

Installing Cisco ONS 15216-MD-ID-50 Optical Interleaver and Deinterleaver Pluggable

Introduction

This document explains how to install and operate the Cisco ONS 15216 50 GHz/100 GHz optical interleaver and deinterleaver module inside the patch panel.

The interleaver and deinterleaver module provides signal interleaving and deinterleaving in 50-GHz channel spacing DWDM systems.

The 15216-MD-ID-50=: 50 GHz/100 GHz interleaver and deinterleaver module operates inside the 15216-MD-40-ODD or 15216-MD-40-EVEN patch panel.



Note

The interleaver and deinterleaver module can be inserted inside an odd or an even patch panel. This document considers the installation of the interleaver and deinterleaver module inside an odd patch panel. For installing the patch panel, refer to the “*Installing the Cisco ONS 15216-MD-40-ODD and 15216-MD-40-EVEN Mux/Demux Patch Panels*” guide.



Safety Information

Before you install, operate, or service the Cisco ONS 15216 50 GHz/100 GHz optical interleaver and deinterleaver module (also referred as the ONS 15216-MD-ID-50), you must read the [Regulatory Compliance and Safety Information for Cisco Optical Transport Products](#) document for important safety information and warning translations.

The ONS 15216-MD-ID-50 is compliant with GR 1089, UL60950 /CSA 22.2 No. 60950-00, and IEC 60950 standards.

Laser Radiation Emission Restrictions

The interleaver and deinterleaver module is Class 1M Laser safety compliant, which indicates that the product should never be used or installed in an optical network with emissions higher than Class 1M.



Warning

Class 1M laser radiation when open. Do not view directly with optical instruments. Statement 281

Laser Safety During Operation



Warning

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

Electrical Safety

The ONS 15216-MD-ID-50 is optically and electrically passive and require no electrical connections. No electrostatic discharge (ESD) or other electrical safety considerations apply.

Product Description

The ONS 15216-MD-ID-50 is a C-band 50 GHz/100 GHz module that operates inside the patch panel. The ONS 15216-MD-ID-50 module interfaces between the 15216-MD-40-ODD and 15216-MD-40-EVEN patch panels, and 80 channels of wavelengths. The advantages of installing the C-band 50 GHz/100 GHz module is as follows:

- Extends existing network capacity
- Provides low cost future proofing of network capacity
- Allows for non-traffic affecting capacity upgrade, when the patch panel is equipped with the ONS 15216-MD-ID-50 module at first installation.

Features

The ONS 15216-MD-ID-50 is a modular component that provides signal interleaving and de-interleaving in 50 GHz channel spacing DWDM systems. It is optically and electrically passive and requires no temperature control. It uses fused fiber coupler technologies and a birefringent crystal technology platform.

The operating features of the ONS 15216-MD-ID-50 module include:

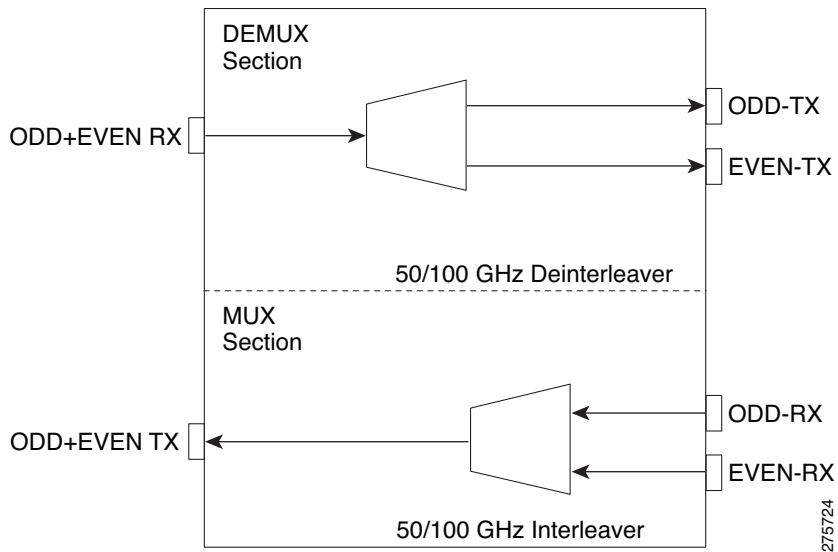
- Low dispersion
- Low insertion loss
- High channel isolation
- Wide clear bandwidth
- Full C-band coverage
- Interleave and Deinterleave 80-channels
- Athermal design

Functional Description

The ONS 15216-MD-ID-50 module increases the network capacity by combining two optical data streams into a single, more densely spaced stream. This module can be used in mux mode to combine two 100 GHz optical signal streams into one 50 GHz stream, or in demux mode to separate the 50 GHz stream into two 100 GHz streams.

The ONS 15216-MD-ID-50 is a bidirectional module in which the mux and demux functions are implemented in two different sections to enable signals flowing in opposite directions to be managed separately. This functionality is illustrated in [Figure 1](#).

Figure 1 *Functional Description of the Interleaver and Deinterleaver Module*



The interleaver in the mux section combines the even and odd channel signals at 100 GHz spacing (EVEN-RX and ODD-RX ports, respectively) into the 50 GHz channel spacing signal.

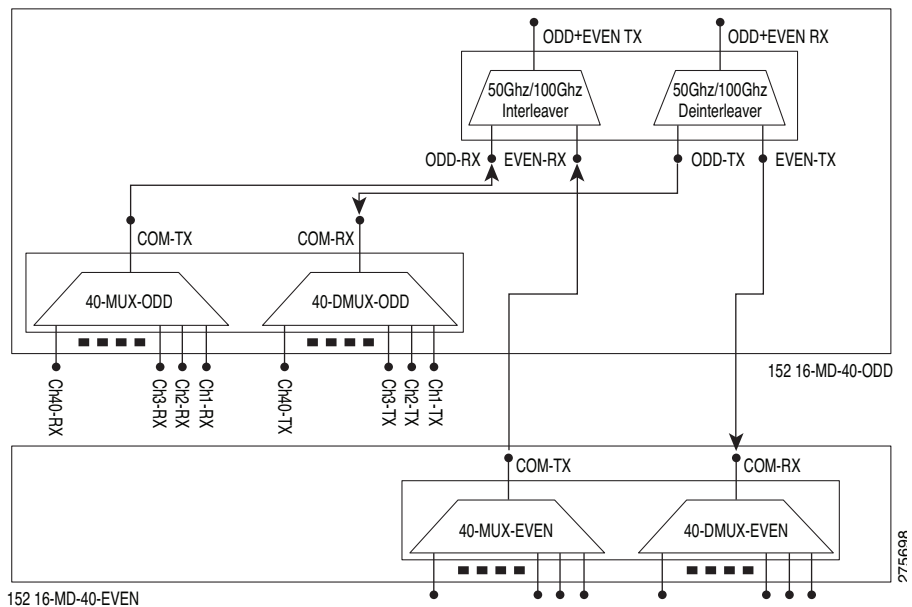
The deinterleaver in the demux section separates the 50 GHz channel spacing signal into even and odd channel signals of 100 GHz spacing (EVEN-TX and ODD-TX ports, respectively).

The interleaver and deinterleaver module is plugged inside the patch panel and is interconnected with another patch panel of a different grid.

Optical Interconnections

The optical interconnections between the odd patch panel, interleaver and deinterleaver module and the even patch panel is shown in [Figure 2](#).

Figure 2 Patch Panel Interconnection with Interleaver and Deinterleaver Module



The port connections between the odd patch panel, interleaver and deinterleaver module, and the even patch panel are established as follows:

- COM-TX port of the odd patch panel and ODD-RX port of the interleaver and deinterleaver module.

- COM-RX port of the odd patch panel and ODD-TX port of the interleaver and deinterleaver module.
- COM-TX port of the even patch panel and EVEN-RX port of the interleaver and deinterleaver module.
- COM-RX port of the even patch panel and EVEN-TX port of the interleaver and deinterleaver module.

Channel Wavelength Allocation

Table 1 describes the channel plan for the interleaver and deinterleaver module.

Table 1 C-Band Channel Wavelength Plan

Channel Wavelength Odd_C Band			Channel Wavelength Even_C Band		
Channel Label	Frequency (THz)	Wavelength (nm)	Channel Label	Frequency (THz)	Wavelength (nm)
1	195.9	1530.33	2	195.85	1530.72
3	195.8	1531.12	4	195.75	1531.51
5	195.7	1531.90	6	195.65	1532.29
7	195.6	1532.68	8	195.55	1533.07
9	195.5	1533.47	10	195.45	1533.86
11	195.4	1534.25	12	195.35	1534.64
13	195.3	1535.04	14	195.25	1535.43
15	195.2	1535.82	16	195.15	1536.22
17	195.1	1536.61	18	195.05	1537.00
19	195	1537.40	20	194.95	1537.79
21	194.9	1538.19	22	194.85	1538.58
23	194.8	1538.98	24	194.75	1539.37
25	194.7	1539.77	26	194.65	1540.16
27	194.6	1540.56	28	194.55	1540.95
29	194.5	1541.35	30	194.45	1541.75
31	194.4	1542.14	32	194.35	1542.54

Channel Wavelength Odd_C Band			Channel Wavelength Even_C Band		
Channel Label	Frequency (THz)	Wavelength (nm)	Channel Label	Frequency (THz)	Wavelength (nm)
33	194.3	1542.94	34	194.25	1543.33
35	194.2	1543.73	36	194.15	1544.13
37	194.1	1544.53	38	194.05	1544.92
39	194	1545.32	40	193.95	1545.72
41	193.9	1546.12	42	193.85	1546.52
43	193.8	1546.92	44	193.75	1547.32
45	193.7	1547.72	46	193.65	1548.11
47	193.6	1548.51	48	193.55	1548.91
49	193.5	1549.32	50	193.45	1549.72
51	193.4	1550.12	52	193.35	1550.52
53	193.3	1550.92	54	193.25	1551.32
55	193.2	1551.72	56	193.15	1552.12
57	193.1	1552.52	58	193.05	1552.93
59	193	1553.33	60	192.95	1553.73
61	192.9	1554.13	62	192.85	1554.54
63	192.8	1554.94	64	192.75	1555.34
65	192.7	1555.75	66	192.65	1556.15
67	192.6	1556.55	68	192.55	1556.96
69	192.5	1557.36	70	192.45	1557.77
71	192.4	1558.17	72	192.35	1558.58
73	192.3	1558.98	74	192.25	1559.39
75	192.2	1559.79	76	192.15	1560.20
77	192.1	1560.61	78	192.05	1561.01
79	192	1561.42	80	191.95	1561.83

Installation

This section explains how to:

- [Unpack and Verify the Equipment](#)
- [Install the Interleaver and Deinterleaver Module](#)
- [Install and Route Fiber-Optic Cables](#)

Unpack and Verify the Equipment

This procedure describes the steps for unpacking and verifying the equipment.

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- Step 1** Unpack and inspect the module. The package should include these components:
- ONS 15216-MD-ID-50 module
 - Production test report form showing the manufacturer's part number and serial number, Cisco part number, date, and device description
 - Packing slip
- Step 2** Compare the equipment received with the packing slip and the equipment list that customer service provided. If there are any discrepancies, notify the Customer Service Center.
- Step 3** Check for external damage. Visually check all components and immediately report any shipping damage to your customer service representative. Have this 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
 - Packing slip

Install the Interleaver and Deinterleaver Module

The ONS 15216-MD-ID-50 module is plugged inside the patch panel. The patch panel is a new ONS 15216 FlexLayer unit that can be installed either above or below the DWDM generating equipment according to the local site practice. For installing the patch panel, refer to the “*Installing Cisco ONS 15216 40-Channel Mux/Demux Patch Panel*” guide.

The ONS 15216-MD-ID-50 module is passive and requires no power cabling or connections. All connectors are on the front panel and are equipped with LC/UPC bulkhead adapters and with a USB Type A receptacle connector for inventory purpose. Fiber-optic cables equipped with the corresponding (LC/UPC) connector type are used. The module ports are labelled on the faceplate. The port assignments of the module is provided in [Figure 9](#). Refer to [Table 2](#) for port label description.



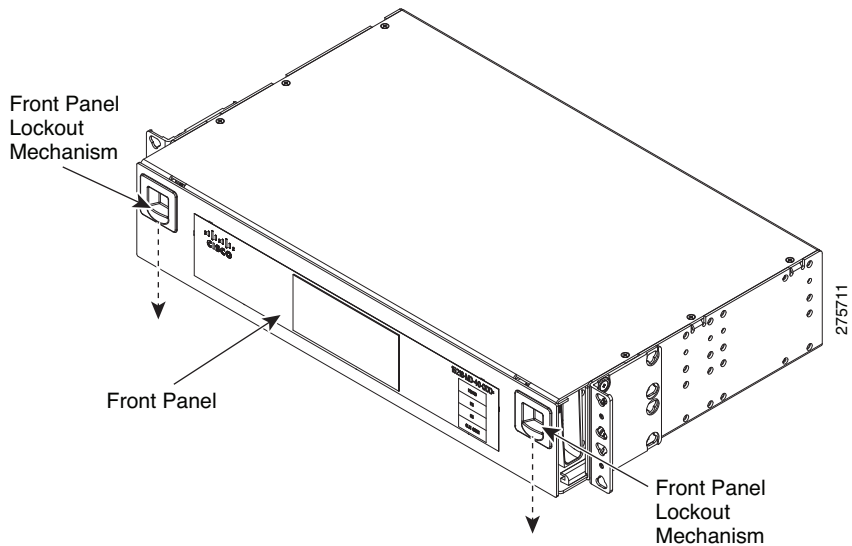
Caution

Use only the fastening hardware provided with the interleaver and deinterleaver module to prevent loosening, deterioration, and electromechanical corrosion of the hardware and joined material.

This procedure describes the steps to install the interleaver and deinterleaver module.

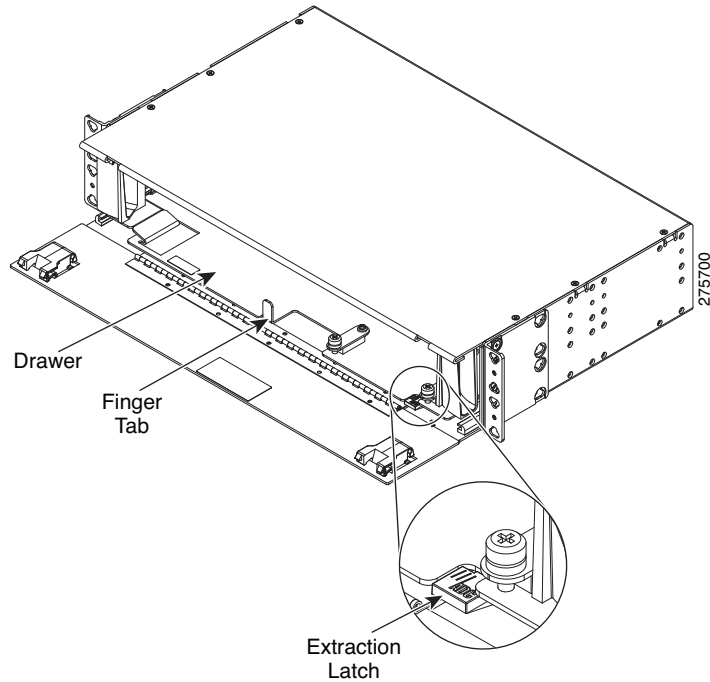
- Step 1** To open the front panel of the patch panel:
- Drag the two front panel lockout mechanisms downward, as shown in [Figure 3](#).
 - Open the front panel to its maximum position.

Figure 3 Cisco ONS 15216 Odd Patch Panel



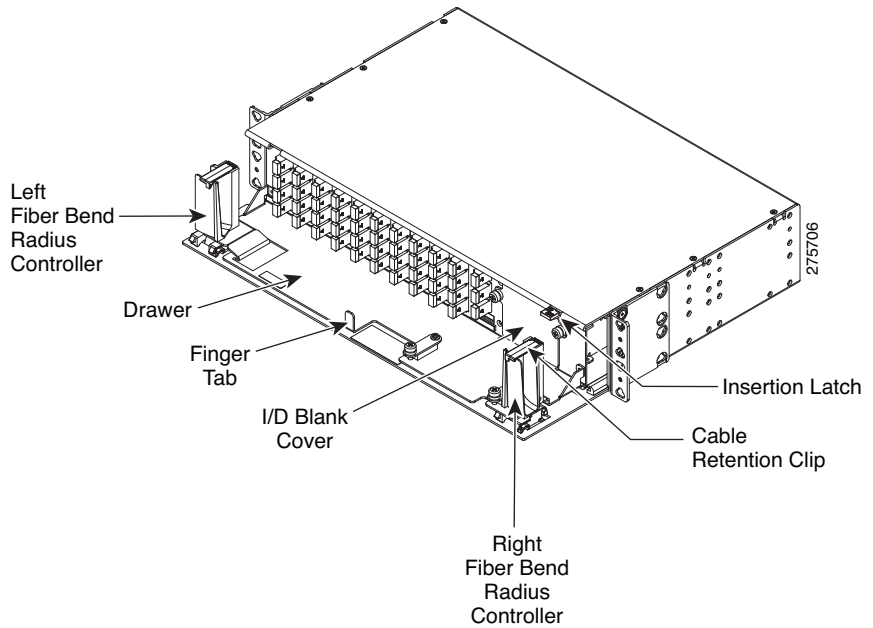
- Step 2** To extract the internal drawer of the patch panel:
- Push the extraction latch with one hand. (See [Figure 4](#).)
 - Pull the drawer holding the finger tab with the other hand. (See [Figure 4](#).)

Figure 4 *Cisco ONS 15216 Odd Patch Panel—Opened Front Panel and Drawer in the Recessed Position*



- c. Extract the drawer from the patch panel until the insertion latch is engaged. (See [Figure 5](#).)

Figure 5 *Cisco ONS 15216 Odd Patch Panel—Opened Front Panel and Drawer in the Extracted Position*



Step 3 Unscrew the captive screws to remove the I/D blank cover. (See [Figure 6](#).)

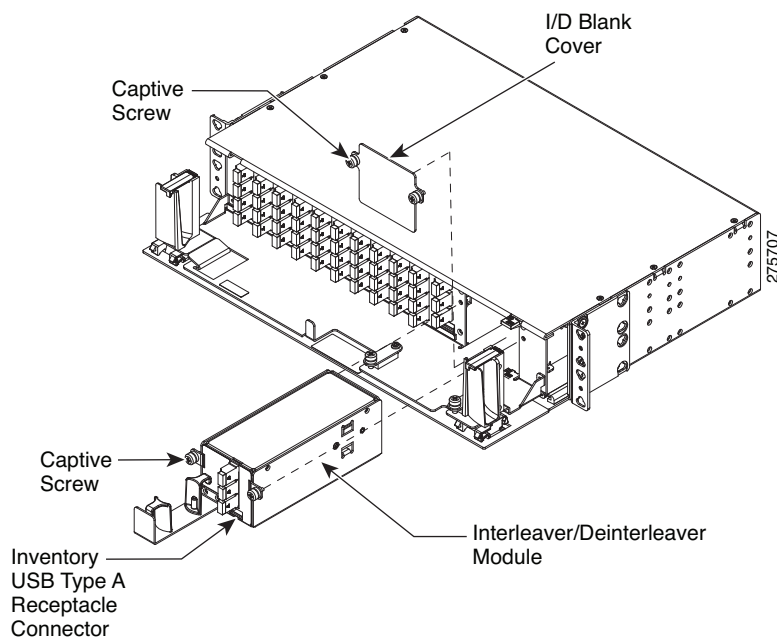


Note

During an in-field upgrade, all the fibers installed previously must be routed toward the left fiber bend radius controller. To plug in the interleaver and deinterleaver module, the space in front of the I/D blank cover must be free of fibers and cables.

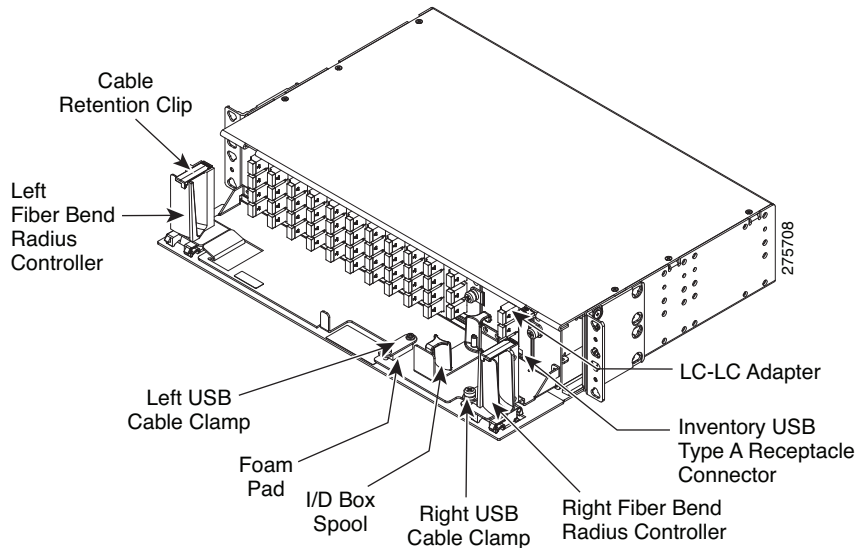
Step 4 Plug the interleaver and deinterleaver module, as shown in [Figure 6](#).

Figure 6 *Cisco ONS 15216 Odd Patch Panel—Plugging the Interleaver and Deinterleaver Module*



Step 5 Tighten the screws of the interleaver and deinterleaver module. (See [Figure 7](#).)

Figure 7 *Cisco ONS 15216 Odd Patch Panel Plugged with Interleaver and Deinterleaver Module*



Step 6 To connect the fibers as appropriate:

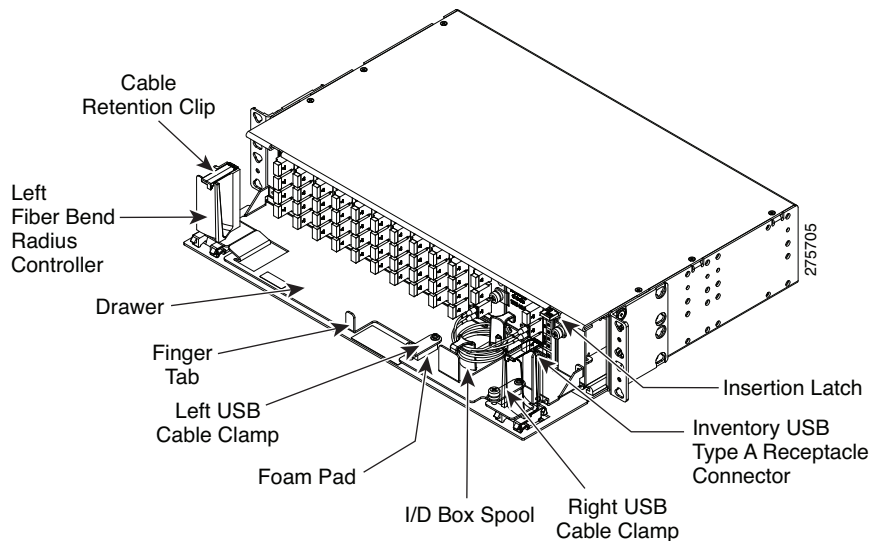
- a. Remove the LC adapter cap from the LC-LC adapter. (See [Figure 7](#).)
- b. Open the cable retention clip of the left or right fiber bend radius controller. (See [Figure 7](#).)
- c. Route the cables through the left or right fiber bend radius controller. Refer to [Table 2](#) for port label description and [Figure 9](#) for channel identification port information. For fibering instructions, see the “[Fiber-Optic Connector Cleaning and Maintenance](#)” section on page 18 and the “[Install and Route Fiber-Optic Cables](#)” section on page 21.

The LC-LC patch cords are used to connect the interleaver and deinterleaver module to the patch panels. The extra fiber length of the two LC-LC patch cords used to connect the patch panel with its plugged I/D box is placed on the I/D box spool, as shown in [Figure 8](#). The I/D box spool can be removed from the interleaver and deinterleaver module and the extra fiber length of the two LC-LC patch cords can be routed outside the patch panel.

For interconnections between the interleaver and deinterleaver module, odd patch panel and the even patch panel, see the [“Optical Interconnections”](#) section on page 5.

- Step 7** To connect the inventory USB Type A plug connector to the inventory USB Type A receptacle connector:
- a. Route the inventory USB cable through the left or right fiber bend radius controller. (See [Figure 8](#).)
 - b. Connect the USB Type A plug connector to the USB Type A receptacle connector. (See [Figure 8](#).)

Figure 8 *Cisco ONS 15216 Odd Patch Panel Plugged with Interleaver and Deinterleaver Module*



Note

In [Figure 8](#), the right fiber radius controller is made invisible.

- Step 8** To secure the USB plug cable:
- a. Unscrew the captive screw of the left or right USB cable clamp. (See [Figure 8](#).)
 - b. Rotate to open the USB cable clamp. (See [Figure 8](#).)
 - c. Place the cable on the foam pad. (See [Figure 8](#).)
 - d. Rotate the clamp to its original position. (See [Figure 8](#).)
 - e. Tighten the captive screw to lock the USB cable. (See [Figure 8](#).)

**Caution**

The ONS 15216-MD-ID-50 module features LC/UPC bulkhead adapters. It uses fiber-optic cables equipped with the corresponding (LC/UPC) connector type with no fiber pigtail leading out. Using any other type of connector damages the connector and/or adapter.

- Step 9** To place the patch panel in the closed working configuration:
- a. Close the cable retention clips to secure the cables after all the cables are connected and routed within the fiber bend radius controllers. (See [Figure 8](#).)
 - b. Push the insertion latch with one hand. (See [Figure 8](#).)
 - c. Push the drawer holding the finger tab with the other hand. (See [Figure 8](#).)
 - d. Push the drawer inside the patch panel until the extraction latch is engaged. (See [Figure 4](#).)
 - e. Close the front panel until the front panel lockout mechanisms are engaged. (See [Figure 3](#).)

Port Label Description

Table 2 lists the connection ports, description, and the type of connectors used for each port. All ports are on the front panel, which is equipped with optical LC adapters and one USB Type A receptacle connector.

Table 2 *Port Label Descriptions*

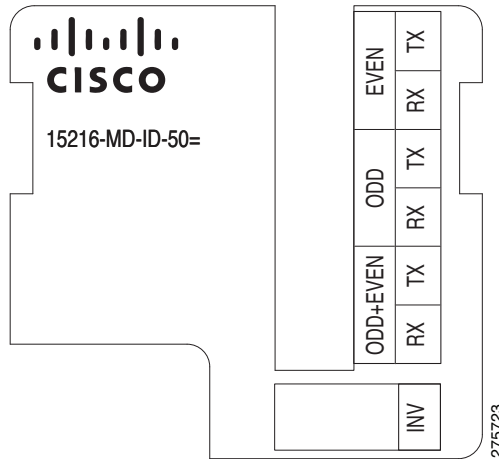
Port Label	Description	Type of Connector
ODD+EVEN-RX	Common input	LC-UPC II
ODD-TX	Odd channels output	LC-UPC II
EVEN-TX	Even channels output	LC-UPC II
ODD+EVEN-TX	Common output	LC-UPC II
ODD-RX	Odd channels input	LC-UPC II
EVEN-RX	Even channels input	LC-UPC II
INV	USB inventory port	USB Type A receptacle connector

Channel Identification Label

The channel identification label is placed on the interleaver and deinterleaver module faceplate:

Figure 9 shows the product identification and channel identification label of the interleaver and deinterleaver module.

Figure 9 Interleaver and Deinterleaver Module—Product and Channel ID Label



Fiber-Optic Connector Cleaning and Maintenance

Connector cleaning is required to maintain the performance of fiber-optic circuits. It is important that both the LC/UPC connector at the end of the fiber-optic cable and the mating bulkhead adapter on the front panel of the patch panel are clean before the connection is made.



Warning

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

The following warning applies to disposal of chemicals and other materials used to clean connectors and adapters:



Warning

Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

**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 front panel.

**Note**

The LC bulkhead adapters on the ONS 15216-ID-50 front panel are less likely to get dirty if they are capped when not in use. Because the procedure for a thorough cleaning of these adapters is complicated and involves opening the patch panel, 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 Type A fiber optic connector cleaners (for example, CLETOP reel) are recommended to clean the cable connectors, but are not supplied with the patch panel.

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 would not require cleaning. However, if you suspect the adapter is dirty, clean it by using the CLETOP stick swab.

**Note**

For multi-fiber cable assemblies, use specific cleaning tools or materials designed for the assembly type.

Clean the Bulkhead Mating Adapters

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- Step 1** Read the manufacturer (cleaning cartridge) instructions to insert the cartridge cleaning tip into the mating adapter.

Step 2 Slide the lever on the cartridge to swipe the mating surface.



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

Clean Fiber-Optic Cable Connectors

The tools required to clean fiber connectors are:

- Inspection microscope
- Type A Fiber Optic Connector Cleaner (CLETOP reel)
- Optical swab
- Optical receiver cleaning stick

Step 1 Using an inspection microscope, inspect each fiber connector for dirt, cracks, or scratches.

Step 2 Replace any damaged fiber connectors.



Note Replace all dust caps whenever the equipment is unused for 30 minutes or more.



Caution Do not reuse optical swabs. Keep unused swabs off of work surfaces.

Step 3 Clean the fiber connectors with CLETOP reel:

- a. Remove the dust cap from the fiber connector.
- b. Press the lever down to open the shutter door. Each time you press the lever, you expose a clean wiping surface.
- c. Insert the connector into the CLETOP cleaning cassette slot, rotate one quarter turn, and gently swipe downwards.
- d. Use an inspection microscope to inspect each fiber connector for dirt, cracks, or scratches. If the connector is not clean, repeat Steps [a](#) to [b](#).

- e. Insert the fiber connector into the applicable adapter or attach a dust cap to the fiber connector.

**Note**

If you must replace a dust cap on a connector, first verify that the dust cap is clean. To clean the dust cap, wipe the outside of the cap using a dry, lint-free wipe and the inside of the dust cap using a CLETOP stick swab (14100400).

Install and Route Fiber-Optic Cables

**Warning**

Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.
Statement 1051

**Caution**

When connecting an optical fiber patch cord between the patch panel 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.

**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 patch panel, which makes regular cleaning imperative. For cleaning instructions see [“Fiber-Optic Connector Cleaning and Maintenance” section on page 18](#).

**Note**

The interleaver and deinterleaver module features LC/UPC bulkhead adapters. Always use fiber-optic cables equipped with the corresponding (LC/UPC) connector type. Using any other type of connector results in damage to the connector and/or adapter.

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- Step 1** Place the LC/UPC cable connector in front of the corresponding bulkhead adapter on the front panel of the patch panel.
 - 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, which indicates that the latching system is engaged.
 - Step 4** Route the fiber cables through the left or right fiber bend radius controller and secure them into place closing the cable retention clip. (See [Figure 8.](#))

Uninstalling the Module

This procedure describes the steps for removing the interleaver and deinterleaver module from the patch panel.

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- Step 1** Open the front panel of the patch panel.
To open the front panel, follow the instructions in [Step 1](#) of the “[Install the Interleaver and Deinterleaver Module](#)” section on [page 9](#). (See [Figure 3.](#))
 - Step 2** Extract the internal drawer of the patch panel.
To extract the internal drawer, follow the instructions in [Step 2](#) of the “[Install the Interleaver and Deinterleaver Module](#)” section on [page 9](#). (See [Figure 4](#) and [Figure 5.](#))
 - Step 3** Open the cable retention clip of the fiber bend radius controller on the appropriate side of the patch panel. (See [Figure 8.](#))
 - Step 4** Gently disconnect the fiber-optic connectors from the LC-LC adapters of the interleaver and deinterleaver module. (See [Figure 8.](#))
 - Step 5** Disconnect the inventory USB cable releasing it from the USB cable clamp and from the USB receptacle connector of the interleaver and deinterleaver module. Clear the front of the interleaver and deinterleaver module from any cable or fiber. (See [Figure 8.](#))
 - Step 6** Unscrew the captive screws of the interleaver and deinterleaver module. (See [Figure 6.](#))
 - Step 7** Remove the interleaver and deinterleaver module from the patch panel. (See [Figure 6.](#))

- Step 8** Close the empty space on the patch panel with the I/D Blank Cover. (See [Figure 5](#).)
- Step 9** Close the cable retention clip.
- Step 10** Insert the patch panel drawer. (See [Figure 4](#).)
- Step 11** Close the front panel of the patch panel. (See [Figure 3](#).)

Interleaver and Deinterleaver Specifications

This section contains environmental, optical, and mechanical specifications for the interleaver and deinterleaver module.

Environmental Specifications

[Table 3](#) provides the environmental specifications for the interleaver and deinterleaver module.

Table 3 *Environmental Performance Specifications*

Environmental Condition	MIN	MAX	Units
Short Term (96 hours/year) Temperature Range (STR)	-5	55	Celsius
	23	131	Fahrenheit
Continuous Operative Temperature Range (OTR)	5	40	Celsius
	41	104	Fahrenheit
Power Handling for the Optical Port	500		mW
Power Handling for the USB Port	400	600	mW

Optical Specifications

[Table 4](#) provides the optical specifications for the interleaver and deinterleaver module.

Table 4 *Optical Specifications*

Parameter	Condition	Min	Max	Units
50 GHz /100 GHz Channel Grids				
ITU Channel Center Frequencies /Wavelength	<ul style="list-style-type: none"> • ODD+EVEN ports 	191.95	195.85	THz
		1530.72	1561.83	nm
ITU Channel Spacing	<ul style="list-style-type: none"> • within short term temperature range 	50		GHz
Number of Channels		80		
ITU Channel Center Frequencies /Wavelength	<ul style="list-style-type: none"> • ODD ports • within short term temperature range 	192.0	195.9	THz
		1530.33	1561.42	nm
ITU Channel Spacing		100		GHz
Number of Channels		40		
ITU Channel Center Frequencies /Wavelength	<ul style="list-style-type: none"> • EVEN ports • within short term temperature range 	191.95	195.85	THz
		1530.72	1561.83	nm
ITU Channel Spacing		100		GHz
Number of Channels		40		
Deinterleaver Module				
Operating Bandwidth		-10	+10	GHz
-0.50 dB Clear Bandwidth	<ul style="list-style-type: none"> • any state of polarization (SOP) and within operative temperature range • around ITU center wavelength 	- 10	+10	GHz
-1.0 dB Clear Bandwidth		- 12	- 12	GHz

Parameter	Condition	Min	Max	Units
-0.50 dB Clear Bandwidth	<ul style="list-style-type: none"> any state of polarization (SOP) and within short term temperature range around ITU center wavelength 	+ 8	- 8	GHz
-1.0 dB Clear Bandwidth		- 10	+10	GHz
Adjacent Channel Isolation ¹ -DEMUX	<ul style="list-style-type: none"> any state of polarization (SOP) and within short term temperature range within operating bandwidth 	25		dB

Interleaver Module

Operating Bandwidth		- 10	+10	GHz
-0.50 dB Clear Bandwidth	<ul style="list-style-type: none"> any state of polarization (SOP) and within operative temperature range around ITU center wavelength 	- 10	+10	GHz
-1.0 dB Clear Bandwidth		- 12	+ 12	GHz

Parameter	Condition	Min	Max	Units
-0.50 dB Clear Bandwidth	<ul style="list-style-type: none"> any state of polarization (SOP) and within short term temperature range around ITU center wavelength 	- 8	+ 8	GHz
-1.0 dB Clear Bandwidth		- 10	+ 10	GHz
Adjacent Channel Isolation ² -MUX	<ul style="list-style-type: none"> any state of polarization (SOP) and within short term temperature range within operating bandwidth 	25		dB

Common Optical Specifications for Interleaver and Deinterleaver Module

Parameter	Condition	Min	Max	Units
Insertion Loss ³	<ul style="list-style-type: none"> any state of polarization (SOP) and within operative temperature range 	1.5	2.5	dB
Insertion Loss Uniformity ⁴			0.5	dB
Channels Band Ripple			0.3	dB
Group Delay Ripple ⁵ (GDR)			2.5	ps
Chromatic Dispersion ⁶	<ul style="list-style-type: none"> within operating bandwidth 	-20.0	+20.0	ps/nm
Optical Return Loss		40.0		dB
Polarization Dependent Loss (PDL) ⁷	<ul style="list-style-type: none"> including connectors 		0.4	dB
Polarization Mode Dispersion (PMD) ⁸			0.3	ps
Directivity ODD <--> EVEN ports		40.0		dB

1. Adjacent Channel Isolation is defined as the difference between the maximum IL in the 50 GHz transmitted channel Bandwidth (ITU \pm 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth (\pm 80 pm, centered on each ITU wavelength of the channel) of both adjacent 100 GHz channels.
2. Adjacent Channel Isolation is defined as the difference between the maximum IL in the 50 GHz transmitted channel Bandwidth (ITU \pm 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth of both adjacent 100 GHz channels.
3. The Insertion Loss values are measured as the maximum IL inside the Operating Wavelength Bandwidth.
4. Insertion Loss Uniformity is defined as the difference between the maximum insertion losses over any two operating wavelength bandwidths.
5. The difference between the maximum and minimum group delay in the Operating Wavelength Bandwidth of each channel evaluated at all SOP.
6. Chromatic Dispersion is defined as the maximum of derivative of the Group Delay versus the wavelength curve in the 50 GHz transmitted channel bandwidth (Operating Wavelength Bandwidth)
7. PDL (Polarization Dependent Loss) is defined as the difference between the maximum and minimum IL in the 100 GHz transmitted channel Bandwidth (Operating Wavelength Bandwidth) evaluated at all SOP, measured at a given wavelength.
8. PMD (Polarization Mode Dispersion) is defined as the maximum of the DGD versus the wavelength curve in the 50 GHz transmitted channel bandwidth (Operating Wavelength Bandwidth).

Mechanical Specifications

The mechanical dimensions of the package are indicated in [Table 5](#).

Table 5 **Mechanical Specifications**

Parameter	Condition	Specification
Connector Type	All optical ports	LC/UPC II
	USB inventory port	USB Type A receptacle connector
Adapter Type	All optical ports	LC
Interleaver and Deinterleaver Module Dimensions		9.911-inches (251.7 mm) long, 2.645-inches (67.2 mm) wide, and 2.452-inches (62.2 mm) high. Considering the captive screw brackets, the interleaver and deinterleaver module width is 3.54- inches (89.9 mm).

Related Documentation

Use this document in conjunction with the following referenced publications:

- *Cisco ONS 15454 DWDM Reference Manual*
- *Cisco ONS 15454 DWDM Procedure Guide*
- *Cisco ONS 15454 DWDM Troubleshooting Guide*

Visit the [End-of-Life and End-of-Sale Notices](#) page for EOL and EOS announcements.

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