

PLEXiS™

MFX Transport System

Overview

C-COR's PLEXiS MFX platform is a highly scalable, reliable, and cost-effective DWDM optical networking system capable of meeting the needs of service providers offering VOD, VoIP, and HSD services over a converged network. With a wide variety of transmitter, receiver, and transceiver options available, both uni- and bidirectional networks can be tailored for converged-services network applications. By utilizing both DWDM and CWDM technologies, PLEXiS MFX can carry multiple services efficiently over a single fiber. PLEXiS MFX is controllable from a powerful management system and has modular service interfaces for GigE to 10GigE services. PLEXiS MFX also offers a wide variety of amplifiers, passives, optical add-drop multiplexers, and physical layer protection modules. Together these modules make the PLEXiS MFX platform the most complete and advanced optical transport system of its kind, enabling the design of cost-efficient networking applications that provide flexibility, scalability, and reliability.

Flexibility: Each service offered has different network requirements and impacts the network design in a different way. With the PLEXiS flexible solutions, a wide variety of architecture types, protection levels, and wavelength routing schemes can be envisioned. The PLEXiS MFX transport system supports Gigabit Ethernet, SONET, and other traffic types as well, thus supporting different types of legacy traffic that may already exist. A true multiformat solution such as the PLEXiS MFX lowers costs and provides a more efficient way of managing multiple traffic formats.

Scalability: MSOs shouldn't pay for capacity they don't need. Since the PLEXiS MFX transport system is scalable, capacity that is needed can be allocated on a truly pay-as-you-grow basis. Both DWDM and CWDM multiplexing solutions are available, with wavelength scaling from 1 to 40 wavelengths per fiber. Hitless provisioning is possible as well, allowing additional capacity to be incrementally added without service disruption.

High Capacity: New services such as VOD and HDTV require ever-increasing amounts of downstream bandwidth. The PLEXiS MFX solution currently provides capacity levels exceeding 76,000 streams per fiber. Multiple chassis can be interconnected as well to offer MSOs extremely high capacity in a very small footprint.

Reliability: The PLEXiS MFX solution offers MSOs the ability to use transport protocols (for example, Gigabit Ethernet and SONET) that have been proven reliable through years of extensive testing and deployment. The PLEXiS MFX transport system and other related products, including the PSLC-9780 protection switch and the CRYSTAL Network Management Software suite, allow networks to be designed to provide carrier grade reliability.

Long Reach: The reach of the PLEXiS MFX transport system enables MSOs to interconnect headends that are separated by greater distances. Coupled with the Fractional Optical Multiplexer, PLEXiS long reach transmitters enable the design of ring or drop-and-forward architectures that cover larger areas.

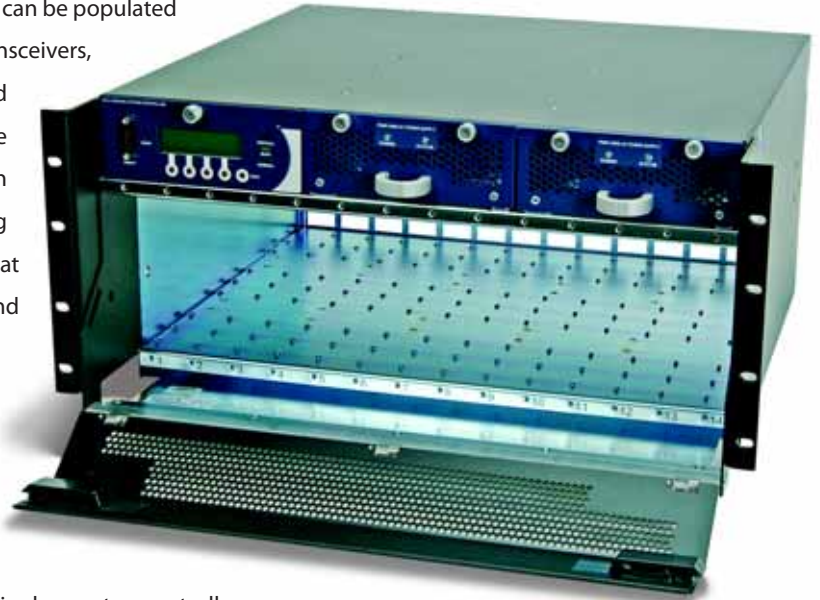
Low Cost: The PLEXiS MFX transport system was designed with cable applications in mind. The modular, functional building blocks emphasize simplicity in design for lowest cost. This simplicity, combined with a range of modular line cards and a sophisticated communication and network management system, ensures a good balance among first-install costs, expansion capabilities, and operational costs. Cost per stream has been minimized while providing reliable, scalable transport.

PLEXiS MFX Components

Item	Module Description	Model No.
Chassis	MFX Flush-mount 5RU AC powered Chassis	CHSS-9454
Power Supply	MFX AC Power Supply, 350W	PSMC-9500
Control Module	MFX Main System Controller	SCLC-9550
Crystal Software	Crystal Network Management Software	SEMS
Fractional Multiplexers		
	Fractional Optical MUX—4 Drop/Express Options	FOML-9350
	Add/Drop MUX	FOML-9360
	Dual Fractional Optical MUX	FOML-9366
Multiplexers		
	40-Channel Multiplexer/Demultiplexer 1RU Enclosure	OMRU
	8-Channel MUX/DEMUX	OMLC-9422
	8-Channel MUX/DEMUX with Expansion Port	OMLC-9424
	8-Channel MUX/DEMUX with Expansion Ports	OMLC-9426
Ethernet		
Gigabit		
	GigE Transmitter-Dual	GBTX-9156
	GigE Receiver-Dual	GBRX-9158
	GigE Transceiver-Dual	GBTR-9160
10 Gigabit		
	10GigE LAN PHY Ethernet Transmitter	GXTX-9180
	10GigE LAN PHY Ethernet Receiver	GXRX-9182
	10GigE LAN PHY Ethernet Transceiver	GXTR-9184
Multiport GigE Line Card	Media Converter	MCLC-9824
Specialty Line Cards		
	EDFA 20dBm Gain Flattened	EDAC-9275
	Dispersion Compensation	ODCM-9730
	Optical Channel Monitor Module	OCMM-9308
	Channel Equalizer Module	CEQM-9370
	Protection Switch	PSLC-9780

PLEXiS MFX Chassis

PLEXiS MFX consists of a universal chassis, which can be populated with any mix of transmitters, receivers, transceivers, WDMs, EDFAs, optical add or drop cards, and protection switches to fulfill the service requirements of the transport network. Each chassis also contains redundant, load-sharing power supplies and a system controller card that enables advanced network monitoring and control. With 14 slots in a compact 5RU chassis, PLEXiS MFX provides exceptional flexibility to meet the specific requirements of a diverse array of network architectures. Up to eight 5RU chassis can be housed in a standard rack, and the chassis can be daisy-chained together for monitoring by a single master controller module.



5RU Chassis Specifications

Dimensions (W x H x D)	8.75 x 19.0 x 19.0 in (22.2 x 48.3 x 48.3 cm)
Weight	29lbs (13kg)
Slots	14
Temperature, Operating (storage)	0–50°C (-20–75°F)
Relative humidity (non condensing)	5–95%
Power Input AC Fused/filtered AC Power Connector (110/200 VAC)	10A @ 110 VAC, 10 A @ 220 VAC
Power Consumption (fully loaded)	380W
Communications	Crystal Management Software (Serial RS-232)
Cooling	None required, modules individually cooled
Temperature Monitoring	None required, modules individually monitored

Specifications are subject to change without notice.

Power Supply and Control Module

PLEXiS Power Supply Module Specifications

Dimensions (W x H x D)	5.75 x 2.25 x 15.25 in (14.6 x 5.7 x 38.7 cm)
Weight (maximum)	6 lbs (2.7 kg)
Input Power	90–264 VAC
Output Line and Load Regulation	±2 %, over input range
Temperature Coefficient	0.03 %/°C
Stability, over 8 hours, after 30 min. warm-up	0,1 %
Output Power	
12VDC	19.25 A
5VDC	20.0 A
3.5VDC	10.6 A
Temperature:	
Operating (external ambient temperature)	0–50 °C
Storage	-20–75 °C
Cooling	Internal fans
Relative Humidity (noncondensing)	5–95 %
Connector	47-pin



Specifications are subject to change without notice.

PLEXiS Controller Module (MA/SE) Specifications

Dimensions (W x H x D)	5.5 x 2.25 x 15.25 in (13.97 x 5.7 x 38.7 cm)
Weight (maximum)	1 lbs (0.457 kg)
Temperature:	
Operating (external ambient temperature)	0–50 °C
Storage	-20–75 °C
Cooling	Not required
Relative Humidity (noncondensing)	5–95 %
Connector	30-pin



Specifications are subject to change without notice.

Crystal Network Management Software

By providing monitoring and control for PLEXiS transport systems, the CRYSTAL Management System is a vital component of C-COR's Advanced DWDM Optical Networking Solution. CRYSTAL's primary responsibility is to collect and display all network, chassis, and line card performance statistics and alarm status. However, CRYSTAL actually enables much more than typical platform management systems. Specifically, the CRYSTAL Management System enables operators to provision the bandwidth and capacity of their DWDM optical network. This level of true service-driven management is key as optical networks evolve in scope from local to regional to national.

Available as either a stand-alone application or client-server based system, the CRYSTAL Management System uses the SNMP information provided by PLEXiS MFX chassis control modules and the controllers in PLEXiS 1RU units. The user-friendly graphical interface provides both high-level network views as well as more detailed screens for monitoring and managing specific network elements.

- Provides overview of network health and capacity
- View wavelength/bandwidth utilization and link status
- Remote firmware upgrades to controller modules and line cards
- Auto-discovery of logical network links
- GigE remote monitoring (RMON) capabilities



Each line card can be controlled via the GUI, with performance parameters and alarm limits defined by the user.



The CRYSTAL GUI is intuitive and easy to navigate, displaying all of the line cards in each chassis.



Network monitor and control spans from the component level to the system level. The entire network can be navigated seamlessly with the click of a mouse button.

Fractional Multiplexer Line Cards

Fractional Optical Multiplexer MFX Line Card

Fractional Optical Multiplexers provide a low-cost method of dividing an information carrying wavelength between multiple destinations, receivers, nodes or hubs. The result is an extremely efficient broadcast or narrowcast network infrastructure that maximizes the effective capacity of each optical transmitter, thus reducing costs.

The FOML-9350 series of line cards provide a broadband division of input power between two output ports. In conjunction with the other line cards of the PLEXiS product line, the FOML-9350 can be part of an optically protected link (sending the same information down multiple paths to the destination), part of a broadcast and select architecture (providing a drop-and-forward capability), or providing a broadband drop or add function in a Reconfigurable Optical Add-Drop Multiplexer (ROADM).

- Connect a single transmitter to multiple receivers
- Variety of split ratios
- Self-identification to Crystal NMS
- Supports multiple traffic formats
- Compatible with any data rate

FOML-9350 Specifications

Optical	
Operating Wavelength	1529–1562nm
Directivity	>45dB
Return Loss	>55dB
Maximum Input Power	1W
Split ratio	50, 30, 20, 10%
Polarization Dependent Loss	<0.12dB
Environmental	
Operating Temperature	0–50°C
Storage Temperature	-20–75°C
Relative Humidity (noncondensing)	5–95%
Mechanical Specifications	
Size (W x H x D)	1.2 x 6.5 x 17in. (16.5 x 3.1 x 43.2cm)
Weight	3.2lbs (1.45kg)
Power Consumption, typ. @ ambient	0.5W
Optical Connectors	SC/APC, LC/PC, SC/UPC
Alarms	
	Fan, communications, module temperature, firmware mismatch
Controls	
	N/A

Specifications are subject to change without notice.

Fractional Multiplexer Line Cards

Dual Power Divider MFX Line Card

Dual Fractional Optical Multiplexer line cards allow information carrying wavelengths to service numerous headends, nodes or hubs, and enables highly flexible traffic routing for cable networks. Wavelengths can be shared between several hubs or nodes. The result is an extremely efficient broadcast or narrowcast network architecture that maximizes the effective capacity of each optical transmitter, thus lowering transport costs.

The FOML-9366 series of line cards provides two discrete optical circuits, each consisting of an input port, and two output ports. The input power is split to provide optical distribution of broadcast content to multiple locations. By combining the FOML-9366 with other line cards of the PLEXiS transport platform, network architectures can be constructed as point-to-multipoint, ring, or broadcast and select. The FOML-9366 can also be incorporated into a ROADM architecture to provide the highest level of network flexibility.

- Two discrete optical circuits
- Independent split ratios
- Full C-Band coverage
- Supports multiple traffic formats
- Compatible with any data rate

FOML-9366

Optical

Operating Wavelength	1529–1562 nm
Directivity	>45 dB
Return Loss	>55 dB
Maximum Input Power	1 W
Split ratio	50, 40, 30, 20, 10 %
Polarization Dependent Loss	<0.12 dB

Environmental

Operating Temperature	0–50 °C
Storage Temperature	-20–75 °C
Relative Humidity (non-condensing)	5–95%

Mechanical Specifications

Size (W x H x D)	1.2 x 6.5 x 17 in (16.5 x 3.1 x 43.2 cm)
Weight	3.2lbs (1.45 kg)
Power Consumption, typ. @ ambient	0.5W
Optical Connectors	SC/APC, LC/PC, SC/UPC
Alarms	Fan failure, communications, module temperature, firmware mismatch
Controls	N/A

Specifications are subject to change without notice.

40-Channel Multiplexer/Demultiplexer 1RU Enclosure

The 40-Channel Multiplexer/Demultiplexer 1RU enclosure provides for the multiplexing or demultiplexing of 100GHz spaced wavelengths on the ITU Grid. Fully compatible with the other line cards of the PLEXiS transport platform, the OMRU-9440 enables high bandwidth DWDM optical transport. The result is an extremely efficient broadcast or narrowcast network architecture that maximizes the effective capacity of each optical fiber, thus lowering transport costs.



The OMRU-9440 multiplexer combines up to 40 ITU grid wavelengths onto a single fiber. With low insertion loss and high isolation, the OMRU-9440 provides reliable performance for even the most demanding optical network applications. By combining the OMRU-9440 with other line cards, network architectures can be constructed as point-to-point, point-to-multipoint, ring, or broadcast and select. The OMRU-9440 can also be incorporated into a ROADM architecture to provide the highest level of network flexibility.

- 100 GHz channel spacing
- Supports multiple traffic formats
- Compatible with linecard multiplexers
- Compatible with any data rate

OMRU-9440

Optical

ITU Channel Plan	16 through 59 (skips 24, 33, 42, 51)
Channel Spacing	100GHz
Passband width (typical at 0.5 dB)	>0.2nm
Insertion Loss	<5 dB
Return Loss	>40dB
Insertion Loss Variation (Uniformity)	<1.5dB
Polarization Dependent Loss	<0.5 dB
Maximum Input Power	250mW
Isolation	>25 dB
Expansion Port Channel Plans, ITU grid	16-42 (Band 1,2,3) and 52-59 (Band 5)
Expansion Port Insertion Loss	<1.5 dB

Environmental

Operating Temperature	0-50°C
Storage Temperature	-20 -65°C
Relative Humidity (noncondensing)	5 -95%

Mechanical Specifications

Size (W x H x D)	19 x 1.75 x 17 in (48.3 x 4.5 x 43.2 cm)
Weight	<10 lbs (4.54 kg)
Optical Connectors	LC/PC

Alarms N/A

Controls N/A

Specifications are subject to change without notice.

Multiplexer Line Cards

8-Channel Multiplexer Or Demultiplexer MFX Line Card

C-COR's PLEXiS product line provides for the multiplexing or demultiplexing of 100 GHz spaced wavelengths on the ITU Grid. Fully compatible with the other line cards of the PLEXiS transport platform, the OMLC-9422 enables high bandwidth DWDM optical transport. The OMLC-9422 series of line cards multiplexes up to eight ITU grid wavelengths. With low insertion loss and high isolation, the OMLC-9422 provides reliable performance for even the most demanding optical network applications. By combining the OMLC-9422 with other line cards of the PLEXiS transport platform, network architectures can be constructed as point-to-point, point-to-multipoint, ring, or broadcast and select. The OMLC-9422 can also be incorporated into a ROADM architecture to provide the highest level of network flexibility.

- 100 GHz channel spacing
- Supports multiple traffic formats
- Used alone or in conjunction with OMLC-9424 and OMLC-9426
- Compatible with any data rate

OMLC-9422

Optical	9422	9424	9426
ITU Channel Plan	16-23 (Band 1) or 52-59 (Band 5)	25-32 (Band 2) or 34-41 (Band 3)	43-50 (Band 4)
Channel Spacing, GHz	100	100	100
Passband width, nm (typical at 0.5 dB)	±0.12	±0.12	±0.12
Insertion Loss, dB	<3.3	<4.1	<4.5
Return Loss, dB	>40	>40	>40
Insertion Loss Variation (Uniformity), dB	<1.0	<1.0	<1.0
Polarization Dependent Loss, dB	<0.5	<0.5	<0.5
Maximum Input Power, mW	300	300	300
Isolation, dB	>25	>25	>25
Environmental			
Operating Temperature	0 to 50°C		
Storage Temperature	-20 to 75°C		
Relative Humidity (noncondensing)	5 to 95%		
Mechanical Specifications			
Size (W x H x D)	1.2 x 6.5 x 17 in (16.5 x 3.1 x 43.2 cm)		
Weight	3.2lbs (1.45kg)		
Power Consumption, typ. @ ambient	0.5W		
Optical Connectors (SC in double-wide card)	SC/APC, LC/PC, SC/UPC		
Alarms	Fan failure, communications, module temperature, firmware mismatch		
Controls	N/A		

Specifications are subject to change without notice.

GigE MFX Line Cards

PLEXiS 2 GigE transceivers, transmitters, and receivers can be flexibly combined to provide both unidirectional and bidirectional transport. Combining multiple units incrementally scales bandwidth to match evolving network requirements. This PLEXiS 2 GigE hardware is the transitional element between local origination or termination of information signals (video, data, or voice) and the network transport. Local interfaces are small form-factor pluggable (SFP) optical and RJ-45 electrical for flexibility and convenience in connecting to a wide variety of servers, switches, routers, or other GigE devices. The network-side optics operate on the ITU Grid between 1530 and 1565nm for compatibility with standard C-band optical amplifiers.

The GBTX-9156 transmitter and GBRX-9158 receiver are used together to provide cost-effective unidirectional transport either in point-to-point topologies or in broadcast-and-select architectures, where point-to-multipoint transmission is desirable for the economy of the shared transmitter of common-information broadcasts. The GBTR-9160 transceiver enables both transmitter and receiver functions where bidirectional applications are desired.



- Transport of two line-rate GigEs
- Versatile SFP and RJ-45 LAN-side interfaces
- User-defined alarms
- Jumbo frames
- RMON support
- FEC

GBTX-9156, GBRX-9158, GBTR-9160 Specifications

	2 Gbps Long Haul WAN-side	Gigabit Ethernet LAN-side (SFP or RJ-45 Electrical)
Transmitter		
Optical Output Power, dBm	-1	-9 @ 850nm (550m) & 1310nm (10km), typ. 0 @ 1550nm (80km), typ.
Output Wavelengths, nm, ITU Grid	1530 to 1565	
Link Distance	600km	
Dispersion Penalty, dB @ 80km	<2 dB	
Extinction Ratio, dB	>10	
Receiver		
Optical Input Power, dBm	-21 to -3	-17 @ 850nm (550m), typ., -22 @ 1310nm (10km), typ. -26 @ 1550nm (80km), typ.
Optical Return Loss, dB	45	12
Environmental Specifications		
Operating Temperature, °C	0 to 50	
Storage Temperature, °C	-20 to 75	
Relative Humidity, % (noncondensing)	5 to 95%	
Mechanical Specifications		
Size (W x H x D)	1.2 x 6.5 x 17in (3.1 x 16.5 x 43.2cm)	
Weight	3.2lbs (1.45kg)	
Power Consumption, typ. @ ambient	23W	
Optical Connectors	SC/APC, LC/PC, SC/UPC	
Alarms	Optical power, laser diode bias current, laser and module temperature, LAN and WAN link status, RMON statistics group 1	
Controls	Alarm limits, link negotiation, loopbacks, laser on/off, alarm suppression	

Specifications are subject to change without notice.

10 GigE MFX Line Cards

10 GigE LAN-PHY MFX Line Card

The PLEXiS product family's LAN-PHY Module enables long-haul transport of a full line rate 10 Gigabit Ethernet (10 GigE) service over a DWDM wavelength. Specifically, the LAN-PHY Module interfaces a 10 GigE signal from the LAN side of the network with a 10 G DWDM wavelength on the WAN side of the network. The LAN-PHY Module provides network operators with the long-haul, high bandwidth transport needed for applications like VOD, Commercial Services, and Storage Area Networking (SAN). Typically this is accomplished by interconnecting routers or servers with 10 GigE interfaces. By using the LAN-PHY Module, operators can improve their fiber utilization by enabling these 10 GigE services to be carried using a single DWDM wavelength. This greatly improves bandwidth capacity compared with other solutions capable of transporting only 1 or 2 GigE services per wavelength.

- One full line rate 10 GigE LAN side port
- One 10 G WAN side interface
- Long reach (80 km) WAN side optics
- Versatile LAN side XFP port
- IEEE 802.3ae compliant
- Supports jumbo frames
- Utilizes forward error correction



GXTX-9180, GXTR-9184, and GRRX-9182 Specifications

WAN-Side Specifications	GXTX-9180 Transmitter	GXTR-9184 Transceiver	GRRX-9182 Receiver
Output Power, dBm	2–3	—	—
Output λ , ITU Grid ch.	16–59, except 24, 33, 42, 51	—	—
Link Distance, w/o dispersion compensation, km	80	—	—
λ Range, nm	—	—	1530 to 1560
Optical Input Power, dBm	—	—	–25 to –7
Optical Return Loss, dB	—	—	45
LAN-Side			
Number of Optical Ports (XFP)	1		
Link Distance	dependent on XFP device		
Mechanical			
Size (W x H x D), inches (cm)	1.2 x 6.5 x 17 in (3.1 x 16.5 x 43.2 cm)		
Weight	4 lbs (1.81 kg)		
Power Consumption, typ. @ ambient	<25 W		
Optical Connectors, WAN	SC/APC, LC/PC, SC/UPC		
Environmental			
Operating Temperature	0 to 50 °C		
Storage Temperature	–20 to 65 °C		
Relative Humidity (noncondensing)	5 to 95 %		
Alarms			
	Loss of LAN link, laser power low, high/low, module temp high/low, power failure, communications failure (Laser temperature—Transmitter and Transceiver Only)		
Controls			
	Laser ON/OFF, set laser diode temp. & limits, set laser bias current, autonegotiation ON/OFF	Laser ON/OFF, RX power low alarm limit	Autonegotiation ON/OFF

Specifications are subject to change without notice.

Multiport GigE Line Card

The Multiport GigE Line Card leverages the existing HFC infrastructure and increases fiber utilization through coarse wave division multiplexing (CWDM). Unlike other alternatives, C-COR's approach reduces CapEx and rapidly enables business service traffic on the same fibers MSOs use for residential subscribers. This solution eliminates the significant construction costs associated with fiber and equipment overlay architectures.

Each MCLC line card connects up to four business customers to your metro network. Each PLEXiS MFX chassis can house up to 14 MCLCs capable of interconnecting 56 businesses. Coupled with C-COR's array of customer premise modules and CWDM/DWDM optical multiplexing and routing hardware, they can provide a low cost, easy-to-deploy method of providing triple-play connectivity to businesses and campuses.



- Compact footprint and robust design
- Remote management and configuration
- 10/100/1000 Mbps LAN speed
- SFP WAN optics, CWDM or DWDM
- 1 Gbps WAN optics speed
- Up to 120 km reach
- 4 RJ-45 and 4 SFP ports
- Line card design for PLEXiS chassis
- Compatible with PLEXiS BXE CPE devices

MCLC-9824 Specifications

Optical/Electronic Specifications	MCLC-9824
Number of Optical Ports	4
Optical Link Distance, max (SFP dependent)	120km,
TX Power, typical (SFP dependent)	-2 to 3 dBm
RX Power, min. (SFP dependent)	-27 dBm
Available Wavelength Range, nm	1470 to 1610 nm, CWDM channels 47-61 nm
Speed, Client Side, Auto MDIX	10/100/1000Mbps,
Speed, WAN Side, Mbps	1000Mbps
Number of Electrical Ports (RJ-45)	4
Environmental Specifications	
Operating Temperature,	0 to 50 °C
Storage Temperature	-20 to 65 °C
Relative Humidity (noncondensing)	5 to 95 %
Mechanical Specifications	
Size (W x H x D)	1.2 x 6.5 x 17 in (3.1 x 16.5 x 43.2 cm)
Weight	4 lbs (1.81 kg)
Power Consumption	< 15W
Connectors	SFP, RJ-45
Alarms	Fan failure, temperature out of range, communications fault
Controls	Autonegotiation, Bandwidth

Specifications are subject to change without notice.

EDFA Line Card

The EDFA MFX line card has an optical power of up to 20 dBm and provides the optical signal amplification necessary for long distance transport networks. In addition to a high optical gain, the EDFAs have a low noise figure, are gain flattened, and provide automatic gain control—all features that ensure reliable, precise performance for the most stringent network applications. In particular this module is essential for operators deploying high channel count DWDM systems or that are migrating their local networks into regional or national systems. These modules enable the PLEXiS application modules, such as the PLEXiS Gigabit Ethernet Transceiver (GBTR), to meet the demands of today's network architectures.

- 20 dBm output power
- Gain flattened output
- Automatic gain control (AGC)
- Single width line card
- Multiple fiber connector style options



EDAC Specifications

Optical Specifications

Operational Wavelength, nm	1529–1565nm
Output Power, dBm, saturated	20dBm
Output Power per Channel, dBm, max.	Equal to $20 - 10 * \log(n)$, where n=the number of channels (Note 1)
Optical Return Loss, w/APC connectors	>40dB
Noise Figure, typ.	6.6dB
Isolation, max.	>30dB
Gain	18dB
Gain Flatness, @ 18dB	$< \pm 0.5$ dB
AGC Excursion, ≤ 3 dB change in input	$\leq \pm 0.5$ dB
AGC Response Time, ≤ 3 dB change in input	$\leq \pm 0.5$ ms
Automatic Shutoff Power, min.	-28 dBm

Environmental Specifications

Operating Temperature	0–50 °C
Storage Temperature	-20–75 °C
Relative Humidity, noncondensing	5–95%

Mechanical Specifications

Dimensions (W x H x D), inches (cm)	1.2 x 6.5 x 17 in (3.1 x 16.5 x 43.2cm)
Weight	6 lbs (2.72kg)
Power Consumption	10 W
Optical Connectors	SC/APC, LC/PC, SC/UPC

Alarms	Loss of input and output power, high temperature, high laser drive current, high/low power, fan failure, communications fault
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Controls	Set output power, gain set point, and mode of operation (constant gain/constant output power)
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Notes

1. All channels are operated at the same power level (that is, leveled output).

Specifications subject to change without notice

Optical Channel Monitoring Line Card

The Optical Channel Monitor Module (OCMM) provides real-time performance feedback for DWDM fiber-optic networks. Specifically, the OCMM is a line card that plugs into the PLEXiS MFX chassis and monitors signal status as well as gathers important quantitative data such as wavelength, frequency, and signal power for each individual wavelength channel in a common optically multiplexed input. These parameters are important for the proper evaluation, management, and maintenance activities of optical transport systems. As such, it will be a key element as networks evolve in scope from local to regional to national.

Also referred to as a Tilt Monitor, the OCMM is commonly used to ensure that per channel power is the same in each of the channels. The OCMM can be used with the PLEXiS Channel Equalizer Module (CEQM) if altering of the power levels of the monitored channels is necessary. All information is collected by the CRYSTAL Network Management System.

- Full scanning over entire C band
- Provides per channel wavelength and signal power
- Monitors 100 GHz spaced DWDM channels
- (ITU 16–59)
- Single width line card



OCMM Specifications

Optical Specifications

ITU Channels	16–59 (C band)
Channel Spacing	100GHz
Operating Frequency	191.6 to 195.9THz
Laser Frequency	ITU ±12.5GHz
Relative Power Accuracy	± 0.6dB
Total Power Accuracy	± 1.5dB
Power Repeatability	± 0.1dB
Band Tilt, max.	12dB
Adjacent Channel Uniformity	2dBm
Polarization Dependent Loss	± 0.15dB
Return Loss, min.	30dB
Optical Power Handling	–40 to –10dBm/Ch.
Total Input Power Handling	–23 to 7dBm

Environmental Specifications

Operating Temperature	0 to 50°C
Storage Temperature	–20 to 75°C
Relative Humidity (noncondensing)	5 to 95%

Mechanical Specifications

Dimensions (W x H x D)	1.2 x 6.5 x 17 in (3.1 x 16.5 x 43.2 cm)
Weight	5.3 lbs (2.40 kg)
Optical Connectors	SC/APC, LC/PC, SC/UPC

Alarms Module temperature low or high, fan failure, communications fault

Controls Set peak threshold and wavelength watchdog alarm

Specifications are subject to change without notice.

Optical Channel Equalizer Line Card

The Channel Equalizer Module (CEQM) functions as a variable attenuator to provide channel leveling and blocking capabilities for DWDM wavelengths, operating on individual channels or all channels transmitted at once. More specifically, the module functions to maintain equal power levels for wavelengths that experience differential gain or loss from various network elements. The primary contributors to this differential include wavelength add or drop filters, other optical passives, and the non-flat gain of optical amplifiers. The CEQM's functionality is also referred to as Dynamic Gain Equalization (DGE) or Dynamic Channel Equalization (DCE).

The CEQM provides vital functionality that network operators will need as they migrate their networks toward having more dynamically provisioned wavelengths with full ROADM capability. For example, the CEQM provides for effective wavelength add/drop capability at a hub by improving the isolation of dropped channels and ensuring uniform power per wavelength through EDFAs in order to maintain signal to noise ratio uniformity over many channels. Additionally, a single wavelength injected at a high optical power level can be prevented by the CEQM from disproportionately using the available gain of an EDFA and thus rendering the co-propagating channels undetectable or power limited. Other capabilities include channel blocking and the ability to remotely control the wavelengths being input into a system at various locations.



CEQM Specifications

Optical Specifications

ITU Channels	16–59 (C band)
Channel Spacing	100GHz
Minimum Insertion Loss, max.	6.5 dB
Channel Equalization Range, min.	15 dB
Channel Blocking, min.	30 dB
Accuracy	±0.25 dB or 5% of attenuation, whichever is greater
Repeatability	±0.2 dB, up to 15 dB of attenuation
Passband	±25 GHz, ITU center
Insertion Loss Ripple	±0.3 dB, within any channel
Polarization Dependent Loss	0.3 dB or 5% of attenuation whichever is greater
Polarization Mode Dispersion, max.	0.5 ps
Return Loss, min.	45 dB
Optical Power/Channel, max.	15 dBm
Optical Power Handling, max.	25 dBm
Fiber Type	Corning SMF-28 or equivalent

Environmental Specifications

Operating Temperature	0 to 50°C, external ambient temperature
Storage Temperature	–20 to 75°C
Relative Humidity (noncondensing)	5 to 95%

Mechanical Specifications

Dimensions (W x H x D)	1.2 x 6.5 x 17 in (3.1 x 16.5 x 43.2 cm)
Weight	5.3 lbs (2.40 kg)
Optical Connectors	SC/APC, LC/PC, SC/UPC

Alarms Module temperature low or high, fan failure, communications fault

Controls Set attenuation on individual or ALL chs, switch blocked status on individual or ALL chs

Specifications are subject to change without notice.

Protection Switch Line Card

The Optical Ring Switch line cards allows information carrying wavelengths to be protected against fiber path failure while following multiple diverse paths from source to destination. Utilized in broadcast and select networks, both unidirectional and bidirectional traffic is optically protected. The result is an extremely efficient broadcast or narrowcast network architecture with resilience against fiber breaks and equipment failure.

The PSLC-9740 line card consists of two monitored input ports and a single output port. The input power to each port is monitored independently, and user-settable switch thresholds allow customization to the individual network. In contrast to the PSLC-9780 (A/B switch), the PSLC-9740 monitors both input ports, but only the B path is connected to the output. As a result, when the primary (A) path senses a failure, the line card switches to allow the input to the secondary path (B) to reach the output. By combining the PSLC-9740 with other line cards of the PLEXiS transport platform, broadcast and select network architectures can be transformed into optically protected “switched bus” configurations. The PSLC-9740 can be configured by the network management software to operate in a number of logical switching protocols (manual, auto-revertive, non-revertive, forced). Alarm conditions report the activation of the switch, failure of both paths, or even failure of an unused backup path.

- Rapid switching time
- Multiple logic protocols
- User defined thresholds
- Manual override
- Supports multiple traffic formats
- Compatible with any data rate

PSLC-9780 Specifications

Optical	
Operating Wavelength	1529–1562nm
Optical input Power	-20 to 6dB
Switching Speed	<10ms
Maximum Input Power	500mW
Optical Isolation (Channel A to Channel B)	>55dB
Polarization Dependent Loss	<0.1dB
Return Loss	>45dB
Optical Insertion Loss	<1.5dB
Repeatability	<±0.02dB
Environmental	
Operating Temperature	0 to 50°C
Storage Temperature	-20 to 75°C
Relative Humidity (noncondensing)	5 to 95%
Mechanical Specifications	
Dimensions (W x H x D)	1.2 x 6.5 x 17in (16.5 x 3.1 x 43.2cm)
Weight	3.2lbs (1.45kg)
Power Consumption, typ. @ ambient	5.0W
Optical Connectors	SC/APC, LC/PC, SC/UPC
Alarms	Fan failure, communications, module temperature, firmware mismatch, fault detection, power failure
Controls	Channel A and channel B thresholds, logical switching protocol, alarm suppression

Specifications are subject to change without notice.

Dispersion Compensation Line Card

Network transport capacities have been greatly improved through the use of a 10 Gbps optical carriers. As link distances increase, chromatic dispersion can adversely impact network performance, resulting in increased bit error rates (BER) and poor signal quality. C-COR's Dispersion Compensation Module allows the deployment of 10 Gbps transport hardware over increased distances.

- Compatible with C-COR's GXTX-9170 transmitter and GXTR-9174 transceiver
- Reliable fiber-based design
- 40, 60, and 80 km versions available
- Low insertion loss
- Compact footprint

ODCM Specifications

Optical Specifications	
Channel Spacing, ITU Grid	100GHz
Wavelength Range	1530.33 to 1564.68nm, ITU Channels 16–59
Passband	30GHz
Insertion Loss, dB	40km <3.8 60km <3.8 80km <3.8
Fiber Type	G.652, SMF28
Polarization Mode Dispersion, ps	40km ≤ 0.5 60km ≤ 0.5 80km ≤ 0.5
Polarization Dependent Loss	≤ 0.3dB
Dispersion @ 1550nm, ps/nm	40km -680 ± 5 % 60km -1020 ± 5 % 80km -1360 ± 5 %
Environmental Specifications	
Operating Temperature	0 to 65°C
Storage Temperature	-20 to 75°C
Relative Humidity (noncondensing)	5 to 95%
Mechanical Specifications	
Dimensions (W x H x D)	1.2 x 6.5 x 17in (3.1 x 16.5 x 43.2cm)
Weight	<3.5lbs (1.59kg)
Optical Connectors	SC/APC, LC/APC, SC/UPC

Specifications are subject to change without notice.

Ordering Information

Item	Description
CHSS-9454	MFX 6RU Chassis
PSMC-9500	Power Supply
SCLC-9550	Controller Module
SEMS	Crystal Management Software
FOML-9350-xx-0y (Notes 1 and 2)	Broadband power splitter line card
FOML-9366-xy-0z (Notes 4, 5, 6)	Dual broadband power splitter line card
OMRU-9440-01-02	40-channel multiplexer or demultiplexer rack mount unit
OMLC-9422-0x-0y (Notes 2 and 7)	Eight channel multiplexer or demultiplexer line card
OMLC-9424-0x-0y (Notes 2 and 8)	Eight channel multiplexer or demultiplexer line card
OMLC-9426-04-0y (Note 2)	Eight channel multiplexer or demultiplexer line card
GBTX-9156-xx-0y (Notes 3 and 9)	Dual 2 GigE transmitter line card
GBRX-9158-00-0y (Note 9)	Dual 2 GigE receiver line card
GBTR-9160-xx-0y (Notes 3 and 9)	Dual 2 GigE transceiver line card
GTX-9180-xx-yy (Note 10)	10GigE LAN-PHY transmitter line card
GXR-9182-00-yy	10GigE LAN-PHY receiver line card
GXTR-9184-xx-yy (Notes 10, 11 and 12)	10GigE LAN-PHY transceiver line card
GTX-9170-xx-yy (Notes 10, 14 and 15)	8-port GigE muxponder, 1RU system, 10G WAN-side transmitter
GXR-9172-xx-yy (Notes 13, 14 and 15)	8-port GigE muxponder, 1RU system, 10G WAN-side receiver
GXTR-9174-xx-yy (Notes 10, 14 and 15)	8-port GigE muxponder, 1RU system, 10G WAN-side transceiver
MCLC-9824-00-00	4 Port Media Converter Line Card
EDAC-9275-00-01	EDFA Line Card, 20dBm, with Gain Flattening Filter (GFF), SC/APC
EDAC-9275-00-02	EDFA Line Card, 20dBm, with GFF, LC/PC
EDAC-9275-00-03	EDFA Line Card, 20dBm, with GFF, SC/UPC
OCMM-9308-01-01	Optical Channel Monitor Module, Tilt Version, SC/APC
OCMM-9308-01-02	Optical Channel Monitor Module, Tilt Version, LC/PC
OCMM-9308-01-03	Optical Channel Monitor Module, Tilt Version, SC/UPC
CEQM-9370-00-01	Channel Equalizer Module Line Card, SC/APC
CEQM-9370-00-02	Channel Equalizer Module Line Card, LC/PC
CEQM-9370-00-03	Channel Equalizer Module Line Card, SC/UPC
PSLC-9780-00-0x (Note 16)	Optical Protection Switch line card
PSLC-9780-00-0x (Note 16)	Optical Protection Switch line card
ODCM-9730-40-yy()Note 2)	Dispersion Compensation Module, 40km version
ODCM-9730-60-yy()Note 2)	Dispersion Compensation Module, 60km version
ODCM-9730-80-yy()Note 2)	Dispersion Compensation Module, 80km version

Notes:

- xx=split ratio in percent (50, 30, 20, 10)
- y= connector style: 1 for SC/APC, 2 for LC/PC, 3 for SC/APC (LC/PC preferred)
- xx= 00, ITU Grid channels: Standard ITU Grid channels 16 to 59, except 24, 33, 42, and 51
- x=Tap% Side A (1=10%; 2=20%; 3=30%; 4=40%; 5=50%)
- y=Tap % Side B (1=10%; 2=20%; 3=30%; 4=40%; 5=50%)
- z= connector style: 1 for SC/APC, 2 for LC/PC, 3 for SC/APC (LC/PC preferred)
- x= wavelength plan: 1 for Band 1 (ITU 16-23), 5 for Band 5 (ITU 52-59)
- x= wavelength plan: 2 for Band 2 (ITU 25-32), 3 for Band 3 (ITU 34-41)
- y = WAN-side connectors: 1 for SC/APC, 2 for LC/PC, and 3 for SC/UPC.
- xx = ITU Grid channels: Standard ITU Grid channels 16 – 59, except 24, 33, 42, and 51.
- yy= WAN-side connectors (01 = SC/APC, 02 = LC/PC, and 03 = SC/UPC).
- XFPs not included. Contact your C-COR sales professional or C-COR Customer Service for XFP ordering information.
- xx = 00, no option.
- y = controller type (1 = main controller w/AC power; 3 = secondary controller w/AC power). z = WAN-side connectors (1 = SC/APC, 2 = LC/PC, and 3 = SC/UPC).
- SFPs not included. Contact your C-COR sales professional or C-COR Customer Service for SFP ordering information.
- x= connector style: 1 for SC/APC, 2 for LC/PC, 3 for SC/APC (LC/PC preferred)

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