

## CWDM Passives for 16-Channel CWDM HFC Architectures

### Description

To handle increasing bandwidth requirements cable operators are being forced to upgrade their network architectures. These changes are pushing optical fiber deeper into the network. But simply replacing existing transmission lines with fiber is no longer the most cost-effective means to expand bandwidth. Improvements in optical filtering are making it possible to significantly increase the number of wavelengths in a single fiber. CWDM (Coarse Wavelength Division Multiplexing) has gained prominence in multi-wavelength digital transport architectures because it permits the use of low-cost, un-cooled DFB laser transmitters. Moreover, powering requirements are reduced and reliability is increased compared with DWDM solutions.



This suite of CWDM passives is specifically designed to meet the requirements of HFC architectures. The CWDM laser is located in the optical node, which is typically placed in an outdoor environment with relatively high temperature changes. These temperature variations place special restrictions on the channel bandwidth in the CWDM passives. The analog nature of the signals transmitted through the HFC network also necessitates a tighter control of the specifications of the CWDM passives compared to those designed for digital transmission systems.

Scientific-Atlanta's 16-Channel CWDM system is optimized for the analog transmission in HFC networks. It also provides a very powerful solution for fiber-poor areas, and a cost-efficient alternative to DWDM for short to medium distances. CWDM differs from Dense Wavelength-Division Multiplexing (DWDM) in that the optical channel spacing between the light sources is much greater (20 nm). This wide spacing, combined with a tight control of the channel boundaries in the CWDM passives, means that variations in the wavelength of reverse transmitters due to temperature changes will not result in loss of signal/service. This in turn allows the use of un-cooled DFB lasers and therefore drives down the costs and power consumption significantly while increasing overall reliability.

The CWDM Multiplexer/Demultiplexer (MUX/DMUX) is an essential component for implementing CWDM to increase network efficiency by significantly reducing fiber counts. The unit is available in the industry recognized, LGX-compatible form factor to allow easy, snap-in mounting in a variety of enclosures and cabinets. The LGX module can be used in the same chassis as coupler/splitters and patching modules to achieve high-density rack configurations. The MUX/DMUX component is also optimized to reduce combined insertion loss at all wavelengths.

### Features

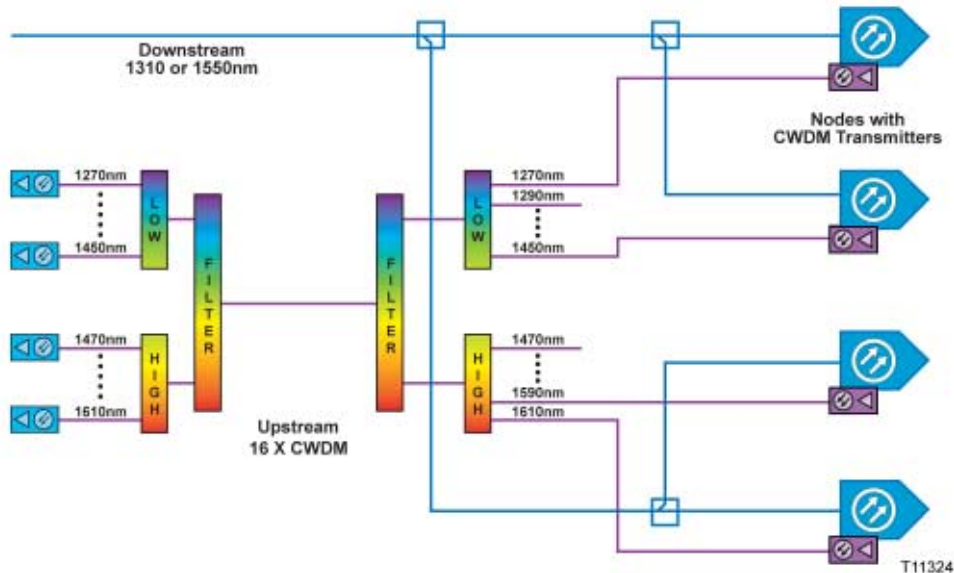
- Enables up to 16-fold capacity increase in the reverse path over single wavelength solutions
- Specifically designed for HFC node applications
- Universal MUX/DMUX module available for 4, 8, 12 or 16 channel configurations
- Channels spaced at 20 nm, following the standard CWDM wavelength grid
- The CWDM's wide channel spacing allows the use of un-cooled DFB lasers
- Wavelength mapping options allow combination of broadcast and reverse services on a single fiber
- LGX-compatible modules easily snap in to a wide variety of enclosures and cabinets
- Industry-standard SC/APC or E2108 adapters ensure connector compatibility; minimize back reflection and insertion losses; simplify moves, adds & changes; and reduce connector maintenance requirements

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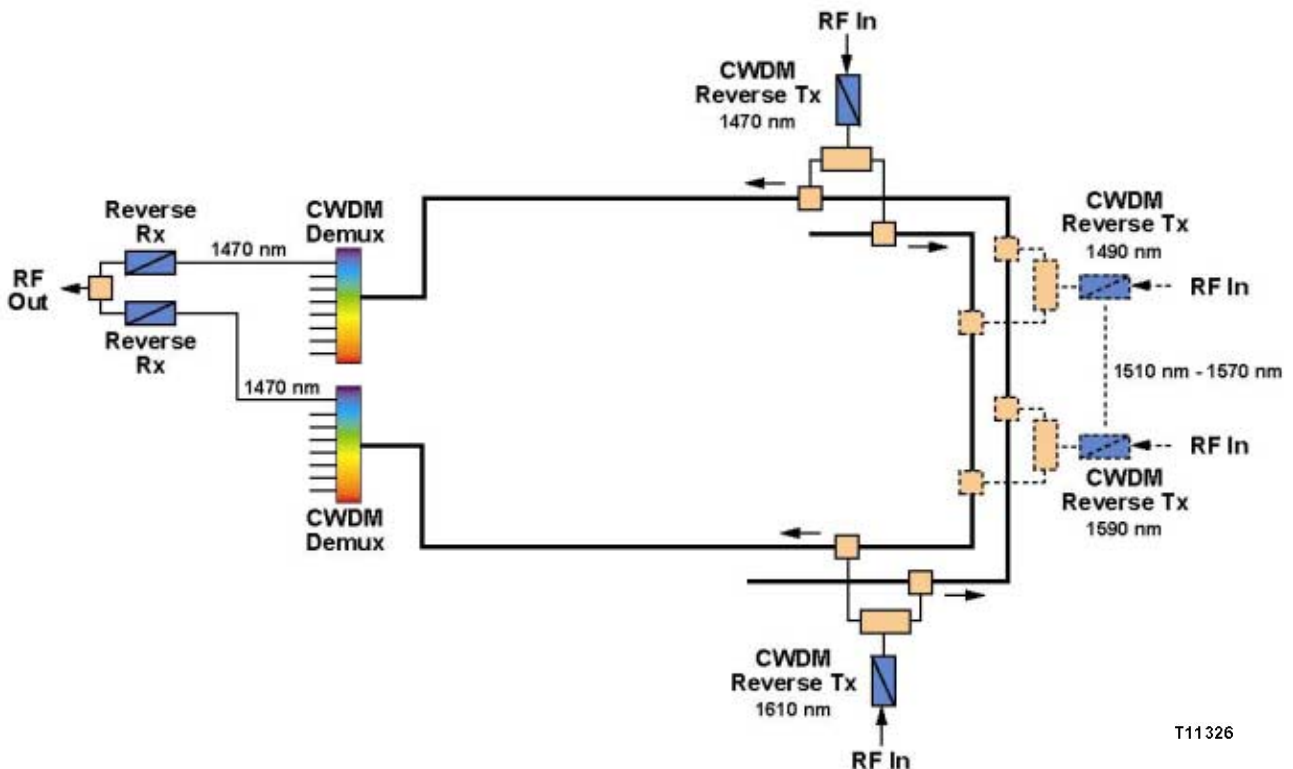
## 16-Channel Architecture

When segmenting a network into smaller clusters the lack of fiber is often a bottleneck. However, deploying the CWDM solution can solve this problem, as this will considerably reduce the amount of fiber required from the hub and the node. The CWDM solution can be deployed in incremental steps. Operators can start out with four channels and as demand for reverse traffic grows, the number of wavelengths can be increased to 8, 12 and even up to 16 wavelengths on a single fiber.



## Redundant Reverse Path on Two Fibers

To eliminate the bandwidth “choke point”, the CWDM provides a proven and cost-efficient solution in fiber poor areas. With CWDM it is possible to segment the reverse bandwidth from different nodes and enable up to a 16-fold capacity increase on each fiber.



# CWDM Passives for 16-Channel CWDM HFC Architectures



## Specifications

### CWDM LGX-Compatible 4-Channel MUX/DMUX

Parameters	Units	4-Channel Low band	4-Channel High band	Notes
Center Wavelengths	nm	1271, 1291, 1311, 1331	1511, 1531, 1551, 1571	
<b>Module Dimensions</b>				
Depth (max)	cm/in	15.9 / 6.26		
Width	cm/in	2.9 / 1.15 (1 LGX slot)		
Height	cm/in	10.2 / 4.0		
Faceplate Height	cm/in	13.0 / 5.1		
<b>Common Specifications</b>				
Channels		4		
Bandwidth per Channel @ - 0.5 dB	nm	> 13,5	> 14 @ 1511 and 1531 > 15 @ 1551 and 1571	
Pass Band Ripple	dB	< 0.5		
<b>Isolation</b>				
@ adjacent channel	dB	> 30		
@ non-adjacent channel	dB	> 40		
<b>Insertion Loss</b>				
@ 4 channels	dB	< 2.5		1
Directivity	dB	> 50		
Return Loss	dB	> 50		
Operating Temperature	°C	-15 to +70 -40 to +85		2
Connector		SC/APC or E2108		
<b>Notes:</b>				
1) Losses include input/output and common connector losses				
2) With 0.5 dB additional insertion loss				

*Recommended for use in non-condensing environments only*

### CWDM LGX-Compatible 8-Channel MUX/DMUX

Parameters	Units	8-Channel Low band	8-Channel High band	Notes
Center Wavelengths	nm	1271, 1291, 1311, 1331 1351, 1371, 1431, 1451	1471, 1491, 1511, 1531 1551, 1571, 1591, 1611	
<b>Module Dimensions</b>				
Depth (max)	cm/in	15.9 / 6.26		
Width	cm/in	5.8 / 2.3 (2 LGX slot)		
Height	cm/in	10.2 / 4.0		
Faceplate Height	cm/in	13.0 / 5.1		
<b>Common Specifications</b>				
Channels		8		
Bandwidth per Channel @ - 0.5 dB	nm	> 13,5	> 14 @ 1471 - 1531 > 15 @ 1551 - 1571	
Pass Band Ripple	dB	< 0.5		
<b>Isolation</b>				
@ Adjacent channel	dB	> 30		
@ Non-adjacent channel	dB	> 40		
<b>Insertion Loss</b>				
@ 8 channels	dB	< 3.0		1
Directivity	dB	> 50		
Return Loss	dB	> 50		
Operating Temperature	°C	-15 to +70 -40 to +85		2
Connector		SC/APC or E2108		
<b>Notes:</b>				
1) Losses include input/output and common connector losses				
2) With 0.5 dB additional insertion loss				

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# CWDM Passives for 16-Channel CWDM HFC Architectures



## CWDM LGX-Compatible High/Low Band Filter

Parameters	Units		Notes
Center Wavelengths	nm		
Low band		1271 to 1451	
High band		1471 to 1611	
<b>Module Dimensions</b>			
Depth (max)	cm/in	15.9 / 6.26	
Width	cm/in	2.9 / 1.15 (1 LGX slot)	
Height	cm/in	10.2 / 4.0	
Faceplate Height	cm/in	13.0 / 5.1	
<b>Common Specifications</b>			
Insertion Loss	dB	< 1.5	1
Isolation low band @ port 1	dB	> 15	
Isolation high band @ port 2	dB	> 30	
Return Loss	dB	> 50	
Operating Temperature	°C	-15 to +70 -40 to +85	2
Connector		SC/APC or E2108	
<b>Notes:</b>			
1) Losses include input/output and common connector losses			
2) With 0.5 dB additional insertion loss			

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# CWDM Passives for 16-Channel CWDM HFC Architectures



## Ordering Information

4-Channel MUX/DMUX	Part Number
CWDM, 4-Channel Low band MUX/DMUX, E2108 adapter	A90574.1012704
CWDM, 4-Channel High band MUX/DMUX, E2108 adapter	A90574.1015104
CWDM, 4-Channel Low band MUX/DMUX, SC/APC adapter	A90574.1012708
CWDM, 4-Channel High band MUX/DMUX, SC/APC adapter	A90574.1015108
8-Channel MUX/DMUX	
CWDM, 8-Channel Low band MUX/DMUX, E2108 adapter	A90578.1012704
CWDM, 8-Channel High band MUX/DMUX, E2108 adapter	A90578.1014704
CWDM, 8-Channel Low band MUX/DMUX, SC/APC adapter	A90578.1012708
CWDM, 8-Channel High band MUX/DMUX, SC/APC adapter	A90578.1014708
High / Low band filter	
CWDM, High / Low band filter, E2108 adapter	A90570.104
CWDM, High / Low band filter, SC/APC adapter	A90570.108
Card Frame/Chassis for CWDM MUX/DMUX	
Chassis 19" 2RU 4 LGX slots – only single wide modules	750180
Chassis 19" 3RU 8 LGX slots	750181
Chassis 19" 4RU 12 LGX slots	750182
Bracket Assembly, 19" 1RU 3 LGX slots - only single wide modules	4001126
Bracket Assembly, 19" 2RU 6 LGX slots	4001125
Bracket Assembly, 19" 4RU 19 LGX slots	4000150
Reverse CWDM Transmitters with Pilot Tone	
3 dBm, xxxx nm, DFB without adapter*	A90083.10xxxx
6 dBm, xxxx nm, DFB without adapter*	A90086.10xxxx
xxxx equals the wavelength in nm i.e. 1270, 1290, 1310, 1330, 1350, 1370, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590 or 1610 nm * One adapter is required for each optical connection forward and reverse. Internal optical connector is SC/APC. Optical adapters must be ordered separately.	



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