



Enhanced CWDM

Multi-Wavelength Downstream Broadband Transport

Motorola's E-CWDM solution enables cable operators to increase downstream services by up to five times by transmitting multiple CWDM optical signals over a single fiber optic cable.

Motorola's Enhanced Coarse Wavelength Division Multiplexing (E-CWDM) solution enables cable operators to segment their node serving areas in the forward-path over a single fiber. By increasing bandwidth through greater segmentation, operators can raise overall voice, data, and video broadband throughput while avoiding the expense of adding new fiber, or they can reclaim fiber for other revenue-generating services. By multiplexing the different wavelengths of optical signals from these transmitters onto a fiber, the cable operator can segment nodes up to five ways with link distances up to 10km. By adding Motorola's R1U-ECWDM* conditioning unit, the link distances can increase up to 25km with the same transmitters.

FEATURES

- Robust multi-wavelength downstream solution over different fiber types and environments
- Available in five standard CWDM wavelengths per ITU-T Recommendation G.694.2: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm
- Available in three optical output powers to cover various link distances: +6dBm, +9dBm, +12dBm
- Full bandwidth loading capability from 50MHz to 1GHz
- Motorola's R1U-ECWDM* conditioning unit increases the link distance up to 25km
- Scalable, cost-effective solution to expand from 2 CWDM wavelengths to 5 CWDM wavelengths

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Shown below are a few of the various system configurations that can be accommodated using the E-CWDM products.

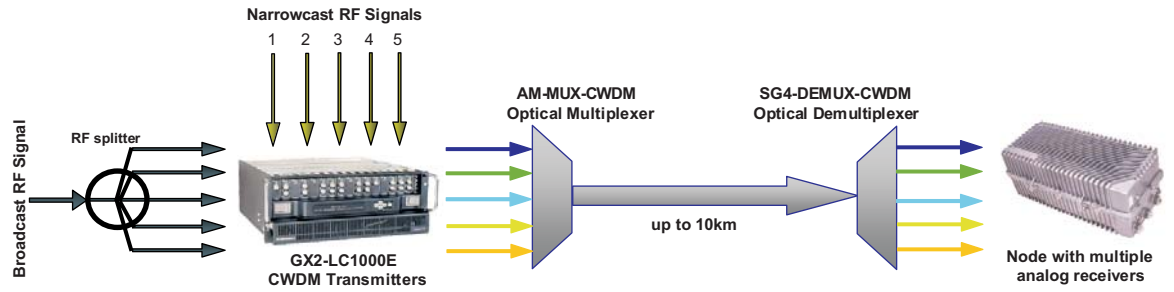


Figure 1 — Schematic of Motorola's E-CWDM solution with no RF conditioning, Short-Reach, 5 wavelengths

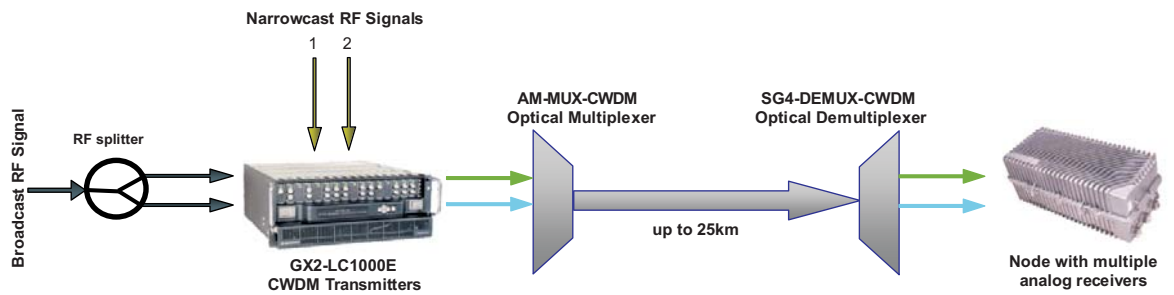


Figure 2 — Schematic of Motorola's E-CWDM solution with RF conditioning unit, Long-Reach, 2 wavelengths

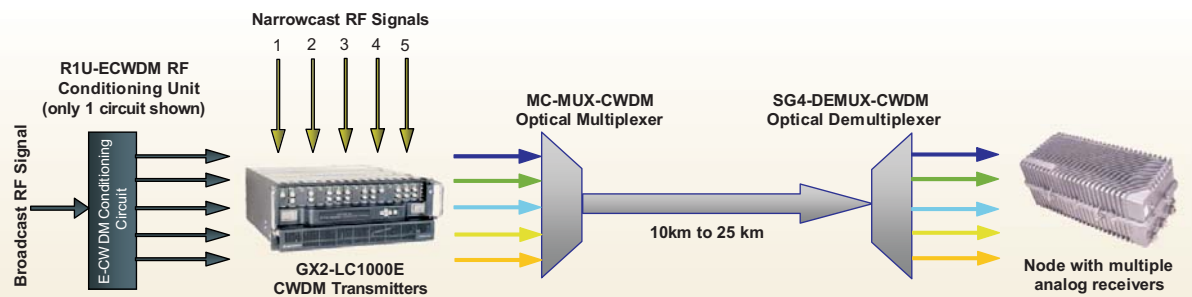


Figure 3 — Schematic of Motorola's E-CWDM solution with RF conditioning unit, Long-Reach, 5 wavelengths

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GX2-LC1000E* E-CWDM Transmitters

The GX2-LC1000E* series of transmitters are available at five standard Coarse Wavelength Division Multiplexing (CWDM) wavelengths as defined by ITU-T Recommendation G.694.2. They are also available in three optical output powers to cover a variety of node link distances. Each optical transmitter carries a full 1 GHz loading of broadcast and narrowcast content so operators can cost-effectively meet the need for additional service capacity. The OmniStar GX2 is a fiber optic transmission platform designed to deliver Ultra-Broadband services for cable operators over their Hybrid Fiber/Coax networks. It is a universal platform with a full complement of high-performance application modules that can accommodate any system architecture. The four rack-unit chassis accommodates 16 Plug-n-Play application modules, minimizing headend space requirements.



Specifications

OPTICAL

Optical Power Output	6 dBm, 9 dBm, or 12 dBm min.
Optical Wavelength, Center	1291nm, 1311nm, 1331nm, 1351nm, 1371nm
Optical Wavelength Range	Center \pm 3.5nm
Optical Connector Types	SC/APC or E2000 with Optical Safety Shutter
Laser Shutdown	Enable/Disable via GX2 Control Module

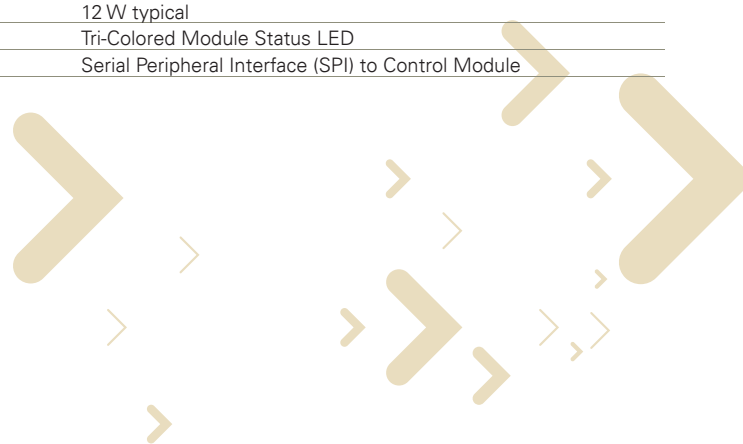
RF

Operational Bandwidth	47 to 1002 MHz
Broadcast Input Level	15 \pm 0.5 dBmV/ch (79 NTSC channels + 450 MHz digital at -6 dBc)
Narrowcast Input Level	6 dBc above broadcast input levels
Flatness	1.5 dB max. peak to valley; 47 to 1002 MHz
Gain Control Range	20 dB
RF Input Test Point	-20 \pm 0.5 dB relative to main RF input port
RF Input Impedance	75 Ω
RF Input Return Loss	16 dB min., 47 to 1002 MHz (broadcast and narrowcast)
Narrowcast to Main	50 dB min., 47 to 1002 MHz
RF Input Isolation	

GENERAL

Dimensions	1.0 in W x 5.9 in H x 15.0 in D (2.5 cm x 15.0 cm x 38.0 cm)
Weight	2.0 lbs. (1 kgs)
Mounting	GX2-HSG* Equipment Shelf
RF Connector Types	
Input	F-type (using G-to-F adapter on chassis)
Test Points	F-type
Operating Temperature Range	0 $^{\circ}$ C to 50 $^{\circ}$ C (32 $^{\circ}$ F to 122 $^{\circ}$ F)
Storage Temperature Range	-40 $^{\circ}$ C to 80 $^{\circ}$ C (-40 $^{\circ}$ F to 176 $^{\circ}$ F)
Power Consumption	12 W typical
Visual Interface	Tri-Colored Module Status LED
Data/Control Interface	Serial Peripheral Interface (SPI) to Control Module

Specifications are subject to change without notice.



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R1U-ECWDM* Conditioning Unit

In one rack-unit, the R1U-ECWDM* contains four separate sets of RF conditioning circuitry to segment four node serving areas at diverse locations. Each RF conditioning circuit provides RF input signals for 3, 4 or 5 transmitters at different wavelengths for each node serving area - up to 20 transmitters (4 node areas X 5 CWDM wavelengths) can be served from a single R1U-ECWDM unit.

The R1U-ECWDM* unit also houses the mini-cassette optical multiplexer modules (MC-MUX-CWDM*). The R1U-ECWDM* housing has four slots to hold four of these passive modules.



Specifications

RF

RF conditioning circuitry sets	4
RF input connector type (4 rear inputs)	F connector
RF output connector type (20 outputs)	D-SUB (4) (D-SUB to F connector cable assemblies provided)
RF input level	15dBmV to 20dBmV
RF gain	0 to 2dB

POWERING, DUAL AC VERSION

AC Inputs	2
AC Voltage Input Range	100 to 240 Vrms, Auto Sensing
AC Voltage Frequency Range	50 to 60 Hz
AC Current:	
@ 115 V	0.63 Amps rms, Maximum
@ 230 V	0.57 Amps rms, Maximum
Power Consumption	70 Watts, Maximum
Efficiency	64% @ Max. Load
Fusing	4 Amp fuse on input

GENERAL

Dimensions (including mounting brackets)	1.75 in H x 19 in W x 17.8 in D (4.4 cm x 48.3 cm x 45.2 cm)
Weight	17 lbs (7.7 kgs)
Operating Temperature Range	0° C to +50° C (32° F to +122° F)
Storage Temperature Range	-40° C to +80° C (-40° F to +176° F)
Alarm Relay	Contact Closure, 250mA/40 Vac or Vdc Max

Specifications are subject to change without notice.

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E-CWDM Optical Multiplexers and Demultiplexers

Two form factors are available for the optical multiplexers which combine the E-CWDM wavelengths onto a single fiber: AM-MUX-CWDM* series and MC-MUX-CWDM* series. The AM-MUX-CWDM* modules, which mount into Motorola's OCM housings, are packaged with industry standard LGX modules. When using the E-CWDM conditioning unit to increase link distances, the MC-MUX-CWDM* mini-cassette modules mount in the front of the R1U-ECWDM* housing.

The SG4-DEMUX-CWDM* series of modules demultiplex the optical wavelengths onto individual fibers. The modules are installed into the fiber tray of Motorola's SG4000 1GHz modular optical node.

Specifications

OPTICAL	
Optical Wavelengths, Center	1291nm, 1311nm, 1331nm, 1351nm, 1371nm
Optical Wavelength Range	Center Wavelength +/- 5.0 nm
Adjacent Channel Isolation Multiplexers	20 dB, Minimum
Demultiplexers	40 dB, Minimum
Non-Adjacent Channel Isolation	40 dB, Minimum
Optical Input Return Loss	45 dB, Minimum
Optical Connector Types	SC/APC or E2000 with Optical Safety Shutter

GENERAL	
Dimensions	
AM-MUX-CWDM* LGX Modules	1.16 in W x 4.0 in H x 5.13 in D (2.9 cm x 10.2 cm x 13.0 cm)
MC-MUX-CWDM*	5.8 in W x 0.5 in H x 7.8 in D (14.7 cm x 1.3 cm x 19.8 cm)
SG4-DEMUX-CWDM*	4 in W x 0.5 in H x 4.5 in D (10.2 cm x 1.3 cm x 11.4 cm)
Weight	
AM-MUX-CWDM*	1.3 lbs (0.6 kgs)
MC-MUX-CWDM*	1.3 lbs (0.6 kgs)
SG4-DEMUX-CWDM*	0.8 lbs (0.4 kgs)
Operating Temperature Range	(See tables on the next page)
Storage Temperature Range	-40° C to 85° C (-40° F to 176° F)
Alarm Relay	Contact Closure, 250mA/40 Vac or Vdc Max

Specifications are subject to change without notice.



AM-MUX-CWDM*



MC-MUX-CWDM*



SG4-DEMUX-CWDM*

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E-CWDM Optical Multiplexers, LGX Modules mounted in AM-OCM* Housing, single slot

Model	Wavelengths	Insertion Loss, Max ¹ (dB)	Optical Connector	Operating Temperature Ranges
AM-MUX-CWDM-2:1-1371	2 wavelengths: 1371nm, 1291nm – 1351nm ²	1.0	SC/APC with Optical Safety Shutter	0° C to 50° C (32° F to 122° F)
AM-MUX-CWDM-5:1-1291	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	SC/APC with Optical Safety Shutter	0° C to 50° C (32° F to 122° F)
AM-MUX-CWDM-2:1-1371/E	2 wavelengths: 1371nm, 1291nm – 1351nm ²	1.0	E2000 with Optical Safety Shutter	0° C to 50° C (32° F to 122° F)
AM-MUX-CWDM-5:1-1291/E	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	E2000 with Optical Safety Shutter	0° C to 70° C (32° F to 122° F)

E-CWDM Optical Multiplexers, Mini-Cassette Modules mounted in R1U-ECWDM Conditioning Unit, single slot

Model	Wavelengths	Insertion Loss, Max ¹ (dB)	Optical Connector	Operating Temperature Ranges
MC-MUX-CWDM-5:1-1291	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	SC/APC with Optical Safety Shutter	0° C to 70° C (32° F to 158° F)
MC-MUX-CWDM-5:1-1291/E	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	E2000 with Optical Safety Shutter	0° C to 70° C (32° F to 158° F)

E-CWDM Optical Demultiplexers, SG4 module mounted in SG4000 node fiber tray

Model	Wavelengths	Insertion Loss, Max ¹ (dB)	Optical Connector	Operating Temperature Ranges
SG4-DEMUX-CWDM-1:2-1331/SC-R	2 wavelengths: 1371nm, 1291nm – 1351nm ²	1.0	SC/APC with Optical Safety Shutter	-40° C to 75° C (-40° F to 158° F)
SG4-DEMUX-CWDM-1:5-1291/SC-R	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	SC/APC with Optical Safety Shutter	-40° C to 75° C (-40° F to 158° F)
SG4-DEMUX-CWDM-1:2-1331/E-R	2 wavelengths: 1371nm, 1291nm – 1351nm ²	1.0	E2000 with Optical Safety Shutter	-40° C to 75° C (-40° F to 158° F)
SG4-DEMUX-CWDM-1:5-1291/E-R	5 wavelengths: 1291nm, 1311nm, 1331nm, 1351nm, 1371nm	1.6	E2000 with Optical Safety Shutter	-40° C to 75° C (-40° F to 158° F)

¹Insertion loss includes the loss of two optical connectors.

²This model multiplexes 2 optical wavelengths: the first wavelength is 1371nm and the second wavelength is one of the following CWDM wavelengths: 1291nm, 1311nm, 1331nm, or 1351nm.

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Ordering Information

GX2-LC1000E* E-CWDM Transmitters

Transmitters with SC/APC Optical Connectors

GX2-LC1000Ep/xxxx-R
xxxx: wavelength (1291, 1311, 1331, 1351, 1371)
p – optical power output (6, 9, 12)

Transmitters with E2000 Optical Connectors

GX2-LC1000Ep/xxxx/E-R
xxxx: wavelength (1291, 1311, 1331, 1351, 1371)
p – optical power output (6, 9, 12)

R1U-ECWDM* Conditioning Unit

Model	Description
R1U-ECWDM-2A	E-CWDM Conditioning Unit, 1 rack-unit housing, Dual AC power supplies
R1U-ECWDM-2D	E-CWDM Conditioning Unit, 1 rack-unit housing, Dual DC power supplies
ECWDM-CABLE-DSUB-5	High-density, multi-coax cable assembly (for sparing)

E-CWDM Optical Multiplexers and Demultiplexers

Refer to the tables on the previous page for model information.



MOTOROLA

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