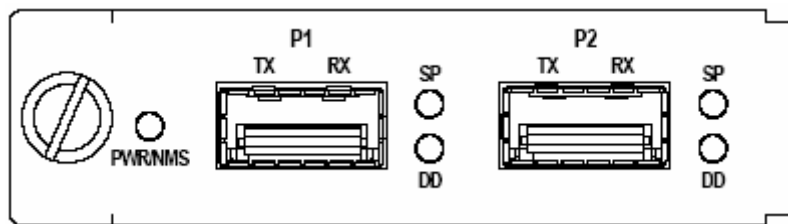




EM316-2XFP

XFP-to-XFP Transparent Converter

User Guide



March 2007

Table of Contents

1 Preliminary Considerations	iv
1.1 Trademarks.....	iv
1.2 Copyright	iv
1.3 Customer Support.....	iv
1.4 MRV Regulatory Compliance	v
1.5 General Safety.....	vi
1.5.1 Cautions and Warnings	vi
1.5.2 Laser Safety.....	vi
1.5.3 Static Electricity	vii
1.5.4 Workplace Preparation	vii
1.6 Specific Document Information.....	viii
1.7 Latest Revision and Related Documents.....	viii
1.8 EM316NM and EM316NM-5 References	viii
2 Product Overview	1
2.1 Management Features.....	1
2.1.1 LIN	1
2.1.2 Loopback	1
3 Preparation and Installation	2
3.1 Unpacking the Fiber Driver Module	2
3.2 Front Panel Description	3
3.3 Hardware Configuration.....	4
3.4 Module Installation.....	5
3.5 Small Form Pluggables (SFP/XFP): Handling and Installation.....	7
3.5.1 Cleaning Fibers.....	7
3.6 Working with XFPs	8
3.6.2 Bale Clasp XFP Module.....	9
4 Network Management	10
4.1 EM316NM[-5] Command Line Interface (CLI)	11
4.2 EM316LNxNM-OT Command Line Interface (CLI)	14
4.2.1 Interface Setup	14
4.2.2 Session Login	15
4.2.3 Show Commands	17
4.2.4 Slot-Level Command Session	18
4.2.5 Port-Level Command Session	22
5 Appendix	27
5.1 Technical Specifications	27
5.2 Supported Data Rates	28
5.3 Firmware Download.....	29
5.4 Troubleshooting.....	29

Table of Figures

Figure 1 -- Unpacking	2
Figure 2 -- EM316-2XFP Front Panel	3
Figure 3 -- LED Legend	3
Figure 4. -- DIP switch settings: SW1 and SW2.....	4
Figure 5 -- Remove the required blank panels	5
Figure 6 -- Module installation (not all chassis are shown).....	6
Figure 7 -- Correctly inserted Fiber Driver module in a powered chassis.....	6
Figure 8 -- Cleaning cartridge	7
Figure 9 -- Contaminated fiber and clean fiber	7
Figure 10 -- XFP cleaners.....	8
Figure 11 -- Bale Clasp Module	9
Figure 12 -- Insertion of a Bale Clasp XFP Module	9
Figure 13 -- Removal of a Bale Clasp XFP Module.....	9
Figure 14 -- EM316NM[-5] CLI commands for EM316-2XFP management	11
Figure 15 -- EM316LNxNM-OT commands for the EM316-2XFP.....	14
Figure 16 -- Technical specifications	27
Figure 17 -- Supported data rates and protocols	28

1 Preliminary Considerations

1.1 Trademarks

All trademarks are the property of their respective holders.

1.2 Copyright

MRV Communications reserves the right to make changes to products and documentation without notice in order to improve reliability, function, or design. The user assumes sole responsibility for applying the information supplied herein.

Copyright © 2007 by MRV Communications. All rights reserved.

1.3 Customer Support

Before contacting customer support, look for software updates, technical specifications, and frequently asked questions (FAQ) online at the MRV support website:

<http://service.mrv.com>.

The website includes information regarding software updates, technical specifications, and frequently asked questions (FAQ) as well as contact information.

Contact help online by sending email to support@mrv.com or through the website request link at <http://service.mrv.com/support/forms/supportcall.cfm>

For direct MRV customer support by telephone, call your local sales representative, system engineer, or one of the following numbers.

MRV Americas (US, Canada, and Latin America)	+1-800-435-7997
	+1-978-952-4888
MRV Europe	+49-6105-2070
MRV International	+972-4-993-6200

Include the following important information when opening a support case.

- Site ID or company name
- Contact information
- Model or product name
- Serial number
- Top assembly revision (see label on board)
- Brief problem or question including a description of the host network environment
- Attenuation data for applicable high-speed fiber links
- Urgency of the issue

1.4 MRV Regulatory Compliance

Contact your sales representative for more regulatory compliance information regarding specific MRV products or product families.

Fiber Driver Chassis

FCC Part 15 (Class A); IC (Class A); EMC Directive: Emission (Class A) and Immunity; LVD Directive: Electrical Safety; CE Marking; TUV CUE Mark (Canada, USA, EU); GOST; RoHS Directive, WEEE Directive: Wheelie Bin Mark; ETSI, NEBS, C-Tick

Fiber Driver Modules

FCC Part 15 (Class A); IC (Class A); EMC Directive: Emission (Class A) and Immunity; LVD Directive: Electrical Safety; RoHS Directive, WEEE Directive: Wheelie Bin Mark; ETSI

Optical and Copper Transceivers

FCC Part 15 (Class A); IC (Class A); EMC Directive: Emission (Class A) and Immunity; LVD Directive: Electrical Safety; CE Marking; TUV; UL, CSA, RoHS Directive, ETSI, NEBS, compliant with EN 60825-1/A1:2002 Safety of Laser Products

China RoHS Disclosure 中国 RoHS 声明

Component Name 部件名称	Pollution Control Logo 污染控制标志	Hazardous Substance Name 有毒有害物质或元素					
		Lead 铅 (Pb)	Mercury 汞 (Hg)	Cadmium 镉 (Cd)	Hexavalent Chromium 六价铬 Cr (VI)	Polybrominated Biphenyls 多溴联苯 (PBB)	Polybrominated Diphenyl Ethers 多溴二苯醚 (PBDE)
Fiber Driver Chassis, Modules and Accessories 光纤驱动器机架, 组件和附件		X	O	O	O	O	O
Pluggable Optics 插入式光学器件		X	O	O	O	O	O
Power Supplies 电源		X	O	O	O	O	O

O: Indicates that this hazardous substance contained in all of the homogeneous materials for this component is below the limit requirement in SJ/T11363-2006.
 O: 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。
 X: Indicates that this hazardous substance contained in at least one of the homogeneous materials used in this component is above the limit in SJ/T11363-2006. Contain lead in solder.
 X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求, 焊锡中含铅。

Table of Hazardous Substances Name and Concentration 有毒有害物质名称及含量的标识格式

1.5 General Safety

1.5.1 Cautions and Warnings

Disconnect all power from electronic devices before servicing. Some equipment may have multiple power cords requiring disconnection.

1.5.2 Laser Safety



WARNING: Fiber optic equipment may emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a laser light source.



CAUTION: Do not install or terminate fibers when a laser may be active.

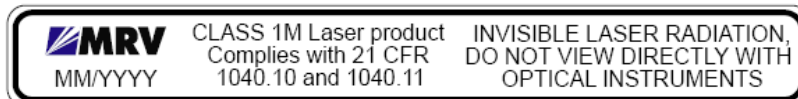


WARNING: Never look directly into a live optical fiber. Always wear appropriate laser safety glasses when working with open fiber cables that might be connected to an operational laser transmitter. Direct open fibers ends away from faces.



CAUTION: Use of controls or adjustments or performing procedures other than those specified herein may result in hazardous radiation exposure.

If a fiber optic laser device output is recognized as a higher than Class 1 product (Class 1M, for example), the device is evaluated, labeled, and certified by TUV. Class 1 and 1M outputs are not considered hazardous, but laser safety practices should always be observed.



A fiber optic transceiver emits either single-mode or multi-mode light into a fiber optic strand. Take the following precautions when handling optical fibers.

- Wear safety glasses when you install optical fibers.
- Be aware of the risk of laser radiation exposure.
- Because transmitted light is invisible to the human eye, always assume that a fiber optic transceiver is on and operational.
- Never look directly into a beam (T_x part of a transmitter) or open fiber ends. The invisible light can damage your eyes.
- Place optical fibers in a safe location during installation.
- Protect optical fiber connectors with clean dust caps for safety and cleanliness.
- Follow the manufacturer instructions when using optical test equipment.

1.5.3 Static Electricity

Eliminate static electricity in the workplace by grounding operators, equipment, and devices including components and computer boards. Grounding prevents static charge buildup and electrostatic potential differences. Transporting products in special electrostatic shielding packages reduces electrical field damage potential.

1.5.4 Workplace Preparation

A safe and effective workplace provides the following items.

- ESD protective clothing/smocks: Street clothing must not come in contact with components or computer boards since the various materials in clothing can generate high static charges. ESD protective smocks, manufactured with conductive fibers, are recommended.
- Electrostatic shielding containers or totes: These containers (bags, boxes, etc.) are made of specially formulated materials, which protect sensitive devices during transport and storage.
- Antistatic or dissipative carriers: These provide ESD protection during component movement in the manufacturing process. It must be noted that antistatic materials alone will not provide complete protection. They must be used in conjunction with other methods such as totes or electrostatic shielding bags.
- Dissipative tablemat: The mat should provide a controlled discharge of static voltages and must be grounded. The surface resistance is designed such that sliding a computer board or component across its surface will not generate more than 100 V.
- Operator grounding: Keep a wrist strap or ESD cuff in constant contact with bare skin with a cable for attaching it to the ESD ground. The wrist strap drains off the static charge of the operator. The wrist strap cord has a current-limiting resistor for personnel safety. Wrist straps must be tested frequently to ensure that they are undamaged and operating correctly. Use special grounding heel straps or shoes when a wrist strap is impractical. These items are effective only when used in conjunction with a dissipative floor.
- ESD protective floor or mat: The mat must be grounded through a current-limiting resistor. The floor or mat dissipates the static charge of personnel approaching the workbench. Special conductive tile or floor treatment can be used when mats are not practical or cause a safety hazard. Chairs should be conductive or grounded to the floor with a drag chain.

1.6 Specific Document Information

Document Number: P/N 1279003-001 Rev B1
Document: EM316-2XFP User Guide
Release Date: March 2007

1.7 Latest Revision and Related Documents

The latest revision of MRV documents may be found online at <http://www.mrv.com>.

Release Notes for Fiber Driver modules are produced as required.

MegaVision Pro® User Guide: Describes management of Fiber Driver modules and other MRV Communications SNMP manageable products using MRV Communication's MegaVision Pro Network Management System.

EM316NM[-5] Network Management: Fiber Driver network management module software guide.

EM316LNxNM-OT User Guide: Linux-based Fiber Driver network management module.

1.8 EM316NM and EM316NM-5 References

The latest EM316NM network management module revision is designated as the EM316NM-5. This document refers to these names together as EM316NM[-5], but examples refer to the EM316NM-5 model.

This name change indicates a significant product design change. Some commands may be affected. Refer to the corresponding documentation revision for information about your specific modules. There are known compatibility issues between versions when used with AH modules. If necessary, refer to AH circuit upgrade and downgrade documentation to change firmware revision levels for your application.

2 Product Overview

The EM316-2XFP transparent converter contains two MSA-compliant XFP sockets connected back-to-back. No components on the module are connected to the data path, so the module is considered transparent. The converter supports speed ratings around 10 Gigabits per second with speed-matching or multi-rate XFPs required in both ports. This EM316-2XFP converter is hot-pluggable, and it is managed through the Fiber Driver management bus from a network management module (NM) installed in the same chassis.

The XFP sockets support a wide range of XFP units available from MRV to address any network situation.

- Single-mode
- Multi-mode
- Multi-rate
- Single fiber bi-directional
- Coarse and Dense Wave Division Multiplexing (CWDM and DWDM)

2.1 Management Features

2.1.1 LIN

Link Integrity Notification (LIN) notifies connected equipment and network management systems where applicable, if the EM316-2XFP module detects a loss of receive signal link integrity on one of its XFP ports. The loss of receive signal may be caused by a cable break, disconnection, remote power loss, or a variety of other events. With LIN enabled on a module, the loss of receive signal is propagated downstream to the remote end, notifying the remote device of a fault in the circuit. This communication ensures that connected equipment is notified of a link fault. The connected device, such as a switch or router, can then activate preconfigured, link-state dependent redundancy mechanisms, and properly react to link conditions. This feature is extremely important in fault-tolerant network designs.

LIN works in unmanaged and managed modes, and it applies globally to the module rather than to individual ports. Enable LIN on the module to allow remote control of this feature through network management.

LIN is not supported in a mixed copper and fiber environment.

Refer to appendix sections or online documents for further details regarding LIN.

2.1.2 Loopback

Loopback mode is not supported on the EM316-2XFP module with the EM316NM[-5]. Avoid setting this mode either with DIP switches or through network management.

The EM316LNXNM-OT management module supports EM316-2XFP loopback when both installed XFPs also support loopback. Check XFP documentation for loopback support information.

3 Preparation and Installation

3.1 Unpacking the Fiber Driver Module

Follow these steps with reference to the figure below.

Step 1. Open the cardboard box

Step 2. Remove the static bag containing the device.

Step 3. Check for additional accessories in the box that may move beneath the module tray during transit.

In the unlikely event that any package content is missing, contact an authorized MRV dealer or representative. If it becomes necessary to return the shipment, repackage the unit in its original box.

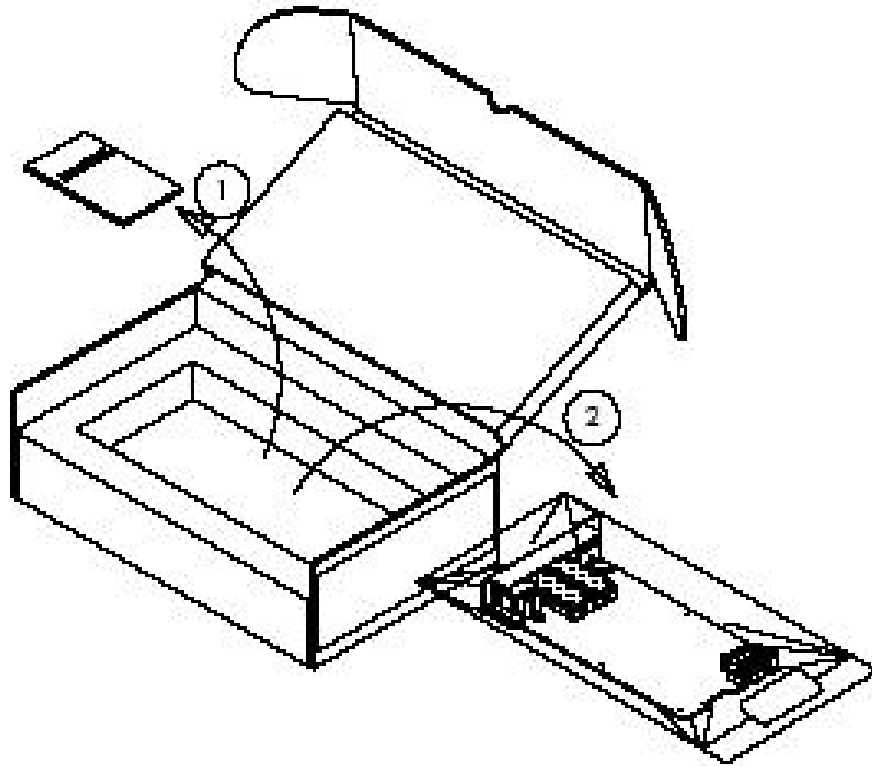


Figure 1 -- Unpacking

3.2 Front Panel Description

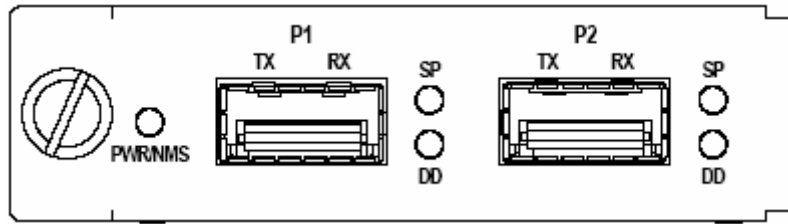


Figure 2 -- EM316-2XFP Front Panel

The EM316-2XFP module is equipped with two XFP interface ports (P1 and P2). XFP transceivers are rated at 10 Gigabits per second.

Cable Lengths

The maximum cable length for XFP links is dependent upon the optical characteristics of the XFP transceivers, but independent from the EM316-2XFP module.

LED Definitions

- PWR/NMS:** Indicates power and management support
- SP(each port):** Indicates an inserted XFP with a link signal detected
- DD(each port):** indicates Digital Diagnostic status for the inserted XFP

LED	Color	Explanation
PWR/NMS	Off	No power to unit
	Green	Power OK; user wire port active
SP	Off	No XFP Present
	Green	Signal/Link present
	Amber	XFP inserted, no link/signal present
DD	Off	Digital Diagnostics not supported
	Green	No alarm
	Amber	Alarm

Figure 3 -- LED Legend

3.3 Hardware Configuration

The EM316-2XFP factory default configuration is designed to operate in the most common applications. In most cases, no switch settings require changes. The default DIP switch settings are marked in the following figure with “*”.

DIP Switch Settings for Switch Block S1			
DIP Switch Number	DIP Switch Name	Setting	Description
1	S1/1	On	Not supported
	P1 Loopback	Off*	Not supported
2	S1/2	On	Not supported
	P2 Loopback	Off*	Not supported
3	S1/3	On	Not supported
		Off*	Not supported
4	S1/4	On	Not supported
		Off*	Not supported

DIP Switch Settings for Switch Block S2			
DIP Switch Number	DIP Switch Name	Setting	Description
1	S2/1	On	DISABLE network management
		Off*	ENABLE network management
2	S2/2	On*	ENABLE LIN
		Off	DISABLE LIN
3	S2/3	On	Not supported
		Off*	Not supported
4	S2/4	On	Not supported
		Off*	Not supported

Figure 4. – DIP switch settings: SW1 and SW2

By default, network management and LIN are both enabled. This configuration optimizes the EM316-2XFP module for most applications. If changes are necessary for a specific application, use the Fiber Driver® Network Management Module CLI after installation. Network management configuration overrides hardware DIP switches except for the network management setting itself. This switch must be set to ENABLE to allow remote access to the LIN setting and other management features discussed later in the CLI section.

MRV Communications does not recommend or support Loopback on either port for the EM316-2XFP module. EM316-2XFP operation is unpredictable with loopback enabled through the DIP switches or through Network Management. Do not enable Loopback.

DIP switches S1/1, S1/2, S1/3, S1/4, S2/3, and S2/4 features are not supported. These switches must always remain in the default (OFF) position. Do not operate the module with different settings for these switches.

3.4 Module Installation

EM316xx cards are hot-swappable in a powered Fiber Driver chassis. Install the EM316xx module by aligning the edge of the card with the rail of the chassis slot. Hand-tighten the thumb screw. Do not over-tighten.

The thumb screw points to the left in the BU-1, BU-2, BU-3, and BU-4 chassis. The thumb screw points to the bottom in the BU-16 chassis.

Tools

- 6-inch Phillips screwdriver (for some module screws)
- 6-inch flat-tip screwdriver

Procedure

Follow all guidelines to eliminate static electricity while handling the module and other electronic devices. Refer to the front of this manual for some suggestions.

Step 1. Remove the blank panel or old module from the target chassis slot. Unfasten the mounting screws with a 6-inch Phillips screwdriver, or disengage thumb screws by hand.

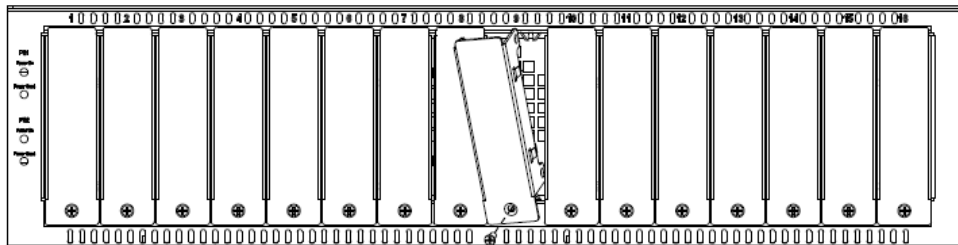


Figure 5 -- Remove the required blank panels

To comply with FCC regulations, a cover panel or a module must cover every chassis slot. No chassis slot should remain open when the unit is operational to limit external signal radiation. Securing modules and panels with appropriate screws is also important for grounding and compliance.

Step 2. Install the module inside a Fiber Driver chassis by aligning the edge of the card with the rail of the chassis. Tighten the thumbscrew by hand.

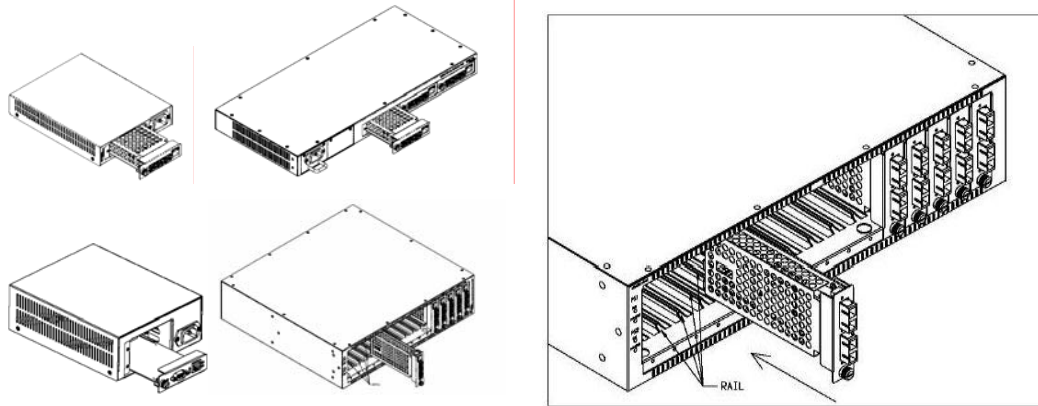


Figure 6 -- Module installation (not all chassis are shown)

Handle the module by the edges to avoid damaging any components. Follow all ESD precautions listed at the front of this manual. Use your thumb to push the module securely into the chassis. Do not use excessive force, but make sure the module connector is fully inserted in the chassis. Secure the module by hand using the thumbscrew.

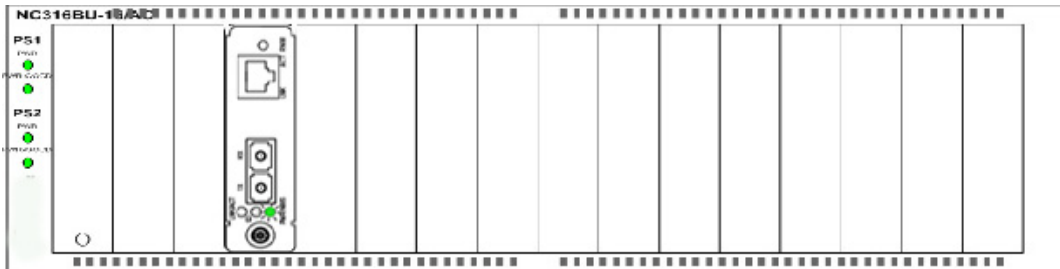


Figure 7 -- Correctly inserted Fiber Driver module in a powered chassis

3.5 Small Form Pluggables (SFP/XFP): Handling and Installation

The EM316-2XFP accepts any XFP unit that complies with the MSA standard. Follow all ESD precautions listed at the front of this manual.

3.5.1 Cleaning Fibers

Fiber optic components and cables are very sensitive to dirt, dust and mishandling, especially in high-speed networks. Dirty or mistreated fiber may cause errors and an unwanted degradation of signal quality.

Prior to an installation the fiber and fiber optic transceivers should be cleaned following the procedure below.

3.5.1.1 Cleaning Supplies

Optical cleaner cartridge

Can of compressed air



Figure 8 -- Cleaning cartridge

3.5.1.2 Cleaning Procedure:

1. Blow a stream of compressed air on the fiber ends while the caps are in place.
2. Remove the caps, and blow the ends of the fibers again.
3. Clean the ends of the fibers using the cleaner cartridge; follow the instructions included with the cartridge.

3.5.1.3 Fiber Examples

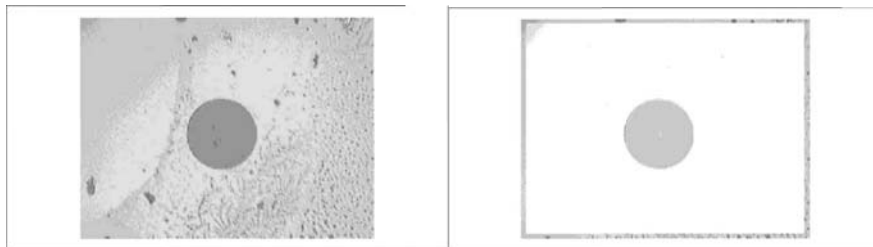


Figure 9 -- Contaminated fiber and clean fiber

3.6 Working with XFPs

The pluggable optics modules used in the EM316xx products are very portable, and may be easily mistreated. SFPs and XFPs should be protected against dust and cleaned when dirty. Remove the dust caps and clean them with 1.25 millimeter cleaners.



Figure 10 -- XFP cleaners

3.6.1.1 Cleaning XFPs

(1) Requirements

Dirty module
1.25 mm cleaners

(2) Procedure

- Insert the 1.25mm cleaner into the XFP
- Turn $\frac{1}{4}$ turn
- Remove the 1.25mm cleaner and discard
- Repeat the process

Do not stretch optical fibers or bend them too tightly. Install optical cables with as little fiber stress as possible.

3.6.2 Bale Clasp XFP Module

The bale clasp XFP module has a bale clasp that secures the module into a switching module port.

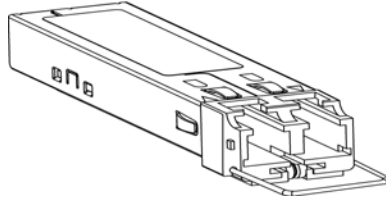


Figure 11 -- Bale Clasp Module

(3) Inserting a Bale Clasp SFP/XFP Module into a Switching Module Port

Step 1 Close the bale clasp upward before inserting the XFP module.

Step 2 Line up the XFP module with the port, and slide it into the port.

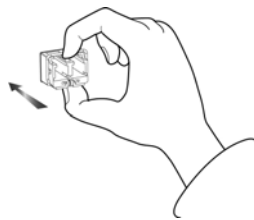


Figure 12 -- Insertion of a Bale Clasp XFP Module

(4) Removing a Bale Clasp XFP Module

Step 1 Open the bale clasp on the XFP module. Press the clasp downward with your index finger, as shown below. Use a flat-blade screwdriver to open the bale clasp, as shown below, if the bale clasp is difficult to reach.

Step 2 Grasp the XFP module between your thumb and index finger to carefully remove it from the switching module port as shown.

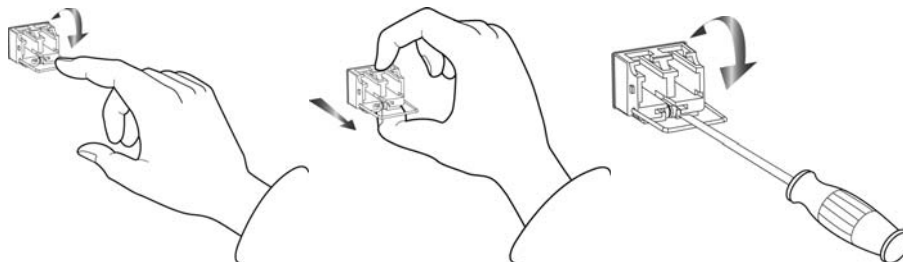


Figure 13 -- Removal of a Bale Clasp XFP Module

4 Network Management

The EM316-2XFP may be managed by a Fiber Driver network management module. Although the factory settings are appropriate for most installations, network management through either the EM316NM[-5] or the EM316LNxNM-OT managers is highly recommended. Network environments are unpredictable, and Fiber Driver network management is a critical tool for proactive administration as well as reduced operating expenses.

Either module provides a command line interface (CLI), accessible either through a local serial port or from the IP network using a terminal emulation environment. Some CLI commands specific to the EM316-2XFP in each manager environment are discussed in this section. Refer to the respective manager documentation for further details regarding each management module.

The network management modules also provide Simple Network Management Protocol (SNMP) support to allow control through any industry standard network management system (NMS). To maximize the graphical remote management control of Fiber Driver modules, MRV offers MegaVision® Pro. It is a unique and full-featured NMS with graphical user interfaces (GUI) for all managed MRV network components including Fiber Driver. A limited version of MegaVision called “Configurator” is available for trial through the MRV website (<http://www.mrv.com>). Refer to MegaVision Pro documentation for more information on the benefits offered with the product.

4.1 EM316NM[-5] Command Line Interface (CLI)

Command Line Interface (CLI) commands are used to manage the EM316-2XFP module through Network Management interfaces. A set of relevant commands is given here with a description of their function and syntax. A Fiber Driver® Network Management Module (EM316NM[-5]) must be installed in the chassis containing the EM316-2XFP to enable this module management access. For more complete details on the EM316NM[-5], consult the related manuals or contact your local MRV representative.

RS-232 Serial Port Parameters	<ul style="list-style-type: none"> • 9600 baud • 8 data bits • 1 stop bit • no parity • no flow control
--	--

An abbreviated list of CLI commands appears below.

EM316 Commands	
get-chassis-info	Display chassis information
Slot (Module) Commands	
get-module-info	Display module information
init-module	Initialize specified module to Defaults
reset-module	Reset specified module to Saved settings
Port Commands	
get-port-info	Display port information
get-port-name	Show current port name
set-port-name	Change the port name
clear-port-name	Clear the port name
SFP (or XFP) Port Commands	
get-port-dd	Get port optics digital diagnostics information
get-sfp-poll	Display SFP/XFP polling interval
set-sfp-poll	Set SFP/XFP polling interval
Console Commands	
banner	Display banner

Figure 14 -- EM316NM[-5] CLI commands for EM316-2XFP management

EM316 Commands

get-chassis-info arg1	Display chassis information
[arg1] chassis number {1}	

Slot (Module) Commands

get-module-info arg1 arg2	Display module information
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16}	
init-module arg1 arg2	Initialize specified module to defaults
[arg1] chassis number {1} [arg2] slot number {1-16}	
reset-module arg1 arg2	Reset specified module to saved settings
[arg1] chassis number {1} [arg2] slot number {1-16}	

Port Commands

get-port-info arg1 arg2 arg3	Display port information
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16} [arg3] port number	
get-port-name arg1 arg2 arg3	Show current port name
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16} [arg3] port number	
set-port-name arg1 arg2 arg3 arg4	Change the port name
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16} [arg3] port number [arg4] port name	
clear-port-name arg1 arg2 arg3	Clear the port name
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16} [arg3] port number	

SFP (or XFP) Port Commands

get-port-dd arg1 arg2 arg3 arg4	Get the port optics digital diagnostic information
[arg1] chassis number (physical or virtual) {1-3} [arg2] slot number {1-16} [arg3] port number [arg4] optional: type <now> to fetch info in real-time	
get-sfp-poll	Display SFP/XFP polling interval
set-sfp-poll arg1	Set SFP/XFP polling interval
[arg1] interval [sec]	

Console Commands

banner	Display banner

4.2 EM316LNXNM-OT Command Line Interface (CLI)

The Linux-based Fiber Driver network manager provides Fiber Driver system management for its host chassis. Some commands applicable to the EM316-2XFP module are illustrated in this section in sample session output after the login exchange. The figure below lists the partial set of commands addressed in this document. Refer to EM316LNXNM-OT documents for more detail.

- | | |
|---|---|
| <ul style="list-style-type: none">• show• show version• show slots• show x.x• ?• list• lin / no lin | <ul style="list-style-type: none">• show digital-diagnostics• show config• show defaults• description <name>• shutdown / no shutdown• loopback / no loopback |
|---|---|

Figure 15 -- EM316LNXNM-OT commands for the EM316-2XFP

Some of these commands apply to both slot-level and port-level contexts or 'nodes'. Refer to EM316LNXNM-OT documentation for more complete discussion of the Linux-based interface and available commands.

4.2.1 Interface Setup

After the EM316LNXNM-OT management module is installed, power up the chassis and attach the serial cable (RS-232) to the PC.

- Adapter (part number 350-0308 REV-B MRG/20028-2)
- Cable (part number 151-3028 REV-F AI 04/04)

The device has at least one Ethernet port, which is typically used to connect to a Local Area Network (LAN). The factory default IP address is 192.168.14.201 with netmask 255.255.255.0, sometimes written as 192.168.14.201/24. The XFP ports may also connect to the network, depending on the transceivers installed. From the network, connect to the EM316LNXNM-OT command line interface (CLI) using SSH (secure shell) to an available module IP address. Telnet services are disabled by default, but they may be enabled for additional CLI access.

The device has an RS-232 interface that is used for serial communications to the CLI. This connection is recommended for setup, and it offers the advantage of "out-of-band" management for greater network autonomy.

Configure the serial parameters with the following RS-232 parameters.

- • 38400 baud
- • 8 data bits
- • 1 stop bit
- • no parity
- • no flow control

4.2.2 Session Login

Connect to the CLI using the local serial port or from the network using SSH or Telnet. By default, SSH is enabled and Telnet is disabled for optimal security.

A login prompt appears in the CLI terminal window. Sign into the CLI as shown below. The EM316LNXM-OT factory configuration includes a super user with username admin and password admin.

```
login as: admin

MRV EM316LNXM

Using keyboard-interactive authentication.
Password:
Last login: Sat Jan  1 21:47:11 2005 from 192.168.12.128

Please wait, initializing...now ready.
EM316LNXM v4.0 fdr 49 (Dec 13 2006 - 11:47:29).
U-Boot 1.0.1 (Jan 25 2005 - 11:08:25).
Linux kernel v2.4.26 (#1 Wed Dec 13 10:36:44 PST 2006).
EM316LNXM (firmware 5c.13) (00:20:1a:02:48:28).
MegaVisionJ v2.32k5 - August 24, 2006
Copyright (c) MRV Corp. 1993-2007
You are a SUPER user!
fiberdriver#
```

The example above shows a login as SUPER user.

Type the following command to enter "configuration" mode.

```
fiberdriver# configure terminal
```

Note that each command is completed with the <CR> or <Enter> key, which is not printable.

Once the mode is changed, the prompt also changes. Change the SUPER user password using the "username" command.

```
fiberdriver(config)# username admin password <new password>
```

Set the IP configuration using the "ip" command group. Set IP address and IP mask information using the following command.

```
fiberdriver(config)# ip interface 169.254.88.200/16
```

The IP address (169.254.88.200) and the netmask (16) are examples only. Use the IP address and netmask appropriate for the EM316LNXM-OT on your network. Classless Inter-Domain Routing (CIDR) notation is used to specify the address (169.254.88.200) and mask (16) corresponding to 255.255.0.0.

Set specific gateway information using the following command:

```
fiberdriver(config)# ip default gateway 169.254.88.1
```

The IP information configured does not load until restarting the system or using the command:

```
ip interface update
```

Use the following command to save the configuration into permanent (non-volatile) storage:

```
fiberdriver(config)# write file  
fiberdriver(config)# exit
```

The system does not automatically save configurations to permanent storage. Use the `write file` command to save a configuration before restarting the system. Now the IP configuration is complete. The default SNMP community names are "public" for read and "private" for write.

Use the `description` command to change names of the chassis, slot, and port. Use the `show` command to verify the change. Chassis names are limited to nine characters.

4.2.3 Show Commands

4.2.3.1 Show Version

```
fiberdriver#
fiberdriver# show version
EM316LNXXNM v4.0 fdr 49 (Dec 13 2006 - 11:47:29).
U-Boot 1.0.1 (Jan 25 2005 - 11:08:25).
Linux kernel v2.4.26 (#1 Wed Dec 13 10:36:44 PST 2006).
EM316LNXXNM (firmware 5c.13) (00:20:1a:02:48:28).
MegaVisionJ v2.32k5 - August 24, 2006
Copyright (c) MRV Corp. 1993-2007
fiberdriver#
```

4.2.3.2 Show Slots

```
fiberdriver#
fiberdriver# show slots
Slot  Model                Name                               Serial Number
====  =====                =====                               =====
1.1   EM316-2XFP              EM316-2XFP at 1.1                 N/A
1.3   EM316LNXXNM-OT         EM316LNXXNM-OT at 1.3            00:20:1a:02:48:28

fiberdriver#
```

4.2.3.3 Show a Port

```
fiberdriver#
fiberdriver# show 1.1
      Slot: 1.1
      Model: EM316-2XFP
      Name: EM316-2XFP at 1.1
Hardware Revision: 1

Sw Configurable: yes  Operation Type: converter

Number Of Ports: 2
Port  Enable  Link                LIN    DDiags  WL(nm)  Name
=====
1.1.1 enable  signal Detect      enable  Ok       850     XFP-port1
1.1.2 enable  signal Detect      enable  Ok       850     XFP-port2

fiberdriver#
fiberdriver#
```

4.2.4 Slot-Level Command Session

4.2.4.1 Change to Slot Context

```
fiberdriver# configure terminal
fiberdriver(config)#
fiberdriver(config)# slot 1.1
fiberdriver(slot/1.1)#
```

4.2.4.2 Slot Command Lists

Command list (type '?' at the prompt)

```
fiberdriver(slot/1.1)#
clear-type    Clear Type, if locking types
default       Restore parameter(s) to defaults
description   Set slot name
echo          Display text for scripting
end           End current mode and down to previous mode
exit          Exit current mode and down to previous mode
list          Print command list
logout        Logout of the system
next          Configure next element
no            Negate a command
pager         Pause scrolling when screen is full
port          Configure a port
previous      Configure previous element
quit          Exit current mode and down to previous mode
show          Show basic info
sleep         Pause CLI for scripting
slot          Configure a slot
up            Configure parent element
who           Find out who is connected to the system
whoami        Who am I?
write         Write running configuration to memory or terminal
fiberdriver(slot/1.1)#
```

```
fiberdriver(slot/1.1)# list
clear-type
default all
default description
default me
description .LINE
echo
echo .LINE
end
exit
list
logout
next
no description
no pager
pager
port (PORT-NUM|PORT)
previous
quit
show
show config
show defaults
show digital-diagnostics
show running-config
show statistics
sleep <0-10>
slot SLOT
up
who
who am i
whoami
write file
write terminal
fiberdriver(slot/1.1)#
```

4.2.4.3 Slot Show Commands

```
fiberdriver(slot/1.1)# show
      Slot: 1.1
      Model: EM316-2XFP
      Name: EM316-2XFP at 1.1
Hardware Revision: 1
```

```
Sw Configurable: yes  Operation Type: converter
```

```
Number Of Ports: 2
```

Port	Enable	Link	LIN	DDiags	WL(nm)	Name
1.1.1	enable	signal Detect	enable	Ok	850	XFP-port1
1.1.2	enable	signal Detect	enable	Ok	850	XFP-port2

```
fiberdriver(slot/1.1)#
```

```
fiberdriver(slot/1.1)# show digital-diagnostics
```

Port	DDiags	Temp(C)	Supply(V)	TxPower(dBm)	RxPower(dBm)	BiasCurrent(mA)
1.1.1	Ok	46	3.272	-5.066	-6.055	4.852
1.1.2	Ok	47	3.272	-6.053	-5.394	5.18

```
fiberdriver(slot/1.1)#
```

```
fiberdriver(slot/1.1)# show config
```

```
slot 1.1
! Configured parameters that override defaults:
! Configured parameters that match defaults:
! Parameters that will follow defaults:
! description EM316-2XFP at 1.1
fiberdriver(slot/1.1)#
```

```
fiberdriver(slot/1.1)# show defaults
```

```
slot 1.1
! description EM316-2XFP at 1.1
fiberdriver(slot/1.1)#
```

4.2.4.4 Slot Description

```
fiberdriver(slot/1.1)# description myslot1.1
fiberdriver(slot/1.1)# show
    Slot: 1.1
    Model: EM316-2XFP
    Name: myslot1.1
Hardware Revision: 1
```

Sw Configurable: yes Operation Type: converter

Number Of Ports: 2

Port	Enable	Link	LIN	DDiags	WL(nm)	Name
1.1.1	enable	signal Detect	enable	Ok	850	XFP-port1
1.1.2	enable	signal Detect	enable	Ok	850	XFP-port2

```
fiberdriver(slot/1.1)#
```

4.2.5 Port-Level Command Session

4.2.5.1 Change to Port Context

```
fiberdriver(slot/1.1)# port 1.1.1
fiberdriver(port/1.1.1)#
```

4.2.5.2 Port Command Lists

```
# Command list (type '?' at the prompt)

fiberdriver(port/1.1.1)#
  default      Restore parameter(s) to defaults
  description  Set port name
  echo         Display text for scripting
  end          End current mode and down to previous mode
  exit         Exit current mode and down to previous mode
  lin          Enable LIN
  list         Print command list
  logout       Logout of the system
  loopback     Enable Loopback
  next         Configure next element
  no           Negate a command
  pager        Pause scrolling when screen is full
  port         Configure a port
  previous     Configure previous element
  quit         Exit current mode and down to previous mode
  rm-chassis   Set remote chassis connectivity information
  rm-port      Set remote port connectivity information
  rm-slot      Set remote slot connectivity information
  show         Show basic info
  shutdown     Disable the port
  sleep        Pause CLI for scripting
  up           Configure parent element
  who          Find out who is connected to the system
  whoami       Who am I?
  write        Write running configuration to memory or terminal
fiberdriver(port/1.1.1)#
```

```
fiberdriver(port/1.1.1)# list
default all
default description
default lin
default loopback
default me
default rm-chassis
default rm-port
default rm-slot
default shutdown
description .LINE
echo
echo .LINE
end
exit
lin
list
logout
loopback
next
no description
no lin
no loopback
no pager
no shutdown
pager
port PORT
previous
quit
rm-chassis <0-4294967294>
rm-port <0-4294967294>
rm-slot <0-4294967294>
show
show config
show defaults
show digital-diagnostics
show running-config
show statistics
shutdown
sleep <0-10>
up
who
who am i
whoami
write file
write terminal
fiberdriver(port/1.1.1)#
fiberdriver(port/1.1.1)#
```

4.2.5.3 Port Show Commands

```
fiberdriver(port/1.1.1)# show
  Port: 1.1.1
  Name: XFP at 1.1.1
Part #/Rev: XFP-10GD-LR/00
  Protocol: Transparent

Enable: enable          LIN: enable
  Link: signal Detect   Nom. BR: 2100

  Loopback: off
Serial Number: P6K21R5
  Vendor Info: MRV COMM. INC.

Connector: fo LC Medium: multi Mode
Wavelength(nm): 850
  TxPower(dBm): -5.066  RxPower(dBm): -6.042  BiasCurrent(mA): 5.008
  DDiags: Ok           Temp(C): 46           Supply(V): 3.272

fiberdriver(port/1.1.1)#
```

```
fiberdriver(port/1.1.1)# show config
port 1.1.1
! Configured parameters that override defaults:
! Configured parameters that match defaults:
! Parameters that will follow defaults:
! no loopback
! no shutdown
! lin
! description XFP at 1.1.1
! rm-chassis 0
! rm-slot 0
! rm-port 0
fiberdriver(port/1.1.1)#
```

```
fiberdriver(port/1.1.1)# show defaults
port 1.1.1
! no loopback
! no shutdown
! lin
! description XFP at 1.1.1
! rm-chassis 0
! rm-slot 0
! rm-port 0
fiberdriver(port/1.1.1)#
```

4.2.5.4 Port Description

```
fiberdriver(port/1.1.1)# description xfp-port1
fiberdriver(port/1.1.1)# show
  Port: 1.1.1
  Name: xfp-port1
Part #/Rev: XFP-10GD-LR/00
  Protocol: Transparent

Enable: enable          LIN: enable
Link: signal Detect
      Nom. BR: 2100

  Loopback: off
Serial Number: P6K21R5
  Vendor Info: MRV COMM. INC.

Connector: fo LC Medium: multi Mode
Wavelength(nm): 850
  TxPower(dBm): -5.066  RxPower(dBm): -6.044  BiasCurrent(mA): 4.716
  DDiags: Ok          Temp(C): 46          Supply(V): 3.271

fiberdriver(port/1.1.1)#
```

4.2.5.5 Shutdown

```
fiberdriver(port/1.1.1)#
fiberdriver(port/1.1.1)# shutdown
fiberdriver(port/1.1.1)# fdrd[60]|TRAP|    err|22:40:06 2005 Port 1.1.1 Amps Too Low, 0.160 Chassis
Name: NC316BU-16 Slot Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|    err|22:40:06 2005 Port 1.1.1 Tx Power Too Low, -26.085 Chassis Name: NC316BU-16 Slot
Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|    err|22:40:06 2005 Port 1.1.1 Rx Power Too Low, -28.860 Chassis Name: NC316BU-16 Slot
Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|    warn|22:40:06 2005 Port 1.1.1 Disabled, Chassis Name: NC316BU-16 Slot Name: myslot1.1
Port Name: xfp-port1
  fdrd[60]|TRAP|    err|22:40:06 2005 Port 1.1.1 Link Down, Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|    err|22:40:11 2005 Port 1.1.2 Amps Too Low, 0.136 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|    err|22:40:11 2005 Port 1.1.2 Tx Power Too Low, -inf Chassis Name: NC316BU-16 Slot
Name: myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|    err|22:40:11 2005 Port 1.1.2 Rx Power Too Low, -30.256 Chassis Name: NC316BU-16 Slot
Name: myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|    err|22:40:11 2005 Port 1.1.2 Link Down, Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2

fiberdriver(port/1.1.1)# no shutdown
fiberdriver(port/1.1.1)# fdrd[60]|TRAP|    warn|22:41:57 2005 Port 1.1.1 Enabled, Chassis Name:
NC316BU-16 Slot Name: myslot1.1 Port Name: xfp-port1
fiberdriver(port/1.1.1)#
```

4.2.5.6 Loopback

```
fiberdriver(port/1.1.1)# loopback
  fdrd[60]|CORE|   warn|22:42:51 2005 1.1.2: Auto-adjusted PortLoopback -> on Ok
fiberdriver(port/1.1.1)# fdrd[60]|TRAP|   warn|22:42:52 2005 Port 1.1.1 Loopback On, Chassis Name:
NC316BU-16 Slot Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:42:52 2005 Port 1.1.2 Amps Ok, 4.696 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|   warn|22:42:52 2005 Port 1.1.2 Tx Power Ok, -6.089 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|   warn|22:42:52 2005 Port 1.1.2 Rx Power Ok, -5.638 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|   warn|22:42:52 2005 Port 1.1.2 Loopback On, Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
  fdrd[60]|TRAP|   warn|22:42:57 2005 Port 1.1.1 Amps Ok, 4.832 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:42:57 2005 Port 1.1.1 Tx Power Ok, -5.146 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:42:57 2005 Port 1.1.1 Rx Power Ok, -6.112 Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:42:57 2005 Port 1.1.1 Link Changed, signal Detect Chassis Name: NC316BU-16
Slot Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:42:57 2005 Port 1.1.2 Link Changed, signal Detect Chassis Name: NC316BU-16
Slot Name: myslot1.1 Port Name: XFP at 1.1.2
```

```
fiberdriver(port/1.1.1)# no loopback
  fdrd[60]|CORE|   warn|22:43:09 2005 1.1.2: Auto-adjusted PortLoopback -> off Ok
fiberdriver(port/1.1.1)# fdrd[60]|TRAP|   warn|22:43:09 2005 Port 1.1.1 Loopback Off, Chassis Name:
NC316BU-16 Slot Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:43:09 2005 Port 1.1.2 Loopback Off, Chassis Name: NC316BU-16 Slot Name:
myslot1.1 Port Name: XFP at 1.1.2
fiberdriver(port/1.1.1)#
```

4.2.5.7 LIN

```
fiberdriver(port/1.1.1)# lin
  fdrd[60]|CORE|   warn|22:43:35 2005 1.1.2: Auto-adjusted PortLIN -> enable Ok
fiberdriver(port/1.1.1)#
fiberdriver(port/1.1.1)#
fiberdriver(port/1.1.1)# no lin
  fdrd[60]|CORE|   warn|22:44:02 2005 1.1.2: Auto-adjusted PortLIN -> disable Ok
fiberdriver(port/1.1.1)# fdrd[60]|TRAP|   warn|22:44:05 2005 Port 1.1.1 LIN Off, Chassis Name:
NC316BU-16 Slot Name: myslot1.1 Port Name: xfp-port1
  fdrd[60]|TRAP|   warn|22:44:05 2005 Port 1.1.2 LIN Off, Chassis Name: NC316BU-16 Slot Name: myslot1.1
Port Name: XFP at 1.1.2
fiberdriver(port/1.1.1)#
```

5 Appendix

5.1 Technical Specifications

Physical Dimensions	25 mm x 75 mm x 175 mm deep (1" x 3" x 7" deep)
Weight	360 g (9.6 oz) depending on configuration
Power	5V DC @ 2A maximum
Storage Temperature	-40° C to 70° C (-40° F to 158° F)
Operating Temperature	0° C to 50° C (32° F to 122° F)
Relative Humidity	85% maximum, non-condensing
Dust (installed XFP)	Less than 10 ⁶ particles/m ³ (or 30,000 particles/ft ³)
Air Flow Clearance	1 inch (25 millimeters) clearance from external chassis vents
Regulatory Compliance	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

Figure 16 -- Technical specifications

5.2 Supported Data Rates

Data rates depend upon the XFP transceivers installed in the module. Consult the MRV website (<http://www.mrv.com>) or a local representative for current XFP availability and specifications.

SONET OC-192	9.95 Gbps
SONET OC-192 over FEC	10.70 Gbps
10 Gigabit Ethernet	10.31 Gbps
10 Gb/s Fibre Channel	10.52 Gbps
G.709	11.08 Gbps

Figure 17 -- Supported data rates and protocols

5.3 Firmware Download

There is no field upgradeable firmware on the EM316-2XFP.

5.4 Troubleshooting

This section provides basic troubleshooting to rectify the most common issues with the EM316-2XFP. If the information provided in this section and in this manual do not resolve the issue, please do not hesitate to contact MRV Communications Customer Support or your local MRV sales representative.

Basic Troubleshooting Checklist

- Ensure all chassis are powered and operating properly.
- Ensure all modules are inserted correctly and receiving power.
- Ensure XFPs are inserted properly and functioning correctly.
- Ensure User Links are functioning properly and sending the desired signal.
- Ensure Fiber Optic connections are correct (R_x to T_x).
- Ensure DIP switches are set to the proper settings for your application.



**20415 Nordhoff Street
Chatsworth, CA 91311**

**Tel: 818-773-0900
Fax: 818-773-0906
<http://www.mrv.com>**