Installing the Cisco ONS 15216 100 GHz DWDM Filters

Overview

This document contains functional and physical descriptions as well as instructions for installing the Cisco ONS 15216 DWDM filters. The ONS 15216 has two separate rack mounted filter assemblies, a red base unit and a blue upgrade unit. The filters mount in a 19- or 23-inch rack and occupy 1 RU. The ONS 15216 filters are intended for use with the ONS 15454 DWDM ITU optics cards but can be used with other optical equipment with laser outputs that follow the ITU 200 GHz optics plan.
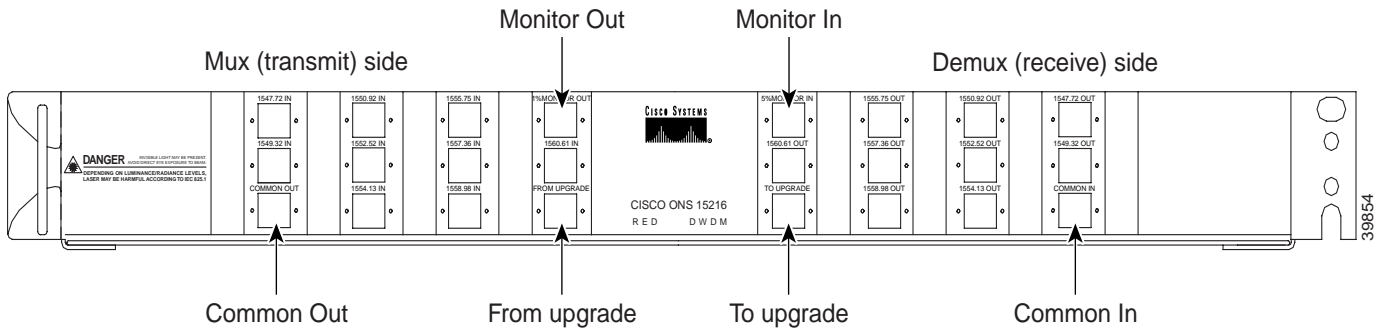
Red Base Unit

The ONS 15216 Red DWDM base unit is a passive filter comprised of an ITU-compliant 200 GHz unidirectional 9x1 multiplexer (mux) and a 200 GHz unidirectional 1x9 demultiplexer (demux) that operate at the following wavelengths: 1547.72 nm, 1549.32 nm, 1550.92 nm, 1552.52 nm, 1554.13 nm, 1555.75 nm, 1557.36 nm, 1558.98 nm, and 1560.61 nm.

The base unit also features a red/blue band splitter (coupler) with a corresponding pair of blue upgrade ports that connect the blue upgrade unit to the red base unit. The blue upgrade ports on the red base unit can support wavelengths from 1530.33 nm to 1542.94 nm. This allows growth of up to 18 wavelengths on a single fiber pair.

The ONS 15216 base unit has nine mux ports and nine demux ports. The unit also has a pair of monitor ports (outputs) that allows the user to monitor the signals in the common transmit and receive fibers in a non-intrusive manner. The monitor ports use a 1%/99% tap splitter on the transmitter (mux) side and a 5%/95% tap splitter on the receiver (demux) side. The *Common In* port connects fiber into the base unit. Outgoing fiber connects to the *Common Out* port. The base unit connects to the upgrade unit through the *To Upgrade* and *From Upgrade* ports. Figure 1 shows the front panel of the red base unit.
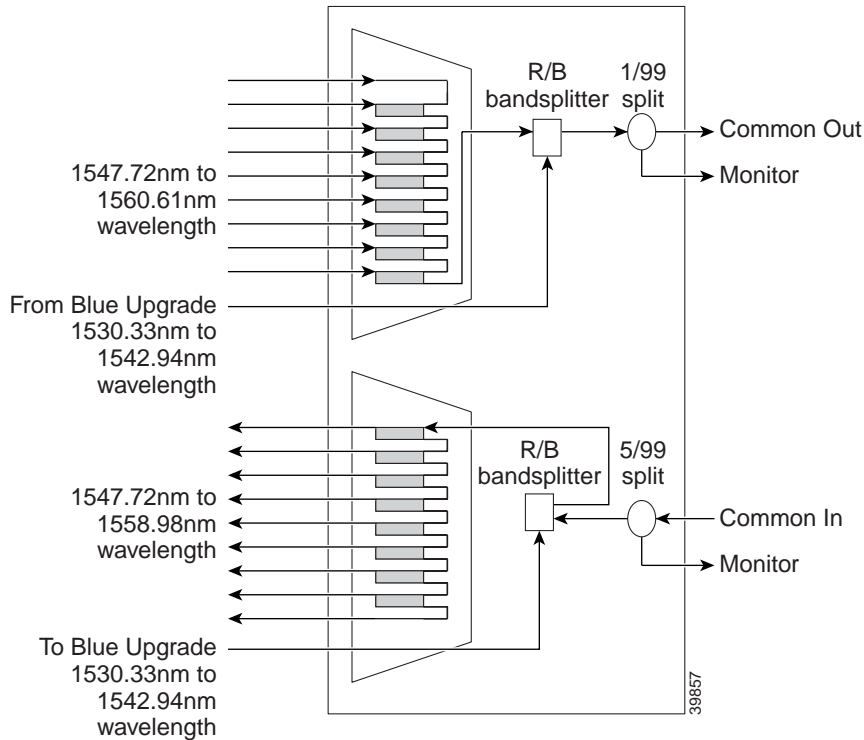
Figure 1   Front Panel of the ONS 15216 Red DWDM Base Unit

The red base unit is divided into two halves: mux and demux. The mux half is the transmit side and the demux half is the receive side. Figure 2 is a block diagram that shows the functional layout of the red base unit.

Figure 2   Block Diagram of the ONS 15216 Red DWDM Base Unit

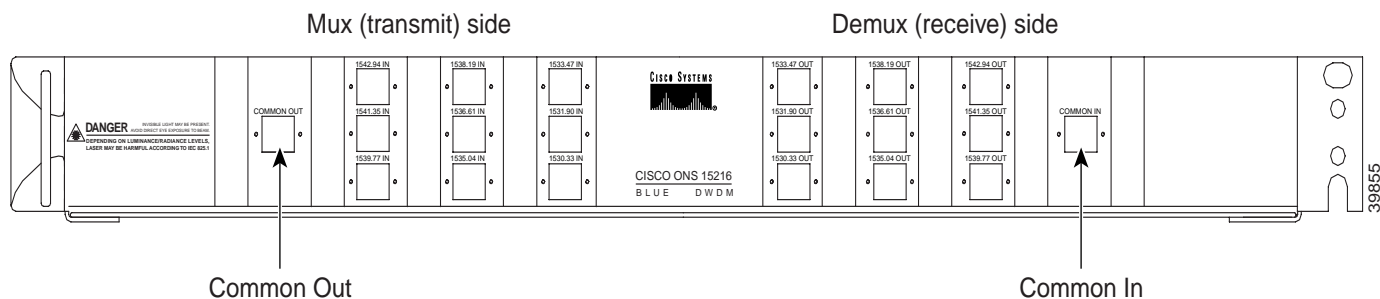

Blue Upgrade Unit

The ONS 15216 Blue DWDM upgrade unit is a passive filter consisting of an ITU-compliant 200 GHz unidirectional 9x1 mux and a 200 GHz unidirectional 1x9 demux that operate at the following wavelengths: 1530.33 nm, 1531.90 nm, 1533.47 nm, 1535.04 nm, 1536.61 nm, 1538.19 nm, 1539.77 nm, 1541.35 nm, and 1542.94 nm.

The ONS 15216 upgrade unit has nine mux ports and nine demux ports. The *Common In* port connects fiber into the base unit. Outgoing fiber connects to the *Common Out* port. The Blue DWDM filter can also operate as a stand alone unit for up to nine wavelengths on a fiber pair.

Figure 3 shows the front panel of the blue upgrade unit.

Figure 3   *Front Panel of the ONS 15216 Blue DWDM Upgrade Unit*

The blue upgrade unit is also divided into two halves: mux and demux. As with the red base unit, the mux half is the transmit side and the demux half is the receive side. Figure 4 is a block diagram that shows the functional layout of the blue upgrade unit.

Figure 4   *Block Diagram of the ONS 15216 Blue DWDM Base Unit*
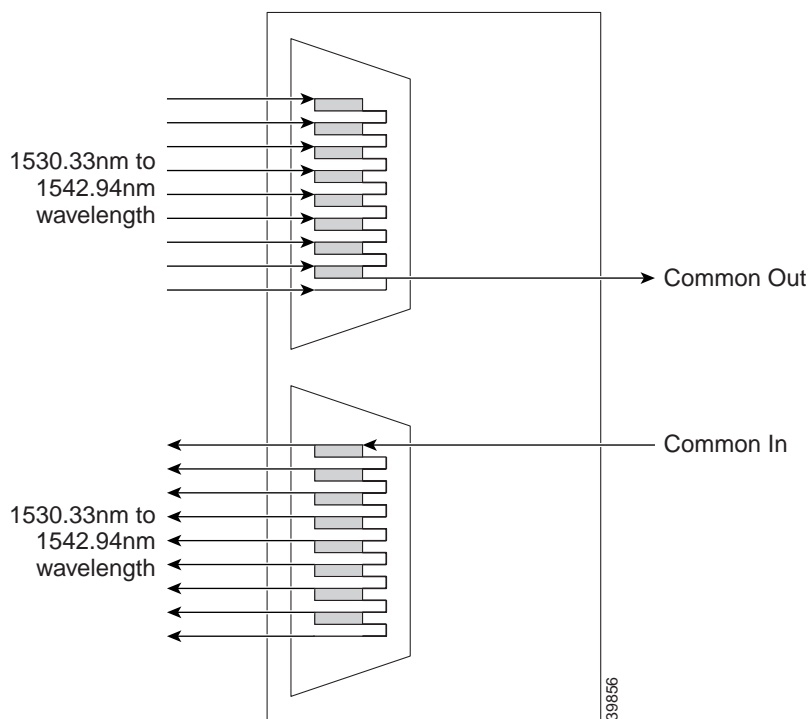
Physical Description

Both the red base unit and the blue upgrade unit are housed in 1 RU, 19 inch rack mounted assemblies and measure 1.75-in. high by 17-in. wide by 12-in. deep.

The connectors on both filters are SC bulkhead adapters. As you face the unit, the group of connectors on the left-hand side are the mux (transmit) connectors and the group of connectors on the right hand side are the demux (receive) connectors. The connectors are labeled with the corresponding wavelength or function. A retractable tray located under the front panel contains a port map to help you identify port locations.

Installation

The ONS 15216 filters can be installed in a standard 19- or 23-inch equipment rack. Each assembly includes reversible mounting brackets that you can rotate to fit either rack size. The units ship with the mounting brackets in the 23-inch position. Figure 5 shows the top view of a unit with the mounting brackets in both positions.

Figure 5   Reversible Mounting Brackets
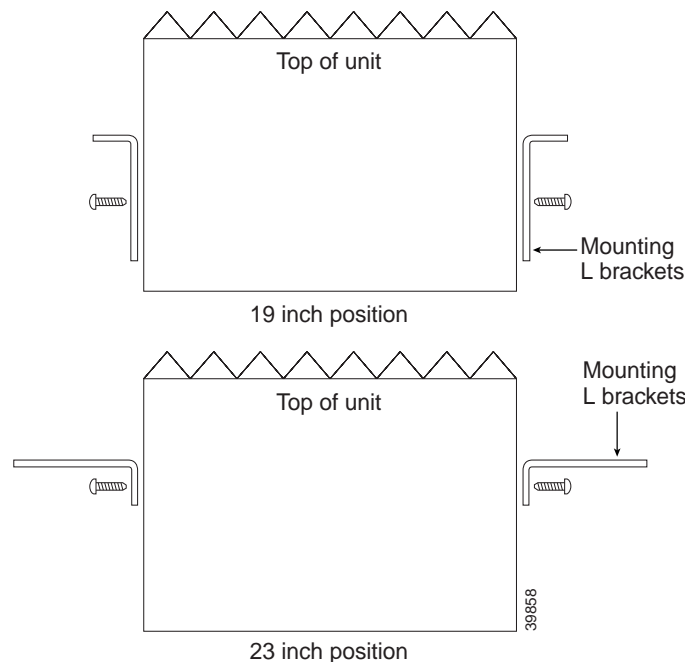
Four rack-mounting screws are included with each ONS 15216. Because the units are passive devices, no power cabling or connections are necessary. The units can be installed anywhere in the rack (in other words, above or below the DWDM generating equipment) according to local site practice.

Procedure to Install the ONS 15216

Step 1   Set the mounting brackets to either the 19- or 23-inch position, depending on the rack you are using.

Keep in mind that the units are shipped with the mounting brackets in the 23-inch position. See Figure 5 for mounting bracket positioning information.

Step 2   Secure the unit to the rack using the four mounting screws included.

Step 3   Connect the ONS 15454 OC-48 ITU cards (Transmit goes to 15xx.xx IN, Receive goes to 15xx.xx OUT).

Step 4   Route the cables out through the fiber lockers on each side of the ONS 15216.

Step 5   Connect the Common In/Out fibers To/From the outside plant optical patch panel.

Figure 6 shows an ONS 15216 installed in a rack.

Figure 6   ONS 15216 Installed in a Rack
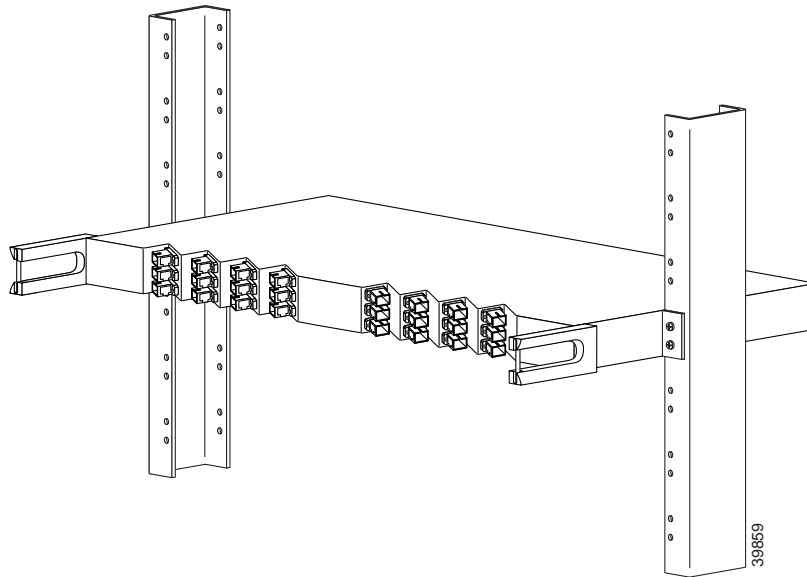
Fiber Optic Connector Cleaning and Maintenance

Disciplined connector cleaning care is required to maintain the performance of fiber optic circuits. It is important that both the SC/UPC connector at the end of the fiber optic cable and the mating bulkhead adapter on the front panel of the ONS 15216 are clean before the connection is made.

Warning   **To prevent serious eye damage, never look directly into a fiber optic cable connector or mating adapter. Never assume laser power is turned off or the fiber is disconnected at the other end.**

Warning   **Always handle, use, and dispose of chemicals and other cleaning materials in accordance with manufacturer's instructions.**

Note   Before installing the fiber optic cable, always perform the cleaning procedure for cable connectors described in the following section. Whenever possible, inspect each connector before connecting it to the mating bulkhead adapter on the ONS 15216 front panel.

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Note   The SC bulkhead adapters on the ONS 15216 front panel are less likely to get dirty if they are capped when not in use. Since the procedure for a thorough cleaning of these adapters is complicated and involves opening the ONS 15216 unit, Cisco recommends that you use a commercially available cleaning kit and closely follow the instructions included with the kit. Only a simple, routine cleaning procedure for these adapters that can be easily performed by the customer is described here.

Customer Supplied Cleaning Materials

The following cleaning materials are recommended but are not supplied with the ONS 15216 module:

- Reagent grade ethyl alcohol in an alcohol dispenser
- Lint free laboratory wipes
- Clean, dry, oil-free compressed air

When cleaning a paired cable connector (bulkhead mating adapter), always clean the mating adapter first. If properly maintained (only used with clean, defect-free fiber connectors and capped when not in use), the mating adapter should not require cleaning. However, if you suspect the adapter is dirty, clean it by blowing with clean, dry, oil-free compressed air.

Procedure to Clean the Bulkhead Mating Adapters

Step 1   Read the manufacturer's instructions to properly use the compressed air can.

Improper use of the compressed air may cause more contamination to the part being cleaned and defeat the purpose of cleaning the bulkhead mating adapters.

Step 2   Before blowing the adapter clean, release a short blast of compressed air to remove any dust inside the nozzle of the compressed air can.

Step 3   Blow three to four short blasts of air into the adapter housing to remove any dust.

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Note   Always keep unused adapter ports and fiber connectors capped with a clean dust cap.

Procedure to Clean Fiber Optic Cable Connectors

Step 1   Fold a clean wipe several times to get a pad of 6 to 8 layers of material.

Step 2   Remove the protective cap on the SC/UPC optical fiber cable connector.

Step 3   Dampen (but do not soak) a corner of the pad with alcohol using the alcohol dispenser.

Step 4   Firmly press the tip of the ferrule into the alcohol-moistened area of the wipe. Pinch the wipe firmly with your fingers against the ferrule and twist the ferrule to firmly wipe the ferrule. Repeat this step three times, using a clean alcohol-moistened area each time.

✎

Note The design of the SC connector makes it difficult to clean the entire perimeter of the ferrule, because only a small portion close to the ferrule tip is accessible. Clean the tip of the ferrule and the entire accessible perimeter. Keep the fiber connector capped at all times when not in use.

Step 5 Press the ferrule tip into a clean, dry spot on the wipe and perform the pinch-and-twist procedure described in Step 4 once.

Step 6 Discard the used wipe.

Step 7 (Optional) A couple of short blasts of clean, dry oil-free compressed air should remove any tissue fragments that may have been deposited on the ferrule during cleaning.

Step 8 Whenever possible, inspect the ferrule end-face to ensure the cleaning procedure effectively removed the dust/dirt from the ferrule and that no cleaning-induced damages are present.

Step 9 If the ferrule end-face is still dirty, repeat Steps 1 through 8.

Step 10 If the ferrule shows damages (for example, scratches or pits across the fiber core), replace the fiber patch cord with a new one equipped with a defect-free connector.

Defects on the fiber cable connector are likely to damage the mating connector inside the ONS 15216, which results in more costly repairs.

Step 11 If the ferrule end-face is clean and damage-free, place the connector into the corresponding clean mating adapter on the ONS 15216 front panel following the instructions in the next section.

Fiber Optic Cable Installation

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Warning **Follow all directions and warning labels when working with optical fiber cables and adapters. To prevent serious eye damage, never look directly into an optical fiber cable connector or mating adapter.**

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Warning **When connecting an optical fiber patch cord between the ONS 15216 and the optical card ports in the ONS 15454, use the electrostatic discharge wristband supplied with the ONS 15454. Plug the wristband into the ESD jack on the lower right front side of the ONS 15454.**

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Note Always clean all fiber connectors thoroughly before making the connection with the mating adapter. Very small particles can permanently damage the end of the mating fiber inside the ONS 15216 unit which makes regular cleaning imperative. See the "Fiber Optic Connector Cleaning and Maintenance" section on page 5 for cleaning instructions.

✎

Note The ONS 15216 front panel features SC/UPC bulkhead adapters. Always use fiber optic cables equipped with the corresponding (SC/UPC) connector type. Using any other type of connector results in damaging the connector and/or adapter.

Procedure to install and route fiber optic cables to the ONS 15216

Step 1 Place the SC/UPC cable connector in front of the corresponding bulkhead adapter on the front panel of the ONS 15216.

Step 2 Align the keyed ridge of the cable connector with the slot in the receiving adapter.

Step 3 Gently push the cable connector into the adapter until you hear a click, indicating the latching system is engaged.

Step 4 Open the fiber guide by pulling the fiber guide locker on the appropriate side of the front panel.

A spring-ball screw that allows the fiber guide locker to be easily opened or closed secures the top.

Step 5 Route fiber cables through the fiber guide and lock them into place using the fiber guide locker.

Adding Wavelengths (Upgrading)

To add wavelengths, install the blue upgrade unit and connect it to the red base unit. If you need to upgrade your DWDM system (add wavelengths), use the *Common In/Common Out* ports on the blue upgrade unit and the *To Upgrade/From Upgrade* ports on the red base unit. This provides multiplexing/demultiplexing of 18 wavelengths with two fibers.

Procedure to connect the blue upgrade unit to the red base unit

Step 1 Mount the blue upgrade unit near the red base unit.

Step 2 To connect the red base unit to the blue upgrade unit, route a fiber from the *To Upgrade* port on the base unit to the *Common In* port on the upgrade unit.

Step 3 To connect the blue upgrade unit back to the red base unit, route a fiber from the *Common Out* port on the upgrade unit to the *From Upgrade* port on the base unit.

Figure 7 shows the base and upgrade units interconnected.

Figure 7   Interconnected Red Base and Blue Upgrade Units
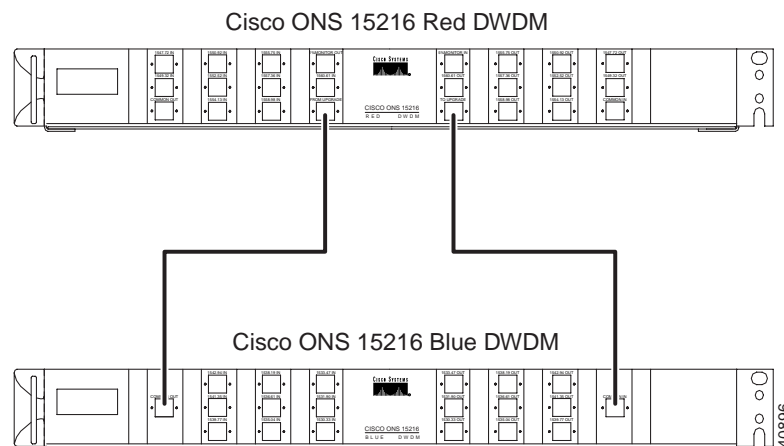
Network Requirements

When deploying the ONS 15216 within the network, make sure that each end of the network mirrors the other. In other words, the same type of ONS 15216 filter should be installed at both ends of the fiber facilities. When you attach transmitting lasers to the ONS 15216, optical filters should comply to the ITU-T 200GHz wavelength plan. Interconnect the transmitting laser's output (transmit) port to the appropriate wavelength input port on the ONS 15216 optical filter. At the other end of the network (or fiber), connect the associated optical receiver to the corresponding wavelength output port consistent with the wavelength of the laser transmitter at the opposite end. Many optical receivers accept any input wavelength between 1310nm and 1550nm. As such, if your terminal equipment uses transceivers, your network can have mirrored optical wavelength cards. Figure 8 depicts a mirrored network using the Cisco ONS 15454 ITU optics cards connected through an ONS 15216 at each end of the network. Figure 9 shows mirrored ONS 15454 ITU optics cards connected through an ONS 15216 at each end of the network. Figure 10 shows non-mirrored ONS 15454 ITU optics cards connected through an ONS 15216 at each end of the network.

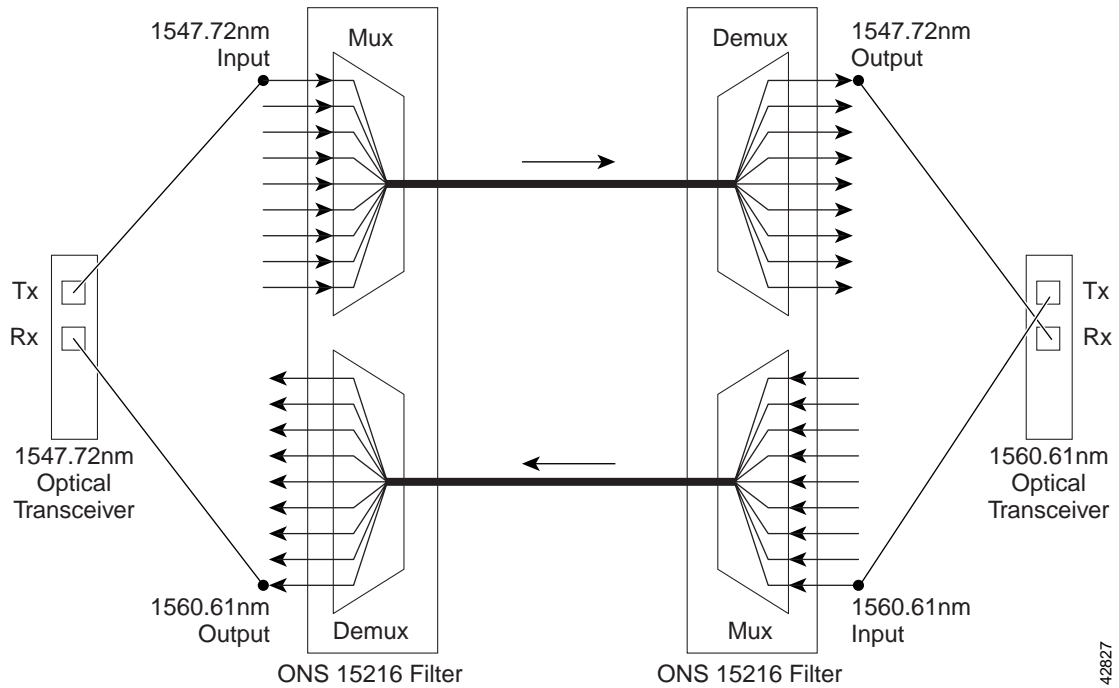*Figure 8   DWDM Mirrored Network*
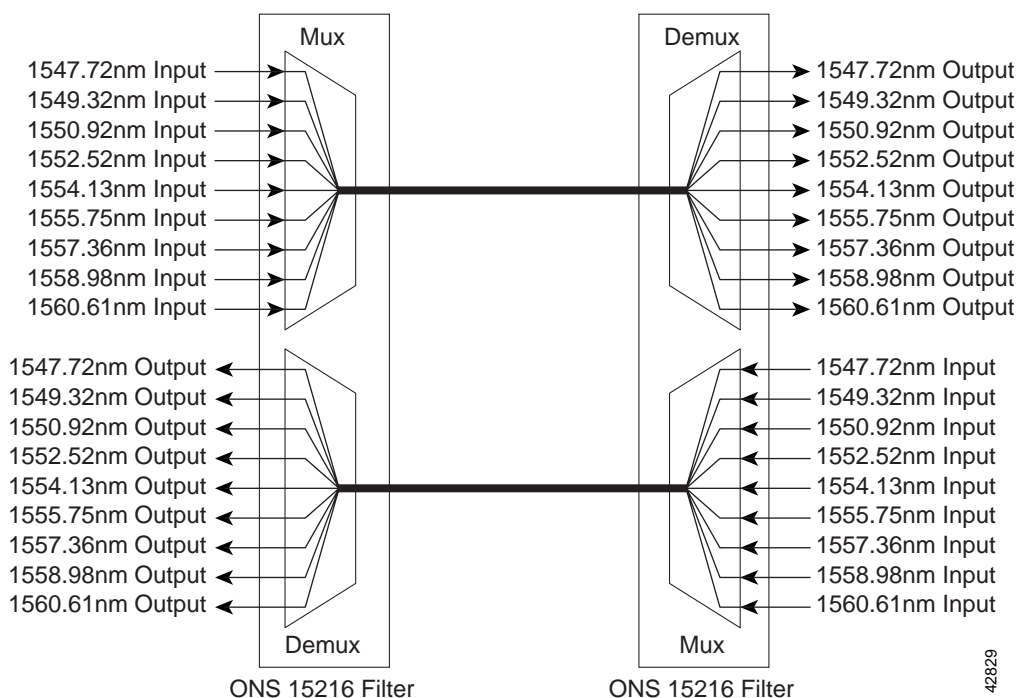
Figure 9   DWDM Mirrored Cards
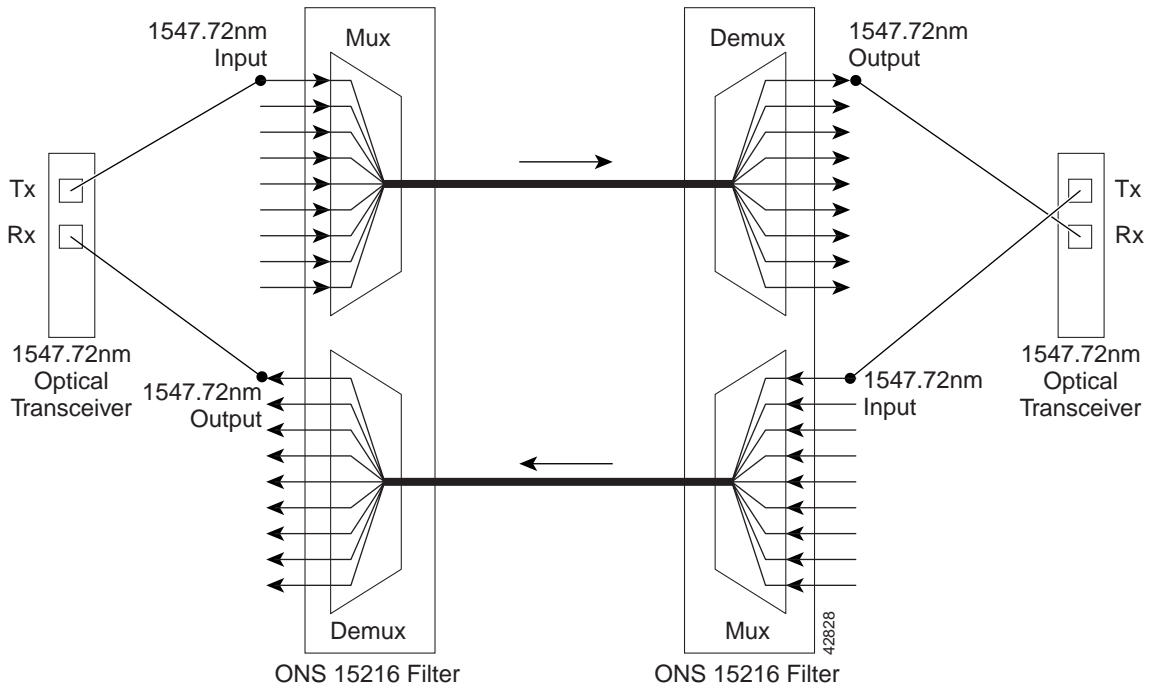
Figure 10   DWDM Non-Mirrored Cards

Specifications

ITU Channel Plan

Center Wavelengths for the Base Red Filter (Model 15216-DWDM8-RED)

1547.72 nm

1549.32 nm

1550.92 nm

1552.52 nm

1554.13 nm

1555.75 nm

1557.36 nm

1558.98 nm

1560.61nm

Center Wavelengths for the Upgrade Blue Filter (Model 15216-DWDM-BLUE)

1530.33 nm

1531.90 nm

1533.47 nm

1535.04 nm

1536.61 nm

1538.19 nm

1539.77 nm

1541.35 nm

1542.94 nm

Channel Spacing

200GHz

Insertion Loss

9 Wavelength Base Red Filter: 9 dB maximum, end to end

9 Wavelength Upgrade Blue Filter: 8.5 dB maximum, end to end

18 Wavelength Red Base Filter + Blue Upgrade Filters: 9 dB maximum, end to end

Channel Uniformity

2.0 dB maximum @ 25˚C

Directivity

35 dB minimum

Optical Return Loss

40dB minimum

Polarization Mode Dispersion

0.1 ps maximum

Chromatic Dispersion

10 ps maximum

Monitor Ports – Insertion Loss

Demultiplexer (5% monitor in port): 14.6 dB maximum

Multiplexer (1% monitor out port): 26.0 dB maximum

Isolation

Adjacent: 25 dB minimum

Non-adjacent: 40 dB minimum

Maximum Optical Power Input

250 mW

Temperature

Operating: 0˚ to 70˚ C

Storage: -40˚ to -85˚ C

Chassis Dimensions

Width: 17.44 in. (without mounting ears)

Height:1.75 in.

Depth: 11 in.

Weight: 5 lbs 9 oz

Connector Type

SC/UPC