


Cisco ONS 15216 Metropolitan Dense Wavelength Division Multiplexing 100-GHz Filter Solution



The Cisco ONS 15216 is part of the Cisco ONS 15200 Metropolitan Dense Wavelength Division Multiplexing (DWDM) solution, the first Metro DWDM solution to deliver instant wavelengths to buildings, premises, or points of presence (POPs). The Cisco ONS 15216 supercharges wavelength services by supporting up to 32 ITU-grid wavelengths, and provides unprecedented transport flexibility with optical filtering, optical add/drop multiplexing (OADM), optical performance monitoring, and amplification. The Cisco ONS 15216 allows service providers to deliver more services per wavelength and more wavelengths per fiber to achieve radical economic benefits.

The Cisco ONS 15216 optical filter solution enables service providers to deploy point-to-point, bus, and ring networks using the terminal filter multiplexing and demultiplexing and OADM. The Cisco ONS 15216 platform provides an open and flexible solution to combine wavelengths launched by the Cisco ONS 15454, ONS 15252, ONS 15201, and ONS 15540. The Cisco ONS 15216 supercharges wavelength services and extends Cisco's optical leadership to metro regional DWDM.

The Cisco ONS 15216 Metropolitan DWDM filter solution for 100-GHz wavelength spacing is comprised of the following elements:

- 32-wavelength terminal filter solution (multiplexing and demultiplexing)
 - 16-wavelength base red filter
 - 16-wavelength upgrade blue filter
- OADMs
 - One-channel, two-path OADM
 - Two-channel, two-path OADM
 - Four-channel, two-path OADM

32-Wavelength Terminal Filter Solution

The Cisco ONS 15216 red and blue filters allow service providers to multiplex multiple ITU grid wavelengths launched by the Cisco ONS 15454 and ONS 15252 onto a single fiber, maximizing network capacity and fiber utilization.

The Cisco ONS 15216 Base Red Filter

The base filter assembly, the Cisco ONS 15216 red filter, is a passive unit comprising a 100-GHz 16-x-1 wavelength unidirectional multiplexer (mux) and a 100-GHz 1-x-16 wavelength unidirectional demultiplexer (demux) operating in the 1546- to 1561-nanometer (nm) frequency band. The mux and demux systems connect independent fibers to the carrier's fiber facilities through the common ports on the chassis



faceplate. The base unit integrates two pairs of expansion ports, enabling in-service upgrades from 16 mux/demux wavelengths to 32 wavelengths. The base unit also incorporates two monitor ports, allowing the user unobtrusive access to the transmit and receive signals (see Figure 1) for monitoring or analysis. The filter mounts in a 19- or 23-inch rack and occupies two rack units (RU).

The Cisco ONS 15216 Upgrade Blue Filter

The upgrade filter assembly, the Cisco ONS 15216 blue filter, is a passive unit comprising a 100-GHz 1-x-16 wavelength unidirectional multiplexer and a 100-GHz 1-x-16 wavelength unidirectional demultiplexer operating in the 1530- to 1545-nm frequency band. The front-panel common connector ports on the upgrade filter are used to connect to the base unit's upgrade ports via user-supplied optical patch cords. The filter mounts in a 19- or 23-inch rack and occupies two RU.

Figure 1 Optical Signal Flow in Cisco ONS 15216 Base Red Filter



Figure 2 Front-Panel Port Layouts: Base Red, Top; Upgrade Blue, Bottom



Cisco ONS 15216 OADMs

The Cisco ONS 15216 optical add/drop multiplexers (OADMs) allow service providers to deliver wavelengths to the building in single-channel increments, and to combine wavelengths from the Cisco ONS 15454, ONS 15252, ONS 15201, and ONS 15540 platforms.

The Cisco ONS 15216 offers three OADMs: A one-channel, two-path OADM that allows service providers to add and drop one protected channel (one in each direction east and west) at any point in a DWDM ring; a two-channel, two-path OADM that allows service providers to add and drop two protected channels; and a four-channel, two-path OADM that allows service providers to add and drop four protected channels (See Figures 3, 4, and 5). The 1 and 2 Channel OADMs are packaged in a compact, 1-RU 19- or 23-inch rack-mounted shelf. The 4 Channel OADM is packaged in a compact, 2-RU 19- or 23-inch rack-mounted shelf. Software-controlled variable optical attenuators are available at the add ports of the units to attenuate the power level of the added channel to match the express stream. This enables the user to ensure the channel being added does not negatively impact the uniformity of the spectrum. This is particularly important for amplified



applications where the flatness response of the C-band erbium doped fiber amplifier (EDFA) is directly linked to the uniformity of the input stream. Two output monitor tap ports are also provided in the same chassis to monitor the outgoing signals in east and west directions.

Figure 3 Front-Panel Port Layouts for the Cisco ONS 15216 100-GHz OADM1



Figure 4 Front-Panel Port Layouts for the Cisco ONS 15216 100-GHz OADM2

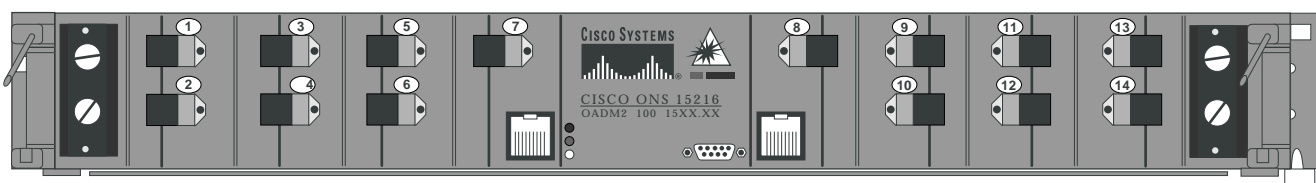
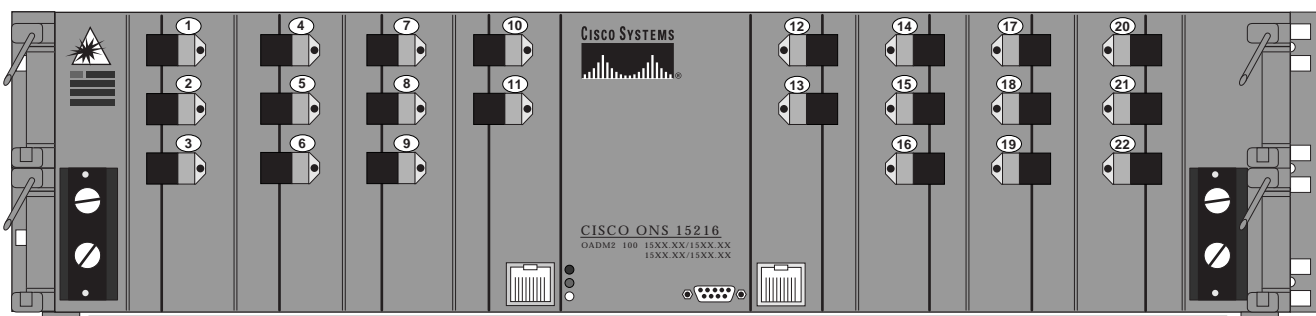


Figure 5 Front-Panel Port Layouts for the Cisco ONS 15216 100-GHz OADM4



Cisco ONS 15216 Filter Solution Benefits

- **Supercharged wavelength services**—Allows service providers to aggregate subwavelength services onto DWDM networks to maximize service density and revenue per wavelength. Subwavelength services can be combined with wavelength services on the same network.
- **Unprecedented transport flexibility**—Supports a range of applications from point-to-point DWDM to more advanced OADM rings scaling to several-hundred-kilometer ring circumferences. Supports up to 32 OADM sites, using a combination of Cisco ONS 15252, ONS 15201 metro DWDM platforms, and ONS 15454 and ONS 15327 optical transport platforms.
- **Radical economics**—Reduces network costs by eliminating transponders and leveraging the ITU interfaces available for the Cisco ONS 15454 or other ITU-enabled, multiservice platforms. Also provides highly cost-effective solutions for transponder-based services using the Cisco ONS 15252 and ONS 15201, particularly for amplified networks where the Cisco ONS 15216 EDFA is used.
- **Small footprint**—The one-channel and two-channel OADMs are only a single RU, and the mux/demux terminal filters and four-channel OADMs are only two RUs, saving costly equipment space.
- **Easy channel upgrades**—Upgrades from base red filters to blue filters can be accomplished without disturbing existing channels on the red filter. Additional OADM sites can easily be added by switching over traffic to the protection path.



- *Network management integration*—The active components in the filter solution—the OADMs—are managed through the Cisco Transport Manager element management system. The Cisco Transport Manager provides integrated management of the complete optical network including the Cisco ONS 15454, ONS 15252, ONS 15201, and all other optical products in the Cisco portfolio.

Specifications

Table 1 Multiplexing/Demultiplexing Terminal Filters

Optical parameters	Cisco 15216 mux/demux
Channel spacing	100 GHz
Center wavelengths, base red filter	1546.12 nm 1546.92 nm 1547.72 nm 1548.51 nm 1550.12 nm 1550.92 nm 1551.72 nm 1552.52 nm 1554.13 nm 1554.94 nm 1555.75 nm 1556.55 nm 1558.17 nm 1558.98 nm 1559.79 nm 1560.61 nm
Center wavelengths, upgrade blue filter	1530.33 nm 1531.12 nm 1531.90 nm 1532.68 nm 1534.25 nm 1535.04 nm 1535.82 nm 1536.61 nm 1538.19 nm 1538.98 nm 1539.77 nm 1540.56 nm 1542.14 nm 1542.94 nm 1543.73 nm 1544.53 nm
End-to-end insertion loss, mux+demux	<11 dB
Channel uniformity, mux+demux	<1.2 dB
Filter passband	ITU +/-0.11 nm

Optical parameters	Cisco 15216 mux/demux
Passband flatness	<0.5 dB
Isolation of dropped channels	>25 dB for adjacent >28 dB for second adjacent >40 dB for nonadjacent
Polarization dependent loss	<0.35 dB
Polarization mode dispersion	<0.5 ps
Directivity	>50 dB
Optical return loss	>40 dB
Insertion loss of monitor ports	17.8 +/- 1 dB
Temperature	
Operating	0 to 70 C
Storage	-40 to +85 C
Connector type	SC/UPC
Dimensions H x W x D	3.5" x 17" x 11" in. (89 x 437 x 279 mm)

Table 2 Cisco 15216 OADMs

Parameters	Cisco 15216 OADM1	Cisco 15216 OADM2	Cisco 15216 OADM4
Channel spacing	100 GHz	100 GHz	100 GHz
Number of wavelength versions	32	16	8
End-to-end insertion loss	<1.6 dB pass- through <2.2 dB drop <3.2 dB add	<2.0 dB pass- through <2.5 dB drop <3.5 dB add	<1.5 dB pass- through <3.6 dB drop <4.5 dB add
Filter passband	ITU +/- 0.10 nm	ITU +/- 0.10 nm	ITU +/- 0.10 nm
Passband flatness	<0.5 dB	<0.5 dB	<0.5 dB
Isolation of dropped channels	>25 dB for adjacent >40 dB for non-adjacent	>25 dB for adjacent >40 dB for non-adjacent	>25 dB for adjacent >40 dB for non-adjacent
Polarization mode dispersion	<0.1 ps	<0.1 ps	<0.1 ps
Directivity	>55 dB	>55 dB	>55 dB
Optical return loss	>40 dB	>40 dB	>40 dB
Insertion loss of monitor ports	17.8 +/- 1 dB	17.8 +/- 1 dB	17.8 +/- 1 dB

Parameters	Cisco 15216 OADM1	Cisco 15216 OADM2	Cisco 15216 OADM4
VOA dynamic range	>35 dB	>35 dB	>35 dB
Connector type	SC/UPC	SC/UPC	SC/UPC
Temperature			
Operating	0 to 70 C	0 to 70 C	0 to 70 C
Storage	-40 to 85 C	-40 to 85 C	-40 to 85 C
Input voltage	-48 VDC A+B	-48 VDC A+B	-48 VDC A+B
Power consumption	<25W	<25W	<25W
Network management			
Physical interfaces	Ethernet, RS232	Ethernet, RS232	Ethernet, RS232
Protocols supported	FTP, TL1, CLI	FTP, TL1, CLI	FTP, TL1, CLI
Dimensions H x W x D	1.75" x 17" x 11" in. (44 x 437 x 279 mm)	1.75" x 17" x 11" in. (44 x 437 x 279 mm)	3.5" x 17" x 11" in. (44 x 437 x 279 mm)

For More Information

For more information about the Cisco ONS 15216, please visit:

http://www.cisco.com/en/US/products/hw/optical/ps1996/prod_literature.html



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