



## SAN Products



### Overview

Storage Area Networks (SANs) use the Fibre Channel protocol to allow servers and workstations to access shared, remote data storage devices without adding congestion to the Local Area Network (LAN). The Fiber Driver™ Fibre Channel managed media converters extend and enhance the deployment of SANs. While the standard Fibre Channel link distance limit is just 500 m over Multimode (MM) fiber, the Fiber Driver Gigabit Multimode Extender (GMX) modules can achieve link distances of 2 km or more over MM fiber, and the Multimode to Singlemode converters provide distances up to 80 km over SM fiber.

In addition to the GMX modules and Multimode-to-Singlemode converters, the Fiber Driver Fibre Channel product line offers solutions in Single Fiber converters, Coarse Wave Division Multiplexers (CWDMs), Splitter/Combiners, and Signal Repeaters

### GMX

The effects of modal dispersion severely limit the distance that high-speed protocols can travel over Multimode fiber. For the Fibre Channel protocol, transmission distances are typically restricted to 500 meters. This limitation makes using existing Multimode fiber plants for SANs impractical.

To overcome these limitations, the Fiber Driver™ Gigabit Multimode Extender modules apply unique anti-dispersion technology that allows high-speed protocols such as Fibre Channel to travel over Multimode fiber (FDDI graded) to a guaranteed distance of 2 km, and as far as 6 km under ideal conditions.

### Multimode to Singlemode

Fiber Driver Multimode-to-Singlemode converters allow network managers to transparently connect Multimode and Singlemode fiber segments. Converting from Multimode to Singlemode fiber can extend the transmission distance of Fibre Channel up to 80 km.

### Features

- Converts Multimode fiber to Singlemode fiber
- Extends standard Fibre Channel distance limit of 10 km to 80 km
- Dual or Single fiber connector option
- Modules are hot swappable
- SNMP managed
- ANSI X3.230-1994 compliant
- Most modules fit in all Fiber Driver chassis (CWDM modules fit in any 16 slot Fiber Driver Chassis)
- Standalone CWDM units include redundant power supplies and built in Management Module functionality

## Datasheet

### Single Fiber

Fiber Driver Single Fiber modules use unique technology, which provide the ability to combine transmit (TX) and receive (RX) signals onto a single fiber strand while maintaining Full Duplex operation. This effectively doubles the available fiber in a network, and eliminates the need for additional fiber installation. Fibre Channel versions are available for distances up to 65 km.

### CWDM

The Fiber Driver WDM44 and WDM84 Wave Division Multiplexers are capable of combining four data channels and eight data channels, respectively, onto one fiber pair. Using cost-effective CWDM technology, the WDM84 provides 16 Gbps of Full Duplex data transmission at distances up to 35 km, while the WDM44 provides 8 Gbps of Full Duplex transmission at distances up to 65 km. CWDMs are available as modules that occupy five slots of a Fiber Driver 16-slot chassis, or as standalone units that include redundant AC or DC power supplies and have the built-in full functionality of the Fiber Driver EM316NM Network Management Module.

### Splitter/Combiner

Splitter/Combiner technology provides the ability to propagate two signals, transmit (TX) and receive (RX), over a single fiber strand using the same wavelength. Since the Fiber Driver™ Splitter/Combiner modules are protocol independent, they can be used in SAN applications. Splitter/Combiner modules operate at a specific wavelength, and do not perform media conversion. They are passive devices with no power requirements; if manageability is not needed, they will fit in any of the Fiber Driver™ chassis

including the non-powered single-slot NC316-NP. A pair of Splitter/Combiners add a power loss of 6.4 dB to 7.0 dB for SM fiber and 9 dB for MM fiber. Angled Polished Connectors (APC) are used at the link connections to eliminate cross-talk.

### Signal Repeater

Some SAN networks may require link distances that are longer than what can be achieved by even high-powered optics. For these situations, the Fiber Driver family has a selection of Fibre Channel signal repeaters. These devices retime and regenerate the incoming signal making it possible to transmit data over multiple hops totaling distances of hundreds of kilometers.

### Self Healing/Redundant Link

The Fiber Driver Self Healing/Redundant Link modules are designed for mission critical applications that demand maximum uptime. Each module provides two point-to-point connections. One link functions as the primary data path while the other provides a secondary, fail-over path. In the event of link loss, the data stream is switched automatically from the primary link to the secondary. Utilizing the built-in link detect circuitry, the switchover is completed in a matter of microseconds, preventing loss of data and network down time. Fibre Channel models of the Self Healing / Redundant Link modules are available for distances up to 45 km..

For additional information including pricing and availability, contact your MRV Communications sales representative today.

#### Physical Specifications: CWDM Standalone Units

<b>Operating Temperature Range:</b>	0°C to 50°C (32°F to 122°F)
<b>Storage Temperature:</b>	-10°C to 60°C (14°F to 140°F)
<b>Relative Humidity:</b>	85% maximum, non-condensing
<b>Safety Compliance:</b>	UL – UL 1950; CUL – CSA 22.2, No. 950; TUV – EN 60950; CE – IEC 950/EN 60950
<b>Emission Compliance:</b>	FCC - PART 15, SUBPART B, 1999, CLASS A; CE MARK - EN 50081-1:1992; EN 50082:1997; EN 55024:1998; EN 55022:1998; AS/NZS 3548:1995
<b>Electrical Requirement:</b>	48V, 2A DC / 94-240V, 47-63Hz, 2A AC
<b>Power Consumption (WDM44):</b>	35 - 40 Watts
<b>Power Consumption (WDM84) :</b>	45 - 50 Watts
<b>Physical Dimensions:</b>	44 mm x 457 mm x 432 mm wide (1.75" high x 18" deep x 17" wide)
<b>Weight (WDM44):</b>	8.0 kg (17.65 lbs.)
<b>Weight (WDM84):</b>	8.64 kg (19.05 lbs.)
<b>Mounting:</b>	19" rack

## Datasheet

### SINGLE FIBER

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output	Minimum Loss Budget (dB)	Range <sup>2</sup> Approx. (km)
	EM316FCFSF/S2	Fibre Channel MM to Single Fiber SM S2	Fibre Channel	DSC / SC-APC	850 / 1550	9	0 - 35
	EM316FCFSF/S3	Fibre Channel MM to Single Fiber SM S3	Fibre Channel	DSC / SC-APC	850 / 1550	12	10 - 50
	EM316FCFSF/S4	Fibre Channel MM to Single Fiber SM S4	Fibre Channel	DSC / SC-APC	850 / 1550	15	15 - 60

### DUAL WAVELENGTH SINGLE FIBER

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output	Minimum Loss Budget (dB)	Range <sup>2</sup> Approx. (km)
	EM316WFCC/S2	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1550	12 (@1310 nm)	0 - 25
	EM316WFCT/S2	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1310		
	EM316WFCC/S3	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1520	12	25 - 50
	EM316WFCT/S3	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1560		
	EM316WFCC/S4	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1520	16	45 - 65
	EM316WFCT/S4	Fibre Channel MM to Single Fiber SM	Fibre Channel	DSC / SC	850 / 1560		

### WDM SYSTEMS

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output	Minimum Loss Budget (dB)	Range <sup>2</sup> Approx. (km)
	WDM40002	Four Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. Standalone unit.	Fibre Channel	DSC / DSC	850 / 1500, 1520, 1540, 1560	16	10 - 65
	EM316W40002	Four Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. 5-slot module.	Fibre Channel	DSC / DSC	850 / 1500, 1520, 1540, 1560	16	10 - 65
	WDM841220	Eight Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. Standalone unit.	Fibre Channel	DSC / DSC-APC	850 / 1500, 1520, 1540, 1560	9	0 - 35
	EM316W841220	Eight Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. 5-slot module.	Fibre Channel	DSC / DSC-APC	850 / 1500, 1520, 1540, 1560	9	0 - 35
	WDM882000	Eight Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. Standalone unit.	Fibre Channel	DSC / DSC	850 / 1470-1610 (20 dB delta)	16	10 - 65
	EM316WDM882000	Eight Fibre Channel input ports (MM) to one WDM SM Dual Fiber trunk. 5-slot module.	Fibre Channel	DSC / DSC	850 / 1470-1610 (20 dB delta)	16	10 - 65
	WDM882100	Eight Fibre Channel input ports (MM) to one WDM SM Single Fiber trunk. Standalone unit.	Fibre Channel	DSC / SC-APC	850 / 1470-1610 (20 dB delta)	9	0 - 35
	EM316WDM882100	Eight Fibre Channel input ports (MM) to one WDM SM Single Fiber trunk. 5-slot module.	Fibre Channel	DSC / SC-APC	850 / 1470-1610 (20 dB delta)	9	0 - 35

### WDM REPEATERS

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output	Minimum Loss Budget (dB)	Range <sup>2</sup> Approx. (km)
	WDMR0101	Four-wavelength WDM Gigabit Repeater with one Dual Fiber SM WDM input trunk port and one Dual Fiber SM WDM output trunk port. Standalone unit. Works only with WDM4xxx units.	***	DSC / DSC	1500-1560 / 1500-1560	16	10 - 65
	WDMR4111	Four-wavelength WDM Gigabit Repeater with one Single Fiber SM WDM input trunk port and one Single Fiber SM WDM output trunk port. Standalone unit. Works only with WDM4xxx units.	***	SC-APC / SC-APC	1500-1560 / 1500-1560	9	0 - 35

<sup>1</sup>Default connectors listed, other connectors are optional.

<sup>2</sup>Distances are approximate and assume 9µ SM and 62.5µ MM. For WDM84 distances less than 10 km, use 3dBm attenuator.

\*\*\* WDM44 Repeaters support all Gigabit protocols. Fast Ethernet is also available; contact your local sales office for configuration and ordering information.

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### Physical Specifications: Modules

<b>Operating Temperature Range:</b>	0°C to 50°C (32°F to 122°F)
<b>Storage Temperature:</b>	-10°C to 60°C (-14°F to 140°F)
<b>Relative Humidity:</b>	85% maximum, non-condensing
<b>Emission Compliance:</b>	FCC - PART 15, SUBPART B, 1999, CLASS A; CE MARK - EN 50081-1:1992; EN 50082:1997; EN 55024:1998; EN 55022:1998; AS/NZS 3548:1995
<b>Physical Dimensions (Modules other than CWDM):</b>	25 mm x 75 mm x 175 mm deep (1" x 3.5" x 7" deep)
<b>Physical Dimensions (CWDM Modules):</b>	125 mm x 87 mm x 175 mm deep (5" x 3.5" x 7" deep)
<b>Weight (Modules other than CWDM):</b>	213 g (7.5 oz)
<b>Weight (WDM44):</b>	1.08 kg (2.35 lbs.)
<b>Weight (WDM84):</b>	1.70 kg (3.75 lbs.)

### SAN REPEATERS

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Port / Link	Wavelength Input / Output (nm)
	EM316FCRDM/DSx <sup>2</sup>	Dual MM to Dual SM Repeater	Fibre Channel	DSC / DSC	850 / 1310 or 1550
	EM316FCRDM/SSx <sup>2</sup>	Dual MM to Single Fiber SM Repeater	Fibre Channel	DSC / SC-APC	850 / 1550
	EM316FCRDLX/DSx <sup>2</sup>	Dual MM LX to Dual SM Repeater	Fibre Channel	DSC / DSC	1310 / 1310 or 1550
	EM316FCRDLX/SSx <sup>2</sup>	Dual MM LX to Single Fiber SM Repeater	Fibre Channel	DSC / SC-APC	1310 / 1550
	EM316FCRDSx/DSx <sup>2</sup>	Dual SM to Dual SM Repeater	Fibre Channel	DSC / DSC	1310 / 1310 or 1550
	EM316FCRDS1/SSx <sup>2</sup>	Dual SM to Single Fiber SM Repeater	Fibre Channel	DSC / SC-APC	1310 / 1550
EM316FCRSSx/SSx <sup>2</sup>	Single Fiber SM to Single Fiber SM Repeater	Fibre Channel	SC-APC / SC-APC	1550 / 1550	

Fibre Channel	Minimum Loss Budget (dB)	Range Approx. (km) <sup>3</sup> (each side)	SSX <sup>2</sup>	Minimum Loss Budget (dB)	Range Approx. (km) <sup>3</sup> (each side)
S1	DL	0 - 10	SF/S2	9	0 - 35
S2	8	0 - 30	SF/S3	12	10 - 50
S3	15	30 - 60	SF/S4	15	15 - 60
S4	20	50 - 80			

### GIGABIT MULTIMODE EXTENDERS

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output (nm)	Minimum Loss Budget (dB)	Range Approx. (km)
	EM316FC/MX	Fibre Channel MM to Extended MM	Fibre Channel	DSC / DSC	1310	DL	0-6 <sup>4</sup>

### MULTIMODE TO SINGLEMODE

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output (nm)	Minimum Loss Budget (dB)	Range <sup>3</sup> Approx. (km)
	EM316FC/S1	Fibre Channel MM to SM	Fibre Channel	DSC / DSC	850 / 1310	DL	0 - 10
	EM316FC/S2	Fibre Channel MM to SM	Fibre Channel	DSC / DSC	850 / 1550	8	0 - 30
	EM316FC/S3	Fibre Channel MM to SM	Fibre Channel	DSC / DSC	850 / 1550	15	30 - 60
	EM316FC/S4	Fibre Channel MM to SM	Fibre Channel	DSC / DSC	850 / 1550	20	50 - 80

<sup>1</sup> Default connectors listed, DST optional.

<sup>2</sup> x = distance specification (i.e., can be S1, S2, S3, or S4) depending on optical power; see table below. Distances are approximate and assume 9µ SM.

<sup>3</sup> Distances are approximate and assume 9µ SM and 62.5µ MM. For WDM84 distances less than 10 km, use 3dBm attenuator.

<sup>4</sup> 2 km guaranteed. Maximum range is dispersion limited, and depends upon grade and condition of fiber plant used.

DL=Dispersion Limited

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### SPLITTER/COMBINERS

Ordering Info	Part Number	Function	Protocol	Connectors <sup>1</sup> Input / Output	Wavelength Input / Output	Maximum Lost Budget (dB)	Range Approx. (km)
	EM316SC/3M	Dual Fiber to Single Fiber MM Converter	Any	SC / SC-APC	1310 / 1310	4.5 (ea. side)	***
	EM316SC/8M	Dual Fiber to Single Fiber MM Converter	Any	SC / SC-APC	850 / 850	4.5 (ea. side)	***
	EM316SC/3S	Dual Fiber to Single Fiber SM Converter	Any	SC / SC-APC	1310 / 1310	3.5 (ea. side)	***
	EM316SC/5S	Dual Fiber to Single Fiber SM Converter	Any	SC / SC-APC	1550 / 1550	3.2 (ea. side)	***

<sup>1</sup>Default connectors listed, other connectors are optional.  
 \*\*\* Range is dependent upon available optical budget

For additional information including pricing and availability, contact your MRV Communications sales representative today.

MRV has more than 50 offices throughout the world. Addresses, phone numbers, and fax numbers are listed at [www.mrv.com](http://www.mrv.com). Please e-mail us at [sales@mrv.com](mailto:sales@mrv.com) or call us for assistance.

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