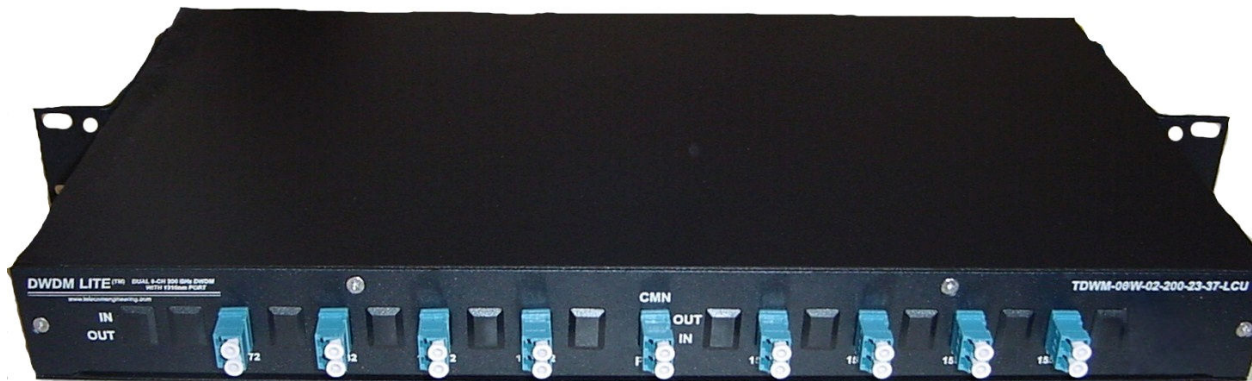


Telecom Engineering DWDM/CWDM/WDM Lite™ Manual



Features:

- 4-80 channel DWDMs 4-16 channel CWDMs, or 2 channel cross band WDMs.
- Easy to install, requires no configuration
- Environmentally friendly product, completely passive, no power and no cooling required for operation!
- Standalone, no other equipment required
- Can be used on 2 or 1 fiber spans (for 1 fiber span, one unit is required at each end, for two fiber spans, two units are required at each end of the fiber link)
- Can be connected to any fiber type
- Low insertion loss - high isolation
- Disassembles easily for cleaning
- Fully Universal, bidirectional operation on any port
- Fully transparent at all data rates and protocols
- High reliability, MTBF of 100 years
- Telcordia/Bellcore GR-1209 and GR-1221 qualified
- Accepts any data rate on any port up to and including 40 Gbps (OC768/STM256)

*Note, Unit pictured above is of a specific configuration is only representative of DWDM/CWDM/WDM Lite™ Products

Introduction:

All Telecom Engineering DWDM/CWDM/WDM Lite™ Products have 4 common features:

1. They are all 1 RMU in height.
2. They all come with a hybrid mounting bracket that enables these units to be mounted on 19 or 23 inch racks without any extra hardware.
3. They all have a number of ports that are assigned to a specific channel (or wavelength) that connect to the client side of the network.
4. They all have a common port, which connects up to the line (aggregate or OSP) side.

These features are displayed in Figure 1.

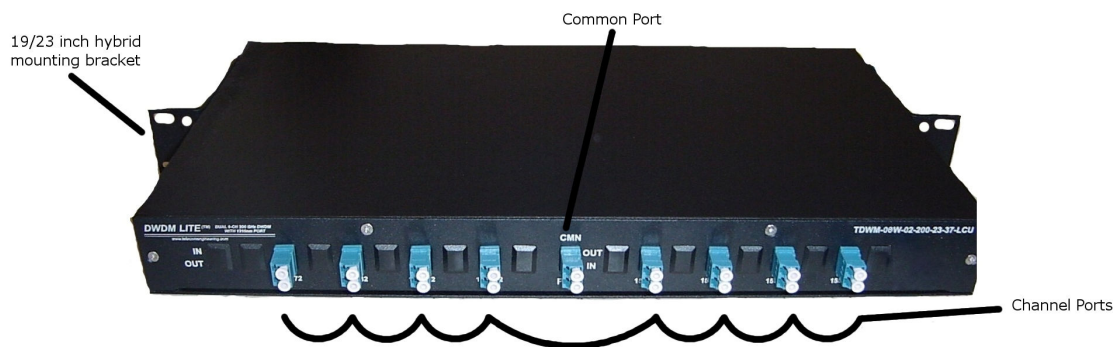


Figure 1: An 8 channel Dual Fiber DWDM showing the common parts of all Telecom Engineering DWDM/CWDM/WDM Lite™ Products

Installation:

If installing the unit on a 19 inch rack, no adjustment of the mounting brackets is necessary. If installing on a 23 inch rack, the screws holding on the bracket must be removed and the bracket be must rotated so that the portion sticking out in the 19 inch configuration is seated flush against the unit. The screws may then be replaced and standard mounting procedures can commence.

When connecting fibers, make sure that they are properly cleaned.

Setting up a DWDM/CWDM/WDM system:

There are 3 basic setups that are commonly used in DWDM/CWDM/WDM systems. They are dual units over two fibers; single units over two fibers; and single units over one fiber. Each covered in more detail below. Channel compatibility with transmit sources should also be checked, as all Telecom Engineering DWDM/CWDM/WDM Lite™ Products use the standardized ITU-T channel grid listed in Appendix A.

Dual units over two fibers:

With the dual units, the IN and OUT common ports are each located on a single unit, as well as IN and OUT ports for each channel. The IN on the unit must be connected to the OUT on the other unit. Once both CWDM/DWDM/WDMs are connected to each other, the client side may now be connected to the units, again with care that the jumper coming from the laser source is placed in the IN on the appropriate client port, corresponding with the wavelength of the laser source. This is diagrammed in Figure 2.

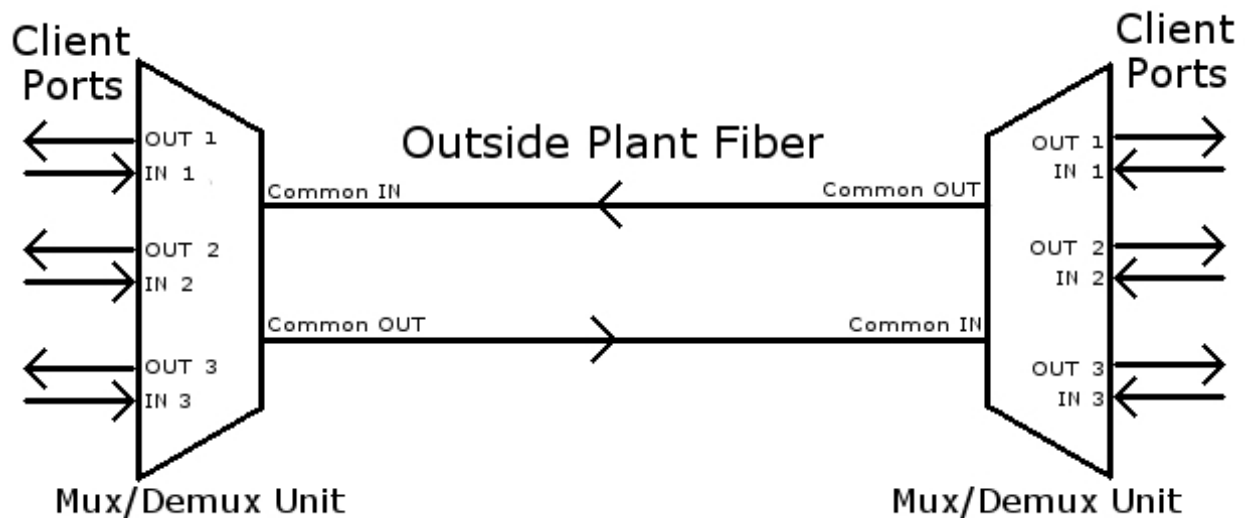


Figure 2: A diagram of a dual unit DWDM/CWDM/WDM system over two fibers

Single units over two fibers:

With the single units, each unit has common port and a single client port for each channel. The common and channel ports can be used as in or out ports. To ensure optimal functionality, care must be taken to ensure that the Mux units are paired up with the Demux units. Once both pairs of DWDM/CWDM/WDMs are connected to each other, transceivers may now be connected to the units. The jumper coming from the transceiver laser source is connected to the client IN port and the jumper from the client transceiver receive is connected to the client OUT port. This is diagrammed in Figure 3.

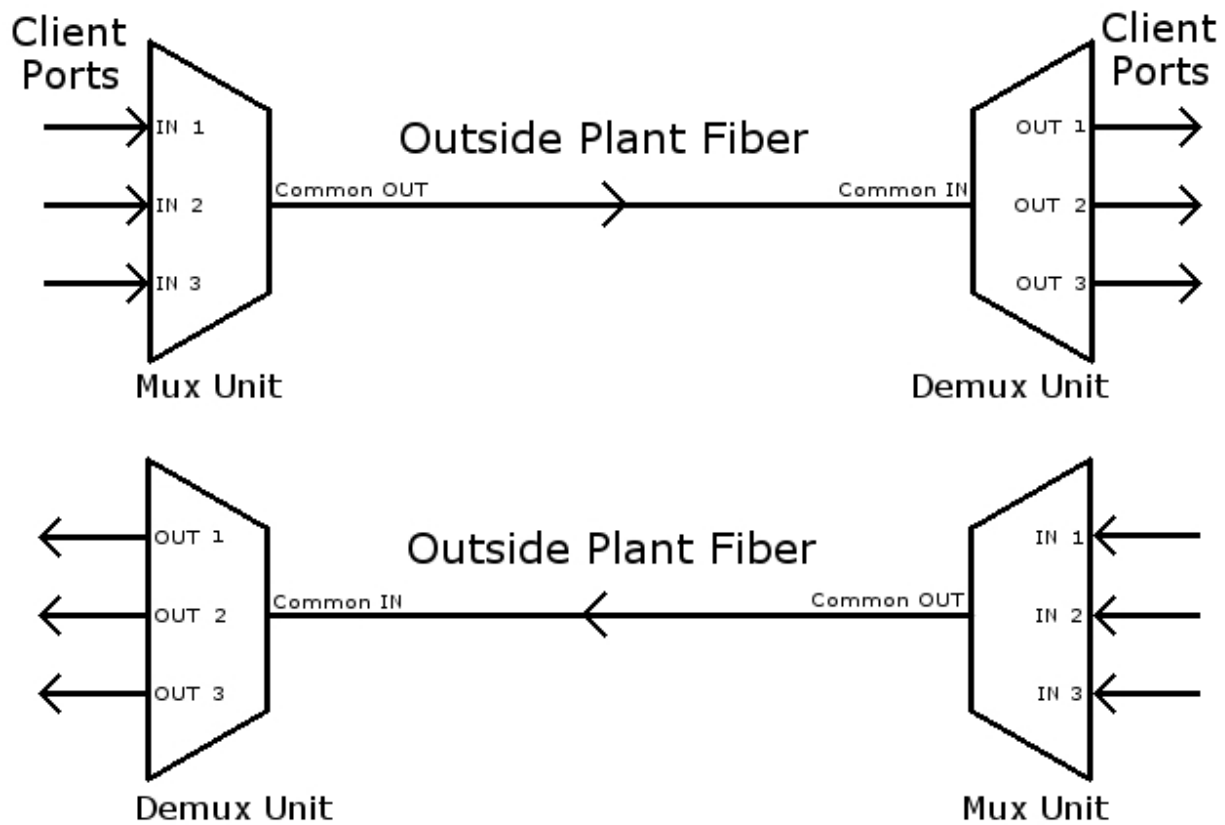


Figure 3: A diagram of a single unit DWDM/CWDM/WDM system over two fibers

Single units over one fiber:

With the single units over one fiber the common port and client ports are used for both receive and transmit signals. Common ports are connected together with one fiber. Then two transceivers with different lasers wavelengths are connected to create one channel. This is diagrammed in Figure 4 with SFPs used as an example to show proper channel assignments. It should be noted that in addition to the SFPs used in the example, XFPs, Xenpaks, Telecom Engineering DWDM Lite™ Transponders, and any other DWDM/CWDM/WDM capable transceiver can be used. Finally the terms Mux and Demux for the single fiber scenario does not mean you can not transmit into a demux unit, and receive on a mux unit, but rather indicates how they must be paired up.

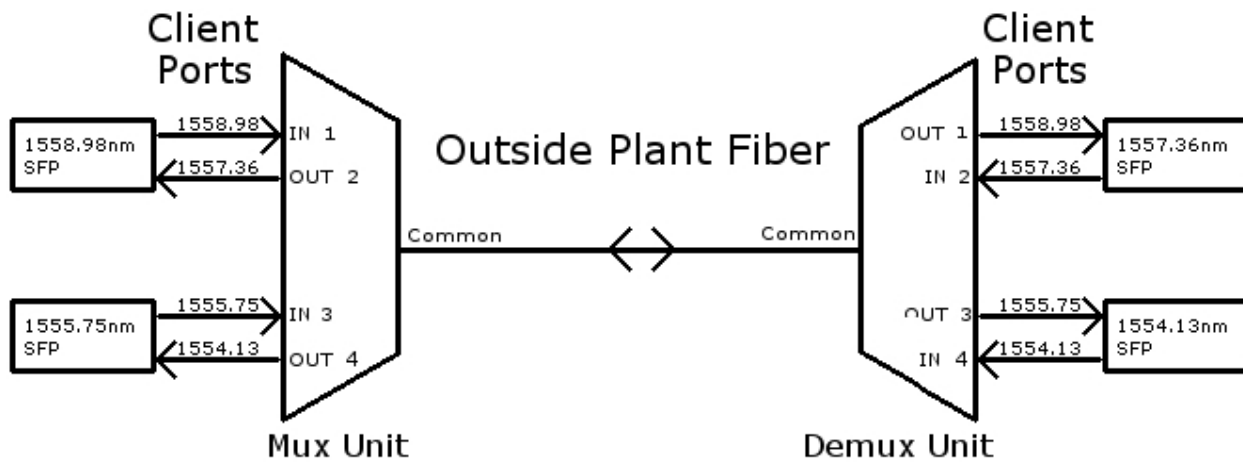


Figure 4: A diagram of a single unit DWDM/CWDM/WDM system over one fiber

Cleaning and maintenance of a DWDM/CWDM/WDM:

During the course of operation and changing configurations, the internal connectors on the DWDM/CWDM/WDM may become dirty. Should this happen, they can be cleaned without disturbing any other channels. This is done by removing the four screws on the front of the unit. Then the faceplate can be pulled out slowly, until the back of the faceplate is exposed and can be worked on. Once opened up, the connectors on the inside may then be removed and cleaned. This process is diagrammed in Figure 5.

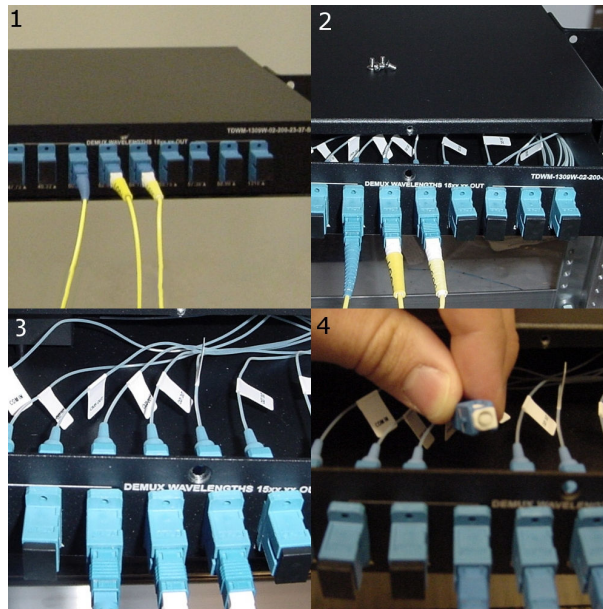


Figure 5: The photo labelled “1” shows an eight channel dual DWDM with the screws removed. “2” shows the drawer slightly pulled outwards. “3” shows the drawer pulled out just enough to access the connectors. “4” shows one of those connectors removed and ready for cleaning.

Specifications:

	100 GHz Units					200 GHz Units				
	4ch	8ch	16ch	32ch	40ch	4ch	8ch	16ch	32ch	40ch
Channel Bandwidth(min)	0.11 nm					.5 nm				
Isolation (min)	30.0 dB					30.0 dB				
Polarization Dependent Loss (max)	0.1 dB					0.1 dB				
Directivity (min)	55.0 dB					50.0 dB				
Insertion Loss (max per pair)	3dB	4.5dB	6dB	7.5dB	7.5dB	2dB	4dB	5.5dB	NA	NA

Appendix A:

ITU Grid at 200 GHz:

ITU Grid Channels (200 GHz Spacing)					
Channel	Frequency (GHz)	Wavelength (nm)	Channel	Frequency (GHz)	Wavelength (nm)
1	190,100	1577.03	39	193,900	1546.12
3	190,300	1575.37	41	194,100	1544.53
5	190,500	1573.71	43	194,300	1542.94
7	190,700	1572.06	45	194,500	1541.35
9	190,900	1570.42	47	194,700	1539.77
11	191,100	1568.77	49	194,900	1538.19
13	191,300	1567.13	51	195,100	1536.61
15	191,500	1565.50	53	195,300	1535.04
17	191,700	1563.86	55	195,500	1533.47
19	191,900	1562.23	57	195,700	1531.90
21	192,100	1560.61	59	195,900	1530.33
23	192,300	1558.98	61	196,100	1528.77
25	192,500	1557.36	63	196,300	1527.22
27	192,700	1555.75	65	196,500	1525.66
29	192,900	1554.13	67	196,700	1524.11
31	193,100	1552.52	69	196,900	1522.56
33	193,300	1550.92	71	197,100	1521.02
35	193,500	1549.32	73	197,300	1519.48
37	193,700	1547.72			

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ITU Grid at 100GHz:

ITU Grid Channels (100 GHz Spacing)					
Channel	Frequency (GHz)	Wavelength (nm)	Channel	Frequency (GHz)	Wavelength (nm)
1	190,100	1577.03	38	193,800	1546.92
2	190,200	1576.20	39	193,900	1546.12
3	190,300	1575.37	40	194,000	1545.32
4	190,400	1574.54	41	194,100	1544.53
5	190,500	1573.71	42	194,200	1543.73
6	190,600	1572.89	43	194,300	1542.94
7	190,700	1572.06	44	194,400	1542.14
8	190,800	1571.24	45	194,500	1541.35
9	190,900	1570.42	46	194,600	1540.56
10	191,000	1569.59	47	194,700	1539.77
11	191,100	1568.77	48	194,800	1538.98
12	191,200	1567.95	49	194,900	1538.19
13	191,300	1567.13	50	195,000	1537.40
14	191,400	1566.31	51	195,100	1536.61
15	191,500	1565.50	52	195,200	1535.82
16	191,600	1564.68	53	195,300	1535.04
17	191,700	1563.86	54	195,400	1534.25
18	191,800	1563.05	55	195,500	1533.47
19	191,900	1562.23	56	195,600	1532.68
20	192,000	1561.42	57	195,700	1531.90
21	192,100	1560.61	58	195,800	1531.12
22	192,200	1559.79	59	195,900	1530.33
23	192,300	1558.98	60	196,000	1529.55
24	192,400	1558.17	61	196,100	1528.77
25	192,500	1557.36	62	196,200	1527.99
26	192,600	1556.55	63	196,300	1527.22
27	192,700	1555.75	64	196,400	1526.44
28	192,800	1554.94	65	196,500	1525.66
29	192,900	1554.13	66	196,600	1524.89
30	193,000	1553.33	67	196,700	1524.11
31	193,100	1552.52	68	196,800	1523.34
32	193,200	1551.72	69	196,900	1522.56
33	193,300	1550.92	70	197,000	1521.79
34	193,400	1550.12	71	197,100	1521.02
35	193,500	1549.32	72	197,200	1520.25
36	193,600	1548.51	73	197,300	1519.48
37	193,700	1547.72			

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