NETWORKS

MUX & OADM SERIES
USER MANUAL
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Safety Information

Before you install, operate, or service the DWDM and CWDM passive optical modules, you must read the Regulatory Compliance and Safety Information for important safety information and warning translations.

Laser Radiation Emission Restrictions

The Class 1M Laser safety and warning label affixed to the DWDM and CWDM passive optical modules indicate 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.

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.

Notices:

1. Note: MUX can be used to build and augment WDM networks by increasing network bandwidth capacity if combined with EDFA, transponders and other FMT assemblies.

2. Note: Before installing the fiber-optic cable, always keep adapter ports and fiber connectors clean. When it is not in use, please always capped with a clean dust cap.

3. Note: Attached sticker describes the specifications of MUX, which improves deployment flexibility for your WDM system.
Chapter 1 Optical Mux Introduction/Features

1.1 Introduction

1.1.1 CWDM MUX

The CWDM Mux Demux covers all channels from 1270nm to 1610nm in 20nm increments. It is a flexible network solution that allows network operators to cost-effectively implement point to point or ring based WDM optical networks.

The main fields of applications are the use in SDH (STM-1, STM-4, STM-16, STM-64), IP (Fast Ethernet, Gigabit Ethernet, 10 Gigabit) ATM and storage (1G, 2G, 4G, 8G, 10G Fibre Channel) networks.

1.1.2 DWDM MUX

The DWDM passive Mux Demux modules deliver the benefits of a Dense Wave Division Multiplexer in a fully passive solution. They are designed for long-haul transmission where wavelengths are packed tightly together over the C-band range of wavelengths, up to 48 wavelengths in 100GHz grid (0.8nm) and 96 wavelengths in 50GHz grid (0.4nm). ITU G.694.1 standard and Telcordia GR1221, GR1209, CE, RoHS, FCC are compliant.

Our DWDM Mux Demux are modular, scalable and are perfectly suited to transport PDH, SDH/SONET, ETHERNET services over WWDM, CWDM and DWDM in optical metro edge and access networks.

1.2 Main Module Features

- Low insertion loss
- LC/SC/FC/ST, UPC/APC connectors are available
- High quality thin film filter technology and AWG technology
- Protocol transparent including 10/1G Ethernet, SDH/SONET, 16/8/4/2G Fibre Channel, FTTx and CATV, STM64, OC192, 3G SDI, OTU2, CPRI 1-7
- Monitor/expansion/1310nm/1550nm port for external functions
- Completely passive, no power & no cooling required
1.3 Functional Description

1.3.1 8ch CWDM MUX, DF

Front Panel

![Diagram of 8ch CWDM MUX, DF](image)

Line: Line interface for common signal

Figure 1-1

**Configuration Diagram**

<table>
<thead>
<tr>
<th>1470 RX → TX Line</th>
<th>RX Line → 1470 TX</th>
</tr>
</thead>
<tbody>
<tr>
<td>1490 RX → TX Line</td>
<td>RX Line → 1490 TX</td>
</tr>
<tr>
<td>1510 RX → TX Line</td>
<td>RX Line → 1510 TX</td>
</tr>
<tr>
<td>1530 RX → TX Line</td>
<td>RX Line → 1530 TX</td>
</tr>
<tr>
<td>1550 RX → TX Line</td>
<td>RX Line → 1550 TX</td>
</tr>
<tr>
<td>1570 RX → TX Line</td>
<td>RX Line → 1570 TX</td>
</tr>
<tr>
<td>1590 RX → TX Line</td>
<td>RX Line → 1590 TX</td>
</tr>
<tr>
<td>1610 RX → TX Line</td>
<td>RX Line → 1610 TX</td>
</tr>
<tr>
<td>RX/EXP → TX Line</td>
<td>RX Line → TX EXP</td>
</tr>
</tbody>
</table>

1.3.2 9ch CWDM MUX, SF

Front Panel

![Diagram of 9ch CWDM MUX, SF](image)

Line: Line interface for common signal

Figure 1-2

**Configuration Diagram**

<table>
<thead>
<tr>
<th>Line → 1270 TX</th>
<th>1290 RX → Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line → 1310 TX</td>
<td>1330 RX → Line</td>
</tr>
<tr>
<td>Line → 1350 TX</td>
<td>1370 RX → Line</td>
</tr>
<tr>
<td>Line → 1390 TX</td>
<td>1410 RX → Line</td>
</tr>
<tr>
<td>Line → 1430 TX</td>
<td>1450 RX → Line</td>
</tr>
<tr>
<td>Line → 1470 TX</td>
<td>1490 RX → Line</td>
</tr>
<tr>
<td>Line → 1510 TX</td>
<td>1530 RX → Line</td>
</tr>
<tr>
<td>Line → 1550 TX</td>
<td>1570 RX → Line</td>
</tr>
<tr>
<td>Line → 1590 TX</td>
<td>1610 RX → Line</td>
</tr>
</tbody>
</table>
Chapter 2 Optical Add/Drop Introduction/Features

2.1 Introduction

2.1.1 CWDM OADM

CWDM Optical Add/Drop multiplexer (OADM) is a passive optical device used in WDM networks for adding and dropping one/multiple CWDM channels into one or two fibers, while letting the rest of the wavelengths bypass to the needed destination. Through the use of CWDM technology, individual channels can be optically extracted from a fiber pair while allowing pass-through traffic to continue unobstructed through the bus or ring.

CWDM OADM modules are available in single-sided (East or West) and dual-sided (East and West) configurations supporting up to four wavelengths. Each CWDM OADM uses wavelengths that fall within the ITU-T G.694.2 (2002) CWDM grid standard from 1270nm to 1610nm with 20nm spacing.

2.1.2 DWDM OADM

DWDM Optical Add/Drop multiplexer (OADM) is a passive optical device used in WDM networks for adding and dropping one/multiple 100GHz DWDM channels in the C-band into one or two fibers, while letting the rest of the wavelengths bypass to the needed destination.

Using the DWDM technology can add effectively WDM capability to their existing and new networks, and extend the optical signals transmission distance.

2.2 Main Module Features

- Low insertion loss
- Protocol transparent (support 1G, 10G etc.)
- Based on thin film optics with epoxy free optical path
- Fully compliant with Telcordia GR1221, GR1209, RoHS, ISO
- Plug-in module for integration in a standalone or 2-slot 1U 19" rack
- Completely passive, no power or maintenance required
- Ideal for WDM ring structures or daisy chain applications
2.3 Functional Description

2.3.1 4ch DWDM OADM East and West, DF

Front Panel

Line: Line interface for common signal

Configuration Diagram

| RX Line W → TX C57 W | RX Line E → TX C57 E |
| RX Line W → TX C58 W | RX Line E → TX C58 E |
| RX Line W → TX C59 W | RX Line E → TX C59 E |
| RX Line W → TX C60 W | RX Line E → TX C60 E |
| RX C57 W → TX Line W | RX C57 E → TX Line E |
| RX C58 W → TX Line W | RX C58 E → TX Line E |
| RX C59 W → TX Line W | RX C59 E → TX Line E |
| RX C60 W → TX Line W | RX C60 E → TX Line E |

RX Line W → TX Line E (Other than C57-C60)
RX Line E → TX Line W (Other than C57-C60)

Remark: The TX of the channel port is drop, and RX is add.

2.3.2 4ch DWDM OADM East or West, DF

Front Panel

Line: Line interface for common signal

Configuration Diagram

| RX Line W → TX C57 W | RX C57 W → TX Line W |
| RX Line W → TX C58 W | RX C58 W → TX Line W |
| RX Line W → TX C59 W | RX C59 W → TX Line W |
| RX Line W → TX C60 W | RX C60 W → TX Line W |

RX Line W → TX Line E (Other than C57-C60)
RX Line E → TX Line W (Other than C57-C60)

Remark: The TX of the channel port is drop, and RX is add.
2.3.3 2ch DWDM OADM East and West, SF

Front Panel

Line: Line interface for common signal

Configuration Diagram

<table>
<thead>
<tr>
<th>Line W → TX C22 W</th>
<th>Line E → TX C21 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line W → TX C24 W</td>
<td>Line E → TX C23 W</td>
</tr>
<tr>
<td>RX C21 W → Line W</td>
<td>RX C22 E → Line E</td>
</tr>
<tr>
<td>RX C23 W → Line W</td>
<td>RX C24 E → Line E</td>
</tr>
<tr>
<td>Line W ↔ Line E (Other than C21-C24)</td>
<td></td>
</tr>
</tbody>
</table>

Remark: The TX of the channel port is drop, and RX is add.

2.3.4 2ch DWDM OADM East or West, SF

Front Panel

Line: Line interface for common signal

Configuration Diagram

<table>
<thead>
<tr>
<th>Line W → TX C22 W</th>
<th>RX C21 W → Line W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line W → TX C24 W</td>
<td>RX C23 W → Line W</td>
</tr>
<tr>
<td>Line W ↔ Line E (Other than C21-C24)</td>
<td></td>
</tr>
</tbody>
</table>

Remark: The TX of the channel port is drop, and RX is add.
Chapter 3 Installation

3.1 Installing FMU 1U Rack Mount

3.1.1 Installation Procedures

Step 1: Mounting the equipment in a rack

To attach the chassis to a standard 19" rack:

1. Place the track mounting bracket on the desired position.
2. Put the enclosure that inserted the Mux Demux on the rack.
3. Use M6*12mm screws and M6 nuts to secure.

NOTE: Align the rack mounting bracket screw holes against the equipment rack screw holes (see Figure 3-2).
Step 2: Installation complete

Make sure that the screws are tightened and the nuts are assembled correctly.

3.2 Installing FMU Plug-in Module
1U Rack Mount Chassis

Figure 3-5

NOTES: The fiber adapters panel and dust caps can be replaced. DO NOT disassemble the machine cover.

3.2.1 Installation Procedures

Step 1: Inserting MUX Demux modules in a 1U 2-slot chassis

To insert a module:
1. Align the module with the chassis shelf.
2. Gently push the module into the shelf cavity.
3. Press on the M3 captive screws first and then tighten it on each side.

Figure 3-6

NOTE: The side with no label is facing up.
Step 2: Mounting the equipment in a rack

To attach the chassis to a standard 19" rack:

1. Place the track mounting bracket on the desired position.
2. Put the enclosure that inserted the Mux Demux on the rack.
3. Use M6*12mm screws and M6 nuts to secure.

![Diagram of mounting bracket and screws](image)

NOTE: Align the rack mounting bracket screw holes against the equipment rack screw holes (see Figure 3-7).

Step 3: Installation complete

Make sure that the screws are tightened and the nuts are assembled correctly.

![Completed installation](image)
3.3 Installing Fiber Cables

To connect fiber optic cables from the Mux Demux module ports to the WDM (SFP) transceivers:

1. Remove the protective cover from the port. Clean all fiber optic connectors on the cable before inserting them into the Mux Demux.

![Dust Covered LC Port](image)

![CWDM Module](image)

Figure 3-9

2. Connect one end of the fiber optic cable to the MUX Demux module connector and connect the other end of the fiber optic cable to the corresponding WDM (SFP) transceivers installed on the network device.

![CWDM MUX](image)

![Transceiver](image)

Figure 3-10
Chapter 4 Example Applications

4.1 Connection of MUX in the Optical Transport Network

Mux/Demux can increase your network capacity combined with FS Multiservice Transport (such as EDFA, DCM, OEO and so on), which can improve the manageability and interconnectivity of WDM network.

![Diagram of MUX connection in optical transport network](image)
# Material Declaration Datas Sheet

## Name and Content of Poisonous or Harmful Substances or Elements in the Product

产品中有毒有害物质或元素的名称及含量

<table>
<thead>
<tr>
<th>Name of Component</th>
<th>Harmful Substances or Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pb 铅</td>
</tr>
<tr>
<td>Metal Parts 金属部件</td>
<td>○</td>
</tr>
<tr>
<td>AWG chip and filter AWG芯片和滤波片</td>
<td>○</td>
</tr>
<tr>
<td>Connector and adapter 连接器和适配器</td>
<td>○</td>
</tr>
<tr>
<td>Cable and Cable Assemblies 线缆和线缆组件</td>
<td>○</td>
</tr>
<tr>
<td>Plastics and Polymer Components 塑料和聚合物部件</td>
<td>○</td>
</tr>
</tbody>
</table>

○: Represents the content of poisonous and harmful materials in all homogeneous materials of this component are less than the requirement in "The limited requirement for poisonous and harmful substances in electronic information products (SJT 11363-2006)" issued by the Ministry of Information Industry of the People’s Republic of China.

×: There are at least a class of materials in all the homogeneous material of this component, which are containing poisonous and harmful materials higher than requirement in "The limited requirement for poisonous and harmful substances in electronic information products (SJT 11363-2006)" issued by the Ministry of Information Industry of the People’s Republic of China.

The environmental protection term of all products and their parts is indicated by the symbol. This environmental protection term only applies to the normal operating conditions specified in the manual.

所有产品及其部件的环保使用期限均由此符号表示，此环保使用期限只适用于该手册中所规定的正常使用条件。
Product Warranty Card

FS.COM ensures our customers that any damage or faulty items due to our workmanship, we will offer a free return within 30-Days from when you receive your goods. This excludes any custom made items or tailored solutions.

What this warranty covers?
This warranty is only available for the original buyer and is not transferable to a third-party.
- Within the first 30 Days of purchase, if for any reason you are not satisfied with your purchase (except custom made items or tailored solutions), simply return it for a refund or replacement.
- Within the first 1 Year of purchase, free repair or maintenance due to manufacturer’s defects (including shipping, handling and parts costs).
- Within 20 Years of purchase except for the first 1 year, repairs and maintenance will be charged.

What is NOT covered?
This warranty is non-transferable and does not cover if the product:
- Has been modified and/or altered, or an addition made thereto, except by FS.COM authorized representatives, or as approved by FS.COM in writing.
- Has been painted or physically modified in any way.
- Has been subjected to misuse, abuse, negligence, abnormal or physical stress, including accident.
- Has been damaged or impaired as a result of using third party firmware.
- Has no original FS.COM label, or miss any other original labels.

FS.COM sole and exclusive obligation and liability under the foregoing warranty shall be for FS.COM, at its discretion, to repair or replace any product that fails to conform to the above warranty during the warranty period. The expense of removal and reinstallation of any product is not included in this warranty. The warranty period of any repaired or replaced products shall not extend beyond its original warranty expiry.

Return Conditions
If you return for refund or replacement within 30 Days, please make sure that the product must be in new or like-new condition with its original trademark and SN number (the SN number is the unique identification number of every product), manual and accessories that were included when delivered to you. Return for replacement or repair is due to an error on our part (you received an incorrect or defective item, etc.), we will cover the shipping and repair cost and customs duty (for international purchase). Otherwise, you are responsible for these charges of returning or repairing items on your own.
FS.COM offers two channels to process your return request, if you purchase from FS.COM website, you may visit the website and log in to your FS “account “center to start a quick return. If you purchased by emails, you may contact your sales representative or visit our website fs.com to talk with customer service team and obtain an approved Return Materials Authorization (RMA) Number. Products returned without a RMA Number will not be processed and will be returned freight collect or subject to disposal. Information on how to start return can be found at https://www.fs.com/day_return_policy.html
Addresses, phone number and fax number also have been listed at www.fs.com. Please e-mail us at sales@fs.com or call us for assistance. All statements, technical information, and recommendations related to the products here are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. Please contact FS for more information.

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