EM316EDFA-BR

Erbium Doped Fiber Amplifier Booster
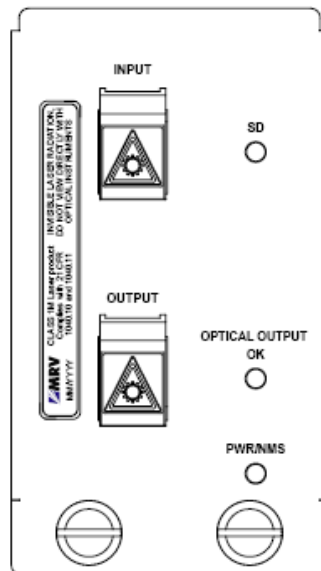
EM316EDFA-LPR

Erbium Doped Fiber Inline Pre-Amplifier

User Guide
1294008-001
Revision D2

January 28, 2008

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1 Preliminary Considerations

1.1 Trademarks

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1.2 Copyright

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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
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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 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 光纤驱动器机箱, 组件和附件	(50)	X	O	O	O	O	O
Pluggable Optics 插入式光学器件	(20)	X	O	O	O	O	O
Power Supplies 电源	(50)	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 ST/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.

MRV MM/YYYY	CLASS 1M Laser product Complies with 21 CFR 1040.10 and 1040.11	INVISIBLE LASER RADIATION, DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
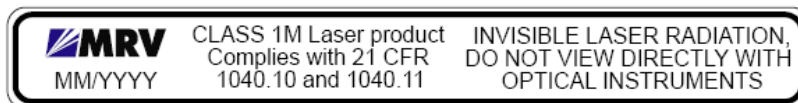
A fiber optic transceiver emits either single-mode or multi-mode light into a fiber optic strand. Take the following precautions when handling optical fibers.

- Wear safety glasses when you install optical fibers.
- Be aware of the risk of laser radiation exposure.
- Always assume that fiber optic cables are active because transmitted light is invisible to the human eye.
- 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 sanitation.
- Follow the manufacturer instructions when using optical test equipment.

1.5.3 Laser Device Classifications

In analogy to EN 60825-1, safety of laser devices, table D.3 - Summary of the precautions users should take:

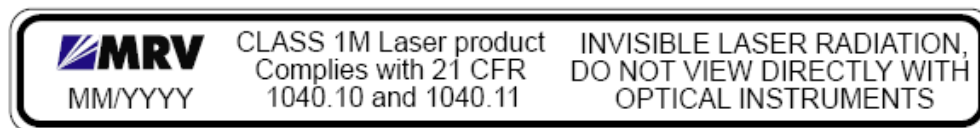| Requirements	Class 1	Class 1M	Class 2	Class 2M	Class 3R	Class 3B
Laser safety officer*	Not required, but recommended for applications which demand a direct look into the laser beam				Not required for visible emissions	Required
Interlock, operatable by remote control	Not required					To be connected to room or door circuits
key switch	Not required					Pull out key if device is not operating
Beam reducer	Not required					Avoids unintentional exposure to beams when operating
Beam indication	Not required				Indicates, when the laser is operating with invisible radiation	Indicates if the laser is operating
Laser warning labels See labels on the laser!	Not required					Follow the indications on the warning labels
Beam paths	Not required for laser classes 1 and 2. For 1M, 2M: Measures as for 3R, 3B					The beam has to finish at the end of its expedient way
Mirroring reflection	Not required for laser classes 1 and 2. For 1M, 2M: Measures as for 3R, 3B				Unintended reflections are to be avoided	
Eye protection	Not required					Required, if constructive or organisational measures are not workable or if permitted max. radiation is exceeded
Protective clothing	Not required					
Schooling	Not required				Required for operational and maintenance staff.	

* Training courses are offered e.g. by the TÜV-Akademie Rheinland in Köln (Tel.: 0221-806-3055, Fax: 0221-806-1534,).

Laser devices of class 1M, class 2, class 2M and class 3R

Precautionary measures are only necessary to avoid a permanent direct looking into the laser beam; for classes 2 and 2M is a momentary (0.25 sec.) irradiation in a wave length range between 400 nm and 700 nm, as it may occur when you accidentally look into the beam, not considered to be dangerous. However, you should not level the laser beam intentionally at people. The use of optical aids (e.g. binoculars) together with laser devices of the classes 1M, class 2M and class 3R may increase the danger for the eyes

MRV MM/YYYY — CLASS 1M Laser product Complies with 21 CFR 1040.10 and 1040.11 — INVISIBLE LASER RADIATION, DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS

1.5.4 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.

1.5.5 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 About This Manual

Document Number: P/N 1294008-001 Rev D2

Document: EM316EDFA-BR / EM316EDFA-LPR User Guide

Release Date: January 28, 2008, 4:26:01 PM

1.7 Latest Revision and Related Documents

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

Release Notes for Fiber Driver modules are produced as required.

EM316LNXNM-OT User Guide: Software-generated manual for EM316LNXNM-OT Network Management module usage describing the command line interface (CLI) and commands.

MegaVision User Manual: Graphical network management system for Fiber Driver modules and other SNMP manageable products and IP devices using MRV Communication's MegaVision Pro® Network Management System.

2 Introduction to EM316EDFA Optical Amplifiers

The fiber optic amplifier module is used to increase an optical signal for extended range or clarity without electrical conversion circuitry. The MRV EM316EDFA modules boost an optical input up to 20 decibels. The amplifier also has a bandwidth of 40 nm, making it suitable for use in wavelength division multiplexing (WDM) applications as an optical spectral amplifier. The module may be controlled from the network through the MRV EM316LNXNM-OT Network Manager Module.

Optical amplifiers operate in different modes, depending upon their position in the optical link. The EM316EDFA is available in two configurations to fill the necessary roles in your network.

EM316EDFA-BR	C-band optical amplifier **booster**
EM316EDFA-LPR	C-band **in-line** optical amplifier
	C-band **pre-amplifier**

The example below illustrates how the EM316EDFA optical amplifiers fit into an optical link.
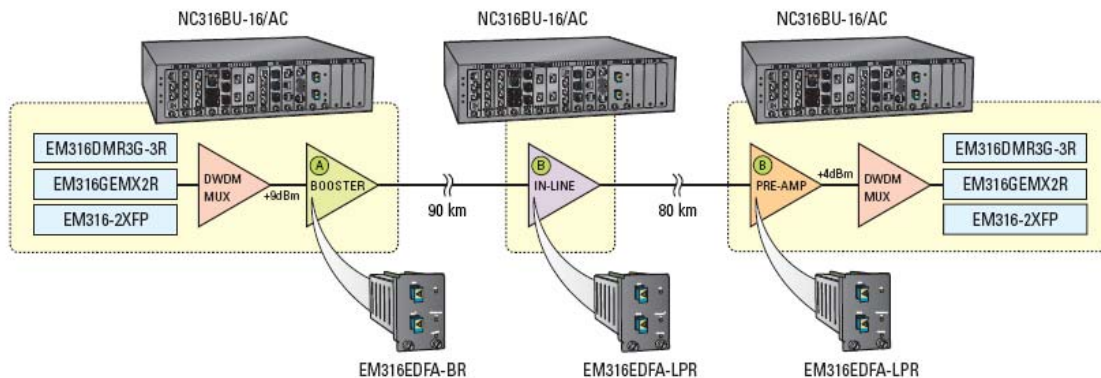
Figure 1   -- EM316EDFA optical amplifier applications

EM316EDFA-BR is used as long haul booster module in combination with an EM316EDFA-LPR inline pre-amplifier.

2.1 Features

The EM316EDFA board can run in standalone mode without any input from a management module. The EM316EDFA analog input power determines the output power because the module runs at a fixed gain.

EM316EDFA status is reported through SNMP through a network management module as well as by LEDs on the front panel.

The green "SD" LED on the front panel indicates input greater than the thresholds corresponding to the EDFA module type, as indicated in the table below.

EM316EDFA-BR	-8 dBm
EM316EDFA-LPR	-30 dBm

A green LED at front panel (Optical Output) indicates output power greater than -10 dBm.

The module temperature is measured from 0° C to 70° C and reported to management. To protect against excessive heat, the laser shuts down when measured temperature reaches 70° C.

2.1.1 EM316EDFA-BR / EM316EDFA-LPR Monitored Parameters

- Input power and output power readings
- Output gain reading
- Case temperature reading
- Amplifier status reading
- Alarm status
    - case temperature
    - loss of input power
    - loss of output power

2.1.2 EDFA Control Inputs
- Software reset
- Output power mute

2.1.3 EDFA Alarm Outputs
- Case temperature
- Loss of input
- Loss of output

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.
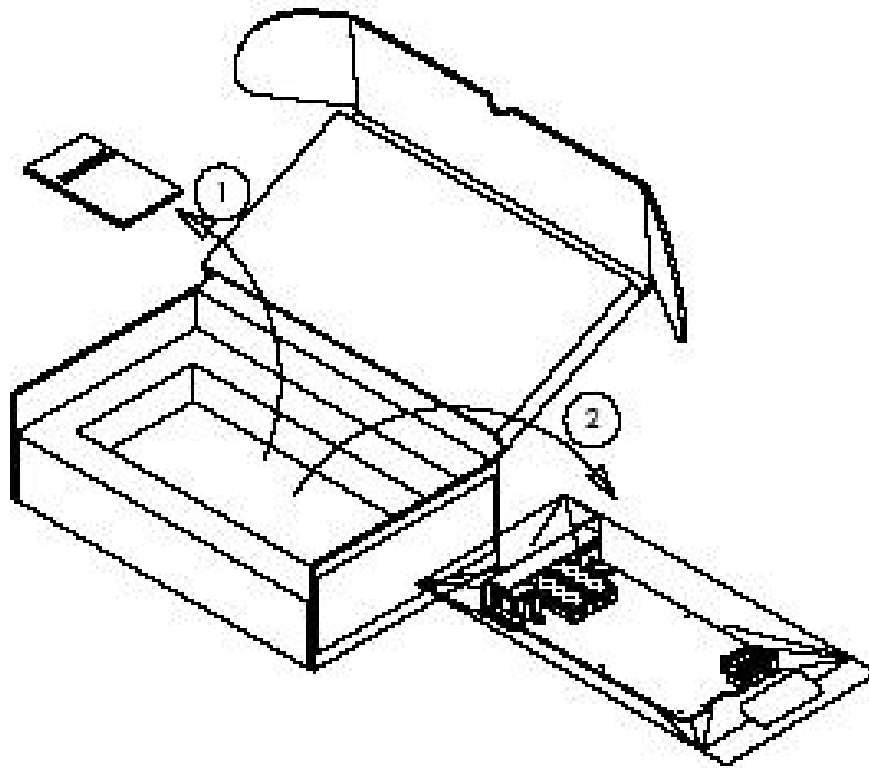
Figure 2   -- Unpacking

3.2 Front Panel
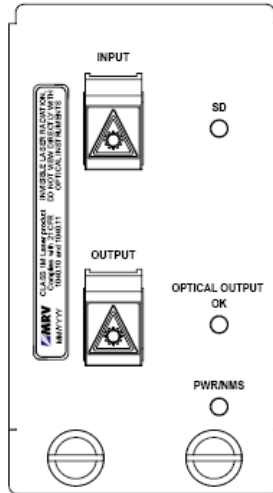
Figure 3   -- EM316EM316EDFA-BR / EM316EDFA-LPR Front Panel

3.3 LEDs

PWR/NMS Power	On – DC +5V power is applied to the card
SD Input Optical Power	On – Input signal greater than the input threshold setting
OPTICAL OUTPUT OK Output Optical Power	On – Output power is greater than -2 dBm, for apc mode or -10 dBm for agc mode

3.4 DIP Switches

The EM316EDFA-BR is pre-configured in booster mode. There are no user-selectable switches.

The EM316EDFA-LPR is pre-configured in inline pre-amplifier mode. There are no user-selectable switches to operate either inline or as a pre-amplifier.

The DIP switch block at the underside of the module has six switches. Only switch 6 affects operation of the amplifier module. Use switch 6 to enable or disable network management.

Switch #	Function	Setting
1-5	N/A	Reserved
6	Management Enable	Default: ON = enable management

3.5 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 is on the left when installed in the BU-1, BU-2, BU-3, and BU-4 chassis. The thumb screw is on the bottom when installed in the BU-16 chassis.

3.5.1.1.1 Tools

- 6-inch Phillips #1 screwdriver (for some module screws)
- 6-inch flat-tip 5.0 screwdriver

3.5.1.1.2 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 safety 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 any thumb screws by hand.
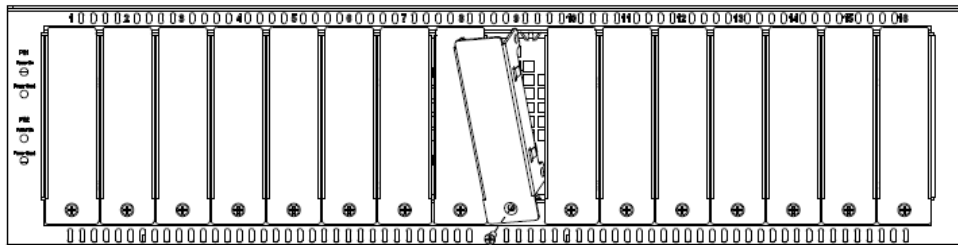
Figure 4   -- Remove the required blank panels

To comply with FCC regulations and for optimal cooling air flow, a cover panel or a module must cover every chassis slot. To limit external signals, no chassis slot should remain open when the unit is operational. Secure modules and panels with appropriate screws for grounding and further compliance.

Step 2 Install the module into a Fiber Driver chassis by aligning the edge of the card with the rail of the chassis. Tighten the thumbscrew by hand.
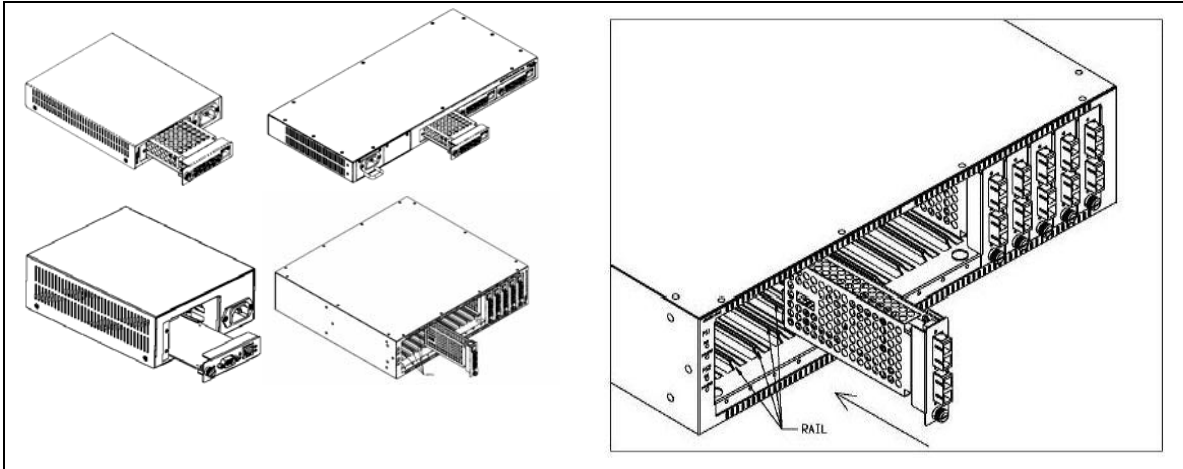
Figure 5   -- Module installation (not all chassis are shown)

Handle modules 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 slot. 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.
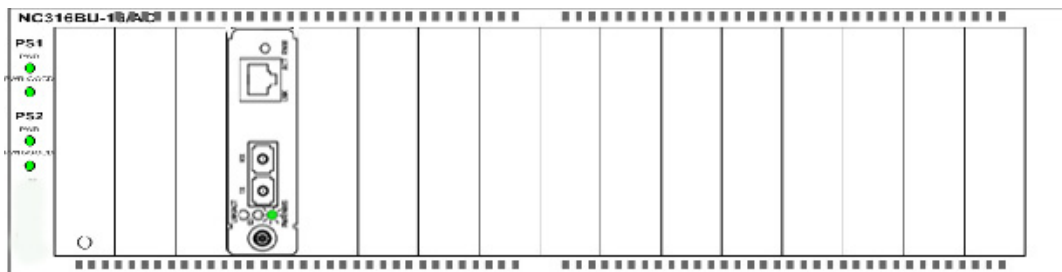
Figure 6   -- Fiber Driver module installed in a powered chassis

4 EDFA Features

While operating correctly in an appropriate environment, EM316EDFA optical amplifier modules require minimal operator intervention. However, because these devices are critical to network infrastructure, administrative monitoring of these devices is essential for early fault detection.

EM316EDFA modules report simple status visually with front panel LEDs. More detailed diagnostic data is available remotely through the EM316LNXNM-OT module management interfaces discussed in the next section.

4.1 Network Management Control and Monitoring

The following EM316EDFA features are managed with an EM316LNXNM-OT network management module.

Control	• Disable amplifier output
Monitoring	Read amplifier module temperature
	Read optical input power
	Read optical output power
	Read amplifier power supply voltage
Alarms	Temperature
	Input power
	Output power
	Common alarm

4.1.1 Management Control from the Network

- Output power or gain control
- Power or gain control limits
- Input power and output power readings
- Output gain reading
- Case temperature reading
- Alarm status including case temperature, loss of input power, loss of output power
- Amplifier status reading
- Software reset
- Output power mute

4.1.2 EM316EDFA Alarm Output Pins

- Case temperature
- Loss of input
- Loss of output

4.1.3 Operating Parameters

Automatic Gain Control (AGC) maintains a constant gain for the module. The tables below show the constant operating parameters of each EDFA module type.

Thresholds

	EM316EDFA-BR	EM316EDFA-LPR
Module Function	Booster	In-line / Preamplifier
Input Threshold	-8 dBm	-30 dBm
Input Shutdown	-10 dBm	-32 dBm
Output Threshold	-10 dBm	-10 dBm
Small Signal Gain	9 dBm	25 dBm
Output Power	0 to 18 dBm	0 to15.5 dBm

Recommended Operating Conditions

	EM316EDFA-BR	EM316EDFA-LPR
Input signal dynamic range	-10 to +9 dBm	-20 to +5 dBm
Output optical power range	0 to 18 dBm	0 to +15.5 dBm
Optical bandwidth	1528 t o1563 nm	1528 t o1563 nm

5 Module Management

Most Fiber Driver modules, including the EDFA amplifier family, may be managed by a Fiber Driver network management (NM) module installed in the same chassis.

The EDFA amplifier modules may be managed by the EM316LNXNM-OT Network Management (NM) module.

The NM module installs in the same chassis as the managed modules. It provides management for the EDFA amplifier module and other compatible Fiber Driver modules resident in the chassis. Refer to specific module documentation to determine compatibility with a specific NM.

Factory settings work in most EDFA amplifier installations, but network management through an NM module is recommended for local and remote- system status monitoring. Network environments are unpredictable, and Fiber Driver network management is a critical tool for proactive administration as well as for reduced operating expenses.

The NM provides a command line interface (CLI), accessible either through a local serial port and console or from the IP network using a terminal emulation environment. Some CLI commands specific to the EDFA amplifier modules in a managed environment are discussed in this section. Refer to the appropriate NM documentation (EM316LNXNM-OT) for further details regarding the interface and commands specific to your installation.

The network management module also provides 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.

5.1 Serial Console Interface

After the network management (NM) module is installed, power up the chassis and attach the serial RS-232 cable to the PC or terminal device. Configuring terminal emulation software on the PC is beyond the scope of this document. The components below may be ordered from MRV.

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

The NM 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 to show the 24 bits masked for subnetting. The default gateway address is 192.168.14.1/24.

From the network, connect to the NM IP address using telnet or SSH (secure shell) to open the command line interface (CLI). Telnet services are disabled by default on the EM316LNXNM-OT, but they may be enabled for additional CLI access.

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

Configure the EM316LNXNM-OT RS-232 serial parameters with the following values.

RS-232 Serial Port Parameters	• 38400 baud • 8 data bits • 1 stop bit • no parity • no flow control

5.2 EM316LNXNM-OT Command Line Interface (CLI)

The EM316LNXNM-OT provides command line interface (CLI), SNMP, and graphical administration options for a Fiber Driver chassis system. This section introduces the CLI for the Linux-based network management (EM316LNXNM-OT) module.

EM316LNXNM-OT management commands are specific to each module.

The EM316LNXNM-OT management module also includes MegaVisionJ, a built-in graphical interface to manage only the Fiber Driver chassis system controlled by the specified NM. This graphical system is accessible from any standard Java-enabled web browser that can reach the IP address assigned to the EM316LNXNM-OT. MegaVisionJ allows remote management of the entire Fiber Driver chassis system and compatible modules.

Some commands applicable to the EDFA amplifier modules or host chassis are illustrated in this manual. The box below lists a few of the sample commands addressed in this document. Refer to the Table of Contents for a list of commands addressed here, and refer to EM316LNXNM-OT documents for more detail.

show	show config
?	show defaults
list	description <name>

Figure 7   -- EM316LNXNM-OT general commands for EDFA modules

Some of these commands apply to both slot-level and port-level contexts as described in the navigation portion of this section. Refer to EM316LNXNM-OT documentation for a more complete discussion of the Linux-based interface and available commands.

5.2.1 EM316LNXNM-OT Boot and CLI Login

The box below shows the NM boot and login to the built-in admin user account. The "banner" information that displays after the login may also be displayed from the CLI prompt with the show version command. The show command is introduced in a later section. Refer to EM316LNXNM-OT documentation for network manager and CLI configuration help.

```
U-Boot 1.0.1 (Jan 25 2005 - 11:08:25)

CPU:   MPC875ZPnn at 133 MHz: 8 kB I-Cache 8 kB D-Cache FEC1 FEC2
BOARD: MRV NM2 v3
DRAM:  (64 MB SDRAM) 64 MB
FLASH: 16.5 MB
Net:   FEC ETHERNET
Hit any key to stop autoboot:  0
## Booting image at e0000000 ...
   Image Name:   EM316LNXNM
   Image Type:   PowerPC Linux Multi-File Image (gzip compressed)
   Data Size:    7324224 Bytes =  7 MB
   Load Address: 00000000
   Entry Point:  00000000
   Contents:
   Image 0:    676629 Bytes = 660.8 kB
   Image 1:   6647580 Bytes =  6.3 MB
   Verifying Checksum ... OK
   Uncompressing Multi-File Image ... OK
   Loading Ramdisk to 03920000, end 03f76f1c (656f1c)... OK

              Welcome to MRV EM316LNXNM

RTC[DS1338]: Clock may be incorrect, reset your time.
RTC[DS1338]: Testing RTC... OK
Reading configuration: ok

Starting up, please wait
FPGA Already Loaded.


MRV EM316LNXNM

login: admin
Password:

Please wait, initializing...now ready.
EM316LNXNM-OT v4.0 fdr 52 (May 14 2007 - 13:35:38).
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).
EM316LNXNM (firmware 5c.13) (00:20:1a:02:53:8f).
MegaVisionJ v2.32k5 - August 24, 2006
Copyright (c) MRV Corp. 1993-2007
You are a SUPER user!
fiberdriver#
```

5.2.2 CLI Navigation

The CLI uses five operational contexts: login, configuration, chassis, slot, and port. Only the login context is not considered a configuration mode. The system prompt includes a string to indicate the current operational context, as illustrated in the example below. The "#" character ends the prompt string, and a space separates the command from the prompt.

Each navigation command in the box below is bold for emphasis in print only.

```
fiberdriver# configure terminal
fiberdriver(config)# chassis 1
fiberdriver(chassis/1)# slot 1.4
fiberdriver(slot/1.4)# port 1.4.2
fiberdriver(port/1.4.2)# next
fiberdriver(port/1.4.3)# exit
fiberdriver(config)# exit
fiberdriver#
```

These contexts are not entirely hierarchical, but the three hardware-specific contexts do follow a structure that reflects the physical device relationships. The chassis contains slots (modules) which in turn contain ports.

Enter the configuration context with the "configure terminal" command. Any hardware context may be reached directly from the config context or any other hardware context. For example, there is no need to pass through the chassis context to reach the slot or port contexts.

The next command is a short-cut for navigating to the hardware context following the current context and at the same level. In the box above, the port value in the prompt increments from 2 to 3 to indicate this context change.

Operations on the larger component may sometimes also apply to the smaller components contained in the larger target device. Refer to EM316LNXNM-OT documentation or use the CLI help feature "?" for more information about CLI context navigation.

5.2.3 Login Context Commands and Examples

The login context refers to the only CLI state not considered a configuration context. Commands in this context are generally for system status monitoring. Use the "?" and "list" commands at the fiberdriver # prompt to display the list of command line options. These help commands are shown in the slot and port command illustrations later in this section.

A few login context commands are illustrated in this section.

5.2.3.1 "show version"

The show version command displays revision levels for the management system components.

```
fiberdriver# show version
EM316LNXNM-OT v4.0 fdr 54 (Jun  8 2007 - 15:57:38).
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).
EM316LNXNM (firmware 5c.13) (00:20:1a:02:48:28).
MegaVisionJ v2.32k5 - August 24, 2006
Copyright (c) MRV Corp. 1993-2007
```

5.2.3.2 "show log"

The show log command displays log settings for the management system components.

```
fiberdriver(config)# show log
 Running Level: warning
 Nvram Level: disabled
 Trap Level: warning
 Remote Server: 0.0.0.0
 Remote Level: notice
fiberdriver(config)#
```

5.2.3.3 "`show running-config`"

The `show running-config` command displays the currently active system parameters for the management system.

```
fiberdriver# show running-config
Building configuration...

Current configuration:
!
! Configuration saved on 2005/01/04 22:39:51
!
! Configuration written by admin!
!
! EM316LNXNM-OT v4.0 fdr 54 (Jun  8 2007 - 15:57:38).
! 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).
! EM316LNXNM (firmware 5c.13) (00:20:1a:02:48:28).
! Copyright (c) MRV Corp. 1993-2007.
!
ip interface 192.168.14.201/24
username admin password encrypted $1$kQ2rIq/$Ob8wFa2EW135XC4TnN7wJ/ class
super
username admin group all
group all write 2
group all write 1
snmp-server community read encrypted $1$hZyZkA1$xiJTxyGDfVb1bcAYyW9Wi1
snmp-server community write encrypted $1$wZCHI9/$6H3mce5Y15iLhtdpoXBoa1
ip interface dhcp
chassis 1 type NC316BU-16 rev 1
slot 1.2 type EM316LNXNM-OT rev 4
slot 1.3 type EM316EDFAv rev 1
slot 1.4 type EM316EDFA rev 1
slot 1.5 type EM316E1MUX4RM rev 1
slot 1.7 type EM316EFE1MUXRJv rev 1
slot 1.8 type EM316EFE1MUXRJ rev 1
port 1.3.1 type FO_SC
fiberdriver#
```

5.2.3.4 "show startup-config"

The `show startup-config` command displays the contents of the **startup-config** file that are applied when the system boots. Default values are applied to any parameters not specified in this file.

```
fiberdriver# show startup-config
!
! Configuration saved on 2005/01/04 21:15:03
!
!
! Configuration written by admin!
!
! EM316LNXNM-OT v4.0 fdr 54 (Jun  8 2007 - 15:57:38).
! 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).
! EM316LNXNM (firmware 5c.13) (00:20:1a:02:48:28).
! Copyright (c) MRV Corp. 1993-2007.
!
ip interface 192.168.14.201/24
username admin password encrypted $1$kQ2rIq/$Ob8wFa2EW135XC4TnN7wJ/ class
super
username admin group all
group all write 1
group all write 2
snmp-server community read encrypted $1$hZyZkA1$xiJTxyGDfVb1bcAYyW9Wi1
snmp-server community write encrypted $1$wZCHI9/$6H3mce5Y15iLhtdpoXBoa1
ip interface dhcp
chassis 1 type NC316BU-16 rev 1
slot 1.2 type EM316LNXNM-OT rev 4
slot 1.3 type EM316EDFAv rev 1
slot 1.4 type EM316EDFA rev 1
slot 1.5 type EM316E1MUX4RM rev 1
slot 1.7 type EM316EFE1MUXRJv rev 1
slot 1.8 type EM316EFE1MUXRJ rev 1
port 1.3.1 type FO_SC
fiberdriver#
```

5.2.3.5 Configuring System Parameters

Enter "configuration" mode, as shown below, to configure the system parameters

> 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 EM316LNXNM-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.

5.2.4 Chassis Context

Command examples in this section are applied in the chassis-level context. The box below shows the command to navigate to the chassis context from the login context.

```
   fiberdriver# configure terminal
   fiberdriver(config)#
   fiberdriver(config)# chassis 1
   fiberdriver(chassis/1)#
```

5.2.4.1 "show"

The following CLI excerpt shows a Fiber Driver chassis system with an EDFA amplifier module and an EM316LNXNM-OT network management (NM) module. Notice that the EDFA module is listed in both slots 1.3 and 1.4.

```
fiberdriver(chassis/1)# show
        Model: NC316BU-16
         Name: NC316BU-1
      Temp(C): 25
  Temp Min(C): 5
Temp Limit(C): 55

PS1: DC Bad  PS2: AC Good
Fan1: good  Fan2: good
Fan3: good
Chassis Traps: on  Slot Change Traps: on  Module Specific Traps: on
   Port Traps: on          Link Traps: on        Loopback Traps: on
    LIN Traps: on  Port Change Traps: on       Port Diags Traps: on

Number Of Slots: 16
Hardware Revision: 1

Slot  Model            Name                   Serial Number
====  ==============   =====================
============================
1.2   EM316LNXNM-OT    EM316LNXNM-OT at 1.2   00:20:1a:02:48:28
1.3   EM316EDFAv       EM316EDFAv at 1.3      N/A
1.4   EM316EDFA        EM316EDFA at 1.4       N/A
1.5   EM316E1MUX4RM    EM316E1MUX4RM at 1.5   12:34:56:78:90:15
1.7   EM316EFE1MUXRJv  EM316EFE1MUXRJv at 1.7 00:20:1a:77:88:99
1.8   EM316EFE1MUXRJ   EM316EFE1MUXRJ at 1.8  00:20:1a:77:88:99

fiberdriver(chassis/1)#
```

Use the command line "?" (help character, shown below) to display command line parameters for the show command.

5.2.4.2 Other Commands

The commands available at the chassis level are consistent in Fiber Driver environments. These general system features are beyond the scope of this document. A list of available commands in the chassis context is displayed by typing "?" or "list" at the prompt.

```
fiberdriver(chassis/1)# ?
  chassis            Configure a chassis
  default            Restore parameter(s) to defaults
  description        Set chassis name
  echo               Display text for scripting
  end                End current context and go down to initial command context
  exit               Exit current context and go down to previous context
  gen-trap           Enable trap generation for the chassis
  list               Print command list
  logout             Logout of the system
  map                Configure port map for entire current context
  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 context and go down to previous context
  show               Show basic info
  sleep              Pause CLI for scripting
  slot               Configure a slot
  temperature-limit  Adjust high-temperature limit (deg. C)
  temperature-min    Adjust low-temperature limit (deg. C)
  who                Find out who is connected to the system
  whoami             Who am I?
  write              Write running configuration to memory or terminal
fiberdriver(chassis/1)#
```

For a list of available commands in any context, type "?" or "list" at the prompt or refer to EM316LNXNM-OT manuals.

5.2.5 Slot Context Commands and Examples

The table below lists commands that relate specifically to the EDFA modules in the slot-level command context of the EM316LNXNM-OT command line interface (CLI). Some sample commands are illustrated in this section following the command table.

Command	Description
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 go down to enable node
exit	Exit current mode and go 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 go down to previous mode
reset	Reset systems on this slot
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

Figure 8 – EM316LNXNM-OT slot context commands for EDFA modules

Command examples in this section are applied in the slot-level context. The box below shows the command to navigate to the slot context from the login context.

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

5.2.5.1 "?"

The "?" is a special help character in the EM316LNXNM-OT command line. In previous releases, the "?" character did not echo to the display when typed. Beginning in version 4.0, the "?" displays as other commands do. Results of the help request are displayed immediately to the monitor.

The box below shows the output of the "?" typed alone on the command line in the slot-level configuration context. In other contexts, the display is different to reflect the commands available from the current prompt. Navigate to each operational context and type "?" at the prompt to become familiar with these commands in your environment. Also notice the different help output in the slot-level context of a different Fiber Driver module type. The box displayed below is specific to EDFA modules. The same command list displays for slot 1.4, except that the "reset" (highlighted) command is not available.

```
fiberdriver(slot/1.3)# ?
  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 context and go down to initial command context
  exit          Exit current context and go down to previous context
  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 context and go down to previous context
  reset         Reset systems on this slot
  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/1.3)#
```

The "?" may also be used in two ways after a command typed at the prompt in any context. When typed immediately after a command line entry with no space separating it from the command, the "?" displays a list of commands that match the preceding string and a description of each matching command function. When a space separates the command string from the "?", the display shows the first matching command and a list of the options for the next required parameter on the command line.

Read more about the "?" help character in the EM316LNXNM-OT User Guide. There is no substitution for practicing the command to become familiar with its behavior.

5.2.5.2 "`list`"

The `list` command displays all the full command options (including applicable command line arguments) available in the current context. The box below illustrates the display in the slot-level context specific to EDFA modules.

```
fiberdriver(slot/1.3)# 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
  reset slot
  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/1.3)#
```

5.2.5.3 "show"

The `show` command displays management and system information related to the EM316LNXNM-OT management module, the hosting chassis, other modules in the chassis, and ports available within the managed system. The arguments (parameters) following the `show` command and the operational context displayed by the system prompt control the many functions available through this command.

The next box displays the CLI help for the `show` command in the slot-level context of the EDFA modules. The first command (shown in bold) is "`show?`" and the second command (also in bold) is "`show ?`". The subtle difference between the two commands is the space separating the command from the "`?`" in the second command.

```
fiberdriver(slot/1.4)# show?
  show  Show basic info
fiberdriver(slot/1.4)# show ?
  <cr>                 Show basic info
  config               Show administrative configuration for this object
  defaults             Show default configuration for this object
  digital-diagnostics  Show Digital Diagnostics summary
  redundancy           Show slot redundancy info
  running-config       Current operating configuration
  statistics           Show port info
fiberdriver(slot/1.4)# show
```

The box below illustrates the `show` command applied with no arguments in the slot-level context of a EDFA module. Notice the difference between the two slot displays.

```
fiberdriver(slot/1.4)# show
            Slot: 1.4
           Model: EM316EDFA
            Name: EM316EDFA at 1.4
Hardware Revision: 1

Sw Configurable: yes  Operation Type: Inline AGC

Number Of Ports: 0
fiberdriver(slot/1.4)# slot 1.3
fiberdriver(slot/1.3)# show
            Slot: 1.3
           Model: EM316EDFAv
            Name: EM316EDFAv at 1.3
Hardware Revision: 1, FPGA 0x6a

Sw Configurable: yes  Operation Type: Inline AGC

Number Of Ports: 2
Port   Enable Link       DDiags Gain(dB)  Gain desired(dB)  Name
=====  ====== =========  ====== ========  ================  ==============
1.3.1  enable no Signal  Alarm  25.25     25                FO_SC at 1.3.1
1.3.2  enable no Signal  Alarm  N/A       N/A               FO_SC at 1.3.2

fiberdriver(slot/1.3)#
```

The boxes below illustrate two common parameters used with the `show` command.

Default settings are listed in the `show defaults` command output. These parameters reflect the module boot configuration which is determined by DIP switches and firmware programming. All lines in this display begin with "!" to indicate that they are comments for information only.

```
fiberdriver(slot/1.3)# show defaults
slot 1.3
 ! description EM316EDFAv at 1.3
fiberdriver(slot/1.3)# slot 1.4
fiberdriver(slot/1.4)# show defaults
slot 1.4
 ! description EM316EDFA at 1.4
fiberdriver(slot/1.4)#
```

The `show config` command displays the active environment settings currently in the operational context. The lines beginning with "!" are comments added for clarity in the CLI display only. The comment lines ending with ":" are headings that describe the settings listed in this display.

```
fiberdriver(slot/1.3)# show config
slot 1.3
 ! Configured parameters that override defaults:
 ! Configured parameters that match defaults:
 ! Parameters that will follow defaults:
 ! description EM316EDFAv at 1.3
fiberdriver(slot/1.3)# slot 1.4
fiberdriver(slot/1.4)# show config
slot 1.4
 ! Configured parameters that override defaults:
 ! Configured parameters that match defaults:
 ! Parameters that will follow defaults:
 ! description EM316EDFA at 1.4
fiberdriver(slot/1.4)#
```

The default parameter values are constant for each module, but can change to reflect DIP switch settings. Changes to these parameter values are reflected in the `show config` command output. Restoring the default values returns the module to its original operating state. Preserve changes made to the configuration for use in future CLI sessions and beyond a reboot by writing them to the **startup-config** file as described later in this section.

Each module may be given a descriptive name with the command below. The show command follows with the new name bolded. Each new slot name may also be displayed with individual show commands in each slot context.

```
fiberdriver(slot/1.3)# description EDFA-1
fiberdriver(slot/1.4)# description EDFA-2
fiberdriver(slot/1.3)# up
fiberdriver(chassis/1)# show
        Model: NC316BU-16
         Name: NC316BU-1
       Temp(C): 25
  Temp Min(C): 5
Temp Limit(C): 55

PS1: DC Bad  PS2: AC Good
Fan1: good  Fan2: good
Fan3: good
Chassis Traps: on  Slot Change Traps: on  Module Specific Traps: on
   Port Traps: on         Link Traps: on        Loopback Traps: on
    LIN Traps: on  Port Change Traps: on        Port Diags Traps: on

Number Of Slots: 16
Hardware Revision: 1

Slot  Model            Name                   Serial Number
====  ===============  =====================  ===========================
1.2   EM316LNXNM-OT    EM316LNXNM-OT at 1.2   00:20:1a:02:48:28
1.3   EM316EDFAv       EDFA-1                 N/A
1.4   EM316EDFA        EDFA-2                 N/A
1.5   EM316E1MUX4RM    EM316E1MUX4RM at 1.5   12:34:56:78:90:15
1.6   EM316DPAD821     EM316DPAD8 at 1.6      N/A
1.7   EM316EFE1MUXRJv  EM316EFE1MUXRJv at 1.7 00:20:1a:77:88:99
1.8   EM316EFE1MUXRJ   EM316EFE1MUXRJ at 1.8  00:20:1a:77:88:99

fiberdriver(chassis/1)#
```

5.2.6 Port Context Commands and Examples

The table below lists commands that relate specifically to EDFA modules in the port-level command context of the EM316LNXNM-OT command line interface (CLI). Some sample commands are illustrated in this section following the command table. A specific command list for each context is displayed by typing the "?" command at any prompt.

Command	Description
default	Restore parameter(s) to defaults
description	Set port name
echo	Display text for scripting
end	End current mode and go down to enable node
exit	Exit current mode and go 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 go 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
speed	Adjust port speed
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

Figure 9 – EM316LNXNM-OT port context commands for EDFA modules

Command examples in this section are applied in the port-level context. The box below shows the command to navigate to a specific port context from the login context.

```
fiberdriver# configure terminal
fiberdriver(config)# port 1.3.1
fiberdriver(port/1.3.1)#
```

5.2.6.1 "?"

The "?" command, used alone on the command line, lists the commands available in the current operational context.

The "?" may also be used in two ways following a command word typed at the prompt in any context. When typed immediately after a command line entry with no space separating it from the command, the "?" displays a list of commands that match the preceding string and a description of each matching command function. When a space separates the command string from the "?", the display shows the first matching command and a list of the options for the next required parameter on the command line.

Read more about the "?" help character in the EM316LNXNM-OT User Guide. There is no substitution for practicing the command to become familiar with its behavior.

The box below shows the output of the "?" typed alone on the command line in the port-level configuration context. The box below is specific to the EDFA modules.

```
fiberdriver(port/1.3.1)# ?
  default       Restore parameter(s) to defaults
  description   Set port name
  echo          Display text for scripting
  end           End current context and go down to initial command context
  exit          Exit current context and go down to previous context
  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 context and go down to previous context
  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/1.4.1)#
```

The commands listed by the help ("?") command may be different depending upon the specific port context displayed.

5.2.6.2 "list"

The list command displays all the full command options (including applicable command line arguments) available in the current context. The box below illustrates the display at the port-level context specific to the EDFA modules.

```
fiberdriver(port/1.3.1)# list
  default all
  default description
  default me
  default protocol
  default rm-chassis
  default rm-port
  default rm-slot
  default shutdown
  description .LINE
  echo
  echo .LINE
  end
  exit
  list
  logout
  next
  no description
  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/1.3.1)#
```

The commands listed by the help ("?") command may be different depending upon the specific port context displayed.

5.2.6.3 "`show`"

The show command displays management and system information related to the EM316LNXNM-OT management module, the hosting chassis, other modules in the chassis, and ports available within the managed system. The arguments (parameters) following the `show` command and the operational context displayed by the system prompt control the many functions available through this command.

The box below illustrates the `show` command. The help "?" is applied first, then the command is used with no arguments in the port context of an EDFA module.

```
fiberdriver(port/1.3.1)# show
Port: 1.3.1
Name: FO_SC at 1.3.1

Enable: enable
  Link: no Signal

Connector: fo SC  Medium: single Mode
TxPower(dBm): -15.26
      DDiags: Alarm   Temp(C): 23  Supply(V): 3.28

Alarm Cause: TX Loss of Signal Alarm (tx -15.26dBm)

Gain desired(dB): 25
       Gain(dB): 25.69

fiberdriver(port/1.3.1)#
```

The CLI help for the show command is identical in the port-level context and the slot-level contexts. Refer to the Slot-Level Commands section for "`show?`" and "`show ?`" information.

5.2.6.4 "`port description`"

As with a module at the slot level, a descriptive name may be applied to each port. An example of the `description` command at the port level is shown below.

```
fiberdriver(port/1.3.1)# description EDFA-port1
fiberdriver(port/1.3.1)# show
Port: 1.3.1
Name: EDFA-port1

Enable: enable
  Link: no Signal

Connector: fo SC  Medium: single Mode
TxPower(dBm): -15.26
      DDiags: Alarm   Temp(C): 23  Supply(V): 3.28

Alarm Cause: TX Loss of Signal Alarm (tx -15.26dBm)

Gain desired(dB): 25
        Gain(dB): 24.76

fiberdriver(port/1.3.1)#
```

5.2.7 Displaying and Saving System Parameters

Use the `write terminal` command to display the current operating parameters.

```
fiberdriver(port/1.3.1)# write terminal
Building configuration...

Current configuration:
!
! Configuration saved on 2005/01/04 21:11:06
!
!
! Configuration written by admin!
!
! EM316LNXNM-OT v4.0 fdr 54 (Jun  8 2007 - 15:57:38).
! 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).
! EM316LNXNM (firmware 5c.13) (00:20:1a:02:48:28).
! Copyright (c) MRV Corp. 1993-2007.
!
ip interface 192.168.14.201/24
username admin password encrypted $1$kQ2rIq/$Ob8wFa2EW135XC4TnN7wJ/ class super
username admin group all
group all write 1
group all write 2
snmp-server community read encrypted $1$hZyZkA1$xiJTxyGDfVb1bcAYyW9Wi1
snmp-server community write encrypted $1$wZCHI9/$6H3mce5Y15iLhtdpoXBoa1
ip interface dhcp
chassis 1 type NC316BU-16 rev 1
slot 1.2 type EM316LNXNM-OT rev 4
slot 1.3 type EM316EDFAv rev 1
 description EDFA-1
slot 1.4 type EM316EDFA rev 1
 description EDFA-2
slot 1.5 type EM316E1MUX4RM rev 1
slot 1.6 type EM316DPAD8 rev 2
slot 1.7 type EM316EFE1MUXRJv rev 1
slot 1.8 type EM316EFE1MUXRJ rev 1
port 1.3.1 type FO_SC
 description EDFA-port1
fiberdriver(port/1.3.1)#
```

Use the `write file` command to save the current parameters to the configuration file.

```
fiberdriver(port/1.3.1)# write file
Building configuration file...
OK, saved to startup-config
fiberdriver(port/1.3.1)#
```

5.2.8 Restoring Default Parameters

Use the `default` command to discard changes applied to the module configuration. The example below illustrates returning the entire module to the original factory defaults. Use the "?" after the `default` command or refer to EM316LNXNM-OT documentation for parameters to reapply only selected default values including individual port settings.

The command below is applied in the main configuration context. The first command line in the box opens this context from the login context.

```
fiberdriver(config)# default 1 all
Restored default configuration for 1
Restored default configuration for 1.1
Restored default configuration for 1.2
Restored default configuration for 1.2.1
Restored default configuration for 1.2.2
Restored default configuration for 1.2.3
Restored default configuration for 1.2.4
Restored default configuration for 1.3
Restored default configuration for 1.3.1
Restored default configuration for 1.3.2
Restored default configuration for 1.4
Restored default configuration for 1.5
Restored default configuration for 1.5.1
Restored default configuration for 1.5.2
Restored default configuration for 1.5.3
Restored default configuration for 1.5.4
Restored default configuration for 1.5.5
Restored default configuration for 1.6
Restored default configuration for 1.6.1
Restored default configuration for 1.6.2
Restored default configuration for 1.6.3
Restored default configuration for 1.6.4
Restored default configuration for 1.6.5
Restored default configuration for 1.6.6
Restored default configuration for 1.6.7
Restored default configuration for 1.6.8
Restored default configuration for 1.6.9
Restored default configuration for 1.6.10
Restored default configuration for 1.7
Restored default configuration for 1.7.1
Restored default configuration for 1.7.2
Restored default configuration for 1.7.3
Restored default configuration for 1.7.4
Restored default configuration for 1.8
Restored default configuration for 1.8.1
Restored default configuration for 1.8.2
Restored default configuration for 1.9
Restored default configuration for 1.10
Restored default configuration for 1.11
Restored default configuration for 1.12
Restored default configuration for 1.13
Restored default configuration for 1.14
Restored default configuration for 1.15
Restored default configuration for 1.16
fiberdriver(config)#
```

6 Appendix

These sections contain technical and support information for the EM316EDFA modules.

6.1 Technical Specifications

Operating Temperature Range	0° C to 45° C (32° F to 113° F)
Storage Temperature	-10° C to 60° C (-14° F to 140° F)
Relative Humidity	85% maximum, non-condensing
Physical Dimensions	50 mm x 75 mm x 175 mm deep (1" x 3" x 7" deep)
Weight	14.4 ounces (408 grams)
Power	5V DC @ 2A maximum
Cooling Air	1 inch clearance for external vents

6.2 Troubleshooting

This section provides basic troubleshooting to rectify the most common issues with the EM316EDFA-BR / EM316EDFA-LPR. 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 SFPs are inserted properly and functioning correctly.
- Ensure User Links are functioning properly and sending the desired signal.
- Ensure Fiber Optic connections are correct (T_x to R_x).
- Ensure Dip-Switches are set to the proper settings for your application.

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