



Opticon CWDM Passive Optical Multiplexers Reference Guide

INTRODUCTION

WAVELENGTH DIVISION MULTIPLEXING

Wavelength Division Multiplexing (WDM) is an optical network technology in which different services are transported via different light wavelengths. From Source equipment, these services are multiplexed together over a regular fibre link, then de-multiplexed back into their separate wavelengths for termination into the Destination equipment.

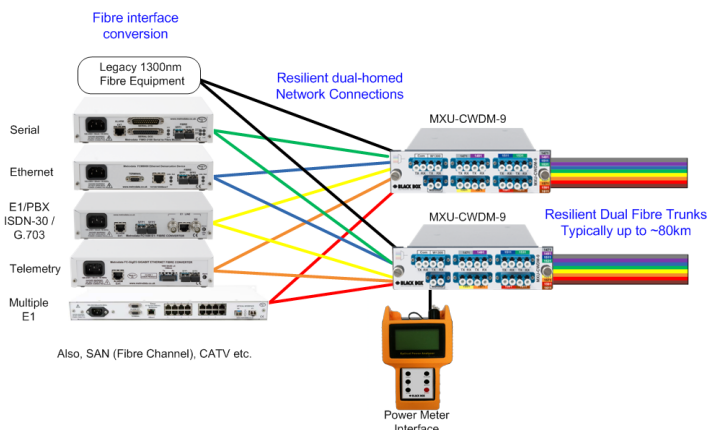
Variations of this approach include both 'Dense' (DWDM) and 'Coarse' (CWDM) wavelength multiplexing. High-end DWDM implementations today offer up to approximately 160 wavelengths, grouped into several 'channel ranges'. This technology is used extensively in the Backbone Networks of both Regional and National Telecoms Carriers. CWDM is defined for just 18 wavelengths in two ranges, the Lower Band centred around 1310nm and the Upper Band centred around 1550nm. As the name implies, Coarse WDM uses more widely dispersed optical signal profiles and therefore requires lower manufacturing tolerances, generally leading to somewhat lower cost products.

OPTICON WDM FIBRE MULTIPLEXERS

The Opticon product family comprises products for both CWDM and DWDM deployments. In all cases, the multiplexing and de-multiplexing functions are implemented entirely 'passively', i.e. optically, without using any conversions to and from electrical signalling. This means that Opticon products are completely unpowered devices, offered at considerably lower cost than active devices performing similar functions, whilst having the additional benefits of being physically small, light in weight and having excellent physical reliability, having no need for power transformers, electronic components, or any moving parts such as cooling fans. Opticon products are highly suitable for both Metro-area Carrier and Enterprise network applications.

In operation, Opticon multiplexers rely purely on the transmission power and reception sensitivity of the optical interfaces of connected equipment. Today, these typically comprise 'plug-in' Optical Transceivers, available in a number of speeds, power/distance ratings and formats, for both CWDM and DWDM usage. Metrodata offers a wide range of compatible Transceivers in popular formats including 'SFP', 'SFP+' and 'XFP', supporting the transmission of multiple high bandwidth services over distances of up to 50-100km.

The diagram below illustrates one typical application of Opticon devices. Many different signalling protocols are supported, including 1Gbps or 10Gbps Ethernet and Fibre-Channel (SAN). 'Dual-homing' capable input devices are used in this example, combining the transmission of several different services across dual-redundant backbone links. In fact, highly resilient Ring topologies are also possible using dual-homed interfaces.



OPTICON CWDM FIBRE MUX

MXU-CWDM-5:

4-port passive CWDM mux/demux

- 4 x CWDM channels in 'high-band' range 1471nm - 1571nm
- Additional port for connection to standard (1310nm) equipment or to 'low-band' CWDM expansion mux, i.e MXU-CWDM-8
- Expansion port to connect MXU-CWDM-4 unit
- Tx/Rx optical Power monitoring port for ease of installation



MXU-CWDM-4A:

4-port passive CWDM mux/demux or expansion unit

- 4 x CWDM channels in 'high-band' range 1551nm - 1611nm



MXU-CWDM-9:

8-port passive CWDM mux/demux

- 8 x CWDM channels in 'high-band' range 1471nm - 1611nm
- Additional port for connection to standard (1310nm) equipment or to 'low-band' CWDM expansion mux, i.e MXU-CWDM-8
- Tx/Rx optical Power monitoring port for ease of installation
- 1550nm CWDM port optimised for minimal insertion loss, to support preferential expansion via DWDM units



MXU-CWDM-8A:

8-port passive CWDM mux/demux or expansion unit

- 8 x CWDM channels in 'low-band' range 1271nm - 1411nm



MXU-CWDM-D925

8-port passive DWDM Mux

- DWDM 100GHz, C-Band, 25-32

MXU-CWDM-D933

8-port passive DWDM Mux

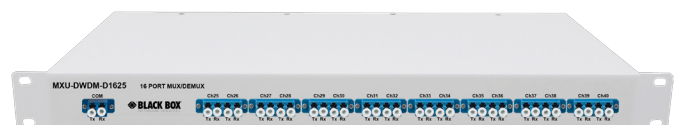
- DWDM 100GHz, C-Band, 33-40



MXU-CWDM-D1625

16-port passive DWDM Mux

- DWDM 100GHz, C-Band, 25-40



EXPANSION OPTIONS

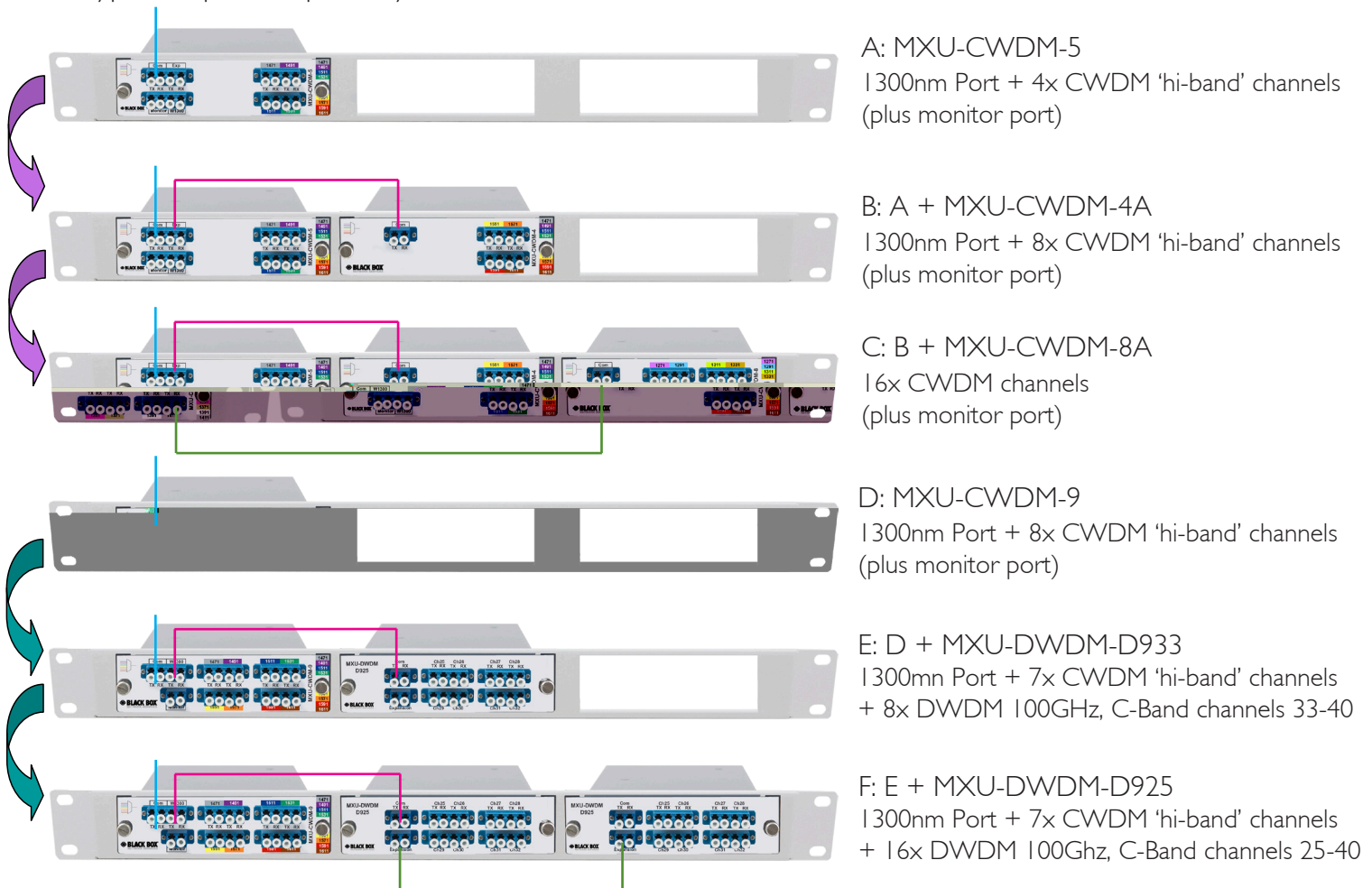
The Opticon CWDM Fibre Mux family offers not only a low cost-of-entry to optical multiplexing for service expansion or convergence applications, but also cost-effective incremental growth options.

Within a simple 1U 19" rack mounting frame, one starting point could be the MXU-CWDM-5 unit, offering 4 CWDM wavelengths in the 'upper' band range, plus a conventional 'wideband' 1310nm port, typically used by non-WDM optical interfaces such as those of standard Ethernet switches. The MXU-CWDM-5 also offers an expansion port and a low-power monitor port for installation and/or in-service link verification.

Cost-effective expansion could then be achieved by the addition of the MXU-CWDM-4A unit, offering 4 CWDM wavelengths and/or by the addition of the MXU-CWDM-8A unit, providing a further 8 CWDM wavelengths in the 'lower' band range.

Alternatively, expansion can be achieved by the addition of DWDM channels. In this case, a single CWDM channel (say 1550nm) can be 'broken out' into multiple, higher-density DWDM channels using, for example, the MXU-DWDM-D9 units. This approach is in fact preferable for 10Gbps applications, due to greater availability of 10Gbps transceivers for DWDM wavelengths compared with low-band CWDM.

Some typical expansion pathways are illustrated below:



EXTENDED FAMILY

Black Box offers a wide range of compatible accessories and interface converters, enabling cost effective solutions to the connectivity needs of our customers. Some of these are shown below:

OPTICAL TRANCEIVERS

Extensive CWDM, DWDM and standard wavelength ranges available, for different transmission distances.

- SFP, SFP+ and XFP types available
- Suitable for various speed & protocol applications including 1 Gbps and 10 Gbps Ethernet
- 'MSA' (Multi-Source Agreement) or specific-vendor coded types can be supplied



OPTICAL POWER METERS

Invaluable for installation and troubleshooting of CWDM and DWDM networks. These meters indicate received optical power for multiple wavelengths simultaneously.

- Hand-held 18 channel CWDM Optical Power Meter
- Hand-held 40 channel DWDM Optical Power Meter



OPTICAL INTERFACE CONVERTERS & OPTICAL EXTENDERS

Wide range available for applications including:

- ISDN-30 (e.g. for conventional PBX 'Voice Trunks')
- E1 and other PDH/SDH standards
- 100Mbps, 1 Gbps and 10 Gbps Ethernet

