Connecting the Cisco ONS 15530

The Cisco ONS 15530 uses RJ-45, SC, MT-RJ and MU connectors on the faceplates of the line cards and modules. Fiber optic cables are routed to the cable management guides that are at the top and bottom of the shelf. The Cisco ONS 15530 is powered by 120–240 VAC or –48 VDC power. Positive, negative, and ground power terminals are accessible on the front of the chassis.

This chapter describes how to connect the Cisco ONS 15530 to the network and contains the following sections:

Note To ensure that your Cisco IOS software release supports your hardware, see the "New and Changed Information" section on page vii. Also refer to the "Hardware Supported" section of the latest release notes for the Cisco ONS 15530.

Note For power supply cable connecting information, see the "Powering Up the Shelf" section on page 2-31.

Connector Types

Various types of connectors are used to connect the line cards and modules of the Cisco ONS 15530 to each other and the Internet. Table 3-1 lists the connector types used on each line card and module. Figure 3-1 through Figure 3-4 show the connector types.

Table 3-1 Line Card and Module Connector Types

Card/Module	Connector Type(s)
CPU switch module	RJ-45 (Figure 3-1)
OSC module	MU (Figure 3-4)
Transponder line card	MU (Figure 3-4), SC-Type (Figure 3-2)
OADM module	MU (Figure 3-4)
4-Port 1-Gbps/2-Gbps FC aggregation card	MU (Figure 3-4)
8-Port FC/GE aggregation card	MU (Figure 3-4)
ESCON aggregation card	MT-RJ (Figure 3-3)
10-Gbps ITU tunable and non tunable trunk card	MU (Figure 3-4)
10-Gbps uplink line card	SC-Type (Figure 3-2)
WB-VOA module	MU (Figure 3-4)
PB-OE module	MU (Figure 3-4)
PSM	MU (Figure 3-4)

Figure 3-1 RJ-45 Connector

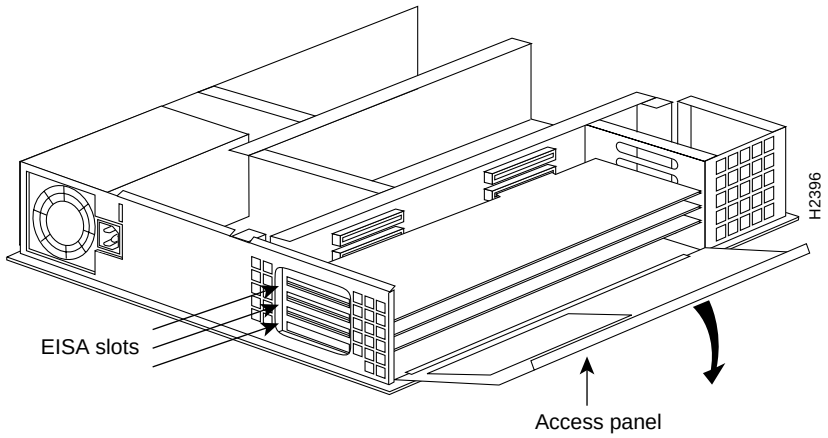


Figure 3-2 Simplex SC-Type Connector

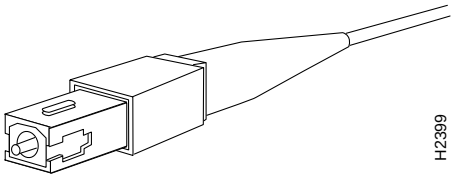


Figure 3-3 MT-RJ Connector

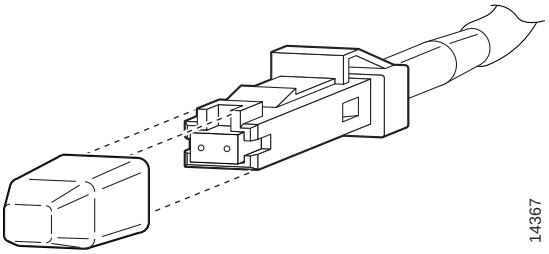
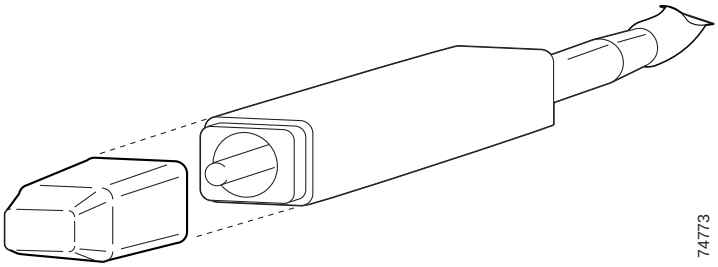


Figure 3-4 MU Connector



Preparing for Network Connections

When preparing your site for network connections to the Cisco ONS 15530, consider the following for each type of interface:

- Cabling required for each type
- Distance limitations for each signal type
- Additional interface equipment needed

Before installing the component, have all additional external equipment and cables on hand.

Cleaning the Shelf and Connectors

If the cleaning process must be done while the system is running, be aware that the airflow system is in operation. 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 may be emitted from the end of the fiber or connector. Do not stare into the beam or view directly with optical instruments.**

Fiber optic connectors are used to connect two fibers together. When these connectors are used in a communication system, proper connection becomes a critical factor. Fiber optic cable connectors can be damaged by improper cleaning and connection procedures. Dirty or damaged fiber optic connectors can result in not repeatable or inaccurate communication.

Fiber optic connectors differ from electrical or microwave connectors. In a fiber optic system, light is transmitted through an extremely small fiber core. Because fiber cores are often 62.5 microns or less in diameter, and dust particles range from a tenth of a micron to several microns in diameter, dust and any contamination at the end of the fiber core can degrade the performance of the connector interface where the two cores meet. Therefore, the connector must be precisely aligned and the connector interface must be absolutely free of trapped foreign material.

Connector, or insertion, loss is a critical performance characteristic of a fiber optic connector. Return loss is also an important factor. It specifies the amount of reflected light; the lower the reflection the better the connection. The best physical contact connectors have return losses better than –40 dB, although –20 to –30 dB is more common.

The connection quality depends on two factors: the type of connector and the proper cleaning and connection techniques. Dirty fiber 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, refer to *Cisco ONS 15530 Cleaning Procedures for Fiber Optic Connections*.

When cleaning fiber components, procedures must be followed precisely and carefully with the goal of eliminating any dust or contamination. A clean component connects properly; a dirty component may transfer contamination to the connector, or it may even damage the optical contacts. Inspecting, cleaning, and re-inspecting are critical steps that must be done before making any fiber connection.

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.

Connecting the CPU Switch Module

The CPU switch module has three RJ-45 ports on the front of the card. This section provides the procedures for making the following connections:

- Ethernet network management cable connections
- Connecting a terminal to a console port
- Auxiliary modem connection

Keep the following guidelines in mind when connecting external cables to the Cisco ONS 15530:

- Avoid crossing high-power lines with any interface cables.
- Verify all cabling limitations (particularly distance) before powering on the system.

Ethernet Network Management Cable Connections

The CPU switch module provides an Ethernet port to a LAN for a 10BASE-T or 100BASE-T connection for network management. Use the following procedures to connect the Cisco ONS 15530 to an Ethernet network.

Note Each CPU switch module must have an Ethernet port connection (typically to the same Ethernet hub) if you are running a redundant configuration in the chassis.

Connecting to a 10BASE-T Ethernet Network

To make A 10BASE-T Ethernet connection, you need the following additional equipment (not included with your Cisco ONS 15530):

- An Ethernet hub (such as a Cisco Micro Hub)
- An Ethernet cable that meets the following specifications:
  - RJ-45 (male) to RJ-45 (male) straight-through cable
  - 100-ohm category 3, 4, or 5 cable, no longer than 328 feet (100 meters)

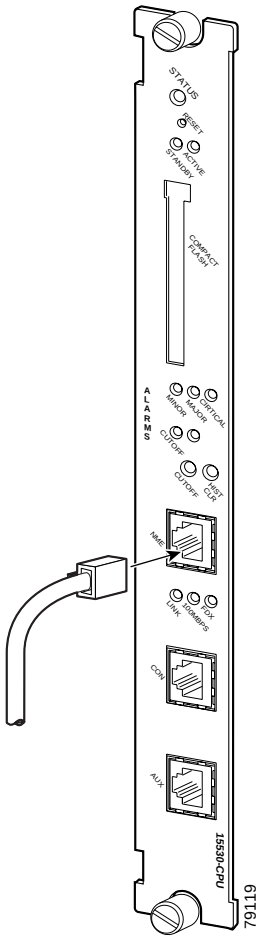
You can identify a straight-through Ethernet cable either by using a cable tester or by making a visual inspection. To make a visual inspection, hold the two ends of a cable side by side, with the tab for each at the back.

- The wire connected to the left-most pin (pin 1) on one connector should be the same color as the wire connected to the left-most pin on the other connector.
- The same rule applies to pins 2 through 8 on each connector. The color of the wire attached to a pin on one connector should match the color of the wire attached to the corresponding pin on the other connector.

To connect the CPU switch module to a 10BASE-T Ethernet LAN, follow these steps:

Step 1 Connect one end of the Ethernet cable to the RJ-45 port on the primary CPU switch module, labeled NME (see Figure 3-5).

Figure 3-5 Connecting 10BASE-T to Ethernet Port



Step 2 Run the cable up and through the cable management bracket and connect the other end of the Ethernet cable to any unoccupied port on the Ethernet hub.

Step 3 Check the LINK LED on the CPU switch module faceplate (below the NME) port.

This LED is green if the CPU switch module is correctly connected to the 10BASE-T Ethernet LAN.

Connecting to a 100BASE-T Ethernet Network

To make a 100BASE-T Ethernet connection, you need the following additional equipment (not included with your Cisco ONS 15530):

- An Ethernet hub (such as a Cisco Micro Hub)
- An Ethernet UTP cable that meets the following specifications:
  - RJ-45 (male) to RJ-45 (male) straight-through cable.
  - 100-ohm category 5 cable no longer than 328 feet (100 meters). (Cisco Systems does not supply Category 5 UTP cables; these cables are available commercially.)

You can identify a straight-through Ethernet cable either by using a cable tester or by making a visual inspection. To make a visual inspection, hold the two ends of a cable side by side, with the tab for each at the back.

- The wire connected to the left-most pin (pin 1) on one connector should be the same color as the wire connected to the left-most pin on the other connector.
- The same rule applies to pins 2 through 8 on each connector. The color of the wire attached to a pin on one connector should match the color of the wire attached to the corresponding pin on the other connector.

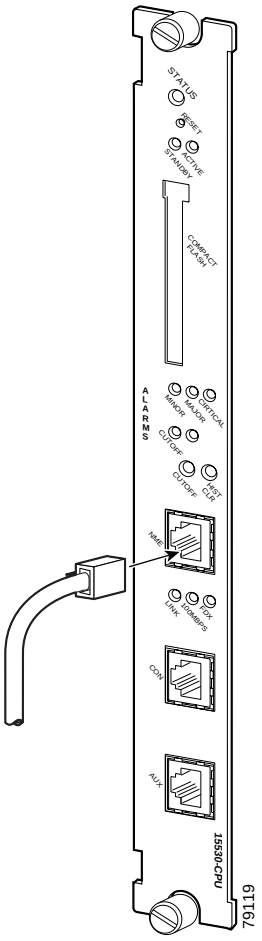
Note Shielded cables, which are grounded at both ends, are required to be used on the 10/100/1000 Ethernet port in order to be in compliance with requirement R4-11 in GR-1089-Core for a Central Office environment. This is not a requirement for customer premise installations.

The port labeled NME on the CPU switch module is configurable for 100-Mbps full-duplex or half-duplex operation (half-duplex is the default) and supports IEEE 802.3, Ethernet, and IEEE 802.3u interfaces compliant with 100BASE-T specifications.

To connect the CPU switch module to a 100BASE-T Ethernet LAN, follow these steps:

Step 1 Connect one end of the Ethernet cable to the RJ-45 port on the primary CPU switch module, labeled NME (see Figure 3-6).

Figure 3-6 Connecting 100BASE-T to Ethernet Port



Step 2 Run the cable up and through the cable management bracket and connect the other end of the Ethernet cable to any unoccupied port on the Ethernet hub.

Step 3 Check the LINK LED on the CPU switch module (below the NME port).

This LED is green if the CPU switch module is correctly connected to the 100BASE-T Ethernet LAN.

Connecting a Terminal to the Console Port

The Cisco ONS 15530 CPU switch module has an asynchronous serial (EIA/TIA-232) RJ-45 console port labeled CON on its front panel. You can connect this port to most types of terminals through use of the console cable kit that is included with your Cisco ONS 15530. The console cable kit contains:

- One RJ-45 to RJ-45 crossover cable
- One RJ-45 to DB-25 (female) adapter
- One RJ-45 to DB-9 (female) adapter

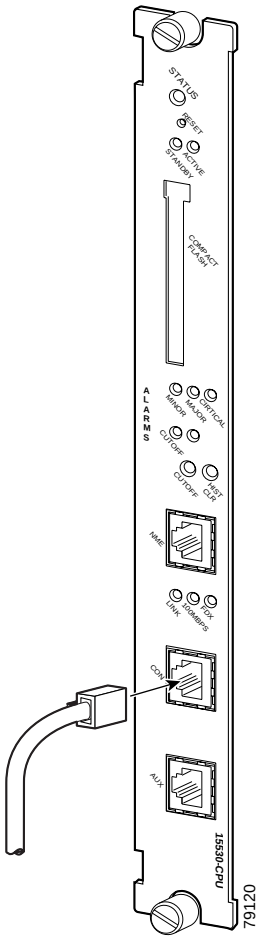
A crossover cable reverses pin connections from one end to the other. In other words, it connects pin 1 (at one end) to pin 8 (at the other end), pin 2 to pin 7, pin 3 to pin 6, and so on. You can identify a crossover cable by comparing the two modular ends of the cable. Hold the cable ends in your hand, side-by-side, with the tabs at the back. Ensure that the wire connected to the outside (left) pin of the left plug (pin 1) is the same color as the wire connected to the outside (right) pin of the right plug (pin 8).

To connect a terminal to the console port on a CPU switch module, follow these steps:

Note Each CPU switch module must have a console port connection (typically to a terminal server) if you are running a redundant configuration in the chassis.

Step 1 Connect one end of the RJ-45 crossover cable to the serial RJ-45 port (CON) on the CPU switch module (see Figure 3-7).

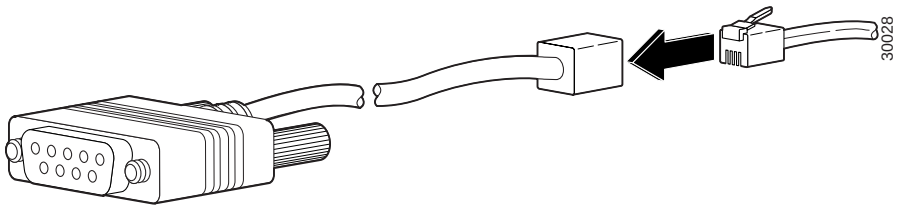
Figure 3-7 Console Port Connection on the CPU Switch Module



Step 2 Run the cable up and through the cable management bracket (not supplied) and connect the other end of the RJ-45 crossover cable to the RJ-45 adapter (see Figure 3-8). If your terminal is equipped with one of the following:

- DB-25 serial connector, use the RJ-45-to-DB-25 adapter.
- DB-9 serial connector, use the RJ-45-to-DB-9 adapter.

Figure 3-8 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

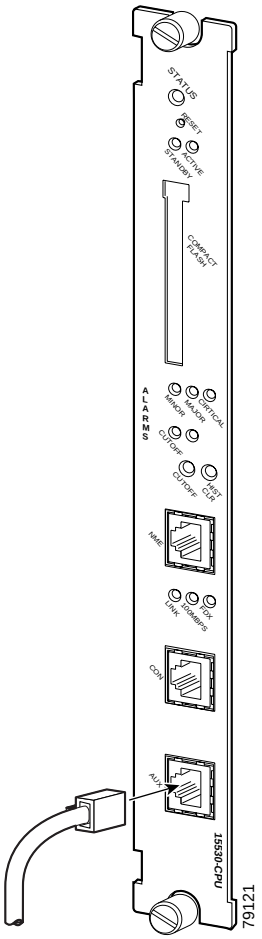
Auxiliary Modem Connection

This asynchronous EIA/TIA-232 serial port connects a modem to the CPU switch module for remote administrative access.

To connect the Cisco ONS 15530 to a modem, follow these steps:

Step 1 Connect one end of the modem cable to the RJ-45 port on the primary CPU switch module, labeled AUX (see Figure 3-9).

Figure 3-9 Connecting Modem Cable to Auxiliary Port



Step 2 Run the cable up and through the cable management bracket and connect the other end of the cable to your modem.

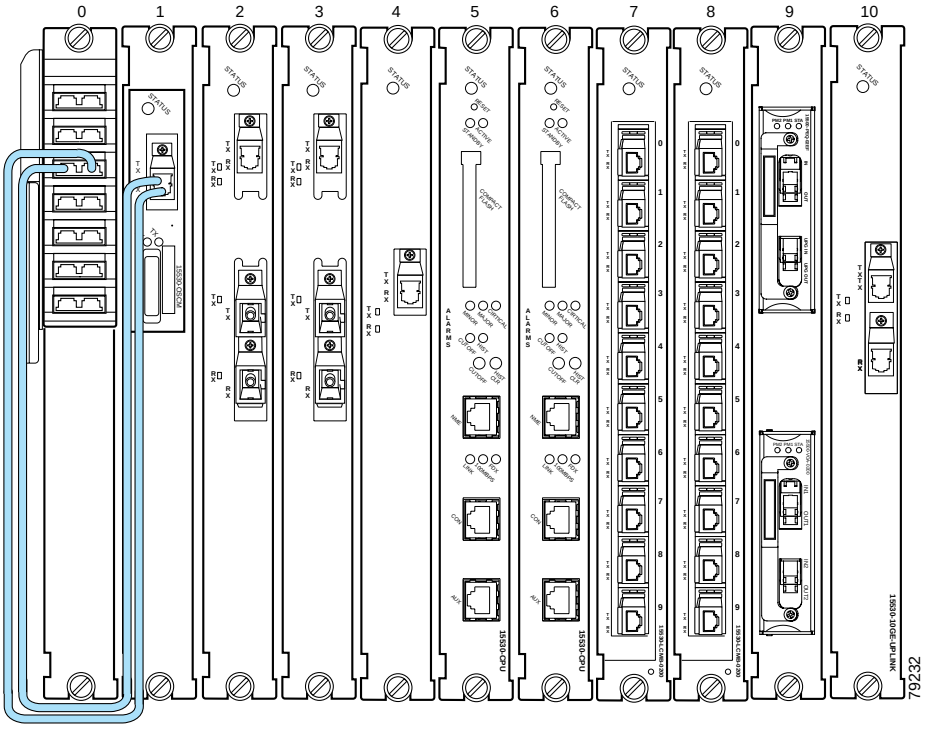
Connecting the OSC Module

One or two OSC modules can be installed in the carrier motherboard. When two OSC modules are installed, one module is for the west direction and one is for the east direction.

The OSC modules are connected to the OADM modules before they terminate on a neighboring node. To install the OSC cables proceed as follows:

Step 1 Connect the OSC module TX port to the OSC IN port of the OADM module (see Figure 3-10).

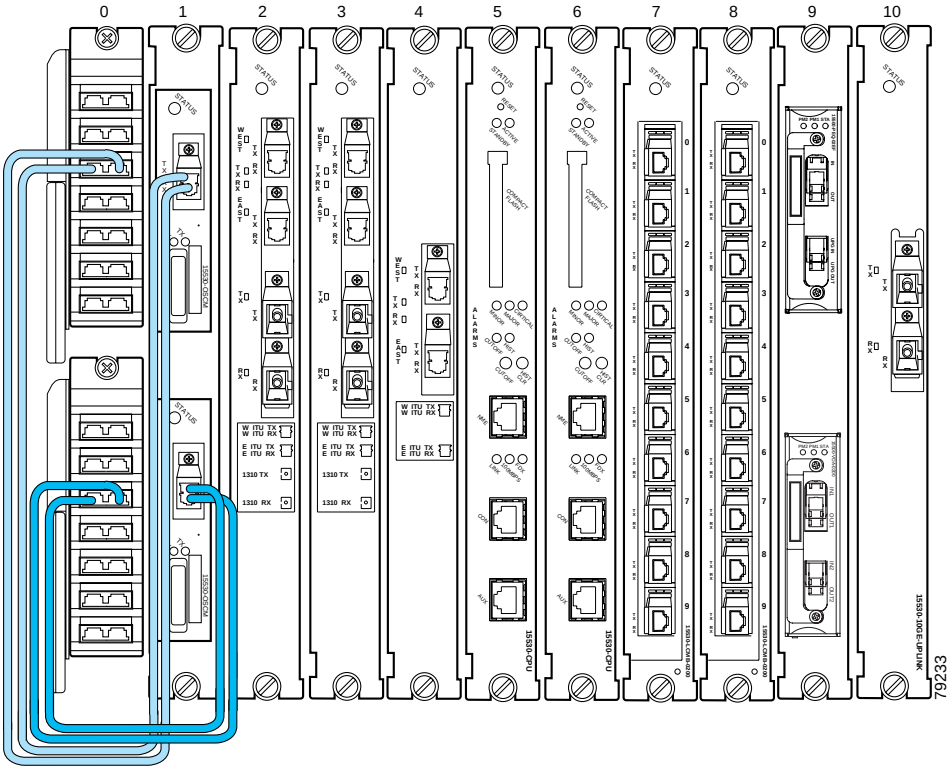
Figure 3-10 OSC Module Cable Connections



Step 2 Connect the OSC module RX port to the OSC OUT port of the OADM module (see Figure 3-10).

Step 3 If a second OSC module has been installed, repeat Step 1 and Step 2, connecting the second OSC module to the second OADM module as shown in Figure 3-11.

Figure 3-11 Dual OSC Module Cable Connections



Connecting the PSM

The PSM (protection switch module) is a shelf replaceable unit that plugs into one of the OADM subslots in the shelf. The unit has a front panel set of MU connectors that interface with the trunk fiber in a 1+1 protection scheme.

To install fiber optic cables in the Cisco ONS 15530, a fiber cable with the corresponding connector type must be connected to the transmit and receive ports on the modules. We recommend that you label the transmit, receive, and the working and protection fibers at each end of the fiber span to avoid confusion with cables that are similar in appearance. Labels are shipped with the system.

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

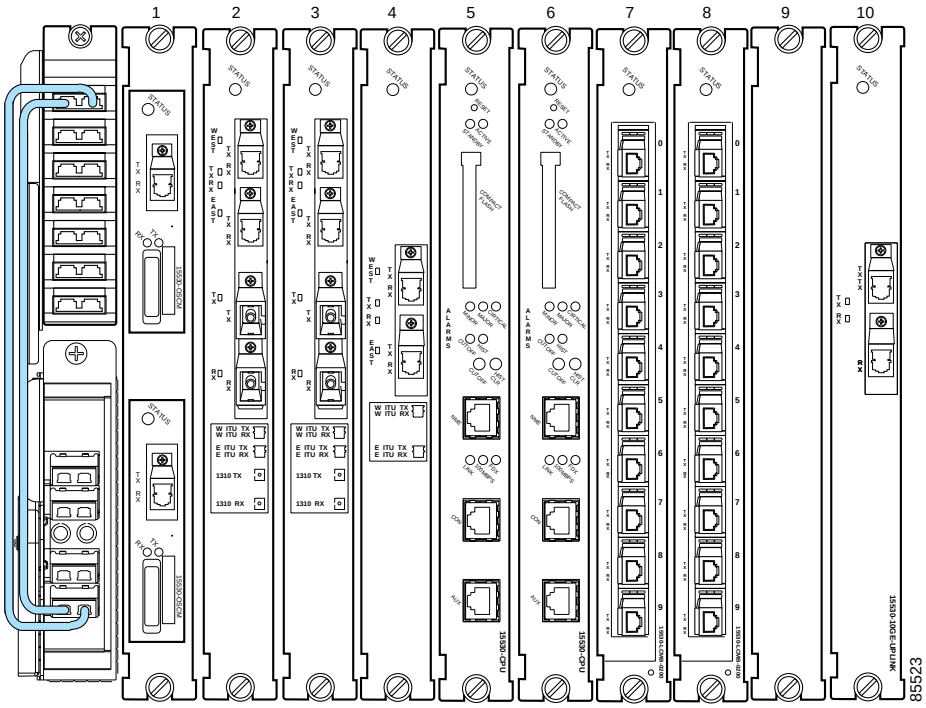
Note Clean all fiber connectors thoroughly. Dust particles can degrade performance. Put caps on any fiber connectors that are not in use.

Cabling PSMs

To attach and route fiber optic cables for the PSM and OADM module, follow these steps:

Step 1 Route the MU fiber cables from the TRUNK IN and TRUNK OUT ports on the OADM module down through the cable management tray (see Figure 3-12).

Figure 3-12 PSM Cable Connections

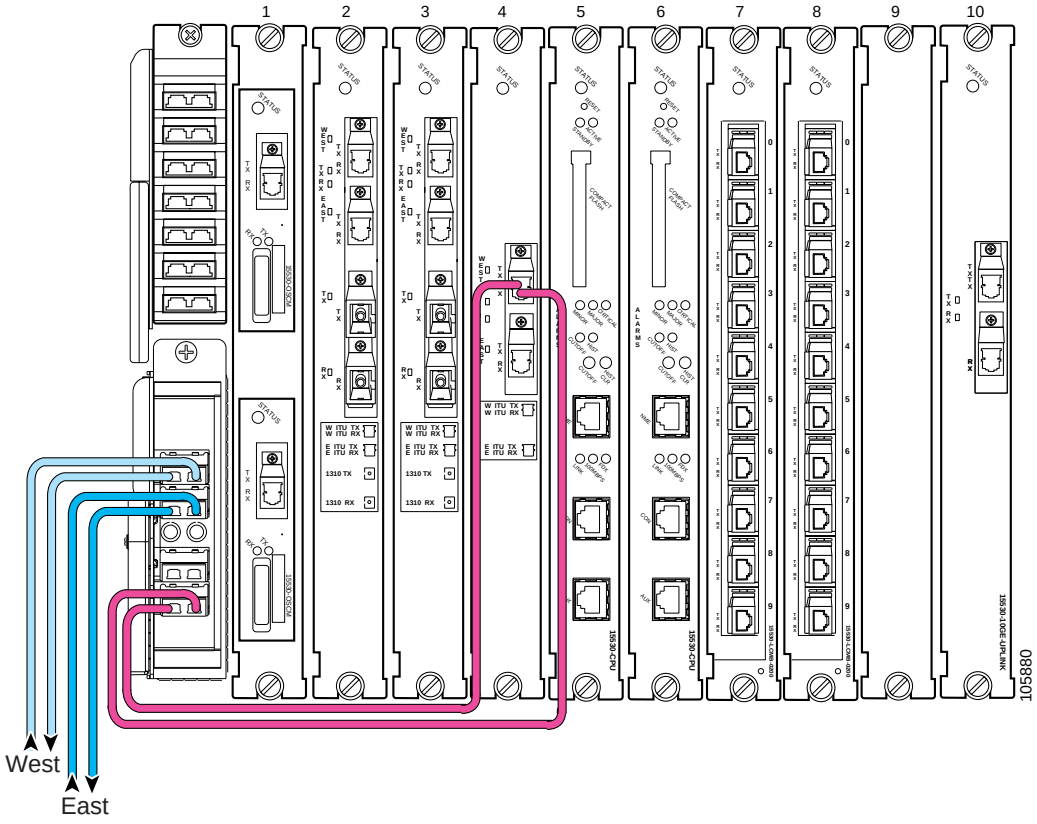


Step 2 Route the cable out of the left side of the tray, down the vertical cable guides, and in through the left side of the cable storage drawer.

Step 3 Route the cable through the cable storage drawer and out the right side. Bring the cable up and into the right side of the cable management tray and continue to route the cable throughout until you come to the bottom of the PSM.

The PSM supports direct connections from the ITU trunk cards, transponder line cards, and 10-Gbps uplink cards. Figure 3-13 shows a the PSM directly connected to a 2.5-Gbps ITU trunk card.

Figure 3-13 PSM Cabled to a 2.5-Gbps ITU Trunk Card



To connect the PSM, follow these steps:

Step 1 Use MU cables to connect the WEST TX RX ports of the PSM to the appropriate west side equipment for your configuration.

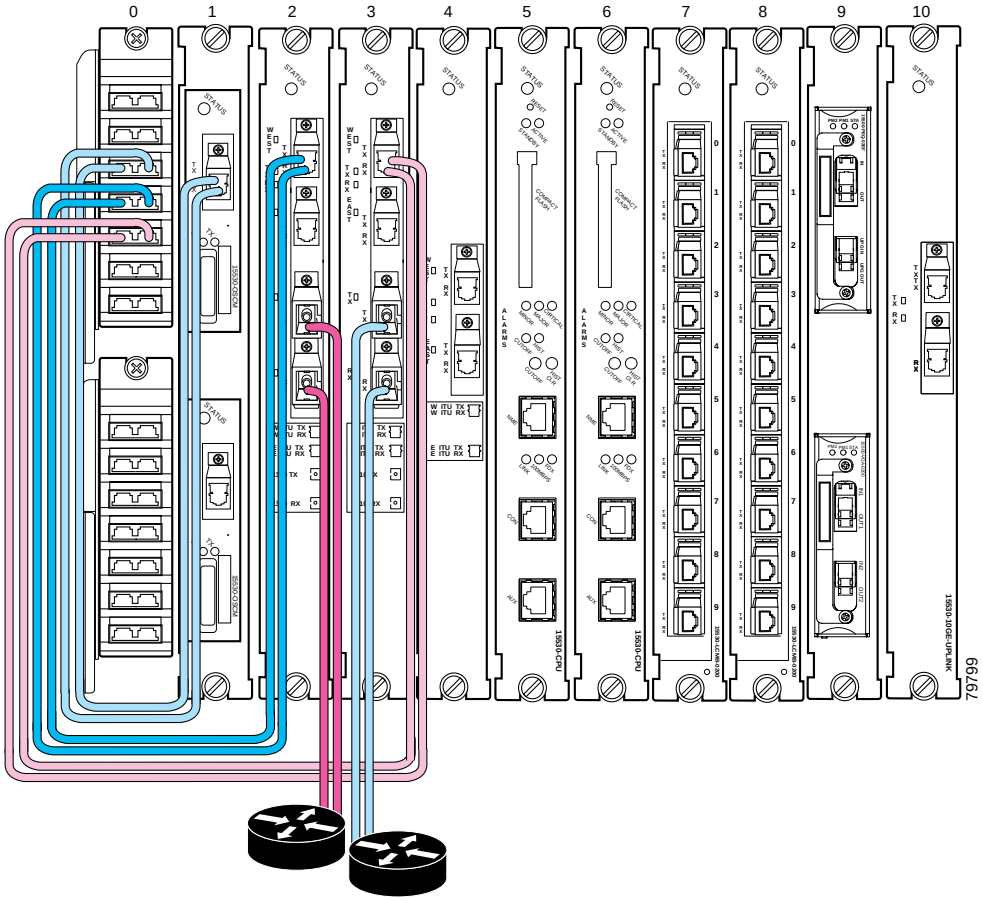
Step 2 Use MU cables to connect the EAST TX RX ports of the PSM to the appropriate east side equipment for your configuration.

Step 3 Use MU cables to connect the MUX/DEMUX OUT IN ports of the PSM to the TX RX ports of the 2.5-Gbps ITU trunk card.

Connecting the Transponder Line Card

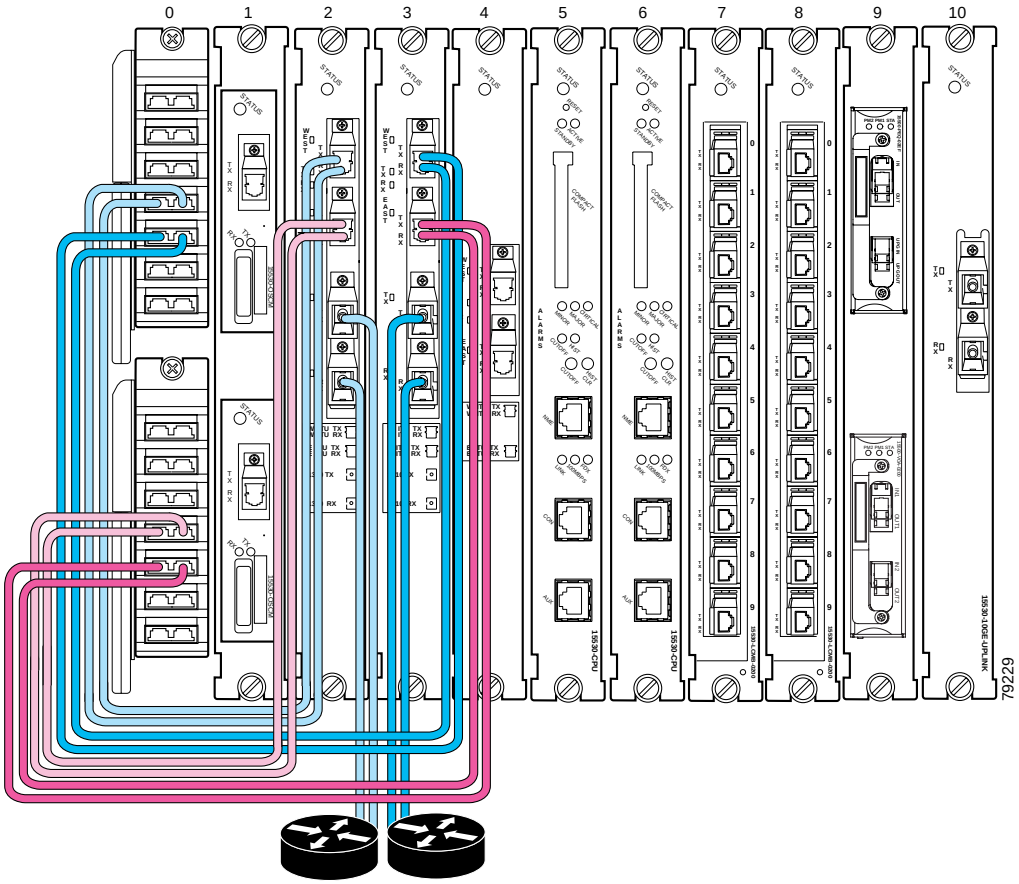
The transponder line card receives a single client signal, converts it into an ITU wavelength or channel, and sends it to the OADM module. Figure 3-14 shows the cable connections in an unprotected configuration. The ITU transmit port of the transponder line card is connected to the Coexists IN port of the OADM module and the ITU receive port is connected to the Coexists OUT port. The client side transmit and receive ports on the transponder line card are connected to the client router.

Figure 3-14 Transponder Line Card Cable Connections (Unprotected)



In a splitter configuration the connections are the same, with the addition of a second set of ITU ports on the transponder line card. In a splitter configuration the two sets of ITU ports are labeled WEST and EAST and two OADM modules are required. Figure 3-15 shows the cable connections in a splitter configuration.

Figure 3-15 Transponder Line Card Cable Connections (Splitter)

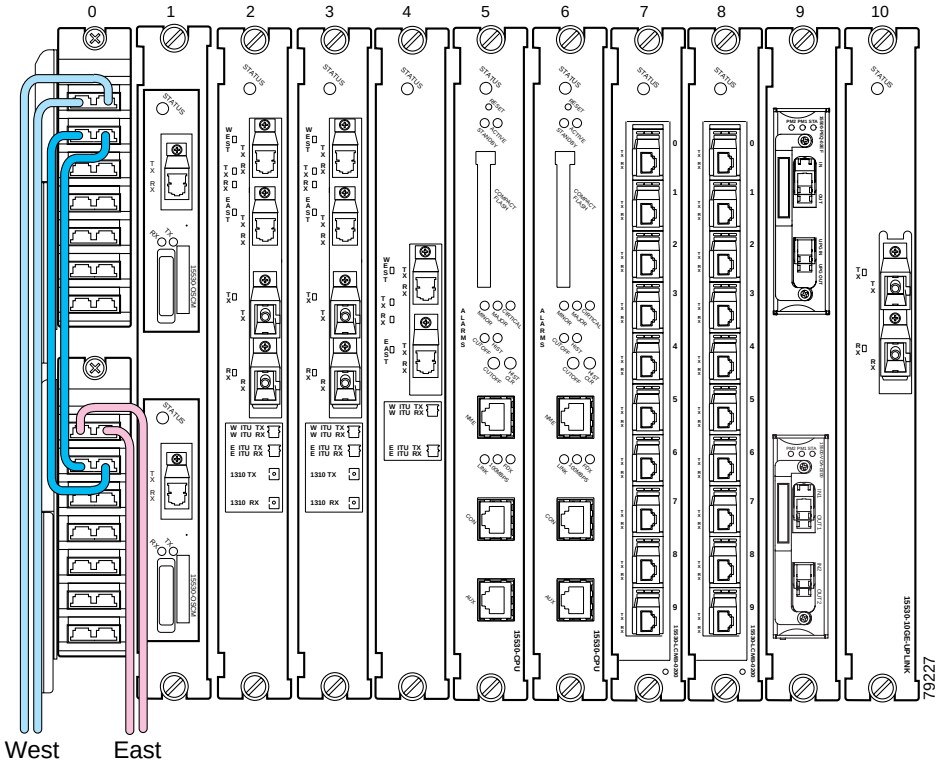


Connecting the OADM Module

The OADM module takes signals from the transponder line cards and the 10-Gbps ITU trunk cards, multiplexes the signals, and puts the multiplexed signal on the network. In the reverse direction, the OADM modules demultiplexes incoming signals and sends them to the transponder line cards and the 10G ITU line cards. See the "Connecting the PSM" section on page 3-14 and the "Connecting the 10-Gbps ITU Tunable and Non tunable Trunk Card" section on page 3-26 for specific information on these connections.

Figure 3-16 shows the OADM module network connections in a splitter configuration. The TRUNK_IN and TRUNK_OUT ports of the first OADM module are connected to the west side trunk. The TRUNK_IN and TRUNK_OUT ports of the second OADM module are connected to the east side trunk. In addition the MID_IN port of the first OADM module is connected to the MID_OUT port of the second OADM module, and the MID_OUT port of the first OADM module is connected to the MID_IN port of the second OADM module.

Figure 3-16 OADM Module Trunk Cable Connections

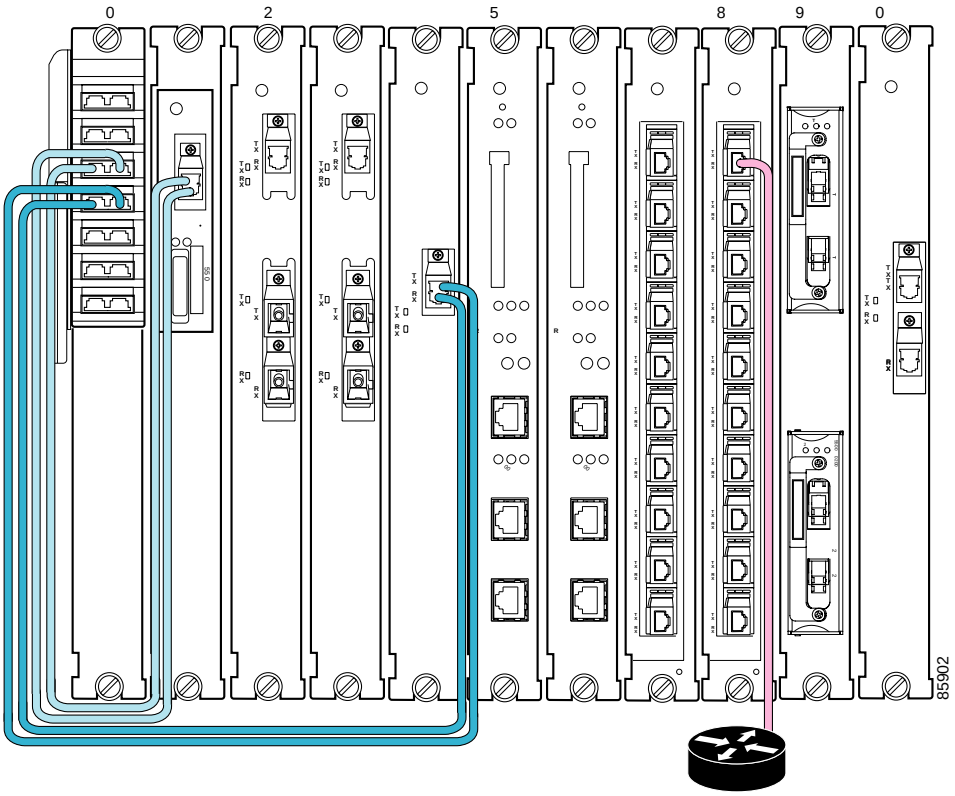


Connecting the ESCON Aggregation Card

The ESCON aggregation card converts up to 10 client signals from optical to electrical and aggregates them into a single 2.5-Gbps signal. The aggregated signal is then sent through the backplane and the active switch fabric to either a 2.5-Gbps ITU trunk card, 10-Gbps ITU trunk card, or a 10-Gbps uplink line card. Figure 3-17 shows the connections.

Note Only use Cisco-certified SFP optics for the ESCON aggregation cards.

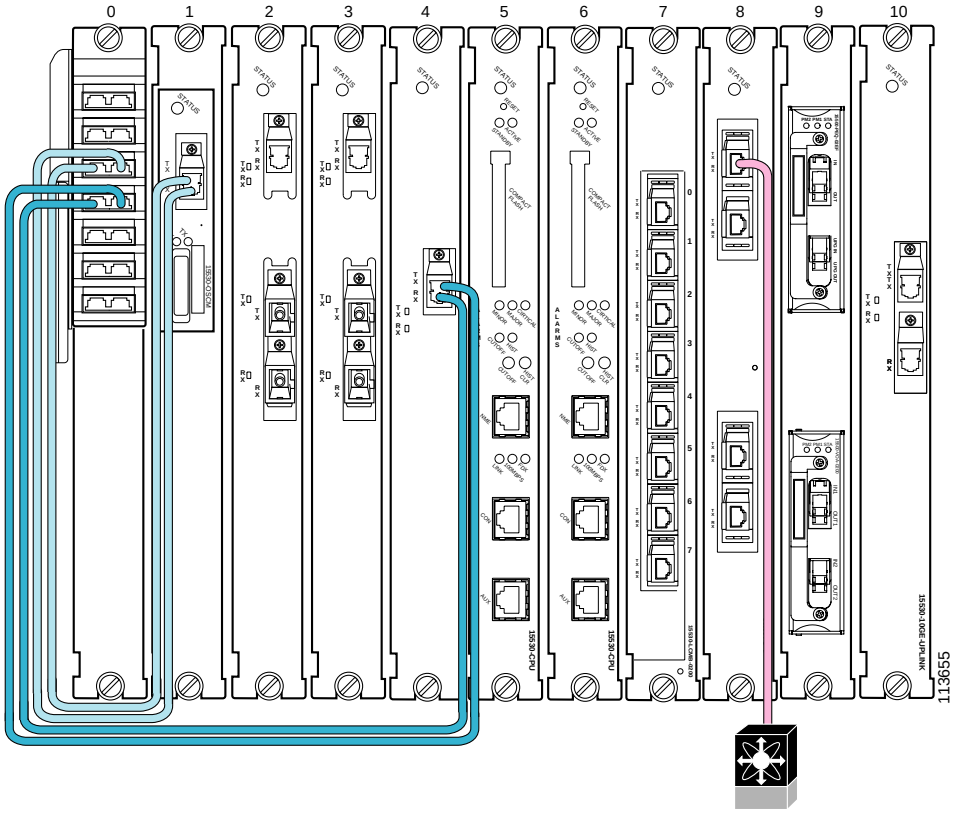
Figure 3-17 ESCON Aggregation Card Cable Connections (Unprotected)



Connecting the 4-Port 1-Gbps/2-Gbps FC Aggregation Card

The 4-port 1-Gbps/2-Gbps FC aggregation card accepts up to four Cisco-certified SFP (small form-factor pluggable) optics for client traffic. Each SFP supports Fibre Channel, FICON, or ISC depending on how it is configured in the CLI. The 4-port 1-Gbps/2-Gbps FC aggregation card converts client signals from optical form to electrical form, and then aggregates them into four 2.5-Gbps signals over the backplane. These aggregated signals pass through the backplane and the switch fabric on the active CPU switch module to a 2.5-Gbps ITU trunk card, a 10-Gbps ITU trunk card, or a 10-Gbps uplink card. The cross connections between the two cards through the backplane and switch fabric are configured using the CLI. The 4-port 1-Gbps/2-Gbps FC aggregation card has redundant connections over the backplane to the switch fabric on the active and standby CPU switch modules. Figure 3-18 shows the connections.

Figure 3-18 4-port 1-Gbps/2-Gbps FC Aggregation Card Cable Connections



The Cisco ONS 15530 supports up to four 4-port 1-Gbps/2-Gbps FC aggregation cards for a total of 16 unprotected and protected client signals and up to three 4-port 1-Gbps/2-Gbps FC aggregation cards for 12 protected client signals.

The 4-port 1-Gbps/2-Gbps FC aggregation cards is configurable on a single port basis. The SFPs enable this card to support four Fibre channel, FICON, or ISC interfaces running at full speed. The card has four ports on the client side and four 2.5-GE lanes on the trunk side.

The 4-port 1-Gbps/2-Gbps FC aggregation card uses single-mode and multimode SFPs for the client signals. There are no restrictions on populating the line card with SFPs. For example, you can mix a single-mode SFP optic with a multimode SFP optic.

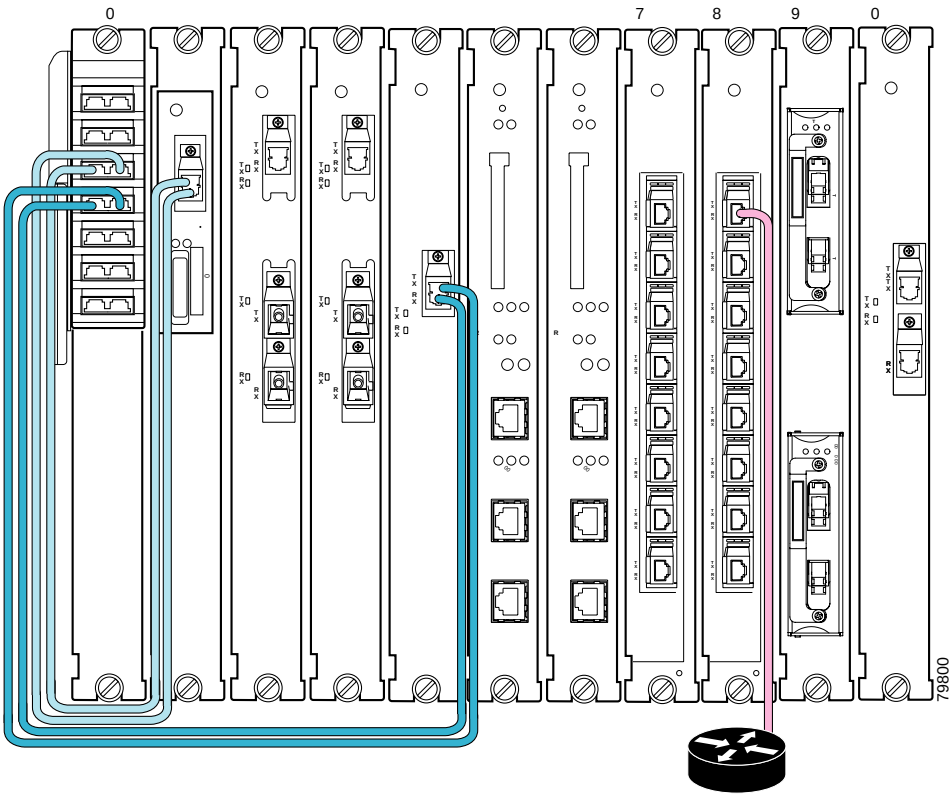
Note Only use Cisco-certified SFPs for the 4-port 1-Gbps/2-Gbps FC aggregation cards.

Connecting the 8-Port FC/GE Aggregation Card

The 8-port FC/GE aggregation card accepts up to eight Cisco-certified SFP (small form-factor pluggable) optics for client traffic. Each SFP supports either FC, FICON, GE or ISC, depending on how it is configured in the CLI. The 8-port FC/GE aggregation card converts client signals from two adjacent port pairs (0–1, 2–3, 4–5, or 6–7) from optical form to electrical form, and then aggregates them into four 2.5-Gbps signals over the backplane. These aggregated signals pass through the backplane and the switch fabric on the active CPU switch module to a 2.5-Gbps ITU trunk card, a 10-Gbps ITU trunk card, or a 10-Gbps uplink card. The cross connections between the two cards through the backplane and switch

fabric are configured using the CLI. The 8-port FC/GE aggregation card has redundant connections over the backplane to the switch fabric on the active and standby CPU switch modules. Figure 3-19 shows the connections.

Figure 3-19 8-Port FC/GE Aggregation Card Cable Connections



Note We strongly recommend configuring port pairs as FC only or GE only. Mixing FC and GE in a port pair increases the FC signal latency between nodes.

The Cisco ONS 15530 supports up to four 8-port FC/GE aggregation cards for a total of 32 unprotected client signals and up to three 8-port FC/GE aggregation cards for 24 protected client signals.

The 8-port FC/GE aggregation card is configurable on a single port basis. The SFPs enable this card to support eight Fibre channel or Gigabit Ethernet interfaces running at full speed. The card has eight ports on the client side and four 2.5-GE lanes on the trunk side.

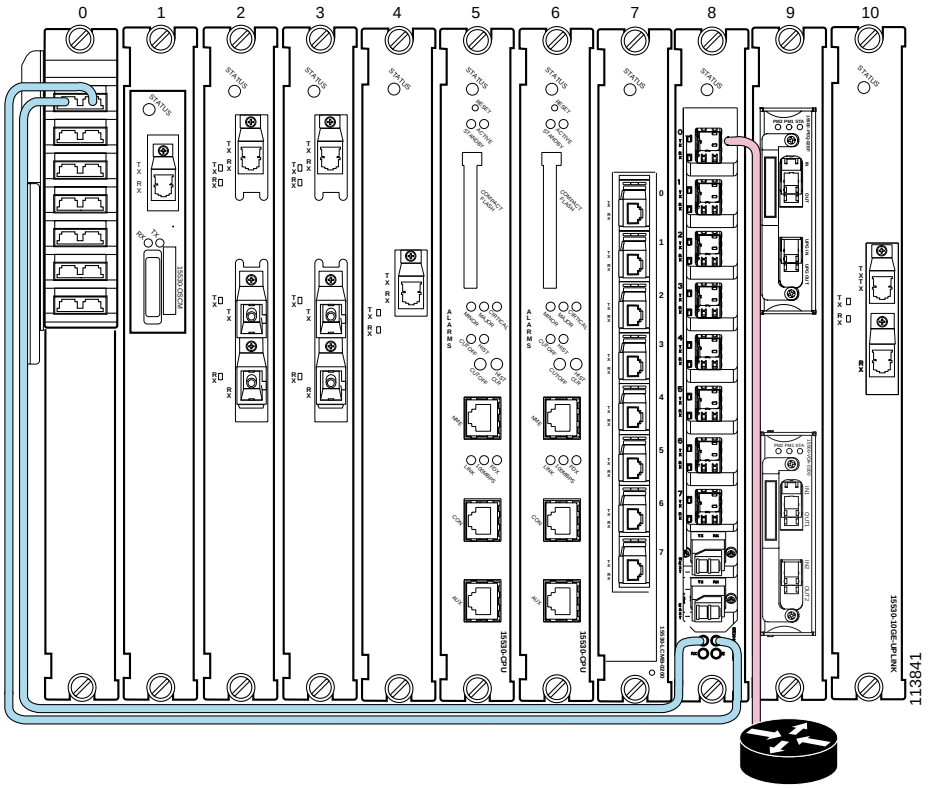
The 8-port FC/GE aggregation card uses single-mode and multimode SFP optics for the client signals. There are no restrictions on populating the line card with SFPs. For example, you can mix a single-mode SFP optic with a multimode SFP optic in the same port pair.

Note Only use Cisco-certified SFP optics for the 8-port FC/GE aggregation cards.

Connecting the 8-Port Multi-Service Muxponder

The 8-port multi-service muxponder accepts up to eight Cisco-certified SFPs for client traffic. Each SFP supports different protocols that can be aggregated and transported ranging from high-speed services such as Fibre Channel and Gigabit Ethernet to low-speed services such as OC-3, Fast Ethernet, T1, or E1, depending on how it is configured in the CLI. The 8-port multi-service muxponder is configurable on a single port basis. The Cisco ONS 15530 supports up to four 8-port multi-service muxponders for a total of 32 unprotected client signals and up to three 8-port multi-service muxponders for 24 protected client signals. Figure 3-20 shows the possible connections.

Figure 3-20 8-Port Multi-Service Muxponder Cable Connections



Note Only use Cisco-certified SFPs for the 8-port multi-service muxponder.

Connecting the 2.5-Gbps ITU Trunk Card

The 2.5-Gbps ITU trunk card has three redundant interfaces to the backplane that pass signals to and from the line cards. The optical ports on the front of the line card are connected to the OADM module. The TX port of the 2.5-Gbps ITU trunk card is connected to the CHxxxIN port of the OADM module and the RX port is connected to the CHxxxOUT port. Figure 3-21 shows these connections in an unprotected configuration.

Figure 3-21 2.5-Gbps ITU Trunk Card Cable Connections (Unprotected)

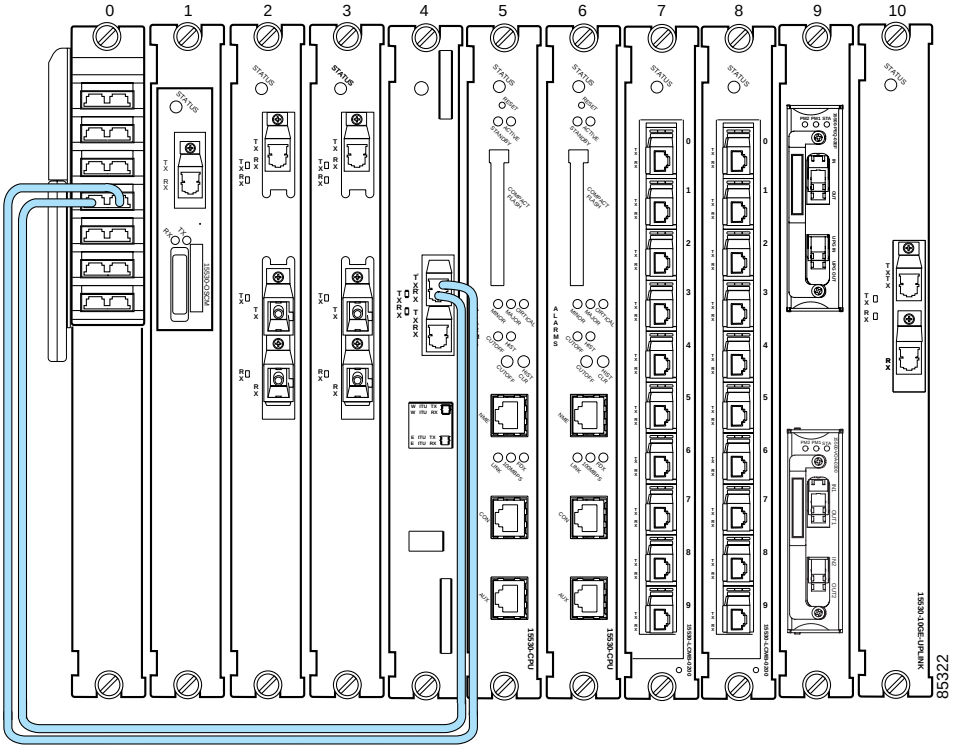
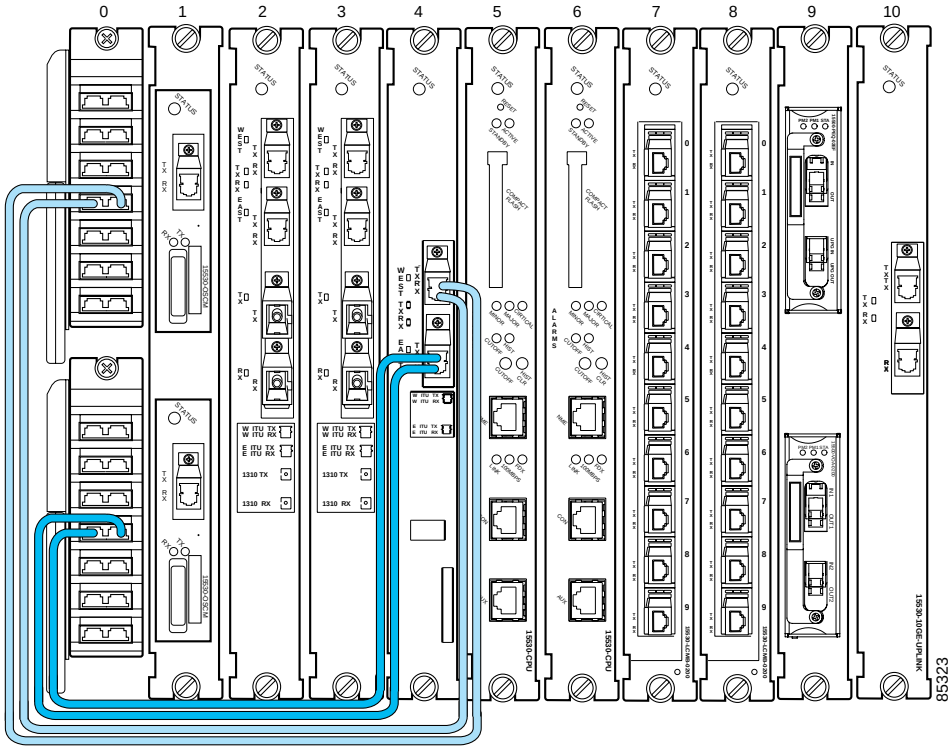


Figure 3-22 shows these connections in a splitter configuration. The WEST port connections go to the first OADM module and the EAST port connections go to the second OADM module.

Figure 3-22 2.5-Gbps ITU Trunk Card Cable Connections (Splitter)



Connecting the 10-Gbps ITU Tunable and Non tunable Trunk Card

The 10-Gbps ITU trunk card, both tunable and non tunable, has four separate redundant interfaces to the backplane that passes signals to and from the line cards. The optical ports on the front of the line card are connected to the OADM module. The TX port of the 10-Gbps ITU trunk card is connected to the CHxxxIN port of the OADM module and the RX port is connected to the CHxxxOUT port. Figure 3-23 show these connections in an unprotected configuration.

Figure 3-23 10-Gbps ITU Tunable or Non tunable Trunk Card Cable Connections (Unprotected)

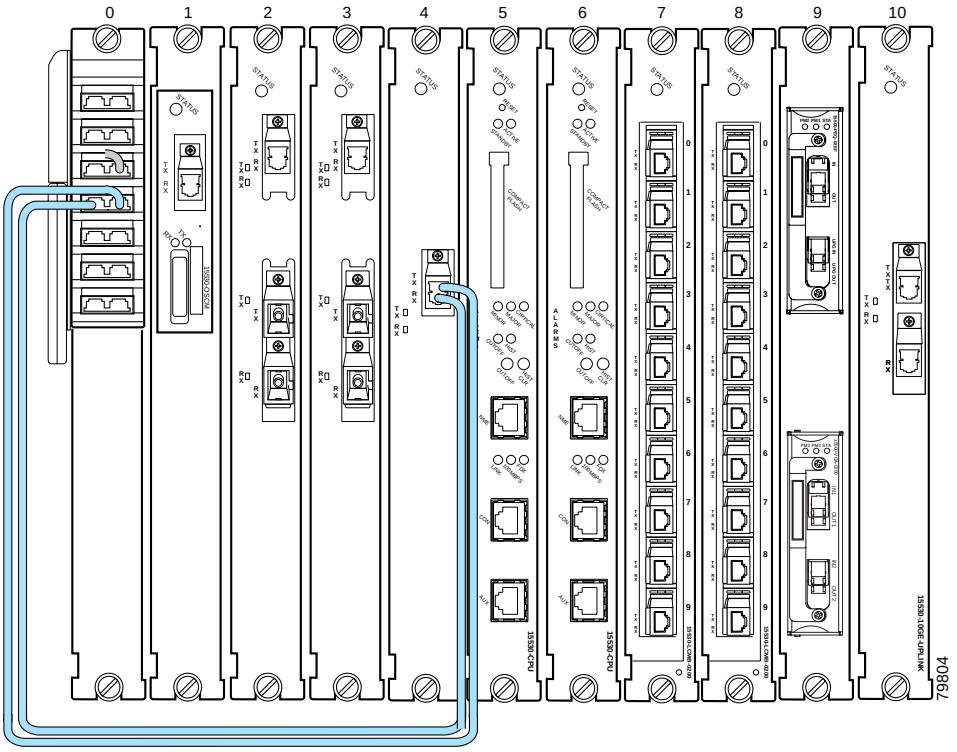
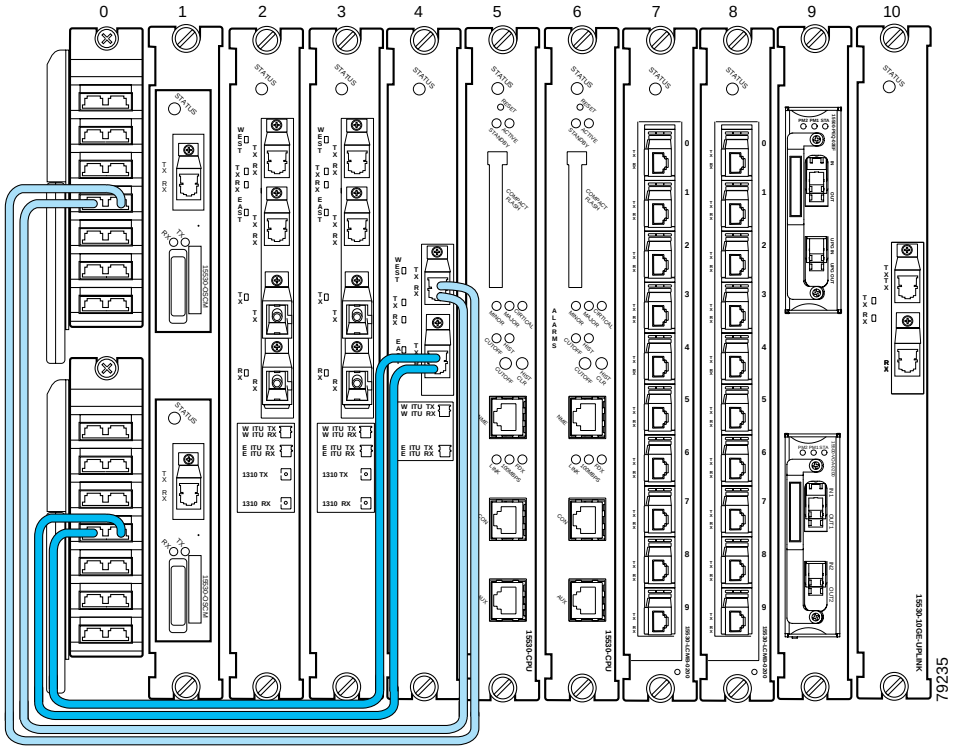


Figure 3-24 shows these connections in a splitter configuration. The WEST port connections go to the first OADM module and the EAST port connections go to the second OADM module.

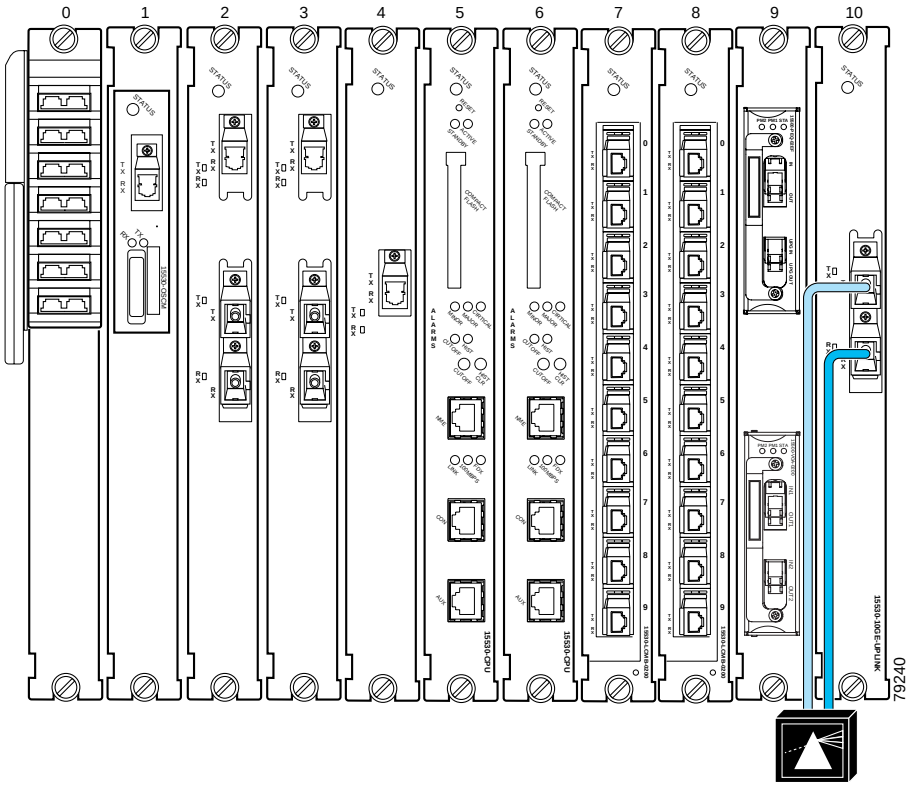
Figure 3-24 10-Gbps ITU Tunable or Non tunable Trunk Card Cable Connections (Splitter)



Connecting the 10-Gbps Uplink Card

The 10-Gbps uplink card sends and receives a 10-GE 1310-nm signal to and from a 10-GE transponder module on a Cisco ONS 15540 ESP or Cisco ONS 15540 ESPx. This card accepts up to four 2.5-Gbps (3.125-Gbps line rate) electrical signals from ESCON line cards and combines them into a 10-GE signal. This signal is converted to a 1310 nm wavelength signal. Figure 3-25 shows the cable connections.

Figure 3-25 10-Gbps Uplink Line Card Cable Connections



Connecting the WB-VOA and PB-OE Modules

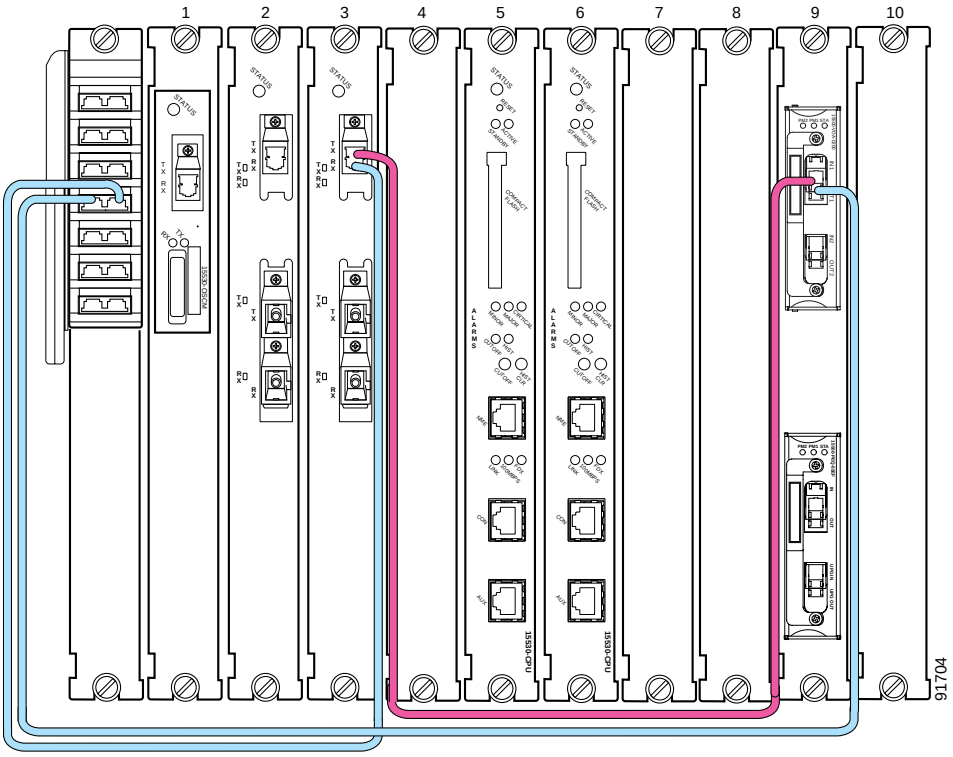
The WB-VOA and PB-OE modules allow the Cisco ONS 15530 to extend the inter-nodal and ring circumference distances, and to extend the number of nodes supported for hubbed ring, and meshed ring networks by equalizing power levels. The WB-VOA and PB-OE modules can be configured in several ways.

This section includes the following topics:

Per-Channel Equalization

Figure 3-26 shows an example of per-channel equalization in an unprotected configuration. In this example, the WB-VOA is the top module in slot 9.

Figure 3-26 Per Channel Equalization (Unprotected)



Note The OSC channels can also be equalized.

To install the cables, follow these steps:

Step 1 Connect the IN port of the WB-VOA module to the TX port of the transponder.

Step 2 Connect the OUT port of the WB-VOA module to the channel IN port of the OADM.

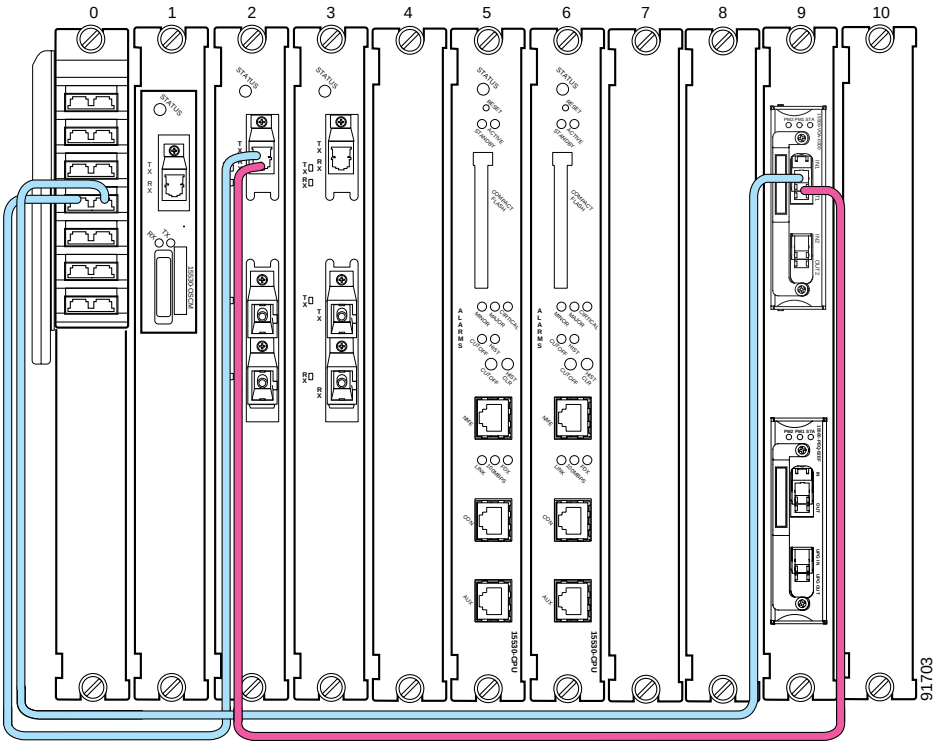
Step 3 Connect the RX port of the transponder to the channel OUT port of the OADM.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

WB-VOA Attenuation on the Receive Side

The WB-VOA module can be connected on the receive side to attenuate the signal. Figure 3-27 shows an example of WB-VOA attenuation on the receive side in an unprotected configuration. In this example, the WB-VOA is the top module in slot 9.

Figure 3-27 WB-VOA Attenuation on the Receive Side (Unprotected)



To install the cables, follow these steps:

Step 1 Connect the IN port of the WB-VOA module to the channel OUT port of the OADM.

Step 2 Connect the OUT port of the WB-VOA module to the RX port of the transponder.

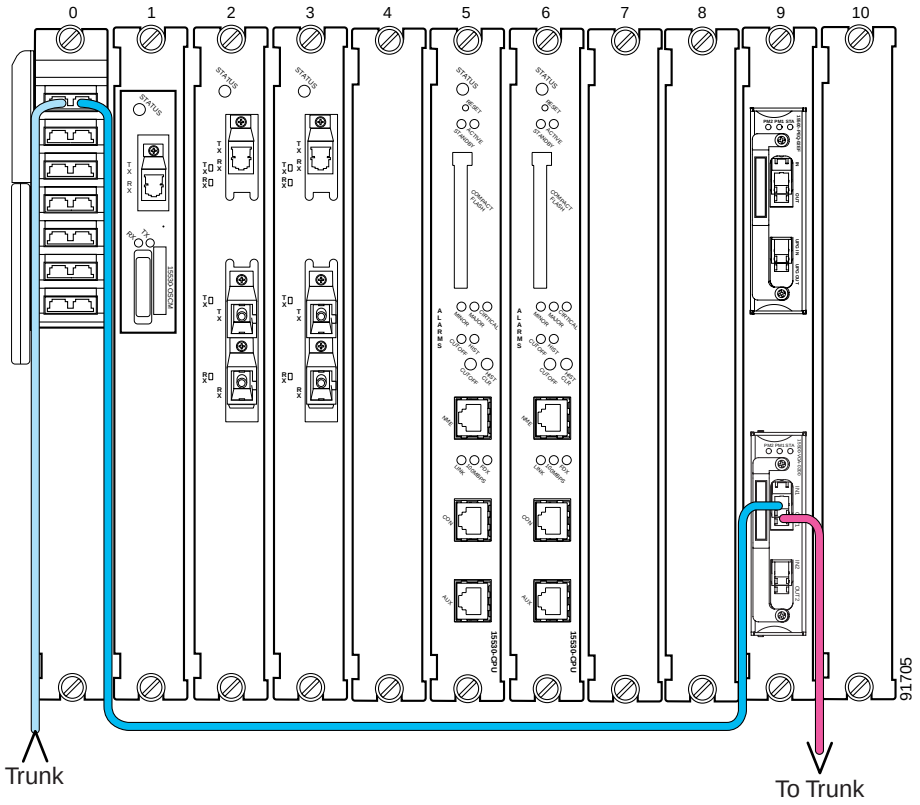
Step 3 Connect the TX port of the transponder to the channel IN port of the OADM.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

WB-VOA on the Trunk

The WB-VOA module can be connected to attenuate the trunk signal leaving the node. Figure 3-28 shows an example of these cable connections on an unprotected configuration. In this example, the WB-VOA is the bottom module in slot 9.

Figure 3-28 WB-VOA on Trunk (TX Side)



To connect the WB-VOA on the trunk, follow these steps:

Step 1 Connect the outside trunk to the TRUNK_IN port of the OADM module.

Step 2 Connect the TRUNK_OUT port of the OADM module to the IN port of the WB-VOA module.

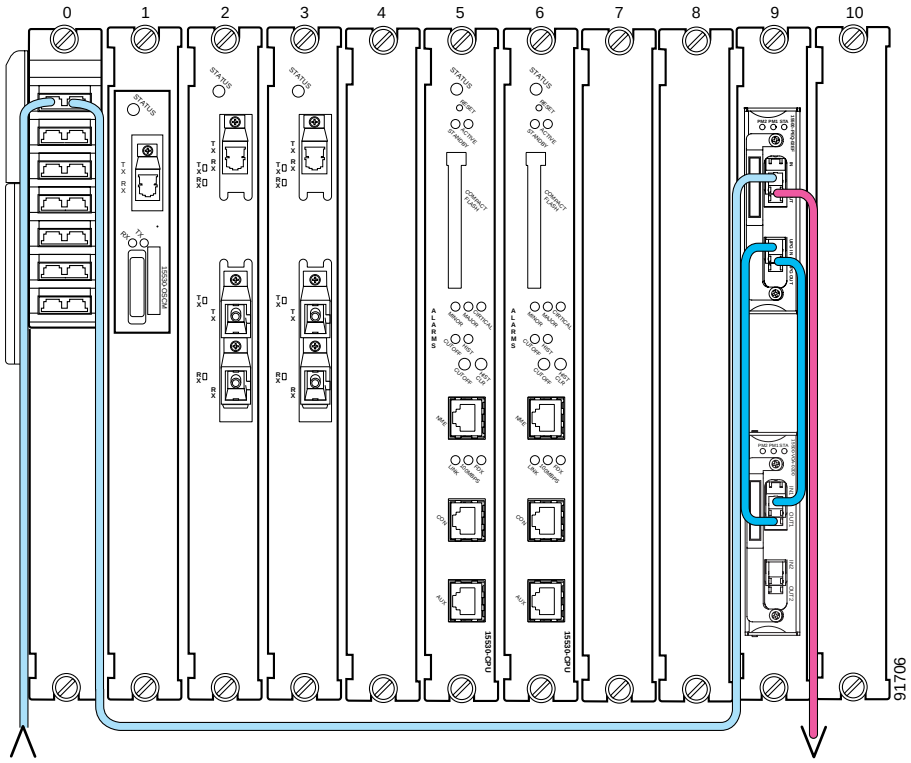
Step 3 Connect the OUT port of the WB-VOA module to the outside trunk.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

PB-OE on the Trunk to Equalizing Add Channel Power to Pass Through Power

The PB-OE provides per-band attenuation on the trunk. Figure 3-29 shows an example of an unprotected configuration of a PB-OE module cabled on the trunk. In this example, the PB-OE is the top module in slot 9, and the WB-VOA is the bottom module in slot 9.

Figure 3-29 PB-OE on the Trunk (Unprotected)



To install the cables in an unprotected configuration, follow these steps:

Step 1 Connect the OUT port of the PB-OE module to the trunk.

Step 2 Connect the IN port of the PB-OE module to TRUNK_OUT port of the OADM.

Step 3 Connect the TRUNK_IN port of the OADM to the outside trunk.

Step 4 Connect the UPG_IN port of the PB-OE module to the OUT port of the WB-VOA module.

Step 5 Connect the UPG_OUT port of the PB-OE module to the IN port of the WB-VOA module.

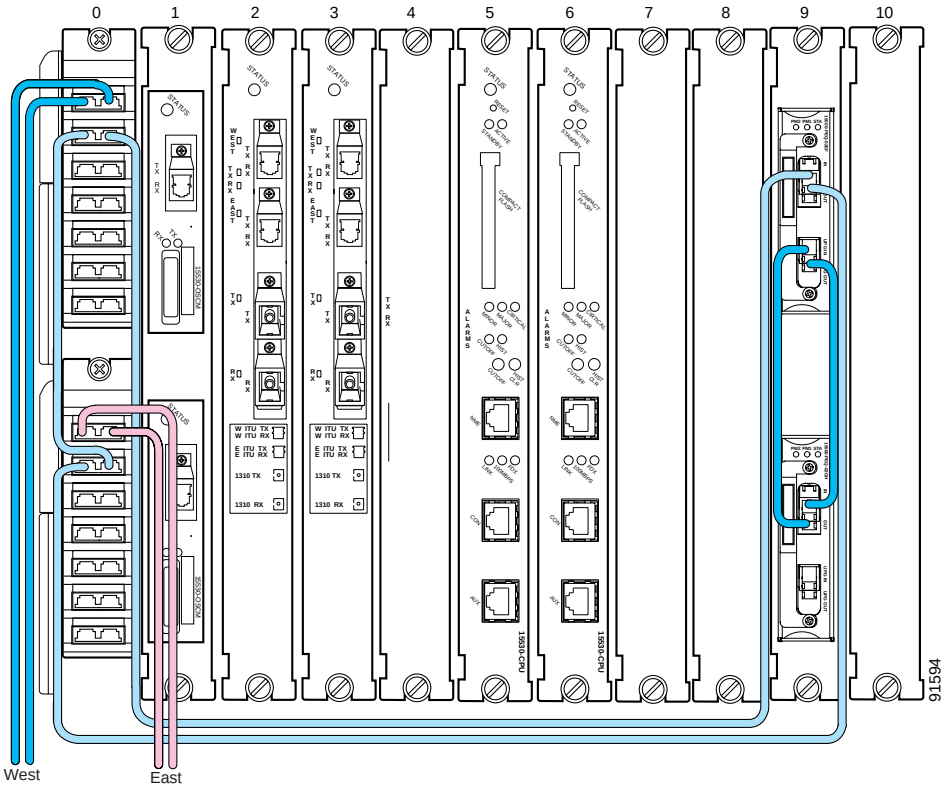
Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

Using PB-OE Modules to Terminate Unused Bands

PB-OE modules can be used to equalize power and terminate unused bands, eliminating potential lasing effects. This configuration is also known as an optical seam. Place optical seams in meshed ring topologies where there are no nodes equivalent to the hub node in a hubbed ring topology where all the used and unused bands terminate. Be sure to have PB-OE modules in the optical seam to equalize every added band on the network.

Figure 3-30 shows an example of two PB-OE modules configured to equalize bands E, F, G and H and terminate the unused bands in the west to east direction only. The east to west direction can be configured on any node.

Figure 3-30 Using PB-OE Modules to Terminate Unused Bands



To install the cables in this configuration, follow these steps:

Step 1 Connect the MID_IN port of the first OADM module to the MID_OUT port of the second OADM module.

Step 2 Connect the MID_OUT port of the first OADM module to the IN port of the first PB-OE module.

Step 3 Connect the MID_IN port of the second OADM module to the OUT port of the first PB-OE module.

Step 4 Connect the UPG_IN port of the first PB-OE module to the OUT port of the second PB-OE module.

Step 5 Connect the UPG_OUT port of the first PB-OE module to the IN port of the second PB-OE module.

Step 6 Connect the TRUNK_IN and TRUNK_OUT ports of the first OADM module to the west side trunks.

Step 7 Connect the TRUNK_IN and TRUNK_OUT ports of the second OADM module to the east side trunks.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

Connecting a Multi-Shelf Node

There are a number of ways to configure a multi-shelf node. Figure 3-31 and Figure 3-32 are two examples of how multi-shelf nodes can be connected. Figure 3-31 shows a configuration of cascaded OADMs which supports multiple bands in the node and Figure 3-32 shows a three shelf node with OSC modules that are added and dropped on each shelf.

Figure 3-31 Cascading the OADMs on a Multi-Shelf Node

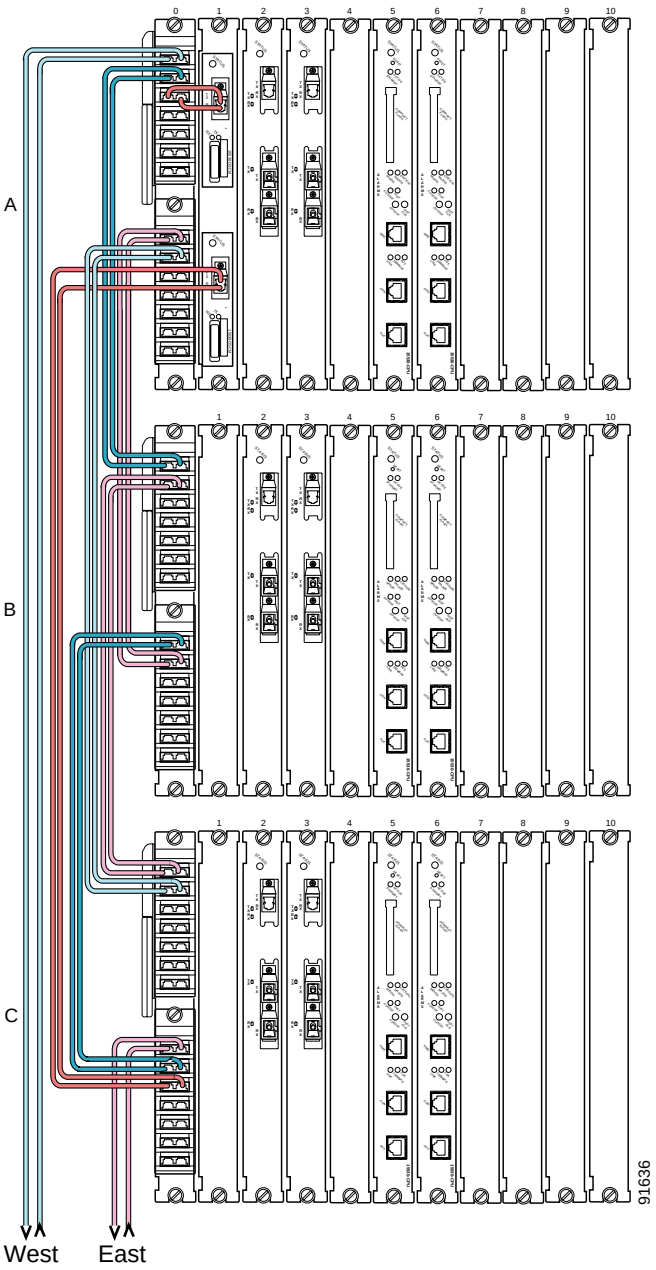
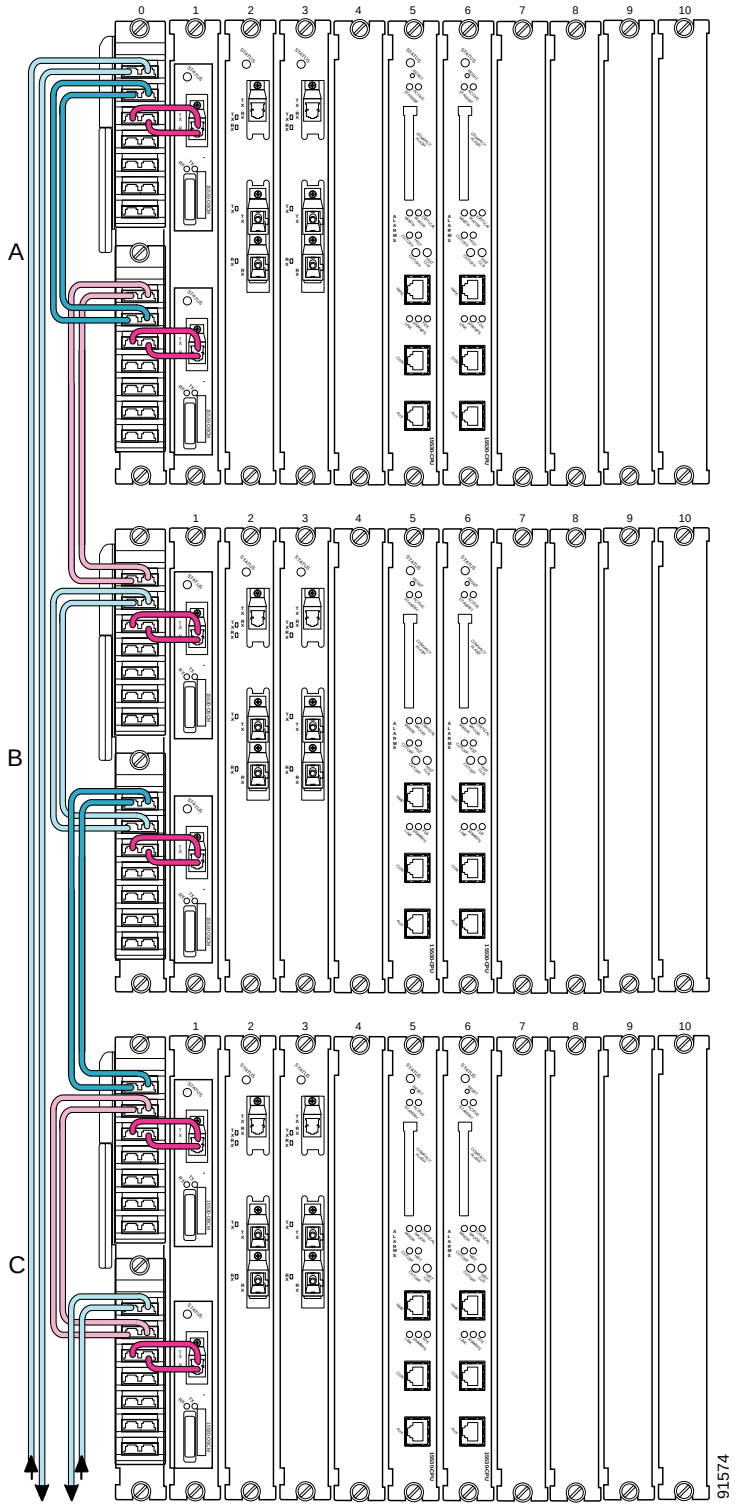


Figure 3-32 Basic Cable Connections on a Multi-Shelf Node



To connect a three shelf node with cascaded OADMs, follow these steps:

Step 1 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 2 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 3 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 4 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 5 Connect the TRUNK_IN and the TRUNK_OUT ports of the second OADM in shelf C to the east side trunk.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

To connect a three shelf node in a splitter configuration where the OSC modules are added and dropped on each shelf, follow these steps:

Step 1 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 2 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 3 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 4 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 5 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 6 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.

Note The IN ports on the OADM module (slot 0) are on the left, the OUT ports are on the right. (See Figure 1-16 on page 1-21).

Cable Management

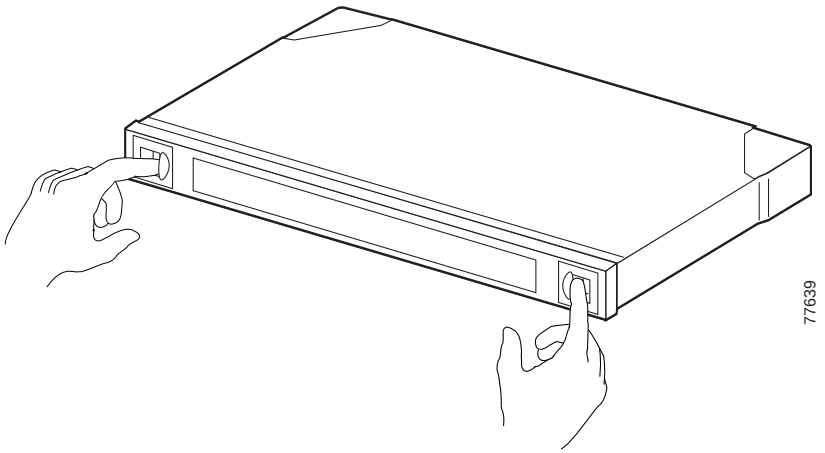
Due to the flexibility and complexity of configurations available with the Cisco ONS 15530, managing the placement and storage of the fiber optic cables is a must. To avoid confusion and ensure the integrity of the fiber optic cables used with the Cisco ONS 15530, we recommend that both ends of all fiber optic cables be labelled. Labels for this purpose are shipped with the system.

Note The cable storage drawer can accommodate attenuators that are available from optical component distributors.

The cable storage drawer provides the management system for the cabling. The following procedures describe how to connect the cables on your system.

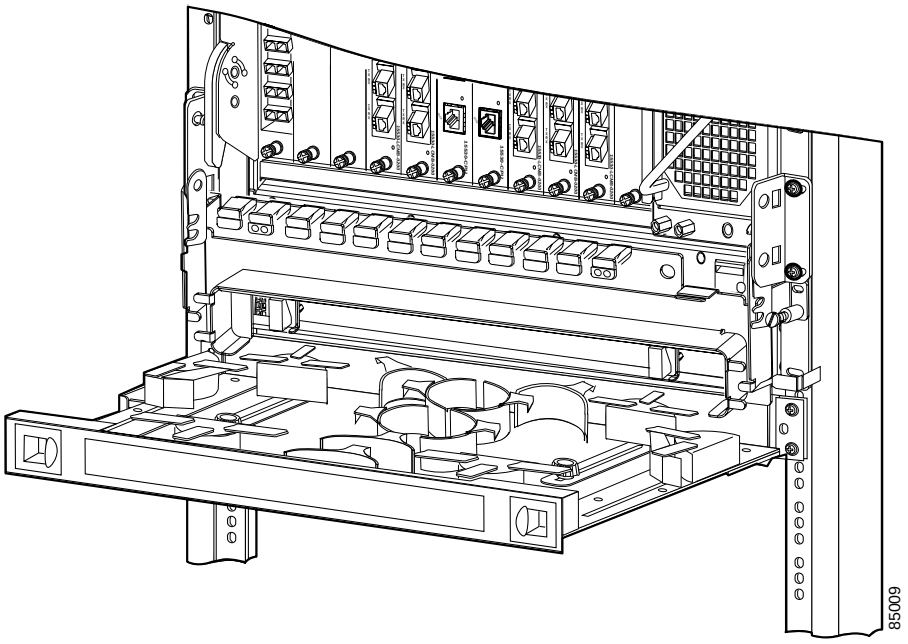
Step 1 Open the cable storage drawer by pushing the tabs in to release the lock on the drawer (see Figure 3-33).

Figure 3-33 Opening the Cable Storage Drawer



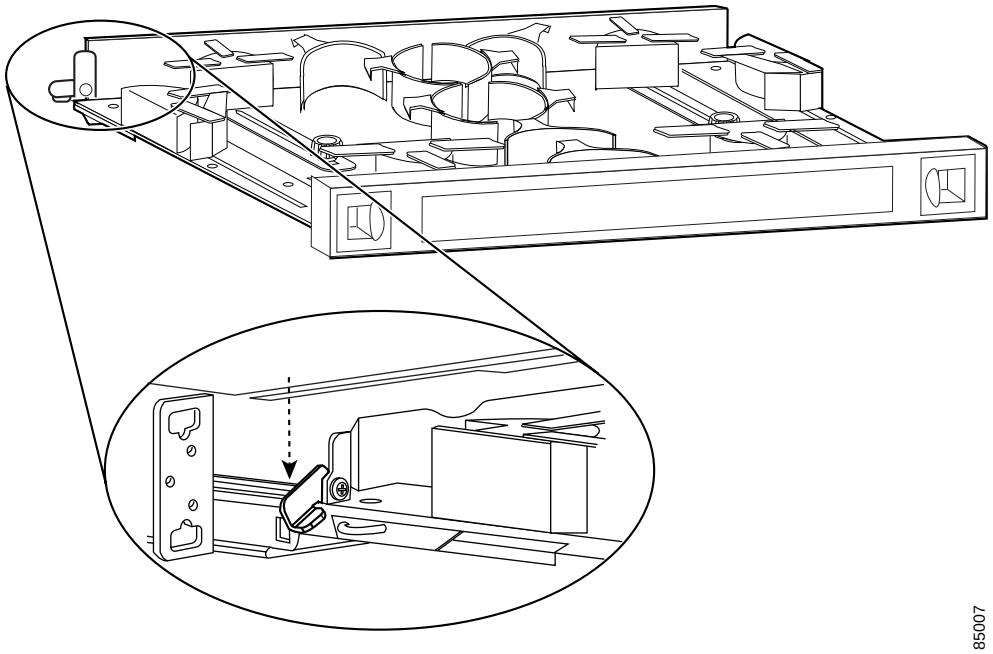
Step 2 Pull out the cable storage drawer (see Figure 3-34).

Figure 3-34 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 3-35).

Figure 3-35 Locking the Cable Storage Drawer Open



Step 4 Install the fiber optic cables as discussed in the preceding sections.

Step 5 Route the excess cable of each connection down through the cable storage drawer.

Step 6 Route the cable around the sliding cable retainers on both sides of the drawer and around the appropriate stationary retainers to take up the cable slack.

Step 7 When all cables have been connected and neatly routed, unlock and close the drawer. To unlock the cable storage drawer, move the latch at the rear of the drawer into an upright position. (See Figure 3-36.)

Step 8 Use the supplied cable ties to secure the cables to the rack.

Figure 3-36 Unlocking the Cable Storage Drawer