step 4 As needed, complete the "DLP-9 Install the Carrier Motherboard" task on page 2-14 before continuing to the "DLP-10 Install the OSC Module" task on page 2-14, the "DLP-11 Install the WB-VOA Module" task on page 2-15, or the "DLP-12 Install the PB-OE Module" task on page 2-16.

Step 5 As needed, complete the "DLP-10 Install the OSC Module" task on page 2-14.

Step 6 As needed, complete the "DLP-11 Install the WB-VOA Module" task on page 2-15.

Step 7 As needed, complete the "DLP-12 Install the PB-OE Module" task on page 2-16.

Step 8 As needed, complete the "DLP-13 Install the Transponder Line Cards" task on page 2-17.

Step 9 As needed, complete the "DLP-63 Install the ESCON Aggregation Card" task on page 2-18.

Step 10 As needed, complete the "DLP-64 Install the 8-Port FC/GE Aggregation Card" task on page 2-20.

Step 11 As needed, complete the "DLP-65 Install the 2.5-Gbps ITU Trunk Card" task on page 2-22.

Step 12 As needed, complete the "DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card" task on page 2-23.

Step 13 As needed, complete the "DLP-67 Install the 10-Gbps Uplink Card" task on page 2-24.

DLP-6 Install the CPU Switch Module

Purpose	This task installs the CPU switch module.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Insert the CPU switch module carefully into chassis slot 5. Guide the upper and lower edges of the CPU switch module in the tracks until its connectors come into contact with the backplane.

Step 2 Use your thumb and forefinger of each hand to simultaneously push the CPU switch module in until it is fully seated in the backplane connector.

Step 3 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the module.

Step 4 Check the LEDs listed in Table 2-1 while powered to ensure proper installation.

Table 2-1 CPU Switch Module LEDs

LED	Status	Description
STATUS	Green	System image is loaded and running.
	Yellow	Card is in the process of booting.
ACTIVE	Green	Module is the primary CPU switch module, otherwise the LED is off.

Table 2-1 CPU Switch Module LEDs (continued)

LED	Status	Description
STANDBY	Green	Module is in standby mode, otherwise the LED is off.
ALARM LEDs		
CRITICAL	Red	A system wide critical alarm exists.
MAJOR	Yellow	A system wide major alarm exists.
MINOR	Yellow	A system wide minor alarm exists.
HIST	Yellow	A system wide major or minor alarm has occurred.
CUTOFF	Red	A major or minor alarm exists and the cutoff button has been pushed.
FDX	Green	NME port is running full-duplex.
	Off	NME port is running half-duplex.
100MBPS	Green	NME port is running at 100 Mbps.
	Off	NME port is running at 10 Mbps.
LINK	Green	Link is up.
	Off	Link is down.

Step 5 Insert a blank card into slot 6 if you are not installing a redundant CPU switch module. Otherwise, continue with the "DLP-7 Install the Redundant CPU Switch Module" task on page 2-12.

DLP-7 Install the Redundant CPU Switch Module

Purpose	This task installs the redundant CPU switch module.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Insert the redundant CPU switch module carefully into chassis slot 6. Guide the upper and lower edges of the redundant CPU switch module in the tracks until its connectors come into contact with the backplane.

Step 2 Use your thumb and forefinger of each hand to simultaneously push the redundant CPU switch module in until it is fully seated in the backplane connector.

Step 3 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the module.

Step 4 Check the LEDs listed in Table 2-1 on page 2-11 while powered to ensure proper installation.

DLP-8 Install the OADM Module

Purpose	This task installs the OADM (optical add/drop multiplexing) module.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	Required if the system adds and drops channels on the trunk fiber.
Onsite/Remote	Onsite
Security Level	None

Step 1 Remove the OADM module or the filler module from a subslot in slot 0 of the Cisco ONS 15530 chassis.

Step 2 Take the new OADM module from the shipping container.

Step 3 Insert the module carefully into the subslot in slot 0 of the Cisco ONS 15530 chassis while guiding the upper and lower edges of the module in the tracks until its connectors come into contact with the backplane connectors.

Step 4 Place the OADM module locking lever in place, and then use a number 1 Phillips screwdriver to tighten the captive installation screw.

Note Captive installation screws must be tightened to guarantee proper seating of the module.

DLP-80 Install the PSM

Purpose	This task installs the PSM.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Take the new PSM from the shipping container.

Step 2 Insert the PSM carefully into the subslot in slot 0 of the Cisco ONS 15530 chassis while guiding the upper and lower edges of the module in the tracks until its connectors come into contact with the backplane connectors.

Step 3 Place the PSM locking lever in place, and then use a number 1 Phillips screwdriver to tighten the captive installation screw.

Note Captive installation screws must be tightened to guarantee proper seating of the module.

DLP-9 Install the Carrier Motherboard

Purpose	This task installs the carrier motherboard, which is used for the OSC modules, WB-VOA modules, and PB-OE modules.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	Required for OSC modules, WB-VOA modules, and PB-OE modules.
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the carrier motherboard and remove the card or filler in the slot. A carrier motherboard can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new carrier motherboard from the shipping container.

Step 3 Insert the carrier motherboard carefully into the chassis slot while guiding the upper and lower edges of the carrier motherboard in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the carrier motherboard in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the carrier motherboard into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of carrier motherboard.

Step 7 Check the Status LED while powered to ensure proper installation.

DLP-10 Install the OSC Module

Purpose	This task installs the OSC module in the carrier motherboard.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-9 Install the Carrier Motherboard, page 2-14, if needed
Required/As Needed	As needed

Onsite/Remote	Onsite
Security Level	None

Step 1 Remove the OSC module or the filler module from the carrier motherboard.

Step 2 Take a new OSC module from the shipping container.

Step 3 Insert the OSC module carefully into the carrier motherboard slot while guiding the upper and lower edges of the OSC module in the tracks until its connectors come into contact with the backplane connectors.

Step 4 Place the OSC module locking lever in place, and then use a number 1 Phillips screwdriver to tighten the module locking lever.

Note Make sure the plastic locking lever is positioned to hold the module in place.

Step 5 Check the LEDs listed in Table 2-2 while powered to ensure proper installation.

Table 2-2 OSC Module LEDs

LED	Status	Description
STATUS	Green	OSC module initialization process is complete.
	Yellow	OSC module is initializing.
TX	Green	Transmit laser is enabled.
RX	Green	Light reception exists at wave OSC interface.

DLP-11 Install the WB-VOA Module

Purpose	This task installs the single WB-VOA module or dual WB-VOA module in the carrier motherboard.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-9 Install the Carrier Motherboard, page 2-14, if needed
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Remove the WB-VOA module or the filler module from the carrier motherboard.

Step 2 Take the new WB-VOA module from the shipping container.

Step 3 Insert the WB-VOA module carefully into the carrier motherboard slot while guiding the upper and lower edges of the WB-VOA module in the tracks until its connectors come into contact with the backplane connectors.

Step 4 Place the WB-VOA module locking lever in place, and then use a number 1 Phillips screwdriver to tighten the module locking lever.

Note Make sure the plastic locking lever is positioned to hold the module in place.

Step 5 Check the LEDs listed in Table 2-3 or Table 2-4 while powered to ensure proper installation.

Table 2-3 Single WB-VOA Module LEDs

LED	Status	Description
PM1	Green	Light reception exists at the port.
STA	Green	Card is properly initialized.

Table 2-4 Dual WB-VOA Module LEDs

LED	Status	Description
PM2	Green	Light reception exists at the port.
PM1	Green	Light reception exists at the port.
STATUS	Green	Card is properly initialized.

DLP-12 Install the PB-OE Module

Purpose	This task installs the single-band PB-OE module or dual-band PB-OE module in a carrier motherboard.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-9 Install the Carrier Motherboard, page 2-14, if needed
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Remove the PB-OE module or the filler module from the carrier motherboard.

Step 2 Take the new PB-OE module from the shipping container.

Step 3 Insert the PB-OE module carefully into the motherboard slot while guiding the upper and lower edges of the PB-OE module in the tracks until its connectors come into contact with the backplane connectors.

Step 4 Place the PB-OE module locking lever in place, and then use a number 1 Phillips screwdriver to tighten the module locking lever.

Note Make sure the plastic locking lever is positioned to hold the module in place.

Step 5 Check the LEDs listed in Table 2-5 or Table 2-6 while powered to ensure proper installation.

Table 2-5 Single-Band PB-OE Module

LED	Status	Description
PM1	Green	Light reception exists at the port.
STA	Green	Card is properly initialized.

Table 2-6 Dual-Band PB-OE LEDs

LED	Status	Description
PM2	Green	Light reception exists at the port.
PM1	Green	Light reception exists at the port.
STATUS	Green	Card is properly initialized.

DLP-13 Install the Transponder Line Cards

Purpose	This task installs the transponder line card.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-8 Install the OADM Module, page 2-13
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the transponder line card and remove the transponder line card or filler module in the slot. A transponder line card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new transponder line card from the shipping container.

Step 3 Insert the transponder line card carefully into the chassis slot while guiding the upper and lower edges of the transponder line card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the transponder line card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the transponder line card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the line card.

Step 7 Check the LEDs listed in Table 2-7 while powered to ensure proper installation.

Table 2-7 Transponder Line Card LEDs

LED	Status	Description
STATUS	Green	Card is properly initialized.
	Blinking green	Good system clock is present and card is out of reset state.
	Yellow	System clock is not present.
EAST[1]	Green	Card is listening to the east side signal.
TX (Trunk port)	Green	Port is up and transmit laser is enabled.
RX (Trunk port)	Green	Light reception exists at the port.
WEST[1]	Green	Card is listening to the west side signal.
TX (Client port)	Green	Port is up and transmit laser is enabled.
RX (Client port)	Green	Light reception exists at the port.

1. This LED is only present on transponder line cards with splitter protection.

DLP-63 Install the ESCON Aggregation Card

Purpose	This task installs the ESCON aggregation card.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the ESCON aggregation card and remove the ESCON aggregation card or filler module in the slot. An ESCON aggregation card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new ESCON aggregation card from the shipping container.

Step 3 Insert the ESCON aggregation card carefully into the chassis slot while guiding the upper and lower edges of the ESCON aggregation card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the ESCON aggregation card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the ESCON aggregation card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Install the SFP optics in the ESCON aggregation card by pushing them into the slots in the card until you hear a click.

Note You do not need to populate all ten slots in the ESCON aggregation card with SFP optics. Empty slots will not affect the operation of the card.

Step 8 Check the LEDs listed in Table 2-8 while powered to ensure proper installation.

Table 2-8 ESCON Aggregation Card LEDs

LED	Status	Description
STATUS	Off	No power to the card.
	Green	Card is properly initialized.
	Blinking green	Good system clock is present and card is out of reset state.
	Yellow	System clock is not present.
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.

DLP-90 Install the 4-Port 1-Gbps/2-Gbps FC Aggregation Card

Purpose	This task installs the 4-port 1-Gbps/2-Gbps FC aggregation card.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 4-port 1-Gbps/2-Gbps FC aggregation card and remove the 4-port 1-Gbps/2-Gbps FC aggregation card or filler module in the slot. A 4-port 1-Gbps/2-Gbps FC aggregation card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new 4-port 1-Gbps/2-Gbps FC aggregation card from the shipping container.

Step 3 Insert the 4-port 1-Gbps/2-Gbps FC aggregation card carefully into the chassis slot while guiding the upper and lower edges of the 4-port 1-Gbps/2-Gbps FC aggregation card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 4-port 1-Gbps/2-Gbps FC aggregation card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 4-port 1-Gbps/2-Gbps FC aggregation card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Install the SFP optics in the 4-port 1-Gbps/2-Gbps FC aggregation card by pushing them into the slots in the card until you hear a click.

Note You do not need to populate all eight slots in the 4-port 1-Gbps/2-Gbps FC aggregation card with SFP optics. Empty slots will not affect the operation of the card.

Step 8 Check the LEDs listed in Table 2-9 while powered to ensure proper installation.

Table 2-9 4-port 1-Gbps/2-Gbps FC Aggregation Card LEDs

LED	Status	Description
STATUS	Off	No power to the card.
	Red	Card is in reset or the LRC is not configured.
	Yellow	Card is out of reset.
	Green	Card is properly initialized.
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.

DLP-64 Install the 8-Port FC/GE Aggregation Card

Purpose	This task installs the 8-port aggregation card.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 8-port FC/GE aggregation card and remove the 8-port FC/GE aggregation card or filler module in the slot. An 8-port FC/GE aggregation card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new 8-port FC/GE aggregation card from the shipping container.

Step 3 Insert the 8-port FC/GE aggregation card carefully into the chassis slot while guiding the upper and lower edges of the 8-port FC/GE aggregation card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 8-port FC/GE aggregation card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 8-port FC/GE aggregation card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Install the SFP optics in the 8-port FC/GE aggregation card by pushing them into the slots in the card until you hear a click.

Note You do not need to populate all eight slots in the 8-port FC/GE aggregation card with SFP optics. Empty slots will not affect the operation of the card.

Step 8 Check the LEDs listed in Table 2-10 while powered to ensure proper installation.

Table 2-10 8-Port FC/GE Aggregation Card LEDs

LED	Status	Description
STATUS	Off	No power to the card.
	Red	Card is in reset or the LRC is not configured.
	Yellow	Card is out of reset.
	Green	Card is properly initialized.
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.

DLP-98 Install the 8-Port Multi-Service Muxponder

Purpose	This task installs the 8-port multi-service muxponder.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 8-port multi-service muxponder and remove the muxponder or filler module in the slot. An 8-port multi-service muxponder can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new muxponder from the shipping container.

Step 3 Insert the 8-port multi-service muxponder carefully into the chassis slot while guiding the upper and lower edges of the muxponder in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 8-port multi-service muxponder in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 8-port multi-service muxponder into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Check the LEDs listed in Table 2-11 while powered to ensure proper installation.

Table 2-11 8-Port Multi-Service Muxponder LEDs

LED	Status	Description
STATUS	Off	No power to the muxponder.
	Red	The functional image on the trunk is not configured.
	Yellow	The system clock is not present.
	Blinking green	The muxponder is out of reset and the system clock is good and waiting for software initialization.
	Green	The muxponder is initialized and operational.
Client port status	Rx green	Port is operational.
	Rx off	The Rx link is down.
	Tx green	Transmit enabled.
	Tx off	Transmit disabled.
Trunk status	East green	The muxponder is communicating with the West signal.
	West green	The muxponder is communicating with the East signal.
	Rx green	Light reception exists at the port.
	Tx green	Transmit enabled.

DLP-65 Install the 2.5-Gbps ITU Trunk Card

Purpose This task installs the 2.5-Gbps ITU trunk card.

Tools/Equipment Number 1 Phillips screwdriver

Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-8 Install the OADM Module, page 2-13
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 2.5-Gbps ITU trunk card and remove the 2.5-Gbps ITU trunk card or filler module in the slot. A 2.5-Gbps ITU trunk card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new 2.5-Gbps ITU trunk card from the shipping container.

Step 3 Insert the 2.5-Gbps ITU trunk card carefully into the chassis slot while guiding the upper and lower edges of the 2.5-Gbps ITU trunk card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 2.5-Gbps ITU trunk card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 2.5-Gbps ITU trunk card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Check the LEDs listed in Table 2-12 while powered to ensure proper installation.

Table 2-12 2.5-Gbps ITU Trunk Card LEDs

LED	Status	Description
STATUS	Green	Card is properly initialized.
WEST	Green	Card is listening to the west side signal (splitter only).
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.
EAST	Green	Card is listening to the east side signal (splitter only).

DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card

Purpose	This task installs the 10-Gbps ITU trunk card, both tunable and non-tunable.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-8 Install the OADM Module, page 2-13
Required/As Needed	As needed

Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 10-Gbps ITU tunable or non-tunable trunk card and remove the 10-Gbps ITU trunk card or filler module in the slot. A 10-Gbps ITU trunk card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new 10-Gbps ITU trunk card, tunable or non-tunable, from the shipping container.

Step 3 Insert the 10-Gbps ITU tunable or non-tunable trunk card carefully into the chassis slot while guiding the upper and lower edges of the 10-Gbps ITU trunk card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 10-Gbps ITU tunable or non-tunable trunk card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 10-Gbps ITU tunable or non-tunable trunk card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Check the LEDs listed in Table 2-13 while powered to ensure proper installation.

Table 2-13 10-Gbps ITU Tunable and Non Tunable Trunk Card LEDs

LED	Status	Description
STATUS	Green	Card is properly initialized.
WEST	Green	Card is listening to the west side signal (splitter only).
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.
EAST	Green	Card is listening to the east side signal (splitter only).

DLP-67 Install the 10-Gbps Uplink Card

Purpose	This task installs the 10-Gbps uplink card.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Select a chassis slot to install the 10-Gbps uplink card and remove the 10-Gbps uplink card or filler module in the slot. A 10-Gbps uplink card can be installed in slots 1 through 4 and slots 7 through 10.

Step 2 Take the new 10-Gbps uplink card from the shipping container.

Step 3 Insert the 10-Gbps uplink card carefully into the chassis slot while guiding the upper and lower edges of the 10-Gbps uplink card in the tracks until its connectors come into contact with the backplane.

Step 4 Use the release levers to push the 10-Gbps uplink card in until it is fully seated in the backplane connector.

Step 5 Push the release levers in simultaneously to lock the 10-Gbps uplink card into the slot.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive installation screws.

Note Captive installation screws must be tightened to guarantee proper seating of the card.

Step 7 Check the LEDs listed in Table 2-14 while powered to ensure proper installation.

Table 2-14 10-Gbps Uplink Card LEDs

LED	Status	Description
STATUS	Green	Card is properly initialized.
TX	Green	Port is up and transmit laser is enabled.
RX	Green	Light reception exists at the port.

NTP-5 Connect the Hardware

Purpose	This procedure describes to how connect the CPU switch module ports and how to connect the optical fiber cables between the optical cards and modules.
Tools/Equipment	RJ-45 to RJ-45 roll over cables RJ-45 to DB-25 (female) adapter RJ-45 to DB-9 (female) adapter Optical cabling
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Complete the "DLP-14 Connect the Console Ports" task on page 2-27 for privileged shelf management access.

Step 2 Complete the "DLP-15 Connect the NME Port on the CPU Switch Module" task on page 2-28 for LAN-based network management access to the shelf.

Step 3 As needed, complete the "DLP-16 Connect the Auxiliary Port on the CPU Switch Module" task on page 2-28 for modem access to the shelf.

Step 4 Complete the "DLP-17 Select Optical Cables" task on page 2-29.

Step 5 Complete the "DLP-18 Clean Optical Connectors" task on page 2-31 task whenever you make optical connections on the shelf.

Step 6 Complete the "DLP-19 Cable Using Cable Storage Drawers" task on page 2-32.

Step 7 As needed, complete the "DLP-20 Connect the OSC Module to the OADM Module" task on page 2-34.

Step 8 As needed, complete the "DLP-21 Connect the Transponder Line Card to the OADM Module" task on page 2-36.

Step 9 As needed, complete the "DLP-68 Connect the 2.5-Gbps ITU Trunk Card to the OADM Module" task on page 2-38.

Step 10 As needed, complete the "DLP-69 Connect the 10-Gbps ITU Trunk Card to the OADM Module" task on page 2-40.

Step 11 As needed, complete the "DLP-22 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Attenuation on the Receive Side" task on page 2-47.

Step 12 As needed, complete the "DLP-70 Connect OADM Modules, WB-VOA Modules, and 2.5-Gbps ITU Trunk Cards for Attenuation on the Receive Side" task on page 2-48.

Step 13 As needed, complete the "DLP-71 Connect OADM Modules, WB-VOA Modules, and 10-Gbps ITU Trunk Cards for Attenuation on the Receive Side" task on page 2-50.

Step 14 As needed, complete the "DLP-23 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Per-Channel Equalization" task on page 2-52.

Step 15 As needed, complete the "DLP-72 Connect OADM Modules, WB-VOA Modules, and OSC Modules for Per-Channel Equalization" task on page 2-54.

Step 16 As needed, complete the "DLP-73 Connect OADM Modules, WB-VOA Modules, and 2.5-Gbps ITU Trunk Card for Per-Channel Equalization" task on page 2-56.

Step 17 As needed, complete the "DLP-74 Connect OADM Modules, WB-VOA Modules, and 10-Gbps ITU Trunk Card for Per-Channel Equalization" task on page 2-57.

Step 18 As needed, complete the "DLP-24 Connect the WB-VOA Modules and OADM Modules to Attenuate the Trunk Transmit Signal" task on page 2-59.

Step 19 As needed, complete the "DLP-25 Connect the PB-OE Modules and OADM Modules to Equalize Added Channel Power to Pass Through Channel Power" task on page 2-61.

Step 20 As needed, complete the "DLP-26 Connect PB-OE Modules and OADM Modules to Terminate Unused Bands" task on page 2-62.

Step 21 As needed, complete the "DLP-27 Connect the OADM Modules for Splitter or Line Card Protection" task on page 2-64.

Step 22 As needed, complete the "DLP-28 Connect a Multi-Shelf Node With Two OSC Modules" task on page 2-66.

Step 23 As needed, complete the "DLP-29 Connect a Multi-Shelf Node With OSC Modules on Every Shelf" task on page 2-69.

Step 24 As needed, complete the "DLP-19 Cable Using Cable Storage Drawers" task on page 2-32.

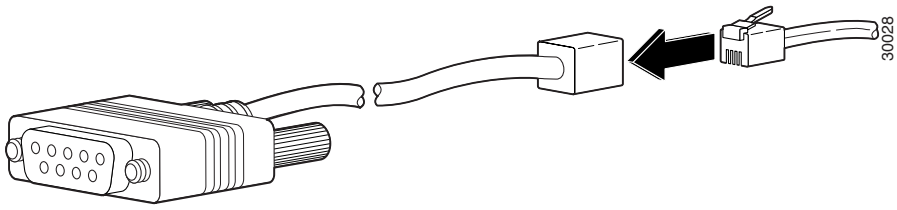
DLP-14 Connect the Console Ports

Purpose	This task connects the console port on the CPU switch module.
Tools/Equipment	RJ-45 to RJ-45 roll over cable RJ-45 to DB-25 (female) adapter RJ-45 to DB-9 (female) adapter
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-7 Install the Redundant CPU Switch Module, page 2-12, if redundancy is desired
Required/As Needed	Required for local console connection and for remote management connection
Onsite/Remote	Onsite
Security Level	None

Step 1 Connect one end of the RJ-45 roll over cable to the serial RJ-45 port (CON) on the CPU switch module.

Step 2 Run the cable up and through the cable management bracket (not supplied) and connect the other end of the RJ-45 roll over cable to the RJ-45 adapter (see Figure 2-9). If your terminal is equipped with a DB-25 serial connector, use the RJ-45-to-DB-25 adapter. If it is equipped with a DB-9 serial connector, use the RJ-45-to-DB-9 adapter.

Figure 2-9 Connecting an RJ-45-to-DB-9 Console Cable Adapter



Step 3 Connect the adapter to your video terminal to complete the cable connection.

Step 4 Power on your video terminal.

Step 5 Configure your video terminal to match the following default console port settings:

- 9600 baud
- 8 data bits
- No parity generation or checking
- 1 stop bit
- No flow control

Step 6 Repeat Step 1 and Step 5 for the redundant CPU switch module, if present.

Step 7 Check pinouts listed in Table 2-15 for the console port.

Table 2-15 Console Port RJ-45 Pinouts

Pin No.	Console		
	Direction	Function	
1	Output	RTS	Request To Send
2	Output	DTR	Data terminal ready
3	Output	TxD	Transmit data
4	N/A	GND	Ground
5	N/A	GND	Ground
6	Input	RxD	Receive data
7	Input	DSR	Data set ready
8	Input	CTS	Clear To Send

DLP-15 Connect the NME Port on the CPU Switch Module

Purpose	This task connects the NME (network management Ethernet) port on the CPU switch module.
Tools/Equipment	Twisted-pair wire with RJ-45 connectors
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-7 Install the Redundant CPU Switch Module, page 2-12, if redundancy is desired
Required/As Needed	Required for10/100BASE-T network management LAN access.
Onsite/Remote	Onsite
Security Level	None

Step 1 Connect the RJ-45 connector on one end of the twisted-pair wire to the NME port on the front panel of the CPU switch module.

Step 2 Connect the RJ-45 connector on the other end of the twisted-pair wire to an Ethernet port in a LAN router.

Step 3 Repeat Step 1 and Step 2 for the redundant CPU switch module, if present.

DLP-16 Connect the Auxiliary Port on the CPU Switch Module

Purpose	This task connects the auxiliary port on the CPU switch module.
Tools/Equipment	Twisted-pair wire with RJ-45 connectors

Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 DLP-7 Install the Redundant CPU Switch Module, page 2-12, if redundancy is desired
Required/As Needed	Required for modem access.
Onsite/Remote	Onsite
Security Level	None

Step 1 Connect the RJ-45 connector on one end of the twisted-pair wire to the NME port on the front panel of the CPU switch module

Step 2 Connect the RJ-45 connector on the other end of the twisted-pair wire to the modem.

Step 3 Repeat Step 1 and Step 2 for the redundant CPU switch module, if present.

Step 4 Check the pinouts listed in Table 2-16 for the auxiliary port.

Table 2-16 Auxiliary Port RJ-45 Pinouts

Pin No.	Auxiliary		
	Direction	Function	
1	Output	RTS	Request To Send
2	Output	DTR	Data terminal ready
3	Output	TxD	Transmit data
4	N/A	GND	Ground
5	N/A	GND	Ground
6	Input	RxD	Receive data
7	Input	CD	Carrier Detect
8	Input	CTS	Clear To Send

DLP-17 Select Optical Cables

Purpose	This task selects the optical patch cables before you connect the hardware.
Tools/Equipment	None
Prerequisite Procedures	NTP-3 Install the Fiber Routing Management System, page 2-8
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Check the placement of the line cards and modules in the shelf. Select the appropriate OADM, intrachassis, and interchassis patch cables from those listed in Table 2-17.

Table 2-17 Optical OADM, Intrachassis, and Interchassis Patch Cables

Part Number	Description
15500-CAB-MMU-02=	0.35 m (14 in.) tuned low loss MU to MU SM[1] patch cable
15500-CAB-MMU-03=	0.45 m (17 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-04=	0.5 m (20 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-05=	1.0 m (40 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-06=	1.5 m (60 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-07=	2.0 m (79 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-08=	2.5 m (98 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-10=	0.2 m (8 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-11=	1.7 m (68 in.) tuned low loss MU to MU SM patch cable
15500-CAB-MMU-12=	2.7 m (106 in.) tuned low loss MU to MU SM patch cable

1. SM = single mode

Step 2 Check the connectors and placement of the equipment at your site. Select the appropriate optical trunk cables from those listed in Table 2-18.

Table 2-18 Optical Trunk Cables

Part Number	Description
15500-CAB-MSC01=	1.0 m tuned low loss MU to SC SM[1] patch cable
15500-CAB-MSC02=	3.0 m tuned low loss MU to SC SM patch cable
15500-CAB-MSC03=	1.0 m tuned low loss MU to ST SM patch cable
15500-CAB-MSC04=	3.0 m tuned low loss MU to ST SM patch cable

1. SM = single mode

Step 3 Check the connectors and placement of the equipment at your site. Select the appropriate optical client cables from those listed in Table 2-19.

Table 2-19 Optical Client Cables

Part Number	Description
15500-CAB-SC11=	1.0 m SC to SC 62.5/125 micrometer MM[1] patch cable
15500-CAB-SC19=	1.0 m SC to SC 50/125 micrometer MM patch cable
15500-CAB-SC12=	1.0 m SC to SC SM patch cable
15500-CAB-SC13=	3.0 m SC to SC 62.5/125 micrometer MM patch cable
15500-CAB-SC20=	3.0 m SC to SC 50/125 micrometer MM patch cable
15500-CAB-SC14=	3.0 m SC to SC SM patch cable
15500-CAB-ST15=	1.0 m SC to ST 62.5/125 micrometer MM patch cable

Table 2-19 Optical Client Cables (continued)

Part Number	Description
15500-CAB-ST21=	1.0 m SC to ST 50/125 micrometer MM patch cable
15500-CAB-ST16=	1.0 m SC to ST SM patch cable
15500-CAB-ST17=	3.0 m SC to ST 62.5/125 micrometer MM patch cable
15500-CAB-ST22=	3.0 m SC to ST 50/125 micrometer MM patch cable
15500-CAB-ST18=	3.0 m SC to ST SM patch cable

1. MM = multimode

Step 4 If the shelf is configured for y-cable protection, check the type of equipment at your site. Select the appropriate optical y patch cables from those listed in Table 2-20.

Table 2-20 Optical Y Patch Cables

Part Number	Description
15500-CAB-YMM-SC=	50/125 micrometer multimode y cable with SC for channel protection
15500-CAB-YMM2-SC=	62.5/125 micrometer multimode y cable with SC for channel protection
15500-CAB-YSM-SC=	Single-mode y cable with SC for channel protection

DLP-18 Clean Optical Connectors

Purpose	This task describes how to clean optical connectors.
Tools/Equipment	Alcohol pad Magnifying glass Canned, dry, oil-free, compressed air
Prerequisite Procedures	None
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Wipe the ferrules and end-face surfaces of the connector gently with an alcohol pad from the cleaning kit. Be sure that the pad makes full contact with the end-face surfaces. Wait five seconds for the surfaces to dry and repeat.

Step 2 Blow dry the connectors with canned, dry, oil-free, compressed air.

Step 3 Use a magnifying glass to inspect the ferrule.

The connectors used inside the system have been cleaned by the manufacturer and connected to the adapters in the proper manner. The operation of the system should be error free if the customer provides clean connectors on the application side, follows the previous directions, and ensures the following:

- Clean the connectors using lens tissues before connecting to the adapters. Use pure alcohol to remove soil.
- Do not clean the inside of the connector adapters. Do not use force or quick movements when connecting the fiber optic connectors in the adapters.
- Cover the connector adapters to avoid soiling or contaminating the inside of the adapters while cleaning the chassis. When not using the connectors, cover the connectors and adapters to avoid the inside of the adapters or the surface of the connectors from getting dirty.

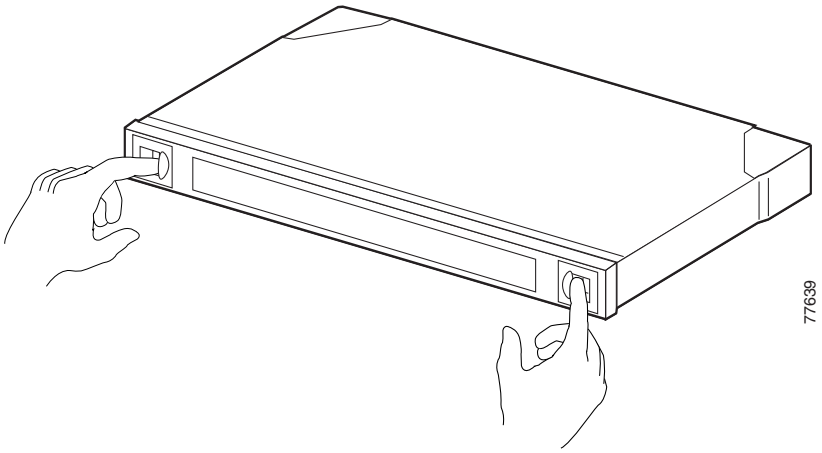
Note If the surface is not clean or does not have a uniform shine, repeat the process using a fresh surface of the alcohol pad.

DLP-19 Cable Using Cable Storage Drawers

Purpose	This task describes how to use the cable storage drawers.
Tools/Equipment	None
Prerequisite Procedures	NTP-3 Install the Fiber Routing Management System, page 2-8
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

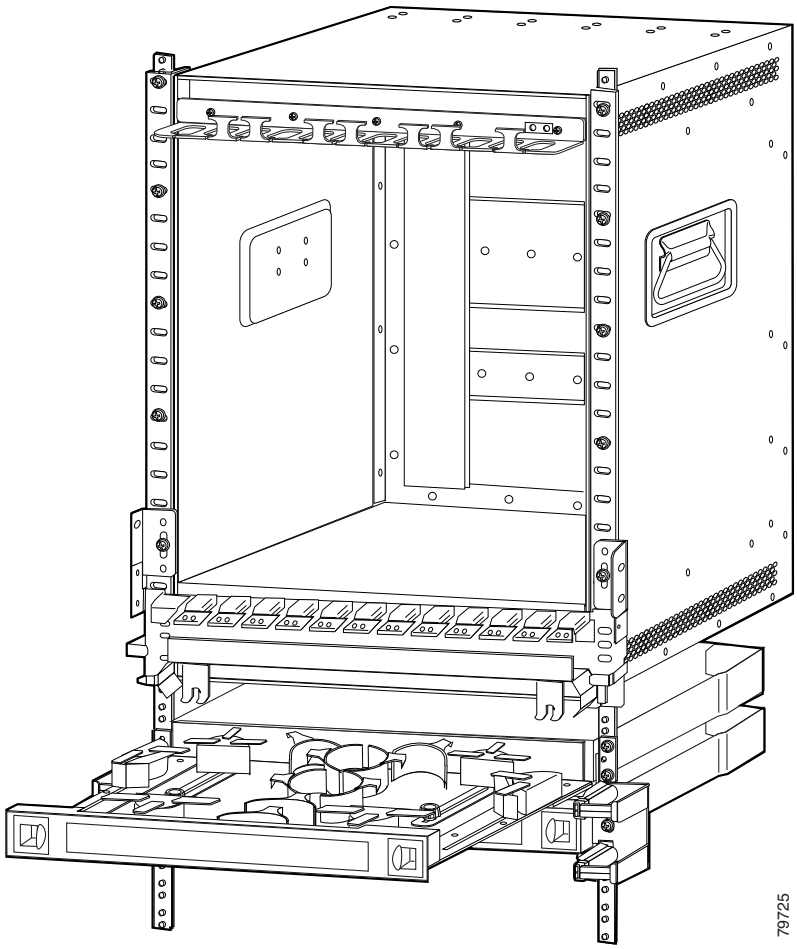
Step 1 Open the cable storage drawer by pushing the tabs in to release the lock on the drawer (See Figure 2-10).

Figure 2-10 Opening the Cable Storage Drawer



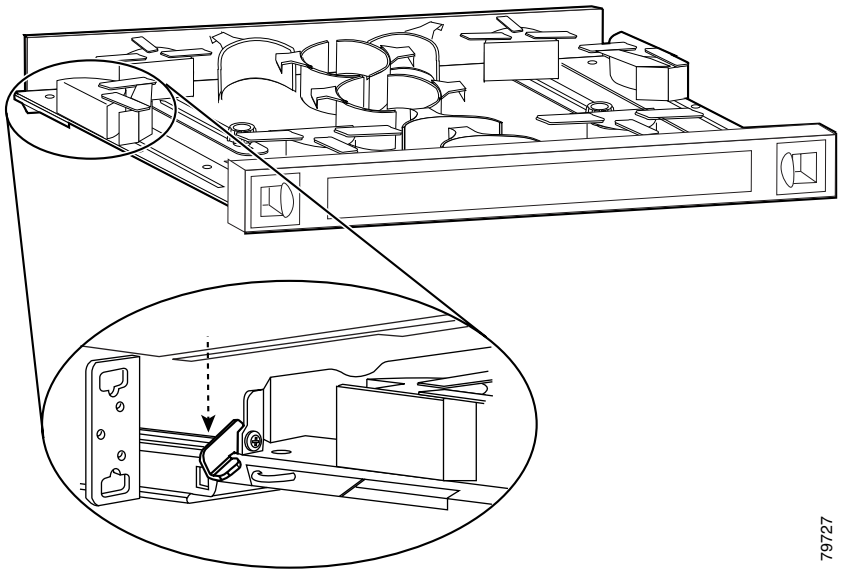
Step 2 Pull out the cable storage drawer (see Figure 2-11).

Figure 2-11 Pulling out the Cable Storage Drawer



Step 3 Lock the drawer in the open position by pushing the latch at the back left of the drawer down into the locked position (see Figure 2-12).

Figure 2-12 Locking the Drawer



Step 4 Push the connector of the cable into the adapter until the connector snaps into place.

Step 5 Route the cable down through the cutout holes on the cable management tray on the bottom of the shelf assembly. Pull the cable out of the left side of the tray.

Step 6 Route the cable down the left side of the chassis and into the drawer. Continue to route the cable through the drawer around the round cable retainers to the right side.

Step 7 Pull the cable up out of the right side of the drawer and then back up through the cutout holes on the cable management tray.

Step 8 Insert the connector into the desired card or module.

Step 9 Unlock the drawer to close it by moving the latch back into an upright position.

DLP-20 Connect the OSC Module to the OADM Module

Purpose	This task connects the OSC module to the OADM module.
Tools/Equipment	Two MU-to-MU cables per OSC module

Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-10 Install the OSC Module, page 2-14 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

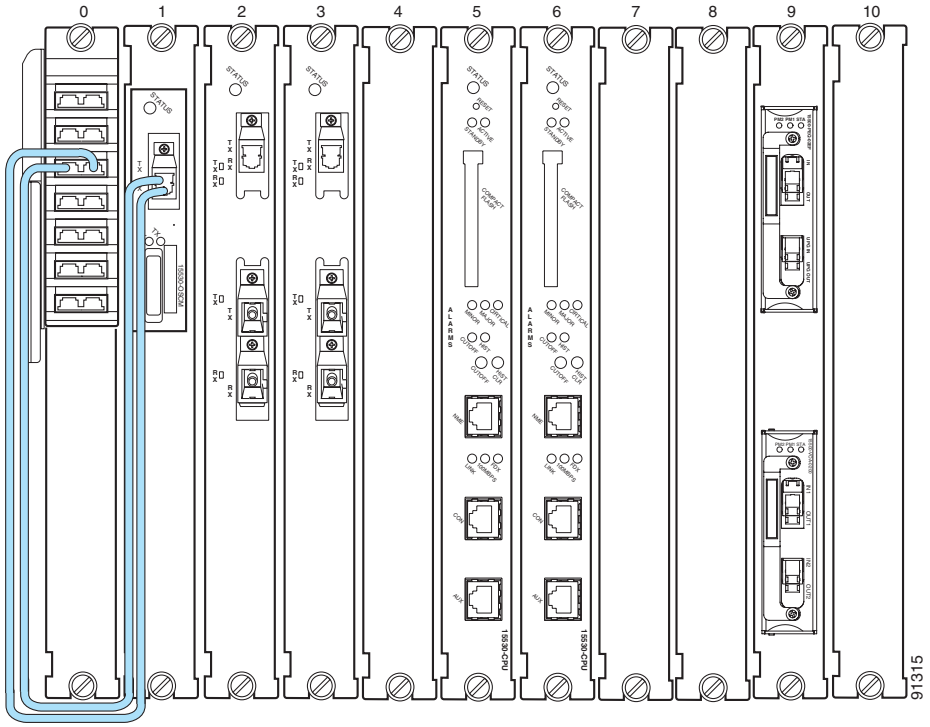
Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the TX port of the OSC module to the OSC_IN port of the OADM module (see Figure 2-13).

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

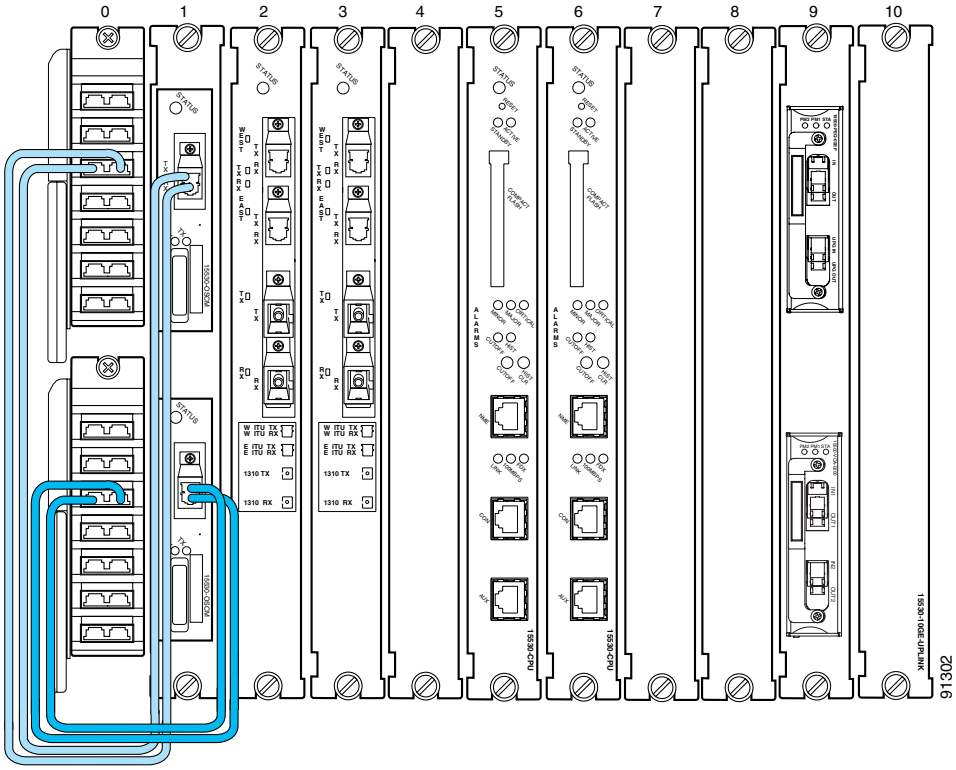
Step 3 Connect the RX port of the OSC module to the OSC_OUT port of the OADM module (see the example in Figure 2-13). In this example, the OSC module is in slot 1, subcard 0.

Figure 2-13 Cable Connections Between an OSC Module and an OADM Module



Step 4 Repeat Step 2 and Step 3 if a second OSC module has been installed. Connect the second OSC module to the second OADM module as shown in the example in Figure 2-14. In this example, the OSC modules are in slot 1, subcard 0 and subcard 1.

Figure 2-14 Cable Connections Between OSC Modules and OADM Modules in Splitter and Line Card Protected Configurations



DLP-21 Connect the Transponder Line Card to the OADM Module

Purpose	This task connects the transponder line card to the OADM module.
Tools/Equipment	Two MU-to-MU cables for a nonsplitter transponder line card or four MU-to-MU cables for a splitter transponder line card
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-13 Install the Transponder Line Cards, page 2-17 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the transponder line card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the transponder line card and locate the part number. The part number format is 15530-TSP1-*ccsm*, where *cc* indicates the lower channel number of the two channels supported by the transponder line card, *s* indicates nonsplitter (value 1) or splitter (value 2), and *m* indicates single-mode (value 1) or multimode (value 2). For example, 15530-TSP1-0321 is the part number for a splitter single-mode transponder line card that supports channels 3 or 4. This transponder line card should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the ITU TX port of the transponder line card to the CHxx_IN port of the OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

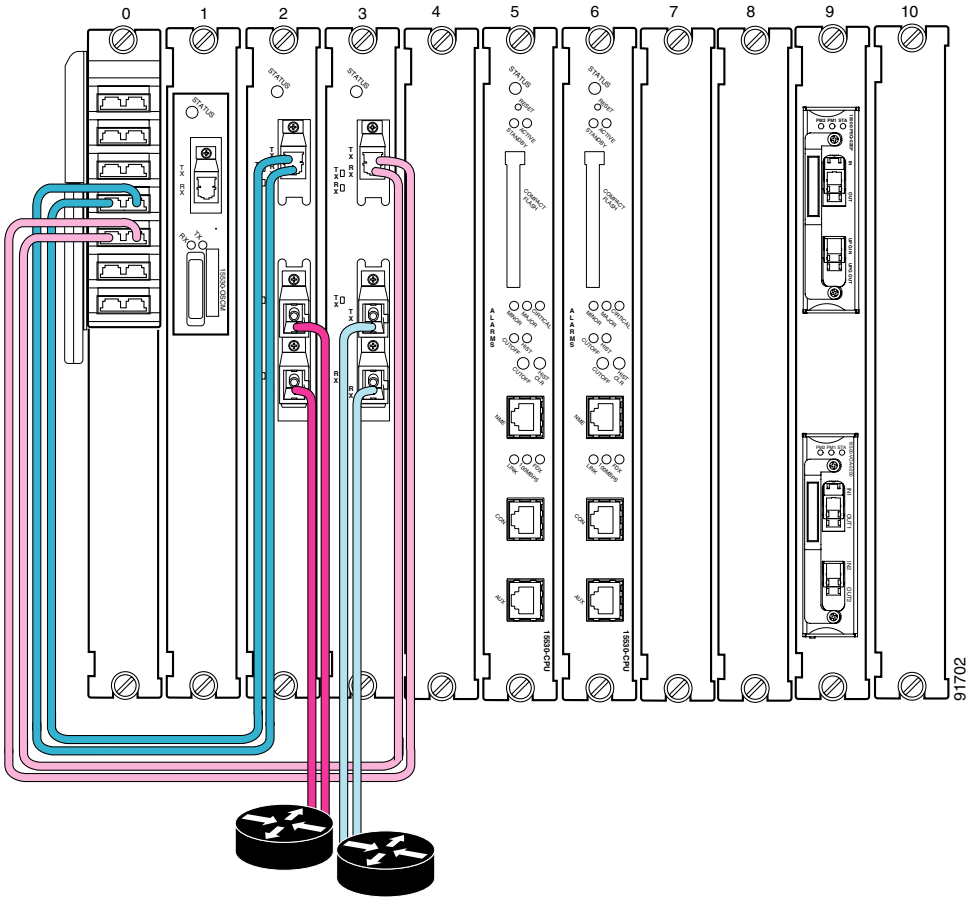
Step 4 Connect the ITU RX port of the transponder line card to the CHxx_OUT port of the OADM module.

Step 5 For a splitter transponder line card, repeat Step 3 through Step 4 for the other TX and RX ports.

Step 6 Connect the client side transmit and receive ports on the transponder line card to the client router.

Figure 2-15 shows an example of two transponder line cards cabled to an OADM in an unprotected configuration. In this example, the transponder line cards are in slots 1 and 2.

Figure 2-15 Transponder Line Card Cable Connections (Unprotected)



DLP-68 Connect the 2.5-Gbps ITU Trunk Card to the OADM Module

Purpose	This task connects the 2.5-Gbps ITU trunk card to the OADM module.
Tools/Equipment	Two MU-to-MU cables for a nonsplitter 2.5-Gbps ITU trunk card or four MU-to-MU cables for a splitter 2.5-Gbps ITU trunk card
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed

Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 2.5-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 2.5-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the lower channel number of the two channels supported by the 2.5-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU3-0320 is the part number for a splitter single-mode 2.5-Gbps ITU trunk card that supports channels 3 or 4. This 2.5-Gbps ITU trunk card should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the TX port of the 2.5-Gbps ITU trunk card to the CHxx_IN port of the OADM module.

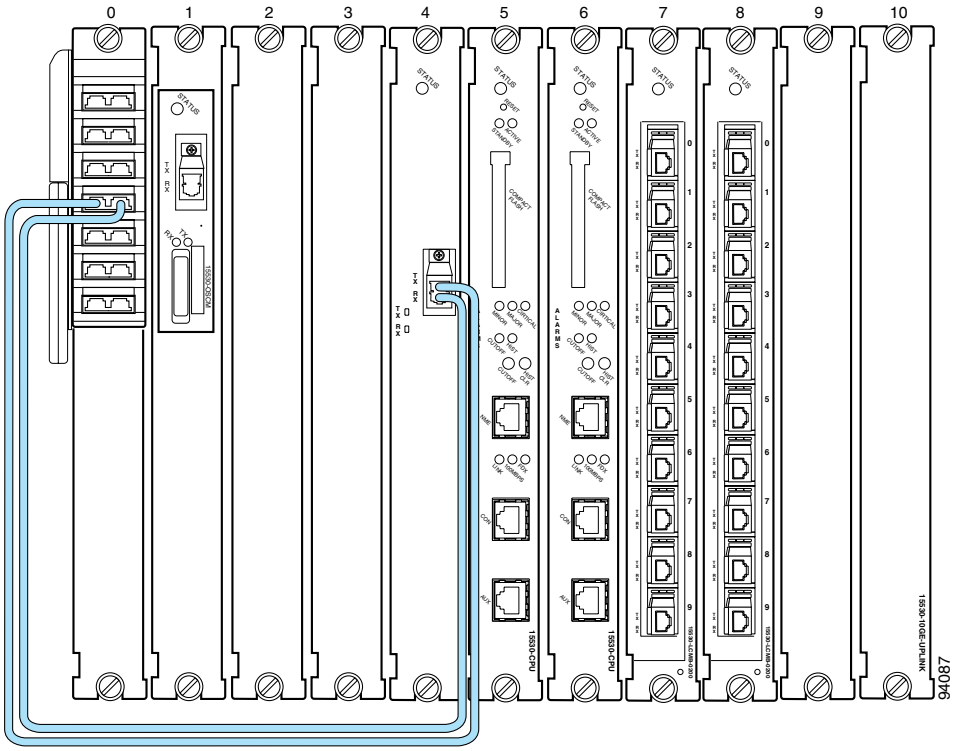
Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the RX port of the 2.5-Gbps ITU trunk card to the CHxx_OUT port of the OADM module.

Step 5 For a splitter 2.5-Gbps ITU trunk card, repeat Step 3 through Step 4 for the other TX and RX ports.

Figure 2-15 shows an example of two 2.5-Gbps ITU trunk cards cabled to an OADM in an unprotected configuration. In this example, the 2.5-Gbps ITU trunk card is in slots 4.

Figure 2-16 Transponder Line Card Cable Connections (Unprotected)



DLP-69 Connect the 10-Gbps ITU Trunk Card to the OADM Module

Purpose	This task connects the 10-Gbps ITU trunk card to the OADM module.
Tools/Equipment	Two MU-to-MU cables for a nonsplitter 10-Gbps ITU trunk card or four MU-to-MU cables for a splitter 10-Gbps ITU trunk card
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 10-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 10-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the channel supported by the 10-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU2-0320 is the part number for a splitter single-mode 10-Gbps ITU trunk card that supports channel 3. This 10-Gbps ITU trunk card should be connected to CH3_IN and CH3_OUT on the OADM module.

Step 3 Connect the TX port of the 10-Gbps ITU trunk card to the CHxx_IN port of the OADM module.

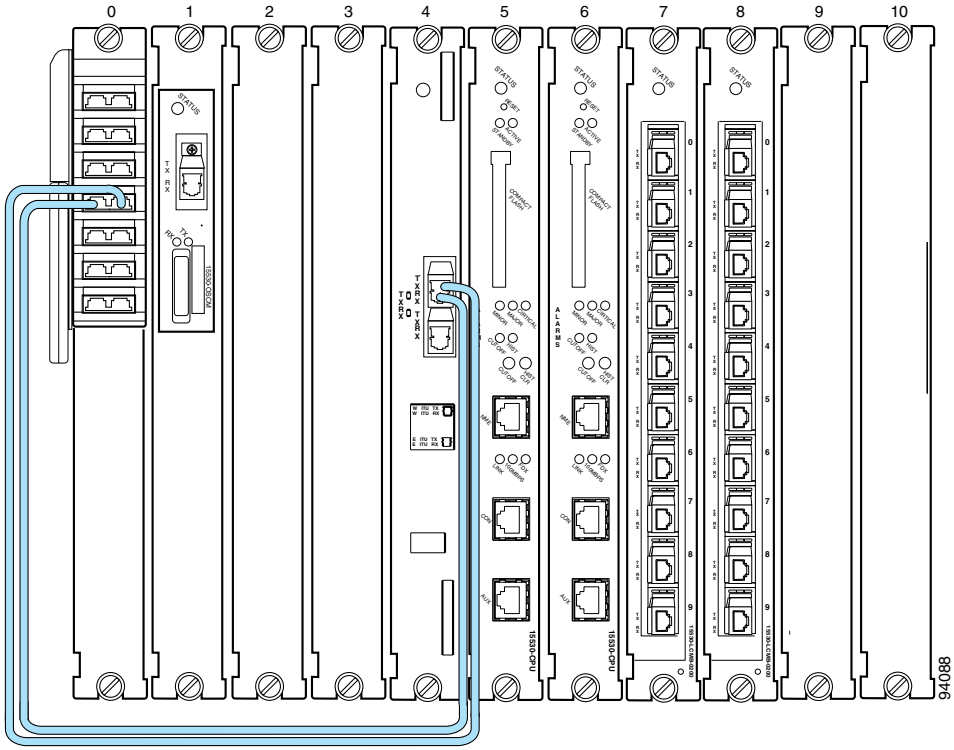
Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the RX port of the 10-Gbps ITU trunk card to the CHxx_OUT port of the OADM module.

Step 5 For a splitter 10-Gbps ITU trunk card, repeat Step 3 through Step 4 for the other TX and RX ports.

Figure 2-15 shows an example of two 2.5-Gbps ITU trunk cards cabled to an OADM in an unprotected configuration. In this example, the 2.5-Gbps ITU trunk card is in slot 4.

Figure 2-17 Transponder Line Card Cable Connections (Unprotected)



DLP-81 Connect the 2.5-Gbps ITU Trunk Card to the PSM

Purpose	This task connects the 2.5-Gbps ITU trunk card to the PSM.
Tools/Equipment	Two MU-to-MU cables.
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the mux/demux In and Out ports on the PSM.

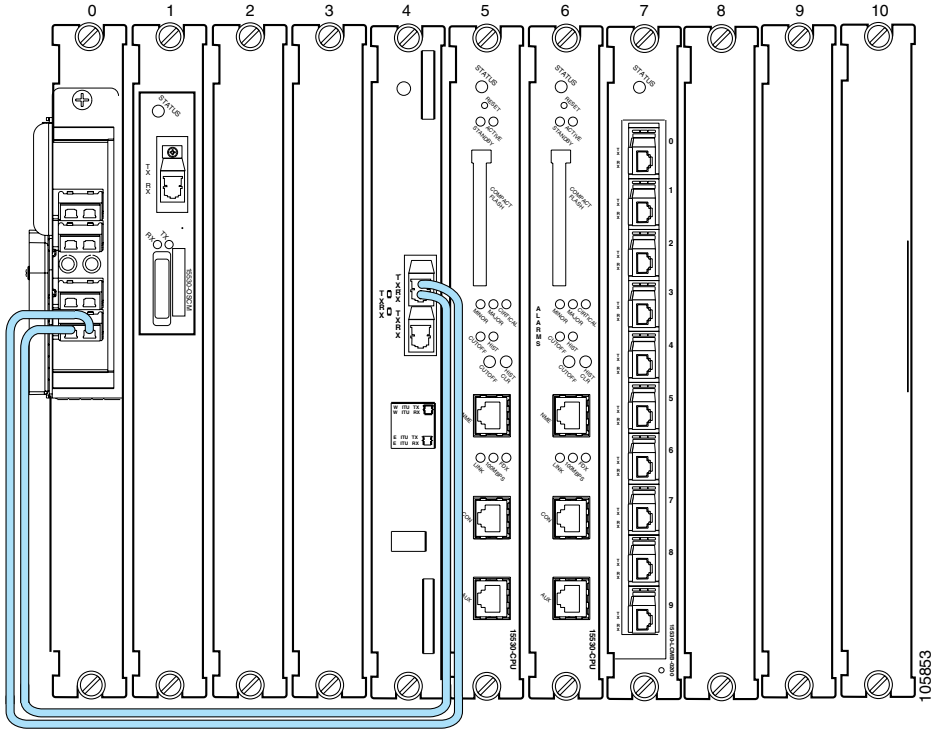
Step 2 Connect the Tx port of the 2.5-Gbps ITU trunk card to the mux/demux In port of the PSM.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the Rx port of the 2.5-Gbps ITU trunk card to the mux/demux Out port of the PSM.

Figure 2-18 shows an example of a 2.5-Gbps ITU trunk card cabled to a PSM. In this example, the 2.5-Gbps ITU trunk card is in slot 4.

Figure 2-18 Cabling a 2.5-Gbps ITU Trunk Card to a PSM



DLP-82 Connect the 10-Gbps ITU Trunk Card to the PSM

Purpose	This task connects the 10-Gbps ITU trunk card to the PSM.
Tools/Equipment	Two MU-to-MU cables.
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the Mux/Demux In and Out ports on the PSM.

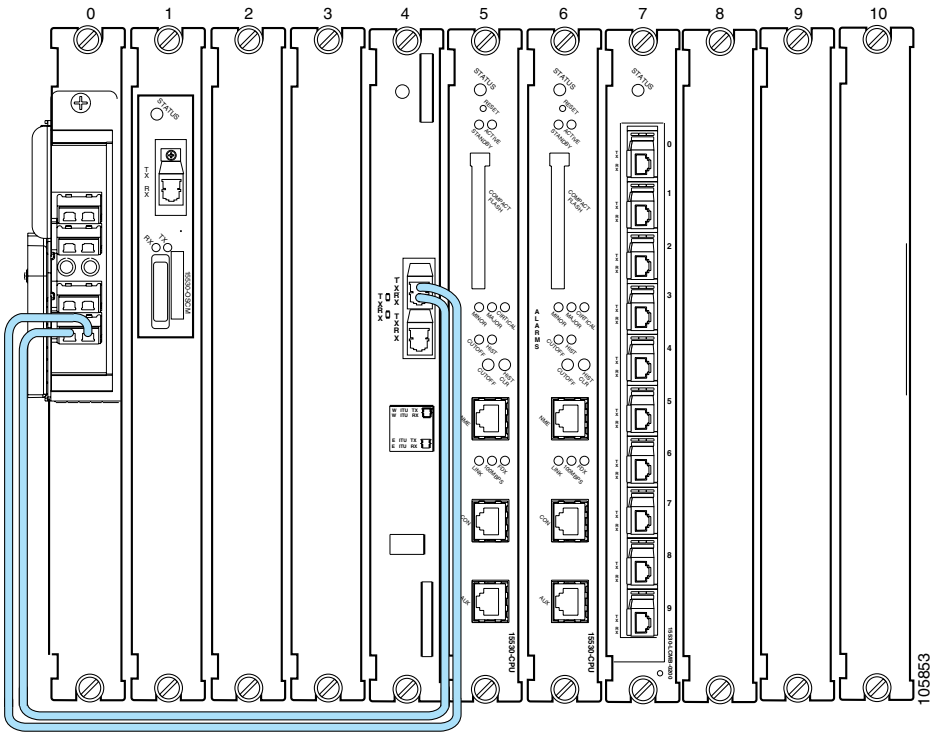
Step 2 Connect the Tx port of the10-Gbps ITU trunk card to the Mux/Demux In port of the PSM.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the Rx port of the 10-Gbps ITU trunk card to the Mux/Demux Out port of the PSM.

Figure 2-19 shows an example of a 10-Gbps ITU trunk card cabled to a PSM. In this example, the 10-Gbps ITU trunk card is in slot 4.

Figure 2-19 Cabling a 10-Gbps ITU Trunk Card to a PSM



DLP-83 Connect the Transponder Line Card to the PSM

Purpose	This task connects the transponder line card to the PSM.
Tools/Equipment	Two MU-to-MU cables.
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the Mux/Demux In and Out ports on the PSM.

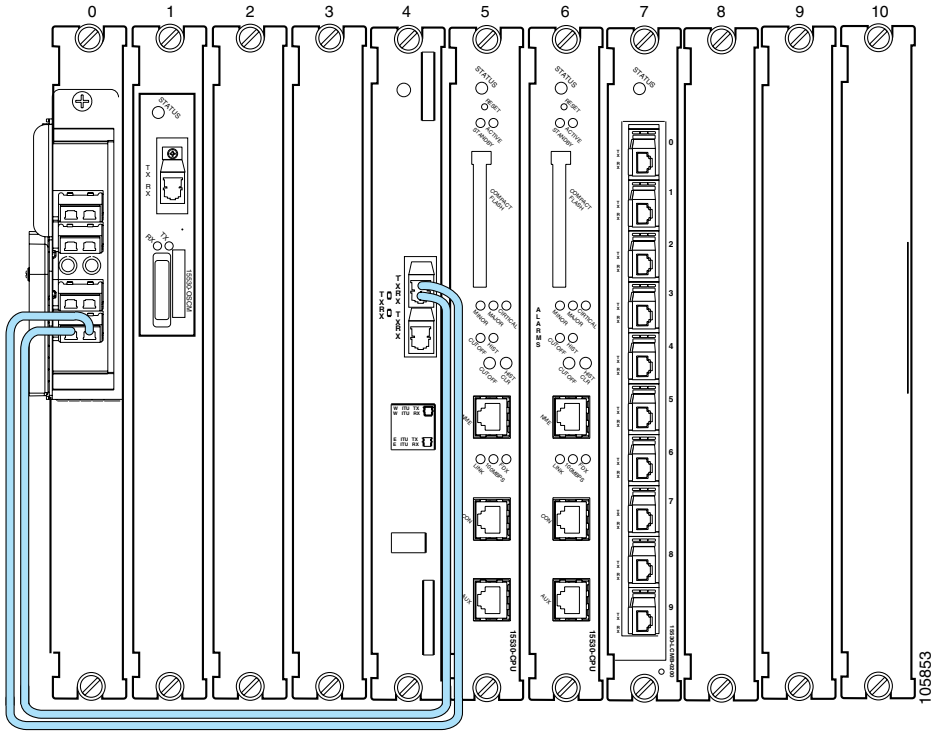
Step 2 Connect the Tx port of the transponder line card to the Mux/Demux In port of the PSM.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the Rx port of the transponder line card to the Mux/Demux Out port of the PSM.

Figure 2-20 shows an example of a transponder line card cabled to a PSM. In this example, the transponder line card is in slot 4.

Figure 2-20 Cabling a 10-Gbps ITU Trunk Card to a PSM



DLP-84 Connect the 10-Gbps Uplink Card to the PSM

Purpose	This task connects the 10-Gbps uplink card to the PSM.
Tools/Equipment	Two MU-to-MU cables.
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed

Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the Mux/Demux In and Out ports on the PSM.

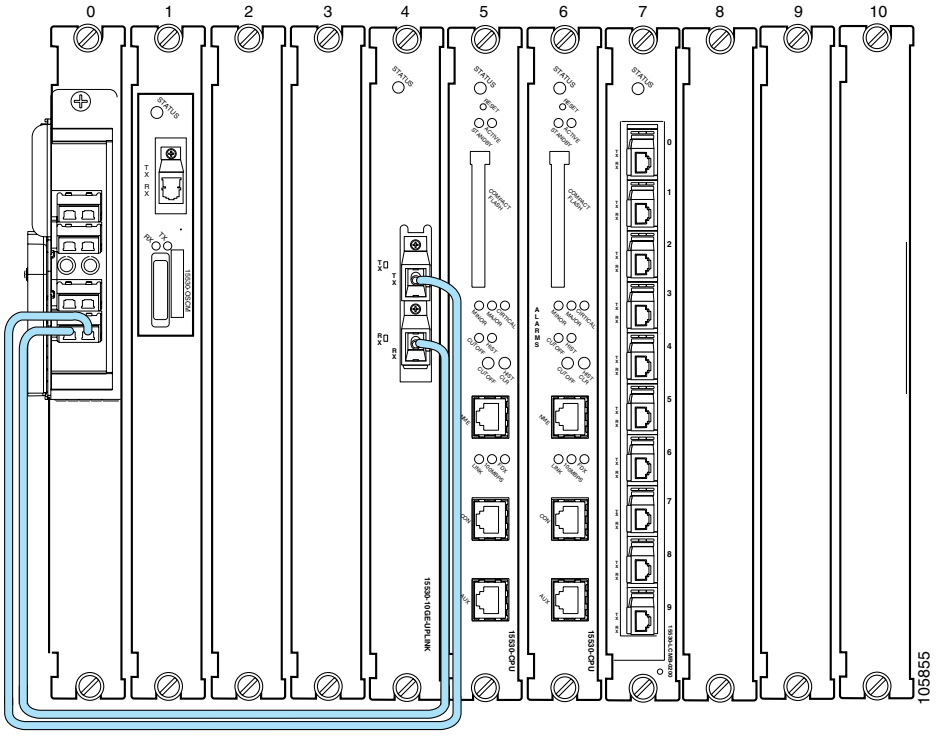
Step 2 Connect the Tx port of the 10-Gbps uplink card to the Mux/Demux In port of the PSM.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the Rx port of the 10-Gbps uplink card to the Mux/Demux Out port of the PSM.

Figure 2-21 shows an example of a transponder line card cabled to a PSM. In this example, the transponder line card is in slot 4.

Figure 2-21 Cabling a 10-Gbps Uplink Card to a PSM



DLP-22 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Attenuation on the Receive Side

Purpose	This task connects the WB-VOA module to an OADM module and a transponder line card for receiver side attenuation.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-13 Install the Transponder Line Cards, page 2-17 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the transponder line card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the transponder line card and locate the part number. The part number format is 15530-TSP1-*ccsm*, where *cc* indicates the lower channel number of the two channels supported by the transponder line card, *s* indicates nonsplitter (value 1) or splitter (value 2), and *m* indicates single-mode (value 1) or multimode (value 2). For example, 15530-TSP1-0321 is the part number for a splitter single-mode transponder line card that supports channels 3 or 4. This transponder line card should connect to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the CHxx_OUT port of the OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the OUT port of the WB-VOA module to the ITU RX port at the top of the transponder line card.

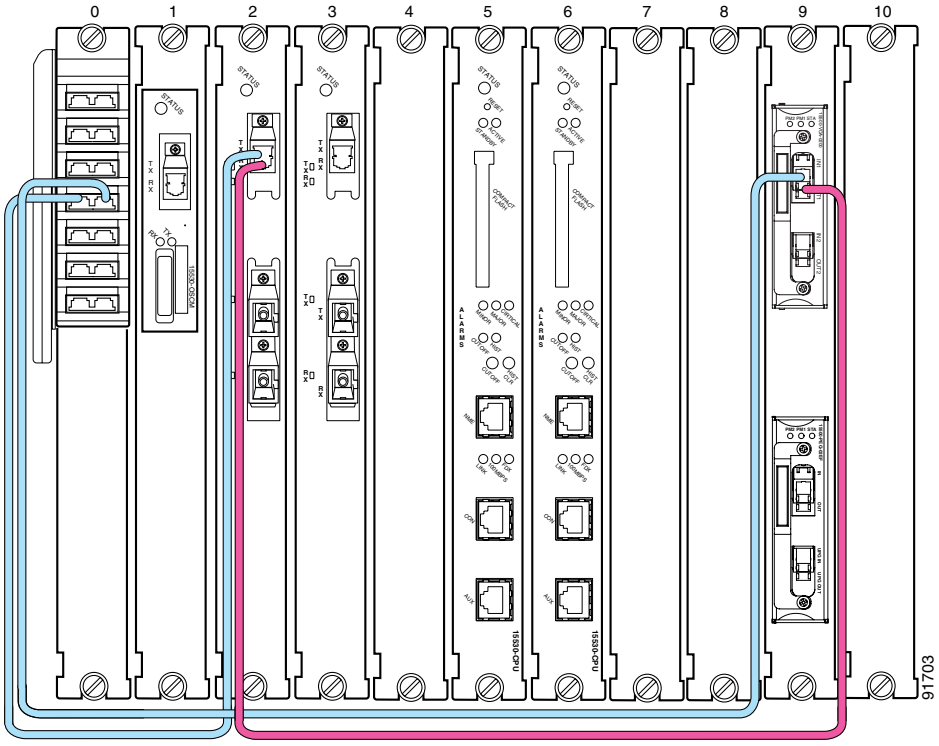
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 5 Connect the ITU TX port at the top of the transponder line card to the CHxx_IN port of the OADM module.

Step 6 For a splitter transponder line card, repeat Step 3 through Step 5 for the other TX and RX ports.

Figure 2-22 shows an example of using a WB-VOA module for attenuation on the receive side in an unprotected configuration. In this example, the transponder line card is in slot 1 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-22 WB-VOA Attenuation on the Receive Side (Unprotected)



DLP-70 Connect OADM Modules, WB-VOA Modules, and 2.5-Gbps ITU Trunk Cards for Attenuation on the Receive Side

Purpose	This task connects the WB-VOA module to an OADM module and a 2.5-Gbps ITU trunk card for receiver side attenuation.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 2.5-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 2.5-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the lower channel number of the two channels supported by the 2.5-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU3-0320 is the part number for a splitter 2.5-Gbps ITU trunk card that supports channels 3 or 4. This 2.5-Gbps ITU trunk card corresponds to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the correct CHxx_OUT port of the OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the OUT port of the WB-VOA module to the RX port at the top of the 2.5-Gbps ITU trunk card.

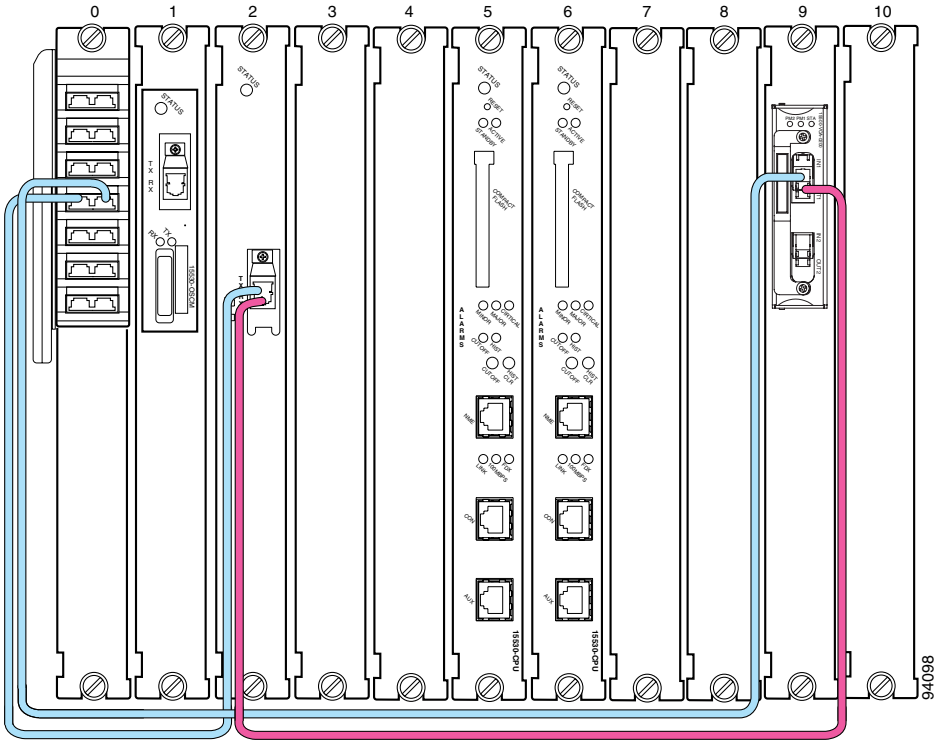
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 5 Connect the TX port at the top of the 2.5-Gbps ITU trunk card to the correct CHxx_IN port of the OADM module.

Step 6 For a splitter 2.5-Gbps ITU trunk card, repeat Step 3 through Step 5 for the other RX and TX ports.

Figure 2-22 shows an example of using a WB-VOA module for attenuation on the receive side in an unprotected configuration. In this example, the 2.5-Gbps ITU trunk card is in slot 1 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-23 WB-VOA Attenuation on the Receive Side (Unprotected)



DLP-71 Connect OADM Modules, WB-VOA Modules, and 10-Gbps ITU Trunk Cards for Attenuation on the Receive Side

Purpose	This task connects the WB-VOA module to an OADM module and a 10-Gbps ITU trunk card for receiver side attenuation.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 10-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 10-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU2-*ccs*0, where *cc* indicates the channel supported by the 10-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU2-0320 is the part number for a splitter single-mode 10-Gbps ITU trunk card that supports channel 3. This 10-Gbps ITU trunk card should be connected to CH3_IN and CH3_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the correct CHxx_OUT port of the OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the OUT port of the WB-VOA module to the RX port at the top of the 10-Gbps ITU trunk card.

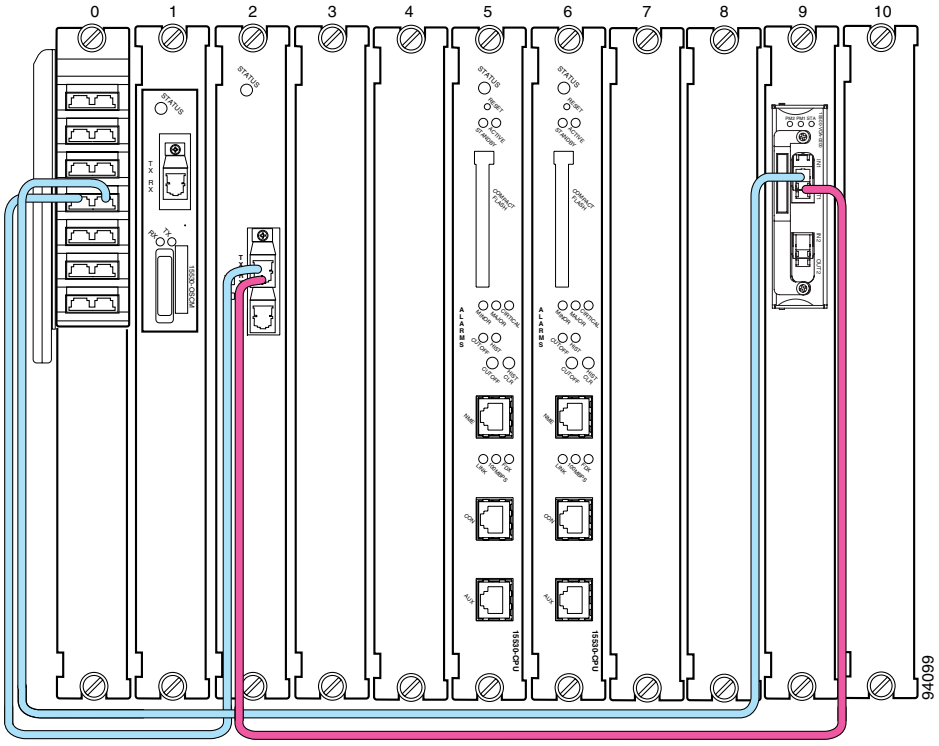
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 5 Connect the TX port at the top of the 10-Gbps ITU trunk card to the correct CHxx_IN port of the OADM module.

Step 6 For a splitter 10-Gbps ITU trunk card, repeat Step 3 through Step 5 for the other RX and TX ports.

Figure 2-22 shows an example of using a WB-VOA module for attenuation on the receive side in an unprotected configuration. In this example, the 10-Gbps ITU trunk card is in slot 1 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-24 WB-VOA Attenuation on the Receive Side (Unprotected)



DLP-23 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Per-Channel Equalization

Purpose	This task connects the WB-VOA module to an OADM module and a transponder line card for per-channel equalization.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-13 Install the Transponder Line Cards, page 2-17 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the transponder line card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the transponder line card and locate the part number. The part number format is 15530-TSP1-*ccsm*, where *cc* indicates the lower channel number of the two channels supported by the transponder line card, *s* indicates nonsplitter (value 1) or splitter (value 2), and *m* indicates single-mode (value 1) or multimode (value 2). For example, 15530-TSP1-0321 is the part number for a splitter single-mode transponder line card that supports channels 3 or 4. This transponder line card should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the ITU TX port at the top of the transponder line card.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the OUT port of the WB-VOA module to the channel IN port of the OADM module.

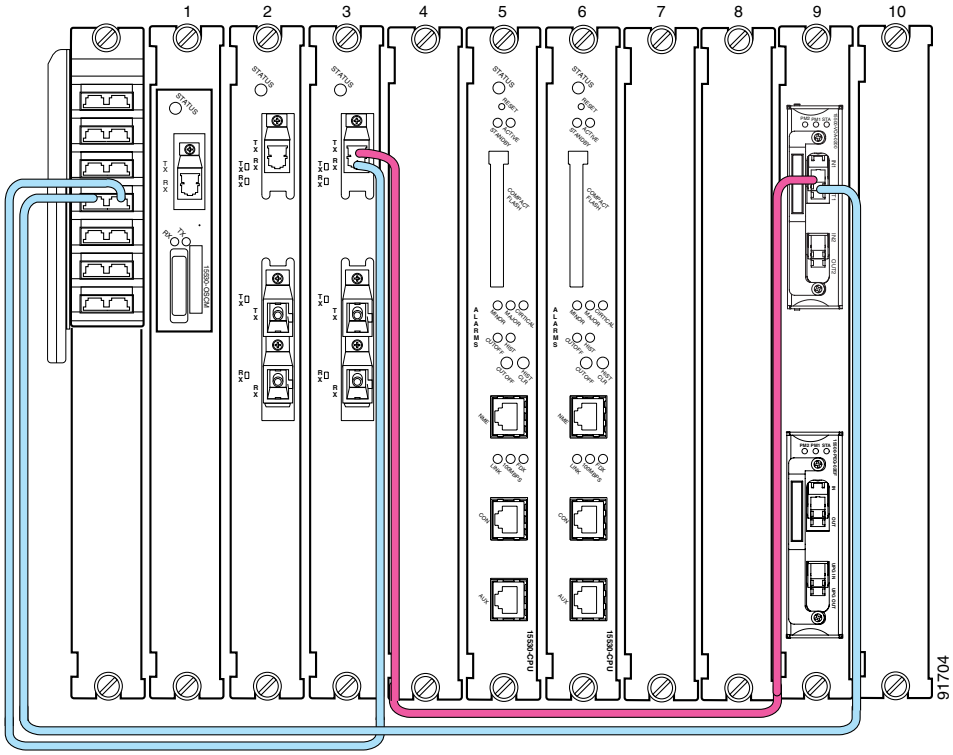
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 5 Connect the ITU RX at the top port of the transponder line card to the channel OUT port of the OADM module.

Step 6 For a splitter transponder line card, repeat Step 3 through Step 5 for the other TX and RX ports.

Figure 2-25 shows an example of per-channel equalization in an unprotected configuration. In this example, the transponder line card is in slot 3 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-25 Transponder Line Card With Per-Channel Equalization (Unprotected)



DLP-72 Connect OADM Modules, WB-VOA Modules, and OSC Modules for Per-Channel Equalization

Purpose	This task connects the WB-VOA module to an OADM module and an OSC module for per-channel equalization.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-10 Install the OSC Module, page 2-14 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the IN port of the WB-VOA module to the TX port of the OSC module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

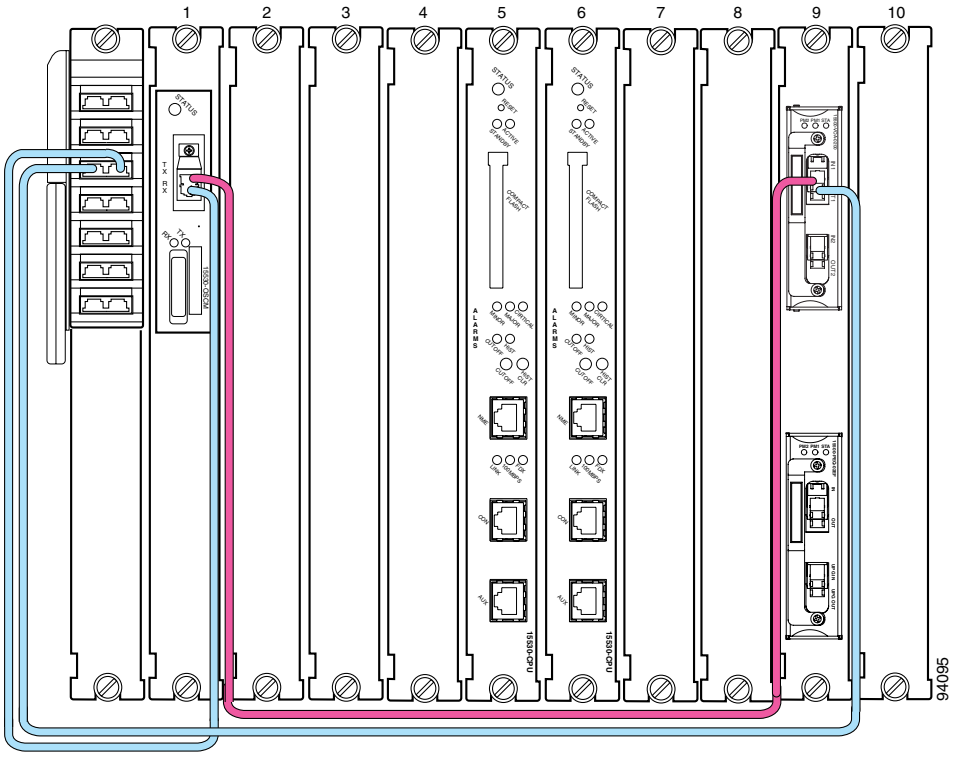
Step 3 Connect the OUT port of the WB-VOA module to the OSC_IN port of the OADM module.

Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 4 Connect the RX port of the OSC module to the OSC_OUT port of the OADM module.

Figure 2-25 shows an example of per-channel equalization in an unprotected configuration. In this example, the OSC module is in slot 1 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-26 OSC Module With Per-Channel Equalization (Unprotected)



DLP-73 Connect OADM Modules, WB-VOA Modules, and 2.5-Gbps ITU Trunk Card for Per-Channel Equalization

Purpose	This task connects the WB-VOA module to an OADM module and a 2.5-Gbps ITU trunk card for per-channel equalization.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 2.5-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 2.5-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the lower channel number of the two channels supported by the 2.5-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU3-0320 is the part number for a splitter 2.5-Gbps ITU trunk card that supports channels 3 or 4. This 2.5-Gbps ITU trunk card corresponds to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the TX port at the top of the 2.5-Gbps ITU trunk card.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

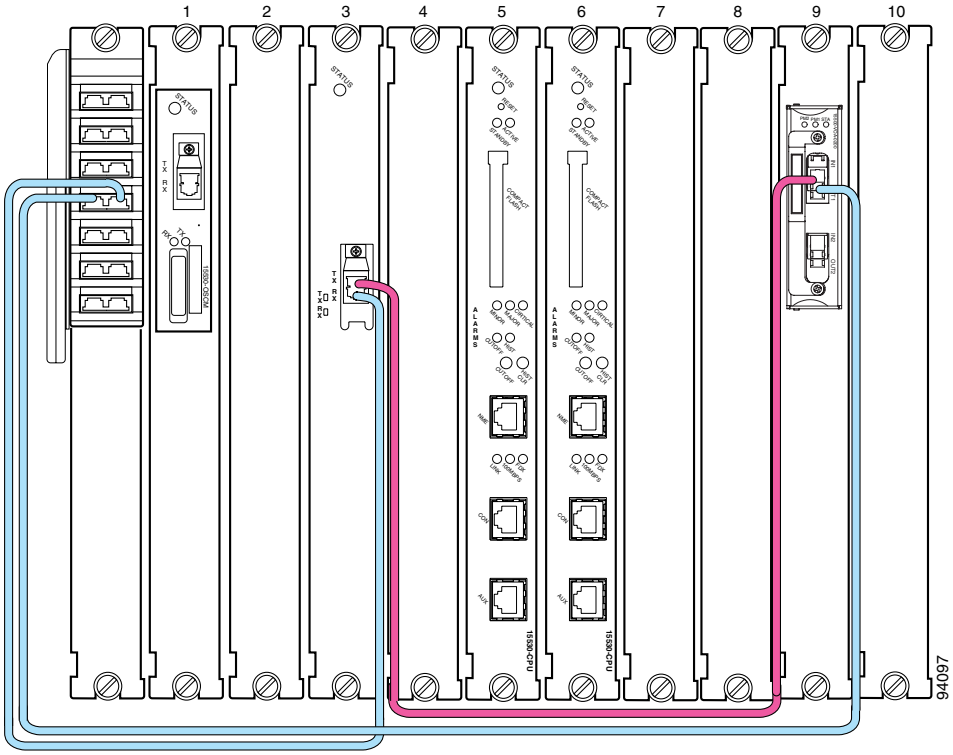
Step 4 Connect the OUT port of the WB-VOA module to the channel IN port of the OADM module.

Step 5 Connect the RX at the top port of the 2.5-Gbps ITU trunk card to the channel OUT port of the OADM module.

Step 6 For a splitter 2.5-Gbps ITU trunk card, repeat Step 3 through Step 5 for the other TX and RX ports.

Figure 2-27 shows an example of per-channel equalization in an unprotected configuration. In this example, the transponder line card is in slot 3 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-27 2.5-Gbps ITU Trunk Card With Per-Channel Equalization (Unprotected)



DLP-74 Connect OADM Modules, WB-VOA Modules, and 10-Gbps ITU Trunk Card for Per-Channel Equalization

Purpose	This task connects the WB-VOA module to an OADM module and a 10-Gbps ITU trunk card for per-channel equalization.
Tools/Equipment	Two MU-to-MU cables per OADM module One MU-to-MU cable per WB-VOA module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Check the part number of the 10-Gbps ITU trunk card and match it to the CHxx_IN and CHxx_OUT ports of the OADM module.

Look at the front panel of the 10-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU2-*ccs*0, where *cc* indicates the channel supported by the 10-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU2-0320 is the part number for a splitter single-mode 10-Gbps ITU trunk card that supports channel 3. This 10-Gbps ITU trunk card should be connected to CH3_IN and CH3_OUT on the OADM module.

Step 3 Connect the IN port of the WB-VOA module to the TX port at the top of the 10-Gbps ITU trunk card.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 4 Connect the OUT port of the WB-VOA module to the channel IN port of the OADM module.

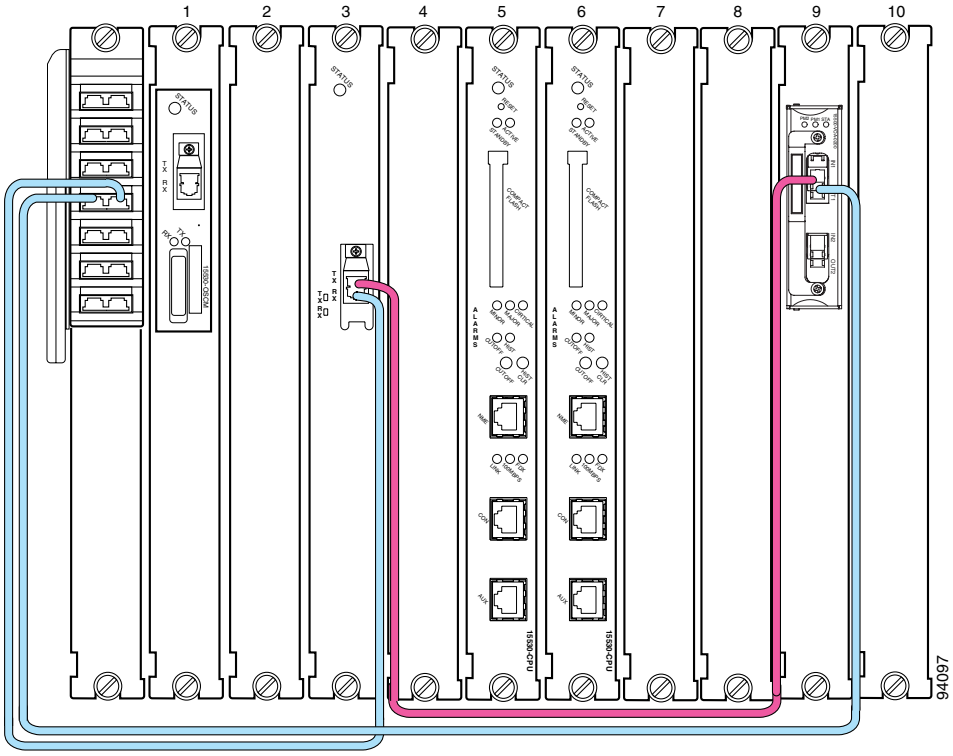
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 5 Connect the RX at the top port of the 10-Gbps ITU trunk card to the channel OUT port of the OADM module.

Step 6 For a splitter 10-Gbps ITU trunk card, repeat Step 3 through Step 5 for the other TX and RX ports.

Figure 2-28 shows an example of per-channel equalization in an unprotected configuration. In this example, the 10-Gbps ITU trunk card is in slot 3 and the WB-VOA module is in slot 9, subcard 0.

Figure 2-28 10-Gbps ITU Trunk Card With Per-Channel Equalization (Unprotected)



DLP-24 Connect the WB-VOA Modules and OADM Modules to Attenuate the Trunk Transmit Signal

Purpose	This task connects the WB-VOA module to an OADM module for the trunk signal leaving the node.
Tools/Equipment	Two optical trunk cables and one MU-to-MU patch cable
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the outside trunk to the TRUNK_IN port of the OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

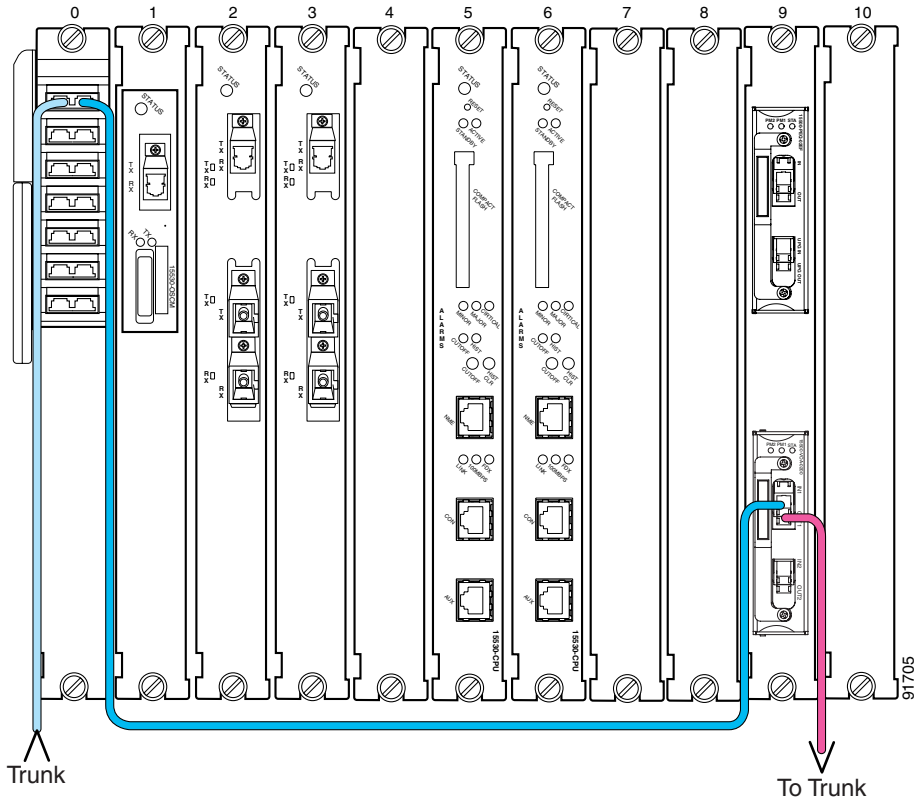
Step 3 Connect the TRUNK_OUT port of the OADM module to the IN port of the WB-VOA module.

Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect to correct ports when using a dual WB-VOA module.

Step 4 Connect the OUT port of the WB-VOA module to the outside trunk.

Figure 2-29 shows an example of these cable connections. In this example, the WB-VOA module is in slot 9, subcard 0.

Figure 2-29 Cable Connections Between a WB-VOA Module and an OADM Module for Trunk Signal Attenuation



DLP-25 Connect the PB-OE Modules and OADM Modules to Equalize Added Channel Power to Pass Through Channel Power

Purpose	This task connects the single-band or dual-band PB-OE module to an OADM module and WB-VOA modules to equalize the added channel power with the pass through channel power.
Tools/Equipment	Two optical trunk cables One MU-to-MU patch cable to connect the OADM to the PB-OE Two MU-to-MU patch cables to connect the PB-OE module to the WB-VOA module or another PB-OE module
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-11 Install the WB-VOA Module, page 2-15 DLP-12 Install the PB-OE Module, page 2-16 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the OUT port of the PB-OE module to the outgoing trunk.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the IN port of the PB-OE module to the TRUNK_OUT port of the OADM module.

Step 4 Connect the UPG OUT port of PB-OE module to an IN port on the WB-VOA module.

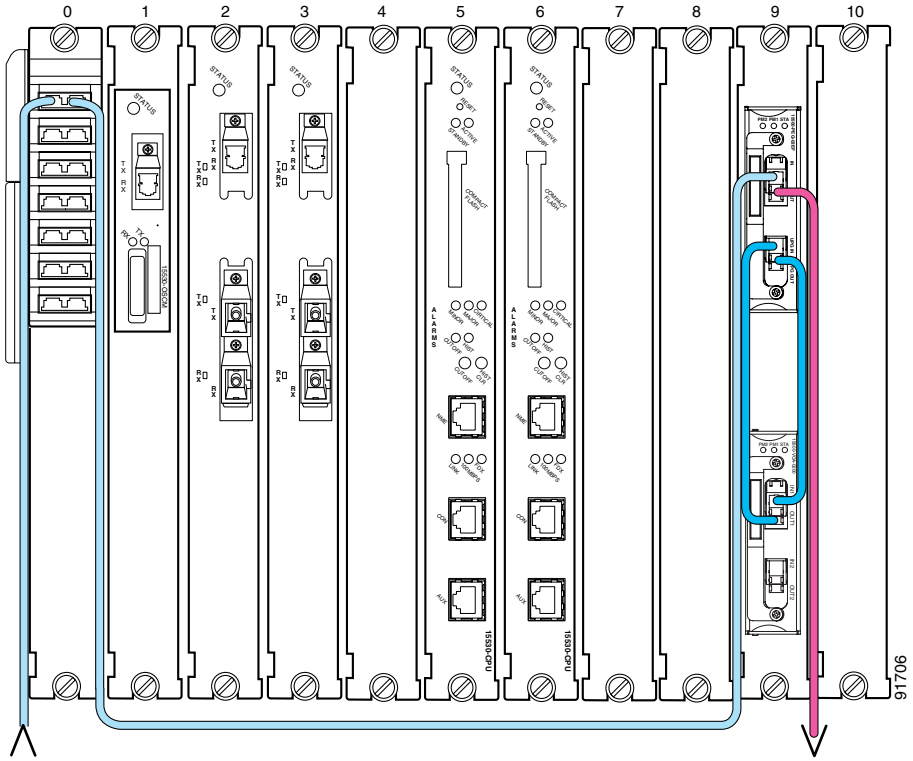
Note A single WB-VOA module has only one IN port and one OUT port. A dual WB-VOA module has two pairs of ports, IN1/OUT1 and IN2/OUT2. Be sure to connect the PB-OE module to correct ports when using a dual WB-VOA module.

Step 5 Connect the UPG IN port of the PB-OE module to an OUT port on the WB-VOA module.

Step 6 Connect the TRUNK_IN port of the OADM module to the incoming trunk.

The example in Figure 2-30 shows a PB-OE module in slot 9, subcard 0, equalizing bands E and F and the WB-VOA module is in slot 9, subcard 1 equalizing the pass through bands.

Figure 2-30 Added Channel Power Equalized With The Pass Through Channel Power (Unprotected)



DLP-26 Connect PB-OE Modules and OADM Modules to Terminate Unused Bands

Purpose	This task connects the single-band or dual-band PB-OE modules to an OADM module to equalize pass through bands and terminate unused bands to eliminate potential lasing effects.
Tools/Equipment	Two MU-to-MU patch cables per OADM Two trunk fibers per OADM Two MU-to-MU patch cable to connect the PB-OE modules
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13 DLP-12 Install the PB-OE Module, page 2-16 DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the MID_IN port of the first OADM module to the MID_OUT port of the second OADM module.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 3 Connect the MID_OUT port of the first OADM module to the IN port of the PB-OE module.

Step 4 Connect the MID_IN port of the second OADM module to the OUT port of the PB-OE module.

Step 5 Connect the UPG OUT port of the PB-OE module connected to the OADM module to the OUT port of the PB-OE module.

Step 6 Connect the UPG_OUT port of the PB-OE module to the IN port of the PB-OE module.

Step 7 If more than one PB-OE module are installed to equalize the bands supported on the network, perform the following steps to cascade the PB-OE modules:

a. Connect the UPG OUT port to the IN port of the next PB-OE module.

b. Connect the UPG IN port to the OUT port of the next PB-OE module.

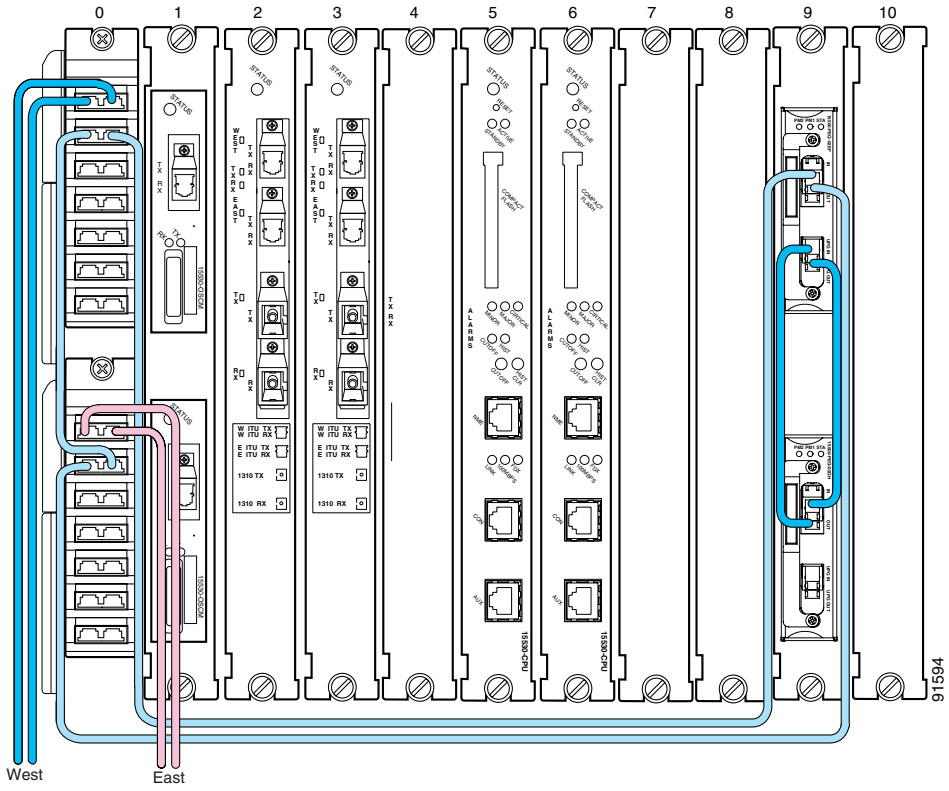
c. Repeat Step a through Step b for the remaining PB-OE modules.

Step 8 Connect the TRUNK_IN and TRUNK_OUT ports of the first OADM module to the west side trunks.

Step 9 Connect the TRUNK_IN and TRUNK_OUT ports of the second OADM module to the east side trunks.

Figure 2-31 shows an example of two PB-OE modules configured to equalize power of four bands and terminate the unused bands. The PB-OE modules are in slot 9.

Figure 2-31 Terminating Unused Bands



DLP-27 Connect the OADM Modules for Splitter or Line Card Protection

Purpose	This task connects the two OADM modules for splitter or line card protected configurations.
Tools/Equipment	Four trunk cables Two MU-to-MU patch cables
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13, for two OADM modules DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the TRUNK_IN port of the top OADM module to the west side trunk.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

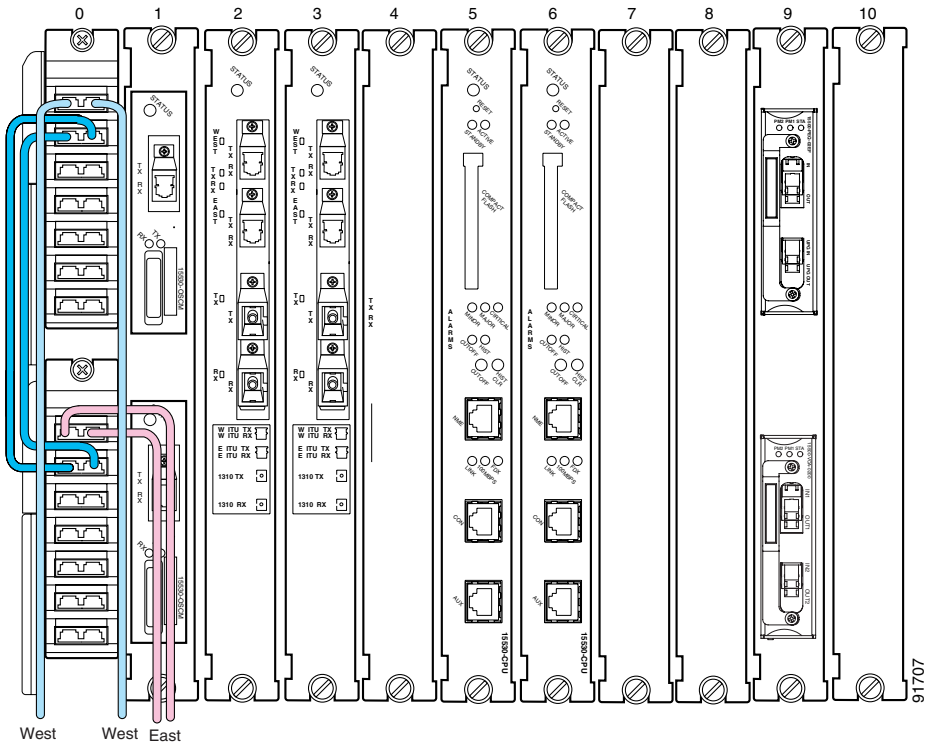
Step 3 Connect the TRUNK_IN and TRUNK_OUT ports of the bottom OADM module to the east side trunk.

Step 4 Connect the MID_IN port of the top OADM module to the MID_OUT port of the bottom OADM module.

Step 5 Connect the MID_OUT port of the top OADM module to the MID_IN port of the bottom OADM module.

Figure 2-32 shows an example of the OADM module network connections in a protected configuration.

Figure 2-32 OADM Module Trunk Cable Connections on a Splitter Configuration



DLP-28 Connect a Multi-Shelf Node With Two OSC Modules

Purpose	This task connects the OADM modules in a multi-shelf node with two OSC modules for the node.
Tools/Equipment	Two trunk cables for unprotected configurations or four trunk cable for protected configurations Two MU-to-MU patch cables per OSC module Two MU-to-MU patch cables per OADM module minus one
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13, for two OADM modules on each shelf DLP-10 Install the OSC Module, page 2-14, for two OSC modules on the shelf connected to the trunk DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31 DLP-20 Connect the OSC Module to the OADM Module, page 2-34, for the OADM module connected to the trunk fiber
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Note The following steps describe how to cable the example multi-shelf node shown in Figure 2-33. You can use these steps for nodes with more shelves or fewer.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the cables of the first OADM module in slot 0 of shelf A as follows:

a. Connect the TRUNK_IN and the TRUNK_OUT ports of the first OADM in shelf A to the west side trunk.

b. Connect the MID_IN port of the first OADM in shelf A to the TRUNK_OUT port of the first OADM in shelf B.

c. Connect the MID_OUT port of the first OADM in shelf A to the TRUNK_IN port of the first OADM in shelf B.

Step 3 Connect the cables of the second OADM module in slot 0 of shelf A as follows:

a. Connect the TRUNK_IN port of the second OADM in shelf A to the MID_OUT port of the second OADM in shelf B.

b. Connect the TRUNK_OUT port of the second OADM in shelf A to the MID_IN port of the second OADM in shelf B.

c. Connect the MID_IN port of the second OADM in shelf A to the MID_OUT port of the first OADM in shelf C.

d. Connect the MID_OUT port of the second OADM in shelf A to the MID_IN port of the first OADM in shelf C.

Step 4 In addition to the cables already connected to the first OADM module in slot 0 of shelf B, make the following connections:

a. Connect the MID_IN port of the first OADM in shelf B to the TRUNK_OUT port of the first OADM in shelf C.

b. Connect the MID_OUT port of the first OADM in shelf B to the MID_OUT port of the first OADM in shelf C.

Step 5 In addition to the cables already connected to the second OADM module in slot 0 of shelf B, make the following connections:

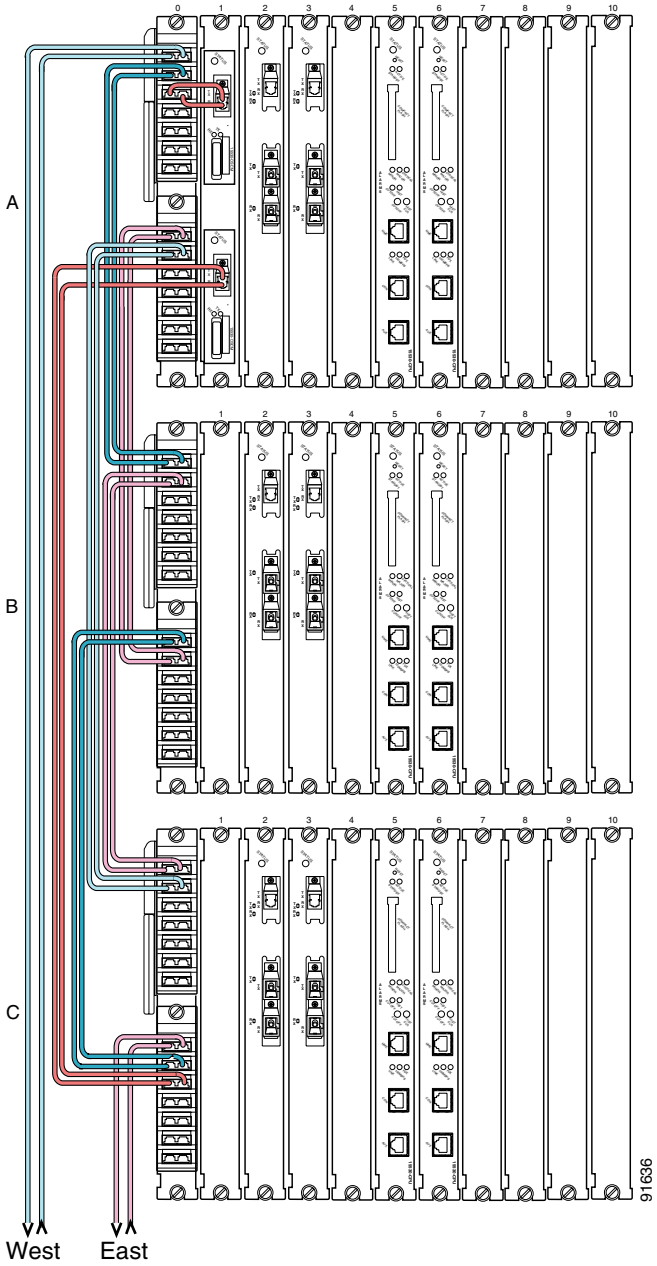
a. Connect the TRUNK_IN port of the second OADM in shelf B to the MID_OUT port of the second OADM in shelf C.

b. Connect the TRUNK_OUT port of the second OADM in shelf B to the MID_IN port of the second OADM in shelf C.

Step 6 Connect the TRUNK_IN and the TRUNK_OUT ports of the second OADM in shelf C to the east side trunk.

Figure 2-33 shows an example of a three shelf node in a splitter or line card protected configuration with OSC modules terminating only on the shelf connected to the trunk.

Figure 2-33 Cable Connections on a Multi-Shelf Node With Two OSC Modules



DLP-29 Connect a Multi-Shelf Node With OSC Modules on Every Shelf

Purpose	This task connects the OADM modules in a multi-shelf node.
Tools/Equipment	Two trunk cables for unprotected configurations or four trunk cable for protected configurations Two MU-to-MU patch cables per OSC module Two MU-to-MU patch cables per OADM module minus one
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13, for two OADM modules on each shelf DLP-10 Install the OSC Module, page 2-14, for two OSC modules on one of the shelves connected to the trunk DLP-17 Select Optical Cables, page 2-29 DLP-18 Clean Optical Connectors, page 2-31
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Note The following steps describe how to cable the example multi-shelf node shown in Figure 2-34. You can use these steps for nodes with more shelves.

Note If you installed the fiber management system, then thread the slack cable on the fiber routing tray or fiber routing drawer, as appropriate, while connecting the cables.

Step 1 Locate the input and output ports on the OADM modules. The input ports are on the left and the output ports are on the right.

Step 2 Connect the cables of the first OADM module in slot 0 of shelf A as follows:

a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the MID_IN port of the first OADM on shelf A to the MID_OUT of the second OADM on the shelf A.

d. Connect the MID_OUT port of the first OADM on shelf A to the MID_IN of the second OADM on the shelf A.

e. Connect the TRUNK_IN port and the TRUNK_OUT port of the first OADM on shelf A to the west side trunk.

Step 3 In addition to the cables already connected to the second OADM module in slot 0 of shelf A, make the following connections:

a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the TRUNK_IN port of the second OADM on shelf A to the TRUNK_OUT port of the first OADM on shelf B.

d. Connect the TRUNK_OUT port of the second OADM on shelf A to the TRUNK_IN port of the first OADM on shelf B.

Step 4 In addition to the cables already connected to the first OADM module in slot 0 of shelf B, make the following connections:

a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the MID_IN port of the first OADM on shelf B to the MID_OUT of the second OADM on the shelf B.

d. Connect the MID_OUT port of the first OADM on shelf B to the MID_IN of the second OADM on the shelf B.

Step 5 In addition to the cables already connected to the second OADM module in slot 0 of shelf B, make the following connections:

a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the TRUNK_IN port of the second OADM on shelf B to the TRUNK_OUT port of the first OADM on shelf C.

d. Connect the TRUNK_OUT port of the second OADM on shelf B to the TRUNK_IN port of the first OADM on shelf C.

Step 6 In addition to the cables already connected to the first OADM module in slot 0 of shelf C, make the following connections:

a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the MID_IN port of the first OADM on shelf C to the MID_OUT of the second OADM on the shelf C.

d. Connect the MID_OUT port of the first OADM on shelf C to the MID_IN of the second OADM on the shelf C.

Step 7 In addition to the cables already connected to the second OADM module in slot 0 of shelf C, make the following connections:

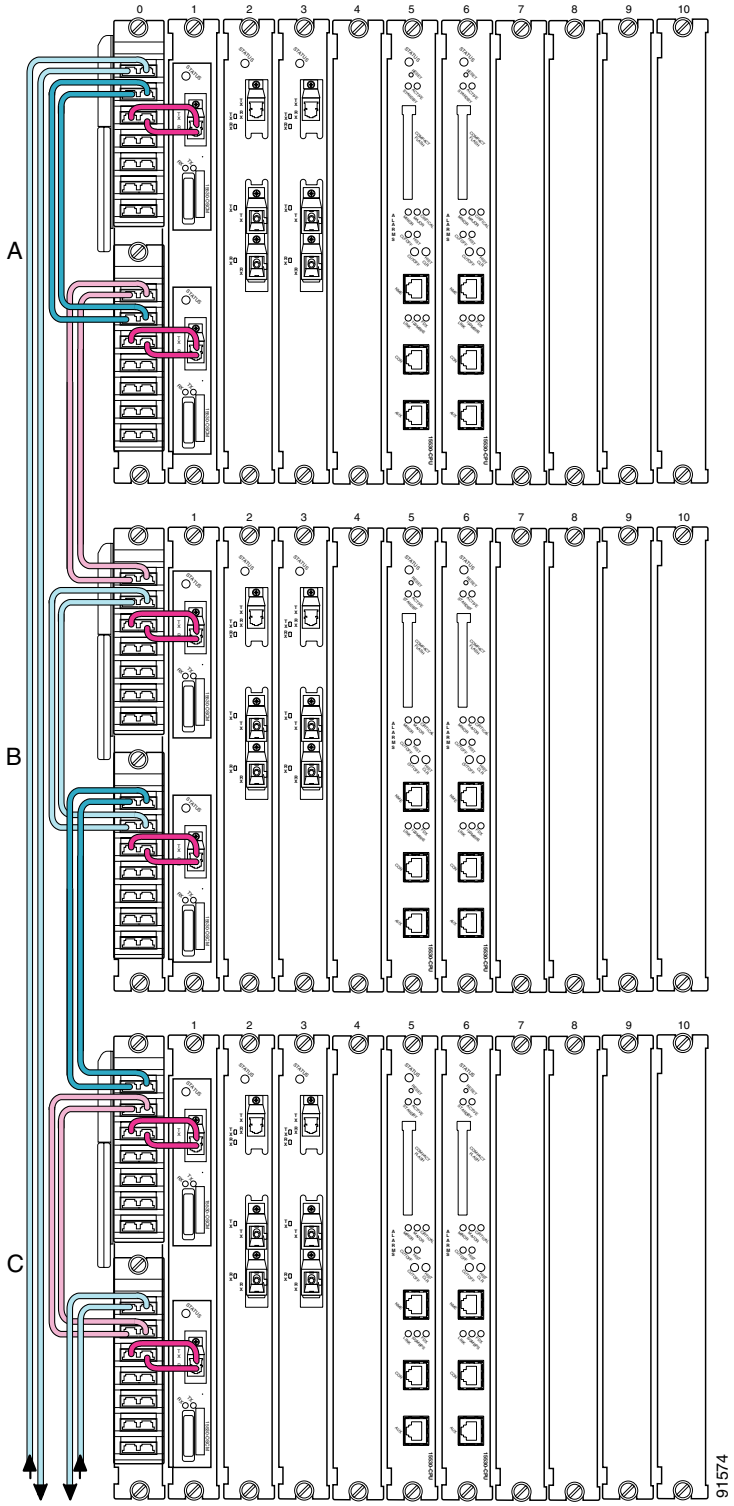
a. Connect the OSC IN port of the OADM to the TX port of the OSC module.

b. Connect the OSC OUT port of the OADM to the RX port of the OSC module.

c. Connect the TRUNK_IN port and the TRUNK_OUT port of the first OADM on shelf C to the east side trunk.

Figure 2-34 shows an example of a three shelf node in a splitter or line card protected configuration with OSC modules that are added and dropped on each shelf.

Figure 2-34 Cable Connections on a Splitter and Line Card Protected Multi-Shelf Node With the OSC Terminating on Every Node



NTP-6 Ground the Shelf

Purpose	This procedure grounds the shelf to the earth ground.
Tools/Equipment	Wire-stripping tool Crimping tool Two grounding lugs Number 1 Phillips screwdriver Two 12-24 screw
Prerequisite Procedures	NTP-2 Install the Cisco ONS 15530 Chassis, page 2-1,
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Tip If you use the cable management guides, install the grounding equipment after you install the top cable management guide.

Step 1 Use a wire-stripping tool to remove approximately 0.75 inch (20 mm) of the covering from the end of the grounding wire.

Step 2 Insert the stripped end of the grounding wire into the open end of the grounding lug.

Step 3 Use the crimping tool to secure the grounding wire in place in the grounding lug.

Step 4 Locate the grounding receptacle on the chassis.

Step 5 Remove the label that covers the grounding receptacle.

Note Step 6 is optional if you are not using the top cable management guide.

Step 6 Place the lug mounting adapter against the grounding receptacle at the top of the chassis.

Step 7 Place the grounding lug against the lug mounting adapter.

Step 8 Insert two 12-24 screws through the holes in the grounding lug and the grounding receptacle. Ensure that the grounding lug does not interfere with other hardware or rack equipment.

Step 9 Install the locking washers and nuts; use a number 1 Phillips screwdriver to tighten the grounding lug to the grounding receptacle.

Step 10 Prepare the other end of the grounding wire and connect it to an appropriate grounding point in your site to ensure adequate earth ground for the Cisco ONS 15530.

NTP-7 Power Up the Shelf

Purpose	This procedure describes how to install the power supplies and power up the shelf.
Tools/Equipment	–48 VDC or 120–240 VAC power supplies Wire-stripping tool AC power cord
Prerequisite Procedures	DLP-6 Install the CPU Switch Module, page 2-11 NTP-6 Ground the Shelf, page 2-72
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 As needed, complete the "DLP-30 Install the Power Supplies" task on page 2-73.

Step 2 As needed, complete the "DLP-31 Remove the Power Supplies" task on page 2-74.

Step 3 Complete the "DLP-32 Connect DC-Input Power" task on page 2-74 for DC power supplies.

Step 4 Complete the "DLP-33 Connect AC-Input Power" task on page 2-76 for AC power supplies.

Step 5 Complete the "DLP-34 Verify the Power Up" task on page 2-78 after connecting the power.

DLP-30 Install the Power Supplies

Purpose	This task installs an AC or DC power supply.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-6 Ground the Shelf, page 2-72 DLP-31 Remove the Power Supplies, page 2-74, if replacing a power supply
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Remove the power supply from its packaging.

Step 2 Grasp the power supply handle with one hand. Place your other hand underneath to support the bottom of the external power supply.

Step 3 Place the power supply correctly at the bay opening.

Step 4 Slide the power supply carefully into the bay. Make sure that the power supply is installed completely and that the faceplate is flush with the chassis.

Step 5 Secure the power supply installation by securing the captive installation screws at the top of the power supply with a number 1 Phillips screwdriver.

DLP-31 Remove the Power Supplies

Purpose	This task removes the AC or DC power supply from the shelf.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Unplug the power cord on an AC power supply, or remove the negative, positive, and ground connections from the DC power supply using a number 1 Phillips screwdriver after disconnecting the power supply at the source.

Note The ground connections should always be connected first and disconnected last.

Step 2 Unscrew the captive installation screws at the top of the power supply using a number 1 Phillips screwdriver.

Step 3 Grasp the power supply handle with one hand and pull the power supply out of the bay. Place your other hand underneath to support the bottom of the external power supply.

DLP-32 Connect DC-Input Power

Purpose	This task connects a DC power supply.
Tools/Equipment	Wire-stripping tool Number 1 Phillips screwdriver
Prerequisite Procedures	DLP-30 Install the Power Supplies, page 2-73 NTP-6 Ground the Shelf, page 2-72
Required/As Needed	Required for DC power supplies
Onsite/Remote	Onsite
Security Level	None

Note The DC return is to remain isolated from the system frame and chassis (DC-I).

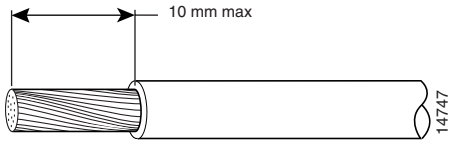
Warning **A readily accessible disconnect device must be incorporated in the building's installation wiring.**

Warning **This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a Listed and Certified fuse or circuit breaker 25A, minimum 60 VDC, is used on all current-carrying conductors.**

Step 1 Verify that the primary and optional redundant external DC power circuits are disconnected at the source.

Step 2 Use a wire-stripping tool to strip not more than 0.4 inches (10 mm) of insulation off the ends of the DC power leads (see Figure 2-35).

Figure 2-35 Stripping Insulation



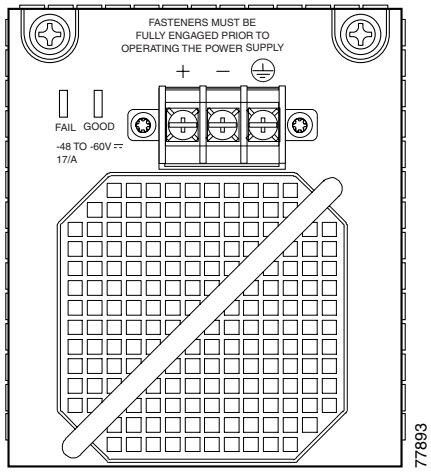
Step 3 Connect the ground wire to the power supply ground terminal using a number 1 Phillips screwdriver (see Figure 2-36).

Note The ground connections should always be connected first and disconnected last.

Step 4 Connect the positive DC power lead from the external power source to the positive (+) DC terminal using a number 1 Phillips screwdriver (see Figure 2-36).

Step 5 Connect the negative DC power lead from the external power source to the negative (–) DC terminal using a number 1 Phillips screwdriver (see Figure 2-36).

Figure 2-36 DC Power Supply



Step 6 If you are installing redundant DC power, repeat Step 2 through Step 5 on the second power supply connecting to a second external power source.

Step 7 Apply power to the primary and redundant DC circuits.

Step 8 Verify that power supply is functioning properly by checking that the GOOD LED is green.

DLP-33 Connect AC-Input Power

Purpose	This task connects power to AC power supplies.
Tools/Equipment	Appropriate AC power cord for your facility
Prerequisite Procedures	DLP-30 Install the Power Supplies, page 2-73 NTP-6 Ground the Shelf, page 2-72
Required/As Needed	Required for AC power supplies
Onsite/Remote	Onsite
Security Level	None

Step 1 Verify that you have the correct style of AC-input power supply power cords for your site. Five styles of power cords are available, differing in plug type (see Figure 2-37 and Table 2-21).

Figure 2-37 AC Power Cords

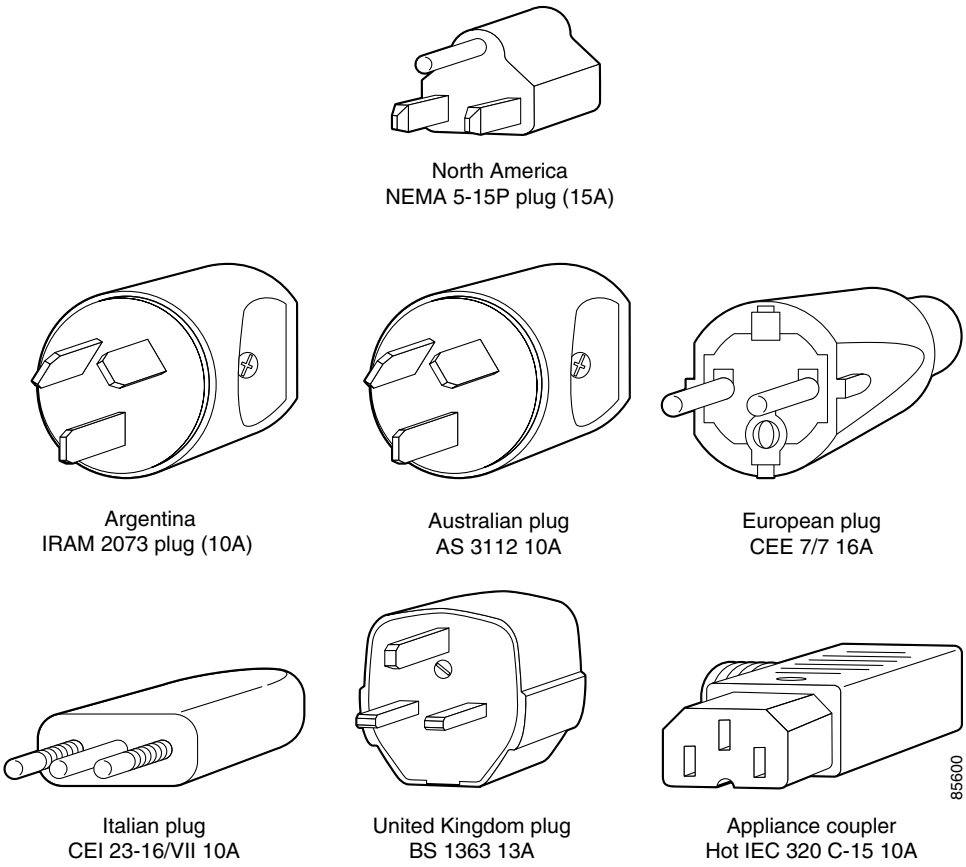


Table 2-21 AC Power Cord Options

Label	Description	Product Number
North America	120 VAC, 60 Hz AC power cord	15500-CAB-AC
Argentina	250 VAC, 50 Hz AC power cord	15500-CAB-ACR
Australian	240 VAC, 50 Hz AC power cord	15500-CAB-ACA
European	230 VAC, 50 Hz AC power cord	15500-CAB-ACE
Italian	220 VAC, 50 Hz AC power cord	15500-CAB-ACI
United Kingdom	240 VAC, 50 Hz AC power cord	15500-CAB-ACU

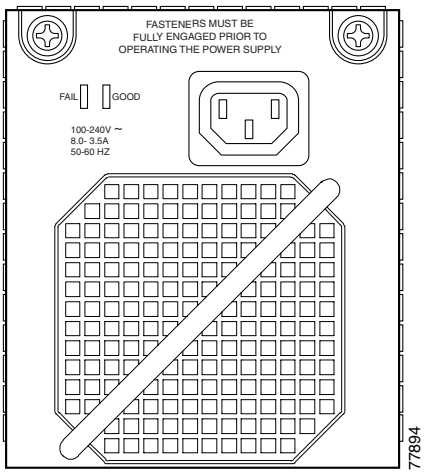
Step 2 Verify that your AC power source is in the correct range (see Table 2-22).

Table 2-22 Source AC Power Specifications

Specification	Nominal Value	Acceptable Range
AC input voltage	100 to 240 VAC, single phase	90 to 255 VAC
AC input line frequency	50/60 Hz	47 to 63 Hz
AC input current	8 A @100 VAC 3.5 A @240 VAC	—

Step 3 Connect the power cord to the power source and to the AC-input power supply (see Figure 2-38).

Figure 2-38 120–240 VAC Power Supply



Step 4 Verify that the power supply is functioning properly by checking that the GOOD LED is green.

DLP-34 Verify the Power Up

Purpose	This task verifies the LEDs on the shelf after power up.
Tools/Equipment	None
Prerequisite Procedures	DLP-32 Connect DC-Input Power, page 2-74 or DLP-33 Connect AC-Input Power, page 2-76
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Verify that the Status LED on the CPU switch module and the redundant CPU switch module, if present, are both green.

Step 2 Verify that the Active LED on the primary CPU switch module and the Standby LED on the standby CPU switch module, if present, are both green.

Step 3 Verify that alarm LEDs on the CPU switch module and the redundant CPU switch module, if present, are both off.

Step 4 Verify that LEDs on all other modules and line cards are green.

Note If any LEDs are not green, release the capture screws on the module or line card and reseat the module or line card. If that fails, call your Cisco customer support representative for assistance.

NTP-8 Verify Installation of Hardware

Purpose	This procedure verifies the hardware installation.
Tools/Equipment	Console
Prerequisite Procedures	NTP-7 Power Up the Shelf, page 2-73
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	None

Step 1 Telnet to the console port on the CPU switch module.

The CLI (command-line interface) on the console prompts you to enter the initial configuration dialog. Answer **no** to this prompt as follows:

```
Would you like to enter the initial dialog? [yes]: no
```

Step 2 Type enable at the user EXEC prompt to enter privilege EXEC mode:

```
Switch> enable
Switch#
```

Step 3 Verify that all hardware is correctly installed in the proper slots by performing a **show hardware** command. The following example shows the command output.

```
Switch# show hardware

------------------------------------------------------------------------------
Prototype Hampton Backplane named Switch, Date:21:15:38 UTC Sun Jan 2 2000
------------------------------------------------------------------------------

------------------------------------------------------------------------------
Back-Plane Information
------------------------------------------------------------------------------
Orderable Product No. MAC-Address       MAC-Size Serial No.   Mfg. Date  H/W Ver
--------------------- ----------------- -------- ------------ ---------- -------
PROTO-HAMPTON-CHASSIS 00-01-64-47-a2-40 16       TBC055089    10/21/2001 3.1

------------------------------------------------------------------------------
Slot Orderable Product No.     Part No.   Rev Serial No.   Mfg. Date  H/W Ver.
---- ------------------------- ---------- --- ------------ ---------- ----------
0/0  15530-MDXB-04C0=          800-20854- 01  H80002157    03/12/2002 1.0
0/1  15530-MDXB-04C0=          800-20854- 01  H80002160    03/25/2002 1.0
1/*  15530-TSP1-27-12          73-6616-05 05  CAB0605MEV3  05/10/2002 5.8
4/*  15530-TSP1-2912=          68-1703-05 09  CAB06170AJY  2002/06/13 5.8
5/*  PROTO-HAMPTON-CPU         73-6572-04 06  CAB0602M9SX  01/20/2002 4.6
6/*  PROTO-HAMPTON-CPU         73-6572-04 06  CAB0602M9X9  01/20/2002 4.6
```

```
7/*  15530-TSP1-2912=          68-1612-05 09  CAB0551lW0H  2002/06/14 4.5
8/*  PROTO-HAMPTON-OSCMB       73-6838-04 01  CAB0607MJXK  02/20/2002 4.2
8/0  PROTO-HAMPTON-OSCDC       73-7238-03 03  CAB0608MNPF  02/20/2002 3.2
8/1  PROTO-HAMPTON-OSCDC       73-7238-03 03  CAB0609MSQ5  03/15/2002 3.2

Power Supply:
Slot Part No.         Rev  Serial No.  RMA No.     Hw Vrs  Power Consumption
---- ---------------- ---- ----------- ----------- ------- -----------------
Unable to read idprom for 0
Power Supply 0 :
               type      :600W AC
               status    :OK
1          34-1811-01 P2   SON05200117 00-00-00-00   1.0             4900 cA
Power Supply 1 :
               type      :600W AC
               status    :Failure
```

Step 4 Verify that the modules have the correct hardware version and software version by performing a **show hardware detail** command. The follow example shows the command output.

```
Switch# show hardware detail
--------------------------------------------------------------------------------
Prototype Hampton Backplane named Switch, Date: 23:50:35 UTC Sat Dec 25 1999
--------------------------------------------------------------------------------

--------------------------------------------------------------------------------
Back-Plane Information
--------------------------------------------------------------------------------
Slot Number             : N/A
Controller Type         : 0x1106
On-Board Description    : Prototype Hampton Backplane
Orderable Product Number: PROTO-HAMPTON-CHASSIS
Board Part Number       : 73-6573-03
Board Revision          : 02
Serial Number           : TBC055089
Manufacturing Date      : 10/21/2001
Hardware Version        : 3.1
RMA Number              :
RMA Failure Code        :
MAC Address             : 00-01-64-47-a2-40
MAC Address Block Size  : 16

--------------------------------------------------------------------------------
Slot Number             : 0/0
Controller Type         : 0x1108
On-Board Description    : Prototype-Hamptons-MUX/DEMUX
Orderable Product Number: PROTO-HAMPTONS-MUX/DEMUX
Board Part Number       : 73-7399-01
Board Revision          : 2
Serial Number           : 65045516
Manufacturing Date      : 11/02/2001
Hardware Version        : 1.0
RMA Number              : 0x00
RMA Failure Code        : 0x00
--------------------------------------------------------------------------------
Slot Number             : 0/1
Controller Type         : 0x1108
On-Board Description    : Prototype-Hamptons-MUX/DEMUX
Orderable Product Number: PROTO-HAMPTONS-MUX/DEMUX
Board Part Number       : 73-7399-01
Board Revision          : 2
Serial Number           : CAB0550LTJC
Manufacturing Date      : 11/02/2001
Hardware Version        : 1.0
```

```
RMA Number              : 0x00
RMA Failure Code        : 0x00
--------------------------------------------------------------------------------
<Information deleted>
```

Software Setup Procedures

This chapter describes procedures for basic software configuration.

Note The procedures and tasks in this chapter assume that you are familiar with the Cisco IOS CLI (command-line interface) and that you have access to the Cisco ONS 15530 technical documentation. The technical documentation is available at the following URL:

http://www.cisco.com/en/US/products/hw/optical/ps2011/ps4002/index.html

Before You Begin

This section lists the chapter non-trouble procedure (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

1. NTP-9 Configure Management Access, page 3-2—Complete this procedure to configure network management access to the shelves in the network.
2. NTP-10 Configure Interfaces, page 3-17—Complete this procedure to configure the interfaces on the line cards.
3. NTP-11 Configure Patch Connections, page 3-33—Complete this procedure to configure the optical patch connections in the command-line interface.
4. NTP-12 Configure APS, page 3-37—Complete this procedure to configure splitter or y-cable APS (Automatic Protection Switching).
5. NTP-13 Configure SNMP, page 3-42—Complete this procedure to configure and verify SNMP trap messages.
6. NTP-14 Verify the System Configuration, page 3-43—Complete this procedure to verify the system configuration before continuing.

Use the data checklist forms to record such information as IP address and host name for each node. Refer to this information when performing the procedures in this section.

Refer to the *Cisco ONS 15530 Configuration Guide* and the *Cisco ONS 15530 Command Reference* document for more detailed configuration information.

NTP-9 Configure Management Access

Purpose	This procedure describes how to configure the enable password, secret password, IP access on the NME interface, and the host name.
Tools/Equipment	None
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-79
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Complete the "DLP-35 Configure the Enable Password" task on page 3-2.

Step 2 As needed, complete the "DLP-36 Configure the Enable Secret Password" task on page 3-3.

Step 3 To establish network access to the shelves in the node, complete the "DLP-37 Configure IP Access on the NME interface" task on page 3-4.

Step 4 To create a meaningful name for the shelf, complete the "DLP-38 Configure Host Name" task on page 3-5.

Step 5 As needed, complete the "DLP-39 Configure IP on the OSC Using the Loopback Interface" task on page 3-6.

Step 6 As needed, complete the "DLP-40 Configure IP on the OSC Using the NME Fastethernet 0 Interface" task on page 3-8.

Step 7 As needed, complete the "DLP-92 Configure IP on the In-Band Message Channel Using the Loopback Interface" task on page 3-10.

Step 8 As needed, complete the "DLP-93 Configure IP on the In-Band Message Channel Using the NME Fastethernet 0 Interface" task on page 3-12.

Step 9 As needed, complete the "DLP-94 Configure IP on the DCC Using the Loopback Interface" task on page 3-14.

Step 10 As needed, complete the "DLP-95 Configure IP on the DCC Using the NME Fastethernet 0 Interface" task on page 3-16.

DLP-35 Configure the Enable Password

The enable password is a nonencrypted password. It can contain any number of uppercase and lowercase alphanumeric characters. Give the enable password only to users permitted to make configuration changes.

Purpose	This task configures the unencrypted enable password which allow users to make configuration changes.
Tools/Equipment	None
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-79
Required/As Needed	Required

Onsite/Remote Onsite or remote
Security Level Privileged

:

	Command	Purpose
Step 1	Switch> **enable** Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **enable password** *password*	Configures the enable password. The password can contain any number of uppercase and lowercase alphanumeric characters.

DLP-36 Configure the Enable Secret Password

Purpose This task configures the secure, encrypted enable secret password that can prevent both configuration changes and unintentionally entering ROM monitor mode.
Tools/Equipment None
Prerequisite Procedures DLP-35 Configure the Enable Password, page 3-2
Required/As Needed As needed
Onsite/Remote Onsite or remote
Security Level Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **enable secret** *password*	Configures the enable secret password. The password contains from 1 to 25 uppercase and lowercase alphanumeric characters. The first character cannot be a number. Spaces are valid password characters. Leading spaces are ignored; trailing spaces are recognized. **Note** For maximum security, the enable secret password should be different from the enable password.

DLP-37 Configure IP Access on the NME interface

Purpose	This task configures IP access on the NME (network management Ethernet) interface on the active CPU switch module. This allows multiple, simultaneous remote Telnet or SNMP network management sessions.
Tools/Equipment	None
Prerequisite Procedures	DLP-35 Configure the Enable Password, page 3-2 Obtain an IP address and IP subnet mask for the NME interface.
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface fastethernet 0** Switch(config-if)#	Enters interface configuration mode on interface fastethernet 0, the NME port on the active processor card.
Step 4	Switch(config-if)# **ip address** *ip-address subnet-mask*	Specifies the IP address and IP subnet mask for the management port interface.
Step 5	Switch(config-if)# **speed** {**10** | **100** | **auto**}	Specifies the transmission speed. The default is **auto** (autonegotiation).
Step 6	Switch(config-if)# **duplex** {**auto** | **full** | **half**}	Specifies the duplex mode. The default is **auto** (autonegotiation).
Step 7	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode.
Step 8	Switch(config)# **ip default-gateway** *ip-address*	Specifies the address of the default IP gateway node.
Step 9	Switch(config)# **end** Switch#	Returns to privileged EXEC mode. The prompt indicates that the host name has been set to the new name.
Step 10	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP access on the NME interface fastethernet 0:

```
Switch# configure terminal
Switch(config)# interface fastethernet 0
Switch(config-if)# ip address 192.31.7.18 255.255.255.0
Switch(config-if)# exit
```

```
Switch(config)# ip default-gateway 192.31.7.1
Switch(config)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-38 Configure Host Name

Purpose	This task configures the system host name, which allows you to keep track of the nodes in your network.
Tools/Equipment	None
Prerequisite Procedures	DLP-35 Configure the Enable Password, page 3-2 Obtain a host name for the system.
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **hostname** *name*	Specifies the system host name.
Step 4	*name*(config)# **end** *name*#	Returns to privileged EXEC mode. The prompt indicates that the host name has been set to the new name.
Step 5	*name*# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the host name:

```
Switch# configure terminal
Switch(config)# hostname node1
node1(config)# end
node1(config)# copy system:running-config nvram:startup-config
```

DLP-39 Configure IP on the OSC Using the Loopback Interface

Purpose	This task configures IP access on the OSC for network management using the loopback interface as a reference. The loopback interface is a software-only virtual interface that is always up and allows routing protocol sessions to stay up even if the OSC wave interface is down.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-10 Install the OSC Module, page 2-14 Obtain an IP address for loopback interface with a subnet separate from the NME fastethernet 0 interface.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface loopback 1** Switch(config-if)#	Selects the loopback interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **ip address** *ip-address subnet-mask*	Configures the IP address and subnet for the interface.
Step 5	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 6	Switch(config)# **interface wave** *slot*/**0** Switch(config-if)#	Selects the first of the OSC wave interfaces
Step 7	Switch(config-if)# **ip unnumbered loopback 1**	Configures an unnumbered interface referencing the loopback interface.
Step 8	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 9	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 10	Switch(config)# **interface wave** *slot*/**1** Switch(config-if)#	Selects the second OSC wave interface.
Step 11	Switch(config-if)# **ip unnumbered loopback 1**	Configures an unnumbered interface referencing the loopback interface.
Step 12	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 13	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.

	Command	Purpose
Step 14	Switch(config)# **ip route** *prefix prefix-mask interface*	Configures IP static routes for some or all destinations.
	or	
	Switch(config)# **router ospf** *process-id*	Configures OSPF as the routing protocol.
	Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id*	
	or	
	Switch(config)# **router eigrp** *as-number*	Configures EIGRP as the routing protocol.
	Switch(config-router)# **network** *network-number* [*network-mask*]	
	or	
	Switch(config)# **router bgp** *as-number*	Configures BGP as the routing protocol.
	Switch(config-router)# **network** *network-number* [**mask** *network-mask*]	
	Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	
Step 15	Switch(config-router)# **end**	Returns to privileged EXEC mode.
Step 16	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an OSC wave interface:

```
Switch# configure terminal
Switch(config)# interface loopback 1
Switch(config-if)# ip address 192.31.7.18 255.255.255.0
Switch(config-if)# exit
Switch(config)# interface wave 2/0
Switch(config-if)# ip unnumbered loopback 1
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wave 2/1
Switch(config-if)# ip unnumbered loopback 1
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

DLP-40 Configure IP on the OSC Using the NME Fastethernet 0 Interface

Purpose	This task configures IP access on the OSC for network management using the NME fastethernet 0 interface as a reference.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-10 Install the OSC Module, page 2-14
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface wave** *slot*/**0** Switch(config-if)#	Selects the first of the OSC wave interfaces.
Step 4	Switch(config-if)# **ip unnumbered fastethernet 0**	Configures an unnumbered interface referencing the NME fastethernet 0 interface.
Step 5	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 6	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 7	Switch(config)# **interface wave** *slot*/**1** Switch(config-if)#	Selects the second OSC wave interface.
Step 8	Switch(config-if)# **ip unnumbered fastethernet 0**	Configures an unnumbered interface referencing the NME fastethernet 0 interface.
Step 9	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 10	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.

	Command	Purpose
Step 11	Switch(config)# **ip route** *prefix prefix-mask interface*	Configures IP static routes for some or all destinations.
	or	
	Switch(config)# **router ospf** *process-id*	Configures OSPF as the routing protocol.
	Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id*	
	or	
	Switch(config)# **router eigrp** *as-number*	Configures EIGRP as the routing protocol.
	Switch(config-router)# **network** *network-number* [*network-mask*]	
	or	
	Switch(config)# **router bgp** *as-number*	Configures BGP as the routing protocol.
	Switch(config-router)# **network** *network-number* [**mask** *network-mask*]	
	Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	
Step 12	Switch(config)# **end**	Returns to privileged EXEC mode.
	Switch#	
Step 13	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an OSC wave interface:

```
Switch# configure terminal
Switch(config)# interface wave 2/0
Switch(config-if)# ip unnumbered fastethernet 0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wave 2/1
Switch(config-if)# ip unnumbered fastethernet 0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

DLP-92 Configure IP on the In-Band Message Channel Using the Loopback Interface

Purpose	This task configures IP access on the in-band message channel for network management using the loopback interface as a reference. The loopback interface is a software-only virtual interface that is always up and allows routing protocol sessions to stay up even if the ethernetdcc interface is down.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 or DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 or DLP-67 Install the 10-Gbps Uplink Card, page 2-24 Obtain an IP address for loopback interface with a subnet separate from the NME fastethernet 0 interface.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface loopback 1** Switch(config-if)#	Selects the loopback interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **ip address** *ip-address subnet-mask*	Configures the IP address and subnet for the interface.
Step 5	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 6	Switch(config)# **interface ethernetdcc** *slot*/**0/0** Switch(config-if)#	Selects the ethernetdcc interface.
Step 7	Switch(config-if)# **ip unnumbered loopback 1**	Configures an unnumbered interface referencing the loopback interface.
Step 8	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 9	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.

	Command	Purpose
Step 10	Switch(config)# **ip route** *prefix prefix-mask interface*	Configures IP static routes for some or all destinations.
	or	
	Switch(config)# **router ospf** *process-id*	Configures OSPF as the routing protocol.
	Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id*	
	or	
	Switch(config)# **router eigrp** *as-number*	Configures EIGRP as the routing protocol.
	Switch(config-router)# **network** *network-number* [*network-mask*]	
	or	
	Switch(config)# **router bgp** *as-number*	Configures BGP as the routing protocol.
	Switch(config-router)# **network** *network-number* [**mask** *network-mask*]	
	Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	
Step 11	Switch(config-router)# **end**	Returns to privileged EXEC mode.
Step 12	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an ethernetdcc interface:

```
Switch# configure terminal
Switch(config)# interface loopback 1
Switch(config-if)# ip address 192.31.7.18 255.255.255.0
Switch(config-if)# exit
Switch(config)# interface ethernetdcc 2/0/0
Switch(config-if)# ip unnumbered loopback 1
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

DLP-93 Configure IP on the In-Band Message Channel Using the NME Fastethernet 0 Interface

Purpose	This task configures IP access on the in-band message channel for network management using the NME fastethernet 0 interface as a reference.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 or DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 or DLP-67 Install the 10-Gbps Uplink Card, page 2-24
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface ethernetdcc** *slot*/**0/0** Switch(config-if)#	Selects the first of the ethernetdcc interfaces
Step 4	Switch(config-if)# **ip unnumbered fastethernet 0**	Configures an unnumbered interface referencing the NME fastethernet 0 interface.
Step 5	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 6	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.

	Command	Purpose
Step 7	Switch(config)# **ip route** *prefix prefix-mask interface* or Switch(config)# **router ospf** *process-id* Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id* or Switch(config)# **router eigrp** *as-number* Switch(config-router)# **network** *network-number* [*network-mask*] or Switch(config)# **router bgp** *as-number* Switch(config-router)# **network** *network-number* [**mask** *network-mask*] Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	Configures IP static routes for some or all destinations. Configures OSPF as the routing protocol. Configures EIGRP as the routing protocol. Configures BGP as the routing protocol.
Step 8	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 9	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an OSC wave interface:

```
Switch# configure terminal
Switch(config)# interface ethernetdcc 2/0/0
Switch(config-if)# ip unnumbered fastethernet 0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

DLP-94 Configure IP on the DCC Using the Loopback Interface

Purpose	This task configures IP access on the DCC (Data Communication Channel) for network management using the loopback interface as a reference. The loopback interface is a software-only virtual interface that is always up and allows routing protocol sessions to stay up even if the sdcc interface is down.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-98 Install the 8-Port Multi-Service Muxponder, page 2-21 Obtain an IP address for loopback interface with a subnet separate from the NME fastethernet 0 interface.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface loopback 1** Switch(config-if)#	Selects the loopback interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **ip address** *ip-address subnet-mask*	Configures the IP address and subnet for the interface.
Step 5	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 6	Switch(config)# **interface sdcc** *slot***/0/0** Switch(config-if)#	Selects the sdcc interface.
Step 7	Switch(config-if)# **ip unnumbered loopback 1**	Configures an unnumbered interface referencing the loopback interface.
Step 8	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 9	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.

	Command	Purpose
Step 10	Switch(config)# **ip route** *prefix prefix-mask interface*	Configures IP static routes for some or all destinations.
	or	
	Switch(config)# **router ospf** *process-id*	Configures OSPF as the routing protocol.
	Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id*	
	or	
	Switch(config)# **router eigrp** *as-number*	Configures EIGRP as the routing protocol.
	Switch(config-router)# **network** *network-number* [*network-mask*]	
	or	
	Switch(config)# **router bgp** *as-number*	Configures BGP as the routing protocol.
	Switch(config-router)# **network** *network-number* [**mask** *network-mask*]	
	Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	
Step 11	Switch(config-router)# **end**	Returns to privileged EXEC mode.
Step 12	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an OSC wave interface:

```
Switch# configure terminal
Switch(config)# interface loopback 1
Switch(config-if)# ip address 192.31.7.18 255.255.255.0
Switch(config-if)# exit
Switch(config)# interface sdcc 2/0/0
Switch(config-if)# ip unnumbered loopback 1
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

DLP-95 Configure IP on the DCC Using the NME Fastethernet 0 Interface

Purpose	This task configures IP access on the DCC for network management using the NME fastethernet 0 interface as a reference.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-98 Install the 8-Port Multi-Service Muxponder, page 2-21
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface sdcc** *slot*/**0/0** Switch(config-if)#	Selects the sdcc interface.
Step 4	Switch(config-if)# **ip unnumbered fastethernet 0**	Configures an unnumbered interface referencing the NME fastethernet 0 interface.
Step 5	Switch(config-if)# **no shutdown**	Configures the interface to a no shutdown state.
Step 6	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 7	Switch(config)# **ip route** *prefix prefix-mask interface* or	Configures IP static routes for some or all destinations.
	Switch(config)# **router ospf** *process-id* Switch(config-router)# **network** *network-address wildcard-mask* **area** *area-id* or	Configures OSPF as the routing protocol.
	Switch(config)# **router eigrp** *as-number* Switch(config-router)# **network** *network-number* [*network-mask*] or	Configures EIGRP as the routing protocol.
	Switch(config)# **router bgp** *as-number* Switch(config-router)# **network** *network-number* [**mask** *network-mask*] Switch(config-router)# **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *number*	Configures BGP as the routing protocol.

	Command	Purpose
Step 8	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 9	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure IP on an OSC wave interface:

```
Switch# configure terminal
Switch(config)# interface sdcc 2/0/0
Switch(config-if)# ip unnumbered fastethernet 0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# router ospf 109
Switch(config-router)# network 131.108.20.0 0.0.0.255 area 10.9.50.0
Switch(config-router)# network 131.108.0.0 0.0.255.255 area 2
Switch(config-router)# network 131.109.10.0 0.0.0.255 area 3
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# network 0.0.0.0 255.255.255.255 area 0
Switch(config-router)# end
Switch# copy system:running-config nvram:startup-config
```

Note For detailed information about configuring routing protocols, refer to the *Cisco IOS IP and IP Routing Configuration Guide*.

NTP-10 Configure Interfaces

Purpose	This procedure describes how to configure interfaces on the shelf.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 As needed, complete the "DLP-41 Configure Transponder Line Card Interfaces" task on page 3-18.

Step 2 As needed, complete the "DLP-75 Configure ESCON Aggregation Card Interfaces" task on page 3-21.

Step 3 As needed, complete the "DLP-91 Configure 4-Port 1-Gbps/2-Gbps FC Aggregation Card Interfaces" task on page 3-23.

Step 4 As needed, complete the "DLP-76 Configure 8-Port FC/GE Aggregation Card Interfaces" task on page 3-24.

Step 5 As needed, complete the "DLP-96 Configure 8-Port Multi-Service Muxponder Interfaces" task on page 3-26.

Step 6 As needed, complete the "DLP-77 Configure 2.5-Gbps ITU Trunk Card Interfaces" task on page 3-28.

Step 7 As needed, complete the "DLP-78 Configure 10-Gbps ITU Trunk Card Interfaces" task on page 3-29.

Step 8 As needed, complete the "DLP-150 Configure 10-Gbps ITU Tunable Trunk Card Interfaces" task on page 3-30.

Step 9 As needed, complete the "DLP-79 Configure 10-Gbps Uplink Card Interfaces" task on page 3-32.

DLP-41 Configure Transponder Line Card Interfaces

Purpose	This task configures the transponder line card interfaces for client data transmission and network topology management.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-13 Install the Transponder Line Cards, page 2-17
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface transparent** *slot*/*subcard*/**0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.

	Command	Purpose
Step 4	Switch(config-if)# **encapsulation** {**fastethernet** | **fddi** | **gigabitethernet** | **escon**}	Specifies Fast Ethernet, FDDI, Gigabit Ethernet, or ESCON. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation sysplex clo**	Specifies Sysplex CLO[1]. OFC[2] is disabled. Forward laser control is enabled on both the transparent and wave interfaces. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation sysplex etr**	Specifies Sysplex ETR[3]. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation sysplex isc** {**compatibility** | **peer** [**1g** | **2g**]}	Specifies ISC[4] compatibility mode (1 Gbps) or peer mode (1 Gbps or 2 Gbps). OFC is enabled for compatibility mode and disabled for peer mode.
	or	
	Switch(config-if)# **encapsulation ficon** {**1g** | **2g**}	Specifies FICON encapsulation and rate. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation sonet** {**oc3** | **oc12** | **oc48**}	Specifies SONET as the signal protocol and OC-3, OC-12, or OC-48 as the transmission rate. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation sdh** {**stm-1** | **stm-4** | **stm-16**}	Specifies SDH as the signal protocol and STM-1, STM-4, or STM-16 as the transmission rate. OFC is disabled.
	or	
	Switch(config-if)# **encapsulation fibrechannel** {**1g** | **2g**} [**ofc** {**enable** | **disable**}]	Specifies Fibre Channel as the signal protocol and 1 Gbps or 2 Gbps as the transmission rate. Enables or disables OFC. OFC is disabled by default.
	or	
	Switch(config-if)# **clock rate** *value*	Specifies the signal transmission clock rate without an associated protocol. OFC is disabled.
Step 5	Switch(config-if)# **laser frequency** *number*	Selects the frequency for the laser to transmit to the trunk.The default is the lower channel frequency for the transponder line card.
Step 6	Switch(config-if)# **topology neighbor** {**name** *node-name* | **ip-address** *node-ip-address* | **mac-address** *node-mac-address*} {**port** {**name** *port-name* | **ip-address** *port-ip-address* | **mac-address** *port-mac-address*}} [**receive** | **transmit**]	Configures the network topology information for the client equipment.
Step 7	Switch(config-if)# **topology neighbor agent ip-address** *ip-address*	Specifies the address of the network topology agent on a neighboring node.
Step 8	Switch(config-if)# **no shutdown**	Enables the interface.
Step 9	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 10	Switch(config)# **interface wave** *slot*/*subcard*/**0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.

	Command	Purpose
Step 11	Switch(config-if)# **laser frequency** *number*	Configures the channel frequency in GHz.
Step 12	Switch(config-if)# **no shutdown**	Enables the interface.
Step 13	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 14	Switch(config)# **interface wavepatch** *slot*/*subcard*/**0** Switch(config-if)#	Selects the interface to configure and enters global configuration mode. **Note** Perform this step for both splitter and nonsplitter modules.
Step 15	Switch(config-if)# **no shutdown**	Enables the interface.
Step 16	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 17	Switch(config)# **interface wavepatch** *slot*/*subcard*/**1** Switch(config-if)#	Selects the interface to configuration and enters global configuration mode. **Note** Perform this step for splitter modules only.
Step 18	Switch(config-if)# **no shutdown**	Enables the interface.
Step 19	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 20	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

1. CLO = control link oscillator
2. OFC = open fiber control
3. ETR = external timer reference
4. ISC = InterSystem Channel links

Example

The following example shows how to configure the transponder line card interfaces:

```
Switch# configure terminal
Switch(config)# interface transparent 2/0/0
Switch(config-if)# encapsulation sonet oc48
Switch(config-if)# topology neighbor ip-address 192.31.7.11 port ip-address 192.31.7.13
Switch(config-if)# topology neighbor agent ip-address 192.31.7.20
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wave 2/0
Switch(config-if)# laser frequency 194700
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 2/0/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 2/0/1
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-75 Configure ESCON Aggregation Card Interfaces

Purpose	This task configures the ESCON aggregation card interfaces for client data transmission and network topology management.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-63 Install the ESCON Aggregation Card, page 2-18
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface esconphy** *slot*/**0**/*port* Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **cdl flow identifier** *number*	Configures the in-band message channel flow identifier. The range is 0 to 174. **Note** You must configure the other esconphy interface in the network that supports this signal with the same flow identifier. **Caution** Use unique flow identifiers for each esconphy interface on the system. Duplicate flow identifiers might interfere with APS switchovers.
Step 5	Switch(config-if)# **topology neighbor** {**name** *node-name* | **ip-address** *node-ip-address* | **mac-address** *node-mac-address*} {**port** {**name** *port-name* | **ip-address** *port-ip-address* | **mac-address** *port-mac-address*}} [**receive** | **transmit**]	Configures the network topology information for the client equipment.
Step 6	Switch(config-if)# **topology neighbor agent ip-address** *ip-address*	Specifies the address of the network topology agent on a neighboring node.
Step 7	Switch(config-if)# **no shutdown**	Enables the interface.
Step 8	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode. Repeat Step 3 through Step 8 for the remaining esconphy interfaces on the ESCON aggregation card.

	Command	Purpose
Step 9	Switch(config)# **interface portgroup** *slot*/**0/0** Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 10	Switch(config-if)# **cdl flow identifier reserve** *group-name*	Configures the in-band message channel flow identifiers for all ten esconphy interfaces even if the SFPs are not populated. This step is required if the aggregated ESCON signal mixes with GE traffic on a 10-Gbps ITU trunk card. **Note** You must configure the other esconphy interface in the network that supports the signals with the same flow identifiers. ⚠ **Caution** Use unique flow identifiers for each esconphy interface on the system. Duplicate flow identifiers might interfere with APS switchovers.
Step 11	Switch(config-if)# **tx-buffer size** *value*	Sets the transmit buffer size for mixed traffic configurations.[1]
Step 12	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode.
Step 13	Switch(config)# **connect portgroup** *slot*/*subcard*/*port* {**waveethernetphy** *slot*/*subcard*[**.***subinterface*]|**tengigethernetphy** *slot*/*subcard*.*subinterface*}	Creates a cross connection between a portgroup interface and a waveethernetphy interface or subinterface or a tengigethernetphy interface through the switch fabric. **Note** Connect to a waveethernetphy interface on a 2.5-Gbps ITU trunk card and to a waveethernetphy subinterface on a 10-Gbps ITU trunk card.
Step 14	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 15	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

1. For detailed information on the transmit buffer, refer to the *Cisco ONS 15530 Configuration Guide*.

Example

The following example shows how to configure the ESCON aggregation card interfaces:

```
Switch# configure terminal  Switch(config)# interface esconphy 2/0/0
Switch(config-if)# cdl flow-identifier 20
Switch(config-if)# topology neighbor ip-address 192.31.7.11 port ip-address 192.31.7.13
Switch(config-if)# topology neighbor agent ip-address 192.31.7.20
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# connect portgroup 2/0/0 waveethernetphy 3/0.1
Switch(config)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-91 Configure 4-Port 1-Gbps/2-Gbps FC Aggregation Card Interfaces

Purpose	This task configures the 4-port 1-Gbps/2-Gbps FC aggregation card interfaces for client data transmission and network topology management.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-90 Install the 4-Port 1-Gbps/2-Gbps FC Aggregation Card, page 2-19
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface gigabitphy** *slot*/**0**/*port* Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **encapsulation {fibrechannel {1g | 2g}** [**ofc** {**enable** | **disable**}] **| ficon {1g | 2g}** [**ofc** {**enable** | **disable**}] **| sysplex isc {compatibility | peer {1g | 2g}}}**	Configures the interface as either FC, FICON, or ISC links.
Step 5	Switch(config-if)# **cdl flow identifier** *number*	Specifies the flow identifier for the signal. The range is 0 to 174.
Step 6	Switch(config-if)# **portgroup** *number*	Maps the twogigabitphy interface to a portgroup interface. The range is 0 to 3.
Step 7	Switch(config-if)# **flow control**	Enables the buffer credits feature. (Optional) **Note** For FC and FICON traffic only.
Step 8	Switch(config-if)# **topology neighbor** {**name** *node-name* | **ip-address** *node-ip-address* | **mac-address** *node-mac-address*} {**port** {**name** *port-name* | **ip-address** *port-ip-address* | **mac-address** *port-mac-address*}} [**receive** | **transmit**]	Configures the network topology information for the client equipment.
Step 9	Switch(config-if)# **topology neighbor agent ip-address** *ip-address*	Specifies the address of the network topology agent on a neighboring node.
Step 10	Switch(config-if)# **tx-buffer size** *value*	Sets the transmit buffer size for mixed traffic configurations.[1]
Step 11	Switch(config-if)# **no shutdown**	Enables the interface.

	Command	Purpose
Step 12	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode. Repeat Step 3 through Step 11 for the remaining gigabitphy interfaces on the 4-port 1-Gbps/2-Gbps FC aggregation card.
Step 13	Switch(config)# **connect portgroup** *slot*/*subcard*/*port* {**waveethernetphy** *slot*/*subcard*[**.***subinterface*]|**tengigethernetphy** *slot*/*subcard*.*subinterface*}	Creates a cross connection between a portgroup interface and a waveethernetphy interface or subinterface or a tengigethernetphy interface through the switch fabric. **Note** Connect to a waveethernetphy interface on a 2.5-Gbps ITU trunk card or to a waveethernetphy subinterface on a 10-Gbps ITU trunk card or 10-Gbps uplink card.
Step 14	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 15	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

1. For detailed information on the transmit buffer, refer to the *Cisco ONS 15530 Configuration Guide*.

Example

The following example shows how to configure the 4-port 1-Gbps/2-Gbps FC aggregation card interfaces:

```
Switch# configure terminal
Switch(config)# interface gigabitphy 4/0/2
Switch(config-if)# encapsulation fibrechannel 2g
Switch(config-if)# cdl flow-identifier 42
Switch(config-if)# portgroup 2
Switch(config-if)# topology neighbor ip-address 192.31.7.11 port ip-address 192.31.7.13
Switch(config-if)# topology neighbor agent ip-address 192.31.7.20
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# connect portgroup 4/2 waveethernetphy 8/0
Switch(config)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-76 Configure 8-Port FC/GE Aggregation Card Interfaces

Purpose	This task configures the 8-port FC/GE aggregation card interfaces for client data transmission and network topology management.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-64 Install the 8-Port FC/GE Aggregation Card, page 2-20
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface gigabitphy** *slot*/**0**/*port* Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **encapsulation {fibrechannel** [**ofc** {**enable** | **disable**}] | **ficon** | **gigabitethernet}**	Configures the interface as either FC, FICON, or GE.
Step 5	Switch(config-if)# **cdl flow identifier** *number*	Specifies the flow identifier for the signal. The range is 0 to 174.
Step 6	Switch(config-if)# **flow control**	Enables the buffer credits feature. (Optional) **Note** For FC and FICON traffic only.
Step 7	Switch(config-if)# **topology neighbor** {**name** *node-name* | **ip-address** *node-ip-address* | **mac-address** *node-mac-address*} {**port** {**name** *port-name* | **ip-address** *port-ip-address* | **mac-address** *port-mac-address*}} [**receive** | **transmit**]	Configures the network topology information for the client equipment.
Step 8	Switch(config-if)# **topology neighbor agent ip-address** *ip-address*	Specifies the address of the network topology agent on a neighboring node.
Step 9	Switch(config-if)# **tx-buffer size** *value*	Sets the transmit buffer size for mixed traffic configurations.[1]
Step 10	Switch(config-if)# **no shutdown**	Enables the interface.
Step 11	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode. Repeat Step 3 through Step 11 for the remaining gigabitphy interfaces on the 8-port FC/GE aggregation card.
Step 12	Switch(config)# **connect portgroup** *slot*/*subcard*/*port* {**waveethernetphy** *slot*/*subcard*[**.***subinterface*] | **tengigethernetphy** *slot*/*subcard*.*subinterface*}	Creates a cross connection between a portgroup interface and a waveethernetphy interface or subinterface or a tengigethernetphy interface through the switch fabric. **Note** Connect to a waveethernetphy interface on a 2.5-Gbps ITU trunk card or to a waveethernetphy subinterface on a 10-Gbps ITU trunk card or 10-Gbps uplink card.

	Command	Purpose
Step 13	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 14	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

1. For detailed information on the transmit buffer, refer to the *Cisco ONS 15530 Configuration Guide*.

Example

The following example shows how to configure the 8-port FC/GE aggregation card interfaces:

```
Switch# configure terminal
Switch(config)# interface gigabitphy 4/0/2
Switch(config-if)# encapsulation gigabitethernet
Switch(config-if)# cdl flow-identifier 42
Switch(config-if)# topology neighbor ip-address 192.31.7.11 port ip-address 192.31.7.13
Switch(config-if)# topology neighbor agent ip-address 192.31.7.20
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# connect portgroup 4/0 waveethernetphy 8/0
Switch(config)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-96 Configure 8-Port Multi-Service Muxponder Interfaces

Purpose	This task configures the 8-port multi-server muxponder interfaces for client data transmission and network topology management.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-98 Install the 8-Port Multi-Service Muxponder, page 2-21
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface multirate** *slot*/**0**/*port* Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **encapsulation {dvb | e1| escon | fastethernet {copper | optical} | fibrechannel | ficon | gigabitethernet {copper | optical} | its | sdh stm1 | sdi | sonet oc3 | t1}**	Configures the client traffic protocol for the interface.

	Command	Purpose
Step 5	Switch(config-if)# **topology neighbor** {**name** *node-name* | **ip-address** *node-ip-address* | **mac-address** *node-mac-address*} {**port** {**name** *port-name* | **ip-address** *port-ip-address* | **mac-address** *port-mac-address*}} [**receive** | **transmit**]	Configures the network topology information for the client equipment.
Step 6	Switch(config-if)# **topology neighbor agent ip-address** *ip-address*	Specifies the address of the network topology agent on a neighboring node.
Step 7	Switch(config-if)# **no shutdown**	Enables the interface.
Step 8	Switch(config-if)# **exit** Switch(config)#	Returns to global configuration mode. Repeat Step 3 through Step 11 for the remaining gigabitphy interfaces on the 4-port 1-Gbps/2-Gbps FC aggregation card.
Step 9	Switch(config)# **interface wavesonetphy** *slot*/**0** Switch(config-if)#	Specifies an interface to configure and enters interface configuration mode.
Step 10	Switch(config-if)# **laser frequency** *number*	Configures the channel frequency in GHz.
Step 11	Switch(config-if)# **no shutdown**	Enables the interface.
Step 12	Switch(config-if)# **no laser shutdown**	Enables the laser.
Step 13	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 14	Switch(config)# **interface wavepatch** *slot*/*subcard*/**0** Switch(config-if)#	Selects the interface to configure and enters global configuration mode. **Note** Perform this step for both splitter and nonsplitter modules.
Step 15	Switch(config-if)# **no shutdown**	Enables the interface.
Step 16	Switch(config-if)# **exit** Switch(config)#	Exits interface configuration mode and returns to global configuration mode.
Step 17	Switch(config)# **interface wavepatch** *slot*/*subcard*/**1** Switch(config-if)#	Selects the interface to configuration and enters global configuration mode. **Note** Perform this step for splitter modules only.
Step 18	Switch(config-if)# **no shutdown**	Enables the interface.
Step 19	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 20	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 21	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the 8-port multi-service muxponder interfaces:

```
Switch# configure terminal
Switch(config)# interface multirate 9/0/0
Switch(config-if)# encapsulation fibrechannel
Switch(config-if)# topology neighbor ip-address 192.31.7.11 port ip-address 192.31.7.13
Switch(config-if)# topology neighbor agent ip-address 192.31.7.20
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavesonetphy 9/0
Switch(config-if)# laser frequency 194700
Switch(config-if)# no shutdown
Switch(config-if)# no laser shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/1
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-77 Configure 2.5-Gbps ITU Trunk Card Interfaces

Purpose	This task configures the 2.5-Gbps ITU trunk card interfaces for client data transmission.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface waveethernetphy** *slot*/**0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **laser frequency** *number*	Selects one of the two frequencies in GHz supported by the laser. The default is the lower frequency for the 2.5-Gbps ITU trunk card. (Optional)
Step 5	Switch(config-if)# **no shutdown**	Enables the interface.

	Command	Purpose
Step 6	Switch(config-if)# **exit** Switch(config)	Returns to global configuration mode.
Step 7	Switch(config)# **interface wavepatch** *slot***/0/0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 8	Switch(config-if)# **no shutdown**	Enables the interface. Repeat Step 7and Step 8 on **wavepatch** *slot***/0/1** for splitter 2.5-Gbps ITU trunk cards.
Step 9	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 10	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the transponder line card interfaces:

```
Switch# configure terminal
Switch(config)# interface waveethernetphy 8/0
Switch(config-if)# laser frequency 194200
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 8/0/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 8/0/1
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-78 Configure 10-Gbps ITU Trunk Card Interfaces

Purpose	This task configures the 10-Gbps ITU trunk card interfaces for client data transmission.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface waveethernetphy** *slot*/**0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **no shutdown**	Enables the interface.
Step 5	Switch(config-if)# **exit** Switch(config)	Returns to global configuration mode.
Step 6	Switch(config)# **interface wavepatch** *slot*/**0/0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 7	Switch(config-if)# [**no**] **shutdown**	Enables or disables the interface. Repeat Step 7 and Step 8 on **wavepatch** *slot*/**0/1** for splitter 10-Gbps ITU trunk cards.
Step 8	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 9	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the 10-Gbps ITU trunk card interfaces:

```
Switch# configure terminal
Switch(config)# interface waveethernetphy 9/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/1
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-150 Configure 10-Gbps ITU Tunable Trunk Card Interfaces

Purpose	This task configures the 10-Gbps ITU tunable trunk card interfaces for client data transmission.
Tools/Equipment	None

Prerequisite Procedures DLP-37 Configure IP Access on the NME interface, page 3-4

DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23

Required/As Needed Required

Onsite/Remote Onsite or remote

Security Level Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface waveethernetphy** *slot***/0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **laser frequency** *number*	Selects one of the four frequencies in GHz supported by the laser. The default is the lower frequency for the 10-Gbps ITU tunable trunk card.
Step 5	Switch(config-if)# **no shutdown**	Enables the interface.
Step 6	Switch(config-if)# **exit** Switch(config)	Returns to global configuration mode.
Step 7	Switch(config)# **interface wavepatch** *slot***/0/0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 8	Switch(config-if)# [**no**] **shutdown**	Enables or disables the interface. Repeat Step 7 and Step 8 on **wavepatch** *slot***/0/1** for splitter 10-Gbps ITU trunk cards.
Step 9	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 10	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the 10-Gbps ITU tunable trunk card interfaces:

```
Switch# configure terminal
Switch(config)# interface waveethernetphy 9/0
Switch(config-if)# laser frequency 194200
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/0
Switch(config-if)# no shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 9/0/1
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-79 Configure 10-Gbps Uplink Card Interfaces

Purpose	This task configures the 10-Gbps uplink card interfaces for client data transmission.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4 DLP-67 Install the 10-Gbps Uplink Card, page 2-24
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **interface tengigethernetphy** *slot*/**0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 4	Switch(config-if)# **no shutdown**	Enables the interface.
Step 5	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 6	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure the 10-Gbps uplink card interfaces:

```
Switch# configure terminal
Switch(config)# interface tengigethernetphy 2/0
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

NTP-11 Configure Patch Connections

Purpose	This procedure configures the patch connections on the CLI.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Configure the patch connections between the OADM modules (required).

Step 2 Configure the patch connections between the wave interface on the OSC modules and the OADM modules (required if using the OSC).

Step 3 Configure the patch connections between the OADM modules and the transponder line cards (required).

Step 4 Configure the patch connections between the WB-VOA modules and other modules on the shelf (required if using WB-VOA modules).

Step 5 Configure the patch connections between the PB-OE modules and other modules on the shelf (required if using PB-OE modules).

Table 3-1 describes the types of patch connections on the Cisco ONS 15530.

Table 3-1 Patch Connection Types

Patch Connection	Description
Thru interface to wdm interface or wdm interface to thru interface	Connection between the OADM modules in an unprotected configuration
Wdm interface to voain interface or voain interface to wdm interface	Connection between an OADM module and a WB-VOA module for post-attenuation
Wdm interface to voaout interface or voaout interface to wdm interface	Connection between an OADM module and a WB-VOA module for pre-attenuation
Wdm interface to voafilterin interface or voafilterin interface to wdm interface	Connection between an OADM module and a PB-OE module for post-attenuation
Wdm interface to voafilterout interface or voafilterout interface to wdm interface	Connection between an OADM module and a PB-OE module for pre-attenuation
Voabypassout interface to voain interface Voain interface to voabypassout interface	Connection between a PB-OE module and a WB-VOA module sending the signal to the WB-VOA module
Voaout interface to voabypassin interface Voabypassin interface to voaout interface	Connection between a PB-OE module and a WB-VOA module sending the signal to the PB-OE module

Table 3-1 Patch Connection Types (continued)

Patch Connection	Description
Voabypassout interface to voafilterin interface Voafilterin interface to voabypassout interface	Connection between two PB-OE modules sending the nonattenuated bands
Voafilterout interface to voabypassin interface Voabypassin interface to voafilterout interface	Connection between two PB-OE modules sending the attenuated bands
Thru interface to thru interface	Connection between the OADM modules in a protected configuration
OSC wave interface to oscfilter interface or oscfilter interface to OSC wave interface	Connection between the wave interface on an OSC module and the oscfilter interface on an OADM module
Wavepatch interface to filter interface or filter interface to wavepatch interface	Connection between the wavepatch on a transponder line card and the filter interface on an OADM module.

Figure 3-1 and Figure 3-2 show examples of transponder line card interfaces and their optical patch connections to OADM modules.

Figure 3-1 Optical Patch Connection Example for Splitter Protection With Transponder Line Cards

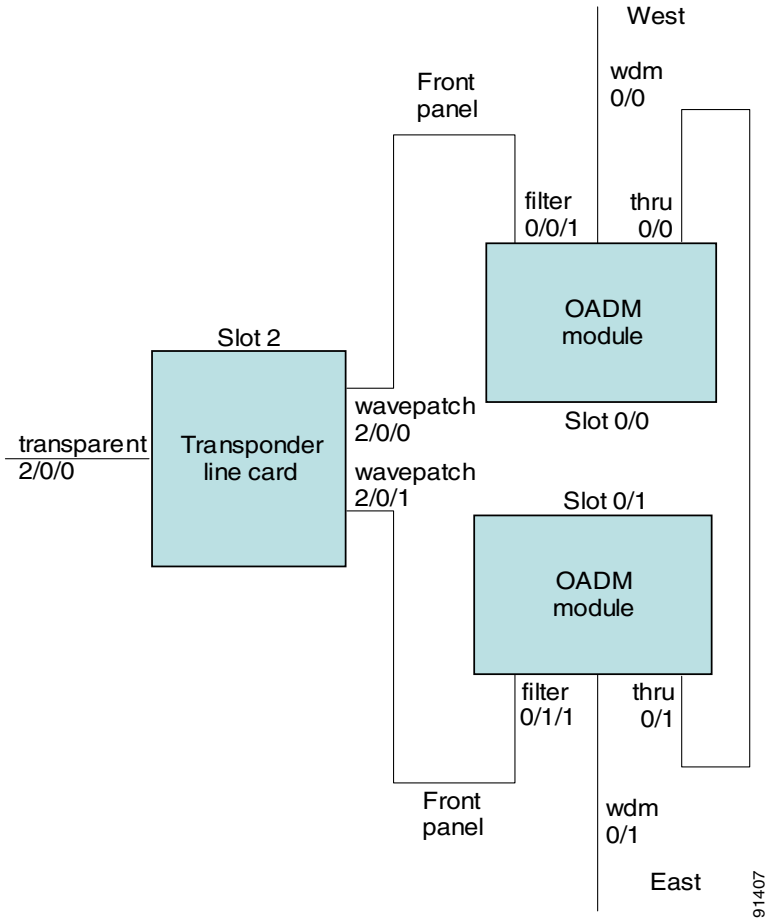


Figure 3-2 Optical Patch Connection Example for Y-Cable Protection With Transponder Line Cards

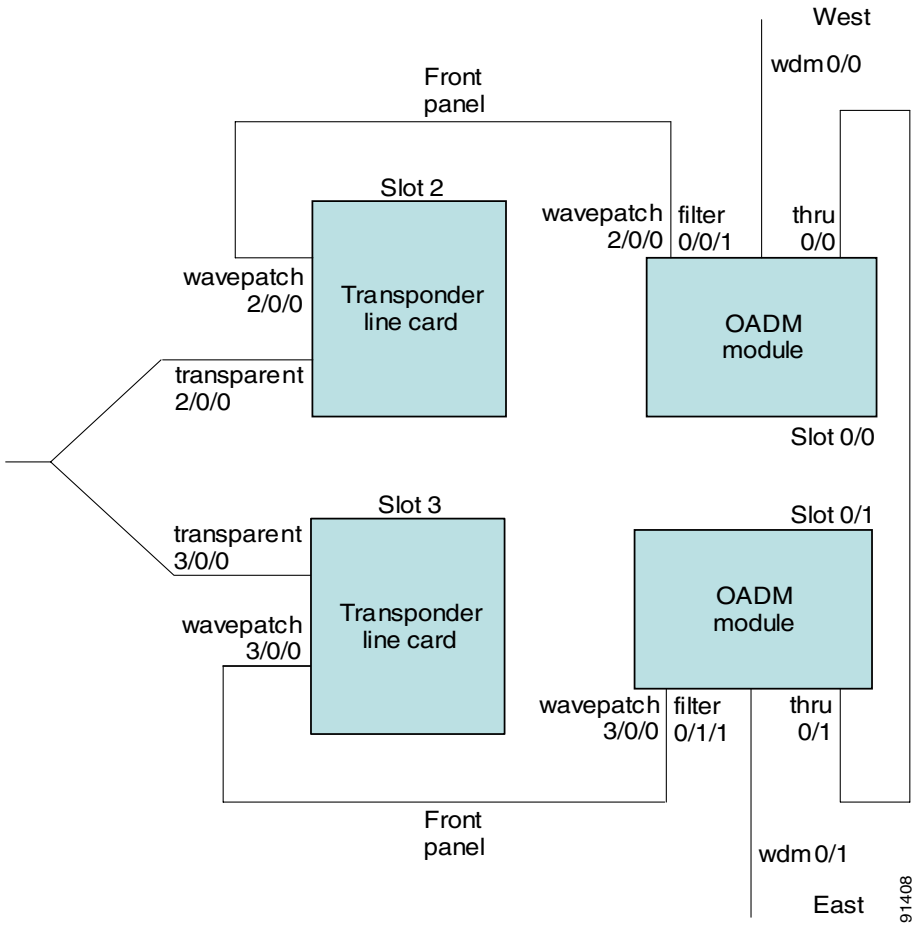
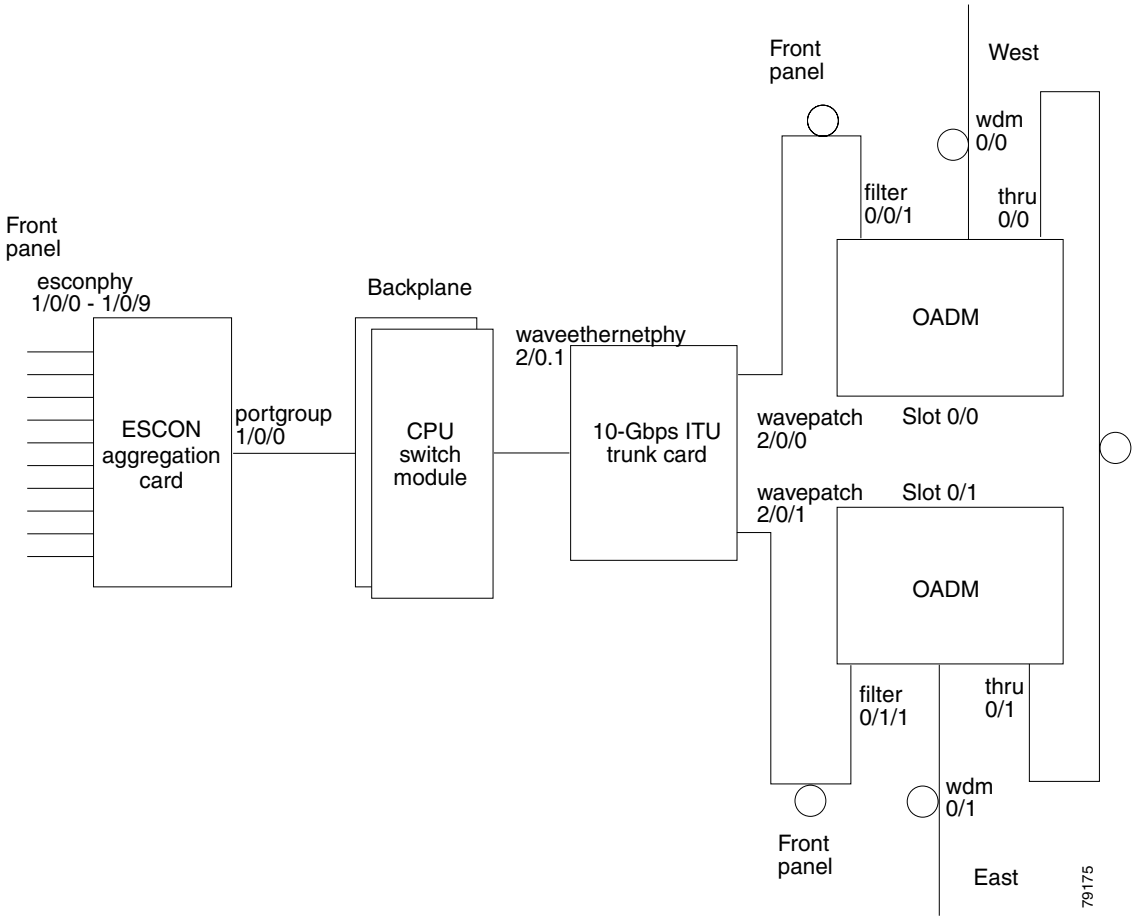


Figure 3-3 shows an example of 10-Gbps ITU trunk card interfaces and their optical patch connections to OADM modules.

Figure 3-3 Optical Patch Connection Example for Splitter Protection With a 10-Gbps ITU Trunk Card



	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	**patch thru** *slot/subcard1* **wdm** *slot/subcard2* or **patch wdm** *slot/subcard1* **thru** *slot/subcard2*	Configures the patch connection between the OADM modules in an unprotected configuration.
Step 4	**patch thru** *slot/subcard1* **thru** *slot/subcard2*	Configures the patch connection between the OADM modules in a protected configuration.

	Command	Purpose
Step 5	**patch wave** *slot/subcard* **oscfilter** *slot/subcard* or **patch oscfilter** *slot/subcard* **wave** *slot/subcard*	Configures the patch connection between the OSC wave interface on an OSC module and the oscfilter interface on an OADM module.
Step 6	**patch wavepatch** *slot1/subcard1/port1* **filter** *slot2/subcard2/port2* or **patch filter** *slot1/subcard1/port1* **wavepatch** *slot2/subcard2/port2*	Configures the patch connection between a wavepatch interface on the transponder line card and a filter interface on an OADM module.
Step 7	Switch(config)# **end** Switch#	Returns to privileged EXEC mode.
Step 8	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Note If you correctly patch your OADM modules, the **patch** command configuration is not necessary for the signal to pass from the client to the trunk fiber. However, without a correct **patch** command configuration, CDP is unable to locate the wdm interfaces that connect to the trunk fiber and discover the topology neighbors. For more information on network monitoring, refer to the *Cisco ONS 15530 Configuration Guide*.

Example

The following example shows how to configure the patch connections between modules:

```
Switch# configure terminal
Switch(config)# patch thru 0/0 thru 1/0
Switch(config)# patch wavepatch 3/0/0 filter 0/0/1
Switch(config)# patch wavepatch 4/0/0 filter 0/1/1
Switch(config)# patch wave 2/0 oscfilter 0/0
Switch(config)# patch wave 2/1 oscfilter 0/1
Switch(config)# end
Switch# copy system:running-config nvram:startup-config
```

NTP-12 Configure APS

Purpose	This procedure describes how to configure APS groups for protection.
Tools/Equipment	None
Prerequisite Procedures	DLP-41 Configure Transponder Line Card Interfaces, page 3-18
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 As needed, complete the "DLP-42 Configure Splitter Protection" task on page 3-38.

Step 2 As needed, complete the "DLP-43 Configure Y-Cable Line Card Protection" task on page 3-40.

Step 3 As needed, complete the "DLP-44 Configure Path Switching" task on page 3-41.

For more information on APS, refer to the *Cisco ONS 15530 Configuration Guide*.

DLP-42 Configure Splitter Protection

Purpose	This task configures splitter protection, which provides facility protection.
Tools/Equipment	None
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13, for two OADM modules DLP-13 Install the Transponder Line Cards, page 2-17 (one splitter transponder line card for each APS group) or DLP-98 Install the 8-Port Multi-Service Muxponder, page 2-21 (one splitter muxponder for each APS group) or DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 (one splitter trunk card for each APS group) or DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 (one splitter trunk card for each APS group) DLP-41 Configure Transponder Line Card Interfaces, page 3-18 or DLP-96 Configure 8-Port Multi-Service Muxponder Interfaces, page 3-26 or DLP-77 Configure 2.5-Gbps ITU Trunk Card Interfaces, page 3-28 or DLP-78 Configure 10-Gbps ITU Trunk Card Interfaces, page 3-29 or DLP-150 Configure 10-Gbps ITU Tunable Trunk Card Interfaces, page 3-30
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **redundancy** Switch(config-red)#	Enters redundancy configuration mode.
Step 4	Switch(config-red)# **associate group** *name* Switch(config-red-aps)#	Specifies an APS group name and enters APS configuration mode. **Note** The group name is case sensitive.
Step 5	Switch(config-red-aps)# **aps working wavepatch** *slot/subcard/port*	Configures the working path interface.

	Command	Purpose
Step 6	Switch(config-red-aps)# **aps protection wavepatch** *slot/subcard/port*	Configures the protection path interface.
Step 7	Switch(config-red-aps)# **aps enable**	Enables APS activity between the interfaces.
Step 8	Switch(config-red-aps)# **end** Switch#	Returns to privileged EXEC mode.
Step 9	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Examples

This example shows how to associate wavepatch interfaces for splitter protection.

```
Switch# configure terminal
Switch(config)# redundancy
Switch(config-red)# associate group dallas1
Switch(config-red-aps)# aps working wavepatch 3/0/0
Switch(config-red-aps)# aps protection wavepatch 3/0/1
Switch(config-red-aps)# aps enable
Switch(config-red-aps)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-43 Configure Y-Cable Line Card Protection

Purpose	This task configures y-cable protection, which provides facility and line card protection.
Tools/Equipment	None
Prerequisite Procedures	DLP-8 Install the OADM Module, page 2-13, for two OADM modules DLP-13 Install the Transponder Line Cards, page 2-17 (two nonsplitter transponder line cards for each APS group) or DLP-65 Install the 2.5-Gbps ITU Trunk Card, page 2-22 (two nonsplitter trunk cards for each APS group) or DLP-66 Install the 10-Gbps ITU Tunable and Non-tunable Trunk Card, page 2-23 (two nonsplitter trunk cards for each APS group) DLP-41 Configure Transponder Line Card Interfaces, page 3-18 or DLP-77 Configure 2.5-Gbps ITU Trunk Card Interfaces, page 3-28 or DLP-78 Configure 10-Gbps ITU Trunk Card Interfaces, page 3-29 or DLP-150 Configure 10-Gbps ITU Tunable Trunk Card Interfaces, page 3-30
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **redundancy** Switch(config-red)#	Enters redundancy configuration mode.
Step 4	Switch(config-red)# **associate group** *name* Switch(config-red-aps)#	Specifies an APS group name and enters APS configuration mode. **Note** The group name is case sensitive.
Step 5	Switch(config-red-aps)# **aps working** {**transparent** *slot/subcard/port* | **gigabitphy** *slot/subcard/port*}	Configures the working path interface.
Step 6	Switch(config-red-aps)# **aps protection** {**transparent** *slot/subcard/port* | **gigabitphy** *slot/subcard/port*}	Configures the protection path interface.
Step 7	Switch(config-red-aps)# **aps y-cable**	Enables y-cable protection. The default state is no y-cable protection (disabled).
Step 8	Switch(config-red-aps)# **aps enable**	Enables APS activity between the interfaces.

	Command	Purpose
Step 9	Switch(config-red-aps)# **end** Switch#	Returns to privileged EXEC mode.
Step 10	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Caution Do not configure y-cable protection with Sysplex CLO, Sysplex ETR, or ISC compatibility protocol encapsulation, or with the OFC safety protocol.

Example

This example shows how to associate two transparent interfaces for y-cable line card protection.

```
Switch# configure terminal
Switch(config)# redundancy
Switch(config-red)# associate group Yosemite
Switch(config-red-aps)# aps working transparent 3/0/0
Switch(config-red-aps)# aps protection transparent 4/0/0
Switch(config-red-aps)# aps y-cable
Switch(config-red-aps)# aps enable
Switch(config-red-aps)# end
Switch# copy system:running-config nvram:startup-config
```

DLP-44 Configure Path Switching

Purpose	This task configures path switching behavior for an APS group.
Tools/Equipment	None
Prerequisite Procedures	DLP-42 Configure Splitter Protection, page 3-38 or DLP-43 Configure Y-Cable Line Card Protection, page 3-40
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note Both nodes in the network that support the APS group must have the same APS configuration. Specifically, both must have the same path switching behavior, and working and protection paths.

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **redundancy** Switch(config-red)#	Enters redundancy configuration mode.

	Command	Purpose
Step 4	Switch(config-red)# **associate group** *name* Switch(config-red-aps)#	Selects the interfaces to associate and enters APS configuration mode. **Note** The group name is case sensitive.
Step 5	Switch(config-red-aps)# **aps disable**	Disables APS activity between the interfaces.
Step 6	Switch(config-red-aps)# **aps direction** {**unidirectional** | **bidirectional**}	Specifies the type of path switching. The default behavior is unidirectional.
Step 7	Switch(config-red-aps)# **aps enable**	Enables APS activity between the interfaces.
Step 8	Switch(config-red-aps)# **end** Switch#	Returns to privileged EXEC mode.
Step 9	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

This example shows how to configure bidirectional path switching.

```
Switch# configure terminal
Switch(config)# redundancy
Switch(config-red)# associate group Yosemite
Switch(config-red-aps)# aps disable
Switch(config-red-aps)# aps direction bidirectional
Switch(config-red-aps)# aps enable
Switch(config-red-aps)# end
Switch# copy system:running-config nvram:startup-config
```

NTP-13 Configure SNMP

Purpose	This procedure configures SNMP trap messages for the system.
Tools/Equipment	None
Prerequisite Procedures	DLP-37 Configure IP Access on the NME interface, page 3-4
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

	Command	Purpose
Step 1	Switch> **enable** Password: Switch#	Enters privileged EXEC mode.
Step 2	Switch# **configure terminal** Switch(config)#	Enters global configuration mode.
Step 3	Switch(config)# **snmp-server community public RO**	Defines the password-like community access string sent with the notification, and assigns read only permission for the MIB objects accessible to the community.

	Command	Purpose
Step 4	Switch(config)# **snmp-server community private RW**	Defines the password-like community access string sent with the notification, and assigns read and write permission for the MIB objects accessible to the community.
Step 5	Switch(config)# **snmp-server enable traps**	Enables SNMP trap notifications.
Step 6	Switch(config)# **interface transparent** *slot***/0/0** Switch(config-if)#	Selects the interface to configure and enters interface configuration mode.
Step 7	Switch(config-if)# **shutdown**	Disables the interface to generate an entity trap.
Step 8	Switch(config-if)# **no shutdown**	Enables the interface to generate an entity trap.
Step 9	Switch(config-if)# **end** Switch#	Returns to privileged EXEC mode.
Step 10	Switch# **copy system:running-config nvram:startup-config**	Saves your configuration changes to NVRAM.

Example

The following example shows how to configure and test SNMP functionality:

```
Switch# configure terminal
Switch(config)# snmp-server community public RO
Switch(config)# snmp-server community private RW
Switch(config)# snmp-server enable traps
Switch(config)# interface transparent 8/0/0
Switch(config-if)# shutdown
Switch(config-if)# no shutdown
Switch(config-if)# end
Switch# copy system:running-config nvram:startup-config
```

NTP-14 Verify the System Configuration

Purpose	This procedure describes how to verify the software configuration for the system.
Tools/Equipment	None
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2 DLP-41 Configure Transponder Line Card Interfaces, page 3-18 NTP-11 Configure Patch Connections, page 3-33 NTP-12 Configure APS, page 3-37, if APS is desired NTP-13 Configure SNMP, page 3-42, if SNMP traps are desired
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Start a session on the console or the LAN connection, if one is not already available.

Step 2 Enter privileged EXEC mode using the **enable** command.

Step 3 Start a session log.

Step 4 Verify that the system is correctly configured, use the **show config** command.

```
Switch# show config
Using 6908 out of 522232 bytes
!
version 12.1
no service pad
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Switch
!
boot bootldr bootflash:ons15530-i-mz.999-99.ONS155XX_12EV_THRT_UB_030
redundancy
 standby privilege-mode enable
 associate group y
   aps working Transparent1/0/0
   aps protection Transparent7/0/0
   aps y-cable
   aps message-channel ip far-end group-name y ip-address 10.0.0.15
   aps enable
enable password xyz
!
diag online
ip subnet-zero
no ip domain-lookup
!
!
interface FastEthernet0
 ip address 172.25.22.113 255.255.255.0
 duplex auto
 speed auto
!
interface Filter0/0/0
 no ip address
!
interface Filter0/1/0
 no ip address
!
interface Oscfilter0/0
 no ip address
!
interface Oscfilter0/1
 no ip address
!
interface Thru0/0
 no ip address
!
interface Thru0/1
 no ip address
!
interface Wdm0/0
 no ip address
!
interface Wdm0/1
 no ip address
!
```

```
interface Filter0/0/1
 no ip address
!
interface Filter0/1/1
 no ip address
!
interface Filter0/0/2
 no ip address
!
interface Filter0/1/2
 no ip address
!
interface Filter0/0/3
 no ip address
!
interface Filter0/1/3
 no ip address
!
interface Transparent1/0/0
 no ip address
 encapsulation gigabitEthernet
 monitor enable
!
interface Wave1/0
 no ip address
!
interface Wavepatch1/0/0
 no ip address
!
interface Wavepatch1/0/1
 no ip address
!

interface Transparent4/0/0
 no ip address
 encapsulation gigabitEthernet
 monitor enable
!
interface Wave4/0
 no ip address
!
interface Wavepatch4/0/0
 no ip address
!
interface Transparent7/0/0
 no ip address
 encapsulation escon
 monitor enable
!
interface Wave7/0
 no ip address
!
interface Wavepatch7/0/0
 no ip address
!
interface Wave8/0
 ip address 10.0.0.10 255.255.0.0
!
interface Wave8/1
 ip address 15.0.0.15 255.255.0.0
!
router ospf 1
 log-adjacency-changes
 network 99.0.0.0 0.255.255.255 area 1
```

```
!
router bgp 10
 bgp log-neighbor-changes
!
ip classless
ip route 0.0.0.0 0.0.0.0 FastEthernet0
ip route 172.25.0.0 255.255.0.0 FastEthernet0
ip http server
!
snmp-server engineID local 800000090300000016447A241
snmp-server community public RO
snmp-server trap-source FastEthernet0
snmp-server queue-length 100
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 entity
snmp-server enable traps fru-ctrl
snmp-server enable traps topology throttle-interval 20
snmp-server enable traps rf
snmp-server enable traps aps
snmp-server enable traps patch
snmp-server enable traps alarms
snmp ifmib ifalias long
snmp mib notification-log globalsize 100
snmp mib notification-log globalageout 10
snmp mib notification-log default
snmp mib notification-log default size 90
patch Oscfilter0/0 Wave8/0
patch Oscfilter0/1 Wave8/1
patch Filter0/0/0 Wavepatch4/0/0
patch Filter0/1/0 Wavepatch7/0/0
alias exec s show contr wavee
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 exec-timeout 0 0
 password lab
 login
 length 0
!
end
```

Step 5 Close the session log and save for future reference.

Basic Node Verification Procedures

This chapter describes the procedures for basic node verification.

Before performing the procedures in this chapter, you must install the chassis, power it up, and complete the hardware installation described in Chapter 2, "Basic Hardware Installation Procedures," and complete the software setup and verification tasks described in Chapter 3, "Software Setup Procedures."

Note This chapter contains preliminary procedures for node installation and setup verification and does not cover the final turn-up procedures for an entire network.

Before You Begin

This section lists the chapter non-trouble procedures (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

1. NTP-15 Verify the Interface Status, page 4-2—Complete this procedure to verify the status and configuration of the interfaces in the system.
2. NTP-16 Verify the Optical Patch Configuration, page 4-19—Complete this procedure to verify the configuration of the patch connections in the system.
3. NTP-17 Verify the Cross Connect Status, page 4-20—Complete this procedure to verify the status and configuration of the cross connects in the system.
4. NTP-18 Verify the Transponder Line Card Laser Frequency, page 4-21—Complete this procedure to verify the ITU laser frequency transmitted by the transponder line card.
5. NTP-19 Verify the Optical Power and Frequency, page 4-25—Complete this procedure to verify the optical power frequency.
6. NTP-20 Test the Optical Transmission Quality, page 4-28—Complete this procedure to test the signal between nodes.
7. NTP-21 Check the Alarms, page 4-30—Complete this procedure to check the function of the alarm messages on the system.
8. NTP-22 Verify the Status of Redundant CPU Switch Modules, page 4-30—Complete this procedure to verify the redundancy of the CPU switch modules, if a redundant switch module is present on the system.

You need the following test equipment:

- Handheld optical power meter
- OSA (optical spectrum analyzer)
- Fiber cleaning kit
- Attenuators
- MU-SC connector (per DWDM interface)
- Traffic generator for bit error rate testing

NTP-15 Verify the Interface Status

Purpose	This procedure describes how to verify the interface status.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Complete the "DLP-45 Verify the Transparent Interface Status" task on page 4-3.

Step 2 Complete the "DLP-46 Verify the Transponder Wave Interface Status" task on page 4-3.

Step 3 As needed, complete the "DLP-47 Verify the OSC Wave Interface Status" task on page 4-4.

Step 4 Complete the "DLP-48 Verify the Wavepatch Interface Status" task on page 4-5.

Step 5 As needed, complete the "DLP-49 Verify the WB-VOA Module Interface Status" task on page 4-6.

Step 6 As needed, complete the "DLP-50 Verify the PB-OE Module Interface Status" task on page 4-7.

Step 7 As needed, complete the "DLP-85 Verify the ESCON Aggregation Card Interface Status" task on page 4-7.

Step 8 As needed, complete the "DLP-91 Verify the 4-port 1-Gbps/2-Gbps FC Aggregation Card Interface Status" task on page 4-8.

Step 9 As needed, complete the "DLP-86 Verify the 8-Port FC/GE Aggregation Card Interface Status" task on page 4-9.

Step 10 As needed, complete the "DLP-97 Verify the 8-Port Multi-Service Muxponder Interface Status" task on page 4-10.

Step 11 As needed, complete the "DLP-87 Verify the 2.5-Gbps ITU Trunk Card Interface Status" task on page 4-12.

Step 12 As needed, complete the "DLP-88 Verify the 10-Gbps ITU Trunk Card Interface Status" task on page 4-14.

Step 13 As needed, complete the "DLP-89 Verify the 10-Gbps Uplink Card Interface Status" task on page 4-16.

Step 14 Complete the "DLP-51 Verify the Fastethernet 0 Interface Status" task on page 4-18.

For more information on interfaces and interface configuration, refer to the *Cisco ONS 15530 Configuration Guide*.

DLP-45 Verify the Transparent Interface Status

Purpose	This task verifies the status of the transparent interface on the client side of the transponder line card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the transparent interfaces on the system.

Step 2 Use the **show interfaces transparent** command to display the status and configuration of the client side interface on the transponder line card. The interface and line protocol should be up and the encapsulation or clock rate should be correct.

```
Switch# show interfaces transparent 10/0/0
Transparent10/0/0 is up, line protocol is up
  Signal quality:Good
  Encapsulation:Sonet    Rate:oc12
  Signal monitoring:on
  Time of last "monitor" state change 2d16h
  Time of last "encapsulation" change 2d16h
  Forward laser control:Off
  Loopback not set
  Threshold monitored for:None
  Section code violation error count(bip1):0
  Number of errored seconds(es):0
  Number of severely errored seconds(ses):0
  Number of severely errored framing seconds(sefs):0
  Last clearing of "show interface" counters 2d16h
  Hardware is transparent
```

Step 3 If there are problems with the interface status or configuration, see the "DLP-41 Configure Transponder Line Card Interfaces" procedure on page 3-18.

DLP-46 Verify the Transponder Wave Interface Status

Purpose	This task verifies the status of the wave interface on the ITU side of the transponder line card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output and the **show hardware** command output to locate the wave interfaces on the system.

Step 2 Use the **show interfaces wave** command to display the status and configuration of the DWDM side interface on the transponder line card. The interface and line protocol should be up.

```
Switch# show interfaces wave 10/0
Wave10/0 is up, line protocol is up
  Channel: 27   Frequency: 195.3 Thz   Wavelength: 1535.04 nm
  Active Wavepatch         : Wavepatch1/0/0
  Splitter Protected       : No
  Signal quality           : Good
  Receiver power level     : -17.98 dBm
  Forward laser control    : Off
  Laser safety control     : Off
  Osc physical port        : No
  Wavelength used for inband management: No
  Loopback not set
  Threshold monitored for: None
  Section code violation error count(bip1): 0
  Number of errored seconds(es): 0
  Number of severely errored seconds(ses): 0
  Number of severely errored framing seconds(sefs): 0

  Last clearing of "show interface" counters 2d17h
  Hardware is data_only_port
```

DLP-47 Verify the OSC Wave Interface Status

Purpose	This task verifies the status of the wave interface on the OSC module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output and the **show hardware** command output to locate the OSC wave interfaces on the system.

Step 2 Use the **show interfaces wave** command to display the status and configuration of the DWDM side interface on the OSC module. The interface and line protocol should be up.

```
Switch# show interfaces wave 2/0
Wave2/0 is up, line protocol is up
  Patched Interface(s) :Oscfilter0/0
  Channel:0    Frequency:191.9 Thz   Wavelength:1562.23 nm
  Signal quality        :Good
  Laser safety control     :Off
  Osc physical port        :Yes
  Wavelength used for inband management:No
  Threshold monitored for:None
  CDL HEC error count:0
  Code violation and running disparity error count( 8b10b cvrd):0
```

```
Last clearing of "show interface" counters never
Hardware is OSC_phy_port
Internet address is 10.0.0.15/24
MTU 1492 bytes, BW 10000000 Kbit, DLY 0 usec,
   reliability 255/255, txload 1/255, rxload 1/255
Encapsulation SNAP, loopback not set
Last input 00:00:02, output never, output hang never
Last clearing of "show interface" counters never
Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   89371 packets input, 6640468 bytes, 0 no buffer
   Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
   0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
   94418 packets output, 6589506 bytes, 0 underruns
   0 output errors, 0 collisions, 0 interface resets
   0 output buffer failures, 0 output buffers swapped out
```

DLP-48 Verify the Wavepatch Interface Status

Purpose	This task checks the status of the wavepatch interfaces on the ITU side of the transponder line card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the wavepatch interfaces on the system. The wavepatch interfaces connect the transponder line card to the filter interfaces on the OADM modules.

Step 2 Use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/0 interface.

```
Switch# show interfaces wavepatch 7/0/0
Wavepatch7/0/0 is up, line protocol is up
  Patched Interface(s) : Filter0/0/2
  Receiver power level: > -13.00 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -24.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 3 For splitter transponder line cards, use the **show interfaces wavepatch** command to verify the status of the wavepatch *slot*/*subcard*/1 interface.

```
Switch# show interfaces wavepatch 7/0/1
Wavepatch7/0/1 is up, line protocol is up
  Patched Interface(s) : Filter0/1/2
  Receiver power level: -15.34 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -24.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -13.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -15.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

DLP-49 Verify the WB-VOA Module Interface Status

Purpose	This task checks the status of the voain interfaces on the WB-VOA module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the voain interfaces on the system.

Step 2 Use the **show interfaces voain** command to display the status and configuration of the input interface on the WB-VOA module. The interface and line protocol should be up.

```
Switch# show interfaces voain 9/0/0
voaIn9/0/0 is up, line protocol is up
  Hardware is voaIn Port
  Port Transmit (Tx) Support:      False
  Port Receive  (Rx) Support:      True
  VOA This Port operates on:       1
  Attenuation Mode:                manual
  Minimum settable Attenuation:    1.7dB
  Maximum settable Attenuation:    30.0dB
  Current set Attenuation:         1.8dB
  Light Quality:                   Good/In Range
  Current Output Power:            1.1dBm
  Low Alarm Threshold Severity:    major (default)
  Low Warning Threshold:           -27.0dBm (default)
  Low Warning Threshold Severity:  not alarmed (default)
  High Warning Threshold:          9.0dBm (default)
  High Warning Threshold Severity: not alarmed (default)
  High Alarm Threshold:            11.0dBm (default)
  High Alarm Threshold Severity:   major (default)
```

DLP-50 Verify the PB-OE Module Interface Status

Purpose	This task checks the status of the voafilterin interfaces on the PB-OE module.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the voafilterin interfaces on the system.

Step 2 Use the **show interfaces voafilterin** command to display the status and configuration of the input interface on the PB-OE module. The interface and line protocol should be up.

```
Switch# show interfaces voafilterin 9/1/0.1
voaFilterIn9/1/0.1 is up, line protocol is up
  Hardware is voaFilterIn Port
  Port Transmit (Tx) Support:      False
  Port Receive  (Rx) Support:      True
  VOA This Port operates on:       2
  Attenuation Mode:                manual
  Minimum settable Attenuation:    3.7dB
  Maximum settable Attenuation:    30.0dB
  Current set Attenuation:         3.7dB (default)
  Light Quality:                   Good/In Range
  Current Output Power:            -0.5dBm
  Low Alarm Threshold Severity:    major (default)
  Low Warning Threshold:           -27.0dBm (default)
  Low Warning Threshold Severity:  not alarmed (default)
  High Warning Threshold:          9.0dBm (default)
  High Warning Threshold Severity: not alarmed (default)
  High Alarm Threshold:            11.0dBm (default)
  High Alarm Threshold Severity:   major (default)
```

DLP-85 Verify the ESCON Aggregation Card Interface Status

Purpose	This task checks the status of the esconphy interfaces on the ESCON aggregation card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the esconphy interfaces on the system.

Step 2 Use the **show interfaces esconphy** command to display the status and configuration of the input interface on the PB-OE module. The interface and line protocol should be up.

```
Switch# show interfaces esconphy 3/0/0
EsconPhy3/0/0 is up, line protocol is up
  Forward laser control: On
  Flow-identifier: 30
  Threshold monitored for: None
  Received Frames: 0
  Transmit Frames: 0
  Code violation and running disparity error count( 8b10b cvrd): 0
  CRC error count: 0
  Egress Packet Sequence error count: 0
  Egress Packet Indicated error count: 0
  5 minute input rate 0 bits/sec, 0 frames/sec
  5 minute output rate 0 bits/sec, 0 frames/sec
  Transmit Buffer size is 16 bytes
  Hardware is escon_phy_port
```

DLP-91 Verify the 4-port 1-Gbps/2-Gbps FC Aggregation Card Interface Status

Purpose	This task checks the status of the twogigabitphy interfaces on the 4-port 1-Gbps/2-Gbps FC aggregation card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the twogigabitphy interfaces on the system.

Step 2 Use the **show interfaces twogigabitphy** command to display the status and configuration of a gigabitphy interface on the 4-port 1-Gbps/2-Gbps FC aggregation card. The interface and line protocol should be up.

```
Switch# show interfaces twogigabitphy 8/0/0
TwoGigabitPhy8/0/0 is up, line protocol is up
  Optical Transceiver: Multi-Mode
  Signal quality: Good
  Client Laser Status: Down due to KeepAlive TimeOut
  Encapsulation: Fibre channel    Rate: 1G    Ofc: off
     flow control: disabled
  Time of last "encapsulation" change 16:33:48
  Portgroup mapping: 1
  Forward laser control: Off
  Flow-identifier: 80
  Loopback not set
  Protection Mode: None    Interface state: Active
  Threshold monitored for: None
  Received Frames: 5101423
  Received Bytes: 652982144
  Transmit Frames: 5890314
  Transmit Bytes: 753959860
  Code violation and running disparity error count( 8b10b cvrd): 0
  RX CRC errors: 0
  TX CRC errors: 10
  Link Failures: 27142382912
  Loss of Sync: 1
  Loss of Light: 1
  Sequence Protocol Error count: 0
  Invalid Transmission Word count: 4171
  BPRX Channel Rx Frame count: 5101423
  BPTX Channel Tx Frame count: 5890314
  BPTX Channel Tx WORD count: 188489970
  5 minute input rate 0 bits/sec, 0 frames/sec
  5 minute output rate 0 bits/sec, 0 frames/sec
  Transmit Buffer size is 1280 bytes
```

DLP-86 Verify the 8-Port FC/GE Aggregation Card Interface Status

Purpose	This task checks the status of the gigabitphy interfaces on the 8-port FC/GE aggregation card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the gigabitphy interfaces on the system.

Step 2 Use the **show interfaces gigabitphy** command to display the status and configuration of a gigabitphy interface on the 8-port FC/GE aggregation card. The interface and line protocol should be up.

```
Switch# show interfaces gigabitphy 3/0/1
GigabitPhy3/0/1 is up, line protocol is up
  Optical Transceiver: Single Mode
  Signal quality: Good
  Encapsulation: GigabitEthernet
  Time of last "encapsulation" change 19:04:46
  Forward laser control: Off
  Flow-identifier: 20
  Loopback not set
  Protection Mode: None    Interface state: Active
  Threshold monitored for: None
  Received Frames: 147257939
  Received Bytes: 21551709228
  Transmit Frames: 146975828
  Transmit Bytes: 21614633316
  Code violation and running disparity error count( 8b10b cvrd): 0
  RX CRC errors: 141157523
  TX CRC errors: 140834717
  Giant Packets: 0
  Runt Packets: 0
  5 minute input rate 0 bits/sec, 0 frames/sec
  5 minute output rate 0 bits/sec, 0 frames/sec
  MTU size is 10232 bytes
  Hardware is gige_fc_phy_port
```

DLP-97 Verify the 8-Port Multi-Service Muxponder Interface Status

Purpose	This task checks the status of the multirate, wavesonetphy, wavepatch, and sdcc interfaces on the 8-port multi-service muxponder.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the gigabitphy interfaces on the system.

Step 2 Use the **show interfaces multirate** command to display the status and configuration of a multirate interface on the 8-port multi-service muxponder. The interface and line protocol should be up.

```
Switch# show interfaces multirate 1/0/2
Multirate1/0/2 is up, line protocol is up
  Encapsulation: GigabitEthernet copper
  Transceiver type: Copper SFP Transceiver GE/FE
  Forward laser control: On
  Signal quality: Good
  Auto negotiation is enabled
  Loopback not set
  Code violation and running disparity error count( 8b10b cvrd): 106005129
  Time of last "encapsulation" change 13:58:10
  Last clearing of "show interface" counters 13:58:10
  Hardware is multirate_client port
```

Step 3 Use the **show interfaces wavesonetphy** command to display the status and configuration of a wavesonetphy interface on the 8-port multi-service muxponder. The interface and line protocol should be up.

```
Switch# show interfaces wavesonetPhy 1/0
waveSonetPhy1/0 is up, line protocol is up
  Channel: 31   Frequency: 195.8 Thz   Wavelength: 1531.12 nm
  Active Wavepatch         : Wavepatch1/0/0
  Splitter Protected       : No
  Signal quality           : Good
  Receive power level      : -16.37 dBm
  Laser shut down          : No
  Laser safety control     : Off
  Wavelength capable for inband management: Yes
  Loopback not set
  Threshold monitored for: None
  Section code violation error count(bip1): 7
  Number of errored seconds(es): 1
  Number of severely errored seconds(ses): 0
  Number of severely errored framing seconds(sefs): 0
  Last clearing of "show interface" counters never
  Hardware is wave_sonet_phy port
```

Step 4 Use the **show interfaces wavepatch** command to display the status and configuration of a wavepatch interface on the 8-port multi-service muxponder. The interface and line protocol should be up.

```
Switch# show interfaces wavepatch 1/0/0
Wavepatch1/0/0 is up, line protocol is up
  Receiver power level: -16.40 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -26.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 5 Use the **show interfaces sdcc** command to display the status and configuration of a sdcc interface on the 8-port multi-service muxponder. The interface and line protocol should be up.

```
Switch# show interfaces sdcc 1/0/0
SDCC1/0/0 is up, line protocol is up
This is the message channel interface on waveSonetPhy1/0
  Hardware is sonet_dcc port
  MTU 1492 bytes, BW 192000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:00, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     35803 packets input, 2199207 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     27484 packets output, 1716789 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

DLP-87 Verify the 2.5-Gbps ITU Trunk Card Interface Status

Purpose	This task checks the status of the waveethernetphy, wavepatch, and ethernetdcc interfaces on the 2.5-Gbps ITU trunk card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the waveethernetphy, wavepatch, and ethernetdcc interfaces on the system.

Step 2 Use the **show interfaces waveethernetphy** command to display the status and configuration of the waveethernetphy interface on the 2.5-Gbps ITU trunk card. The interface and line protocol should be up.

```
Switch# show interfaces waveethernetphy 2/0
WaveEthernetPhy2/0 is up, line protocol is up
  Channel: 3    Frequency: 192.3 Thz   Wavelength: 1558.98 nm
  Active Wavepatch         : Wavepatch2/0/0
  Splitter Protected       : No
  Signal quality           : Good
  Receive power level      : -12.27 dBm
  Laser shut down          : No
  Laser safety control     : Off
  Osc physical port        : No
  Wavelength used for inband management: No
  Loopback not set
```

```
  Configured threshold Group(s): default_WaveEthernetPhy
  Threshold monitored for: 64b66b cvrd
  SF set value: 10e-5 (206176 in 1 secs)
  CDL HEC error count: 0
  CRC error count: 0
  Code violation and running disparity error count( 64b66b cvrd): 0
  Number of times SF threshold exceeded: 0

  Defect Indication Status      : up
  Configured Node Behavior      : None
  Current Node Behavior         : Path Terminating
  Defect Indication Receive     :          None
  Defect Indication Transmit    :          None

  MTU Size                      : 10232 bytes

  Tx Frames sent to N/W         : 1223066066321

  Tx Frames rcvd from Client    : 1281674257
  Tx CRC Errors                 : 0
  Tx HEC Errors                 : 0
  Tx QuadPHY sybl Errs          : 24992300
  Tx Dropped Frames             : 0
  Tx Oversize Frames            : 0
  Tx Undersize Frames           : 0
  Tx Idle Frames from Fabric    : 390289614
  Tx Generated CDL Idle Frames  : 1221785956386
  (having an SII of 255)

  Rx Frames rcvd from N/W       : 1223070583800
  Rx Dropped Frames             : 0
  Rx Oversize Frames            : 0
  Rx Undersize Frames           : 0
  Rx Total Idle Frames          : 1222179713606
  Rx Dropped CDL Idle Frames    : 1221789417247
  (having an SII of 255)

  Last clearing of "show interface" counters never
  Hardware is data_enabled_port
```

Step 3 Use the **show interfaces wavepatch** command to display the status and configuration of the wavepatch interfaces on the 2.5-Gbps ITU trunk card. The interface and line protocol should be up.

```
Switch# show interfaces wavepatch 2/0/0
Wavepatch2/0/0 is up, line protocol is up
  Receiver power level: -12.27 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Low alarm value            = -28.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -26.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -8.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -10.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 4 Use the **show interfaces ethernetdcc** command to verify the status of the ethernetdcc interface.

```
Switch# show interfaces ethernetdcc 2/0/0
EthernetDcc2/0/0 is up, line protocol is up
This is the message channel interface on WaveEthernetPhy2/0
  Hardware is cdl_enabled_port
  MTU 1492 bytes, BW 500000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     62 packets input, 4491 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24499 packets output, 1422496 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

DLP-88 Verify the 10-Gbps ITU Trunk Card Interface Status

Purpose	This task checks the status of the waveethernetphy, wavepatch, and ethernetdcc interfaces on the 10-Gbps ITU trunk card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the waveethernetphy, wavepatch, and ethernetdcc interfaces on the system.

Step 2 Use the **show interfaces waveethernetphy** command to display the status and configuration of the waveethernetphy interface on the 10-Gbps ITU trunk card. The interface and line protocol should be up.

```
Switch# show interfaces waveethernetphy 3/0
WaveEthernetPhy3/0 is up, line protocol is up
  Channel: 10   Frequency: 193.2 Thz   Wavelength: 1551.72 nm
  Active Wavepatch         : Wavepatch3/0/0
  Splitter Protected       : No
  Signal quality           : Good
  Receive power level      : > -5.00 dBm
  Laser shut down          : No
  Osc physical port        : No
  Wavelength capable for inband management: No
  Loopback not set
  Threshold monitored for: None
  CDL HEC error count: 0
  CRC error count: 0
  Code violation and running disparity error count( 64b66b cvrd): 0

  Defect Indication Status      : up
  Configured Node Behavior      : None
  Current Node Behavior         : Path Terminating
  Defect Indication Receive     :          None
  Defect Indication Transmit    :          None

  MTU Size:      10232 bytes

  Total Tx Frames Sent to N/W:   0
  Tx Gen CDL Idle Frame:         357663583877

  Rx Frames rcvd from N/W:       0
  Rx IPG drpd pkts:              0
  Rx Idle Packets :              0
  Rx Oversize Frames :           0
  Rx Undersize Frames :          0

  Rx SII mismatch drpd data Frames :     0
  Rx SII mismatch drpd idle Frames :     0

  Last clearing of "show interface" counters 15:15:37
  Hardware is data_enabled_port
```

Step 3 Use the **show interfaces wavepatch** command to display the status and configuration of the wavepatch interface on the 10-Gbps ITU trunk card. The interface and line protocol should be up.

```
Switch# show interfaces wavepatch 3/0/0
Wavepatch3/0/0 is up, line protocol is up
  Receiver power level: > -5.00 dBm

  Optical threshold monitored for : Receive Power (in dBm)
  Threshold exceeded for  : High Warning  and High Alarm
  Low alarm value            = -22.0 dBm  (default)
  Low Alarm Severity         = major
  Low warning value          = -20.0 dBm  (default)
  Low Warning Severity       = not alarmed
  High alarm value           = -6.0 dBm  (default)
  High Alarm Severity        = major
  High warning value         = -8.0 dBm  (default)
  High Warning Severity      = not alarmed
  Hardware is passive_port
```

Step 4 Use the **show interfaces ethernetdcc** command to verify the status of the ethernetdcc *slot*/*subcard*/0 interface.

```
Switch# show interfaces ethernetdcc 3/0/0
EthernetDcc3/0/0 is up, line protocol is up
This is the message channel interface on WaveEthernetPhy3/0
  Hardware is cdl_enabled_port
  MTU 1492 bytes, BW 500000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     62 packets input, 4491 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24499 packets output, 1422496 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

DLP-89 Verify the 10-Gbps Uplink Card Interface Status

Purpose	This task checks the status of the tengigethernetphy interface and subinterfaces and ethernetdcc interface on the 10-Gbps uplink card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show config** command output to locate the tengigethernetphy interfaces and subinterfaces and the ethernetdcc interface on the 10-Gbps uplink card.

Step 2 Use the **show interfaces tengigethernetphy** command to display the status and configuration of the tengigethernetphy interface on the 10-Gbps uplink card. The interface and line protocol should be up.

```
Switch# show interfaces tengigethernetphy 9/0
TenGigEthernetPhy9/0 is up, line protocol is up
  Signal quality           : Good
  laser shut down      : Off
  Osc physical port    : No
   Loopback not set
  Wavelength used for inband management: No
  Threshold monitored for: None
  CDL HEC error count: 0
  CRC error count: 424343140
  Code violation and running disparity error count( 64b66b cvrd): 0

  Defect Indication Status      : up
  Configured Node Behavior      : None
  Current Node Behavior         : Path Terminating
  Defect Indication Receive     :          None
  Defect Indication Transmit    :          None

  MTU Size:      10232 bytes

  Total Tx Frames Sent to N/W:   45042278825
  Tx Gen CDL Idle Frame:         359269139487

  Rx Frames rcvd from N/W:       44888316334
  Rx IPG drpd pkts:              0
  Rx Idle Packets :              359437217098
  Rx Oversize Frames :           0
  Rx Undersize Frames :          0

  Rx SII mismatch drpd data Frames :     0
  Rx SII mismatch drpd idle Frames :     359284105602

  Last clearing of "show interface" counters 18:36:20
  Hardware is data_enabled_port
```

Step 3 Use the **show interfaces tengigethernetphy** command to display the status and configuration of the tengigethernetphy subinterfaces on the 10-Gbps uplink card. The subinterface and line protocol should be up.

```
Switch# show interfaces tengigethernetphy 9/0.1
TenGigEthernetPhy9/0.1 is up, line protocol is up

  MTU Size:      10232 bytes

  Tx Frames Sent to N/W:         381897365
  Tx HEC Errors:                 0
  Tx CRC Errors:                 283212990
  Tx QuadPHY sybl Errs:          0
  Tx Dropped Frames:             0
  Tx Oversize Frames:            0
  Tx Undersize Frames:           0
  Tx Rcvd Idle Packets:          86484460

  Rx Frames Sent to Clnt:        294847773
  Rx FIFO full drpd pkts:        0
  Rx Gen Idle pkt cnt:           133871460

  Last clearing of "show interface" counters 18:38:48
  Hardware is data_enabled_port
```

Step 4 Use the **show interfaces ethernetdcc** command to verify the status of the ethernetdcc *slot*/*subcard*/0 interface.

```
Switch# show interfaces ethernetdcc 9/0/0
EthernetDcc9/0/0 is up, line protocol is up
This is the message channel interface on TengigEthernetPhy9/0
  Hardware is cdl_enabled_port
  MTU 1492 bytes, BW 500000 Kbit, DLY 0 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation SNAP, loopback not set
  Last input 00:00:01, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     62 packets input, 4491 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicast)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24499 packets output, 1422496 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
```

DLP-51 Verify the Fastethernet 0 Interface Status

Purpose	This task verifies the status of the NME fastethernet 0 interface.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required

Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show interfaces fastethernet 0** command to display the status and configuration of the fastethernet 0 interface. The interface and line protocol should be up.

```
Switch# show interfaces fastethernet 0
FastEthernet0 is up, line protocol is up
  Hardware is Gt96k FE, address is 0001.6447.a240 (bia 0001.6447.a240)
  Internet address is 172.25.22.114/30
  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 00:00:08, 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 1000 bits/sec, 3 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     774035 packets input, 54454844 bytes
     Received 770073 broadcasts, 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
     30737 packets output, 4926085 bytes, 0 underruns
     0 output errors, 0 collisions, 1 interface resets
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier
     0 output buffer failures, 0 output buffers swapped out
```

NTP-16 Verify the Optical Patch Configuration

Purpose	This procedure verifies the optical patch configuration on the system.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show patch detail** command to verify the patch connections configured on the system.

```
Switch# show patch detail
Patch Interface     Patch Interface     Type       Dir   Error
------------------  ------------------  ---------  ----  ----------------
Filter0/0/0         Wavepatch1/0/0      USER       Both
Filter0/1/0         Wavepatch1/0/1      USER       Both
Filter0/0/1         Wavepatch2/0/0      USER       Both
Filter0/1/1         Wavepatch2/0/1      USER       Both
Oscfilter0/0        Wave8/0             USER       Both
Oscfilter0/1        Wave8/1             USER       Both
```

Step 2 Check that the patch configuration shown in the command output matches the actual system cable connections. If it does not match or there is an error condition, use the **patch** command to correct the configuration or correct the cabling on the system.

NTP-17 Verify the Cross Connect Status

Purpose	This procedure verifies the status of the cross connection on the system.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-16 Verify the Optical Patch Configuration, page 4-19
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Perform a **show connect intermediate** command. This command shows the complete path of the traffic through all components and interfaces.

```
Switch# show connect intermediate
client/       wave          wave             wdm
wave          client        patch   filter   trk  channel
------------  ------------  -------  ------  -----  -------
Tran1/0/0     Wave1/0       1/0/0*  0/0/0   0/0    29
                            1/0/1   0/1/0   0/1    29
Tran4/0/0     Wave4/0       4/0/0*  0/0/1   0/0    30
                            4/0/1   0/1/1   0/1    30
Tran7/0/0     Wave7/0       7/0/0   0/0/2   0/0    31
                            7/0/1*  0/1/2   0/1    31
```

Note The asterisk after the interfaces identifiers in the wave patch column indicate the active wavepatch interface.

Step 2 Check that the connections appear as expect. If they do not, recheck the channels supported by the transponder line card, the laser frequency configured on the transponder line card wave interface, and the channel supported by the port on the OADM module cabled to the transponder line card.

NTP-18 Verify the Transponder Line Card Laser Frequency

Purpose	This procedure verifies the ITU laser frequency current configured on the transponder wave interface. The transponder line card ITU lasers can be tuned to one of two channel frequencies. The frequencies correspond to channel numbers in the part number listed on the front panel of the transponder line card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-16 Verify the Optical Patch Configuration, page 4-19
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Verify which channels the transponder line card supports.

Look at the front panel of the transponder line card and locate the part number. The part number format is 15530-TSP1-*ccsm*, where *cc* indicates the lower channel number of the two channels supported by the transponder line card, *s* indicates nonsplitter (value 1) or splitter (value 2), and *m* indicates single-mode (value 1) or multimode (value 2). For example, 15530-TSP1-0321 is the part number for a splitter single-mode transponder line card that supports channels 3 or 4. This transponder line card should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 2 Verify the current channel configured on the transponder line card using the **show interfaces wave** command.

```
Switch# show interfaces wave 10/0
Wave10/0 is up, line protocol is up
➔   Channel: 32   Frequency: 195.9 Thz   Wavelength: 1530.33 nm
<Information deleted>
```

Step 3 Compare the frequency information with channel frequency supported by the filter interface on the OADM module using the **show interfaces filter** command.

```
Switch# show interfaces filter 0/0/3
Filter0/0/3 is up, line protocol is up
  Patched Interface(s) :Wavepatch10/0/0
  Channel:32 Frequency:195.9 Thz    Wavelength:1530.33 nm
  Hardware is filter
```

Step 4 Change an incorrectly configured frequency using the **laser frequency** command.

```
Switch# global configuration
Switch(config)# interface wave 10/0
Switch(config-if)# laser frequency 195700
```

Table 4-1 lists the channels, wavelengths, and frequencies for each band.

Table 4-1 Channel to Wavelength Mapping

Cisco ONS 15530 Band	Cisco ONS 15530 Channel	ITU Channels	ITU Wavelength (nm)	ITU Frequency (THz)
OSC		19	1562.23	191.9000
A	1	21	1560.61	192.100
	2	22	1559.79	192.200
	3	23	1558.98	192.300
	4	24	1558.17	192.400
B	5	26	1556.55	192.600
	6	27	1555.75	192.700
	7	28	1554.94	192.800
	8	29	1554.13	192.900
C	9	31	1552.52	193.100
	10	32	1551.72	193.200
	11	33	1550.92	193.300
	12	34	1550.12	193.400
D	13	36	1548.51	193.600
	14	37	1547.72	193.700
	15	38	1546.92	193.800
	16	39	1546.12	193.900
E	17	41	1544.53	194.100
	18	42	1543.73	194.200
	19	43	1542.94	194.300
	20	44	1542.14	194.400
F	21	46	1540.56	194.600
	22	47	1539.77	194.700
	23	48	1538.98	194.800
	24	49	1538.19	194.900
G	25	51	1536.61	195.100
	26	52	1535.82	195.200
	27	53	1535.04	195.300
	28	54	1534.25	195.400
H	29	56	1532.68	195.600
	30	57	1531.90	195.700
	31	58	1531.12	195.800
	32	59	1530.33	195.900

NTP-33 Verify the 2.5-Gbps ITU Trunk Card Laser Frequency

Purpose	This procedure verifies the ITU laser frequency current configured on the 2.5-Gbps ITU trunk card waveethernetphy interface. The 2.5-Gbps ITU trunk card ITU lasers can be tuned to one of two channel frequencies. The frequencies correspond to channel numbers in the part number listed on the front panel of the 2.5-Gbps ITU trunk card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-16 Verify the Optical Patch Configuration, page 4-19
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Verify which channels the 2.5-Gbps ITU trunk card supports.

Look at the front panel of the 2.5-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the lower channel number of the two channels supported by the 2.5-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU3-0320 is the part number for a splitter single-mode 2.5-Gbps ITU trunk card that supports channels 3 or 4. This 2.5-Gbps ITU trunk card should be connected to either CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 2 Verify the current channel configured on the 2.5-Gbps ITU trunk card using the **show interfaces wave** command.

```
Switch# show interfaces waveethernetphy 3/0
WaveEthernetPhy3/0 is up, line protocol is up
➔   Channel: 10   Frequency: 193.2 Thz   Wavelength: 1551.72 nm
<Information deleted>
```

Step 3 Compare the frequency information with channel frequency supported by the filter interface on the OADM module using the **show interfaces filter** command.

```
Switch# show interfaces filter 0/0/1
Filter0/0/1 is up, line protocol is up
  Patched Interface(s) :Wavepatch10/0/0
  Channel:10 Frequency:193.2 Thz    Wavelength:1551.72 nm
  Hardware is filter
```

Step 4 Change an incorrectly configured frequency using the **laser frequency** command.

```
Switch# global configuration
Switch(config)# interface waveethernetphy 3/0
Switch(config-if)# laser frequency 193200
```

NTP-34 Verify the 10-Gbps ITU Tunable Trunk Card Laser Frequency

Purpose	This procedure verifies the ITU laser frequency current configured on the 10-Gbps ITU tunable trunk card waveethernetphy interface. The 10-Gbps ITU tunable trunk card ITU lasers can be tuned to one of four channel frequencies. The frequencies correspond to channel numbers in the part number listed on the front panel of the 10-Gbps ITU trunk card.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-16 Verify the Optical Patch Configuration, page 4-19
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Verify which channels the 10-Gbps ITU tunable trunk card supports.

Look at the front panel of the 10-Gbps ITU trunk card and locate the part number. The part number format is 15530-ITU3-*ccs*0, where *cc* indicates the lower channel number of the two channels supported by the 2.5-Gbps ITU trunk card and *s* indicates nonsplitter (value 1) or splitter (value 2). For example, 15530-ITU2-tun-0110 is the part number for a splitter 10-Gbps ITU trunk card that supports channels 1 to 4. This 10-Gbps ITU trunk card should be connected to CH1_IN and CH1_OUT, CH2_IN and CH2_OUT, CH3_IN and CH3_OUT or CH4_IN and CH4_OUT on the OADM module.

Step 2 Verify the current channel configured on the 10-Gbps ITU trunk card using the **show interfaces wave** command.

```
Switch# show interfaces waveethernetphy 3/0
WaveEthernetPhy3/0 is up, line protocol is up
→   Channel: 10   Frequency: 193.2 Thz   Wavelength: 1551.72 nm
<Information deleted>
```

Step 3 Compare the frequency information with channel frequency supported by the filter interface on the OADM module using the **show interfaces filter** command.

```
Switch# show interfaces filter 0/0/1
Filter0/0/1 is up, line protocol is up
  Patched Interface(s) :Wavepatch10/0/0
  Channel:10 Frequency:193.2 Thz    Wavelength:1551.72 nm
  Hardware is filter
```

Step 4 Change an incorrectly configured frequency using the **laser frequency** command.

```
Switch# global configuration
Switch(config)# interface waveethernetphy 3/0
Switch(config-if)# laser frequency 193200
```

NTP-19 Verify the Optical Power and Frequency

Purpose	This procedure describes how to verify the power and frequency of the data channel.
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-15 Verify the Interface Status, page 4-2 NTP-17 Verify the Cross Connect Status, page 4-20 NTP-16 Verify the Optical Patch Configuration, page 4-19
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Complete the "DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces" task on page 4-25.

Step 2 Complete the "DLP-53 Verify the Power Levels on the Client Interfaces" task on page 4-27.

DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces

Purpose	This task verifies the power levels of the channel signal transmitted from the shelf on the trunk fiber.
Tools/Equipment	OSA
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-79
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Power up the OSA and make sure that the OSA wavelength value range is set in the 1530 to 1563 nm range.

Step 2 Connect an OSA to the TRUNK_OUT port on the OADM module.

Step 3 Check and record all power levels and frequencies.

Step 4 Compute the minimum transmit power (dBm) by subtracting the maximum loss (dBm) from the recorded powers, using Table 4-2 through Table 4-5.

Table 4-2 Trunk Side Specifications for Transponder Line Cards

Specification	Minimum	Maximum
Receive sensitivity	–28 dBm	
Receive overload		–8 dBm
Input wavelength	1260 nm	1580 nm
Transmitter power	5 dBm	10 dBm

Table 4-3 Optical Link Loss for Transponder Line Cards

Protection Type and Direction	Loss (dB)
Splitter Tx	4.05
Splitter Rx	1.35
Nonsplitter Tx	0.5
Nonsplitter Rx	0.5

Table 4-4 Optical Link Loss for Data Channels Through the OADM Modules

OADM Module Type	Trunk IN to Line Card (Data Drop) (dB)	Line Card to Trunk OUT (Data Add) (dB)	Trunk IN to Thru OUT (Pass-Through Drop) (dB)	Thru IN to Trunk OUT (Pass-Through Add) (dB)
4-channel with OSC	4.1	4.1	1.5	1.5
4-channel without OSC	4.1	4.1	1.0	1.0

Table 4-5 Optical Link Loss for the OSC Through the OADM Modules

	Trunk IN to OSC Transceiver (dB)	OSC Transceiver to Trunk OUT (dB)
4-channel with OSC	2.8	2.8

Step 5 Verify that the transmit optical power measurements recorded in Step 3 are greater than the figure computed in Step 4.

Step 6 Loop back the TRUNK_OUT port to the TRUNK_IN port on the OADM module with a adequate attenuation.

Caution You must add attenuation to ensure that the optical signal power at the TRUNK_IN port is less than the receiver overload value for the transponder line cards (–8 dBm). Use the optical power values measured in the Step 4 to determine the amount of attenuation needed on the loopback.

Step 7 Perform a **show interfaces wave** command to check the optical power.

Note For accurate power transmit levels from the transponder line cards, ensure that correct protocol encapsulation and monitoring is configured using the **show interfaces transparent** command, and that the client equipment is connected to the transponder line card.

Step 8 Refer to the optical budget losses in Table 4-3 and Table 4-4 to compute total losses for connectors and OADM modules, in both the transmit and receive directions.

Step 9 Verify that the optical power figure listed in the **show interfaces** command output is greater than the following calculation:

Minimum Tx power (dBm) - total losses

where

Total losses = maximum link loss (dBm) + attenuation + other insertion losses

Step 10 Repeat Step 7 through Step 9 for each interface.

Step 11 If another OADM module is present, repeat Step 1 through Step 10 for that module.

DLP-53 Verify the Power Levels on the Client Interfaces

Purpose	This task verifies the power levels of the client side signal on the transponder line card.
Tools/Equipment	OPM (optical power meter)
Prerequisite Procedures	NTP-8 Verify Installation of Hardware, page 2-79
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Run a jumper cable from the client Tx port of the first client interface module to the external power meter.

Note When using a jumper cable to test, the cable should be pretested for its own loss and the same cable should be used for all tests.

Step 2 Set the wavelength on the OPM to 1310 nm.

Step 3 Measure and record the OPM of the client side transmitter.

Step 4 Compare the measured power with the specifications provided in Table 4-6.

Table 4-6 Client Side Specifications for SM Transponder Line Cards and MM Transponder Line Cards

Specification	SM Transponder Line Card		MM Transponder Line Card	
	Minimum	Maximum	Minimum	Maximum
Bit rate	16 Mbps	2.5 Gbps	16 Mbps	622 Mbps
Receive sensitivity	–19 dBm		–25 dBm	
Receive overload		–1.5 dBm		–8 dBm
Input wavelength	1249 nm[1]	1600 nm	1249 nm	1600 nm
Transmitter power	–5 dBm	0 dBm	–5 dBm	0 dBm
Output wavelength	1260 nm	1360 nm	1260 nm	1360 nm

1. nm = nanometers.

Step 5 Repeat these steps for all other interfaces.

NTP-20 Test the Optical Transmission Quality

Purpose	This procedure tests the quality of the optical transmission from the node.
Tools/Equipment	BER test set
Prerequisite Procedures	NTP-19 Verify the Optical Power and Frequency, page 4-25 DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces, page 4-25
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

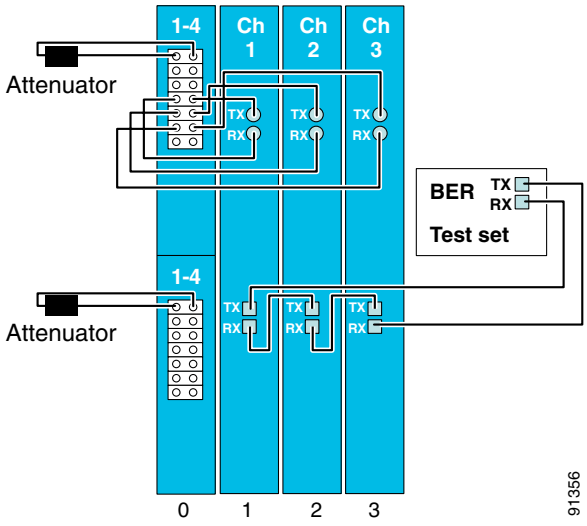
Step 1 Connect the BER test set transmit port to the receive port of the first transponder interface to be tested.

Note Measure the power level on the BER test set transmit port and use appropriate attenuation.

Step 2 Measure the power level on the ITU TX port on each transponder line card using the optical power meter and record the results.

Step 3 Daisy-chain the client interfaces with the appropriate attenuation. Connect the client TX port of the first transponder line card to the receive port of the BER test set. Connect the client RX port of the last transponder line card to the transmit port of the BER test set. See the example in Figure 4-1.

Figure 4-1 Example Setup for Testing Bit Error Rate



Note You can daisy chain as many as four transponder line cards

Step 4 Loop back the TRUNK_OUT port to the TRUNK_IN port on the OADM modules (see the example in Figure 4-1).

Caution Add adequate attenuation, if necessary, to ensure that the optical signal power at the TRUNK_IN port is less than the receiver overload value for the transponder line cards (–8 dBm), minus the insertion loss (see Table 4-3 and Table 4-4). Use the optical power values measured in the "DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces" task on page 4-25 to determine the amount of attenuation needed on the loopback.

Step 5 Clear all errors on the BER test set.

Step 6 Start the BER test, and verify that the test runs error free for 15 minutes.

If there are errors within the 15-minute test period, remove the daisy chain configuration and try to isolate the problem by performing the BER test on each individual channel.

Step 7 If the system supports splitter protection, perform the following steps:

a. Issue **shutdown** commands on the active wavepatch interfaces.

b. Issue **no shutdown** commands on the standby wavepatch interfaces.

c. Repeat Step 5 through Step 6 on the new active wavepatch interfaces.

NTP-21 Check the Alarms

Purpose	This procedure checks the functioning of the alarms on the shelf.
Tools/Equipment	SONET analyzer
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Remove the client Rx and verify that a loss of light alarm is generated. A Loss of Light alarm on the client Rx should appear in the **show facility-alarm status** command output.

Step 2 Remove the trunk cable and verify a loss of light alarm on the wave interface of the transponder line card. A Loss of Light alarm on the wave interface should appear in the **show facility-alarm status** command output.

Step 3 Use a SONET analyzer to inject errors such as loss of frame, and verify that corresponding alarms are generated.

Note To perform this test, you must have a transponder line card configured for SONET protocol encapsulation.

Alarms for the injected errors should appear in the **show facility-alarm status** command output.

NTP-22 Verify the Status of Redundant CPU Switch Modules

Purpose	This procedure verifies the status of the redundant CPU switch modules.
Tools/Equipment	None
Prerequisite Procedures	NTP-9 Configure Management Access, page 3-2
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Verify that the conditions in Table 4-7 have been met. If all the conditions are not met, then the system is only conditionally redundant, not fully redundant.

Table 4-7 Conditions for Full Redundancy

Requirement	Notes
Two CPU switch modules are required. The CPU switch modules have identical hardware configurations.	Verify that both CPU switch modules have identical configurations such as DRAM size with the **show redundancy capability** command.
Both CPU switch modules have the same functional image.	Verify after power up that both CPU switch modules have the same functional image with the **show hardware detail** command.
Both CPU switch modules are running compatible system images.	Verify that the system images are compatible across one major release with the **show version** command.
Both the running and startup configurations are automatically synchronized between the CPU switch modules.	Verify that the running and startup configurations are listed as synchronized using the **show redundancy** command.
Both CPU switch modules are set to autoboot (default setting).	Verify that the configuration register reads 0x2102 using the **show version** command.

Step 2 Use the **show redundancy capability** command to display capabilities for the active and standby CPU switch modules. Verify that all results in the Sby Compat columns are OK.

```
Switch# show redundancy capability

CPU capability support

 Active CPU  Sby CPU    Sby Compat        CPU capability description
 ---------- ---------- ---------- ----------------------------------------
    48 MB      48 MB   OK          CPU DRAM size
    16 MB      16 MB   OK          CPU PMEM size
   512 KB     512 KB   OK          CPU NVRAM size
    16 MB      16 MB   OK          CPU Bootflash size
    4.6        4.6     OK          CPU hardware major.minor version
    1.43       1.43    OK          CPU functional major.minor version

Linecard driver major.minor versions, (counts: Active=13, Standby=13)

 Active CPU  Sby CPU   Sby Compat  Drv/Ch/F ID  Driver description
 ---------- ---------- ---------- ----------- ------------------------------
    1.3        1.3     OK          0x1100/0/0  CPU with Switch Fabric
    2.3        2.3     OK          0x1101/0/0  10 Port ESCON line card
    2.1        2.1     OK          0x110A/0/0  8 Port GE-FC line card
    3.1        3.1     OK          0x1105/0/0  2.5G Transparent line card
    1.9        1.9     OK          0x1105/1/0  2.5G Transparent line card
    3.1        3.1     OK          0x1109/0/0  2.5G Transparent line card
    1.9        1.9     OK          0x1109/1/0  2.5G Transparent line card
 Active CPU  Sby CPU   Sby Compat  Drv/Ch/F ID  Driver description
 ---------- ---------- ---------- ----------- ------------------------------
    1.3        1.3     OK          0x1103/0/0  OSC line card
    0.1        0.1     OK          0x1107/1/0  OSC daughter card
    2.1        2.1     OK          0x1102/0/0  10G trunk card
    1.0        1.0     OK          0x110B/0/0  2.5G trunk card
    2.1        2.1     OK          0x1110/0/0  PSM wdm splitter
    1.1        1.1     OK          0x1100/0/1  ONS15530 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   4358                 4358
order_part_num_str          YES   PROTO-HAMPTON-CHASSIS
                                                       PROTO-HAMPTON-CHASSIS
description_str             YES   Prototype Hampton Backplane
                                                       Prototype Hampton Backplane
board_part_num_str          YES   73-6573-03           73-6573-03
board_revision_str          YES   02                   02
serial_number_str           YES   TBC055089            TBC055089
date_of_manufacture_str     YES   10/21/2001           10/21/2001
deviation_numbers_str       YES   N/A                  N/A
manufacturing_use           YES   0                    0
rma_number_str              YES
rma_failure_code_str        YES
oem_str                     YES   Cisco                Cisco
clei_str                    YES   TBD                  TBD
snmp_oid_substr             YES   TBD                  TBD
schematic_num_str           YES   92-4568-03           92-4568-03
Backplane IDPROM field      Match Local CPU            Peer CPU
--------------------------- ----- -------------------- --------------------
hardware_major_version      YES   3                    3
hardware_minor_version      YES   1                    1
engineering_use_str         YES   LAB Prototype        LAB Prototype
crc16                       OK    52960                10284
user_track_string           NO    hello PhyAlias  test AssetTag123
                                                       lab
diagst                      YES   ^A                    ^A
board_specific_revision     YES   1                    1
board_specific_magic_number YES   153                  153
board_specific_length       YES   56                   56
mac_address_block_size      YES   16                   16
mac_address_base_str        YES   00016447a240         00016447a240
cpu_number                  OK    0                    1
optical_backplane_type      YES   255                  255
```

Step 3 Use the **show redundancy** command to verify that the running and startup configurations are synchronized.

```
Switch# show redundancy

Redundant system information
-----------------------------
Available Uptime:              1 day, 15 hours, 16 minutes
sysUpTime (switchover clears): 31 minutes
Switchover Count:              1

Inter-CPU Communication State: UP
Last Restart Reason:           Switch over
Reported Switchover Reason:    User forced (reload)
Software state at switchover:  STANDBY HOT

Last Running Config sync:      30 minutes
Running Config sync status:    In Sync
Last Startup Config sync:      30 minutes
Startup Config sync status:    In Sync

This CPU is the Active CPU.
-------------------------------
Slot:                          5
Time since CPU Initialized:    1 day, 15 hours, 17 minutes
Image Version:                 ONS-15530 Software (ONS15530-I-M), Version
12.1(12EV.030317.), CISCO DEVELOPMENT TEST VERSION
Image File: ons15530-i-mz.
Software Redundancy State:     ACTIVE
Hardware State:                ACTIVE
Hardware Severity:             0

Peer CPU is the Standby CPU.
-------------------------------
Slot:                          6
Time since CPU Initialized:    31 minutes
Image Version:                 ONS-15530 Software (ONS15530-I-M), Version
12.1(12EV.030317.), CISCO DEVELOPMENT TEST VERSION
Image File (on sby-CPU):       ons15530-i-mz.121-12.EV
Software Redundancy State:     STANDBY HOT
Hardware State:                STANDBY
Hardware Severity:             0
Privilege Mode:                Enabled
```

Step 4 Use the **show version** command to verify that the configuration register reads 0x2102.

```
Switch# show version
Cisco Internetwork Operating System Software
<Information deleted>
Configuration register is 0x2102
```

CHAPTER 5

Basic Network Verification Procedures

This chapter describes the procedures for basic network-level verification.

Note Before performing the procedures in this chapter, the nodes must have been installed and configured. All cabling must be complete.

Note This chapter contains preliminary procedures for network installation and setup verification and does not cover the final turn-up procedures for an entire network.

Before You Begin

This section lists the chapter non-trouble procedures (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

1. NTP-23 Verify the Optical Power Budget Between Nodes, page 5-2—Complete this procedure to verify the power of the signal between two nodes.
2. NTP-24 Verify the Connectivity Between OSC Modules, page 5-3—Complete this procedure to verify the connectivity between the OSC modules on separate nodes.
3. NTP-25 Verify the Topology Neighbor Connectivity, page 5-3—Complete this procedure to verify the network topology connectivity on the network.
4. NTP-26 Verify the Power Levels, page 5-4—Complete this procedure to verify the channel power levels on the node.
5. NTP-27 Test the Optical Transmission Quality, page 5-5—Complete this procedure to verify the status of the optical signal transmission between nodes.
6. NTP-28 Verify the Optical Protection Configuration, page 5-6—Complete this procedure to verify the correct configuration and functioning of APS on the network.

NTP-23 Verify the Optical Power Budget Between Nodes

Purpose	This procedure verifies the optical power budget between the nodes.
Tools/Equipment	Signal generator OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note Record the test measurements in Table A-4 in Appendix A, "Node Data Checklist."

Note Prior to performing this procedure, each node must be installed and configured and all cabling must be completed. To optimize the power budget, OADM module cabling should be done to minimize insertion loss.

Step 1 Set the data rate on the signal generator based on the protocol rate or clock rate configured on the interfaces.

Step 2 Connect a signal generator to the client ports on the local node and loop back the client TX and RX ports at the remote peer node.

Step 3 Use an OSA to measure and record the wavelengths and their optical power of the band added and dropped on the shelf. Take measurements at the TRUNK_OUT port on the OADM module local node, and at the TRUNK_IN port on the OADM module on the remote peer node.

Step 4 On systems with splitter protected configurations, perform a **shutdown** command on the active interface on node 1, and a **no shutdown** command on the standby interface. For example:

```
Switch# configure terminal
Switch(config)# interface wavepatch 2/0/0
Switch(config-if)# shutdown
Switch(config-if)# exit
Switch(config)# interface wavepatch 2/0/1
Switch(config-if)# no shutdown
```

Repeat Step 3.

Step 5 Issue **show interfaces wave** commands on each node for all wave interfaces and record wavelength and power displayed in the command outputs.

Step 6 Compare the expected results from the network design, the results recorded in Step 3, and the results from the command outputs.

If the results for a particular wavelength do not match, make sure the connectors are fully inserted and the transponder line cards are correctly installed. Clean the fibers and connectors, if necessary. Rerun the test.

If the results still do not match, there might be a hardware problem.

Step 7 Go to the remote peer node and repeat Step 2 through Step 6 for the opposite direction.

NTP-24 Verify the Connectivity Between OSC Modules

Purpose	This procedure verifies the connectivity between the OSC modules on two adjacent nodes.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show oscp interface** command to display OSCP (Optical Supervisory Channel Protocol) status information for the OSC interfaces.

```
Switch# show oscp interface wave 2/0
Codes: Bndl - bundling identifier, Pri - OSCP selection priority
       OSCP - dedicated wavelength channel, CDL - in-band wavelength channel

OSCP Interface(s)
 Local Port    Port ID Type Status  OSCP St Bndl Pri  Rem Port ID Rem Node Id
 ~~~~~~~~~~~~ ~~~~~~~ ~~~~ ~~~~~~  ~~~~~~~ ~~~~ ~~~  ~~~~~~~~~~~ ~~~~~~~~~~~~~~
  Wave2/0      1000000 OSCP  Active  2way      0   0  1000000     0000.1644.28fb
```

Step 2 Verify that Active is displayed in the Status column. This indicates that the local port status is active.

If the status is not active, the interface is not enabled. Perform a **no shutdown** command on the OSC wave interface.

Step 3 Verify that 2way is displayed in the OSCP St column. This indicates that the local node has received Hello messages from the neighbor node and verifies that the neighbor has received Hello packets from the local node.

NTP-25 Verify the Topology Neighbor Connectivity

Purpose	This procedure verifies connectivity of neighboring nodes in the network topology.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Use the **show topology neighbor detail** command to verify network neighbors in the topology.

```
Switch# show topology neighbor detail
Physical Topology:

Local Port: Wdm0/0
Neighbor Node         : node3
Neighbor Port         : Wdm0/1
Neighbor Agent Address: 172.20.50.21
Neighbor Discovery    : Via CDP (Proxy Port: Wave2/1)
Link Direction        : Both

Local Port: Wdm0/1
Neighbor Node         : node1
Neighbor Port         : Wdm0/0
Neighbor Agent Address: 172.20.42.27
Neighbor Discovery    : Via CDP (Proxy Port: Wave2/0)
Link Direction        : Both
```

Step 2 Use the **ping** command on the IP addresses listed for the network neighbors to verify connectivity.

Step 3 If the **ping** command fails, recheck the IP configuration on each node.

NTP-26 Verify the Power Levels

Purpose	This procedure verifies the expected power levels provided by a network design.The measured power should be within an acceptable range from the expected power
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-15 Verify the Interface Status, page 4-2
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Connect the OSA to the TAP.

Step 2 Use the wavelength spectrum application to verify the channel count and power on the wavelength screen of the OSA.

Step 3 Verify the channel power equalization. The wavelength screen displays the power peaks and the table format screen displays the measurements.

Step 4 Verify the optical signal-to-noise ratio (OSNR) of each channel on each line fiber. The OSNR figures are listed in the table format screen on the OSA.

Step 5 Repeat these steps for all nodes in the topology.

NTP-27 Test the Optical Transmission Quality

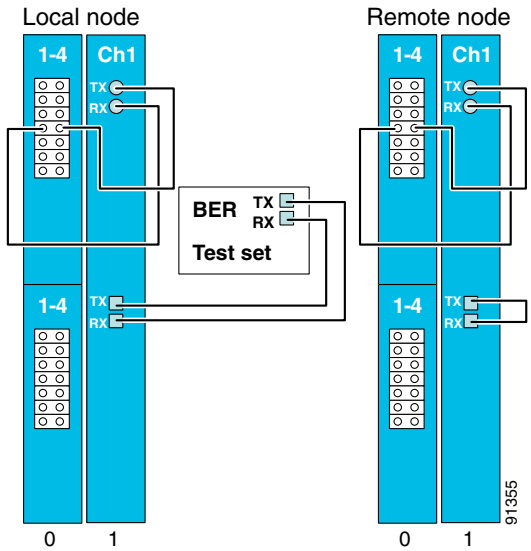
Purpose	This procedure tests optical transmission quality between the nodes that add and drop the same channel.
Tools/Equipment	BER test set
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-19 Verify the Optical Power and Frequency, page 4-25
Required/As Needed	Required
Onsite/Remote	Onsite
Security Level	Privileged

Step 1 Connect the BER test set transmit port and receive port to the client RX port and client TX port, respectively, of the transponder line card on the local node.

Step 2 Loop back the client TX port to the client RX port on the transponder line card supporting the same channel on the remote node with appropriate attenuation. See the example setup in Figure 5-1.

Note Determine the attenuation using the power values recorded in the "DLP-53 Verify the Power Levels on the Client Interfaces" task on page 4-27.

Figure 5-1 Example Setup for Testing Bit Error Rate



Step 3 Clear all errors on the BER test set.

Step 4 Start the traffic with the BER test set.

Step 5 Verify that the BER test runs error free for 15 minutes.

Step 6 If the system has splitter protection, perform the following steps:

a. Issue **shutdown** commands on the active wavepatch interfaces on both nodes.

b. Issue **no shutdown** commands on the standby wavepatch interfaces on both nodes.

c. Perform Step 3 through Step 5 on the client interface.

Step 7 Verify that the BER test runs error free for 15 minutes.

Step 8 Repeat Step 1 through Step 7 for all channels on every node in the network.

NTP-28 Verify the Optical Protection Configuration

Purpose	This procedure describes how to verify that APS configuration is correctly configured and that it is operating properly.
Tools/Equipment	SONET analyzer
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Complete the "DLP-54 Verify the APS Configuration" task on page 5-6.

Step 2 As needed, complete the "DLP-55 Verify the Splitter Protection Operation" task on page 5-7.

Step 3 As needed, complete the "DLP-56 Verify the Y-Cable Protection Operation" task on page 5-8.

DLP-54 Verify the APS Configuration

Purpose	This task configures the enable password and secret password, IP access on the NME interface, and the host name.
Tools/Equipment	None
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Step 1 Issue a **show aps group** command for each APS group on both nodes in the topology.

```
Switch# show aps group sonet-group

APS Group sonet-group :

  architecture.: 1+1, remote prov: 1+1
  span.........: end-to-end
  prot. mode...: client side y-cable
  direction....: prov: bi, current: bi, remote prov: bi
  revertive....: no
  aps state....: enabled (associated)
  request timer: holddown: 5000 ms, max: 15000 ms, count 2
  msg-channel..: auto (up on osc)
  created......: 17 hours, 10 minutes
  auto-failover: enabled
  transmit k1k2: reverse-request, 1, 1, 1+1, bi
  receive  k1k2: forced-switch, 1, 1, 1+1, bi
  switched chan: 1
  protection(0): Transparent7/0/0 (ACTIVE - UP), Wave7/0 (UP)
               : channel  request: no-request
               : switchover count: 2
               : last  switchover: 15 hours, 14 minutes
  working...(1): Transparent4/0/0 (STANDBY - UP), Wave4/0 (UP)
               : channel  request: no-request
               : switchover count: 3
               : last  switchover: 14 hours, 41 minutes
```

Step 2 Check the prot. mode field for the state of the protection switching. For each APS group, both nodes should be configured with the same type of protection switch, either unidirectional (uni) or bidirectional (bi).

Step 3 Check the aps state field for the status of each APS group. The state should be enabled and associated. If it is not enabled, perform an **aps enable** command on the APS group.

Step 4 Check the protection and working fields for the state of the interfaces. Both should be UP. If they are not up, perform **no shutdown** commands on the interfaces on both nodes.

Step 5 Check the msg-channel field for the state of the message channel for the APS channel messages. The state should be up. If the message channel is not up, check the status of the OSC and OSCP, and the configuration of the patch connections for the OSC modules and OADM modules on both nodes.

DLP-55 Verify the Splitter Protection Operation

Purpose	This task verifies the operation of the splitter protection configuration on your network.
Tools/Equipment	SONET analyzer or Ethernet analyzer
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-26 Verify the Power Levels, page 5-4
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note To perform these measurements with a SONET analyzer, you must have SM transponder line cards or MM transponder line cards configured to SONET OC-3 or OC-12 protocol encapsulation. Otherwise, use an Ethernet analyzer, measure how many frames are lost, and divide by the frame rate to determine the restoration time.

Step 1 To verify restoration time after a fiber break on the trunk, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Disconnect the active trunk fiber.

c. Verify that the restoration time is less than 50 ms.

Step 2 To verify restoration time after removing the DWDM filter from the active DWDM, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Remove the DWDM filter from the active DWDM.

c. Verify that the restoration time is less than 50 ms.

Step 3 To verify protection switching from the working path to the protection path, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:

aps switch *group-name* **manual working-to-protection**

c. Verify that the restoration time is less than 50 ms.

Step 4 To verify protection switching from the protection path to the working path, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:

aps switch *group-name* **manual protection-to-working**

c. Verify that the restoration time is less than 50 ms.

Step 5 For bidirectional switching configurations, repeat Step 1 through Step 4 on the remote node.

DLP-56 Verify the Y-Cable Protection Operation

Purpose	This task verifies the operation of the y-cable protection configuration on your network.
Tools/Equipment	SONET analyzer or Ethernet analyzer
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 NTP-26 Verify the Power Levels, page 5-4
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note To perform these measurements with a SONET analyzer, you must have SM transponder line cards or MM transponder line cards configured to SONET OC-3 or OC-12 protocol encapsulation. Otherwise, use an Ethernet analyzer, measure how many frames are lost, and divide by the frame rate to determine the restoration time.

Step 1 To verify restoration time after removing an active transponder line card, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Remove the active transponder line card.

c. Verify that the restoration time is less than 50 ms.

Step 2 To verify restoration time after a fiber break on the trunk, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Disconnect the active trunk fiber.

c. Verify that the restoration time is less than 50 ms.

Step 3 To verify protection switching from the working path to the protection path, perform these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:

aps switch *group-name* **manual working-to-protection**

c. Verify that the restoration time is less than 50 ms.

Step 4 To verify protection switching from the protection path to the working path, perfor these steps:

a. Connect a SONET analyzer (with service time disruption measurement) to the client side.

b. Perform a manual switch command through the CLI to verify manual protection switch functionality. Enter the following command:

aps switch *group-name* **manual protection-to-working**

c. Verify that the restoration time is less than 50 ms.

Step 5 For bidirectional switching configurations, repeat Step 1 through Step 4 on the remote node.

Network Turn Up of Amplified Ring Topologies with Per-Channel Equalization

This chapter describes how to deploy amplified meshed ring and hubbed ring topologies with per-channel equalization.

Before You Begin

This section lists the chapter non-trouble procedures (NTPs). Turn to a procedure for applicable tasks or detailed level procedures (DLPs).

1. NTP-29 Initial Deployment, page 6-1
2. NTP-30 Add or Remove Data Channels, page 6-11
3. NTP-31 Add or Remove the OSC, page 6-13
4. NTP-32 Remove and Reinsert a Transponder Line Card or OSC Module Online, page 6-15

NTP-29 Initial Deployment

Purpose	This procedure describes how to initially turn up a Cisco ONS 15530 amplified ring network with per-channel equalization.
Tools/Equipment	Optical TAPs installed on the trunk output of every site OPM (optical power meter) OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-14 Verify the System Configuration, page 3-43 for every node in the network
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Complete the "DLP-57 Equalize the Optical Power at the Site" task on page 6-3.

Step 2 Complete the "DLP-58 Equalize the Optical Power in the Network" task on page 6-9.

Prerequisites

This procedure requires the following:

- You are familiar with the Cisco ONS 15530, its components, and the Cisco IOS CLI (command-line interface).
- Cisco ONS 15530 technical documentation is available and consulted during installation, configuration, and testing. You can find the documentation at this URL:

  http://www.cisco.com/univercd/cc/td/doc/product/mels/15530/index.htm
- You have used design analysis or a design tool for the network to determine the target power for channel power equalization (P_{target}) at each site, plus EDFA gains (Gain). There may be exceptions in the design analysis where the full equalization is not applied to a particular span. In those cases, the design analysis provides a minimum value to use as the local target power.

  Note The acceptable tolerance that is provided in the procedure for equalizing to the proper P_{target} values should already be accounted for in the design analysis phase.
- Certain designs that are optimized and do not follow the strict per-channel equalization rules. The per-channel equalization rule for equalizing added channels to pass through channels are relaxed in nonamplified spans. During initial deployment, you can equalize the added channels d to a minimum power derived from the downstream P_{target} value. The Gain for amplifiers is usually set to a mid-range value and then adjusted during the final network equalization.
- The complete site cabling diagram is available from the design analysis or the design tool. This diagram provides DWDM cabling detail for interchassis and intrachassis connections.
- All Cisco ONS 15530 components are installed and optically characterized as described in Chapter 2, "Basic Hardware Installation Procedures," Chapter 3, "Software Setup Procedures," the *Cisco ONS 15530 Hardware Installation Guide*, and the *Cisco ONS 15530 Configuration Guide and Command Reference*. This includes the OSC modules, transponder line cards, WB-VOA modules, PB-OE modules, and OADM modules needed in the design. All trunk connections have a TAP.

  Note The final OADM modules for the design should be installed at initial deployment to allow for future uninterrupted upgrades.
- You have selected and recorded the Reference Node. For hubbed ring topologies, use the hub node as the Reference Node. For meshed ring topologies, use the node with the optical seam.
- You have selected and recorded the Reference Channel on each node. Select an added data channel that is readily available in the initial stage as the Reference Channel. The Reference Channel is initially used to achieve the desired P_{target} with high degree of accuracy. We recommend that you select a data channel because not all deployments require the OSC (Optical Supervisory Channel).

Note In the first phase of the deployment (Site Equalization) for meshed rings, you might not start from the Reference Node because the network sites are not connected at that point. During the last phase (Network Equalization), we recommend starting from Reference Node so you can make the initial adjustments to the PB-OE modules in the optical seam.

- If there are EDFAs in the optical path, their input ports are disconnected.
- Perform a procedure first in one direction (for example, clockwise). After completing the first pass, perform the same procedure for the other direction (counter-clockwise).

Note These turn-up procedures require multiple passes through the network.

Overview

There are two main steps for per-channel equalization in the initial deployment of the amplified ring:

Step 1 Site power equalization.

At this point the site trunks are not connected to an EDFA or to another site. The objective is to equalize the added channels to P_{target}. The procedure starts with equalizing the Reference Channel to P_{target} using an OPM (optical power meter). Then the procedure equalizes the rest of the added channels to the Reference Channel using an OSA (optical spectrum analyzer).

Step 2 Network power equalization.

At the end of the site power equalization procedure the site trunks are connected to an EDFA or to another site. The network power equalization procedure consists of starting from a Reference Node and adjusting amplifier gain to equalize the express channels to the Reference Channel.

DLP-57 Equalize the Optical Power at the Site

Purpose	This task equalizes the optical power of the added channels to the selected Reference Channel at the node site.
Tools/Equipment	OPM (optical power meter) OSA (optical spectrum analyzer)
Prerequisite Procedures	DLP-23 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Per-Channel Equalization, page 2-52 NTP-14 Verify the System Configuration, page 3-43 Prerequisites, page 6-2
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Assumptions

- All conditions described in the "Prerequisites" section on page 6-11 are met or considered.
- The following states apply to the corresponding components following the initial installation.
  - ITU lasers on all transponder line cards are turned off using the **shutdown** command on the wave interfaces.
  - WB-VOA module attenuations are set to the minimum values using the **optical attenuation manual** command on the voain interfaces.
  - PB-OE module attenuations are set to the minimum using the **optical attenuation manual** command on the voafilterin subinterfaces.
  - EDFA gain values are set to the minimum.
  - Trunk or EDFA connections are not in place.

Step 1 Start with the Reference Node.

Step 2 Select the Reference Channel as described in the "Prerequisites" section on page 6-2.

Step 3 Make sure that the client services are connected to the transponder line card and that the transparent interface is modulated with the correct protocol encapsulation or clock rate to provide more accurate power readings.

Step 4 Turn on the transponder line card ITU laser for the Reference Channel using the **no shutdown** command on the wave interface.

Note At this point the Reference Channel should be the only active signal on the node output trunk. Make sure that the MID_IN and MID_OUT ports on the OADM modules are not cabled yet. This prevents pass through channels from interfering with the added channel equalization procedure.

Step 5 Connect the OPM to the TRUNK_OUT port on the OADM module to monitor the Reference Channel power.

Note Use the TAP trunk output and not the TAP monitoring port to provide a higher degree of accuracy for the Reference Channel that is used for equalizing the other channels.

Step 6 Adjust the attenuation of the WB-VOA module using the **optical attenuation manual** command on the voain interface to bring the Reference Channel power within ±0.1 dB of P_{target}.

Step 7 Issue a **show interfaces voain** command on the WB-VOA module and record the power reading from the command output for future reference.

Step 8 Disconnect the OPM from the TRUNK_OUT port on the OADM module and connect an OSA.

Step 9 Perform the following steps for each of the other transponder line cards installed at this site:

a. Make sure that the client services are connect to the transponder line card and that the transparent interface is modulated with the correct protocol encapsulation or clock rate to provide more accurate power readings.

b. Turn the ITU laser on using the **no shutdown** command on the wave interface.

c. Monitor the added channel using the OSA connected to the TRUNK_OUT port on the OADM module.

d. While monitoring the newly added channel, adjust the WB-VOA module output using the **optical attenuation manual** command on the voain interface to equalized this channel to the Reference Channel.

Note The acceptable tolerance while setting attenuation and equalizing the new channel is within ±0.5 dB with respect to the Reference Channel.

e. Use the **show interface voain** command on the WB-VOA module to obtain the power reading and record it for future reference.

Step 10 Equalize the OSC (if present) as described in Step 9 for added data channels, except for modulating the client interface.

Note In some designs, the OSC is not completely equalized due to its hop-by-hop nature and the receiver sensitivity range of the OSC module. Depending on the desired degree of equalization, set the appropriate attenuation for the OSC.

Step 11 Record the optical power of the data channels measured by the OSA at the TAP trunk output when the added channel equalization is completed,.

Step 12 Disconnect the OSA from the trunk and connect the trunk to the TRUNK_OUT port on the OADM in the desired direction.

Step 13 Switch the WB-VOA modules from manual attenuation to automatic control with the **optical attenuation automatic** command on the voain interfaces using the power readings of the WB-VOA modules recorded in Step 9 and Step 10.

Step 14 Make sure that the connections for the pass through (express) channels are completed by connecting the MID_IN and MID_OUT ports on the OADM modules as described in the "DLP-27 Connect the OADM Modules for Splitter or Line Card Protection" task on page 2-64.

Step 15 If a post amplifier is present, perform the following steps:

a. Connect the OADM module TRUNK_OUT port in the desired direction to the trunk input port on the post amplifier.

b. Use the **setgainmean** command to adjust the gain value on the EDFA as indicated in the design analysis.

c. Connect the OSA to the trunk output port of the post amplifier and read the power of all added channels. Record all power readings.

d. Using the OSA, verify that the actual gain values and gain tilt values agree with the design analysis. The gain tilt value is the difference between the highest and lowest gain values for all the added channels.

e. Disconnect the OSA and reconnect the trunk to the trunk output port on the post amplifier.

Step 16 Connect the incoming trunk (or preamplifier, if present) to the OADM module TRUNK_IN port in the desired direction.

Step 17 Move to the next downstream node.

Step 18 Connect to the OSA to the trunk, before the preamplifier (if present), and record all power readings.

Step 19 If a preamplifier is present, perform the following steps:

a. Connect the trunk to the trunk input port of the preamplifier.

b. Connect the OSA to the trunk output port of the preamplifier.

c. Use the **setgainmean** command to set the gain on the preamplifier as defined in the design analysis and record all power readings.

d. Using the OSA, verify that the actual gain values and gain tilt values agree with the design analysis. The gain tilt value is the difference between the highest and lowest gain values for all the added channels.

e. Disconnect the OSA and connect the trunk between the node and the preamplifier to the trunk input port on the preamplifier.

Step 20 Repeat Step 2 through Step 19 for the remaining nodes in the current direction.

Step 21 You have now equalized the added channels on all of the nodes in one direction. Repeat Step 1 through Step 20 for the other direction.

Note The added channels at every site are equalized to their appropriate P_{target} value or the power value designated by the design analysis but the pass through channels have not been considered yet.

Considerations

- If you replace the Reference Channel transponder line card with a new transponder line card during the life of the network, you can use the remaining equalized channels can to adjust the replacement. Adjust and equalize the newly replaced Reference Channel to the average peak of the existing channels.
- If you remove the Reference Channel and do not replace it with another transponder line card, the remaining equalized channels are left intact. If you add a new channel, you can equalize it to the average peak of the existing channels.
- There are many ways to address the number of people and equipment needed (for example, the OSAs and OPMs). To minimize movements and coordination difficulties during troubleshooting, ideally you can have an individual with an OSA and OPM at every site with conference bridges available. However, this might not always be possible. You can use the following steps to efficiently address this issue:
  1. Start with the Reference Node as the first site. Have individuals with OSAs and OPMs at three consecutive sites moving in one direction around the ring topology.
  2. Complete the procedure in this section, including the specified monitoring and trunk connections, at the first and the second sites.
  3. Then complete the procedure at the second and the third sites, while the individual who was at the first site goes to the fourth site in the ring topology, if one exists.
  4. Complete this procedure on the next two nodes and continue around the ring until you reach the Reference Node.

Example

Figure 6-1 shows an example of a protected ring topology. Table 6-1 lists the detailed steps for the site equalization process.

Note Only the clockwise direction is considered. A similar process must performed for the counter-clockwise direction.

Figure 6-1 Example of a Protected Ring Network Topology

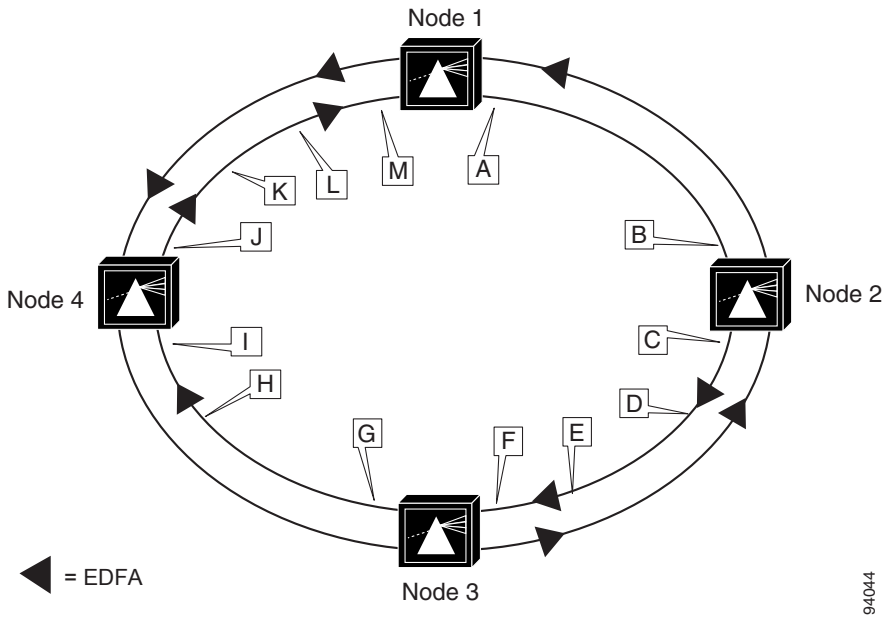


Table 6-1 Site Power Equalization Process Example

Site	Steps	Test Location	Actions
Node 1	1 to 8	Point A	Start with Node 1 (the Reference Node), select a Reference Channel, and set and record the power for the Reference Channel based on the network design.
	9 to 13	Point A	Equalize all other added channels on Node 1 relative to the Reference Channel and record the power values.
	14	Node 1	Connect the pass through channels between the two OADM modules.
	15		Not applicable. In the example, this span has no post amplifier after Node 1 in the clockwise direction.
	16	Node 1	Connect the input trunk to the OADM module.
	17	Node 2	Continue to Node 2.
	18	Point B	Record power values at the end of the span between Node 1 and Node 2.
	19		Not applicable. In the example, this span has no preamplifier before Node 2 in the clockwise direction.

Table 6-1 Site Power Equalization Process Example (continued)

Site	Steps	Test Location	Actions
Node 2	2 to 8	Point C	Select a Reference Channel and set the power for the Reference Channel based on the network design
	9 to 13	Point C	Equalize all other added channels on Node 2 relative to the Reference Channel and record the power values.
	14	Node 2	Connect the pass through channels between the two OADM modules.
	15	Point D	Measure the power from the trunk output on the post amplifier and set the gain as defined in the design analysis.
	16	Node 2	Connect the input trunk to the OADM module.
	17	Node 3	Move to Node 2.
	18	Point E	Record power values at the end of the span between Node 2 and Node 3.
	19	Point F	Measure the power from the trunk output on the preamplifier and set the gain as defined in the design analysis.
Node 3	2 to 8	Node 3	Select a Reference Channel and set the power for the Reference Channel based on the network design
	9 to 13	Point G	Equalize all other added channels on Node 3 relative to the Reference Channel and record the power values.
	14	Node 3	Connect the pass through channels between the two OADM modules.
	15		Not applicable. In the example, this span has no post amplifier after Node 3 in the clockwise direction.
	16	Node 3	Connect the input trunk to the OADM module.
	17	Node 4	Continue to Node 4.
	18	Point H	Record power values at the end of the span between Node 3 and Node 4.
	19	Point I	Measure the power from the trunk output on the preamplifier and set the gain as defined in the design analysis.

Table 6-1 Site Power Equalization Process Example (continued)

Site	Steps	Test Location	Actions
Node 4	2 to 8	Node 4	Select a Reference Channel and set the power for the Reference Channel based on the network design
	9 to 13	Point J	Equalize all other added channels on Node 4 relative to the Reference Channel and record the power values.
	14	Node 4	Connect the pass through channels between the two OADM modules.
	15	Point J	Measure the power from the trunk output on the post amplifier and set the gain as defined in the design analysis.
	16	Node 4	Connect the input trunk to the OADM module.
	17	Node 1	Continue to Node 1.
	18	Point K	Record power values at the end of the span between Node 4 and Node 1.
	19	Point L	Measure the power from the trunk output on the preamplifier and set the gain as defined in the design analysis.

DLP-58 Equalize the Optical Power in the Network

Purpose	This task equalizes the optical power of the pass through channels to the added channels on the entire network.
Tools/Equipment	OSA (optical spectrum analyzer)
Prerequisite Procedures	DLP-57 Equalize the Optical Power at the Site, page 6-3 Prerequisites, page 6-2
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note The network power equalization phase might require a different approach at each site, such as the following:

- No action indicated by the network design.
- Equalize the express channels by adjusting attenuation settings on the seam or adjusting prior EDFA gain.
- Make adjustments to the attenuation of the WB-VOA module for the remote upstream site based on the actual readings (since the analysis may consider the worst statistical values) to bring the local express channel powers inline with respect to the Reference Channel.

Assumptions

- All added channels on all of the nodes have been equalized properly or all factors have been considered as outlined in the "DLP-57 Equalize the Optical Power at the Site" task on page 6-3.
- Al the trunk connections are completed.

Step 1 Start at the Reference Node.

Step 2 Connect the OSA to the TAP trunk output.

Step 3 Monitor all channels using the OSA.

Step 4 Equalize the express channels to the added channels, as needed, by changing the attenuation setting of the optical seam PB-OE modules using the **optical attenuation manual** command on the voafilterin interfaces or by changing the attenuation setting of the WB-VOA modules at the remote upstream site.

Note For the hub node in hubbed ring topologies, all channels terminate on this node and no optical seam is required.

Step 5 Disconnect the OSA.

Step 6 Continue to the next downstream node and connect the OSA to the TAP trunk output.

Step 7 Equalize the express channels, as needed, by either adjusting the gain on the preamplifier using the **setgainmean** command or adjusting the attenuation setting on the WB-VOA module at the remote upstream site.

Step 8 Continue to the next node and repeat Step 2 through Step 7 on the remaining nodes in the network.

Considerations

- While adjusting the express channels, the average peak can be used with respect to the Reference Channel if a single value is needed for all express channels.
- We recommend having one individual with an OSA at each site for fully connecting the network and isolating problems during the network power equalization stage. However, it may not be practical to do so. Consider streamlining the number of staff and equipment needed as described in the "DLP-57 Equalize the Optical Power at the Site" task on page 6-3.

Example

Table 6-2 lists the detailed steps for the network power equalization process for the example network shown in Figure 6-1.

Note Only the clockwise direction is considered. A similar process must performed for the counter-clockwise direction.

Table 6-2 Network Power Equalization Process Example

Site	Steps	Test Location	Actions
Node1	1 to 6	Point A	Start with the Reference Node. If this is a meshed ring topology, make any necessary adjustments to the PB-OE modules in the optical seam on this node.
Node 2	7 to 8	Point C	Make any necessary adjustments to the WB-VOA modules on Node 1 for the pass through channels.
Node 3	7 to 8	Point G	Make any necessary adjustments to the preamplifier gain setting.
Node 4	7 to 8	Point J	Make any necessary adjustments to the preamplifier gain setting.

NTP-30 Add or Remove Data Channels

Purpose	This procedure describes how to incrementally add a data channel to or remove it from an equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of every site OPM (optical power meter) OSA (optical spectrum analyzer) Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 As needed, complete the "DLP-59 Add a Data Channel" task on page 6-12 to add a data channel to an existing equalized network.

Step 2 As needed, complete the "DLP-60 Remove a Data Channel" task on page 6-12 to remove a data channel from an existing equalized network.

Prerequisites

The tasked outlined here rely on the following:

- The final maximum OADM module configuration is in place.
- The design analysis and values are available based on the final design.

DLP-59 Add a Data Channel

Purpose	This task adds a single data channel to an equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of every site OPM (optical power meter) OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1 DLP-11 Install the WB-VOA Module, page 2-15 DLP-13 Install the Transponder Line Cards, page 2-17 DLP-23 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Per-Channel Equalization, page 2-52
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 Set the attenuation on the particular WB-VOA module to the maximum (30 dB) using the **optical attenuation manual** command on the voain interface.

Step 2 Place an OSA on the TAP trunk output.

Step 3 Adjust the WB-VOA module attenuation in 3 dB increments to equalize the newly added channel to the Reference Channel. If the Reference Channel is not available, use the average peak of the existing equalized channels. Apply smaller increments as the value gets closer to the equalized value. The acceptable tolerance is within ±0.5 dB of the Reference Channel power.

Step 4 Issue a **show interfaces voain** command on the WB-VOA module when the channel is equalized and record the power value.

Step 5 Switch to automatic mode using the **optical attenuation automatic** command using the power value recorded in Step 4.

DLP-60 Remove a Data Channel

Purpose	This task removes a single data channel from an equalized network.
Tools/Equipment	Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Note If you are performing an online removal and reinsertion of the same transponder line card, follow the process described in the "NTP-32 Remove and Reinsert a Transponder Line Card or OSC Module Online" procedure on page 6-15.

Assumptions

The appropriate client services are disconnected.

Step 1 Use the **optical attenuation manual** command on the voain interface on the WB-VOA module to gradually increase attenuation in 3 dB increments until the attenuation reaches the maximum value (30 dB). (This is a conservative recommendation and not due to any limitation, such as EDFA receiver sensitivity.)

Step 2 Monitor the WB-VOA module output power to make sure that it is less than –20 dBm.

Step 3 Turn off the transponder line card ITU laser using the **shutdown** command on the wave interface.

Step 4 Disconnect the WB-VOA module output from OADM module and the transponder line card.

Step 5 Loosen the captive screws on the transponder line card with a number 1 Phillips screwdriver and carefully remove the transponder line card from the slot.

NTP-31 Add or Remove the OSC

Purpose	This procedure describes how to incrementally add or remove the OSC from an equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of the site OPM (optical power meter) OSA (optical spectrum analyzer) Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Step 1 As needed, complete the "DLP-61 Add the OSC" task on page 6-14, to add the OSC on an existing equalized network.

Step 2 As needed, complete the "DLP-62 Remove the OSC" task on page 6-14, to remove the OSC from an existing equalized network.

Prerequisites

The final maximum OADM module configuration is in place.

DLP-61 Add the OSC

Purpose	This task adds the OSC to an existing equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of the site OSA (optical spectrum analyzer)
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1 DLP-10 Install the OSC Module, page 2-14 DLP-11 Install the WB-VOA Module, page 2-15 DLP-23 Connect OADM Modules, WB-VOA Modules, and Transponder Line Cards for Per-Channel Equalization, page 2-52
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Assumptions

- The OADM module with OSC is installed and cabled properly.
- The OSC module is available.
- The P_{target} value for the Reference Channel has been noted for this particular node. If the analysis has dictated a non-equalized power value for the OSC, a fixed attenuator can be used at the receiver.

Step 1 Set the attenuation on the WB-VOA module to the maximum (30 dB) using the **optical attenuation manual** command on the voain interface.

Step 2 Place an OSA on the TAP trunk output.

Step 3 Adjust the WB-VOA module attenuation in 3 dB increments to equalize the newly added channel to the Reference Channel. If the Reference Channel is not available, use the average peak of the existing equalized channels. Apply smaller increments as the value gets closer to the equalized value. The acceptable tolerance is within ±0.5 dB of the Reference Channel power.

Step 4 Issue a **show interfaces voain** command on the WB-VOA module once the equalization is achieved and record the power value.

Step 5 Switch to automatic attenuation mode using the **optical attenuation automatic** command with the power value determined in Step 4.

DLP-62 Remove the OSC

Purpose	This task removes the OSC from an existing equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of every site OPM (optical power meter) OSA (optical spectrum analyzer) Number 1 Phillips screwdriver

Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Privileged

Note If you are performing an online removal and reinsertion of the same OSC module, follow the process described in the "NTP-32 Remove and Reinsert a Transponder Line Card or OSC Module Online" procedure on page 6-15.

Assumptions

The appropriate services, such as a network management system and APS, that depend on this OSC are addressed properly.

Step 1 Use the **optical attenuation manual** command to gradually raise the WB-VOA module attenuation (or decrease output power) in 3 dB increments until it reaches the maximum attenuation (30 dB).

Step 2 Monitor the WB-VOA module output to make sure that it is less than –20 dBm.

Step 3 Turn off the laser using the **shutdown** command on the OSC module wave interface.

Step 4 Disconnect the OSC module from the WB-VOA module and the OADM module.

Step 5 Use the number 1 Phillips screwdriver to loosen the screw on the module locking level, release the module locking lever, and carefully remove the module from the carrier motherboard.

Considerations

During initial deployment and future updates to the network, if you remove and reinsert an OSC module online, make sure that the attenuation on the corresponding WB-VOA module is set to the maximum before removing the OSC module (see the"NTP-32 Remove and Reinsert a Transponder Line Card or OSC Module Online" procedure on page 6-15).

NTP-32 Remove and Reinsert a Transponder Line Card or OSC Module Online

Purpose	This procedure removes and reinsert a transponder line card or OSC module that is connected to a WB-VOA module in an equalized network.
Tools/Equipment	Optical TAPs installed on the trunk output of every site OPM (optical power meter) OSA (optical spectrum analyzer) Number 1 Phillips screwdriver
Prerequisite Procedures	NTP-29 Initial Deployment, page 6-1
Required/As Needed	As needed
Onsite/Remote	Onsite
Security Level	None

Note The online removal and reinsertion of a transponder line card or OSC module must follow the following steps. You can avoid inaccurate power readings and incorrect attenuation settings by using this procedure.

Step 1 Read the current WB-VOA module setting using the **show interfaces** command on the voain interface.

Step 2 Use the **optical attenuation manual** command on the voain interface to gradually raise the WB-VOA module attenuation in 3 dB increments until it reaches the maximum attenuation (30 dB).

Step 3 Use a number 1 Phillips screwdriver to release the captive screws on the transponder line card or the module locking lever on the carrier motherboard.

Step 4 Remove the transponder line card or OSC module from the shelf.

Step 5 Reinsert the same transponder line card or OSC module into the shelf and seat firmly.

Note If you do not reinsert the same module into the shelf, you must follow the equalization steps in the "DLP-59 Add a Data Channel" task on page 6-12 for a new transponder line card, or the "DLP-61 Add the OSC" task on page 6-14 for a new OSC module.

Step 6 Use a number 1 Phillips screwdriver to tighten the captive screws on the transponder line card or the module locking lever on the carrier motherboard.

Step 7 Reset the WB-VOA module attenuation setting to the value obtained in Step 1 using the **optical attenuation manual** command on the voain interface.

Step 8 Switch the WB-VOA module from manual attenuation mode to automatic attenuation mode using the **optical attenuation automatic** command on the voain interface.

Node Data Checklist

The tables in this appendix are used to keep track of data for each node. Make copies of these tables to record information for additional nodes.

Table A-1 tracks essential node data, such as IP address, host name, and IDs.

Table A-1 Node Data Checklist

Node data	Value
Node IP address	
Node IP subnet mask	
Node host name	
Node ID	

Table A-2 tracks of customer site information, such as customer name, the site name, the location of the equipment, and the system configuration (network topology, number of CPUs).

Table A-2 Customer Information

Customer data	Value
Customer name	
Site name	
Location	
System Configuration	

Table A-3 records contact information for the engineers responsible for installation and verification of the node.

Table A-3 Team Information

Team data	Value
Lead Engineer	
Test Engineer	
Test Engineer	
Date	

Table A-4 records the expected power from the network design, and the power measured by the OSA during system span testing.

Refer to the "NTP-23 Verify the Optical Power Budget Between Nodes" procedure on page 5-2.

Table A-4 Expected and Measured Power for Channels in the Network

Channel	Expected Power	OSA Measured Power

Test Results Tables

This appendix contains tables and checklists to use during the turn-up and test of a Cisco ONS 15530.

Table B-1 Test Results for the Cisco ONS 15530

Test or Procedure Section	Expected Result (After Power-up)	Notes
"Performing Fiber Plant Characterization" section on page 1-7	Tested fiber meets the specifications listed in that section.	
"DLP-13 Install the Transponder Line Cards" section on page 2-17	All LEDs on the modules are off (default).	
"DLP-34 Verify the Power Up" task on page 2-78	The Status LED is green. The Active LED on the primary processor and the Standby LED on the standby processor are both green. The alarm LEDs are off.	
"NTP-8 Verify Installation of Hardware" procedure on page 2-79	All modules in the chassis are reported in the proper slot by Cisco IOS software. The modules have the correct hardware version and software version.	
"NTP-15 Verify the Interface Status" procedure on page 4-2	Confirm that the interfaces are administratively up.	
"NTP-16 Verify the Optical Patch Configuration" procedure on page 4-19	Confirm that the patch connections are correctly configured.	
"DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces" task on page 4-25	Tx optical power and wavelengths are in line with figures in the power specification tables.	
"DLP-52 Verify the Power Levels at the DWDM Trunk Interfaces" task on page 4-25	Measured power matches the specifications provided.	
"NTP-18 Verify the Transponder Line Card Laser Frequency" procedure on page 4-21	The laser frequency (channel number) is configured to the proper wavelength.	
"NTP-20 Test the Optical Transmission Quality" procedure on page 4-28	The test runs error free for 15 minutes.	

Table B-1 Test Results for the Cisco ONS 15530

Test or Procedure Section	Expected Result (After Power-up)	Notes
"NTP-21 Check the Alarms" procedure on page 4-30	Alarms are generated for the listed fault conditions.	
"NTP-23 Verify the Optical Power Budget Between Nodes" procedure on page 5-2	Expected results (from network design), measured results, and results as seen by Cisco IOS software match.	
"NTP-24 Verify the Connectivity Between OSC Modules" procedure on page 5-3	Active is displayed under the Status field. 2way is displayed under the OSCP St. field.	
"NTP-26 Verify the Power Levels" procedure on page 5-4	Channel count, power, power equalization, and OSNR meet the network design requirements.	
"NTP-27 Test the Optical Transmission Quality" procedure on page 5-5	The test runs error free for 15 minutes.	

Numerics

A

B

C

D

E

F

G

H

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L

M

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P

R

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W