Installing the Cisco ONS 15216-MD-48-ODD/15216-MD-48-ODDE and 15216-MD-48-EVEN/15216-MD-48-EVENE Mux/Demux Patch Panels

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Installing the Cisco ONS 15216-MD-48-ODD, 15216-MD-48-ODDE, 15216-MD-48-EVENE, and 15216-MD-48-EVEN Mux/Demux Exposed Faceplate Patch Panels

This document explains how to install and operate the Cisco ONS 15216-MD-48-ODD, 15216-MD-48-ODDE, 15216-MD-48-EVENE, and 15216-MD-48-EVEN Mux/Demux Exposed Faceplate patch panels.

Overview of the ONS 15216-MD-48-ODD, ONS 15216-MD-48-ODDE, and ONS 15216-MD-48-EVENE and ONS 15216-MD-48-EVEN Mux/Demux Patch Panels

The ONS 15216-MD-48-ODD=/15216-MD-48-ODDE= and ONS 15216-MD-48-EVEN=/15216-MD-48-EVENE= units are the Cisco ONS 15216 exposed faceplate multiplexer/demultiplexer patch panels of 48-channels spaced at 100 GHz on the odd or even ITU grid respectively. The difference between the ONS 15216-MD-48-ODD/15216-MD-48-ODDE and ONS 15216-MD-48-EVEN/15216-MD-48-EVENE patch panel is the operating 100 GHz ITU grid.

The ONS 15216-MD-48-ODD/15216-MD-48-ODDE or ONS 15216-MD-48-EVEN/15216-MD-48-EVENE patch panel enables 48-channels of ITU wavelengths to be placed or removed from a single fiber. For C-band channel wavelength plan for the odd and even patch panels, see "Channel Wavelength Allocation ".

Note Unless otherwise specified, "ONS 15216-MD", , or “Patch Panel” refers to both odd and even patch panels. The odd and even patch panels mentioned in this document refers to the Cisco ONS 15216-MD-48-ODD/15216-MD-48-ODDE and Cisco ONS 15216-MD-48-EVEN/15216-MD-48-EVENE patch panels.

The patch panel can combine 48-channels of ITU wavelengths spaced at 100 GHz to a denser DWDM signal and separate the combined signal to 48-channels of ITU wavelengths spaced at 100 GHz. To increase the network capacity, the patch panel is plugged with a Cisco ONS 15216 50/100 GHz Interleaver and Deinterleaver module (15216-MD-48-CM) for ONS 15216-MD-48-ODD= and ONS 15216-MD-48-EVEN= units. To increase the network capacity, the patch panel is plugged with a Cisco ONS 15216 50/100 GHz Coupler and Splitter module (15216-MD-48-CME) for ONS 15216-MD-48-ODDE= and ONS 15216-MD-48-EVENE= units. The patch panel can then be used along with another patch panel of a different grid (odd or even).

The interleaver or coupler module combines the signals from the 15216-MD-48-ODD/15216-MD-48-ODDE and 15216-MD-48-EVEN/15216-MD-48-EVENE patch panels spaced at 100 GHz to a denser DWDM signal spaced at 50 GHz and the deinterleaver or splitter module splits the combined signal (96 channel signal) to the 15216-MD-48-ODD/15216-MD-48-ODDE and 15216-MD-48-EVEN/15216-MD-48-EVENE patch panels in the opposite direction.

Note

- Cisco NCS 2000 Series does not support the 15216-MD-48-ODDE and 15216-MD-48-EVENE patch panels.
- The monitor ports on the 15216-MD-48-ODDE and 15216-MD-48-EVENE patch panels are reserved for future features.

Features

The Cisco ONS 15216 MD 48-channel mux/demux patch panel provides signal multiplexing and demultiplexing in 100 GHz channel-spacing DWDM systems. It is optically and electrically passive and requires no temperature control. It uses fused fiber coupler and birefringent crystal technologies. The ultra-low dispersion of the patch panel coupled with the wide bandwidth reduces dispersion accumulation and bandwidth narrowing, making the patch panel ideal for multi-OADM metro-ring or mesh-based architectures.

Some of the operating features of the patch panel include:

- Low dispersion
- Low insertion loss
- High channel isolation
- Wide clear bandwidth
- Full C-band coverage
- Multiplex and demultiplex 48-channels
- Athermal design

The patch panel works with 50 GHz and 100 GHz WXC cards. However, when used with a 50 GHz card, the patch panel should be used with a pluggable interleaver and deinterleaver module along with another patch panel of a different grid (odd or even).

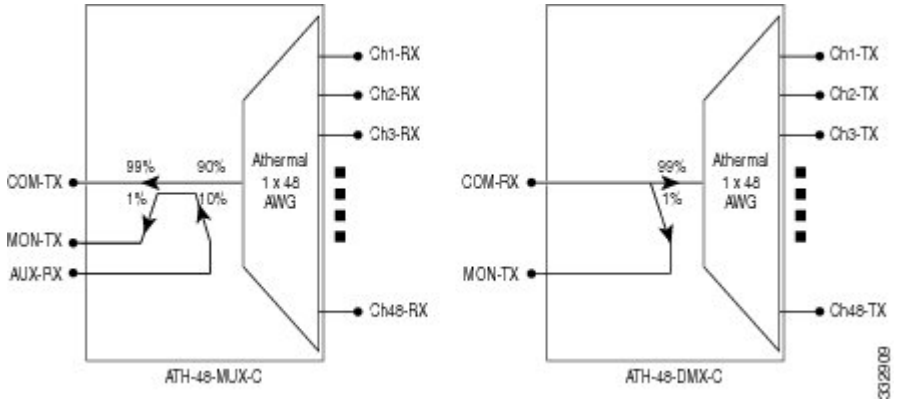
The patch panel can be used in these scenarios:

- Point-to-point network
- Hub node for an open-ring network
- Multiplex add/drop for multi-degree ROADM

Functional Description

The functional unit of the ONS 15216 odd and even patch panel is the passive athermal AWG (arrayed waveguide grating) optical module. The athermal AWG optical module comprises mux and demux modules as shown in the following figure:

Figure 1: Mux and Demux Athermal AWG Modules



The mux module combines signals from Ch*i*-RX ports (48-channels) into the aggregated COM-TX port. An integrated tap-coupler combines the aggregated signals with the additional external sources injected at AUX-MUX port and splits 1% of the aggregated signals towards the MON-MUX port that is used for monitoring purpose.

The demux module separates the aggregated signals into individual Ch*i*-TX ports. An integrated tap-coupler splits 1% of the aggregated signals coming from the COM-RX port towards MON-DMX port that is used for monitoring.

Channel Wavelength Allocation

The following table describes the C-band channel wavelength allocation plan for the odd and even patch panels.

Table 1: C-Band Channel Wavelength Allocation Plan

Channel Wavelength			**Channel Wavelength**		
15216-MD-48-ODD/15216-MD-48-ODDE			**15216-MD-48-EVEN/15216-MD-48-EVENE**		
Channel Label	**Frequency (THz)**	**Wavelength (nm)**	**Channel Label**	**Frequency (THz)**	**Wavelength (nm)**
1	196.1	1528.77	1	196.05	1529.16
2	196.0	1529.55	2	195.95	1529.94
3	195.9	1530.33	3	195.85	1530.72
4	195.8	1531.12	4	195.75	1531.51
5	195.7	1531.90	5	195.65	1532.29
6	195.6	1532.68	6	195.55	1533.07
7	195.5	1533.47	7	195.45	1533.86
8	195.4	1534.25	8	195.35	1534.64
9	195.3	1535.04	9	195.25	1535.43
10	195.2	1535.82	10	195.15	1536.22
11	195.1	1536.61	11	195.05	1537.00
12	195	1537.40	12	194.95	1537.79
13	194.9	1538.19	13	194.85	1538.58
14	194.8	1538.98	14	194.75	1539.37
15	194.7	1539.77	15	194.65	1540.16
16	194.6	1540.56	16	194.55	1540.95
17	194.5	1541.35	17	194.45	1541.75
18	194.4	1542.14	18	194.35	1542.54
19	194.3	1542.94	19	194.25	1543.33
20	194.2	1543.73	20	194.15	1544.13
21	194.1	1544.53	21	194.05	1544.92
22	194	1545.32	22	193.95	1545.72

Channel Wavelength			Channel Wavelength		
15216-MD-48-ODD/15216-MD-48-ODDE			15216-MD-48-EVEN/15216-MD-48-EVENE		
Channel Label	**Frequency (THz)**	**Wavelength (nm)**	**Channel Label**	**Frequency (THz)**	**Wavelength (nm)**
23	193.9	1546.12	23	193.85	1546.52
24	193.8	1546.92	24	193.75	1547.32
25	193.7	1547.72	25	193.65	1548.11
26	193.6	1548.51	26	193.55	1548.91
27	193.5	1549.32	27	193.45	1549.72
28	193.4	1550.12	28	193.35	1550.52
29	193.3	1550.92	29	193.25	1551.32
30	193.2	1551.72	30	193.15	1552.12
31	193.1	1552.52	31	193.05	1552.93
32	193	1553.33	32	192.95	1553.73
33	192.9	1554.13	33	192.85	1554.54
34	192.8	1554.94	34	192.75	1555.34
35	192.7	1555.75	35	192.65	1556.15
36	192.6	1556.55	36	192.55	1556.96
37	192.5	1557.36	37	192.45	1557.77
38	192.4	1558.17	38	192.35	1558.58
39	192.3	1558.98	39	192.25	1559.39
40	192.2	1559.79	40	192.15	1560.20
41	192.1	1560.61	41	192.05	1561.01
42	192	1561.42	42	191.95	1561.83
43	191.9	1562.23	43	191.85	1562.64
44	191.8	1563.05	44	191.75	1563.45
45	191.7	1563.86	45	191.65	1564.27
46	191.6	1564.68	46	191.55	1565.09
47	191.5	1565.50	47	191.45	1565.90
48	191.4	1566.31	48	191.35	1566.72

Port Label Description

The channel identification labels provide port identification. The Channel ID label is placed on the front panel. The below table lists the connection ports, description, and the type of connectors used for each port. All ports are on the front faceplate, 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
COM-RX	Common input	LC-UPC II
COM-TX	Common output	LC-UPC II
Ch*i*_RX	Channel input	LC-UPC II
Ch*i*_TX	Channel output	LC-UPC II
MON-DMX	Monitor port-demux section	LC-UPC II
MON-MUX	Monitor port-mux section	LC-UPC II
AUX-MUX	Auxiliary input-mux section	LC-UPC II
INV	USB inventory port	USB Type A receptacle connector

Performance Monitoring

The patch panel uses Optical Test Access Port (TAP) devices to enable passive access and monitoring in the fiber-optic network. TAPs enable network-based intrusion detection system sensors to operate efficiently without interruption. They send traffic data to a monitoring device by splitting the network signal, without introducing delay or changing the content or structure of the information contained in the packets. An optical spectrum analyzer (OSA)) or power meter (PM) can be used for optical power monitoring and optical analysis.

The following table shows the manufacturer-specified TAP split ratios for the TAP coupler optical power in the patch panel. The split ratio denotes the ratio of the TAP input signal to the output signal.

Table 3: Manufacturer-specified TAP Split Ratio

Parameter	Condition	Minimum	Maximum	Units
Monitor Attenuation MUX	Attenuation = IL1 - IL2, where IL1 = Ch1-RX to MON-MUX Insertion Loss and IL2 = Ch1-RX to COM-TX Insertion Loss.	18	22	dB
Monitor Attenuation DEMUX	COM-RX to MON-DMX Insertion Loss	18	22	dB

Safety Information

Before you install, operate, or service this product, you must read the Regulatory Compliance and Safety Information for Cisco Optical Transport Products document for important safety information and warning translations.

This product is compliant with the GR 1089, UL60950 /CSA 22.2 No. 60950-00, and IEC 60950 standards.

Laser Radiation Emission Restrictions

The Class 1M Laser safety and warning label is affixed to this product and 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

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

This product is optically and electrically passive and requires no electrical connections. No electrostatic discharge (ESD) or other electrical safety considerations apply.

Mounting Brackets and Rack Equipment

The patch panel is two-rack units (RUs) high and can be installed either above or below the DWDM generating equipment according to the local site practice. Each package includes one set of the following brackets:

- 19-inch (482.6-mm) or 23-inch (584.2-mm) reversible (two-way) mounting brackets that can be rotated to fit either rack size. These reversible brackets are used for EIA and IEC standard racks.
- ETSI brackets that are used for 600 mm x 600 mm or 600 mm x 300 mm ETSI racks.

Note The patch panel is shipped with the mounting brackets in the 19-inch (482.6-mm) position.

The patch panel mounting brackets can be mounted such that the patch panels project:

- 4.2, 4.9, 7.6, or 9.2 inches from the front of the EIA standard racks fixing plane (or)
- 39 mm from the front of the ETSI standard racks fixing plane (or)
- 55 mm from the front of the IEC standard racks fixing plane

Diagram 1 in the following figure shows 4.2 inch recess location for EIA standard racks.

Diagram 2 in the following figure shows 4.9 inch recess location for EIA standard racks.

Figure 2: 19-inch Brackets with 4.2" and 4.9" Recess Location for EIA Standard Racks

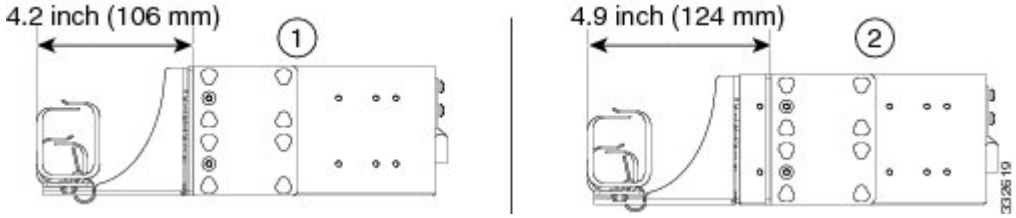
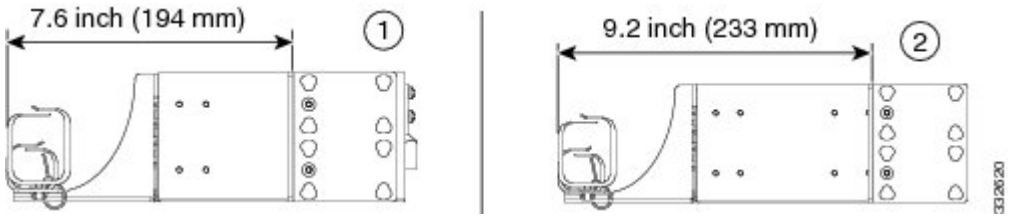


Diagram 1 in the following figure shows 7.6 inch recess location for EIA standard racks.

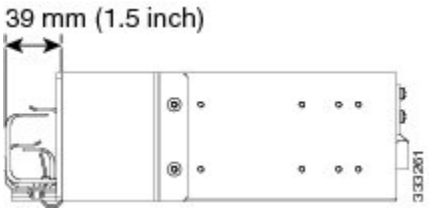
Diagram 2 in the following figure shows 9.2 inch recess location for EIA standard racks.

Figure 3: 19-inch Brackets with 7.6" and 9.2" Recess Location for EIA Standard Racks



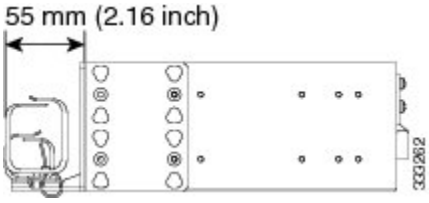
The following figure shows 39 mm recess location for ETSI standard racks.

Figure 4: ETSI Brackets with 39 mm Recess Location for ETSI Standard Racks



The following figure shows 55 mm recess location for IEC standard racks.

Figure 5: 19-inch Brackets with 55 mm Recess Location for IEC Standard Racks



Unpacking and Verifying the ONS 15216 MD Odd and Even Patch Panels

Procedure

Step 1 Unpack and inspect the module. The package should include these components:

Note The shipped quantity of each item is in parentheses.

- Patch panel module (1)
- Adhesive fiber holder clips (3)
- Tie-wrap (2)
- Velcro strips (4)
- 19-inch/23-inch ANSI brackets (2)
- ETSI brackets (2)
- #12-24 Philips pan head mounting screws (4)
- #12 lock washers (4)
- M6 Philips pan head mounting screws (4)
- M6 lock washers (4)
- Packing slip

Step 2 Compare the equipment received with the packing slip and the equipment list that the customer service representative 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

Installing the Patch Panels

Caution Use only the fastening hardware provided with the ONS 15216 MD odd and even patch panel to prevent loosening, deterioration, and electromechanical corrosion of the hardware and joined material.

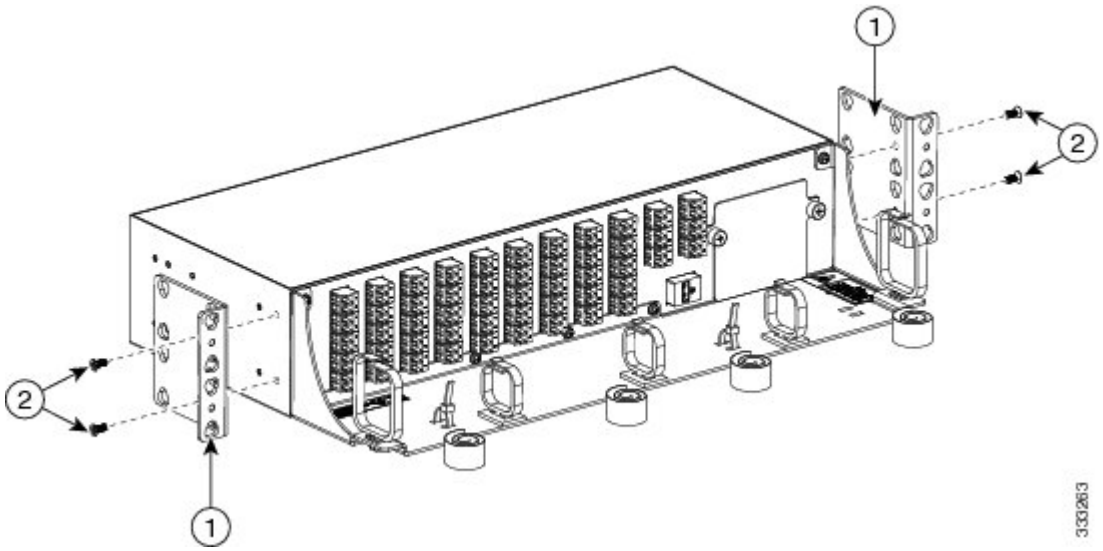
Caution When mounting the ONS 15216 MD odd and even patch panel in a frame with a nonconductive coating (such as paint, lacquer, or enamel) use either the thread-forming screws provided with the ONS 15216 MD patch panel shipping kit or remove the coating from the threads to ensure electrical continuity.

Procedure

Step 1 Mount the brackets on the patch panel (see the following figure):

a) Place the mounting bracket flush against the patch panel.
b) Align the mounting bracket screw holes against the patch panel screw holes.
c) Insert the screws and tighten them.
d) Repeat steps 1a through 1c to mount another bracket on the opposite side.

Figure 6: Mounting the Brackets on the Cisco ONS 15216 MD Odd and Even Patch Panel



1	Mounting bracket	**2**	Screw

Step 2 Install the patch panel on the appropriate rack equipment:

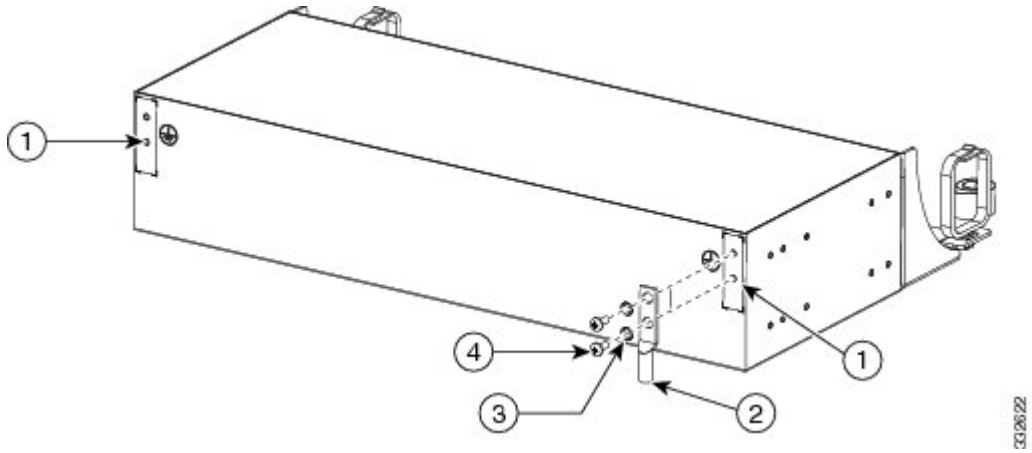
a) Lift the patch panel to the desired position in the rack.
b) Align the screw holes on the mounting brackets with the mounting holes in the rack.
c) Insert the screws and tighten them.

For information on mounting brackets and rack equipment, see Mounting Brackets and Rack Equipment, on page 7.

Step 3 Establish grounding for the patch panel:

a) Crimp a #14 AWG ground cable to the ground lug.
b) Attach the ground lug to the patch panel. The ground points are present on the left and right rear side of the patch panel, as shown in the following figure:

Figure 7: Grounding the Cisco ONS 15216 MD Odd and Even Patch Panel



1	Ground point	**2**	Ground lug
3	Lock washer	**4**	Pan head screw

c) Tighten the lug using the screws.
d) Terminate the other end of the ground cable either at the office ground point or the rack ground point.

For installing and routing fiber-optic and USB cables, see "Installing and Routing Fiber-Optic and USB Cables, on page 11". For cleaning the fiber-optic connectors, see "Cleaning and Maintaining Fiber-Optic Connectors, on page 15".

Installing and Routing Fiber-Optic and USB Cables

The patch panel 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. For port label description, see "Table 2: Port Label Descriptions, on page 6".

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 a Cisco 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 "Cleaning and Maintaining Fiber-Optic Connectors, on page 15".

⚠

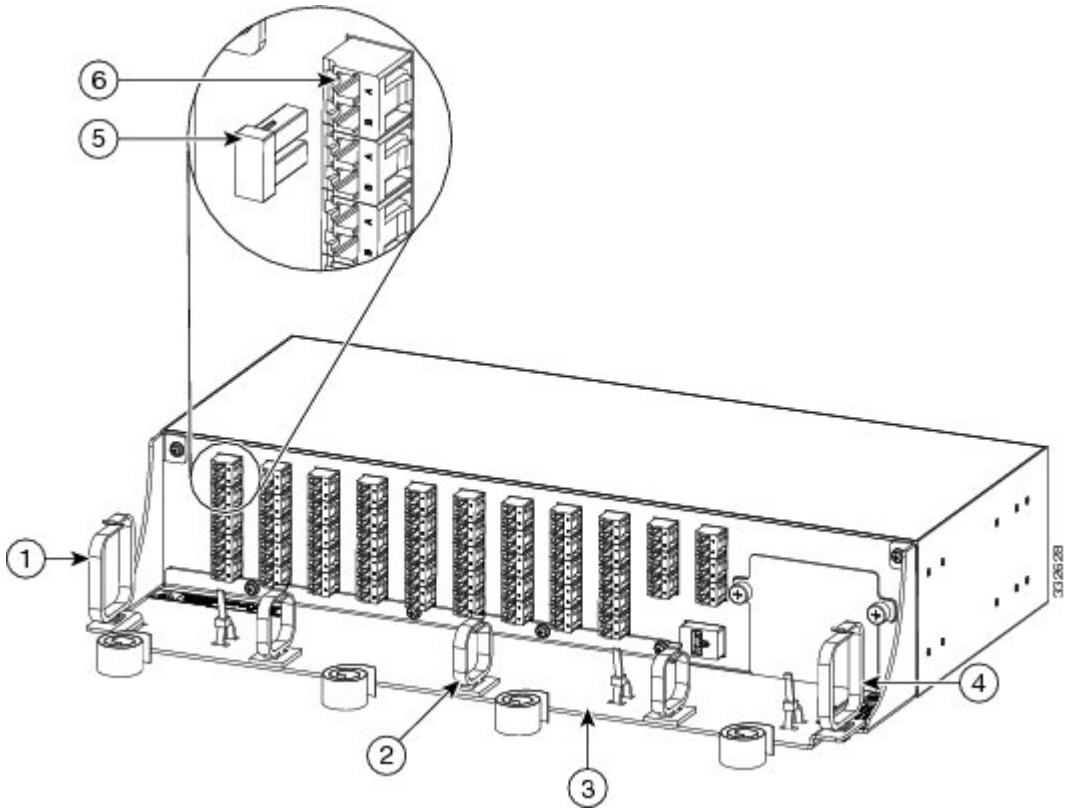
Caution The patch panel features LC/UPC bulkhead adapters for optical connections. Always use fiber-optic cables equipped with the corresponding (LC/UPC) connector type. Using any other type of connector results in damage to the connector or adapter, or both.

Procedure

Step 1 To connect the fibers as appropriate (see the following figure):

a) Remove the LC adapter cap from the LC-LC adapter.
b) Place the LC/UPC cable connector in front of the corresponding bulkhead adapter on the front panel of the patch panel.
c) Align the keyed ridge of the cable connector with the slot in the receiving adapter.
d) Gently push the cable connector into the adapter until you hear a click, which indicates that the latching system is engaged.
e) Route the cables through the left or right fiber holder clip.
f) The operator can choose to further secure the fibers placing them into one or more adhesive clips which can be placed on the fiber management plate as per the actual installation conditions.

Figure 8: Connecting and Routing Fibers

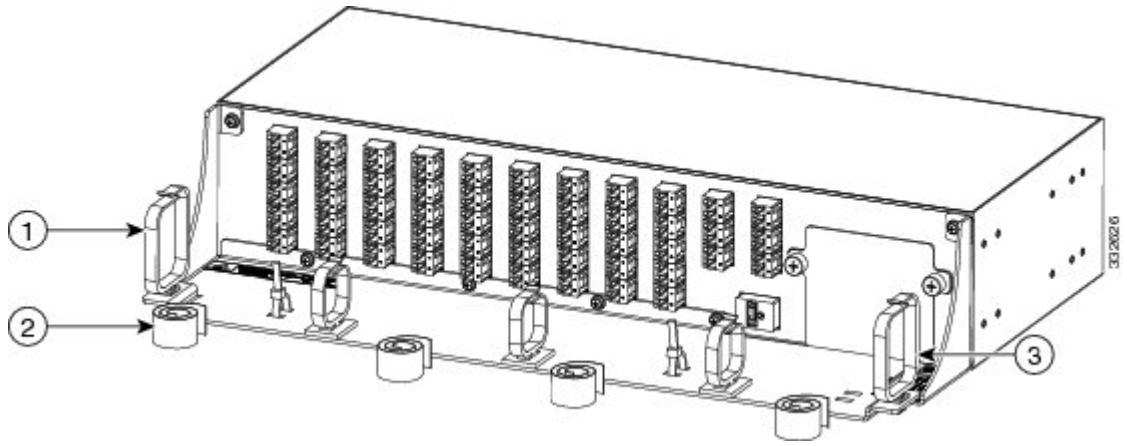


1	Left fiber holder clip	**2**	Adhesive fiber holder clip
3	Fiber management plate	**4**	Right fiber holder clip

5	LC adapter cap	**6**	LC duplex adapter

Step 2 To secure the fibers, bundle the fibers using one of the four velcro strips that is provided (see the following figure):

Figure 9: Routing Fiber-Optic Cables

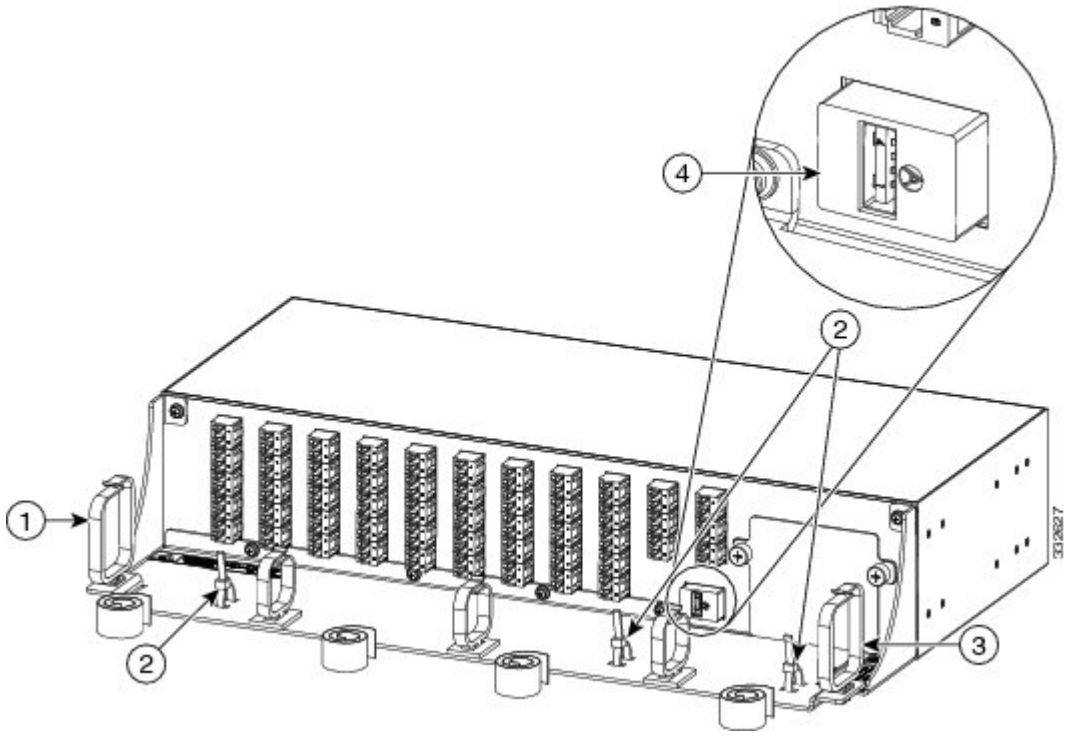


1	Left fiber holder clip	**2**	Velcro strip
3	Right fiber holder clip		

Step 3 To connect and secure the inventory USB Type A plug connector to the inventory USB Type A receptacle connector (see the following figure):

a) Route the inventory USB cable through the left or right fiber holder clip.
b) Connect the USB Type A plug connector to the USB Type A receptacle connector.
c) Secure the USB cable with a tie-wrap at one of the three available locations on the patch panel.

Figure 10: Connecting and Securing the USB Cable



1	Left fiber holder clip	**2**	Tie-wrap
3	Right fiber holder clip	**4**	Inventory USB type A receptacle connector

Uninstalling the Cisco ONS 15216 MD Odd and Even Patch Panels

Procedure

Step 1 Gently disconnect the fiber-optic connectors from the LC-LC adapters.

Step 2 Disconnect the inventory USB cable releasing it from the USB tie-wrap and from the USB receptacle.

Step 3 Remove the fibers and the USB cable from the fiber holder clips.

Step 4 Disconnect the ground lug.

Step 5 Loosen the mounting screws and remove the patch panel from the rack.

Cleaning and Maintaining Fiber-Optic Connectors

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 optical mating adapter on the front panel of the device 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 optical mating adapter on the front panel.

Note The LC optical mating adapter on the faceplate of the device is less likely to get dirty if it is capped when not in use. On some devices, the optical mating adapter has a shutter. The shutter automatically closes when the LC/UPC connector is disconnected. This prevents entry of dirt.

The procedure for a thorough cleaning of these adapters is complicated. Use a commercially available cleaning kit and closely follow the instructions included with the kit.

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 device.

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 multifiber cable assemblies, use specific cleaning tools or materials designed for the assembly type.

Cleaning the Optical Mating Adapter

Procedure

Step 1 Read the cartridge cleaning instructions (provided by the manufacturer) to insert the cartridge cleaning tip into the optical 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. The optical mating adapters that have shutter need not be capped.

Cleaning 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

Procedure

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) If present, 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 the above sub-steps.
e) Insert the fiber connector into the applicable adapter or attach a dust cap to the fiber connector.

Note Before replacing a dust cap on a connector, 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).

Cisco ONS 15216 MD Patch Panel Specifications

This section contains environmental, power, optical, mechanical, and connector specifications for the patch panel.

Environmental and Power Specifications

Table 4: Environmental and Power Specifications for 15216-MD-48-ODD and 15216-MD-48-EVEN

Environmental Condition	Minimum	Maximum	Units
Continuous Operative Temperature Range (OTR)	-5	65	Celsius
	23	149	Fahrenheit
Power handling for the optical port	300	—	mW
Power handling for the USB Port	400	600	mW

Table 5: Environmental and Power Specifications for 15216-MD-48-ODDE and 15216-MD-48-EVENE

Environmental Condition	Minimum	Maximum	Units
Storage Temperature Range	-40	85	Celsius
	-40	185	Fahrenheit
Continuous Operative Temperature Range (OTR)	-5	65	Celsius
	23	149	Fahrenheit
Operating Humidity	5	95	%RH
Power handling for the each port	500	—	mW

Optical Specifications

Table 6: Optical Specifications for 15216-MD-48-ODD and 15216-MD-48-EVEN

Parameter	Condition	Min	Max	Units
Frequency/Wavelength Range (Odd Grid version)	Within operative temperature range	196.1	191.4	THz
		1566.31	1528.77	nm
Frequency/Wavelength Range (Even Grid version	Within operative temperature range	196.05	191.35	THz
		1566.72	1529.16	nm
Channel Spacing (Odd and Even Grid)	Within operative temperature range	100		GHz
Operating Bandwidth		-20	+20	GHz
-0.50 dB Clear Bandwidth	• Any state of polarization (SOP) and within operative temperature range • Around ITU center wavelength	-18	+18	GHz
-1.0 dB Clear Bandwidth		-23	+23	GHz
-3.0 dB Clear Bandwidth		-32	+32	GHz

Parameter	Condition	Min	Max	Units
Insertion Loss BOL[1] (Beginning of life) - DEMUX module	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth • Including connectors	3.0	6.0	dB
Insertion Loss BOL (Beginning of life) - MUX module		4.0	6.0	dB
Insertion Loss EOL (End of life) - DEMUX module		3.0	6.5	dB
		4.0	6.5	dB
Insertion Loss EOL (End of life) - MUX module				
Insertion Loss Uniformity[2]		—	1.5	dB
Adjacent Channel Isolation[3] DEMUX	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth	20.0	—	dB
Non-Adjacent Channel Isolation[4] DEMUX		30.0	—	dB
Total Crosstalk DEMUX		16.0	—	dB
Adjacent Channel Isolation MUX	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth	17.0	—	dB
Non-Adjacent Channel Isolation MUX		30.0	—	dB
Total Crosstalk MUX		14.0	—	dB
Group Delay Ripple[5] (GDR)	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth • Including connectors	-1.0	+1.0	ps
Chromatic Dispersion[6]		-12.0	+12.0	ps/nm
Return Loss		40	—	
Polarization Dependent Loss (PDL)[7]		—	0.7	dB
Polarization Mode Dispersion (PMD)[8]		—	0.5	ps
Monitor Attenuation MUX[9]		18	22	dB
Monitor Attenuation DEMUX[10]		18	22	dB
AUX-MUX to COM-TX Insertion Loss		—	11	dB

[1] The Insertion Loss (IL) values are measured as the maximum IL inside the Operating Wavelength Bandwidth (± 80 pm, centered on each ITU wavelength of the channel).
[2] Insertion Loss Uniformity is defined as the difference between the maximum insertion losses over any two operating wavelength bandwidths.
[3] Adjacent Channel Isolation is defined as the difference between the maximum IL in the 100 GHz transmitted channel Bandwidth (ITU ± 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth of both adjacent 100 GHz channels.
[4] Non-Adjacent Channel Isolation is defined as the difference between the maximum IL in the 100 GHz transmitted channel Bandwidth (ITU ± 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth of both non-adjacent 100 GHz channels.
[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 derivative of the Group Delay versus the wavelength curve in the 100 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 100 GHz transmitted channel bandwidth (Operating Wavelength Bandwidth).
[9] Mux Module: Attenuation = IL1 - IL2, where IL1 = Ch1-RX to MON-MUX Insertion Loss and IL2 = Ch1-RX to COM-TX Insertion Loss.
[10] Demux Module: COM-RX to MON-DMX Insertion Loss.

Table 7: Optical Specifications for 15216-MD-48-ODDE and 15216-MD-48-EVENE

Parameter	**Condition**	**Min**	**Max**	**Units**
Frequency/Wavelength Range (Odd Grid version)	Within operative temperature range	196.1	191.4	THz
		1566.31	1528.77	nm
Frequency/Wavelength Range (Even Grid version	Within operative temperature range	196.05	191.35	THz
		1566.72	1529.16	nm
Channel Spacing (Odd and Even Grid)	Within operative temperature range	100		GHz
Operating Bandwidth		-33	+33	GHz
-1.5 dB Clear Bandwidth	• Any state of polarization (SOP) and within operative temperature range • Around ITU center wavelength	-30	30	GHz
-3.0 dB Clear Bandwidth		-37.5	+37.5	GHz

Parameter	Condition	Min	Max	Units
Insertion Loss BOL[11] (Beginning of life) - DEMUX module	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth • Including connectors	3.0	5.0	dB
Insertion Loss BOL (Beginning of life) - MUX module		3.0	5.0	dB
Insertion Loss EOL (End of life) - DEMUX module		3.0	5.5	dB
Insertion Loss EOL (End of life) - MUX module		3.0	5.5	dB
Insertion Loss Uniformity[12]		—	1	dB
Adjacent Channel Isolation[13] DEMUX	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth	8.0	—	dB
Non-Adjacent Channel Isolation[14] DEMUX		25.0	—	dB
Total Crosstalk DEMUX		5.0	—	dB
Adjacent Channel Isolation MUX	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth	8.0	—	dB
Non-Adjacent Channel Isolation MUX		25.0	—	dB
Total Crosstalk MUX		5.0	—	dB
Group Delay Ripple[15] (GDR)	• Any state of polarization (SOP) and within operative temperature range • Within operating bandwidth • Including connectors	0	3	ps
Chromatic Dispersion[16]		-12.0	+12.0	ps/nm
Return Loss		40	—	
Polarization Dependent Loss (PDL)[17]		—	0.7	dB
Polarization Mode Dispersion (PMD)[18]		—	0.5	ps
Monitor Attenuation MUX[19]		18	22	dB
Monitor Attenuation DEMUX[20]		18	22	dB
AUX-RX to COM-TX Insertion Loss MUX		—	11	dB

[11] The Insertion Loss (IL) values are measured as the maximum IL inside the Operating Wavelength Bandwidth (± 80 pm, centered on each ITU wavelength of the channel).

[12] Insertion Loss Uniformity is defined as the difference between the maximum insertion losses over any two operating wavelength bandwidths.

[13] Adjacent Channel Isolation is defined as the difference between the maximum IL in the 100 GHz transmitted channel Bandwidth (ITU ± 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth of both adjacent 100 GHz channels.

[14] Non-Adjacent Channel Isolation is defined as the difference between the maximum IL in the 100 GHz transmitted channel Bandwidth (ITU ± 80 pm) and the minimum IL measured over the Operating Wavelength Bandwidth of both non-adjacent 100 GHz channels.

[15] The difference between the maximum and minimum group delay in the Operating Wavelength Bandwidth of each channel evaluated at all SOP.

[16] Chromatic Dispersion is defined as the maximum derivative of the Group Delay versus the wavelength curve in the 100 GHz transmitted channel bandwidth (Operating Wavelength Bandwidth)

[17] 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.

[18] PMD (Polarization Mode Dispersion) is defined as the maximum of the DGD versus the wavelength curve in the 100 GHz transmitted channel bandwidth (Operating Wavelength Bandwidth).

[19] Mux Module: Attenuation = IL1 - IL2, where IL1 = Ch1-RX to MON-MUX Insertion Loss and IL2 = Ch1-RX to COM-TX Insertion Loss.

[20] Demux Module: COM-RX to MON-DMX Insertion Loss.

Connector and Mechanical Specifications

Table 8: Connector and Mechanical Specifications

Parameter	Condition	Specification
Connector Type	All optical ports	LC/UPC II
	USB inventory port	USB Type A receptacle connector
Optical Adapter Type	All optical ports	LC
Patch Panel Dimensions		The Cisco ONS 15216 MD odd or even patch panels measure 3.45-inches (87.6 mm) high, 17.21-inches (437.1 mm) wide, and 10.96-inches (278.4 mm) deep

Related Documentation

Use this guide in conjunction with the following referenced publications:

- *Cisco ONS 15454 DWDM Configuration Guides*
- *Cisco ONS 15454 DWDM Troubleshooting Guide*

Short Description

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