

# EM316LNXNM-OT

Network Manager with Linux



Optical Communications Systems®

**Fiber Driver Optical Multi-Service Platform**

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For EM316LNXNM v4.7 fdr 39 built Oct 16 2012 - 19:07:17

## User Guide

Three thick, parallel purple diagonal lines originate from the bottom left and extend towards the top right, creating a sense of motion or expansion.

EMPOWERING  
THE OPTICAL EDGE™

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The user assumes sole responsibility for applying the information supplied in product documents.

MRV Communications reserves the right to make changes to technical specifications and documentation without notice.

This document represents the most recent product versions at the time of writing, which may differ from previous releases. To ensure maximum functionality, use the latest software updates and documents. Contact customer support regarding previous product revisions and documents.

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# Chapter 1. Support and Safety

## *...company and industry references*

### 1.1. Customer Support

Before contacting customer support, look for release notes, 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, frequently asked questions (FAQ), and contact information. Contact help online by sending email to <mailto:support@mrv.com> or through the website request link at <http://service.mrv.com/support/contact>.

	MRV Americas (US, Canada, 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:

1. Site ID or company name
2. Contact information
3. Model or product name
4. Serial number
5. Top assembly revision (see label on device)
6. Brief problem or question including a description of the host network environment
7. Attenuation data for applicable high-speed fiber links
8. Urgency of the issue

### 1.2. User Guides and Related Documents

Download Fiber Driver product documents from:

- [http://service.mrv.com/support/tech\\_docs/10](http://service.mrv.com/support/tech_docs/10)
- [ftp://ftp.mrv.com/pub/doc/manuals/Fiber Driver/](ftp://ftp.mrv.com/pub/doc/manuals/Fiber%20Driver/)

Release Notes are produced as needed for specific product revisions. MRV reserves the right to change products and documents without notice. The user assumes sole responsibility for application and use of products and information supplied.

### 1.3. FCC Notice

This equipment generates, uses, and can radiate radio frequency energy. This equipment is tested and complies with the limits for a Class A digital device in Part 15 of the FCC rules. These limits and product manuals provide protective guidelines to avoid communication interference for operation in a commercial environment. Users must correct interference when operating this equipment in a residential area. Use only shielded and grounded cables to ensure compliance with FCC rules. Changes and modifications not expressly approved by the manufacturer can void users' authority to operate the equipment.



## 1.4. Regulatory Compliance

Contact an MRV representative for additional details regarding specific MRV products.




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, REACH SVHC Directive, WEEE Directive: Wheelie Bin Mark; ETSI, NEBS, C-Tick

Media Cross Connect 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); RoHS Directive, REACH SVHC Directive, WEEE Directive: Wheelie Bin Mark; ETSI

Fiber Driver Modules: FCC Part 15 (Class A); IC (Class A); EMC Directive: Emission (Class A) and Immunity; LVD Directive: Electrical Safety; RoHS Directive, REACH SVHC Directive, WEEE Directive: Wheelie Bin Mark; ETSI, EN 60825-1:2007 (Safety of Laser Products)

Media Cross Connect Blades: FCC Part 15 (Class A); IC (Class A); EMC Directive: Emission (Class A) and Immunity; LVD Directive: Electrical Safety; RoHS Directive, REACH SVHC Directive, WEEE Directive: Wheelie Bin Mark

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, REACH SVHC Directive, WEEE Directive, ETSI, NEBS, EN 60825-1 (Safety of Laser Products), 21 CFR 1040.10 (except deviations noted in Laser Notice #50, 6/24/2007)

	<p>As a leading supplier of network equipment to carriers, service providers, and enterprise customers worldwide, the Quality Management System of MRV Chatsworth Product Division has been registered to ISO 9001.</p>
<p>ISO 14001</p>	<p>MRV Communications, Chatsworth Product Division has established, implemented, and properly maintains an environmental management system in accordance with the requirements of ISO 14001.</p>
	<p>The TUV CUE Marking is applied to the equipment certified by TUV Product Service. CUE is the acronym for TUV's 3-in-1 certification service, combining electrical safety certification for three of the most sought-after markets in the world: C=Canada (SCC), U=United States (NRTL), and E=Europe (EU Directives).</p>
	<p>The Wheelie Bin symbol refers to the WEEE Directive. Do not dispose of this equipment as unsorted municipal waste. Dispose of the equipment and its components as specified by all national laws and regulations.</p>

Preserve, protect, and improve the quality of the environment, protect human health, and use natural resources prudently and rationally.

## 1.5. International Regulations

### European Union

This equipment conforms with the provisions of EMC Directive 2004/108/EC (Class A) and Low Voltage Directive 2006/95/EC in the application of harmonized standards.

The "CE" marking of the CE Marking Directive is applied to MRV products.

Contact MRV's EU authorized representative (international@mrv.com) for routing information to return EU equipment for WEEE collection.

### Canada

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

### Australia and New Zealand



The C-tick mark is applied to equipment certified for compliance with EMC standards for Australia and New Zealand.








### China

#### 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		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
<p>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.</p> <p>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。</p> <p>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.</p> <p>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。</p>							

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









## 1.6. General Safety

	One person must not lift heavy devices alone. Lift with legs and a straight back to prevent injury. Use both hands, grasping underneath the lower edge only. Do not lift from the chassis power supply handles, interface processors, or plastic panels on the front of the chassis.
	Do not stack unsecured equipment that can cause damage or injury when falling.
	Stabilize the equipment and rack while mounting or servicing components by: <ul style="list-style-type: none"> <li>• Mounting devices from the bottom of an empty rack.</li> <li>• Mounting the heaviest rack devices at the bottom of the rack.</li> <li>• Installing rack stabilizing equipment before mounting or servicing rack devices.</li> </ul>
	While operating, secure all modules, cover empty slots, and plug lasers outputs.
	Proposition 65: Some MRV products may contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.
	Operate devices only in areas within the recommended ambient temperature range. Provide at least 3 inch (7.6 cm) of clearance around the ventilation openings for proper air flow.
	Only trained and qualified service personnel (IEC 60950-1) should install or service this equipment.

## 1.7. Electrical Safety

	Provide proper grounding to avoid ESD damage to components during service and operation. Use antistatic carriers to transport exposed electronic devices. Use protective clothing, grounding straps, antistatic furniture and surfaces, and any recommended devices.
	Use only shielded and grounded cables to comply with FCC rules.
	Electrical equipment relies on building installation safety devices for short-circuit, over-current, and earth (ground) fault protection. Ensure that these devices are properly rated to protect the equipment. Use a listed or certified fuse or circuit breaker on all current-carrying conductors.
	Install the equipment near the power source. The power cord plug must be always accessible as the main disconnecting device. Unplug the power cord before working on a system without an on/off switch.
	Disconnect all power sources before servicing equipment. Connect power cords to equipment before applying the power source.
	The equipment is not intended for direct copper connection to a public switched telephone network or telecommunication network (EU) connection ports.
	Install MRV equipment in accordance with applicable building and electrical codes such as: NFPA NEC 70, CEC, Part 1, CSA C22.1, IEC 60364, BS7671, etc.

## 1.8. Laser Safety

	Do not open laser devices for service. Removing the cover may cause exposure to harmful laser beams. Return defective laser devices to the vendor for service.
	Un-terminated connectors or fiber cable ends may emit invisible laser radiation. To avoid eye injury, do not view them within 100 mm or directly with optical instruments such as eye loupes, magnifiers, or microscopes. The amplified laser output can dramatically increase eye hazard.
	<p>This equipment is intended for use with Class 1 pluggable (SFP, SFP+, XFP, QSFP, GBIC) fiber optic transceivers with a label indicating the following specifications:</p> <ol style="list-style-type: none"> <li>1. Classification as a Class 1 Laser product</li> <li>2. Compliance with Food and Drugs Administration Center for Radiological Health (FDA CDRH) performance standards, 21 CFR 1040.10 (except deviations noted in Laser Notice #50, 6/24/2007)</li> <li>3. Certification from Nationally Recognized Testing Laboratory (NRTL), CSA, or TUV</li> </ol>
	Some fiber optics modules (EM316EDFA) may contain Class 1M levels of invisible laser radiation. Class 1M equipment must be installed in a restricted location that is accessible only to authorized personnel with laser safety training.
	<b>WARNING:</b> Laser products labeled as Class 1M may have internal laser diodes containing Class 3B lasers.
	<b>Caution:</b> use of controls, adjustments, or procedures not specified by the manufacturer may result in hazardous radiation exposure.
	 <div> <p>CLASS 1M Laser product Complies with 21 CFR 1040.10 and 1040.11</p> <p>INVISIBLE LASER RADIATION, DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS</p> </div>

## 1.9. Aggregated Power

Access to the fiber ends and connections constitutes potential risks with live laser transmissions. Although individual components may produce output within Class 1 parameters, some devices combine signals that collectively exceed Class 1 hazard level of 10 dBm. Measure all risk potentials for both skin and retinal hazards when working with equipment such as Fiber Driver WDM add/drop and multiplex/de-multiplex devices.

### IEC 60825-2, D.5.1 - Aggregated Wavelengths on a Fiber (excerpt)

When more than one wavelength is combined on the same fiber as in a WDM system, then the hazard level depends on aggregated power levels. Hazards are cumulative for common wavelengths used in optical communications.

Refer to the IEC document quoted above for more information on laser safety.

## 1.10. Input Thresholds

Receiver inputs are sensitive to power levels, particularly on small pluggable transceivers. Observe component thresholds for optimal operation, to avoid damage, and to maintain warranty support.

# Chapter 2. Network Managers

## *...introduction to the Linux-based network managers*

### 2.1. The EM316LNXNM Modules

The EM316LNXNM network managers control either the Fiber Driver (FD) or the Media Cross Connect (MCC) network platforms. The EM316LNXNM models are specifically configured for each product line, as shown below.

EM316LNXNM-OT	Fiber Driver manager (two SFP sockets and embedded MegaVisionJ GUI)
EM316LNXNM-MCC	MCC manager (no SFP sockets and embedded PathFinder GUI)

The MCC configuration is bundled and distributed as an integral part of each MCC chassis. The Fiber Driver configuration is ordered as a separate module to allow for many unmanaged and remotely managed CO/CPE applications. Default settings may work for many applications, but management allows customization to optimize installations or to use the powerful features of the MRV network devices. Examples and figures may show either module configuration, but management features are consistent between the modules except as stated.

### 2.2. Features

EM316LNXNM modules provide powerful and extensive tools for managing Fiber Driver and MCC systems. The management module firmware is based on a Linux kernel for security and extensibility.

- Local and remote administration interface for Fiber Driver and MCC platforms
- Linux-based onboard software for extensible, open-source configuration
- Serial port and IP network interface access with Telnet or SSH terminal services
- Native command line interface (CLI) and SNMP support
- Field upgrade support to expand software features with limited downtime
- Extensive management tools and environment controls for users, groups, and administration
- Custom graphical user interface (GUI) support with MegaVision
- PathFinder graphical user interface (GUI) support (MCC only)
- Application programming interface (API) for automated and scripted administration (MCC only)
- Additional SFP interface sockets for more network expansion (Fiber Driver only)
- Cluster Discovery Protocol for groups of managed systems (Fiber Driver only)
- Synchronization of commands with devices (**flush**) and software (**sync**)

## 2.3. Management Environments

The NM module provides a command line interface (CLI) management environment that is accessible locally through the RS-232 serial console port or remotely through the RJ-45 Ethernet port using SSH or Telnet protocols. The CLI environment and some of the available CLI commands are addressed in dedicated manual sections. Refer to EM316LNXNM command line help for specific command syntax and usage not included in this document.

The EM316LNXNM module also provides Simple Network Management Protocol (SNMP) support that allows control through any industry standard network management system (NMS). To maximize the graphical remote management control of MRV modules, MRV offers MegaVision® Pro. It is a powerful NMS with unique graphical user interfaces (GUI) for managed MRV network components including Fiber Driver and MCC. A limited version of MegaVision called “Configurator” is available for trial through <http://www.mrv.com>. Refer to MegaVision Pro documentation for more information on the benefits and options for graphical management.

The firmware of the EM316LNXNM module includes a graphical network manager: MegaVisionJ for Fiber Driver and PathFinder for MCC. Each graphical user interface (GUI) is accessible through a Java-enabled HTTP browser at the IP address configured on the module. The embedded GUI provides access to all the necessary management features available for one managed system only.

An Application Programming Interface (API) is available for customized automation and software control of managed systems. Refer to MRV technical support for details not included in this document.

# Chapter 3. Module Installation

## *...unpacking and installing hardware*

### 3.1. The EM316LNXNM Network Manager

The FD NM (EM316LNXNM-OT) is a standard Fiber Driver module that occupies one slot in a Fiber Driver chassis. It is not bundled with any chassis because network management is optional for some Fiber Driver platform solutions.

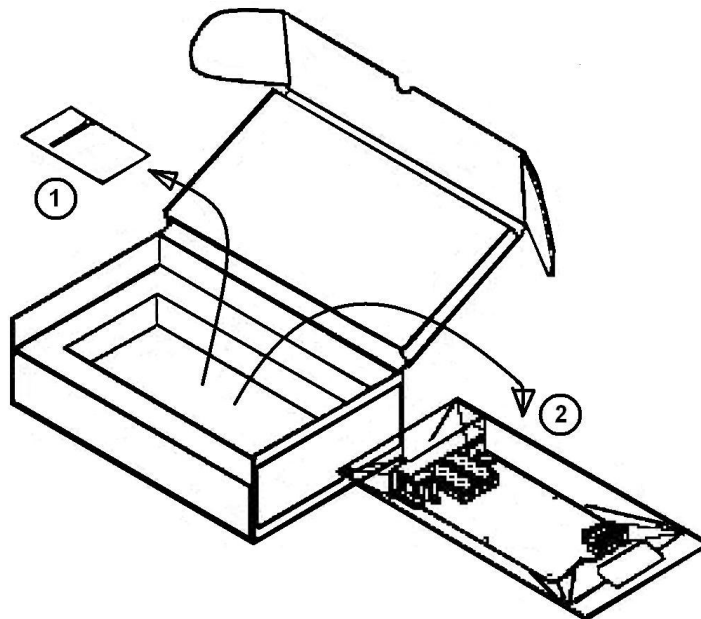
The appropriate MCC network manager model is bundled as part of each MCC modular chassis, but it is also available as a replacement or spare.

### 3.2. Unpacking the NM Module

This information is primarily for the FD NM that is sold independently, but the general information below can also apply to the spare MCC NM. Follow the steps below as illustrated in the figure.

1. Open the cardboard box.
2. Remove the static bag containing the device.
3. Check for additional accessories in the box that may move beneath the module tray during transit.

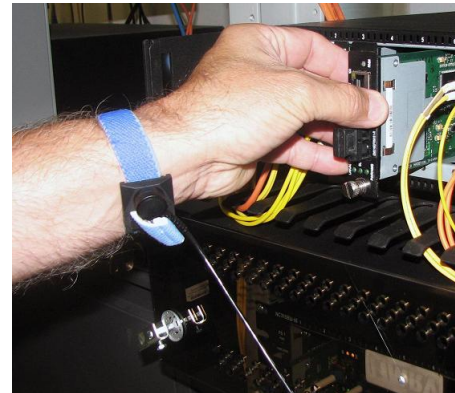
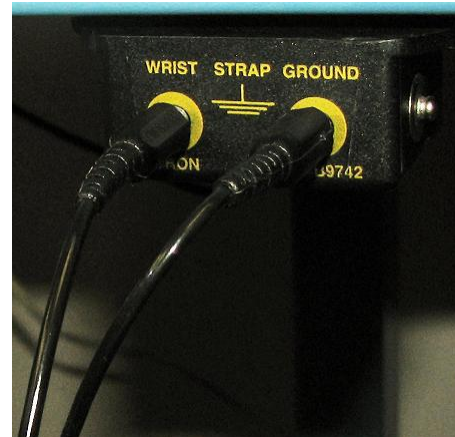
Contact your authorized MRV dealer or representative if any contents are missing or damaged during shipment. The EM316LNXNM-OT package includes a power cable and a serial data cable. If returning the unit becomes necessary, repackage all contents in the original container.



Unpacking a module

### 3.3. Module Handling and ESD

MRV delivers electronic devices in antistatic packaging to limit electrical damage during shipping. Avoid electrostatic discharge when unpacking and handling all electronic equipment. Use grounding straps and antistatic surfaces to minimize equipment damage. Some of these safety devices are pictured below.





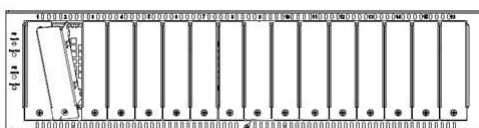
## 3.4. NM Module Installation

Fiber Driver modules including the FD NM are hot-swappable in a powered Fiber Driver chassis. A #1 Phillips and a 5.0 flat-tip screwdriver may be useful when working with Fiber Driver chassis and components.

If it does become necessary to handle the MCC NM, refer to the guidelines described below for the Fiber Driver NM with allowances for the illustrated Fiber Driver chassis examples.

Follow all guidelines to eliminate static electricity while handling the module and other electronic devices. Follow all safety suggestions in this manual and guidelines for all related equipment.

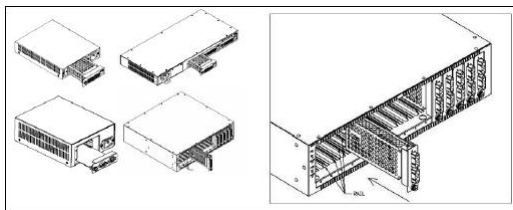
**Step 1** Remove the blank panel or old module from the target chassis slot. Unfasten the mounting screws with a 6-inch Phillips screwdriver, or disengage any thumb screws by hand.



Remove the required blank panels

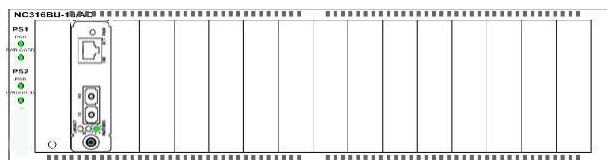
To comply with FCC regulations and for optimal cooling air flow, a cover panel or a module must cover every chassis slot. To limit external signals, no chassis slot should remain open when the unit is operational. Secure modules and panels with appropriate screws for grounding and further compliance.

**Step 2** Install the module into a Fiber Driver chassis by aligning the edge of the circuit board with the rail of the chassis. Tighten the thumbscrew by hand, and do not over-tighten.



Module installation (not all chassis are shown)

Handle modules by the edges to avoid damaging any components. Follow ESD precautions in this manual and electrical component guidelines. Push the module securely into the chassis slot your thumbs. 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.



Fiber Driver module installed in a powered chassis

## 3.5. Fiber Optic Transceivers Care


Optical devices use a variety of cables, connectors, transceivers, and other components that require special handling care.

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 degradation of signal quality that affect network performance or module functionality.

#### 3.5.1.1. Cleaning Supplies

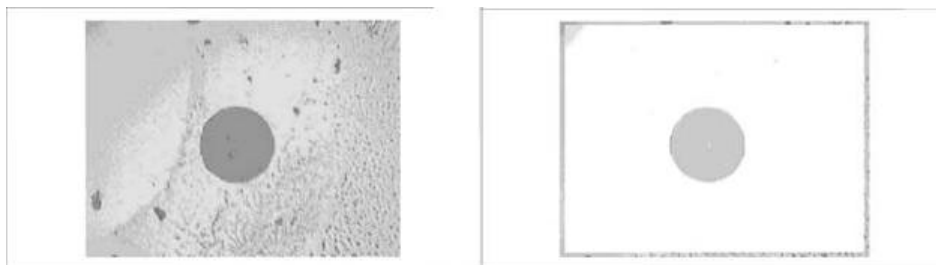
<ol style="list-style-type: none"><li>1. Optical cleaner cartridge</li><li>2. Can of compressed air</li></ol>	 <p>Cleaning cartridge</p>
---	--

#### 3.5.1.2. Cleaning Procedure

Follow the procedure below to clean optical transceivers before each cable installation.

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. Follow the cartridge instructions to clean the ends of the fibers.

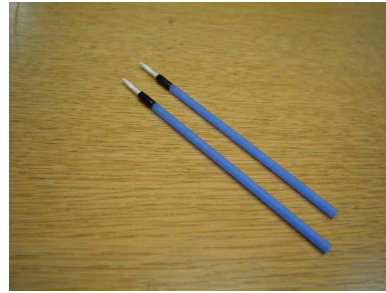
#### Fiber Inspection



Contaminated fiber and clean fiber through a scope

## 3.5.2. Working with Fiber Optic Transceivers

The pluggable optics modules used in the EM316xx products are extremely portable, and consequently may be easily mistreated. If optical transceivers have not been protected against dust, remove the dust caps and clean them with 1.25 millimeter cleaners.



Optical transceiver cleaners

### 3.5.2.1. Cleaning Fiber Optic Transceivers

Use the 1.25mm cleaners shown above and the steps below to clean optical transceivers.

1. Insert the 1.25mm cleaner into the optical transceivers
2. Turn  $\frac{1}{4}$  turn
3. Remove the 1.25mm cleaner and discard
4. Repeat the process

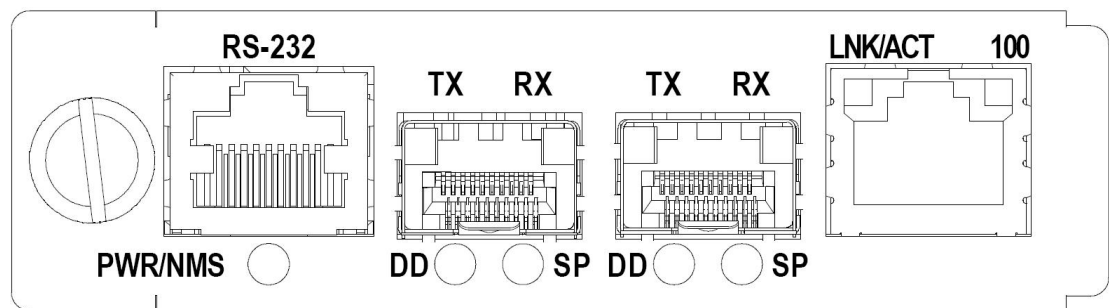
Install optical cables with as little fiber stress as possible. Stretching or bending optical fibers can damage them and affect performance.

# Chapter 4. EM316LNXNM Hardware

*...network manager ports and LEDs*

## 4.1. The EM316LNXNM Front Panels

The EM316LNXNM-OT front panel designed for Fiber Driver is shown below:



The EM316LNXNM-MCC designed for the MCC system is similar, but it has no SFP sockets.

Serial, Ethernet, and SFP ports are described in this section along with optical maintenance. The SFP port descriptions apply to the EM316LNXNM-OT module only.

## 4.2. Access Ports and Connectors

There are two RJ port connectors built into the EM316LNXNM front panel for serial and Ethernet access. The RS-232 port connects to a PC serial port for direct "out-of-band" secure access to the command line interface (CLI). The serial interface configuration is discussed later in this section. The Ethernet port opposite the serial port connects to an IP network for CLI and SNMP control.

The EM316LNXNM-OT includes two SFP sockets in addition to the two RJ ports. An SFP transceiver may be installed in each of these sockets for addition network connections. Refer to the transceiver documentation for connection information not covered in this document or appendices.

## 4.3. LED Legend

LED indicators built into the front panel of the EM316LNXNM module display operational status.

LED Label	Functional Description
PWR/NMS	Lights amber while booting and green when the module is operating
DD *	Lights green when the installed SFP Digital Diagnostics report good status or amber for error codes
SP *	Lights green when the installed SFP detects signal presence
LNK/ACT	Lights green when an Ethernet link is detected, and blinks for activity
100	Lights green for Ethernet link at 100 Mbps or amber for 10 Mbps

\* SFP ports and the associated LEDs are on the EM316LNXNM-OT module only.

## 4.4. Command Line Interface (CLI) Setup

The EM316LNXNM may be controlled through SNMP tools or through a command line interface (CLI). This manual deals primarily with the CLI, which may be accessed through either a serial or network connection.

### 4.4.1. Local Serial Console Setup

The EM316LNXNM RS-232 interface is used for secure "out-of-band" communications to the CLI. Use this serial interface for configuring the module to eliminate error sources from the network. Another advantage of the serial interface is "out-of-band" management that is entirely secure and does not compete with network traffic.

Connect one end of a serial cable (included parts listed below) to a terminal (or a PC terminal emulator) and the other end to the EM316LNXNM serial port.

**Table 4.1. RS-232 Serial Cables (current and previous versions)**

Cable Assembly	Part Number
Adapter Cable (current)	2012001-001R
Cable and adapter (previous)	151-3028 REV-F AI 04/04 and 350-0308 REV. B MRG/20028-2

Configure the terminal serial parameters with the following values:

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

### 4.4.2. Remote IP Setup

Besides local serial access, the EM316LNXNM also provides an Ethernet interface for remote administration. SFP transceivers may be installed in the EM316LNXNM-OT for additional network interfaces.

The factory default IP configuration for the RJ-45 Ethernet port is shown below:

IP Address - 192.168.14.201

Netmask - 255.255.255.0

The IP address and netmask above may be written as 192.168.14.201/24 (24-bit netmask).

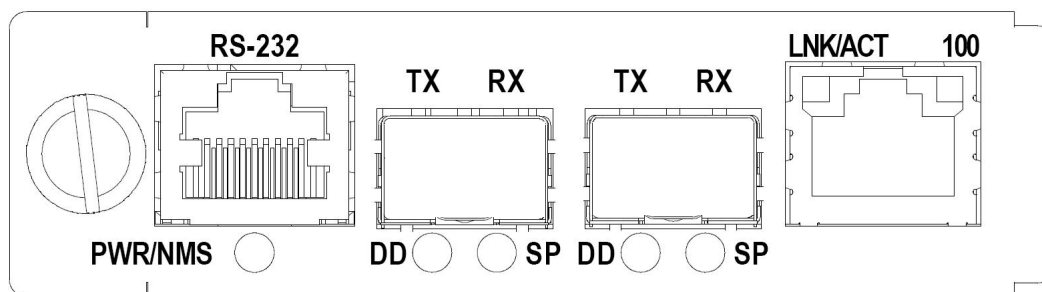
Without a gateway, the EM316LNXNM cannot respond to either CLI (Telnet/SSH) or SNMP requests beyond the subnet. For wider management access, consult your network administrator for an IP gateway within your subnet.

The EM316LNXNM supports SSH and Telnet. Use SSH (secure shell) from the network to the EM316LNXNM IP address to open a secure command line interface (CLI). Telnet services are disabled by default on the EM316LNXNM, but they may be enabled for additional CLI access.

# Chapter 5. Management Basics

## *...getting started with the EM316LNXNM-OT manager for Fiber Driver*

This chapter includes only Fiber Driver management features that are not specific to any device. Later chapters may introduce commands for specific Fiber Driver devices. Use the latest product revisions to ensure support for all features.



The EM316LNXNM (LNXNM) network management module provides monitoring and configuration access to a chassis and all installed manageable components. The EM316LNXNM-MCC module is integrated into the Media Cross Connect (MCC) chassis. Installing the EM316LNXNM-OT in any slot of a powered Fiber Driver multi-slot chassis is recommended for most applications. This chapter uses Fiber Driver examples to introduce the LNXNM basic concepts and commands that apply to both product platforms except where noted otherwise.

While the factory default device configurations may address some applications, network management is a powerful tool for proactive Fiber Driver administration and reduced operating expenses. The LNXNM provides monitoring and configuration access locally or remotely through the serial or Ethernet ports.

The LNXNM provides a command line interface (CLI) that is accessible either through a local serial console or from the IP network using SSH or Telnet. This section includes common CLI commands and management concepts. The display examples may vary slightly between LNXNM firmware versions. Refer to the CLI help commands in this chapter for complete command lists, options, and syntax.

The network management module also provides Simple Network Management Protocol (SNMP) support to allow control through any industry standard network management system (NMS). MRV's MegaVision Pro is a general purpose network management system with unique graphical support for MRV products including Fiber Driver. A limited version of MegaVision called "Configurator" is available for trial through the MRV website. Refer to <ftp://ftp.mrv.com/pub/software/megavision/> for the latest MegaVision software, documentation, and more product details. ResourceFinder is the powerful graphical system designed for MCC management in any application. MegaVisionJ is a compact graphical manager that is built into the EM316LNXNM-OT firmware to manage only a single chassis system. Access this interface from any standard Java-enabled web browser with an IP route to the LNXNM. Some GUI management windows are included later in this manual.

## 5.1. System Response Time

The EM316LNXNM-OT is part of a distributed architecture that uses polling, which can impact the response time of the system. The resulting command latencies should be considered during initial installation and testing as well as during operation.

The command process begins by sending a command to the LNXNM through the command line, API, or graphical interfaces.

There is a time lag before the requested action executes in the target line card. Use the **flush** command to complete outstanding action requests before continuing with dependent actions, especially in automated management.

There is another delay before the LNXNM reads the updated information back from the device to display the updates in the user interfaces such as the **show** command in the CLI. The Command latency depends on the type and quantity of modules managed in the chassis. LNXNM statistics collection from the modules for presentation to the user may take several seconds. The delay may be longer when collecting information from remotely managed Fiber Driver CPE modules. Use the **sync** command to complete all requested actions and allow the LNXNM to finish polling before continuing with dependent actions. The **sync** requires more processing time than **flush**, so it is most useful when managing through a manual interface such as the CLI or API.

Avoid rapidly plugging managed devices in and out to allow time for the EM316LNXNM-OT software to register modules, pluggable transceivers, and cables. Otherwise unexpected configuration and synchronization conflicts may result.



## 5.2. Command Line Console Setup

The LNXNM front panel includes an RS-232 serial port and an RJ-45 Ethernet port for management access, as described below. The Fiber Driver EM316LNXNM-OT model has two SFP ports for additional network access options.

### 5.2.1. Serial Console Connection

Use the serial connection for the initial system configuration and for secure "out-of-band" management. Connect the LNXNM RS-232 port to the PC or terminal with the serial cable (shown below) and power up the chassis.

Adapter Cable (current)	2012001-001R
Cable and adapter (previous)	151-3028 REV-F AI 04/04 and 350-0308 REV. B MRG/20028-2

Terminal Parameters:	<ul style="list-style-type: none"> <li>• 38400 baud</li> <li>• 8 data bits</li> <li>• 1 stop bit</li> <li>• no parity</li> <li>• no flow control</li> </ul>
----------------------	---

### 5.2.2. Network Console Connection

The EM316LNXNM-OT has an RJ-45 Ethernet port that is typically used to connect to a local area network (LAN). Use a standard Ethernet Cat-5e cable to connect between the LNXNM RJ-45 network port and a network switch or hub.

The LNXNM Fiber Driver model also includes two SFP ports on the front panel. MSA-compliant pluggable transceivers may be installed for additional network access options. Contact MRV sales or visit <http://www.mrv.com> for current SFP availability.

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.

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

## 5.3. LED Legend

LED indicators built into the front panel of the EM316LNXNM module display operational status.

PWR/NMS	Lights amber while booting and green when the module is operating
DD *	Lights green when the installed SFP Digital Diagnostics report good status or amber for error codes
SP *	Lights green when the installed SFP detects signal presence
LNK/ACT	Lights green when an Ethernet link is detected, and blinks for activity
100	Lights green for Ethernet link at 100 Mbps or amber for 10 Mbps

\* SFP ports and the associated LEDs are on the EM316LNXNM-OT module only.

## 5.4. Command Line Interface (CLI)

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

### 5.4.1. EM316LNXNM-OT Boot and Login

The box below shows the NM boot banner. *Do not interrupt this boot process.*

```
U-Boot 1.0.3.2 (Mar  5 2009 - 11:55:56)

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
Detecting flash layout:
.. no magic header
Detected extended flash layout!
### JFFS2 loading 'uImage.initrd' to 0x800000
Scanning JFFS2 FS:  . done.
#####
###                               lines omitted                               ###
#####
Verifying Checksum ... OK
Uncompressing Multi-File Image ... OK
Flash version 2
Image version 2 ... OK
Loading Ramdisk to 0373e000, end 03f71b15 (833b15)... OK

Welcome to MRV EM316LNXNM

FPGA 5c.18 Already Loaded.
Starting up, please wait

MRV EM316LNXNM

login:
```

*Use the default user "admin" with password "admin" to login, as shown below.*

```
login: admin
Password:
EM316LNXNM v4.7 fdr 17 (Aug 2 2011 - 14:02:31).
U-Boot 1.0.3.4 (Sep  1 2010 - 01:58:56).
Linux kernel v2.6.32.1-mrv (#1 Mon Dec 14 15:13:11 PST 2009).
EM316LNXNM (firmware 5c.1c) (00:20:1a:02:83:c8).
Copyright (c) MRV Corp. 1993-2010
You are a SUPER user!
fiberdriver#
```

## 5.4.2. Command Syntax

To execute a command at the command prompt, type the command followed by the parameters required in the syntax. Use online help to display the syntax for a command by entering the command followed by a "?". Using an incorrect number of parameters displays an error message with correct command syntax. <Up> and <Down> arrow keys display the history of commands entered during the current CLI session. The <Enter> key completes and executes each command entered.

The <Backspace> and <Delete> keys allow editing of entered commands before they are executed. Depending on the terminal type, <Delete> may act as a backspace rather than deleting the character at the cursor.

There are also several special keystrokes.

**Table 5.1. Special CLI Keystrokes**

Key	Function
<Enter>	Enter the command
<Up>	Previous command - in the history of commands
<Down>	Next command - in the history of commands
<^C> (Ctrl+C)	Cancel command
?	Context sensitive list of available commands and on-line help
!	Begin a comment. Any text after this to the end of the line is ignored
<Tab>	Command completion (see below)
<Tab><Tab>	Command completion (see below)

The <Tab> key completes partially entered commands. It searches the available CLI command list for commands that begin with the text entered so far on the command line. For a single match, the full command is completed and displayed. For multiple matches, the system beeps and displays as much text as is shared by all the commands that match the text entered. More text may be entered to narrow the command match selections, or you may press <Tab> again to list all the commands that match beginning of the command entered so far.

For example, suppose that the command line interface consisted only of the commands "telnet" and "terminal". If you type "t<Tab><Tab>", the system displays two commands: "telnet" and "terminal".

```
fiberdriver# t<Tab><Tab>
telnet terminal
fiberdriver# t
```

If you continue by typing "el<Tab>", then the system would complete the command "telnet".

Similarly, a command may be abbreviated by typing enough characters to make it unique. Using the example above, you could type "tel 192.168.2.237", and the CLI would execute "telnet 192.168.2.237" because no other command begins with "tel".

The CLI maintains a history list of commands that have been entered by the user. To move backward through this list, use <Up> key. To move forward, use <Down> key.

If you enter a command incorrectly, a message is displayed indicating the type of error that occurred. For example, typing a nonexistent command gives the following message:

```
fiberdriver# pn
% Unknown command 'pn'
fiberdriver#
```

If the command exists but the number of parameters is incorrect, the following message is displayed:

```
fiberdriver# ping
% Command incomplete.
fiberdriver#
```

Use the '?' command (entered alone on the command line) to display a list of available commands.

To see current state of the chassis, slot, and port, use the **show** command. To make changes to the configuration, enter the configuration context by typing "configure terminal".



After entering a command, there may be a delay of several seconds before the action displays in the "**show**" command.

### 5.4.2.1. Command Truncation

As with many operating environments, the CLI recognizes partial commands and arguments if enough of the character string is typed to make the word unique.

For example, **show version** may be shortened to **sho ver**.

If the truncated entry is not unique or does not match any valid CLI command string, an appropriate message is displayed.

### 5.4.2.2. Command History

A history of commands is maintained for each CLI login session. The "up-arrow" key moves backwards through the list from the most recent commands to the more distant ones. The "down-arrow" key moves forward through the list towards the most recent. A recovered command may be edited when it is visible on the command line.

The **show history** command displays the entire saved history of commands.

### 5.4.2.3. Command Argument Completion

When entering commands, specify all the parameters listed in the command syntax. The wrong number of command parameters may cause the command to fail, or worse, the command may cause unexpected results. Extra command line arguments are ignored while unspecified arguments retain previous attribute values. It is good practice to verify the expected command results using the **show** command. If results are not as expected, revert to default values or try the command again.

The box below shows an example command with all arguments specified:

```
fiberdriver(config)# aaa remote-server host 1 1.2.3.4 mySecret 1 2 3
fiberdriver(config)# show aaa remote-server hosts
aaa remote-server host 1 1.2.3.4 mySecret 1 2 3
```

The next box below shows the same command with too few arguments specified, which results in the final parameters keeping the values 1, 2, and 3 from the previous command.

```
fiberdriver(config)# aaa remote-server host 1 1.2.3.4 myNewSecret
fiberdriver(config)# show aaa remote-server hosts
aaa remote-server host 1 1.2.3.4 myNewSecret 1 2 3
```

### 5.4.2.4. Command Argument By Name

The unique descriptive name assigned to a chassis, slot, or port in the system may be used in place of the numbered hardware designation in most commands. Refer to the **description** command sections to set up a unique device name. These names can be used to make administration clearer with names that reflect location or function.

### 5.4.3. CLI Navigation

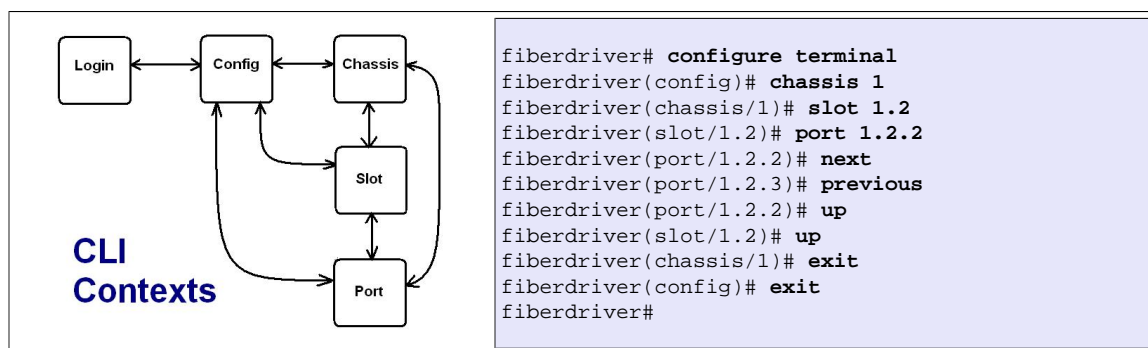
The CLI operates in five states that affect or determine the command availability and behavior. The CLI provides an organized system layout that the user follows with navigation tools to address actions toward specific system components.

At login, the CLI has a fixed set of available commands. This state alone determines the working "context" for the CLI command environment. This environment is referred to simply as the "login context".

There are also four configuration states: Config, Chassis, Slot, and Port. The Config (Configuration) state also has a fixed set of available commands, so the CLI environment is referred to as the "config context".

The available commands and resulting actions in the other three CLI states (Chassis, Slot, and Port) depend partially on the specific hardware component being accessed. These three states are roughly hierarchical, corresponding to the hardware represented; a chassis contains slots which contain ports. The CLI environment is in a similar operating state for chassis, for slots, or for ports, but the specific characteristics of each hardware component also affects the available commands. The hardware state (chassis, slot, or port) along with these individual component characteristics determines the command "context".

The default system prompt displays the active command context. The box below shows the state model and a command sequence traversing through the CLI environment. Notice how the prompt changes with each navigation command.



Enter the Config context with the **configure terminal** command. Return to the Login context with the **exit** command.

```
fiberdriver(config)# port 1.2.2
fiberdriver(port/1.2.2)# chassis 1
fiberdriver(chassis/1)#
```

The three hardware contexts follow a partly hierarchical structure that mirrors the physical device relationships. The chassis contains slots (modules) which in turn contain ports. Operations on the larger component often affect the components contained in the larger target device.

The **next** command is a short-cut for navigating to the following slot or port context. The **previous** command navigates in the reverse direction. The **up** navigates either from the port to the slot context or from the slot to the chassis context. Notice how the port value in the prompt changes in the box below.

```
fiberdriver(port/1.2.2)# next
fiberdriver(port/1.2.3)# previous
fiberdriver(port/1.2.3)# up
fiberdriver(slot/1.2)# up
fiberdriver(chassis/1)#
```

## 5.5. Login Context Commands and Examples

Commands in the Login context are generally for system status monitoring. Use the "?" and "list" commands at the **fiberdriver#** prompt to display the list of command line options.

### 5.5.1. "?" and "list"

? displays the commands available in the current context of the CLI. The box below shows the login context commands:

```
fiberdriver# ?
configure  Enter configuration context
cp         Copy files
echo       Display text for scripting
erase      Erase configuration or NVRAM
exit       Exit current context and go down to previous context
flush      Wait for changes to be flushed to hardware
list       Print command list
logout     Logout of the system
ls         List files
more       Display file
mv         Rename files
no         Negate a command
pager      Pause scrolling when screen is full
ping       Send ICMP echo messages to test network connectivity
quit       Exit current context and go down to previous context
restart    Reboot the NM card
rm         Remove files
scp        Use SCP to transfer files (small config files only)
show       Show running system information
sleep      Pause CLI for scripting
source     Read CLI commands from file
ssh        Open a SSH connection
sync       Wait for changes to be flushed to hardware / display
telnet     Open a TELNET connection
terminal   Set current terminal parameters
tftp       TFTP commands
upgrade    Upgrade software
who        Find out who is connected to the system
whoami     Who am I?
write      Write running configuration to memory or terminal
fiberdriver#
```

For more detailed syntax help, type **list <command>** to display all options for the specified command. If no command is specified, then it displays every valid command for the current context.

The "?" character may also be used on the command line after a valid command in the box above. The display shows the valid parameters that may be used following the specified command. If the given parameter does not complete the command line, then another "?" may be used to display the list of valid options for the next parameter on the command line.



## 5.5.2. "show"

The **show** command displays information about the target system component. Use the command line "?" (help character) to display command line syntax and parameters for the show command.

```

fiberdriver# show?
  show - Show running system information
fiberdriver# show ?
  C.S.P          - Display info for port P of slot S in chassis C
  NAME           - Display info for an element with the given name
  C              - Show info for a chassis
  C.S            - Show info for a slot
  aaa            - Show AAA (RADIUS/TACACS+) configuration
  chassis        - Show chassis list
  config         - Show administrative configuration for a location
  cos            - Show CoS configuration
  defaults       - Show default configuration for a location
  digital-diagnostics - Show Digital Diagnostics summary
  discovery      - L2 Discovery Protocol
  dscp           - Dscp Map
  firmware       - Show firmware info
  flows          - Show flow configuration
  groups         - Show group configuration
  history        - Display the session command history
  inventory      - Show information about every object in the system
  ip             - Show administrative IP status
  license        - Displays licensing information about this system
  log            - Show logging configuration and log entries
  map            - Display port map
  mapping-types  - Show mapping-type info
  memory         - Show memory usage
  ntp            - Show NTP configuration
  ntp-server     - NTP server configuration
  packages       - Show installed packages and versions
  permissions    - Show your permissions
  plugins        - Show Pluggable Optics (SFP/GBIC/XFP) summary
  ports          - Show port list
  proc           - Process information
  redundancy     - Show redundancy info
  rm             - Remotely manageable module version information
  running-config - Current operating configuration
  slot           - Show slot list
  slots          - Show slot list
  snmp-server    - Show SNMP server configuration
  startup-config - Contents of startup configuration
  statistics     - Show port info
  sys           - Show system information
  table          - Display a system table
  terminal       - Show local terminal information
  tftp           - Show tftp information
  unmapped       - Show unmapped ports
  user-class     - User class (debug, super, etc)
  users         - User accounts
  version        - Displays software version
  vid-map        - Show VID map
  warranty       - Displays information about the warranty for this system
fiberdriver#

```

The following examples use the **show** command with some possible command line parameters.

### 5.5.3. "show version"

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

```
fiberdriver# show version
EM316LNXNM v4.7 fdr 17 (Aug 2 2011 - 14:02:31).
U-Boot 1.0.3.4 (Sep 1 2010 - 01:58:56).
Linux kernel v2.6.32.1-mrv (#1 Mon Dec 14 15:13:11 PST 2009).
EM316LNXNM (firmware 5c.1c) (00:20:1a:02:83:c8).
Copyright (c) MRV Corp. 1993-2010
fiberdriver#
```

### 5.5.4. "show chassis"

The following box displays the configuration of a chassis:

```
fiberdriver# show chassis
Chassis  Model      Name      Number Of Slots  Temp(C)  Serian Num
=====  =====  =====  =====
1         NC316BU-16  Chassis 1 16          20        xxxxxxxxxx

fiberdriver#
```

## 5.5.5. "show slots"

The following example displays information about modules in the slots in a chassis:

```
fiberdriver# show slots
Slot  Model          Name                               Mac Address      Serial Num
=====
1.1    EM316LNXNM-OT      EM316LNXNM-OT at 1.1          00:20:1a:02:48:28  N/A
1.2    EM316T1E1-XY       Dual-converter-with-2-CPEs    N/A               030309EM1YAG
1.3    EM316-GSWXY-4      GSWXY FD Module              00:20:1a:12:12:34  032309EM1ZLM
1.5    EM316GSW-XY        EM316GSW-XY at 1.5           00:02:1a:08:08:08  N/A
1.7    EM316O3C/S1        EM316O3C at 1.7              N/A               N/A

fiberdriver#
```

## 5.5.6. "show ports"

The following example displays information about the available ports in a chassis:

```
fiberdriver# show ports
Port    Enable  Link          LIN      Speed    DDiags  WL(nm)  Name
=====
1.1.1    N/A     N/A           N/A      N/A      N/A     N/A     RS232 at 1.1.
1.1.2    enable  no Signal     N/A      100 Mbps N/A     N/A     SFP at 1.1.2
1.1.3    enable  no Signal     N/A      100 Mbps N/A     N/A     SFP at 1.1.3
1.1.4    enable  link          N/A      100 Mbps N/A     N/A     RJ-45 at 1.1.
1.2.1    enable  no Signal     enable   N/A      N/A     N/A     RJ48 at 1.2.1
1.2.2    enable  no Signal     enable   100 Mbps Alarm  850     SFP at 1.2.2
1.2.3    enable  no Signal     enable   100 Mbps Alarm  850     SFP at 1.2.3
1.2.4    enable  no Signal     enable   N/A      N/A     N/A     Tlport4
1.3.1    enable  no Signal     disable  10 Mbps  N/A     N/A     RJ-45 at 1.3.
1.3.2    enable  signal Detect disable  1 Gbps   Ok      850     GSWXY port 2
1.3.3    enable  signal Detect disable  1 Gbps   Ok      850     SFP at 1.3.3
1.3.4    enable  no Signal     disable  10 Mbps  N/A     N/A     RJ-45 at 1.3.
1.5.1    enable  no Signal     N/A      10 Mbps  N/A     N/A     RJ-45 at 1.5.
1.5.2    enable  signal Detect N/A      1 Gbps   Ok      850     SFP at 1.5.2
1.5.3    enable  signal Detect N/A      1 Gbps   Ok      850     SFP at 1.5.3
1.5.4    enable  no Signal     N/A      10 Mbps  N/A     N/A     RJ-45 at 1.5.
1.7.1    N/A     no Signal     N/A      N/A      N/A     N/A     2BNC at 1.7.1
1.7.2    N/A     no Signal     N/A      N/A      N/A     N/A     S1_DSC_SM at

fiberdriver#
```

## 5.5.7. "show log"

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

```
fiberdriver# show log
Running Level: warning
Nvram Level: disabled
Trap Level: warning
Remote Server: 0.0.0.0
Remote Level: notice
Debug Messages: disabled
fiberdriver#
```

## 5.5.8. "show groups" and "show users"

Management access is controlled through group and user permissions. Display the current system groups and users with the commands shown below.

```
fiberdriver# show groups
System group configuration:
group all write 1
group all write 2

Your configured permissions:
Read/Write Chassis: 1, 2
                    (From Group 'all')
fiberdriver#
```

```
fiberdriver# show users
username admin password encrypted $1$kQ2rIq/$0b8wFa2EW134TnN7wJ/ class super
username admin groups all
username debug password encrypted $1$NUIVuN/$sN7tmW5aoZG8ggT.I30 class debug
username debug groups all
fiberdriver#
```

## 5.5.9. "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 2011/08/15 12:05:55
!
!
! Configuration written by admin!
!
! EM316LNXNM v4.7 fdr 17 (Aug 2 2011 - 14:02:31).
! U-Boot 1.0.3.4 (Sep 1 2010 - 01:58:56).
! Linux kernel v2.6.32.1-mrv (#1 Mon Dec 14 15:13:11 PST 2009).
! EM316LNXNM (firmware 5c.1c) (00:20:1a:02:83:c8).
! Copyright (c) MRV Corp. 1993-2010
!
ip interface 192.168.14.201/24
snmp-server community write encrypted $1$wZCHI9/$6H3mce5Y15iLhtdpoXBoa1
snmp-server community read encrypted $1$hZyZkA1$xiJTxyGDfVb1bcAYyW9Wil
snmp-server sys name fiberdriver
ip interface dhcp
chassis 1 type NC316BU-16 rev 1
chassis 2 type VIRTUAL16
slot 1.1 type EM316LNXNM-OT rev 4
slot 1.2 type EM316-10G-XY rev 1
slot 1.3 type EM316E3 rev 8
slot 1.4 type EM316F rev 12
slot 2.2 type EM316EFRM rev 6
port 1.1.1 type RS232
port 1.1.2 type SFP
port 1.1.3 type SFP
port 1.1.4 type RJ-45
port 1.2.1 type SFP
port 1.2.2 type XFP
port 1.2.3 type XFP
username admin password encrypted $1$kQ2rIq/$0b8wFa2EW134Tn7wJ/ class super
username admin groups all
username debug password encrypted $1$NUIVuN/$sN7t87lmWZG8ggT.I30 class debug
username debug groups all
group all write 1
group all write 2
fiberdriver#
```

## 5.5.10. "show startup-config"

The show startup-config command displays the contents of the startup-config file, which 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 2005/01/01 00:22:42
!
!
! Configuration written by admin!
!
! EM316LNXNM v4.0 fdr 58 (Jul 25 2007 - 09:34:25).
! 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/$Ob8wFa2EWXC4TnN7wJ/ class super
username admin group all
username debug password encrypted $1$NUIVuN/$sN7t87lmWZG8ggT.I30 class debug
username debug group all
group all write 2
group all write 1
snmp-server community read encrypted $1$hZyZkA1$xiJTxyGDfVblbcAYyW9Wil
snmp-server community write encrypted $1$wZCHI9/$6H3mce5Y15iLhtdpoXBoa1
ip interface dhcp
snmp-server sys name fiberdriver
chassis 1 type NC316BU-16 rev 1
chassis 2 type VIRTUAL16
slot 1.1 type EM316LNXNM rev 4
slot 1.2 type EM316O3C rev 5
slot 1.3 type EM316E3 rev 8
slot 1.4 type EM316F rev 12
slot 2.2 type EM316EFRM rev 6
fiberdriver#
```

## 5.5.11. "show defaults"

The show defaults command displays the startup-config parameters for the specified system component.

```
fiberdriver# show defaults?
NAME      - Display info for an element with the given name
defaults  - Show default configuration for a location
fiberdriver# show defaults ?
C         - Chassis
C.S       - Slot
C.S.P    - Port
NAME      - Element
fiberdriver# show defaults 1
chassis 1
! temperature-limit 45
! temperature-min 5
! gen-trap link
! gen-trap chassis
! gen-trap loopback
! gen-trap slot-change
! gen-trap port
! gen-trap module-specific
! loopback-timeout 0
! description "Chassis 1"
! gen-trap lin
! gen-trap port-change
! gen-trap port-diags
! gen-trap switchover
fiberdriver#
```

## 5.5.12. "show config"

The "show config" command displays the operating parameters for the specified system component.

```
fiberdriver# show config?
NAME      - Display info for an element with the given name
config    - Show administrative configuration for a location
fiberdriver# show config ?
C         - Chassis
C.S       - Slot
C.S.P    - Port
NAME      - Element
fiberdriver# show config 1
chassis 1
! Configured parameters that override defaults:
! Configured parameters that match defaults:
! Parameters that will follow defaults:
! temperature-limit 45
! temperature-min 5
! gen-trap link
! gen-trap chassis
! gen-trap loopback
! gen-trap slot-change
! gen-trap port
! gen-trap module-specific
! loopback-timeout 0
! description "Chassis 1"
! gen-trap lin
! gen-trap port-change
! gen-trap port-diags
! gen-trap switchover
fiberdriver#
```

## 5.5.13. Displaying and Saving System Parameters

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

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

These commands display no output besides the prompt.

## 5.5.14. EM316LNXNM Hot-Swapping

Hot-swap settings are stored on each EM316LNXNM module. Stored startup values are read by the EM316LNXNM when the module restarts.

The EM316LNXNM may be removed from the chassis during operation and replaced with a spare that is configured the same as the original. Data flow may be affected while the manager is not available, but normal Fiber Driver operation resumes when the EM316LNXNM reboots in the system.

Not all line cards or settings support EM316LNXNM hot-swap. Modules that do not support hot-swap are reconfigured according to the "startup-config" file when the NM is booted, which can interrupt traffic. Settings that do not support EM316LNXNM hot-swap are reloaded from "startup-config". For example, port, slot, and chassis names cannot be read from the hardware, so the EM316LNXNM software uses these values as stored in the configuration file. To minimize impact from hot-swapping modules, it is very important to save changes made to the running configuration.

## 5.5.15. "flush" and "sync"

The **flush** command forces the system to wait for all previous commands to execute on the target device. This command assures that the target devices are in the desired operating state. This command is useful with automated management before any command that requires a known system state.

```
fiberdriver# flush
```

The **sync** command forces the system to wait for all previous commands to execute on the target device AND for the EM316LNXNM-OT to poll the system to update any changes in the status tables. This command assures that the target devices are in the desired operating state AND that the user interfaces correctly report the current status including changes. This command is useful with manual management before any command that reads system status and manageable parameters.

```
fiberdriver# sync
```



## 5.5.16. Network Testing: "ping"

The system's ping tool can be used to check the IP connectivity between the EM316LNXNM and any external device. Ping is an ICMP/IP utility that sends an echo request from one host to another and expects a reply from the remote host. The reply requests are answered if there is a logical network connection between the device and the destination. If there are no responses, either there is no connection or the IP configuration is not configured correctly on the device or at least one of the sending and receiving devices. If there are some responses and some timeouts, then there is likely an intermittent cabling problem.

Use the **ping** command to verify network connectivity between IP devices. Type the destination IP address in dotted decimal notation (e.g. 192.168.1.1).

Use <^C> (Ctrl+C) to stop the ping command in the EM316LNXNM CLI.

```
fiberdriver# ping 192.168.1.1
Press Ctrl-C to terminate.
PING 192.168.1.1 (192.168.1.1): 56 data bytes
64 bytes from 192.168.1.1: icmp_seq=0 ttl=20 time=5.5 ms
64 bytes from 192.168.1.1: icmp_seq=1 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=4 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=5 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=6 ttl=20 time=1.0 ms
64 bytes from 192.168.1.1: icmp_seq=7 ttl=20 time=1.1 ms <^C> (Ctrl+C)

--- 192.168.1.1 ping statistics ---
8 packets transmitted, 8 packets received, 0% packet loss
round-trip min/avg/max = 1.0/1.5/5.5 ms
fiberdriver#
```

## 5.5.17. IP Access

The EM316LNXNM-OT supports standard IP access tools for remote network monitoring and administration. HTTP, Telnet, and SSH operate as server and client services to connect a remote user with the Fiber Driver system manager. To use each protocol for management access, first verify that the server is enabled on the LNXNM to accept the connection request from the remote client.

The server setup commands are similar for each service. Configuring the LNXNM IP address, mask, and gateway is always the first step before using any network service. Set these parameters in the Configuration context with the IP commands shown below.

```
fiberdriver(config)# ip?
  ip - IP configuration
fiberdriver(config)# ip ?
  default-gateway - Set default gateway
  gratuitous-arp - Send broadcast gratuitous ARP when IP address changes or network
comes up
  interface - System interface configuration
  ssh-server - Enable ssh server
  tables - iptables configuration
  telnet-server - Enable TELNET server
  web-server - Enable web server
fiberdriver(config)#
```

Enable and disable the Telnet server with the commands:

```
fiberdriver# ip telnet-server
fiberdriver# no ip telnet-server
```

Enable and disable the SSH server with the commands:

```
fiberdriver# ip ssh-server
fiberdriver# no ip ssh-server
```

Enable and disable the HTTP (web) server with the commands:

```
fiberdriver# ip web-server
fiberdriver# no ip web-server
```

Use the **write file** command to apply the current configuration each time the EM316LNXNM-OT restarts.

When the IP parameters are configured and the server is enabled, then the EM316LNXNM-OT is ready to receive connection requests from corresponding remote clients.

The EM316LNXNM-OT also supports outward (client) Telnet and SSH connections. Telnet and SSH connections originating at the LNXNM require IP configuration, but servers may be disabled.

### 5.5.17.1. Server Ports

Telnet, SSH, and HTTP use ports 23, 22, and 80 by default. These default ports may be changed with the following commands:

```
fiberdriver# ip telnet-server port <1-65535>
fiberdriver# ip ssh-server port <1-65535>
fiberdriver# ip web-server port <1-65535>
```

### 5.5.17.2. Remote CLI: "Telnet"

Contact the EM316LNXNM-OT from a network workstation with the TCP/IP terminal interface "Telnet" client.

The CLI operates and appears the same as using the serial interface. For security, the Telnet server is disabled by default. Refer to the following section for more secure management access through secure shell (SSH).

Use the **open** command to open a user CLI session.

Use the **quit** command to exit the CLI and close the Telnet connection.

### 5.5.17.3. Secure Remote CLI: "SSH"

Contact the EM316LNXNM-OT from a network workstation with the TCP/IP terminal interface "SSH" client for secure management.

The CLI operates and appears the same as using the serial interface.

### 5.5.17.4. Graphical Web Access

The EM316LNXNM-OT includes an HTTP server for direct graphical management of a single Fiber Driver system. The HTTP (web) server is enabled by default.

Use a web browser (Internet Explorer, Firefox, etc.) from a network client to access the graphical HTTP server on the target Fiber Driver manager. Use the EM316LNXNM-OT IP address configured above in the address line to open the administration starting page.

## 5.5.18. Upload/Download: "tftp"

Trivial File Transfer Protocol (TFTP) transfers files to or from the network management (NM) module. The EM316LNXNM firmware includes a TFTP client that must be configured with an external TFTP server to send or receive files. The **tftp** command is available in the Login context of the CLI.

The **tftp** tool is intended for moving revision (\*.rev), source (\*.src), and configuration files. Once used, these files should be removed from LNXNM storage because onboard capacity is limited. Use the **ls** command to view the current files stored.

Use the **upgrade** command for firmware revision images. Files such as uImage.initrd that are too large can cause problems.

## 5.5.19. Configuration Scripts: "scp"

SCP copies files to or from the system with the security of authentication and encryption. SCP establishes an SSH connection to either send or receive files. SCP transfers can initiate only from the LNXNM. SCP transfers can't be initiated by an SCP client running on an external host. Use the "**scp**" command to start a file transfer.

To copy a file to the local system from a remote host (with IP Address 192.168.1.1, for example):

```
fiberdriver# scp localfile from user@192.168.1.1:remotefile
Password:
remotefile                               100% 1759      0.0KB/s   00:00
fiberdriver#
```

To copy a file from the local system to a remote host (with IP Address 192.168.1.1, for example):

```
fiberdriver# scp localfile to user@192.168.1.1:remotefile
The authenticity of host '192.168.1.1 (192.168.1.1)' can't be established.
RSA key fingerprint is 1f:e6:7f:7b:c2:56:2c:74:42:11:c7:a3:a6:f6:d0:05.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.1.1' (RSA) to the list of known hosts.
user@192.168.1.1's password:
localfile                               100% 1759      0.0KB/s   00:00
fiberdriver#
```

The **scp** tool is intended for moving revision (\*.rev), source (\*.src), and configuration files. Once used, these files should be removed from LNXNM storage because onboard capacity is limited. Use the **ls** command to view the current files stored.

Use the **upgrade** command for firmware revision images. Files such as uImage.initrd that are too large can cause problems.

## 5.5.20. Custom Scripts

Write CLI scripts using any text editor and then, using TFTP or SCP, transfer the files to the device to run them. Provide an external TFTP or SCP server. For improved security, the EM316LNXNM system does not include an onboard TFTP or SCP server. However, it does provide TFTP and SCP clients.

### 5.5.20.1. Moving Files

Using the "**sys tftp-host-ip 10.1.1.1**" command, set up the IP address of the external TFTP server. The "**tftp get**" and "**upgrade**" commands use the address (10.1.1.1) if it is not specified in the command itself.

Use the "**tftp get script.txt**" command to transfer the script file to the device. If the command does not specify a TFTP server using "**sys tftp-host-ip**", or if you wish to use a different server than the one specified by **tftp-host-ip**, use the "**tftp get 10.1.1.2 script.txt**" command.

```
fiberdriver# con t
fiberdriver(config)# sys tftp-host-ip 10.1.1.1
fiberdriver(config)# exit
fiberdriver# tftp get script.txt
Fetching script.txt from 10.1.1.1...
Copying...
fiberdriver#
```

Alternately, use the steps described in "[SCP](#)".

Unix-like commands **ls**, **mv**, and **rm** are available to operate on those files.

```
fiberdriver# ls
...
-rw-rw----  1 admin    config      12 Mar 29 11:58 script.txt
...
fiberdriver# mv script.txt script2.txt
fiberdriver# ls
...
-rw-rw----  1 admin    config      12 Mar 29 11:58 script2.txt
...
fiberdriver# rm script2.txt
fiberdriver# ls
-rw-----  1 root      config      668 Sep  2  2005 ssh_host_dsa_key
-rw-r--r--  1 root      config      606 Sep  2  2005 ssh_host_dsa_key.pub
-rw-----  1 root      config      531 Sep  2  2005 ssh_host_key
-rw-----  1 root      config      335 Sep  2  2005 ssh_host_key.pub
-rw-----  1 root      config      883 Sep  2  2005 ssh_host_rsa_key
-rw-r--r--  1 root      config      226 Sep  2  2005 ssh_host_rsa_key.pub
-rw-r-----  1 root      config     1734 Mar 29 09:30 startup-config
-rw-r-----  1 root      config     1708 Mar 20 13:19 startup-config.sav
fiberdriver#
```

### 5.5.20.2. Executing Scripts (source)

Use the "**ls**" command to verify that the script is loaded in the LNXNM. Type "**source script.txt**" to execute the CLI commands in the named script file.

Example script.txt:

```
port 1.1.1
description port 1
```

Loading and running script.txt:

```
fiberdriver# tftp get script.txt
Fetching script.txt from 10.1.1.19...
Copying...
fiberdriver# show 1.1.1
Port: 1.1.1
Name: RS232 at 1.1.1

Enable: enable

Connector: cu Db9

fiberdriver# source script.txt
fiberdriver# show 1.1.1
Port: 1.1.1
Name: port 1

Enable: enable

Connector: cu Db9

fiberdriver#
```

### 5.5.20.3. Restoring a Saved Configuration

Beginning with EM316LNXNM-OT v4.5, the "**source**" command does not process script command lines that reset default values. Previous versions simply processed each script line sequentially. Contact customer support if scripts behave differently after upgrading EM316LNXNM-OT versions.

To return a module configuration to a specific saved state, follow the steps below.

#### *Save Configuration*

1. Use the "**write file**" command to save the module configuration
2. Note the module hardware settings (necessary for most recent Fiber Driver products)

#### *Restore Configuration*

1. Set module hardware to the setting when the configuration was saved (recent Fiber Driver modules)
2. Use the "**default all**" command to configure default settings (hardware-dependent in recent Fiber Driver modules)
3. Use the "**sync**" command to wait for all defaults to reset
4. Use the "**source [config-file]**" command to restore the non-default system configuration

## 5.5.21. LNXNM Firmware Upgrades



Use the **"write file"** command to make sure that the "startup-config" file is current and matches the running configuration.

Backup the "startup-config" file by using the **"tftp put A.B.C.D startup-config remote-file-name"** command, where A.B.C.D is the address of your external TFTP server. A backup makes it easier to go back to the previous software version if you have problems with the new software. See ["Firmware: Upgrade"](#) for more information.

When the system software is working properly, upgrade process is simplest with a TFTP server on a PC. Setup the external TFTP server and use **upgrade** command to update the EM316LNXNM software. This "upgrade" command may run for a minute or more. If not specified, the **upgrade** command retrieves the file "uImage.initrd" by default. If security is important, then use **upgrade scp**, where "scp" means 'Secure Copy'.

```
fiberdriver# upgrade 169.254.192.116 uImage.initrd
Fetching uImage.initrd from 169.254.192.116...
```

Use SCP to upgrade the system with the command:

```
fiberdriver# upgrade scp user@10.1.120.16 filename
fetching filename ...
Password:
filename                               100% 4978KB 551.0KB/s   00:08

Erasing Flash: Erased!

Writing image: Software updated!
all done!
fiberdriver#
```

SSH uses RSA keys, which the system may not know at the time of executing an SSH command. Therefore, the system may ask you to acknowledge the authenticity of any host being contacted the first time. Also, the Linux NM does *not* have a DNS client, so you must use an actual IP Address (e.g. 192.168.1.1) for SSH remote hosts.

To restart the system, use one of the following commands:

- To re-start the LNXNM and all line cards, reload firmware and configuration settings as show below.

```
fiberdriver# restart cold
Waiting for processes..ok
Restarting system
```

- To re-start the LNXNM but not reload firmware or configuration settings:

```
fiberdriver# restart warm
Waiting for processes..ok
Restarting system

MRV EM316LNXNM

login:
```

- To re-start the LNXNM and reload firmware only, but not reload configuration:

```
fiberdriver# restart upgrade  
Waiting for processes..ok  
Restarting system
```

If the EM316LNXNM does not start after an upgrade process, the normal boot process can be interrupted to download a valid "uImage.initrd" file from a TFTP server. See the "[Recovering from a failed 'upgrade' command](#)" section in the Troubleshooting chapter.

## 5.5.22. LNXNM Firmware Downgrades

Before *upgrading* the system software, always make a backup of the current "startup-config" file. This backup may be used to *downgrade* the EM316LNXNM to this previous version of software, if necessary.

To back up the current startup-config file:

```
fiberdriver# write file  
Building configuration file...  
OK, saved to startup-config  
fiberdriver# tftp put 10.1.1.15 startup-config saved-startup-config  
putting startup-config ...  
TFTP finished!  
fiberdriver#
```

See "[Firmware: Upgrade](#)" for more information.



## Procedure 5.1. Downgrading LNXNM software

Configure the TFTP server with the required files. Required files should include current LNXNM software (uImage.initrd), old LNXNM software (old-uImage.initrd), and old startup-config file (old-startup-config).

### 1. Load the current version of software

Skip this step if you are already running the current version of the software.

```
fiberdriver# upgrade
Erasing Flash: Erased!

Writing image: Software updated!
all done!
fiberdriver#
```

### 2. Restore the previous version of "startup-config"

To be sure that your "startup-config" file contains commands compatible with the older version of software, restore the "startup-config" file with the working copy before upgrading. Use the **tftp get** command:

```
fiberdriver# tftp get 10.1.1.15 old-startup-config startup-config
Fetching old-startup-config from 10.1.1.15...
Copying...
fiberdriver#
```

Do not execute **write file** after restoring the "startup-config" from old-startup-config. That command would overwrite the newly restored "startup-config".

### 3. Load old version of software

Follow the same steps used in the ["Firmware: Upgrade"](#) section to downgrade your NM card to the desired version of software.

```
fiberdriver# upgrade 10.1.1.15 old-uImage.initrd
fetching old-uImage.initrd ...

Erasing Flash: Erased!

Writing image: Software updated!
all done!
fiberdriver#
```

### 4. Reboot!

Use the **restart upgrade** command to reset the NM card and reload the operating software without interrupting module (or blade) function. Note that "restart upgrade" is equivalent to LNXNM [hot-swap](#).

```
fiberdriver# restart upgrade
Waiting for processes..ok
Restarting system
```

# Chapter 6. Configuration Context

## *...LNXNM environment setup in the CLI*

The configuration context is used to set up system and environment parameters. For a list of commands available in this (or any) context, type "?" after the command prompt.

```
fiberdriver(config)# ?
aaa                Remote authentication/authorization/accounting
chassis            Configure a chassis
default            Restore parameter(s) to defaults
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
firmware           Onboard firmware manipulation
flush              Wait for changes to be flushed to hardware
foreach            Execute a command on a set of objects
group              Group configuration
ip                 IP Configuration
list               Print command list
log                Logging configuration
logout             Logout of the system
map                Configure port map
no                 Negate a command
ntp                Enable NTP
ntp-server         NTP server configuration
pager             Pause scrolling when screen is full
port               Configure a port
quit               Exit current context and go down to previous context
scp                Use SCP to transfer files (small config files only)
show               Show running system information
sleep              Pause CLI for scripting
slot               Configure a slot
snmp-server        SNMP server configuration
sync               Wait for changes to be flushed to hardware / display
sys                System configuration
terminal           Set current terminal parameters
username           User account management
who                Find out who is connected to the system
whoami             Who am I?
write              Write running configuration to memory or terminal
fiberdriver(config)#
```

Use the **list** command to display all the complete commands available.

The "?" character may also be used on the command line after a valid command in the box above. The display shows the valid parameters that may be used following the specified command. If the given parameter does not complete the command line, then another "?" may be used to display the list of valid options for the next parameter on the command line.

## 6.1. Storage of Configuration Parameters

The device has a Non-Volatile RAM (NVRAM) to store configuration parameters. The "startup-config" file contains device configuration parameters. This file is simple text, readable with any text editor. It contains a list of the CLI commands required to bring the box from the known default condition to the desired running condition.



The manager does not automatically save the current running configuration. Use the "**write file**" command to save current parameters to the "startup-config" file and use them when the system restarts.

## 6.2. 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.

```
fiberdriver(config)# default?
  default  Restore parameter(s) to defaults
fiberdriver(config)# default ?
C          Chassis
C.S        Slot
C.S.P      Port
aaa        Remote authentication/authorization/accounting
ip          IP Configuration
log         Logging configuration
ntp         Restore ntp to its default state
snmp-server SNMP server configuration
sys        System configuration
fiberdriver(config)# default 1
Restored defaults for 1.
Removed configuration for 1.

fiberdriver(config)#
```

## 6.3. Configuring System Parameters

Enter "configuration" mode, as shown below, to configure the system parameters. The prompt changes to reflect the current command context.

```
fiberdriver# configure terminal
```

Commands are completed with the -CR- or -Enter- key, which does not display or print.

Change the SUPER user password using the 'username' command.

```
fiberdriver(config)# username admin password -new password-
```

Set IP address and netmask information using the following command:

```
fiberdriver(config)# ip interface 192.168.88.114/24
```

The IP address (192.168.88.114) and netmask (255.255.255.0) above are examples only. Use IP parameters appropriate for your network.

Set specific gateway information using the following command:

```
fiberdriver(config)# ip default gateway 192.168.88.1
```

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

```
fiberdriver(config)# 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 SNMPv1 and SNMPv2c community names are "**public**" for read and "**private**" for write. You can reset the SNMP community strings using the "**snmp-server community**" command. SNMPv3 configuration information is provided later in this manual.

```
fiberdriver(config)# snmp-server community read readsecret  
fiberdriver(config)# snmp-server community write writeseecret  
fiberdriver(config)#
```

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.

## 6.4. Dynamic IP (DHCP)

The EM316LNXNM-OT supports Dynamic Host Control Protocol (DHCP) for convenient IP configuration. The DHCP client automatically requests IP configuration values from a local DHCP server. These values are applied when the LNXNM boots, and may change if the IP connection resets.

The box below shows the syntax help for the **ip** command in the config context.

```
fiberdriver(config)# ip ?
  default-gateway - Set default gateway
  gratuitous-arp   - Send broadcast gratuitous ARP when IP address changes or network
comes up
  interface        - System interface configuration
  ssh-server       - Enable ssh server
  tables           - iptables configuration
  telnet-server    - Enable TELNET server
  web-server       - Enable web server
fiberdriver(config)# ip interface ?
  A.B.C.D - IP address
  A.B.C.D/M - IP address/prefix length
  dhcp    - Enable DHCP
  update  - Apply administrative interface configuration to operational
vlan-id   - Set 802.1q VLAN ID (0 to disable). Will not take effect until next cold-
restart
fiberdriver(config)# ip interface dhcp ?
  <cr>
  >   - Redirect output to a file
  >>  - Append output to file
fiberdriver(config)#
```

Use the **ip interface dhcp** command to enable automatic IP addressing.

```
fiberdriver# ip interface dhcp
```

Use the **no ip interface dhcp** command to disable automatic IP addressing.

```
fiberdriver# no ip interface dhcp
```

Use the **show ip interface** command to display the IP network settings.

```
fiberdriver# show ip interface
Desired IP Interface Configuration:
DHCP enabled
Internet Address: 192.168.72.72
Netmask: 255.255.255.0
Broadcast: 192.168.72.255
Default Gateway: 192.168.73.73
802.1q VLAN ID: unconfigured

Actual IP Interface Configuration:
DHCP enabled, lease time: 1209600 seconds, server ID: 192.168.11.21
Internet Address: 192.168.12.105
Netmask: 255.255.255.0
Broadcast: 192.168.12.255
Default Gateway: 192.168.12.1
802.1q VLAN ID: unconfigured

fiberdriver#
```

With DHCP enabled, changes applied to IP parameters display in the "Desired" section at the top of the display. DHCP manages the "Actual" IP interface configuration until it is disabled. Desired IP interface configuration is applied when DHCP is disabled.

For IP parameter configurations not discussed in this manual, consult the local network administrator. Misconfigured IP parameters can interrupt network communication and services.

## 6.5. Configuring the Prompt

The default login prompt for the EM316LNXNM is:

```
fiberdriver#
```

There are two ways to change the EM316LNXNM prompt string:

1. CLI command
2. SNMP sysName SNMP object (OID .1.3.6.1.2.1.1.5) - see SNMP section

From the CLI configuration prompt, use the command below to change the CLI prompt string:

```
fiberdriver(config)# snmp-server sys name someprompt  
someprompt(config)#
```

The prompt cannot include the characters "#", "\$", "(", or ")". The CLI prompt maximum length is 40 characters. Additional characters in the new prompt string are ignored. The SNMP sysName string limit is 255 characters, but only the first 40 characters are displayed.

The command "**default snmp-server sys name**" returns the prompt to the default, as shown below:

```
OLD-PROMPT(config)# default snmp-server sys name  
fiberdriver(config)#
```

## 6.6. Editing the Login Banner

Unless changed, you will see the following banner when you login to the LNXNM:

```
MRV EM316LNXNM
login:
```

The box above shows the default EM316LNXNM login banner. The banner may be changed, and can contain up to 256 characters including newline. There are two ways to change the LNXNM Banner: by single command or interactively.

### *Single Command*

Use the command below from the configuration prompt to change the EM316LNXNM prompt. STRING is the new banner text to apply. If you want to insert a tab Use the "\t" sequence to insert a tab within the string. Use the "\n" sequence to insert a newline within the string.

```
fiberdriver(config)# sys login-banner STRING
fiberdriver(config)#
```

For example, "**sys login-bannner First Line \n Second Line**" displays the following on login:

```
First Line
Second Line login:
```

### *Interactive Changes*

Use the command command below from the configuration prompt to enter the EM316LNXNM prompt editor. Next, type the exact banner text you wish to use. Start a new line with the <Enter> key. End the banner entry with a new line containing only "." followed by <Enter>, or a new line with only <^D> (Ctrl+D).

```
fiberdriver(config)# sys login-banner
Enter banner (. or ^D alone on a new line to end):
> This is my login banner.
> This is the second line of my login banner.
> .
done!
fiberdriver(config)#
```



*Removing the LNXNM banner*

Use the "**no sys login-banner**" command from the configuration prompt to delete the banner. Only "login:" displays when the EM316LNXNM session starts.

*Returning the LNXNM banner to default*

From the configuration prompt, use the command "**default sys login-banner**." The default banner string is at the beginning of this section.

*Displaying the current LNXNM banner*

Use the "**show sys login-banner**" command from the configuration prompt to display the literal banner text, as shown below:

```
fiberdriver(config)# show sys login-banner
Login Banner: \nMRV EM316LNXNM\n\n
fiberdriver(config)#
```

The following characters may be used in the banner editor: **0-9, A-Z, a-z, <Tab>**, or one of **!"#\$%&'()\*+,-./:;<=>?@[\\]^\_`{|}~**". All other characters are converted to "?".

## 6.7. Users, Classes, Groups, and Access

User accounts include a username, a password, and an access class that determines the commands available to each user. The three access classes and general permissions are:

Class	Permissions
Super	Full access to all commands
Normal	Access to non-sensitive show/config commands
View	Access to non-sensitive show commands

"Non-sensitive" commands cannot have a fatal impact on managing the system and cannot reveal sensitive information such as passwords and community strings.

"Super" access allows users to add, remove, or change access to user accounts.

Change the active user in a CLI session by using logging out and logging back into the CLI with the other username and password.

A Super class user does not need to know the password of a user to change or delete the account. If a Normal or View user forgets his password, a Super user can set a new password for the user by using the **"user password"** command. Passwords must have *strong* security. (See ["Password Strength"](#) below.) The factory default Super user account is "admin" with the default password "admin", which is the only exception to the password strength rules.



Remember the super user password when it changes, and safely record it in a secure location.

## 6.7.1. Adding and Removing Users

Create separate users and groups for better administrative security. Each user account includes a username, a password, and an access class. The only factory default user account is "admin", with password "admin" and class "Super".

Other users may be added and managed from any account in the "Super" class. The account access class determines the commands available to each user.

Use the "**username**" command to create a user:

```
fiberdriver(config)# username jsmith password goodfella2 class normal
```

Use the "**no username**" command to remove a user:

```
fiberdriver(config)# no username jsmith
```

The CLI help display below gives the command description. The "list" command shows all the command line options.

```
fiberdriver(config)# username?
  username - User account management
fiberdriver(config)# username ?
  NAME - User name
fiberdriver(config)# list username
  username NAME
  username NAME class (debug|view|normal|super)
  username NAME group NAME
  username NAME groups WORD
  username NAME password
  username NAME password PASS
  username NAME password PASS class (debug|view|normal|super)
  username NAME password class (debug|view|normal|super)
  username NAME password encrypted PASS
  username NAME password encrypted PASS class (debug|view|normal|super)
fiberdriver(config)#
```

Use the "?" after any portion of an incomplete command to display the options for the next argument on the command line.

User name rules:

- must be 1 to 32 characters long
- must start with the following characters: a-z or \_
- must only contain the following characters: a-z, 0-9, -, or \_

Group name rules:

- must be 1 to 16 characters long
- must start with the following characters: a-z or \_
- must only contain (except for the one exception below) the following characters: a-z, 0-9, -, or \_
- may end with the following character: \$

There must always be at least one SUPER class user configured in the system. If there is only one SUPER class user on the system, it cannot be deleted. Even the built-in "admin" user may be deleted if another SUPER user is added first.

The example below adds a new user "david2" with the password "david2pw".

```
fiberdriver(config)# username david2 password david2pw
fiberdriver(config)#
fiberdriver(config)#
fiberdriver(config)# show users
username admin password encrypted $1$kQ2rIq/$0b8wFa235XC4TnN7wJ/ class super
username admin groups all
username david2 password encrypted $1$ER4TU/7.$m/4mcdXw1OjM/LVEHW.
fiberdriver(config)#
```

The system does not automatically save configurations to permanent storage. Use the write file command to save a configuration before restarting the system. Unsaved changes are lost, including new user accounts!

## 6.7.2. Password Strength

Descriptive error messages give helpful information when a password does not meet the system requirements. Passwords created must meet be:

- at least 6 characters long
- at least one alphabetic character
- at least one non-alphabetic character

The commands below remove and re-apply the password strength restrictions above.

```
fiberdriver(config)# no sys password-strength-checking
fiberdriver(config)#
fiberdriver(config)# sys password-strength-checking
```

## 6.7.3. Protecting Passwords

The most recent commands entered in a CLI session may be viewed by using "**show history**". If passwords are typed as part of a command line, then these passwords are visible in the command history log. Log out of CLI sessions after password changes are made to clear the command history.

```
fiberdriver(config)# username foouser password foouser1 class super
fiberdriver(config)# show history
configure terminal
username foouser password foouser1 class super
fiberdriver(config)# logout
```

Another way to hide displayed passwords is by using commands that prompt for separate password input. When the passwords are entered interactively as in the example below, the system does not display or save them in the command history.

```
fiberdriver(config)# username foouser password
Password:          - Password not echoed to screen
Again:             - Password not echoed to screen
fiberdriver(config)# username foouser class super
fiberdriver(config)# show history
configure terminal
username foouser password
username foouser class super
fiberdriver(config)#
```

Some CLI commands (like the ones listed below) include passwords in their syntax. Most of these commands have alternative syntax that prompt for passwords interactively and hide them from the display and history.

- fiberdriver(config)# **snmp-server community read**
- fiberdriver(config)# **snmp-server community write**
- fiberdriver(config)# **snmp-server user foouser**
- fiberdriver(config)# **username foouser**
- fiberdriver(config)# **username foouser password**

## 6.7.4. Groups

Limiting the privileges of users increases system security and integrity. User classes provides a very general measure of security. Groups provide more specific control over two types of user permissions:

1. *Port/Slot/Chassis Control*

...which Fiber Driver components can each set of users manage

2. *Login Access*

...which user interfaces each set of users is allowed to login through:

- console
- telnet
- ssh
- api
- gui

These interface permissions may be granted all together using the keyword "all", or they may be denied together using the keyword "none".

The default group "all" has full access to all system resources.

## 6.7.5. Port/Slot/Chassis Control

The CLI controls user access to Fiber Driver components through group permissions. Each group is assigned read, read/write, or no access to each manageable component in the system. A user can be a member of any or all the available groups. The one factory default group, called "**all**", has read/write access to all possible ports. The "**admin**" username is assigned to group "**all**", so this user can access and change the configuration of any port on the system.

To add a user to a group (from "configuration" context):

```
fiberdriver(config)# username USERNAME group GROUPNAME
fiberdriver(config)#
```

To remove a user from a group:

```
fiberdriver(config)# no username USERNAME group GROUPNAME
fiberdriver(config)#
```

To configure the READ port membership of a group:

```
fiberdriver(config)# group GROUPNAME read 1.1.1
fiberdriver(config)#
```

To remove that access privilege:

```
fiberdriver(config)# no group GROUPNAME read 1.1.1
fiberdriver(config)#
```

Similar commands exist for read/write access rights. Use "**write**" instead of "**read**" in the above commands. The system checks chassis, slot, and port access rights on each command. If a user has permission to manage a system component through a "chassis", "slot", or "port" access configuration, then the user can access the component. Read and read/write access rights are stored separately. Each port, slot, or chassis read or write access must be allowed through a specific component access right.

For example, consider the following sequence of commands:

```
fiberdriver(config)# username guest group read-group
fiberdriver(config)# username guest group guest-group
fiberdriver(config)# username admin group write-group
fiberdriver(config)# group read-group read 1
fiberdriver(config)# group guest-group write 1.1
fiberdriver(config)# group guest-group write 1.2.1
fiberdriver(config)# group write-group write 1
fiberdriver(config)#
```

This will allow "admin" full read/write access to every port on the chassis. User "guest" will be able to read every port on the chassis, and will also be able to configure ports on slot 1.1, and will be able to configure port 1.2.1, but will not be able to configure any other port.

## 6.7.6. Login Access

User groups may be used to restrict access to the various interfaces to the management system. There are five interfaces supported by the EM316LNXNM manager:

- Console
- SSH
- Telnet
- API
- GUI

A group may be granted or denied permission to use each of these management interfaces. By default, new groups (and users) have no access restrictions. For convenience, all these access permissions may be granted or denied together with the two key words below:

- any
- none

The screen shot below shows the CLI help ("?",) display for a group called "b":

```
fiberdriver(config)# group b access ?
any  Enable access via any service
api  Enable api service access
console Enable console service access
gui  Enable pathfinder service access
none Remove access via any services
ssh  Enable ssh service access
telnet Enable telnet service access
fiberdriver(config)#
```

Group permissions may be added or removed by any SUPER user. Each user account is denied access to an interface only if no associated group allows that access. If a user belongs to two groups and one of those groups allows API access, for example, then the user can access management through the API.

The commands below add, remove, and reset access privileges for the specified "GROUP":

group GROUP access (any none console telnet ssh api)
no group GROUP access (any console telnet ssh api)
default group GROUP access

Each interface access may be restricted to some or all groups. If a group with SUPER class members is assigned no ("none") access, those SUPER class members are granted FULL ("any") access to all interfaces. This exception protects against possibly locking out SUPER class control from the system, but it may be opposite from the intended effect for any SUPER class users in a fully restricted group. Note a SUPER class user may be restricted from SOME interfaces, but not from ALL interfaces.



## 6.7.7. Access by Address

The Linux kernel in the network manager (NM) supports the standard **iptables** command. Access to the NM may be granted or denied based on IPv4 or MAC addresses through packet filtering and network address translation (NAT).

The **ip tables** command is complex with many command line arguments. The command syntax options are listed below. Refer to online documentation (e.g. <http://www.netfilter.org>) for more information.

- **ip tables** **-[AD]** chain rule-specification [options]
- **ip tables** **-I** chain [rulenum] rule-specification [options]
- **ip tables** **-R** chain rulenum rule-specification [options]
- **ip tables** **-D** chain rulenum [options]
- **ip tables** **-[LFZ]** [chain] [options]
- **ip tables** **-N** chain
- **ip tables** **-X** [chain]
- **ip tables** **-P** chain target [options]
- **ip tables** **-E** old-chain-name new-chain-name

By default, access is open to all IP and MAC addresses.

To return **iptables** to the default configuration, type **default ip tables**.

To display the **iptables** configuration, type **show ip tables**.

## 6.7.8. Forcing User Logouts

Super class users can force logout of a user currently logged into the system. There are two situations to address.

First, a particular connection may be locked or another user may require access from that location. A Super user can end the session of the user currently connected at that point without affecting other connections. Use the "**who**" command to find the process identification (PID) number for the command argument.

Disconnect a specific session or sessions:

```
sys disconnect pid PID
```

Second, a rogue user may be logged into the system through multiple connections. All connections belonging to this user can be terminated by a Super user.

Disconnect a user's session(s):

```
sys disconnect user USER
```

Disconnecting a specified user's sessions can be also be limited to an access interface type listed below:

COMMAND	FUNCTION
sys disconnect user USER api	Disconnect user from all API sessions
sys disconnect user USER console	Disconnect user from serial console
sys disconnect user USER ssh	Disconnect user from all ssh sessions
sys disconnect user USER telnet	Disconnect user from all telnet sessions
sys disconnect user USER gui	Disconnect user from all gui sessions

## 6.8. EM316LNXXNM Reboot

There are three commands to reboot the EM316LNXXNM:

- **"restart upgrade"**
- **"restart warm"**
- **"restart cold"**

The **"restart warm"** command restarts the current version of the software. The EM316LNXXNM will not reconfigure line cards that support hot-swap.

The **"restart upgrade"** simulates unplugging and re-plugging the EM316LNXXNM in the chassis. It reloads the software from flash memory, but it does not reconfigure modules that support hot-swap. Ensure that the running configuration and the **"startup-config"** remain synchronized after the restart is completed by running **"write file"** before using the **"restart upgrade"**.

The **"restart cold"** simulates a power cycle to the entire chassis. The EM316LNXXNM reloads its software from flash, and it reconfigures all modules according to **startup-config**. Use this command to ensure that the configuration in **"startup-config"** is applied to the hardware.

## 6.9. Configuration Backup and Restoration

Once the device is configured with proper parameters, backup the configuration file on a remote tftp-server. Use **"tftp put"** to make a copy of the **"startup-config"** file on a remote tftp-server. If necessary, restore the **"startup-config"** on the same EM316LNXXNM or a replacement card. Use **"tftp get"** to copy **"startup-config"** from the external tftp-server on to the EM316LNXXNM. Use a different chassis (even a 1-slot chassis) to restore EM316LNXXNM system settings to avoid the risk of disturbing the traffic flow in the target chassis.

Make sure that the right **"startup-config"** is programmed into the replacement EM316LNXXNM. Then, unplug the old EM316LNXXNM from the live chassis and replace it with the new EM316LNXXNM (hot-swap). The swap will not disturb the traffic flow through the other modules in the chassis.

## 6.10. Module Replacement and Type-Locking

By default, there are no restrictions between slots in a system chassis for slot devices (modules or blades) that are supported by the chassis. Once configured for a specific application, use the following command to restrict each slot in the Fiber Driver chassis to allow only the currently installed device type.

```
fiberdriver# configure terminal
fiberdriver(config)# sys lock-types
fiberdriver(config)#
```

Once locked by the command above, each system slot will initialize only the associated device type. To return to the default state, unlock all slots in the chassis with the command below:

```
fiberdriver# configure terminal
fiberdriver(config)# no sys lock-types
fiberdriver(config)#
```

To unlock only one slot in the chassis and install any supported device into that slot, use the command below in the target slot context:

```
fiberdriver(slot/1.s)# clear-type
fiberdriver(slot/1.s)#
```

When removing and inserting slot devices in a chassis, the LNXNM uses the following initialization rules:

- With type-locking enabled, a slot device may be replaced only with the same device type; the system rejects any other device type in the same slot. The "**clear-type**" command releases the slot as if it was not previously occupied. The "**no sys lock-types**" command releases all the slot type restrictions.
- When type-locking is disabled, a slot device may be replaced with any supported device type. The system discards any previous module configuration, and it initializes the new card to its default settings.
- When replacing a slot device with the same type in the same slot, the LNXNM manager initializes the new device with the current saved configuration for that slot. Type-locking does not matter, in this case.
- If a slot has never been occupied, then the LNXNM initializes a newly installed module to its default settings. If type-locking is enabled, the slot restricts future replacement devices to the installed type.

Configuration commands for hardware that is not yet installed allows setup of slot devices before plugging them in. Any configuration may be entered, but options that are not supported by the new device are dropped. Only the applicable commands are used to initialize the new device.

The running configuration may also include information for devices that have been removed from the system. Saving this information is very useful when replacing the old device with the same model. If the previous module configuration is no longer needed in a slot, the administrator can remove the slot entries from the **show running-config** display by using the "**clear-type**" command in the target slot context.

## 6.11. Restoring Parameters (Restart / Hot-Swap)

When the managed system is booted, the management module (EM316LNXXNM) reads the 'startup-config' file into its memory area called the configuration storage layer (CSL). These stored parameters form the starting point for the running configuration of the application modules in the system.

Next, the EM316LNXXNM sequentially interacts with each manageable application module installed in the system.

If the module was not previously configured, then the EM316LNXXNM writes the corresponding CSL values into the module configuration. This module is marked as 'configured' for the next boot sequence and the stored parameters will take precedence over the CSL values. The EM316LNXXNM then looks for the next installed module until all the manageable modules in the chassis are configured.

If the module was previously configured, then the EM316LNXXNM tries to read the operating parameter values from the module. The EM316LNXXNM stores configuration values successfully read from each module into the CSL, overwriting the corresponding values read from the 'startup-config' file.. If a value is not readable, then the EM316LNXXNM uses the value already stored in the CSL without overwriting the values in the module. The EM316LNXXNM then looks for the next installed module until all the manageable modules in the chassis are configured.

The above process is very reliable, but an operational anomaly could cause the EM316LNXXNM to read a previously configured module as unconfigured. Such a reading anomaly would cause the EM316LNXXNM to overwrite the module configuration with the CSL values. This theoretical situation is suggested only as a reminder to back up system configurations and to document critical parameter values.

## 6.12. Message Logging

The EM316LNXNM can display log messages on a CLI terminal, send syslog messages, and send SNMP traps in response to certain conditions detected by the system. The default parameters configure these message logging options for the most common applications.

To change the default setting for displaying log messages to a CLI user, use the "**log level running**" command shown below.

```
fiberdriver(config)# log level running info
fiberdriver(config)# show log
Running Level: info
Nvram Level: disabled
Trap Level: warning
Email Level: disabled
Remote Server: 0.0.0.0
Remote Level: memo
fiberdriver(config)#
```

To specify the remote syslog server address, use the "**log remote-server**" command. To change the remote syslog message level, use the "**log level remote**" command.

```
fiberdriver(config)# log remote-server 192.168.11.20
fiberdriver(config)# log level remote info
fiberdriver(config)# show log
Running Level: info
Nvram Level: disabled
Trap Level: warning
Email Level: disabled
Remote Server: 192.168.11.20
Remote Level: info
```

To stop sending messages to the remote syslog server, use the "**no log remote-server**" command or the "**no log level remote**" command.

```
fiberdriver(config)# no log remote-server
fiberdriver(config)# no log level remote
fiberdriver(config)# show log
Running Level: info
Nvram Level: disabled
Trap Level: warning
Email Level: disabled
Remote Server: 0.0.0.0
Remote Level: disabled
fiberdriver(config)#
```

An event can trigger an SNMP trap to one or more remote SNMP managers. A network administrator can receive immediate notification of these events through a manager GUI like MegaVision™. Specify the SNMP trap manager address with the "**snmp-server host**" command. Change the default setting for trap message level with the "**log level trap**" command.

```
fiberdriver(config)# snmp-server host 169.254.1.100
fiberdriver(config)# snmp-server host 169.254.1.101
fiberdriver(config)# show snmp-server hosts
snmp-server host 169.254.1.100 public warning
snmp-server host 169.254.1.101 public warning

fiberdriver(config)# log level trap error
fiberdriver(config)# show log
Running Level: info
Nvram Level: disabled
Trap Level: error
Email Level: disabled
Remote Server: 0.0.0.0
Remote Level: memo
fiberdriver(config)#
```

The LNXNM can also use onboard NVRAM to store log messages. Change the log message storage from default to NVRAM with the **log level nvram** command. To preserve the limited space, use the NVRAM logs only as needed for troubleshooting. The manager deletes the oldest messages to make room for new messages. To reduce NVRAM usage, set thresholds to log only messages above desired importance level from "fatal" down to "memo". For best operation, disable the log with the **no log level nvram** command when all problems are resolved.

```
fiberdriver(config)# log level nvram error
fiberdriver(config)# show log
Running Level: info
Nvram Level: error
Trap Level: error
Email Level: disabled
Remote Server: 0.0.0.0
Remote Level: memo
fiberdriver(config)#
```

## 6.13. Audit Logging

The audit log is a history of changes made in the Fiber Driver system by users. Each change creates an entry that includes the log level, a time stamp, the OID of the object changed, the ID of the user, and the new value of the changed object. All audit log messages have a level of "info".

The audit log messages may be displayed on the monitor (running log) or routed to syslog. An example of a typical audit log message is shown below:

```
fdrd[119]|kern|   info|Oct 15 15:25:10 1.2.3: cli user admin  
set nbsCmmcPortName to newName
```

SNMPv1 and SNMPv2 messages do not include a user name because they use only community strings for identification.

Toggle the audit log on and off with the following commands in the Config context:

```
fiberdriver(config)# sys audit-log
```

```
fiberdriver(config)# no sys audit-log
```

The syslog must be configured to receive "info" level messages to record the audit log messages.



# Chapter 7. Managing Fiber Driver Devices

## *...managing the Fiber Driver components: chassis, slots, and ports*

The EM316LNXNM-OT provides management access to Fiber Driver hardware components: chassis, slots, and ports. Factory configurations may work for some applications, but network management is highly recommended. Many applications require interactive configuration access provided by the LNXNM module. Fiber Driver network management provides proactive administration and reduced operating expenses.

The LNXNM provides a command line interface (CLI) that is accessible either through the secure serial port or the Ethernet port. The Ethernet port supports SSH or Telnet connections. SSH provides greater administrative security. The Telnet server is disabled by default to improve security.

## 7.1. Hardware Contexts

Hardware contexts (chassis, slot, and port) are dependent on the modular components installed in the managed Fiber Driver system. Refer to device-specific documents for individual command details. Use the '?' command line help key to display available options in any context. The hardware contexts are arranged hierarchically under the configuration context for CLI navigation, as described earlier.

## 7.1.1. Chassis Context

Commands typed at the chassis context prompt without a specified target apply to the entire managed chassis system. In some cases, a command may also apply to all slots and ports included within the chassis. Display the commands available in this context by typing '?' at the prompt, as shown in the example below.

```
fiberdriver(chassis/1)# ?
chassis          Configure a chassis
clear-counters   Clear counters for all ports in this 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
loopback-timeout Adjust loopback timeout
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 running system information
sleep          Pause CLI for scripting
slot           Configure a slot
sync           Wait for changes to be flushed to hardware / display
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)#
```

## 7.1.2. Slot Context

Commnads typed at the slot context prompt without a specified target apply only to the slot specified in the prompt. In some cases, a command may also apply to all ports included within the module. Display commands available in this context by typing '?' at the prompt.

Slot context command options can vary depending on the module addressed. The example display below shows commands available for a Fiber Driver module.

```
fiberdriver(slot/1.4)# ?
chassis      Configure a chassis
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
show        Show running system information
sleep       Pause CLI for scripting
slot        Configure a slot
sync        Wait for changes to be flushed to hardware / display
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/1.4)#
```

## 7.1.3. Port Context

Commnads typed at the port context prompt without a specified target apply only to the individual port specified in the prompt. Display commands available in this context by typing '?' at the prompt.

Port context command options can vary depending on the slot and port type addressed. The example below shows commands available for one type of port.

```
fiberdriver(port/1.4.1)# ?
chassis      Configure a chassis
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 running system information
sleep        Pause CLI for scripting
slot         Configure a slot
sync         Wait for changes to be flushed to hardware / display
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)#
```

## 7.1.4. Device Descriptions

The "**description**" command sets a descriptive name for a chassis, slot, or port. Use the "**show**" command to verify device changes. For example, the following command changes the device name from "chassis 1" to "myFDchass":

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



After entering a command, there may be a delay of several seconds before the action displays in the "**show**" command.

The next command changes a slot description:

```
fiberdriver(config)# slot 1.1
fiberdriver(slot/1.1)# description myslot1.1
fiberdriver(slot/1.1)# exit
fiberdriver(config)#
```

The next command changes a port description:

```
fiberdriver(config)# port 1.1.1
fiberdriver(port/1.1.1)# description myport1.1.1
fiberdriver(port/1.1.1)# exit
fiberdriver(config)#
```

Chassis names are restricted to nine (9) characters.

Slot and port names are restricted to fifty (50) characters.

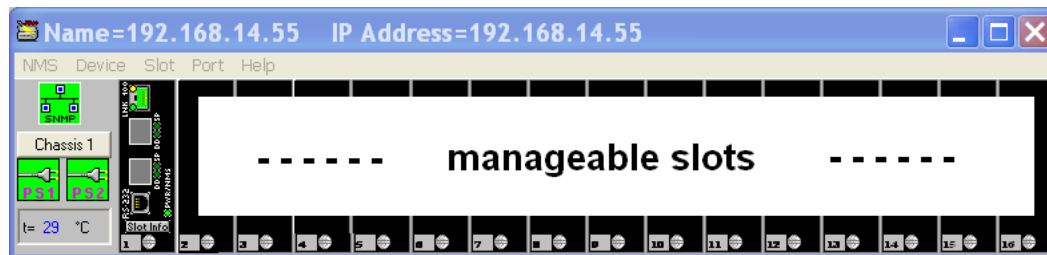
Device descriptions must be unique within the managed system. Duplicate names produce an error message.

Device descriptions cannot "look like" device hardware descriptors (e.g. "1", "1.3", or "1.4.12"). Any name with the form (integer)[.(integer)[.(integer)]] produces an error message, even if an integer is out of range for a chassis, slot, or port in the system.

## 7.2. MegaVision Graphical Management

MegaVision is a general purpose graphical user interface (GUI) for network management with special graphical extensions for MRV networking devices including Fiber Driver. There are several MegaVision variants including a free download (Configurator), an embedded version in the EM316LNXNM-OT firmware, and the full network version (MegaVision Pro). The GUI is extensive and powerful; visit <ftp://ftp.mrv.com/pub/software/megavision> for information and downloads. Contact MRV sales or support for purchasing and technical questions.

MegaVision presents the administrative controls with a realistic representation of the device. Each Fiber Driver system is controlled by a window that looks like the target physical device. Open the desired network node by double-clicking the icon from the main map window of the MegaVision interface. If the node is a Fiber Driver system, a control window representing the specific chassis model appears. The example below shows the MegaVision control windows for a generic Fiber Driver chassis with a EM316LNXNM-OT in slot 1. There is no restriction between specific slots and hosted devices, so the manager can operate from any available slot in the chassis.



Display chassis details below by clicking the "Chassis 1" button at the left edge of the window.

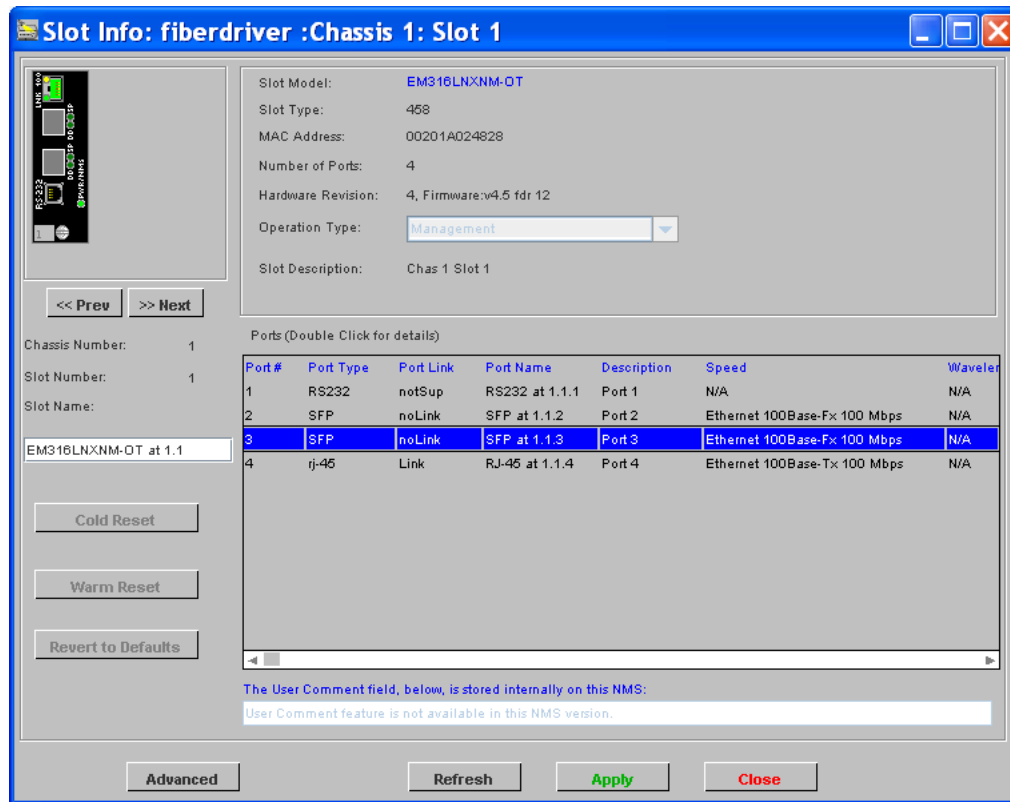
The image shows a software window titled "Chassis Info: 192.168.14.55 : Chassis 1". The window contains several sections of information:

- General Information:**
  - Chassis Name: Chassis 1
  - Hardware Version: 1
  - Chassis Type: 16-Slot Chassis
  - Number of Slots: 16
  - Chassis Model: NC316BU-16
  - Serial #: N/A
- Power and Fan Status:**
  - Power Supply 1 Status: dc-good
  - Power Supply 2 Status: dc-good
  - Fan 1 Status: Good
  - Fan 2 Status: Good
  - Fan 3 Status: Good
  - Fan 4 Status: notSupported
- Temperature Settings:**
  - Temperature: 29 (degrees Celsius)
  - Temperature upper limit: 55 (degrees Celsius)
  - Temperature lower limit: 5 (degrees Celsius)
- Loopback Settings:**
  - Loopback timeout: 30 (min; 0 means forever)
- Traps and Diagnostics:**
  - ☐ Enable AutoReset?
  - ☐ Reset All Modules?
  - ☒ Enable Chassis Status Traps?
  - ☒ Enable Slot Inserted/Removed Traps?
  - ☒ Enable Module Specific Traps?
  - ☒ Enable Port Inserted/Removed Traps?
  - ☒ Enable Port En/Disab Traps?
  - ☒ Enable Port Loopback Traps?
  - ☒ Enable Port LIN Traps?
  - ☒ Enable Link ON/OFF Traps?
  - ☒ Enable Digital Diagnostic Traps?
  - ☒ Enable Switchover Traps?

At the bottom of the window are "Ok" and "Cancel" buttons.

In the example above, the EM316LNXNM-OT resides in the first chassis slot. Open the slot and port management windows by clicking on the corresponding parts of the image in the chassis control window.

Click on the module front panel or the 'slot info' button to open a module control window like the example shown below. The module control window provides access to slot-level manager commands. The example below shows the EM316LNXNM-OT module itself.



Open the port-level management windows by clicking on the picture of the port in the chassis control window. The parameters, options, and data presented in the window is specific to the port selected. Port operational statistics are reported, and specific port capabilities may be accessed from this window.



The port window examples below show the serial and Ethernet ports on an EM316LNXNM-OT module.

**Port Info: fiberdriver :Chassis 1 : Slot 1 : Port 1**

Chassis: 1	Chassis 1	Link	notSupported
Slot: 1	EM316LNXNM-OT at 1.1	RxActivity	notSupported
Port: 1	RS232 at 1.1.1	TxActivity	notSupported
Interface #:	101001	ErrorActivity	notSupported
Port Type:	RS232	CollisionActivity	notSupported
Description:	Port 1	Enable LoopBack?	N/A
Wavelength:	N/A	Port Enabled?	<input type="checkbox"/> Desired <input type="checkbox"/> Actual
Connector:	DB9	LIN Function?	notSupported
Medium:	notSupported	Redundancy	Not Supported
AutoNegotiation	notSupported		
Duplex	notSupported		
Speed	Unknown		
Aging?	notSupported		
Max Packet Size?	notSupported		
Flow Control?	notSupported		

The User Comment field, below, is stored internally on this NMS:  
User Comment feature is not available in this NMS version.

LinkUp/LinkDown Email Recipients (comma-separated, no spaces):  
Email Notification is not available in this NMS version.

This port is monitored in the following service(s):  
Service Monitoring is not available in this NMS version.

Advanced Refresh Apply Close

**Port Info: fiberdriver :Chassis 1 : Slot 1 : Port 4**

Chassis: 1	Chassis 1	Link	Link
Slot: 1	EM316LNXNM-OT at 1.1	RxActivity	notSupported
Port: 4	RJ-45 at 1.1.4	TxActivity	notSupported
Interface #:	101004	ErrorActivity	notSupported
Port Type:	RJ-45	CollisionActivity	notSupported
Description:	Port 4	Enable LoopBack?	N/A
Wavelength:	N/A	Port Enabled?	<input checked="" type="checkbox"/> Desired <input checked="" type="checkbox"/> Actual
Connector:	RJ45	LIN Function?	notSupported
Medium:	twistedPair	Redundancy	Not Supported
AutoNegotiation	on		
Duplex	full		
Speed	100Mbps		
Aging?	notSupported		
Max Packet Size?	notSupported		
Flow Control?	notSupported		

Protocol / Bit Rate Selection

Select from List Desired: N/A Actual: Ethernet 100Base-Tx 100 Mbps

The User Comment field, below, is stored internally on this NMS:  
User Comment feature is not available in this NMS version.

LinkUp/LinkDown Email Recipients (comma-separated, no spaces):  
Email Notification is not available in this NMS version.

This port is monitored in the following service(s):  
Service Monitoring is not available in this NMS version.

Advanced Refresh Apply Close

Statistics Graphs

Per Interface Per Counter

Interface Usage

# Chapter 8. Foreach

*...apply a command sequentially to a list of target components*

The "**foreach**" command applies a command sequentially to each component in a specified set of components. If a specified target component does not support the desired command, an error message is generated and the command is applied to the next specified component. Each specified target component that does not support the desired command generates an error message, and the system applies the command to the next specified component. Ports on the network manager module also generate errors.

The component set is designated by individual components or ranges for chassis, slot, and port. The "\*" wildcard character may be used to match any existing component ordinal within the command "**LOC**" syntax. The command syntax is described in more detail below.

The "**foreach**" command is available in the configuration context, as show below in the interactive CLI help display:

```
fiberdriver# configure terminal
fiberdriver(config)# foreach?
  foreach - Execute a command on a set of objects
fiberdriver(config)# foreach ?
  LOC - Range of locations, Ex. 1.2-4,9.* or 1.*.3,4, etc.
fiberdriver(config)#
```

The box below shows an example of the **foreach** command:

```
fiberdriver(config)# foreach 1.*.* shutdown
Executing 'shutdown' for '1.1.1'
Executing 'shutdown' for '1.1.2'
Executing 'shutdown' for '1.2.1'
Executing 'shutdown' for '1.2.2'
Executing 'shutdown' for '1.3.1'
Executing 'shutdown' for '1.3.2'
Executing 'shutdown' for '1.4.1'
Executing 'shutdown' for '1.4.2'
Executing 'shutdown' for '1.5.1'
Executing 'shutdown' for '1.5.2'
Executing 'shutdown' for '1.6.1'
Executing 'shutdown' for '1.6.2'
Executing 'shutdown' for '1.7.1'
Executing 'shutdown' for '1.7.2'
Executing 'shutdown' for '1.8.1'
Executing 'shutdown' for '1.8.2'
Ignoring NM port '1.9.1'
Ignoring NM port '1.9.2'
fiberdriver(config)#
```

Notice that the latest version of the **foreach** command ignores ports on the network manager.

The syntax of the **foreach** command is:

```
fiberdriver(config)# foreach LOC command string
```

...where *C*, *S*, and *P* are one of the following:

- "*N*" - single number, matches one number only.

"Single Number" is the easiest implementation of the "**foreach**" command. For example, "**foreach 1.2.3 command string**" executes "*command string*" on port 3 of slot 2 in chassis 1.

- "\*" - wildcard, matches anything.

The wildcard character (\*) repeats the "**foreach**" command on all sub-components. For example, "**foreach 1.2.\* command string**" executes "*command string*" on all ports of slot 2 in chassis 1. "**foreach 1.\*.\* command string**" executes "*command string*" on all ports of all slots in chassis 1.

- "*S-E*" - range that matches from *S* to *E* inclusive.

The range syntax allows for the inclusion of a continuous span of components. For example, "**foreach 1.2.1-5 command string**" executes "*command string*" on ports 1, 2, 3, 4, and 5 of slot 2 in chassis 1.

- ", - combine ranges or numbers: *S-E,N,N*

Include non-sequential components in the "**foreach**" command by specifying multiple comma-separated ranges. For example, "**foreach 1.2.1-5,10-15 command string**" executes "*command string*" on ports 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, and 15 of slot 2 in chassis 1.

...and the command string for iteration follows the range of components.

The command string appears as if typed in the context of a specific component. Context sensitive command line completion (<Tab> or question mark help) is not available in the **foreach** command string. An error message displays for each designated component that does not exist or if the command does not apply to that component.

# Chapter 9. Network Time Protocol

*...synchronizing the system clock with an external reference*

## 9.1. NTP Introduction

*Network Time Protocol* (NTP) synchronizes the clocks of computer systems communicating in packet-switched, variable-latency data networks. NTP uses UDP port 123 for its transport layer. NTP avoids large time jumps, reversals, and other discontinuities by adjusting the clock incrementally. It makes backward time adjustments by slowing the system clock until the time is correct.

## 9.2. NTP Server Hosts

NTP requires at least one "upstream" server to synchronize the local time. Add an NTP server host to the EM316LNXNM with the "**ntp-server host A.B.C.D**" command from the main configuration context. "A.B.C.D" represents the IP address of the added NTP server.

```
fiberdriver# configure terminal
fiberdriver(config)# ntp-server host A.B.C.D
fiberdriver(config)#
```

Use one of the many public servers that offer NTP if you do not have any local NTP servers. Avoid using more than five servers.

Check that the NTP servers are added correctly with the "**show ntp-server hosts**" command from the main configuration context.

```
fiberdriver(config)# show ntp-server hosts
ntp-server host 192.168.14.98
ntp-server host 192.168.14.106
ntp-server host 10.1.1.8
fiberdriver(config)#
```

## 9.3. Enabling/Disabling NTP

NTP is disabled by default. After adding the NTP server hosts and verifying them, enable NTP from the main configuration context with the "**ntp**" command. Add the server hosts before enabling NTP so that the system can set the time most accurately when NTP starts up.

```
fiberdriver(config)# ntp
fiberdriver(config)#
```

Disable NTP at any time with the "**no ntp**" command from the main configuration context. The EM316LNXNM clock may gradually gain or lose accuracy without synchronization.

```
fiberdriver(config)# no ntp
fiberdriver(config)#
```

To change the time, use the "**sys rdate**" or "**sys date**" commands.

To return NTP to the default state, use the "**default ntp**" command from the main configuration context.

```
fiberdriver(config)# default ntp
fiberdriver(config)#
```

## 9.4. Displaying NTP Status

After some NTP server hosts are set and NTP is enabled, use the "**show ntp**" command from the main configuration context to display the NTP settings.

```
fiberdriver(config)# show ntp
NTP configuration:
Enable: yes
NTP servers:
ntp-server host 192.168.14.98
ntp-server host 192.168.14.106
ntp-server host 10.1.1.8
remote          local          st poll reach  delay    offset    disp
=====
=10.1.1.8       192.168.14.140  16   64    0 0.00000  0.000000  0.00000
=192.168.14.98  192.168.14.140   3   64    1 0.00090  0.001953  2.81735
=192.168.14.106 192.168.14.140  16   64    0 0.00000  0.000000  0.00000
fiberdriver(config)#
```

## 9.5. NTP with "sys rdate" and "sys date"

If the system time is not synchronized with the configured NTP servers, NTP attempts to drift the system time back to the proper time with incremental changes. The further the time is away from the NTP time, the longer the correction will take.

If NTP sees a time offset of more than 1000 seconds (about 17 minutes), it will *not* drift. The user must manually force the clock within 1000 seconds of the NTP time using commands like "**sys rdate**" or "**sys date**".

When NTP first starts up, it tries once to set the time to the NTP time even if the offset is beyond 1000 seconds. Disable and re-enable NTP to force an NTP time synchronization.

```
fiberdriver(config)# no ntp
fiberdriver(config)# ntp
fiberdriver(config)#
```

At least one NTP server *must* be configured and reachable for NTP to reset successfully and synchronize the EM316LNXNM clock.

# Chapter 10. Authentication, Authorization, and Accounting

## *...users, groups, and policies to secure network administration*

Authentication, Authorization, and Accounting (AAA) in a Media Cross Connect includes two server options:

- TACACS+
- Radius

The commands **TACACS+** and **Radius** control each server type, respectively. Each of these server commands uses the same command line options. The commands and options to secure the Fiber Driver system are described in this section.

Authentication maintains user credentials to access the system. Each user must provide a user name and password. When the remote server authenticates the credentials, the user can access the system.

Authorization maintains specific access rights to the system for each user. The remote server provides the class level to the system. The class level can be VIEW, NORMAL, or SUPER for each user account. The user class provides general access to features associated with the assigned level. Specific elements access rights may be set only on the local system level.

On the local system level, port authorization works in two ways: If the user is specified locally, that user's group assignments are transferred to the remote user for element access. If user is not specified locally, element access is set to a special user named "remote" that transfers its group assignments to the remote user. If neither the accessing user nor the special "remote" user are not present on the system, then the user receives no group assignments.

Accounting is a series of records sent from the system to the remote server to keep track of activities on the system. The system records only when users receive access into the system and when they log out of the system.

### *General Notes*

The system allows up to five ordered servers to be contacted. If the first server does not respond or denies access, then the second, third, fourth, and fifth servers are contacted in order until a server permits access. If no server responds, AAA duties return to the local Fiber Driver EM316LNxNM-OT.

Authentication and accounting are independent processes in the system. Either process may be activated without the other.

## 10.1. CLI Interface

AAA may be managed through the command line interface (CLI). This section describes the useful commands for both Radius and TACACS+.

### 10.1.1. Display AAA Status

Use the command **show aaa** to display the current AAA status on the system. Use the command **show aaa remote-server hosts** to display only the AAA remote hosts.

```
fiberdriver(config)# show aaa
AAA configuration:
  Remote AAA Authentication: enabled
  Remote AAA Accounting: enabled
  Remote AAA Protocol: Radius
AAA remote hosts:
aaa remote-server host 1 192.168.14.12 sharedsecret 0 3 0
aaa remote-server host 2 192.168.14.102 sharedsecret2 0 3 0
```

### 10.1.2. Choosing a Protocol

Use the command **aaa protocol** to select either Radius or TACACS+ security protocols. Radius is the default selection. Once the protocol is selected, all remote server hosts switch to the new protocol. When switching between different AAA environments, delete all previous remote server hosts. (See the "Configuring a Remote Server" section).

The TACACS+ protocol has two variations. The first variation is TACACS+ ASCII, which works with TACACS+ servers that support ASCII (i.e. Cisco Secure ACS Express). The second variation is TACACS+ PAP, which works with TACACS+ servers that support PAP (i.e. Tac-Plus UNIX Daemon).

Use the following commands to configure the correct AAA protocol:

- **aaa protocol radius**
- **aaa protocol tacacs-ascii**
- **aaa protocol tacacs-pap**

## 10.1.3. Configuring a Remote Server

Setting up an AAA remote server is done using the "aaa remote-server host" command. The setup parameters for a server are listed below:

- Server Priority (1-5, where 1 is the highest)
- IP Address
- Shared Secret
- Remote Server Port (Optional)
- Wait Time (Optional)
- Retries (Optional)

Typical configuration of a remote server:

```
fiberdriver(config)# aaa remote-server host 1 192.168.14.12 sharedsecret
```

Once an AAA remote server has been declared, operational parameters (specific to that server) may be individually set (revised) using the "aaa remote-server X" commands listed below.

Set the AAA protocol port (default=0 means the normal port for the chosen AAA protocol):

```
fiberdriver(config)# aaa remote-server <1-5> port <0-65535>
```

Set the number of seconds to timeout a server response (default=3):

```
fiberdriver(config)# aaa remote-server <1-5> timeout <0-10>
```

Set the number of server connection retry attempts (default=0):

```
fiberdriver(config)# aaa remote-server <1-5> retries <0-10>
```

The following parameters apply to a TACACS+ AAA remote server:

Set the primary service name (default=ppp):

```
fiberdriver(config)# aaa remote-server <1-5> service NAME
```

Set the sub-protocol for the primary service (default=lcp):

```
fiberdriver(config)# aaa remote-server <1-5> protocol PROTOCOL
```

Set the minimum privilege level corresponding to the SUPER access class (default=5):

```
fiberdriver(config)# aaa remote-server <1-5> priv-super <2-15>
```

Set the minimum privilege level corresponding to the NORMAL access class (default=3):

```
fiberdriver(config)# aaa remote-server <1-5> priv-normal <1-14>
```



Set the minimum privilege level corresponding to the VIEW access class (default=1):

```
fiberdriver(config)# aaa remote-server <1-5> priv-view <0-13>
```

The following commands restore the named parameter to its default value for the given remote server (1-5):

```
fiberdriver(config)# default aaa remote-server <1-5> port  
fiberdriver(config)# default aaa remote-server <1-5> timeout  
fiberdriver(config)# default aaa remote-server <1-5> retries  
fiberdriver(config)# default aaa remote-server <1-5> server  
fiberdriver(config)# default aaa remote-server <1-5> protocol  
fiberdriver(config)# default aaa remote-server <1-5> priv-super  
fiberdriver(config)# default aaa remote-server <1-5> priv-normal  
fiberdriver(config)# default aaa remote-server <1-5> priv-view
```

The following command restores all parameters to their default values for the given remote server (1-5):

```
fiberdriver(config)# default aaa remote-server <1-5>
```

To delete a remote server, use the **no aaa remote-server host X** command where X is the desired host you wish to remove. For example, delete the remote server host above with the following command:

```
fiberdriver(config)# no aaa remote-server host 1
```

## 10.1.4. Configuring Authentication

By default, authentication is disabled. To turn on authentication, use the command **aaa authentication**. To turn off authentication, use the command **no aaa authentication**.

## 10.1.5. Configuring Accounting

By default, accounting is disabled. To turn on accounting, use the command **aaa accounting**. To turn off accounting, use the command **no aaa accounting**.

## 10.1.6. Configuring General Remote User Access

As stated in the Authorization section, a remotely authenticated user that is not recognized locally is treated as the special user "\$remote\$". This special user is used only to assign group permissions for all users in groups without a local user. The user "\$remote\$" is included in each new Fiber Driver system. This user is added to group "all", which has access to the entire chassis. The user may not be added in upgrades from a previous version.

Use the command **show users** to see the permissions of each user. Use the standard user commands from the "Users, Classes, and Logging In and Out" section to setup the group permission.

```
fiberdriver(config)# show users  
username $remote$ groups all  
username admin password encrypted $1$kQ2rIq/$0b8wFa2EW135XC4TnN7wJ/ class debug  
username admin groups all
```

## 10.2. TACACS+

There are three required parameters to use a TACACS+ server:

- Username
- Password
- Priv-Lvl

A user's privilege level (Priv-Lvl) is an integer value that determines the access class. The system compares it against the minimum value configured for each of the three access classes on the given server. The system applies the highest access class that is not more than the user's Priv-Lvl. The default access class minimum level values are as follows:

- 1 = VIEW User
- 3 = NORMAL User
- 5 = SUPER User

The system denies access if the user's Priv-Lvl is less than the configured 'VIEW User' value.

It is always a good practice to verify AAA server functionality before signing the administrator out of the server configuration to reduce possible authentication issues.

The following examples show how to configure a TACACS+ server.

## 10.2.1. Cisco Secure ACS Express

Add a Device Group (Network Resources -> Device Groups)

The following example shows a new Media Cross Connect (MCC) device.

The screenshot shows the 'Edit MCC' form in the Cisco Secure ACS Express interface. The form is titled 'Network Resources: Device Groups > Edit MCC'. It has a header bar with 'Express' on the left and 'admin (Read-Write) | tacplus.chats.int.mrv.com | Logout | About' on the right. The form contains two input fields: 'Name:' with the value 'MCC' and 'Description:' with the value 'Media Cross Connect Connections'. Below these fields is a table titled 'Network Devices in Group' with columns 'Name', 'IP Address', 'RADIUS Secret', and 'TACACS+ Secret'. At the bottom of the form are 'Save' and 'Cancel' buttons.

The screenshot shows the 'Device Groups' list in the Cisco Secure ACS Express interface. The interface has a sidebar with 'Workspace' and 'Network Resources' (containing 'Devices' and 'Device Groups'). The main content area is titled 'Network Resources: Device Groups'. It features a 'Filter:' input field with 'Go' and 'Clear Filter' buttons. Below is a table with columns 'Name', 'Description', and 'Used By'. The table lists several device groups, with 'MCC' highlighted in red. At the bottom are 'Add', 'Edit', 'Copy', and 'Delete' buttons.

Name	Description	Used By
<a href="#">ASA</a>	Adaptive Security Appliance	<a href="#">Devices</a> <a href="#">TACACS+ Access Service</a>
<a href="#">MCC</a>	Media Cross Connect Connections	
<a href="#">Other</a>	Other	
<a href="#">Routers</a>	Routers	
<a href="#">Switches</a>	Switches	
<a href="#">VPN Concentrators</a>	VPN Concentrators	
<a href="#">Wireless Access Points</a>	Wireless Access Points	
<a href="#">Wireless Controllers</a>	Wireless Controllers	

Add a Device (Network Resources -> Devices)

- Attach the device to the Device Group from the previous step
- Enter the IP address of the new Fiber Driver device
- Select a secure shared secret for configuring the AAA remote server host on the new device

The screenshot shows the 'Edit MCC-251' configuration page in Cisco Secure ACS Express. The left sidebar shows 'Workspace' and 'Network Resources' with 'Devices' and 'Device Groups' listed. The main area contains the following fields:

- Name:** MCC-251
- IP Address:** 192.168.15.251
- Network Device Group:** MCC (selected from a dropdown)
- Authenticate Using:** (dropdown menu)
- RADIUS Shared Secret:** (text field)
- TACACS+ Shared Secret:** secret123

At the bottom right are 'Save' and 'Cancel' buttons.

The screenshot shows the 'Devices' list page in Cisco Secure ACS Express. The left sidebar is the same as the previous screenshot. The main area shows a table of devices with the following columns: Name, IP Address, Authenticate Using, and Network Device Group. A filter bar is at the top of the table.

	Name	IP Address	Authenticate Using	Network Device Group
<input type="checkbox"/>	MCC-251	192.168.15.251	TACACS+	MCC

Below the table are buttons for 'Add', 'Edit', 'Copy', and 'Delete'.

Add a User Group (Users & Identity Stores -> User Groups)

- Set "Status" to enabled

The screenshot shows the 'Add' form for a new User Group in the Cisco Secure ACS Express interface. The left sidebar shows the navigation tree with 'Users & Identity Stores' expanded. The main panel is titled 'Users & Identity Stores: Internal User Database > User Groups > Add'. The form fields are: 'Name' (MCC-Group), 'Description' (TACACS MCC Group), and 'Status' (Enabled). There are 'Save' and 'Cancel' buttons at the bottom right.

The screenshot shows the 'User Groups' list view in the Cisco Secure ACS Express interface. The left sidebar shows the navigation tree with 'Users & Identity Stores' expanded. The main panel is titled 'Users & Identity Stores: Internal User Database > User Groups'. It shows a table of user groups with columns: Enabled, Name, Description, and Used By. The 'MCC-Group' is highlighted with a red box.

Enabled	Name	Description	Used By
<input type="checkbox"/>	Default		
<input checked="" type="checkbox"/>	MCC-Group	TACACS MCC Group	Users TACACS+ Access Service

Buttons: Add, Edit, Copy, Delete

Add Users (User & Identity Stores -> Users)

- Make sure to attach the user to the user group created in the last step

The screenshot shows the 'Edit Ravi' configuration page in Cisco Secure ACS Express. The left sidebar shows the navigation tree with 'Users & Identity Stores' expanded. The main content area is divided into three sections: General Settings, Supplementary Information, and Authentication Information.

**General Settings**

- Name: Ravi
- Description: (empty)
- User Group: MCC-Group
- Status: Enabled

**Supplementary Information**

- Full Name: (empty)
- Manager: (empty)
- Phone Number: (empty)
- Email: (empty)

**Authentication Information**

- Password: (masked with dots)
- Confirm Password: (masked with dots)
- Password never expires: ☒
- Password expires in: (empty) days

Buttons: Save, Cancel

The screenshot shows the 'Users' list page in Cisco Secure ACS Express. The left sidebar shows the navigation tree with 'Users & Identity Stores' expanded. The main content area shows a table of users with columns: Enabled, Name, User Group, Manager, and Password Status.

Enabled	Name	User Group	Manager	Password Status
<input type="checkbox"/>	Anthony	MCC-Group		Active. Password never expires
<input type="checkbox"/>	Barry	MCC-Group		Active. Password never expires
<input type="checkbox"/>	Charles	MCC-Group		Active. Password never expires
<input type="checkbox"/>	David	MCC-Group		Active. Password never expires
<input type="checkbox"/>	Eddie	MCC-Group		Active. Password never expires
<input checked="" type="checkbox"/>	Ravi	MCC-Group		Active. Password never expires
<input type="checkbox"/>	Stewart	MCC-Group		Active. Password never expires

Buttons: Add, Edit, Copy, Delete, Password Policy

Add TACACS+ Access Service (Access Policies -> TACACS+ Access Service)

- Set "Status" to enabled
- Attach the network device group created above
- Attach the user group created above
- Set the privilege level for all the users attached to the group

The screenshot displays the Cisco Secure ACS Express web interface. The top navigation bar includes the Cisco logo, the title 'Cisco Secure ACS Express', and user information: 'admin (Read-Write) | tacplus.chats.int.mrv.com | Logout | About'. The left sidebar shows a tree view with 'Access Policies' selected. The main content area is titled 'Access Policies: Access Services > TACACS+ Access Service > Edit Access Rule'. The configuration is divided into three sections: 'Status' (set to 'Enabled'), 'Conditions', and 'Results'. In the 'Conditions' section, 'Network Device Group' is set to 'MCC' and 'User Group(s)' contains 'MCC-Group'. The 'Results' section shows 'Deny Access' as an unchecked checkbox and 'Privilege Level' set to '3'. 'Save' and 'Cancel' buttons are at the bottom right.

Cisco Secure ACS Express

admin (Read-Write) | tacplus.chats.int.mrv.com | Logout | About

Access Policies: Access Services > TACACS+ Access Service > Edit Access Rule

Status: \* Enabled

**Conditions**

Network Device Group: \* MCC

User Group(s): MCC-Group [Search DB](#)

Time Of Day:

**Results**

Deny Access: ☐

Privilege Level: 3

Save Cancel

## 10.2.2. Tac-Plus Daemon

Edit the configuration file typically located at `"/etc/tac-plus/tacacs.conf"`.

The example below shows a typical entry in the configuration file for an MCC device. There are two required parameters:

- IP Address
- Shared Secret

```
host = 192.168.14.12
{
    key=secret123
}
```

The example below shows a typical addition of a user into the configuration file. There are two required parameters and one optional parameter:

- Username
- Password
- Priv-Lvl (Optional)

```
user = Abigail
{
    default service = permit
    pap = cleartext mypassword
    service = ppp protocol = lcp
    {
        priv-lvl = 3
    }
}
```



## 10.3. Radius

An MRV specific dictionary file should be used with the desired Radius server. MRV provides a dictionary for the following Radius servers:

- FreeRADIUS
- Steel-Belted
- Livingston
- Cistron

The RADIUS server requires three parameters:

- Username
- Password
- User Class Level

The user class level is defined by three different attributes. The recommended class attribute is to use the MRV specific version which is MRV-Security-Level.

If using the MRV-Security-Level attribute (dictionary.mrv: Vendor code 33, Attribute 8):

- "View" – The user class level is set to VIEW.
- "Normal" – The user class level is set to NORMAL.
- "Super" – The user class level is set to SUPER.

If using the Cisco-AVPair attribute:

- "Class=View" – The user class level is set to VIEW.
- "Class=Normal" – The user class level is set to NORMAL.
- "Class=Super" – The user class level is set to SUPER.

If using the Service-Type attribute:

- "Login-User" - The user class level is set to NORMAL.
- "Administrative-User" - The user class level is set to SUPER.

If no attribute is specified, the user class level is set to VIEW. Avoid using more than one attribute for each user. If the server configuration requires it, a set of rules determines the final user class. If both MRV-Security-Level and Cisco-AVPair attributes are used, MRV-Security-Level takes precedence. These two attributes are considered part of the explicit class. If the Service-Type attribute is used along with an explicit class, then the highest class level is taken.

The following examples show how to setup a Radius server.

## 10.3.1. FreeRADIUS Server

Add the dictionary file ("dictionary.mrv") supplied for Fiber Driver to the location where the FreeRADIUS server looks for dictionaries. Typically this directory is "/etc/raddb" or "/usr/share/FreeRADIUS".

Edit the file "dictionary" in the same dictionary directory. Include the text "\$INCLUDE dictionary.mrv" so the MRV dictionary file is loaded when FreeRADIUS is started.

```
$INCLUDE dictionary.mikrotik
$INCLUDE dictionary.mrv
$INCLUDE dictionary.navini
```

Edit the host configuration file that is typically located at "/etc/FreeRADIUS/clients.conf". Add the host to this file with the following attributes:

- IP Address
- Secret
- Short Name (Optional)

```
client 192.168.14.12 {
    secret          = secret123
    shortname       = media-cross-connect
}
```

Edit the user configuration file that is typically located at "/etc/FreeRADIUS/users". Add the desired users by using the following parameters:

- Username
- Password
- MRV-Security-Level

```
Boris    User-Password      = "password"
         MRV-Security-Level = Normal
```

## 10.3.2. Steel-Belted Radius Server

Add the dictionary file ("mrv.dct") supplied with the Fiber Driver to the location where the SBR server looks for dictionaries. Edit the main dictionary file to include the MRV dictionary. Include the text "@mrv.dct" to load the MRV dictionary file when the SBR server starts.

```
@marc.dct
@mrv.dct
@nautica.dct
```

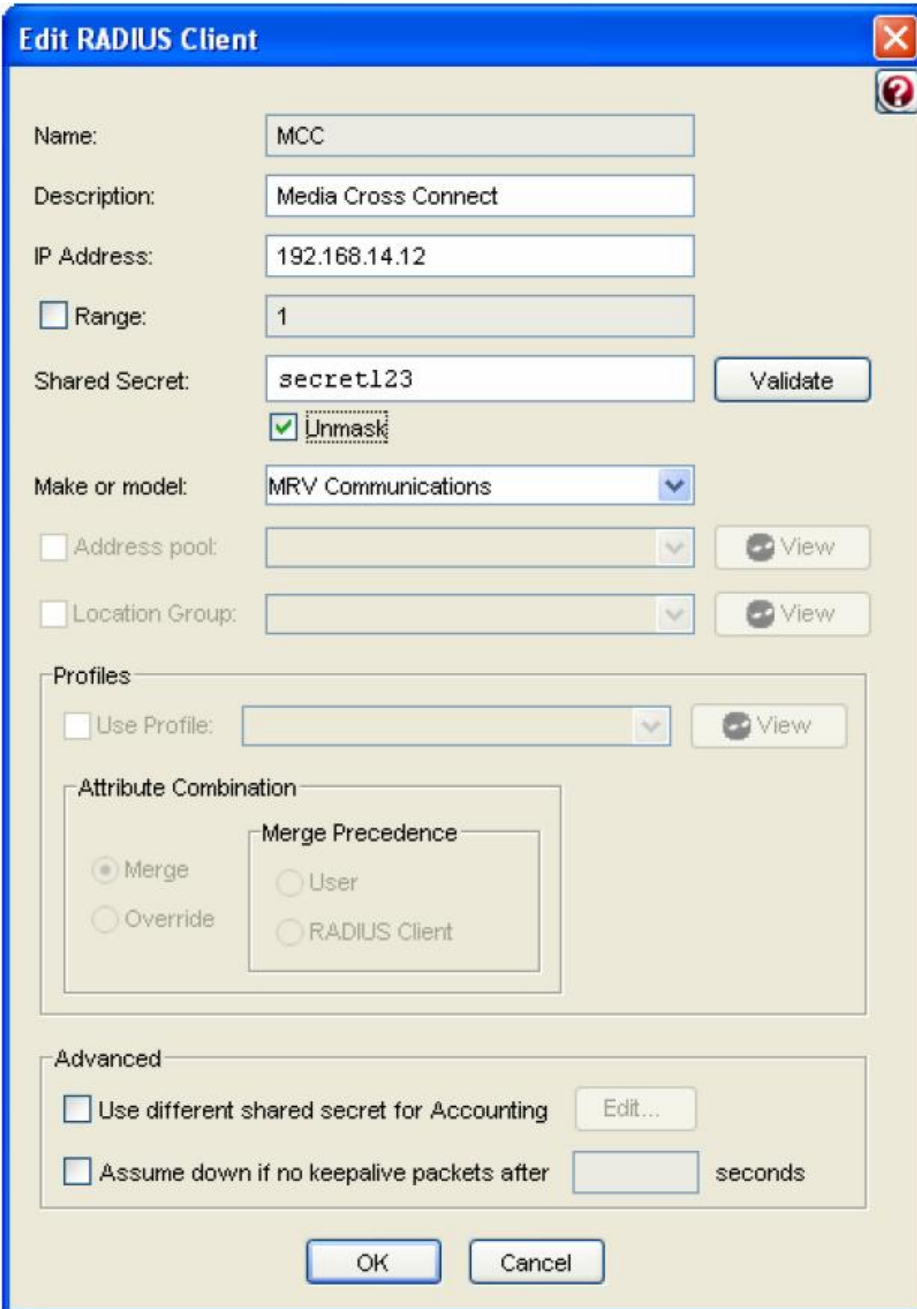
Edit the vendor information file to include the MRV dictionary. Typically, this file is named "vendor.ini".

```
vendor-product      = Meru Networks
dictionary          = radius
ignore-ports        = no
port-number-usage   = per-port-type
help-id             =

vendor-product      = MRV Communications
dictionary          = Mrv
ignore-ports        = no
port-number-usage   = per-port-type
help-id             = 2000

vendor-product      = Netscreen Technologies
dictionary          = Netscreen
ignore-ports        = no
port-number-usage   = per-port-type
help-id             = 2000
```

Login to the SBR server and add the Fiber Driver device as a Radius client. Select "MRV Communications" as the "Make or model" of the Radius client. Add the IP address and shared secret for the Fiber Driver device.



The image shows a Windows-style dialog box titled "Edit RADIUS Client". It contains several input fields and checkboxes for configuring a RADIUS client. The fields are: Name (MCC), Description (Media Cross Connect), IP Address (192.168.14.12), Range (1), Shared Secret (secret123), Make or model (MRV Communications), Address pool, Location Group, Profiles (Use Profile), Attribute Combination (Merge, Override), Merge Precedence (User, RADIUS Client), and Advanced (Use different shared secret for Accounting, Assume down if no keepalive packets after). There are buttons for Validate, View, Edit..., OK, and Cancel.

**Edit RADIUS Client**

Name: MCC

Description: Media Cross Connect

IP Address: 192.168.14.12

☐ Range: 1

Shared Secret: secret123

☒ Unmask

Make or model: MRV Communications

☐ Address pool:

☐ Location Group:

**Profiles**

☐ Use Profile:

**Attribute Combination**

☒ Merge ☐ Override

**Merge Precedence**

☐ User ☐ RADIUS Client

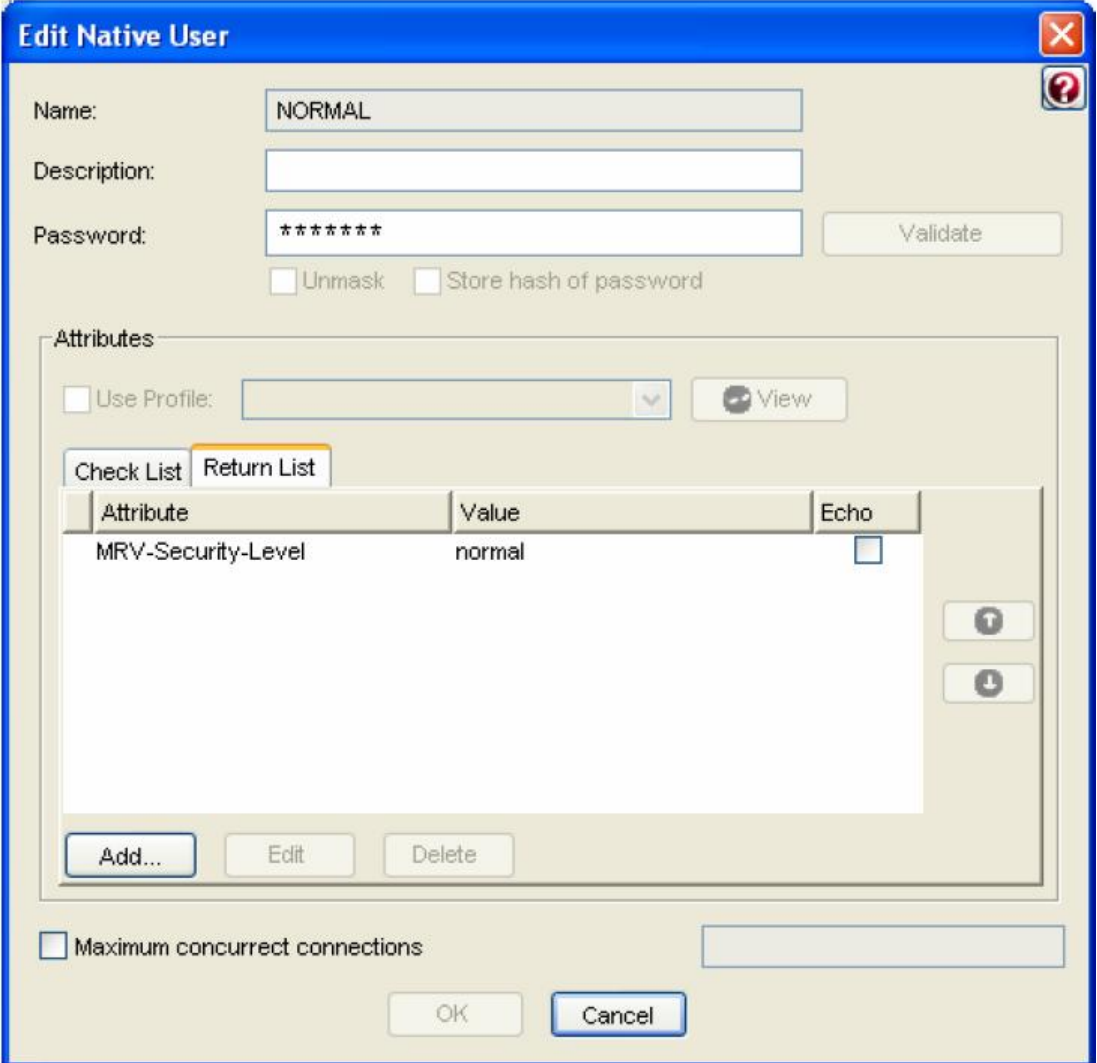
**Advanced**

☐ Use different shared secret for Accounting

☐ Assume down if no keepalive packets after  seconds

When configuring users, add the attribute "MRV-Security-Level" as an item in the return list. This attribute uses the following values:

- "view" – Set the user as a VIEW level user.
- "normal" – Set the user as a NORMAL level user.
- "super" – Set the user as a SUPER level user.



The "Edit Native User" dialog box is shown. It has a blue title bar and a close button (X) in the top right corner. The main area is light beige. At the top, there are three text boxes: "Name:" with "NORMAL", "Description:" (empty), and "Password:" with "\*\*\*\*\*". To the right of the password box is a "Validate" button. Below the password box are two checkboxes: "Unmask" and "Store hash of password", both unchecked. Below these is a section titled "Attributes" with a "Use Profile:" dropdown menu and a "View" button. Below the "Attributes" section are two tabs: "Check List" and "Return List". The "Return List" tab is active, showing a table with three columns: "Attribute", "Value", and "Echo". The table contains one row: "MRV-Security-Level", "normal", and an unchecked checkbox. To the right of the table are two buttons: "Up" (arrow pointing up) and "Down" (arrow pointing down). Below the table are three buttons: "Add...", "Edit", and "Delete". At the bottom of the dialog, there is a checkbox "Maximum concurrent connections" which is unchecked, followed by an empty text box. At the very bottom are "OK" and "Cancel" buttons.

Attribute	Value	Echo
MRV-Security-Level	normal	<input type="checkbox"/>

## 10.4. Upgrading From a Non AAA Capable Software Version

If upgrading from a release without AAA functionality (v1.2 build 36b, v1.2 build 36f), first remove the files "ssh\_config" and "sshd\_config" and then save the configuration.

```
fiberdriver# rm ssh_config  
fiberdriver# rm sshd_config  
fiberdriver# write f
```

After removing these files, you may upgrade your software safely.

There is no way to update sshd\_config. The file copied from "/defaults/sshd\_config" is always overridden by a user-edited version stored in "/config". Delete "/config/sshd\_config" every time you switch back and forth between AAA enabled software and regular software, and before you boot any new AAA capable software.

# Chapter 11. Fiber Driver Applications

*...reference for building managed optical solutions with the EM316LNXNM-OT.*

## 11.1. Building an Optical Service Channel

There are two features included on the EM316LNXNM-OT for cluster support: Discovery Protocol and Loop Management Protocol (LMP). Both protocols work with networks connected to the SFP ports on the EM316LNXNM-OT. The RJ-45 port does not currently support management clustering.

### 11.1.1. Discovery Protocol

Discovery is a simple layer 2 protocol used to discover other NM cards on the same Optical Service Channel (OSC) network. Each NM card multicasts layer 2 frames to announce its presence to other NM cards connected via OSC ports. To see the list of discovered NM cards, use the "**show discovery hosts**" command:

```
fiberdriver# show discovery hosts
MAC Address          Distance  IP Address
=====
00:20:1a:02:0b:19    3         169.254.1.20
00:20:1a:02:13:f1    6         169.254.1.9
00:20:1a:02:13:f2    1         169.254.1.8
00:20:1a:02:13:f6    4         169.254.1.10
00:20:1a:02:26:db    7         169.254.1.6
00:20:1a:02:48:28    5         169.254.1.3
00:20:1a:02:49:f9    2         169.254.1.2
00:20:1a:02:53:8f    0         169.254.1.7
fiberdriver#
```

Discovery is enabled by default.

Disable the discovery protocol using the "**no sys discovery**" command:

```
fiberdriver# configure terminal
fiberdriver(config)# no sys discovery
fiberdriver(config)#
```

The discovery protocol only discovers cards connected to the SFP ports. The copper RJ-45 Ethernet network interface does not support discovery frames.

## 11.1.2. Link Management Protocol

LMP is a ring management protocol. It is disabled by default. LMP, which is similar to Rapid Spanning tree, breaks loops in the network to prevent broadcast storms.

To enable LMP:

```
fiberdriver# configure terminal  
fiberdriver(config)# sys lmp  
fiberdriver(config)#
```

To disable LMP:

```
fiberdriver# configure terminal  
fiberdriver(config)# no sys lmp  
fiberdriver(config)#
```

LMP only breaks rings on segments connected through the OSC (SFP) ports. LMP frames are not sent or received through the RJ45 Ethernet network interface.



Since LMP only functions on the OSC (SFP) ports, segment loops involving the RJ45 port are not detected. Avoid segment loops when configuring RJ45 Ethernet connections.



# Chapter 12. SNMP Management

## *...introduction to SNMP setup*

To ensure proper operation specific to your network configuration and to provide SNMP access, some environment-specific parameters must be configured through the CLI. A brief review of CLI setup is included below for convenience.

## 12.1. CLI Setup - Remote IP

The factory default IP address is 192.168.14.201/24 (netmask 255.255.255.0).

1. Edit the system IP configuration to match your IP network with the "**ip interface**" command.
2. Set the default gateway address using the "**ip default-gateway**" command. This address must be an interface on a local subnet device that can route IP packets to non-local IP networks. For example:
3. Use the "**show ip interface**" command to confirm that the default gateway IP address is set.



IP information configured using the previous commands will only take effect after using the "**ip interface update**" command or the system is restarted.



The manager does not automatically save the current running configuration. Use the "**write file**" command to save current parameters to the "startup-config" file and use them when the system restarts.

## 12.2. SNMPv1 Setup

1. Set up the SNMP community strings for read and write access using the commands shown below. For security reasons, the "**show**" commands do not display the community strings. Community strings are encrypted in the "**show running-config**" command for security.

```
fiberdriver(config)# snmp-server community read readSecret
fiberdriver(config)# snmp-server community write writeSecret
fiberdriver(config)#
```

2. Configure the trap receiver table. Add the IP addresses of each network manager station that should receive traps from the EM316LNXNM.

```
fiberdriver(config)# snmp-server host 169.254.192.117
fiberdriver(config)# show snmp-server hosts
snmp-server host 169.254.192.117 public warning
fiberdriver(config)#
```

3. SNMP traps are sent to address listed in the trap receiver table. Each receiving device must include management capabilities to interpret SNMP traps. MRV recommends MegaVision, which includes special support for graphical management of MRV products. In MegaVision, open the trap receiver table with the "System-->IP/SNMP Configuration" menu selection. SNMP traps are sent to all SNMP capable managers (such as MegaVision™), whose IP addresses are entered into the traps table on the LNXNM through the "System —> IP/SNMP Configuration" windows in MegaVision™.

Some example traps from the EM316LNXNM are listed below:

- Chassis temperature outside pre-determined safe operational limits
- Power supply failure
- Fan failure (certain chassis)
- Hardware or software malfunctions
- Informational occurrences (module specific)
- Change in link status (link up, link down)
- Change in loopback condition (on or off) -- Fiber Driver only
- Change in slot inventory (module removed or inserted)
- Change in port inventory (pluggable port removed or inserted)

See the appendix sections for a complete trap list.

Completely disable trap generation by removing all IP addresses from the SNMP trap table:

```
fiberdriver(config)# no snmp-server host
fiberdriver(config)#
```

Selectively disable specific traps with the "**no gen-trap**" command, found in the chassis 1 config context:

```
fiberdriver(chassis/1)# no gen-trap chassis
fiberdriver(chassis/1)# no gen-trap lin
fiberdriver(chassis/1)# no gen-trap link
fiberdriver(chassis/1)# no gen-trap loopback
fiberdriver(chassis/1)# show
    Model: EM316-16BU
    Name: EM316-16
    Temp(C): 23
    Temp Min(C): 5
    Temp Limit(C): 40

PS1: DC Bad
PS2: AC Good

Fan1: good  Fan3: good
Fan2: good  Fan4: not Installed

Chassis Traps: off  Slot Change Traps: on  Module Specific Traps: on
  Port Traps: on      Link Traps: off      Loopback Traps: off
    LIN Traps: off  Port Change Traps: on      Port Diags Traps: on

Number Of Slots: 16

Slot  Model          Name
====  =====
1.3   EM316-LNXNM12  Slot 1 (EM316-LNXNM12 at 1.3)
fiberdriver(chassis/1)#
```

## 12.3. SNMPv3 Setup

You can create an SNMPv3 user with "auth" and "priv" level security. A new user created will use the already existing "initial" group and existing "internet" and "restricted" views, based on the security level selected.

Use "snmp-server user" commands to create the users.

You can use MegaVision™ SNMPv3 features to communicate with the device. The passwords used in user creation must be at least 8 characters long. SNMPv3 passwords are stored encrypted. The EM316LNXXNM MAC address (which is unique for every NM) is used to encrypt the passwords. For this reason, it is required to recreate the SNMPv3 passwords when a configuration file containing SNMPv3 passwords is moved from one NM to another NM.

Example: The following commands create some SNMPv3 users.

```
fiberdriver(config)# snmp-server user fdrNoAuth
fiberdriver(config)# snmp-server user fdrMd5Auth auth md5 open-sesame
fiberdriver(config)# snmp-server user fdrMd5Priv auth md5 open-sesame priv
des close-sesame
fiberdriver(config)# snmp-server user fdrShaAuth auth sha open-sesame
fiberdriver(config)# snmp-server user fdrShaPriv auth sha open-sesame priv
des close-sesame
fiberdriver(config)#
```

In the above commands, "open-sesame" and "close-sesame" are passwords and usernames start with "fdr". This section assumes familiarity with SNMPv3 concepts.

## 12.4. SNMP Disable

Security conscious users can selectively enable or disable SNMP v1/v2c/v3 agents using either of the following commands:

- "snmp-server (v1|v2c|v3)"
- "no snmp-server (v1|v2c|v3)"

## 12.5. Trap Filtering

Traps can be filtered by chassis, slot, or port with the **trap** command.

Enable all traps for the target device with the **trap** command. Use a trap name as an argument to enable only a specific trap.

```
fiberdriver(chassis/1)# trap?
trap - Enable trap generation
fiberdriver(chassis/1)# trap ?
<cr> - Enable all available traps for this location
> - Redirect output to a file
>> - Append output to file
NAME - Enable generation of a specific trap
fiberdriver(chassis/1)#
```

Disable all traps for the device with the **no trap** command. Use a trap name as an argument to disable only a specific trap.

```
fiberdriver(chassis/1)# no trap
trap - Disable trap generation
fiberdriver(chassis/1)# no trap ?
<cr> - Disable all available traps for this location
> - Redirect output to a file
>> - Append output to file
NAME - Disable generation of a specific trap
fiberdriver(chassis/1)#
```

Specific trap names are listed in the MIB file. For example, the **no trap nbsCmmcTrapPortEnabled** command disables the "PortEnabled" trap. For easier CLI configuration, start by issuing a **show traps** command. All traps for that element display along with the emit status. Copy the name listed and issue a **(no) trap NAME** command to toggle the trap.

```
fiberdriver(chassis/1)# show traps
Name
=====
NBS-CMMC-MIB::nbsCmmcTrapPowerSupplyFailure    yes
NBS-CMMC-MIB::nbsCmmcTrapPowerSupplyRestored    yes
NBS-CMMC-MIB::nbsCmmcTrapFanFailure              yes
NBS-CMMC-MIB::nbsCmmcTrapFanRestored             yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTooHot           yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTooCold         yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTempOk          yes
fiberdriver(chassis/1)# no trap NBS-CMMC-MIB::nbsCmmcTrapFanFailure
fiberdriver(chassis/1)# show traps
Name
=====
NBS-CMMC-MIB::nbsCmmcTrapPowerSupplyFailure    yes
NBS-CMMC-MIB::nbsCmmcTrapPowerSupplyRestored    yes
NBS-CMMC-MIB::nbsCmmcTrapFanFailure              no
NBS-CMMC-MIB::nbsCmmcTrapFanRestored             yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTooHot           yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTooCold         yes
NBS-CMMC-MIB::nbsCmmcTrapChassisTempOk          yes
fiberdriver(chassis/1)#
```

## 12.6. SNMP Ports

To avoid resource conflicts, SNMP administrators can change the SNMP (UDP) ports for sending and receiving traps.

The following CLI commands control UCP port usage:

CLI Command	Description	Default
<b>snmp-server port X</b>	UDP/IP port for the agent to listen for SNMP traffic	161
<b>snmp-server trap-port X</b>	UDP/IP port for the agent to send SNMP traps	162

Value changes do not affect the working environment for management until the system is restarted. Be sure to properly configure connecting devices with the new contact information or communication with the EM316LNXNM manager will not be re-established.

The example below shows the port change using the CLI:

```
fiberdriverconfig)# snmp-server port 150
fiberdriverconfig)# snmp-server trap-port 140

fiberdriverconfig)# show snmp-server
Administrative configuration:
  Snmp V1: disabled
  Snmp V2c: disabled
  Snmp V3: disabled
  Power Supply Traps: enabled
  Module Traps: enabled
  Snmp Port desired: 150
  Trap Port desired: 140
  SysContact:
  SysName:
  SysLocation:
Current operating configuration:
  Snmp Port: 161
  Trap Port: 162
fiberdriverconfig)#
```

The "Current operating configuration" values update after the changes are saved and the system is restarted as shown below:

```
fiberdriverconfig)# write file
fiberdriverconfig)# exit
fiberdriver# restart warm
```

Refer to SNMP documentation or customer support for help changing SNMP ports.

## 12.7. Message Logging

A trap issues an SNMP trap to one or more remote SNMP managers, which allows a network administrator to receive immediate error notification from SNMP management software like MegaVision™. To specify an SNMP trap manager address, use the "**snmp-server host**" command. To change the default setting for trap message level, use the "**log level trap**" command.

```
fiberdriver(config)# snmp-server host 169.254.1.100
fiberdriver(config)# snmp-server host 169.254.1.101
fiberdriver(config)# show snmp-server hosts
snmp-server host 169.254.1.100 public warning
snmp-server host 169.254.1.101 public warning

fiberdriver(config)# log level trap error
fiberdriver(config)# show log
Running Level: info
Nvram Level: disabled
Trap Level: error
Email Level: disabled
Remote Server: 0.0.0.0
Remote Level: memo
fiberdriver(config)#
```

You can't choose "**info**" or "**memo**" level for traps, since the lowest priority trap is of type warning.

## 12.8. Dynamic SNMP Information (MetaMIB)

The MetaMIB is an extension to the MIB architecture used by the Fiber Driver. Instead of relying on static objects, the MetaMIB dynamically builds objects for the system.

### 12.8.1. Usage

The Meta-MIB is not included in the standard MIB "cmmmc.mib" file. Extended MIB information is in the file named "nbs-meta.mib". The Meta-MIB requires that the MIB search path always includes the standard MIB.

The MetaMIB is divided into two portions. The first portion includes the available features covered by the MetaMIB. The second portion includes MetaMIB usage on the Fiber Driver in use.

### 12.8.2. Features Table

MetaMIB Object	Description
metaMibFeatureTableSize	Returns how many MetaMIB features are available.
metaMibFeatureID.X	Returns the ID of MetaMIB feature X.
metaMibFeatureFamily.X	Returns what family MetaMIB feature X is a part of.
metaMibFeatureName.X	Returns what name MetaMIB feature X uses.
metaMibFeatureDesc.X	Returns the full description of MetaMIB feature X.
metaMibFeatureUnits.X	Returns the type of unit MetaMIB feature X uses. (optional)
metaMibFeatureType.X	Returns the MetaMIB feature type: <ul style="list-style-type: none"><li>• Enumeration</li><li>• String</li><li>• Octet String</li><li>• Integer</li><li>• Float</li></ul>

In the table above there is a variable X which refers to a specific feature. When traversing the metaMibFeature\* table, you can tie together a features attributes by using the .X notation. For example to get feature #10's name and description, use metaMibFeatureName.10 and metaMibFeatureDesc.10.



## 12.8.3. Dynamic Element Parameters

MetaMIB Object	Description
metaMibVariableTableSize	Returns how many MetaMIB objects currently in use on the Fiber Driver
metaMibVariableIfIndex.X.Y	Returns the interface index: X
metaMibVariableID.X.Y	Returns the MetaMIB object ID (Y) used in the features table for this variable object
metaMibVariableCaps.X.Y	Returns a list of comma separated strings that indicate the type of values this variable supports. Ranges and string lengths are expressed as a two item list: MIN, MAX. A zero length string indicates that this variable is read-only.
metaMibVariableDefault.X.Y	Returns the default value of this variable.
metaMibVariableJumper.X.Y	<p>Returns the jumper settings of this variable.</p> <p>If the object does not have a jumper for this feature:</p> <ul style="list-style-type: none"> <li>• It will report 'N/A' if metaMibVariableType is string.</li> <li>• It will be zero length otherwise.</li> </ul> <p>When read, a zero length string is valid if Type is string.</p> <p>Note this is not used by the Media Cross Connect.</p>
metaMibVariableOper.X.Y	<p>Returns the current operational value for this variable.</p> <p>If the object cannot report the current operational value:</p> <ul style="list-style-type: none"> <li>• It will report 'N/A' if metaMibVariableType is string.</li> <li>• It will be zero length otherwise.</li> <li>• If Caps reports non-zero length, this variable is write-only due to hardware limitations.</li> </ul> <p>When read, a zero length string is valid if Type is string.</p>
metaMibVariableAdmin.X.Y	<p>Returns the current administrative value of this variable.</p> <p>If the Administrative value cannot be set for this variable, Caps is zero-length and it reports a zero length string. Writing zero length values is rejected unless Type is string and Caps permits it.</p> <p>When read, a zero length string is valid if Type is string.</p>
metaMibVariableStatus.X.Y	Returns any messages relating to this variable.

In the preceding table, X is the interface index of a port in the form CSSPPP. C is the chassis number, SS is the 2-digit slot number (00-10), and PPP is the 3-digit port number (000-100). To target a slot, the PPP field should be empty. To target a chassis, both the SS and the PPP fields should be empty. For example, index notation for port 1.2.3 is 102003 and slot 1.2 is 102000.

In the preceding table, Y is the element's feature ID. For example, if the MetaMIB object ends with 102003.12 then the port 1.2.3 has feature ID #12.

## 12.8.4. Example MetaMIB Session - get

First, do an SNMP walk on the entire Fiber Driver system being used. From there, find the object that you wish to configure. For simplicity, use the “metaMibFeatureOID” of your target object to find the ID for configuration. For example, to find the equalization value on an SFP-SATA-SAS-HT SFP, search for “metaMibFeatureOID” that is set to 1.1.0.

Below is a truncated version of an SNMP walk on a chassis focusing on the equalization feature; other features are ignored.

```
$ snmpwalk -c public -v 1 -m ./nbs-meta.mib 192.168.14.201 metaMib
NBS-META-MIB::metaMibFeatureTableSize.0 = INTEGER: 24
NBS-META-MIB::metaMibFeatureID.11 = Gauge32: 11
NBS-META-MIB::metaMibFeatureFamily.11 = STRING: SATA/SAS Cu SFP
NBS-META-MIB::metaMibFeatureName.11 = STRING: Equalization
NBS-META-MIB::metaMibFeatureDesc.11 = STRING: Input Equalization
NBS-META-MIB::metaMibFeatureUnits.11 = STRING:
NBS-META-MIB::metaMibFeatureType.11 = INTEGER: enum(1)
NBS-META-MIB::metaMibVariableTableSize.0 = INTEGER: 8
NBS-META-MIB::metaMibVariableIfIndex.104001.11 = Gauge32: 104001
NBS-META-MIB::metaMibVariableID.104001.11 = Gauge32: 11
NBS-META-MIB::metaMibVariableCaps.104001.11 = STRING: disabled,low,medium,high
NBS-META-MIB::metaMibVariableDefault.104001.11 = STRING: disabled
NBS-META-MIB::metaMibVariableJumper.104001.11 = STRING:
NBS-META-MIB::metaMibVariableOper.104001.11 = STRING:
NBS-META-MIB::metaMibVariableAdmin.104001.11 = STRING: disabled
NBS-META-MIB::metaMibVariableStatus.104001.11 = STRING:
```

To get specific information on a port, use the relevant MIB object (in the current example, we can use #11) on a port with the desired feature. For example to just get the administrative status of equalization on port 1.4.1 use the example below.

```
$ snmpget -c public -v 1 -m ./nbs-meta.mib 192.168.14.201
metaMibVariableAdmin.104001.11
NBS-META-MIB::metaMibVariableAdmin.104001.11 = STRING: disabled
```

## 12.8.5. Example MetaMIB Session - set

It is suggested to follow the steps in the previous section to figure out what objects are available to be changed on the system. After figuring out which object to configure, use the MetaMIB object “metaMibVariableAdmin” to change the value.

For example using the equalization object from the previous section, we can change the value from “disabled” to “medium”. We know “medium” is an available option by looking at what was returned from “metaMibVariableCaps.104001.11” and “metaMibFeatureType.11”. The values returned were “disabled, low, medium and high” and “enum” respectively. This means the MetaMIB object is an enumeration with the available options: disabled, low, medium and high.

```
$ snmpset -c private -v 1 -m ./nbs-meta.mib 192.168.14.201
metaMibVariableAdmin.104001.11 s medium
NBS-META-MIB::metaMibVariableAdmin.104001.11 = STRING: medium
```

---

# Appendix

## 1. Equivalent EM316NM Commands

This guide gives some EM316LNXNM command equivalents for some EM316NM commands. It is not intended as a comprehensive list of equivalent commands.



The manager does not automatically save the current running configuration. Use the **"write file"** command to save current parameters to the "startup-config" file and use them when the system restarts.

Hints:

- Use '?' and <Tab> keys for context sensitive command line help.
- Make configuration changes in the "configure" context.
- To enter the configure context, type **"configure terminal"** command at the "fiberdriver#" prompt.

```
fiberdriver# configure terminal
fiberdriver(config)#
```

- The command prompt indicates the current command context.

**Table 3. Command Map Table**

EM316NM CLI command	EM316LNXNM CLI command
set-ip	ip interface, ip interface update
get-ip	show ip
set-gatew	ip default-gateway, ip interface update
get-gatew	show ip
set-passwd	username username password
set-comm	snmp-server community
get-comm	show snmp-server
set-tftp-srvr	sys tftp-host-ip
get-tftp-srvr	show sys

## 2. EM316LNXNM Command Reference

### 2.1. Initial Command Context

Table 4. Initial Command Context Table

Command	Description
<code>configure terminal</code>	Configuration from vty interface
<code>cp FROM TO</code>	Copy files
<code>echo</code>	Display text for scripting
<code>echo LINE</code>	Display text for scripting
<code>erase nvram all</code>	Erase all files in NVRAM (including ssh keys, upgrade files, NVRAM log, and startup config)
<code>erase nvram log</code>	NVRAM log records
<code>erase package PACKAGE</code>	Remove a package
<code>erase startup-config</code>	Erase startup configuration
<code>exit</code>	Exit current context and go down to previous context
<code>flush</code>	Wait for changes to be flushed to hardware
<code>list</code>	Print command list
<code>list MATCH</code>	Print command list
<code>logout</code>	Logout of the system
<code>ls</code>	List files
<code>more FILE</code>	Display file
<code>mv FROM TO</code>	Rename files
<code>[no] pager</code>	Pause scrolling when screen is full
<code>ping WORD</code>	Send ICMP echo messages to test network connectivity
<code>quit</code>	Exit current context and go down to previous context
<code>restart cold</code>	Cold reset the NM card and reconfigure all line cards from NVRAM
<code>restart upgrade</code>	Reload software but preserve running configuration. Recommend using "write file" before this
<code>restart warm</code>	Warm reset the NM card
<code>rm FILE</code>	Remove files
<code>scp LOCAL from REMOTE</code>	Copy remote to local
<code>scp LOCAL to REMOTE</code>	Copy local to remote
<code>show C</code>	Display info for chassis C
<code>show C dump</code>	Dump machine readable status

Command	Description
<b>show C.S</b>	Display info for slot S in chassis C
<b>show C.S dump</b>	Dump machine readable status
<b>show C.S.P</b>	Display info for port P of slot S in chassis C
<b>show C.S.P dump</b>	Dump machine readable status
<b>show C.S.P plugin</b>	Show Pluggable Optics (SFP/GBIC/XFP) data
<b>show NAME</b>	Show running system information
<b>show NAME plugin</b>	Show Pluggable Optics (SFP/GBIC/XFP) data
<b>show aaa</b>	Show AAA (RADIUS/TACACS+) configuration
<b>show aaa remote-server hosts</b>	Show remote AAA servers
<b>show chassis</b>	Show chassis list
<b>show chassis all</b>	Show list of all chassis (deprecated, use 'show chassis')
<b>show config C</b>	Chassis
<b>show config C all</b>	Show configuration for this location and all of its children
<b>show config C.S</b>	Slot
<b>show config C.S all</b>	Show configuration for this location and all of its children
<b>show config C.S.P</b>	Port
<b>show config C.S.P all</b>	Show configuration for this location and all of its children
<b>show config NAME</b>	Show administrative configuration for a location
<b>show config NAME all</b>	Show configuration for this location and all of its children
<b>show cos prio</b>	Show CoS priority configuration
<b>show cos prio C</b>	Show CoS priority for all slots in this chassis
<b>show cos prio C.S</b>	Show CoS priority for this slot
<b>show defaults C</b>	Chassis
<b>show defaults C all</b>	Show defaults for this location and all of its children
<b>show defaults C.S</b>	Slot
<b>show defaults C.S all</b>	Show defaults for this location and all of its children
<b>show defaults C.S.P</b>	Port
<b>show defaults C.S.P all</b>	Show defaults for this location and all of its children
<b>show defaults NAME</b>	Show default configuration for a location
<b>show defaults NAME all</b>	Show defaults for this location and all of its children
<b>show digital-diagnostics</b>	Show Digital Diagnostics summary

Command	Description
<b>show digital-diagnostics C</b>	For all ports in this chassis
<b>show digital-diagnostics C.S</b>	For all ports in this slot
<b>show digital-diagnostics C.S.P</b>	For a specific port
<b>show digital-diagnostics NAME</b>	Show Digital Diagnostics summary
<b>show discovery hosts</b>	List of hosts found by L2 Discovery Protocol
<b>show dscp map</b>	For all slots
<b>show dscp map C</b>	For all slots in a chassis
<b>show dscp map C.S</b>	For a slot
<b>show firmware</b>	Show firmware info
<b>show firmware areas</b>	Show firmware non-volatile areas
<b>show firmware areas C</b>	Show firmware non-volatile area for chassis
<b>show firmware areas C.S</b>	Show firmware non-volatile area for slot
<b>show firmware sessions</b>	Show firmware download sessions
<b>show flows</b>	Show flow configuration
<b>show flows C</b>	Show flow configuration for all slots in this chassis
<b>show flows C.S</b>	Show flow configuration for this slot
<b>show groups</b>	Show group configuration
<b>show history</b>	Display the session command history
<b>show hw-config</b>	Show hardware configuration settings (e.g. jumper/DIP switches)
<b>show hw-config C.S</b>	For a slot
<b>show inventory</b>	Show information about every object in the system
<b>show inventory tsv</b>	Inventory in a tab-separated format
<b>show ip</b>	Show administrative IP status
<b>show ip interface</b>	Show system IP interface configuration
<b>show ip interface vlan-id</b>	Show VLAN 802.1q configuration
<b>show ip tables</b>	Show ip tables configuration
<b>show license</b>	Displays licensing information about this system
<b>show log</b>	Show logging configuration and log entries
<b>show log nvram</b>	NVRAM log
<b>show log nvram &lt;1-99999&gt;</b>	NVRAM log
<b>show log nvram all</b>	Show all NVRAM log entries
<b>show log remote-server hosts</b>	Show remote syslog servers
<b>show log running</b>	Running log
<b>show log running &lt;1-99999&gt;</b>	Running log
<b>show log running all</b>	Show all running log entries
<b>show map</b>	Display port map

Command	Description
<b>show map C</b>	Enter chassis location
<b>show map C dump actual</b>	Show actual (operating) state
<b>show map C dump desired</b>	Show desired (administrative) state
<b>show map C names</b>	Map list with full port names
<b>show map C simple</b>	Map list without graphics
<b>show map C.S</b>	Enter slot location
<b>show map C.S dump actual</b>	Show actual (operating) state
<b>show map C.S dump desired</b>	Show desired (administrative) state
<b>show map C.S names</b>	Map list with full port names
<b>show map C.S simple</b>	Map list without graphics
<b>show map C.S.P</b>	Enter port location
<b>show map C.S.P dump actual</b>	Show actual (operating) state
<b>show map C.S.P dump desired</b>	Show desired (administrative) state
<b>show map C.S.P names</b>	Map list with full port names
<b>show map C.S.P simple</b>	Map list without graphics
<b>show map names</b>	Map list with full port names
<b>show map simple</b>	Map list without graphics
<b>show mapping-types</b>	Show mapping-type info
<b>show mapping-types C</b>	Show mapping-type info
<b>show mapping-types C.S</b>	(no description yet)
<b>show mapping-types C.S.P</b>	(no description yet)
<b>show memory</b>	Show memory usage
<b>show ntp</b>	Show NTP configuration
<b>show ntp-server hosts</b>	Show NTP servers
<b>show packages</b>	Show installed packages and versions
<b>show permissions</b>	Show your permissions
<b>show permissions chassis</b>	Show your chassis permissions
<b>show permissions port</b>	Show your port permissions
<b>show permissions slot</b>	Show your slot permissions
<b>show plugins</b>	Show Pluggable Optics (SFP/GBIC/XFP) summary
<b>show ports</b>	Show port list
<b>show proc cpu</b>	CPU utilization and memory statistics
<b>show redundancy C</b>	Show chassis redundancy info
<b>show redundancy C.S</b>	Show slot redundancy info
<b>show redundancy NAME</b>	Show redundancy info
<b>show rm slots</b>	Show s/w versions of rm slots
<b>show running-config</b>	Current operating configuration



Command	Description
<b>show slot all</b>	Show list of all slots (deprecated, use 'show slots')
<b>show slots</b>	Show slot list
<b>show snmp-server</b>	Show SNMP server configuration
<b>show snmp-server hosts</b>	Show trap recipients
<b>show snmp-server users</b>	SNMPv3 user list
<b>show startup-config</b>	Contents of startup configuration
<b>show statistics</b>	Show port info
<b>show sys</b>	Show system information
<b>show sys date</b>	Show the system clock
<b>show sys login-banner</b>	Show login banner
<b>show sys uptime</b>	Show system up-time
<b>show table chassis dump</b>	Dump in machine readable format
<b>show table metamib feature dump</b>	Dump in machine readable format
<b>show table metamib variable dump</b>	Dump in machine readable format
<b>show table port dump</b>	Dump in machine readable format
<b>show table protocol</b>	Display protocol table
<b>show table protocol dump</b>	Dump in machine readable format
<b>show table slot dump</b>	Dump in machine readable format
<b>show tech-support</b>	Generate informational report for technical support
<b>show terminal</b>	Show local terminal information
<b>show unmapped</b>	Show unmapped ports
<b>show unmapped C</b>	Enter slot location
<b>show unmapped C.S</b>	Enter port location
<b>show unmapped C.S.P</b>	Show unmapped ports
<b>show user-class</b>	User class (debug, super, etc)
<b>show users</b>	User accounts
<b>show version</b>	Displays software version
<b>show vid-map</b>	Show VID map
<b>show vid-map C</b>	Show VID map for all slots in this chassis
<b>show vid-map C.S</b>	Show VID map for this slot
<b>show warranty</b>	Displays information about the warranty for this system
<b>sleep &lt;0-10&gt;</b>	Pause CLI for scripting
<b>source FILE</b>	Read CLI commands from file
<b>ssh HOST</b>	Open a SSH connection
<b>sync</b>	Wait for changes to be flushed to hardware / display
<b>telnet WORD</b>	Open a TELNET connection

Command	Description
<b>telnet</b> <i>WORD PORT</i>	Open a TELNET connection
<b>[no]</b> <b>terminal</b> <b>echo-commands</b>	Echo commands when sourcing scripts
<b>no</b> <b>terminal</b> <b>length</b>	Disable pager (use 'terminal length 24' for default)
<b>terminal</b> <b>length</b> <i>&lt;0-512&gt;</i>	Set number of lines on a screen
<b>[no]</b> <b>terminal</b> <b>progress</b>	Show progress indicator while waiting for commands to complete
<b>[no]</b> <b>terminal</b> <b>show-timestamps</b>	Show time stamps for log messages displayed on the CLI
<b>terminal</b> <b>width</b> <i>&lt;0-512&gt;</i>	Set number of columns on a screen
<b>tftp</b> <b>get</b> <i>A.B.C.D REMOTE</i>	Get file
<b>tftp</b> <b>get</b> <i>A.B.C.D REMOTE LOCAL</i>	Get file
<b>tftp</b> <b>get</b> <i>REMOTE</i>	Get file
<b>tftp</b> <b>get</b> <i>REMOTE LOCAL</i>	Get file
<b>tftp</b> <b>put</b> <i>A.B.C.D LOCAL</i>	Put file
<b>tftp</b> <b>put</b> <i>A.B.C.D LOCAL REMOTE</i>	Put file
<b>tftp</b> <b>put</b> <i>LOCAL</i>	Put file
<b>tftp</b> <b>put</b> <i>LOCAL REMOTE</i>	Put file
<b>upgrade</b>	Upgrade software
<b>upgrade</b> <i>A.B.C.D</i>	Upgrade software
<b>upgrade</b> <i>A.B.C.D FNAME</i>	Upgrade software
<b>upgrade</b> <b>scp</b> <i>HOST FNAME</i>	Upgrade software using SCP
<b>who</b>	Show user sessions
<b>whoami</b>	Who am I?
<b>write</b> <b>file</b>	Write configuration to the startup-config file
<b>write</b> <b>terminal</b>	Write to terminal

## 2.2. Main Configuration Context

**Table 5. Main Configuration Context Table**

Command	Description
<code>default C</code>	Chassis
<code>default C all</code>	Restore defaults for this location and all of its children
<code>default C.S</code>	Slot
<code>default C.S all</code>	Restore defaults for this location and all of its children
<code>default C.S.P</code>	Port
<code>default C.S.P all</code>	Restore defaults for this location and all of its children
<code>default NAME</code>	<NO DOC STRING>
<code>default NAME all</code>	Restore defaults for this location and all of its children
<code>[default no] aaa accounting</code>	Enable remote accounting
<code>[default no] aaa authentication</code>	Enable remote authentication
<code>default aaa protocol</code>	Select AAA protocol
<code>aaa protocol radius</code>	Use Radius
<code>aaa protocol tacacs-ascii</code>	Use TACACS+ ASCII password authentication
<code>aaa protocol tacacs-pap</code>	Use TACACS+ PAP password authentication
<code>default aaa remote-server &lt;1-5&gt;</code>	Restore most remote AAA server parameters
<code>default aaa remote-server &lt;1-5&gt; port</code>	Restore remote AAA server port to its default value
<code>aaa remote-server &lt;1-5&gt; port &lt;0-65535&gt;</code>	Configure remote AAA server port
<code>default aaa remote-server &lt;1-5&gt; priv-normal</code>	Restore (min) privilege level for normal access to its default value
<code>aaa remote-server &lt;1-5&gt; priv-normal &lt;1-14&gt;</code>	Configure TACACS+ (min) privilege level for normal access
<code>default aaa remote-server &lt;1-5&gt; priv-super</code>	Restore (min) privilege level for super access to its default value
<code>aaa remote-server &lt;1-5&gt; priv-super &lt;2-15&gt;</code>	Configure TACACS+ (min) privilege level for super access
<code>default aaa remote-server &lt;1-5&gt; priv-view</code>	Restore (min) privilege level for view access to its default value
<code>aaa remote-server &lt;1-5&gt; priv-view &lt;0-13&gt;</code>	Configure TACACS+ (min) privilege level for view access
<code>default aaa remote-server &lt;1-5&gt; protocol</code>	Restore primary service sub-protocol to its default value

Command	Description
<b>aaa remote-server &lt;1-5&gt; protocol <i>PROTOCOL</i></b>	Configure TACACS+ sub-protocol for primary service
<b>default aaa remote-server &lt;1-5&gt; retries</b>	Restore connection retry count to its default value
<b>aaa remote-server &lt;1-5&gt; retries &lt;0-10&gt;</b>	Configure remote AAA server retries
<b>default aaa remote-server &lt;1-5&gt; service</b>	Restore primary user service name to its default value
<b>aaa remote-server &lt;1-5&gt; service <i>SERVICE</i></b>	Configure TACACS+ primary service name
<b>default aaa remote-server &lt;1-5&gt; timeout</b>	Restore response timeout to its default value
<b>aaa remote-server &lt;1-5&gt; timeout &lt;0-10&gt;</b>	Configure remote AAA server response timeout
<b>no aaa remote-server host &lt;1-5&gt;</b>	Remove remote AAA server
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D SECRET</i></b>	Configure remote AAA server
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D SECRET &lt;0-65535&gt;</i></b>	Configure remote AAA server
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D SECRET &lt;0-65535&gt; &lt;1-10&gt;</i></b>	Configure remote AAA server
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D SECRET &lt;0-65535&gt; &lt;1-10&gt; &lt;0-10&gt;</i></b>	Configure remote AAA server
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D encrypted SECRET</i></b>	Encrypted Remote AAA server shared secret
<b>aaa remote-server host &lt;1-5&gt; <i>A.B.C.D encrypted SECRET &lt;0-65535&gt; &lt;1-10&gt; &lt;0-10&gt;</i></b>	Encrypted Remote AAA server shared secret
<b>chassis C</b>	A chassis location
<b>chassis <i>NAME</i></b>	Configure a chassis
<b>chassis <i>NAME</i> type <i>TYPE</i></b>	Specify a specific chassis type (This command is only available in the startup-config file)
<b>chassis <i>NAME</i> type <i>TYPE</i> rev &lt;0-255&gt;</b>	Specify a specific chassis revision (This command is only available in the startup-config file)
<b>echo</b>	Display text for scripting
<b>echo <i>LINE</i></b>	Display text for scripting
<b>end</b>	End current context and go down to initial command context
<b>exit</b>	Exit current context and go down to previous context
<b>firmware download <i>FILE</i> C</b>	Download firmware file to chassis non-volatile area

Command	Description
<b>firmware download <i>FILE</i> C.S</b>	Download firmware file to slot non-volatile area
<b>firmware download <i>FILE</i> all</b>	All cards that are compatible with the firmware
<b>firmware download abort C</b>	Abort current download on chassis
<b>firmware download abort C.S</b>	Abort current download on slot
<b>firmware reload C</b>	Swap/reload firmware in non-volatile area for chassis
<b>firmware reload C.S</b>	Swap/reload firmware in non-volatile area for slot
<b>firmware swap-primary C</b>	Swap/reload firmware in non-volatile area for chassis
<b>firmware swap-primary C.S</b>	Swap/reload firmware in non-volatile area for slot
<b>flush</b>	Wait for changes to be flushed to hardware
<b>foreach <i>LOC COMMAND</i></b>	Execute a command on a set of objects
<b>no group <i>GROUP</i></b>	Group configuration
<b>default group <i>GROUP</i> access</b>	Restore default service access for a group
<b>[no] group <i>GROUP</i> access any</b>	Enable access via any service
<b>[no] group <i>GROUP</i> access api</b>	Enable api service access
<b>[no] group <i>GROUP</i> access console</b>	Enable console service access
<b>group <i>GROUP</i> access none</b>	Remove access via any services
<b>[no] group <i>GROUP</i> access ssh</b>	Enable ssh service access
<b>[no] group <i>GROUP</i> access telnet</b>	Enable telnet service access
<b>[no] group <i>GROUP</i> read C</b>	Enable control for a chassis
<b>[no] group <i>GROUP</i> read C.S</b>	Enable control for a slot
<b>[no] group <i>GROUP</i> read C.S.P</b>	Enable control for a port
<b>[no] group <i>GROUP</i> write C</b>	Enable control for a chassis
<b>[no] group <i>GROUP</i> write C.S</b>	Enable control for a slot
<b>[no] group <i>GROUP</i> write C.S.P</b>	Enable control for a port
<b>[default no] ip default-gateway</b>	Clear default gateway
<b>ip default-gateway <i>A.B.C.D</i></b>	Set the default gateway
<b>[default no] ip gratuitous-arp</b>	Send broadcast gratuitous ARP when IP address changes or network comes up
<b>no ip interface</b>	System interface configuration
<b>ip interface <i>A.B.C.D</i></b>	System interface configuration
<b>ip interface <i>A.B.C.D/M</i></b>	System interface configuration
<b>[default no] ip interface dhcp</b>	Enable DHCP
<b>ip interface update</b>	Apply administrative interface configuration to operational
<b>[default no] ip interface vlan-id</b>	Disable VLAN 802.1q support. Will not take effect until next cold-restart

Command	Description
<code>ip interface vlan-id &lt;0-4095&gt;</code>	Set 802.1q VLAN ID (0 to disable). Will not take effect until next cold-restart
<code>[default no] ip scp-server</code>	Configure SCP server
<code>[default no] ip ssh-server</code>	Configure SSH server
<code>default ip ssh-server port</code>	Set the listening port for ssh traffic to its default state
<code>ip ssh-server port &lt;1-65535&gt;</code>	Set the listening port for ssh traffic
<code>[default no] ip tables</code>	Remove all ip tables
<code>ip tables <i>LINE</i></code>	ip tables configuration
<code>[default no] ip telnet-server</code>	Configure TELNET server
<code>default ip telnet-server port</code>	Set the listening port for TELNET traffic to its default state
<code>ip telnet-server port &lt;1-65535&gt;</code>	Set the listening port for TELNET traffic
<code>[default no] ip web-server</code>	Configure web server
<code>default ip web-server port</code>	Set the listening port for web traffic to its default state
<code>ip web-server port &lt;1-65535&gt;</code>	Set the listening port for web traffic
<code>list</code>	Print command list
<code>list <i>MATCH</i></code>	Print command list
<code>[default no] log level nvram</code>	Disable flash logging
<code>log level nvram alarm</code>	Set log threshold to alarm - similar to LOG_WARNING (4)
<code>log level nvram error</code>	Set log threshold to LOG_ERR (3)
<code>log level nvram fatal</code>	Set log threshold to LOG_EMERG (0)
<code>log level nvram info</code>	Set log threshold to LOG_INFO (6)
<code>log level nvram memo</code>	Set log threshold to LOG_DEBUG (7)
<code>log level nvram warning</code>	Set log threshold to LOG_WARNING (4)
<code>[default no] log level running</code>	Disable display log
<code>log level running alarm</code>	Set log threshold to alarm - similar to LOG_WARNING (4)
<code>log level running error</code>	Set log threshold to LOG_ERR (3)
<code>log level running fatal</code>	Set log threshold to LOG_EMERG (0)
<code>log level running info</code>	Set log threshold to LOG_INFO (6)
<code>log level running memo</code>	Set log threshold to LOG_DEBUG (7)
<code>log level running warning</code>	Set log threshold to LOG_WARNING (4)
<code>[default no] log level trap</code>	Disable sending SNMP Traps
<code>log level trap alarm</code>	Set log threshold to alarm - similar to LOG_WARNING (4)
<code>log level trap error</code>	Set log threshold to LOG_ERR (3)
<code>log level trap fatal</code>	Set log threshold to LOG_EMERG (0)

Command	Description
log level trap info	Set log threshold to LOG_INFO (6)
log level trap memo	Set log threshold to LOG_DEBUG (7)
log level trap warning	Set log threshold to LOG_WARNING (4)
no log remote-server host <1-5>	Remove remote syslog server
log remote-server host <1-5> A.B.C.D	Setup remote syslog server
log remote-server host <1-5> A.B.C.D <0-65535>	Setup remote syslog server
log remote-server host <1-5> A.B.C.D <0-65535> alert	Set log threshold to LOG_ALERT (1)
log remote-server host <1-5> A.B.C.D <0-65535> crit	Set log threshold to LOG_CRIT (2)
log remote-server host <1-5> A.B.C.D <0-65535> debug	Set log threshold to LOG_DEBUG (7)
log remote-server host <1-5> A.B.C.D <0-65535> emerg	Set log threshold to LOG_EMERG (0)
log remote-server host <1-5> A.B.C.D <0-65535> error	Set log threshold to LOG_ERR (3)
log remote-server host <1-5> A.B.C.D <0-65535> info	Set log threshold to LOG_INFO (6)
log remote-server host <1-5> A.B.C.D <0-65535> notice	Set log threshold to LOG_NOTICE (5)
log remote-server host <1-5> A.B.C.D <0-65535> warning	Set log threshold to LOG_WARNING (4)
log send alarm <i>LINE</i>	Send with alarm level
log send error <i>LINE</i>	Send with error level
log send fatal <i>LINE</i>	Send with fatal level
log send info <i>LINE</i>	Send with info level
log send memo <i>LINE</i>	Send with memo level
log send warning <i>LINE</i>	Send with warning level
default log size nvram	Restore nvram to its default state
log size nvram <4-65535>	Configure flash log threshold
logout	Logout of the system
map C clear-all	Clear all related mappings
map C repeater	Set to 'repeater' setting (1 <-> 2, etc.)
map C to-self	Map to itself (and clear other mappings)
map C.S clear-all	Clear all related mappings
map C.S repeater	Set to 'repeater' setting (1 <-> 2, etc.)
map C.S to-self	Map to itself (and clear other mappings)
map C.S.P also-to C.S.P	Enter port location
map C.S.P also-to <i>NAME</i>	

Command	Description
	Map to a port (in addition to this port's existing destinations)
<b>map C.S.P clear-all</b>	Clear all related mappings
<b>map C.S.P not-to C.S.P</b>	Enter port location
<b>map C.S.P not-to NAME</b>	Remove the source port from that destination port
<b>map C.S.P only-to C.S.P</b>	Enter port location
<b>map C.S.P only-to NAME</b>	Map to a port (and clear all other mappings for both ports)
<b>map C.S.P repeater</b>	Set to 'repeater' setting (1 <-> 2, etc.)
<b>map C.S.P to-self</b>	Map to itself (and clear other mappings)
<b>map C.S.P with C.S.P</b>	Enter port location
<b>map C.S.P with NAME</b>	Map a port pair (and clear any other mapping)
<b>map NAME also-to C.S.P</b>	Enter port location
<b>map NAME also-to NAME</b>	Map to a port (in addition to this port's existing destinations)
<b>map NAME clear-all</b>	Clear all related mappings
<b>map NAME not-to C.S.P</b>	Enter port location
<b>map NAME not-to NAME</b>	Remove the source port from that destination port
<b>map NAME only-to C.S.P</b>	Enter port location
<b>map NAME only-to NAME</b>	Map to a port (and clear all other mappings for both ports)
<b>map NAME repeater</b>	Set to 'repeater' setting (1 <-> 2, etc.)
<b>map NAME to-self</b>	Map to itself (and clear other mappings)
<b>map NAME with C.S.P</b>	Enter port location
<b>map NAME with NAME</b>	Map a port pair (and clear any other mapping)
<b>[default no] ntp</b>	Enable NTP
<b>[no] ntp-server host A.B.C.D</b>	Add an NTP server
<b>[no] pager</b>	Pause scrolling when screen is full
<b>port C.S.P</b>	A port location
<b>port NAME</b>	Configure a port
<b>port NAME type TYPE</b>	Specify a specific port type (This command is only available in the startup-config file)
<b>quit</b>	Exit current context and go down to previous context
<b>scp LOCAL from REMOTE</b>	Copy remote to local
<b>scp LOCAL to REMOTE</b>	Copy local to remote
<b>show C</b>	Display info for chassis C
<b>show C dump</b>	Dump machine readable status
<b>show C.S</b>	Display info for slot S in chassis C



Command	Description
<b>show C.S dump</b>	Dump machine readable status
<b>show C.S.P</b>	Display info for port P of slot S in chassis C
<b>show C.S.P dump</b>	Dump machine readable status
<b>show C.S.P plugin</b>	Show Pluggable Optics (SFP/GBIC/XFP) data
<b>show NAME</b>	Show running system information
<b>show NAME plugin</b>	Show Pluggable Optics (SFP/GBIC/XFP) data
<b>show aaa</b>	Show AAA (RADIUS/TACACS+) configuration
<b>show aaa remote-server hosts</b>	Show remote AAA servers
<b>show chassis</b>	Show chassis list
<b>show chassis all</b>	Show list of all chassis (deprecated, use 'show chassis')
<b>show config C</b>	Chassis
<b>show config C all</b>	Show configuration for this location and all of its children
<b>show config C.S</b>	Slot
<b>show config C.S all</b>	Show configuration for this location and all of its children
<b>show config C.S.P</b>	Port
<b>show config C.S.P all</b>	Show configuration for this location and all of its children
<b>show config NAME</b>	Show administrative configuration for a location
<b>show config NAME all</b>	Show configuration for this location and all of its children
<b>show cos prio</b>	Show CoS priority configuration
<b>show cos prio C</b>	Show CoS priority for all slots in this chassis
<b>show cos prio C.S</b>	Show CoS priority for this slot
<b>show defaults C</b>	Chassis
<b>show defaults C all</b>	Show defaults for this location and all of its children
<b>show defaults C.S</b>	Slot
<b>show defaults C.S all</b>	Show defaults for this location and all of its children
<b>show defaults C.S.P</b>	Port
<b>show defaults C.S.P all</b>	Show defaults for this location and all of its children
<b>show defaults NAME</b>	Show default configuration for a location
<b>show defaults NAME all</b>	Show defaults for this location and all of its children
<b>show digital-diagnostics</b>	Show Digital Diagnostics summary
<b>show digital-diagnostics C</b>	For all ports in this chassis

Command	Description
<b>show digital-diagnostics C.S</b>	For all ports in this slot
<b>show digital-diagnostics C.S.P</b>	For a specific port
<b>show digital-diagnostics <i>NAME</i></b>	Show Digital Diagnostics summary
<b>show discovery hosts</b>	List of hosts found by L2 Discovery Protocol
<b>show dscp map</b>	For all slots
<b>show dscp map C</b>	For all slots in a chassis
<b>show dscp map C.S</b>	For a slot
<b>show firmware</b>	Show firmware info
<b>show firmware areas</b>	Show firmware non-volatile areas
<b>show firmware areas C</b>	Show firmware non-volatile area for chassis
<b>show firmware areas C.S</b>	Show firmware non-volatile area for slot
<b>show firmware sessions</b>	Show firmware download sessions
<b>show flows</b>	Show flow configuration
<b>show flows C</b>	Show flow configuration for all slots in this chassis
<b>show flows C.S</b>	Show flow configuration for this slot
<b>show groups</b>	Show group configuration
<b>show history</b>	Display the session command history
<b>show hw-config</b>	Show hardware configuration settings (e.g. jumper/DIP switches)
<b>show hw-config C.S</b>	For a slot
<b>show inventory</b>	Show information about every object in the system
<b>show inventory tsv</b>	Inventory in a tab-separated format
<b>show ip</b>	Show administrative IP status
<b>show ip interface</b>	Show system IP interface configuration
<b>show ip interface vlan-id</b>	Show VLAN 802.1q configuration
<b>show ip tables</b>	Show ip tables configuration
<b>show log</b>	Show logging configuration and log entries
<b>show log nvram</b>	NVRAM log
<b>show log nvram &lt;1-99999&gt;</b>	NVRAM log
<b>show log nvram all</b>	Show all NVRAM log entries
<b>show log remote-server hosts</b>	Show remote syslog servers
<b>show log running</b>	Running log
<b>show log running &lt;1-99999&gt;</b>	Running log
<b>show log running all</b>	Show all running log entries
<b>show map</b>	Display port map
<b>show map C</b>	Enter chassis location
<b>show map C dump actual</b>	Show actual (operating) state

Command	Description
<code>show map C dump desired</code>	Show desired (administrative) state
<code>show map C names</code>	Map list with full port names
<code>show map C simple</code>	Map list without graphics
<code>show map C.S</code>	Enter slot location
<code>show map C.S dump actual</code>	Show actual (operating) state
<code>show map C.S dump desired</code>	Show desired (administrative) state
<code>show map C.S names</code>	Map list with full port names
<code>show map C.S simple</code>	Map list without graphics
<code>show map C.S.P</code>	Enter port location
<code>show map C.S.P dump actual</code>	Show actual (operating) state
<code>show map C.S.P dump desired</code>	Show desired (administrative) state
<code>show map C.S.P names</code>	Map list with full port names
<code>show map C.S.P simple</code>	Map list without graphics
<code>show map names</code>	Map list with full port names
<code>show map simple</code>	Map list without graphics
<code>show mapping-types</code>	Show mapping-type info
<code>show mapping-types C</code>	Show mapping-type info
<code>show mapping-types C.S</code>	(no description yet)
<code>show mapping-types C.S.P</code>	(no description yet)
<code>show memory</code>	Show memory usage
<code>show ntp</code>	Show NTP configuration
<code>show ntp-server hosts</code>	Show NTP servers
<code>show packages</code>	Show installed packages and versions
<code>show permissions</code>	Show your permissions
<code>show permissions chassis</code>	Show your chassis permissions
<code>show permissions port</code>	Show your port permissions
<code>show permissions slot</code>	Show your slot permissions
<code>show plugins</code>	Show Pluggable Optics (SFP/GBIC/XFP) summary
<code>show ports</code>	Show port list
<code>show proc cpu</code>	CPU utilization and memory statistics
<code>show redundancy C</code>	Show chassis redundancy info
<code>show redundancy C.S</code>	Show slot redundancy info
<code>show redundancy NAME</code>	Show redundancy info
<code>show rm slots</code>	Show s/w versions of rm slots
<code>show running-config</code>	Current operating configuration
<code>show slot all</code>	Show list of all slots (deprecated, use 'show slots')
<code>show slots</code>	Show slot list

Command	Description
<code>show snmp-server</code>	Show SNMP server configuration
<code>show snmp-server hosts</code>	Show trap recipients
<code>show snmp-server users</code>	SNMPv3 user list
<code>show statistics</code>	Show port info
<code>show sys</code>	Show system information
<code>show sys date</code>	Show the system clock
<code>show sys login-banner</code>	Show login banner
<code>show table chassis dump</code>	Dump in machine readable format
<code>show table metamib feature dump</code>	Dump in machine readable format
<code>show table metamib variable dump</code>	Dump in machine readable format
<code>show table port dump</code>	Dump in machine readable format
<code>show table protocol</code>	Display protocol table
<code>show table protocol dump</code>	Dump in machine readable format
<code>show table slot dump</code>	Dump in machine readable format
<code>show terminal</code>	Show local terminal information
<code>show unmapped</code>	Show unmapped ports
<code>show unmapped C</code>	Enter slot location
<code>show unmapped C.S</code>	Enter port location
<code>show unmapped C.S.P</code>	Show unmapped ports
<code>show user-class</code>	User class (debug, super, etc)
<code>show users</code>	User accounts
<code>show vid-map</code>	Show VID map
<code>show vid-map C</code>	Show VID map for all slots in this chassis
<code>show vid-map C.S</code>	Show VID map for this slot
<code>sleep &lt;0-10&gt;</code>	Pause CLI for scripting
<code>slot C.S</code>	A slot location
<code>slot NAME</code>	Configure a slot
<code>slot NAME type TYPE</code>	Specify a specific slot type (This command is only available in the startup-config file)
<code>slot NAME type TYPE rev &lt;0-255&gt;</code>	Specify a specific slot revision (This command is only available in the startup-config file)
<code>snmp-server community read</code>	Set read community string
<code>snmp-server community read WORD</code>	Set read community string
<code>snmp-server community read encrypted WORD</code>	Encrypted
<code>snmp-server community write</code>	Set write community string
<code>snmp-server community write WORD</code>	Set write community string
<code>snmp-server community write encrypted WORD</code>	Encrypted

Command	Description
[no] snmp-server host <i>A.B.C.D</i>	Add trap recipient
snmp-server host <i>A.B.C.D COMMUNITY</i>	Add trap recipient
snmp-server host <i>A.B.C.D COMMUNITY</i> alarm	Set host trap threshold to alarm - similar to LOG_WARNING (4)
snmp-server host <i>A.B.C.D COMMUNITY</i> alarm <1-65535>	Set host trap threshold to alarm - similar to LOG_WARNING (4)
snmp-server host <i>A.B.C.D COMMUNITY</i> error	Set host trap threshold to LOG_ERR (3)
snmp-server host <i>A.B.C.D COMMUNITY</i> error <1-65535>	Set host trap threshold to LOG_ERR (3)
snmp-server host <i>A.B.C.D COMMUNITY</i> fatal	Set host trap threshold to LOG_EMERG (0)
snmp-server host <i>A.B.C.D COMMUNITY</i> fatal <1-65535>	Set host trap threshold to LOG_EMERG (0)
snmp-server host <i>A.B.C.D COMMUNITY</i> warning	Set host trap threshold to LOG_WARNING (4)
snmp-server host <i>A.B.C.D COMMUNITY</i> warning <1-65535>	Set host trap threshold to LOG_WARNING (4)
default snmp-server port	Port that the SNMP server listens on
snmp-server port <1-65535>	Port that the SNMP server listens on
[default no] snmp-server sys contact	Clear SNMP sysContact
snmp-server sys contact <i>LINE</i>	Set SNMP sysContact
[default no] snmp-server sys location	Clear SNMP sysLocation
snmp-server sys location <i>LINE</i>	Set SNMP sysLocation
[default no] snmp-server sys name	Clear SNMP sysName and restore prompt to default
snmp-server sys name <i>LINE</i>	Set SNMP sysName (and prompt)
[default no] snmp-server traps module	Enable module traps
[default no] snmp-server traps power-supply	Enable power supply traps
[no] snmp-server user <i>USERNAME</i>	Configure SNMPv3 users
snmp-server user <i>USERNAME</i> auth md5	MD5 authentication hash
snmp-server user <i>USERNAME</i> auth md5 <i>AUTHPASS</i>	MD5 authentication hash
snmp-server user <i>USERNAME</i> auth md5 <i>AUTHPASS</i> priv des <i>PRIVPASS</i>	DES encryption
snmp-server user <i>USERNAME</i> auth md5 priv des	DES encryption
snmp-server user <i>USERNAME</i> auth sha	SHA authentication hash

Command	Description
<code>snmp-server user USERNAME auth sha AUTHPASS</code>	SHA authentication hash
<code>snmp-server user USERNAME auth sha AUTHPASS priv des PRIVPASS</code>	DES encryption
<code>snmp-server user USERNAME auth sha priv des</code>	DES encryption
<code>snmp-server user USERNAME encrypted auth md5 AUTHPASS</code>	MD5 authentication hash
<code>snmp-server user USERNAME encrypted auth md5 AUTHPASS priv des PRIVPASS</code>	DES encryption
<code>snmp-server user USERNAME encrypted auth sha AUTHPASS</code>	SHA authentication hash
<code>snmp-server user USERNAME encrypted auth sha AUTHPASS priv des PRIVPASS</code>	DES encryption
<code>[default no] snmp-server v1</code>	Enable SNMPv1
<code>[default no] snmp-server v2c</code>	Enable SNMPv2c
<code>[default no] snmp-server v3</code>	Enable SNMPv3
<code>sync</code>	Wait for changes to be flushed to hardware / display
<code>[default no] sys api-agent</code>	Enable API agent
<code>[default no] sys audit-log</code>	Enable the audit log
<code>sys clear-counters</code>	Clear counters system wide
<code>sys date DATESTR</code>	Set the system clock
<code>sys disconnect pid PID</code>	Disconnect a specific session(s)
<code>sys disconnect user USER</code>	Disconnect a user's session(s)
<code>sys disconnect user USER api</code>	Disconnect user from all API sessions
<code>sys disconnect user USER console</code>	Disconnect user from serial console
<code>sys disconnect user USER gui</code>	Disconnect user from all gui sessions
<code>sys disconnect user USER ssh</code>	Disconnect user from all ssh sessions
<code>sys disconnect user USER telnet</code>	Disconnect user from all telnet sessions
<code>[default no] sys discovery</code>	Enable L2 Discovery Protocol
<code>[default no] sys gui-server</code>	Configure the GUI server
<code>default sys gui-server port</code>	Set the GUI server port to its default state
<code>sys gui-server port &lt;1-65534&gt;</code>	Set the GUI server port
<code>[default no] sys idle-timeout</code>	Disable CLI idle timeout
<code>sys idle-timeout &lt;0-400000&gt;</code>	Set CLI idle timeout (in minutes)
<code>[default no] sys lmp</code>	Enable loop management protocol
<code>[default no] sys lock-types</code>	Enable Type-Locking
<code>[default no] sys login-banner</code>	Set login-banner

Command	Description
<b>sys login-banner <i>STRING</i></b>	Set login-banner
<b>[default no] sys password-strength-check</b>	Enable password strength checking
<b>default sys prompt</b>	Restore prompt (and SNMP sysName) to default
<b>sys prompt <i>LINE</i></b>	Change prompt (and SNMP sysName)
<b>sys rdate</b>	Set the system clock from an rdate server
<b>sys rdate <i>A.B.C.D</i></b>	Set the system clock from an rdate server
<b>[default no] sys rdate-server</b>	Set rdate server address (only used for 'sys rdate')
<b>sys rdate-server <i>A.B.C.D</i></b>	Set rdate server address (only used for 'sys rdate')
<b>sys serial baudrate 19200</b>	Set to 19200 baud
<b>sys serial baudrate 38400</b>	Set to 38400 baud
<b>sys serial baudrate 9600</b>	Set to 9600 baud
<b>[default no] sys serial terminal-type</b>	Clear serial port terminal type (will auto-detect)
<b>sys serial terminal-type <i>LINE</i></b>	Set serial port terminal type
<b>[default no] sys tftp-host-ip</b>	Set TFTP host address
<b>sys tftp-host-ip <i>A.B.C.D</i></b>	Set TFTP host address
<b>[default no] sys timezone</b>	Use UTC/GMT
<b>sys timezone <i>TIMEZONE</i></b>	Timezone
<b>[no] terminal echo-commands</b>	Echo commands when sourcing scripts
<b>[no] terminal progress</b>	Show progress indicator while waiting for commands to complete
<b>[no] terminal show-timestamps</b>	Show time stamps for log messages displayed on the CLI
<b>[no] username <i>NAME</i></b>	User account management
<b>username <i>NAME</i> class debug</b>	has access to low-level (dangerous) debug commands
<b>username <i>NAME</i> class normal</b>	has access to view and change settings based on group membership
<b>username <i>NAME</i> class super</b>	has access to configure the system
<b>username <i>NAME</i> class view</b>	has read-only access to system
<b>[no] username <i>NAME</i> group <i>NAME</i></b>	Add a single group
<b>no username <i>NAME</i> groups</b>	Remove all groups
<b>username <i>NAME</i> groups <i>WORD</i></b>	Enter full group list
<b>username <i>NAME</i> password</b>	Set password
<b>username <i>NAME</i> password <i>PASS</i></b>	Set password
<b>username <i>NAME</i> password <i>PASS</i> class debug</b>	has access to low-level (dangerous) debug commands
<b>username <i>NAME</i> password <i>PASS</i> class normal</b>	has access to view and change settings based on group membership

Command	Description
<code>username NAME password PASS class super</code>	has access to configure the system
<code>username NAME password PASS class view</code>	has read-only access to system
<code>username NAME password class debug</code>	has access to low-level (dangerous) debug commands
<code>username NAME password class normal</code>	has access to view and change settings based on group membership
<code>username NAME password class super</code>	has access to configure the system
<code>username NAME password class view</code>	has read-only access to system
<code>username NAME password encrypted PASS</code>	Encrypted password
<code>username NAME password encrypted PASS class debug</code>	has access to low-level (dangerous) debug commands
<code>username NAME password encrypted PASS class normal</code>	has access to view and change settings based on group membership
<code>username NAME password encrypted PASS class super</code>	has access to configure the system
<code>username NAME password encrypted PASS class view</code>	has read-only access to system
<code>who</code>	Show user sessions
<code>whoami</code>	Who am I?
<code>write file</code>	Write configuration to the startup-config file
<code>write terminal</code>	Write to terminal



## 2.3. Chassis Configuration Context

**Table 6. Chassis Configuration Context Table**

Command	Description
<code>default all</code>	Restore defaults for this location and all of its children
<code>chassis C</code>	A chassis location
<code>chassis NAME</code>	Configure a chassis
<code>clear-counters</code>	Clear counters for all ports in this chassis
<code>default description</code>	Restore description to its default state
<code>description LINE</code>	Set chassis name
<code>echo</code>	Display text for scripting
<code>echo LINE</code>	Display text for scripting
<code>end</code>	End current context and go down to initial command context
<code>exit</code>	Exit current context and go down to previous context
<code>firmware download FILE</code>	Start/abort firmware download into hardware non-volatile area
<code>firmware download abort</code>	Abort current download
<code>firmware reload</code>	Reload firmware from primary non-volatile area
<code>firmware swap-primary</code>	Swap between primary and backup firmware
<code>flush</code>	Wait for changes to be flushed to hardware
<code>[default no] gen-trap chassis</code>	Enable chassis traps
<code>[default no] gen-trap lin</code>	Enable LIN traps
<code>[default no] gen-trap link</code>	Enable link traps
<code>[default no] gen-trap loopback</code>	Enable loopback traps
<code>[default no] gen-trap module-specific</code>	Enable module specific traps
<code>[default no] gen-trap port</code>	Enable port traps
<code>[default no] gen-trap port-change</code>	Enable port change traps
<code>[default no] gen-trap port-diags</code>	Enable digital diagnostic traps
<code>[default no] gen-trap slot-change</code>	Enable slot change traps
<code>[default no] gen-trap switchover</code>	Enable active/standby switchover change traps
<code>list</code>	Print command list
<code>list MATCH</code>	Print command list
<code>logout</code>	Logout of the system
<code>default loopback-timeout</code>	Adjust loopback timeout
<code>loopback-timeout &lt;0-2147483647&gt;</code>	Adjust loopback timeout
<code>map clear-all</code>	Clear all related mappings

Command	Description
<b>map repeater</b>	Set to 'repeater' setting (1 <-> 2, etc.)
<b>map to-self</b>	Map to itself (and clear other mappings)
<b>default me</b>	Restore defaults for this location only
<b>next</b>	Configure next element
<b>[no] pager</b>	Pause scrolling when screen is full
<b>port C.S.P</b>	A port location
<b>port NAME</b>	Configure a port
<b>port S.P</b>	A port in this chassis
<b>previous</b>	Configure previous element
<b>quit</b>	Exit current context and go down to previous context
<b>show</b>	Show running system information
<b>show config</b>	Show administrative configuration for this object
<b>show config all</b>	Show administrative configuration for this object and all of its children
<b>show defaults</b>	Show default configuration for this object
<b>show defaults all</b>	Show default configuration for this object and all of its children
<b>show digital-diagnostics</b>	Show Digital Diagnostics summary
<b>show dump</b>	Dump machine readable status
<b>show firmware</b>	Show onboard non-volatile areas
<b>show firmware sessions</b>	Show firmware download sessions
<b>show hw-config</b>	Show hardware configuration settings (e.g. jumper/DIP switches)
<b>show map</b>	Display port map
<b>show map dump actual</b>	Show actual (operating) state
<b>show map dump desired</b>	Show desired (administrative) state
<b>show map names</b>	Map list with full port names
<b>show map simple</b>	Map list without graphics
<b>show mapping-types</b>	Show mapping-type info
<b>show redundancy</b>	Show slot redundancy info
<b>show running-config</b>	Current operating configuration
<b>show traps</b>	Show trap filter configuration
<b>show unmapped</b>	Show only unmapped ports
<b>sleep &lt;0-10&gt;</b>	Pause CLI for scripting
<b>slot C.S</b>	A slot location
<b>slot NAME</b>	Configure a slot
<b>slot S</b>	A slot on this chassis

Command	Description
<b>sync</b>	Wait for changes to be flushed to hardware / display
<b>default temperature-limit</b>	Adjust high-temperature limit (deg. C)
<b>temperature-limit &lt;-100-100&gt;</b>	(no description yet)
<b>default temperature-min</b>	Adjust low-temperature limit (deg. C)
<b>temperature-min &lt;-100-100&gt;</b>	(no description yet)
<b>[default no] trap</b>	Enable trap generation
<b>[no] trap <i>NAME</i></b>	Enable trap generation
<b>who</b>	Show user sessions
<b>whoami</b>	Who am I?
<b>write file</b>	Write configuration to the startup-config file
<b>write terminal</b>	Write to terminal

## 2.4. Slot Configuration Context

Table 7. Slot Configuration Context Table

Command	Description
<code>default acc-control tagged</code>	Specify control for tagged frames
<code>acc-control tagged deny-all</code>	Discard all tagged frames
<code>acc-control tagged deny-list <i>LINE</i></code>	Discard only specific tagged frames
<code>acc-control tagged permit-all</code>	Pass all tagged frames
<code>acc-control tagged permit-list <i>LINE</i></code>	Pass only specific tagged frames
<code>default acc-control untag</code>	Specify control for untagged frames
<code>acc-control untag deny</code>	Discard all untagged frames
<code>acc-control untag permit</code>	Pass all untagged frames
<code>default aging-timer</code>	Restore Switch Aging Timer in seconds to default setting
<code>aging-timer &lt;1-86400&gt;</code>	Configure Switch Aging Timer in seconds
<code>default all</code>	Restore defaults for this location and all of its children
<code>chassis C</code>	A chassis location
<code>chassis <i>NAME</i></code>	Configure a chassis
<code>clear-counters</code>	Clear counters for all ports in this slot
<code>clear-type</code>	Clear Type, if locking types
<code>[default no] cos</code>	specify frame priority classification
<code>cos both-tag-dscp</code>	prioritize per DSCP value (has precedence) or VLAN priority
<code>cos dscp-only</code>	prioritize per DSCP value
<code>default cos prio</code>	Return CoS priority configuration to defaults
<code>cos prio &lt;0-7&gt; high</code>	Configure high CoS priority
<code>cos prio &lt;0-7&gt; low</code>	Configure low CoS priority
<code>cos prio &lt;0-7&gt; medium</code>	Configure medium CoS priority
<code>cos prio &lt;0-7&gt; normal</code>	Configure normal CoS priority
<code>cos tag-only</code>	Prioritize per VLAN priority
<code>default description</code>	Restore description to its default state
<code>description <i>LINE</i></code>	Set slot name
<code>default dscp</code>	Return DSCP configuration to defaults
<code>default dscp egress-mode</code>	Specify remarking mode on egress
<code>dscp egress-mode af-mode</code>	Assured forward remarking
<code>dscp egress-mode cs-mode</code>	Class selector remarking
<code>[default no] dscp ingress af</code>	Assured forwarding
	Code point values other than af, cs, ef, zero

Command	Description
[default no] dscp ingress all-other	
[default no] dscp ingress cs	Class selector
[default no] dscp ingress ef	Expedited forwarding
[default no] dscp ingress zero-dscp	Zero code point
no dscp map <0-63>	Remove a DSCP map
dscp map <0-63> active	DSCP row active
dscp map <0-63> high active	DSCP row active
dscp map <0-63> high notInService	DSCP row configured, not active
dscp map <0-63> low active	DSCP row active
dscp map <0-63> low notInService	DSCP row configured, not active
dscp map <0-63> medium active	DSCP row active
dscp map <0-63> medium notInService	DSCP row configured, not active
dscp map <0-63> normal active	DSCP row active
dscp map <0-63> normal notInService	DSCP row configured, not active
dscp map <0-63> notInService	DSCP row configured, not active
[default no] dscp remark	DSCP Remarking
echo	Display text for scripting
echo <i>LINE</i>	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
firmware download <i>FILE</i>	Start/abort firmware download into hardware non-volatile area
firmware download abort	Abort current download
firmware reload	Reload firmware from primary non-volatile area
firmware swap-primary	Swap between primary and backup firmware
default flow	Return flow configuration to defaults
no flow <1-4095> <0-8>	Remove flow
flow <1-4095> <0-8> <0-1000000> active	Flow row active
flow <1-4095> <0-8> <0-1000000> notInService	Flow row configured, not active
flow <1-4095> <0-8> active	Flow row active
flow <1-4095> <0-8> clear	clear counters for this flow
flow <1-4095> <0-8> notInService	Flow row configured, not active

Command	Description
<b>flush</b>	Wait for changes to be flushed to hardware
<b>default homing</b>	Adjust homing setting
<b>homing dualcos</b>	Dual Central Offices
<b>homing singleco</b>	Single Central Office
<b>[default no] iometrix</b>	Process Iometrix cNode Level 1 frames received
<b>[default no] ip default-gateway</b>	Clear default gateway
<b>ip default-gateway A.B.C.D</b>	Set default gateway
<b>no ip interface</b>	Slot interface configuration
<b>ip interface A.B.C.D</b>	Slot interface configuration
<b>ip interface A.B.C.D/M</b>	Slot interface configuration
<b>lga start interval &lt;10-86400&gt;</b>	Monitoring duration (Perf/Mon) or interval (Loss/Gain)
<b>lga stop</b>	Stop Loss Gain Analysis
<b>[default no] link-aggregation</b>	aggregate both trunks into the active path
<b>link-aggregation on-dmac</b>	select trunk based on destination MAC address
<b>link-aggregation on-ip</b>	select trunk based on IP information
<b>link-aggregation on-random</b>	select trunk randomly
<b>link-aggregation on-xor-all</b>	select trunk based on MAC addresses and IP info
<b>link-aggregation on-xor-sd</b>	select trunk based on both MAC addresses
<b>default link-toggle-action</b>	Start or stop link toggle of group members
<b>link-toggle-action start</b>	(no description yet)
<b>link-toggle-action stop</b>	(no description yet)
<b>default link-toggle-cycles</b>	Configure number of link toggle cycles
<b>link-toggle-cycles &lt;0-4294967294&gt;</b>	Configure number of link toggle cycles
<b>default link-toggle-down-rate</b>	Adjust link toggle down rate (microseconds), for group members
<b>link-toggle-down-rate &lt;0-4294967294&gt;</b>	Adjust link toggle down rate (microseconds), for group members
<b>link-toggle-members WORD</b>	Configure ports as a part of a link toggle group
<b>default link-toggle-trap-start-</b>	Restore link-toggle-trap-start-emit to its default state
<b>link-toggle-trap-start- emit-not</b>	(no description yet)
<b>link-toggle-trap-start- emit-yes</b>	(no description yet)
<b>default link-toggle-trap-stop-e</b>	Restore link-toggle-trap-stop-emit to its default state
<b>link-toggle-trap-stop-e emit-not</b>	(no description yet)
<b>link-toggle-trap-stop-e emit-yes</b>	(no description yet)
<b>default link-toggle-up-rate</b>	Adjust link toggle up rate (microseconds), for group members

Command	Description
<b>link-toggle-up-rate &lt;0-4294967294&gt;</b>	Adjust link toggle up rate (microseconds), for group members
<b>list</b>	Print command list
<b>list MATCH</b>	Print command list
<b>logout</b>	Logout of the system
<b>default management-vid</b>	define VLAN id reserved exclusively to management
<b>management-vid &lt;1-4095&gt;</b>	define VLAN id reserved exclusively to management
<b>map clear-all</b>	Clear all related mappings
<b>map repeater</b>	Set to 'repeater' setting (1 <-> 2, etc.)
<b>map to-self</b>	Map to itself (and clear other mappings)
<b>[default no] maps heartbeat</b>	Start MAPS heartbeat
<b>default maps rx-timer</b>	Specify MAPS RX heartbeat timer
<b>maps rx-timer &lt;15-30&gt;</b>	Specify MAPS RX heartbeat timer
<b>default maps tx-timer</b>	Specify MAPS TX heartbeat timer
<b>maps tx-timer &lt;1-10&gt;</b>	Specify MAPS TX heartbeat timer
<b>default maps vid</b>	Specify VLAN ID for MAPS packets
<b>maps vid &lt;1-4095&gt;</b>	Specify VLAN ID for MAPS packets
<b>default maps-mode</b>	Restore maps-mode to its default state
<b>maps-mode master</b>	(no description yet)
<b>maps-mode slave</b>	(no description yet)
<b>default me</b>	Restore defaults for this location only
<b>default mgmt-vid</b>	Restore mgmt-vid to its default state
<b>mgmt-vid &lt;0-4095&gt;</b>	(no description yet)
<b>next</b>	Configure next element
<b>operation-type add-drop-mux</b>	(no description yet)
<b>operation-type booster-agc</b>	Optical Amplifier booster, gain mode
<b>operation-type booster-apc</b>	Optical Amplifier booster, output power mode
<b>operation-type co</b>	Central Office
<b>operation-type co-dual-active</b>	Active Central Office
<b>operation-type co-dual-inactive</b>	Inactive Central Office
<b>operation-type converter</b>	Media Converter
<b>operation-type cpe</b>	Customer Premise Equipment
<b>operation-type fast-repeater</b>	Fast Ethernet Repeater
<b>operation-type gigabit-repeater</b>	Gigabit Ethernet Repeater
<b>operation-type inline-agc</b>	Optical Amplifier inline, gain mode
<b>operation-type inline-apc</b>	Optical Amplifier inline, output power mode
<b>operation-type management</b>	Management Card

Command	Description
<b>operation-type</b> <b>midstage-agc</b>	(no description yet)
<b>operation-type</b> <b>midstage-apc</b>	(no description yet)
<b>operation-type</b> <b>monitor</b>	Monitor
<b>operation-type</b> <b>multi-co10g</b>	(no description yet)
<b>operation-type</b> <b>multi-colg</b>	(no description yet)
<b>operation-type</b> <b>multicast</b>	Configure flooding limit for multicast frames (Kfps)
<b>operation-type</b> <b>multiplexer</b>	Multiplexer
<b>operation-type</b> <b>multiplexer4x10g</b>	(no description yet)
<b>operation-type</b> <b>opt-attenuator</b>	(no description yet)
<b>operation-type</b> <b>optical-switch</b>	Optical Switch
<b>operation-type</b> <b>packet-mux</b>	(no description yet)
<b>operation-type</b> <b>phys-layer-switch</b>	Physical Layer Switch
<b>operation-type</b> <b>preamp-agc</b>	Optical Amplifier preamplifier, gain mode
<b>operation-type</b> <b>preamp-apc</b>	Optical Amplifier preamplifier, output power mode
<b>operation-type</b> <b>preamp-appc</b>	(no description yet)
<b>operation-type</b> <b>redundant</b>	Self Healing Link
<b>operation-type</b> <b>remote</b>	Remote Management Card
<b>operation-type</b> <b>repeater</b>	Repeater
<b>operation-type</b> <b>repeater40g</b>	(no description yet)
<b>operation-type</b> <b>splitter-combiner</b>	Splitter/combiner
<b>operation-type</b> <b>switch</b>	Switch
<b>operation-type</b> <b>variable-gain</b>	(no description yet)
<b>[no]</b> <b>pager</b>	Pause scrolling when screen is full
<b>pm start direction</b> <b>co-to-cpe</b> <b>interval</b> <b>&lt;60-604800&gt;</b>	Monitoring duration (Perf/Mon) or interval (Loss/Gain)
<b>pm start direction</b> <b>cpe-rx</b> <b>interval</b> <b>&lt;60-604800&gt;</b>	Monitoring duration (Perf/Mon) or interval (Loss/Gain)
<b>pm start direction</b> <b>cpe-to-co</b> <b>interval</b> <b>&lt;60-604800&gt;</b>	Monitoring duration (Perf/Mon) or interval (Loss/Gain)
<b>pm start direction</b> <b>cpe-tx</b> <b>interval</b> <b>&lt;60-604800&gt;</b>	Monitoring duration (Perf/Mon) or interval (Loss/Gain)
<b>pm stop</b>	Stop Performance Monitoring
<b>port</b> <b>C.S.P</b>	A port location
<b>port</b> <b>NAME</b>	Configure a port
<b>port</b> <b>P</b>	A port on this slot
<b>port</b> <b>S.P</b>	A port on this chassis
<b>previous</b>	Configure previous element



Command	Description
<b>quit</b>	Exit current context and go down to previous context
<b>[default no] redundancy</b>	Enable slot redundancy
<b>reset cold</b>	Full slot reset
<b>reset warm</b>	Slot software reset
<b>show</b>	Show running system information
<b>show access</b>	Show EUSM access control vid list
<b>show attenuation</b>	Display port attenuation settings
<b>show config</b>	Show administrative configuration for this object
<b>show config all</b>	Show administrative configuration for this object and all of its children
<b>show cos prio</b>	Show CoS priority configuration
<b>show defaults</b>	Show default configuration for this object
<b>show defaults all</b>	Show default configuration for this object and all of its children
<b>show digital-diagnostics</b>	Show Digital Diagnostics summary
<b>show dscp map</b>	DSCP Map
<b>show dump</b>	Dump machine readable status
<b>show eusm</b>	Show EUSM slot info
<b>show firmware</b>	Show onboard non-volatile areas
<b>show firmware sessions</b>	Show firmware download sessions
<b>show flows</b>	Show flow configuration
<b>show hw-config</b>	Show hardware configuration settings (e.g. jumper/DIP switches)
<b>show lga statistics</b>	Show Loss Gain Analysis statistics info
<b>show map</b>	Display port map
<b>show map dump actual</b>	Show actual (operating) state
<b>show map dump desired</b>	Show desired (administrative) state
<b>show map names</b>	Map list with full port names
<b>show map simple</b>	Map list without graphics
<b>show mapping-types</b>	Show mapping-type info
<b>show maps</b>	MAPS information
<b>show mgmt-vid</b>	Display vlan mgmt vid setting
<b>show oam</b>	OAM remote management information
<b>show pattern</b>	Pattern Generator/Checker information
<b>show pm statistics</b>	Show Performance Monitoring statistics info
<b>show redundancy</b>	Show slot redundancy info
<b>show running-config</b>	Current operating configuration
<b>show sniffer</b>	Show slot all ports sniffer status

Command	Description
<b>show statistics</b>	Show port info
<b>show traps</b>	Show trap filter configuration
<b>show unmapped</b>	Show only unmapped ports
<b>show vid-map</b>	Show VID map for the current slot
<b>sleep &lt;0-10&gt;</b>	Pause CLI for scripting
<b>slot C.S</b>	A slot location
<b>slot NAME</b>	Configure a slot
<b>slot S</b>	A slot on this chassis
<b>default storm-control broadcast</b>	Configure flooding limit for broadcast frames (Kfps)
<b>storm-control broadcast &lt;0-255&gt;</b>	Configure flooding limit for broadcast frames (Kfps)
<b>default storm-control multicast</b>	Configure flooding limit for multicast frames (Kfps)
<b>storm-control multicast &lt;0-255&gt;</b>	Configure flooding limit for multicast frames (Kfps)
<b>default storm-control unicast</b>	Configure flooding limit for unicast frames (Kfps)
<b>storm-control unicast &lt;0-255&gt;</b>	Configure flooding limit for unicast frames (Kfps)
<b>sync</b>	Wait for changes to be flushed to hardware / display
<b>default toggle-rate</b>	Adjust toggling rate (microseconds), Value will be rounded to the closest HW value
<b>toggle-rate &lt;1-2147483647&gt;</b>	Adjust toggling rate (microseconds), Value will be rounded to the closest HW value
<b>[default no] trap</b>	Enable trap generation
<b>[no] trap NAME</b>	Enable trap generation
<b>up</b>	Configure parent element
<b>default user-oam-1</b>	Restore User OAM Channel 1 to default setting
<b>user-oam-1 discard</b>	Set User OAM Channel 1 to "discard"
<b>user-oam-1 notSupported</b>	Set User OAM Channel 1 to "notSupported"
<b>user-oam-1 passthru</b>	Set User OAM Channel 1 to "passthru"
<b>default user-oam-2</b>	Restore User OAM Channel 2 to default setting
<b>user-oam-2 discard</b>	Set User OAM Channel 2 to "discard"
<b>user-oam-2 notSupported</b>	Set User OAM Channel 2 to "notSupported"
<b>user-oam-2 passthru</b>	Set User OAM Channel 2 to "passthru"
<b>default user-port-limit</b>	define bandwidth (Kbps) for user-port traffic
<b>user-port-limit &lt;0-1000000&gt;</b>	define bandwidth (Kbps) for user-port traffic
<b>default vid-map</b>	Return VID map configuration to defaults
<b>no vid-map &lt;0-4095&gt;</b>	Remove VID map
<b>vid-map &lt;0-4095&gt; &lt;0-4095&gt; active</b>	VID row active

Command	Description
<b>vid-map &lt;0-4095&gt; &lt;0-4095&gt; notInService</b>	VID row configured, not active
<b>vid-map &lt;0-4095&gt; active</b>	VID row active
<b>vid-map &lt;0-4095&gt; notInService</b>	VID row configured, not active
<b>who</b>	Show user sessions
<b>whoami</b>	Who am I?
<b>write file</b>	Write configuration to the startup-config file
<b>write terminal</b>	Write to terminal

## 2.5. Port Configuration Context

Table 8. Port Configuration Context Table

Command	Description
<code>default acc-control tagged</code>	Specify control for tagged frames
<code>acc-control tagged deny-all</code>	Discard all tagged frames
<code>acc-control tagged deny-list <i>LINE</i></code>	Discard only specific tagged frames
<code>acc-control tagged permit-all</code>	Pass all tagged frames
<code>acc-control tagged permit-list <i>LINE</i></code>	Pass only specific tagged frames
<code>default acc-control untag</code>	Specify control for untagged frames
<code>acc-control untag deny</code>	Discard all untagged frames
<code>acc-control untag permit</code>	Pass all untagged frames
<code>[default no] aging</code>	Enable aging
<code>default all</code>	Restore defaults for this location and all of its children
<code>default amplifier gain</code>	AGC mode gain in dB
<code>amplifier gain <i>GAIN</i></code>	AGC mode gain in dB
<code>default amplifier output-power</code>	APC mode output power
<code>amplifier output-power &lt;-2147483647-2147483647</code>	(no description yet)
<code>default attenuation</code>	Attenuation in dB
<code>attenuation <i>ATTEN</i></code>	Set attenuation in dB
<code>default attenuation rx</code>	(no description yet)
<code>attenuation rx <i>ATTEN</i></code>	0.0-15.0
<code>default attenuation tx</code>	(no description yet)
<code>attenuation tx <i>ATTEN</i></code>	0.0-15.0
<code>[default no] auto-neg-adv</code>	Adjust auto-negotiation advertisement
<code>[no] auto-neg-adv 10</code>	Advertise 10Base-T
<code>[no] auto-neg-adv 10 full</code>	Advertise full duplex only for this speed
<code>[no] auto-neg-adv 10 half</code>	Advertise half duplex only for this speed
<code>[no] auto-neg-adv 100</code>	Advertise 100Base-Tx
<code>[no] auto-neg-adv 100 full</code>	Advertise full duplex only for this speed
<code>[no] auto-neg-adv 100 half</code>	Advertise half duplex only for this speed
<code>[no] auto-neg-adv 1000</code>	Advertise 1000Base-T
<code>[no] auto-neg-adv 1000 full</code>	Advertise full duplex only for this speed
<code>[no] auto-neg-adv 1000 half</code>	Advertise half duplex only for this speed
<code>auto-neg-adv all</code>	Advertise all capabilities
<code>[no] auto-neg-adv flow-control</code>	Advertise flow control

Command	Description
[no] auto-neg-adv full	Advertise full duplex only for all speeds
[no] auto-neg-adv half	Advertise half duplex only for all speeds
auto-neg-adv hex <i>WORD</i>	Advertise using hex format (see MIB descr. for help)
default auto-neg-wait	Set the number of seconds a port should auto-negotiate before deciding a link is down
auto-neg-wait <1-254>	Set the number of seconds a port should auto-negotiate before deciding a link is down
[default no] auto-negotiation	Enable auto-negotiation
default cable-len	Adjust the expected maximum length cable that will be attached this port
cable-len 133	Set to 0-133 feet
cable-len 266	Set to 134-266 feet
cable-len 399	Set to 267-399 feet
cable-len 533	Set to 400-533 feet
cable-len 655	Set to 534-655 feet
cable-len long-haul	(no description yet)
cable-len short-haul	(no description yet)
cable-test	Test copper user cable for opens/shorts/impedance problems
chassis C	A chassis location
chassis <i>NAME</i>	Configure a chassis
clear-counters	Clear counters for this port
[default no] de-emphasis	Enable Output De-emphasis
de-emphasis 0	Set Output De-emphasis to "0"
de-emphasis 2	Set Output De-emphasis to "2"
de-emphasis 4	Set Output De-emphasis to "4"
de-emphasis 6	Set Output De-emphasis to "6"
default description	Restore description to its default state
description <i>LINE</i>	Set port name
default duplex	Adjust port duplex setting
duplex full	Set to full duplex
duplex half	Set to half duplex
echo	Display text for scripting
echo <i>LINE</i>	Display text for scripting
default egress-tag-action	Restore egress-tag-action to its default state
egress-tag-action add	Add outer VLAN tag to egress frames; define VLAN id and priority
egress-tag-action retain	(no description yet)

Command	Description
<b>egress-tag-action strip</b>	Remove outer VLAN tag (if any) from egress frames
<b>end</b>	End current context and go down to initial command context
<b>[default no] equalization</b>	Disable Input Equalization
<b>equalization high</b>	Set Input Equalization to "high"
<b>equalization low</b>	Set Input Equalization to "low"
<b>equalization medium</b>	Set Input Equalization to "medium"
<b>default error-select</b>	Select type of error to monitor
<b>error-select bpv-exz</b>	(no description yet)
<b>error-select cv-exz</b>	(no description yet)
<b>error-select prbs</b>	(no description yet)
<b>exit</b>	Exit current context and go down to previous context
<b>[default no] fiber-auto-neg</b>	Enable Fiber Auto-Negotiation state on line side of RJ45 port
<b>[default no] fiber-mode</b>	Enable Set RJ45 port to work with fiber port on its line side
<b>default fiber-speed</b>	Restore Fiber Speed on line side of RJ45 port to default setting
<b>fiber-speed 100</b>	Set Fiber Speed on line side of RJ45 port to "100"
<b>fiber-speed 1000</b>	Set Fiber Speed on line side of RJ45 port to "1000"
<b>[default no] flow-control</b>	Enable Flow Control
<b>default flow-control receive</b>	Adjust port flow control token reception
<b>flow-control receive comply</b>	Obey received FC tokens
<b>flow-control receive drop</b>	Drop received FC tokens
<b>flow-control receive passthru</b>	Ignore received FC tokens, but relay them to outbound port
<b>[default no] flow-control send</b>	Enable transmission of FC tokens
<b>flush</b>	Wait for changes to be flushed to hardware
<b>default ingress-tag-action</b>	Restore ingress-tag-action to its default state
<b>ingress-tag-action add</b>	Add outer VLAN tag to egress frames; define VLAN id and priority
<b>ingress-tag-action retain</b>	(no description yet)
<b>ingress-tag-action strip</b>	Remove outer VLAN tag (if any) from egress frames
<b>lga start interval &lt;10-86400&gt;</b>	(no description yet)
<b>lga stop</b>	Stop Loss Gain Analysis
<b>[default no] lin</b>	Enable LIN
<b>[default no] link-match</b>	Enable link match mode

Command	Description
<b>default link-threshhold rx-power high</b>	Restore Link Threshold Rx Power High to default setting
<b>link-threshhold rx-power high WORD</b>	Configure Link Threshold Rx Power High
<b>default link-threshhold rx-power low</b>	Restore Link Threshold Rx Power Low to default setting
<b>link-threshhold rx-power low WORD</b>	Configure Link Threshold Rx Power Low
<b>default link-threshhold tx-bias high</b>	Restore Link Threshold Tx Bias High to default setting
<b>link-threshhold tx-bias high WORD</b>	Configure Link Threshold Tx Bias High
<b>default link-threshhold tx-bias low</b>	Restore Link Threshold Tx Bias Low to default setting
<b>link-threshhold tx-bias low WORD</b>	Configure Link Threshold Tx Bias Low
<b>default link-threshhold tx-power high</b>	Restore Link Threshold Tx Power High to default setting
<b>link-threshhold tx-power high WORD</b>	Configure Link Threshold Tx Power High
<b>default link-threshhold tx-power low</b>	Restore Link Threshold Tx Power Low to default setting
<b>link-threshhold tx-power low WORD</b>	Configure Link Threshold Tx Power Low
<b>list</b>	Print command list
<b>list MATCH</b>	Print command list
<b>local</b>	Configure local device
<b>logout</b>	Logout of the system
<b>[no] loopback</b>	Enable Loopback
<b>loopback all</b>	Return all ingress frames
<b>loopback all swap</b>	DA-SA swap
<b>[no] loopback internal</b>	Internal loopback
<b>loopback mac</b>	MAC for loopback
<b>loopback off</b>	Disable loopback
<b>loopback on-both vid &lt;1-4095&gt; mac WORD</b>	MAC for loopback
<b>loopback on-both vid &lt;1-4095&gt; mac WORD swap</b>	DA-SA swap
<b>loopback on-da mac WORD</b>	MAC for loopback
<b>loopback on-da mac WORD swap</b>	DA-SA swap
<b>loopback on-vid vid &lt;1-4095&gt;</b>	VLAN id
<b>loopback on-vid vid &lt;1-4095&gt; swap</b>	DA-SA swap
<b>map also-to C.S.P</b>	Enter port location
<b>map also-to NAME</b>	Map to a port (in addition to this port's existing destinations)
<b>map clear-all</b>	Clear all related mappings

Command	Description
<b>map not-to C.S.P</b>	Enter port location
<b>map not-to NAME</b>	Remove the source port from that destination port
<b>map only-to C.S.P</b>	Enter port location
<b>map only-to NAME</b>	Map to a port (and clear all other mappings for both ports)
<b>map repeater</b>	Set to 'repeater' setting (1 <-> 2, etc.)
<b>map to-self</b>	Map to itself (and clear other mappings)
<b>map with C.S.P</b>	(no description yet)
<b>map with CSSPPP</b>	Connect to ...
<b>map with LINE</b>	Connect to ...
<b>map with NAME</b>	Connect to ...
<b>map with PORT</b>	Connect to ...
<b>default mapping-type</b>	Adjust mapping type of the port, to define mapping restrictions
<b>mapping-type destination</b>	This port would only be able to be mapped from other ports
<b>mapping-type inter-chas-link</b>	This port would only be used for inter-chassis links
<b>mapping-type open</b>	This port would be available for all types of mappings
<b>mapping-type source</b>	This port would only be able to map to other ports
<b>mapping-type source-helper</b>	This port would only be able to map to source ports
<b>mapping-type unavailable</b>	This port will not be able to be mapped
<b>default mdi-pinout</b>	Adjust MDI/MDI-X
<b>mdi-pinout auto-sense</b>	Autodetect MDI/MDI-X
<b>mdi-pinout mdi</b>	MDI
<b>mdi-pinout mdix</b>	MDI-X
<b>default me</b>	Restore defaults for this location only
<b>next</b>	Configure next element
<b>default nominal-bit-rate</b>	Set port custom bit-rate
<b>nominal-bit-rate &lt;0-4294967294&gt;</b>	Set port custom bit-rate
<b>[default no] oam</b>	enable OAM management
<b>[no] pager</b>	Pause scrolling when screen is full
<b>default path-transmitters</b>	Restore The transmitter on each port in a data path to default setting
<b>path-transmitters disable-all</b>	Set The transmitter on each port in a data path to "disable-all"
<b>path-transmitters enable-all</b>	Set The transmitter on each port in a data path to "enable-all"



Command	Description
<b>default pattern-check duration</b>	Restore duration to its default state
<b>pattern-check duration</b> <b>&lt;0-4294967294&gt;</b>	(no description yet)
<b>pattern-check start allOnes</b>	(no description yet)
<b>pattern-check start alternatingOnes</b>	(no description yet)
<b>pattern-check start cjt</b>	(no description yet)
<b>pattern-check start cr</b>	(no description yet)
<b>pattern-check start cs</b>	(no description yet)
<b>pattern-check start none</b>	(no description yet)
<b>pattern-check start prbs15</b>	(no description yet)
<b>pattern-check start prbs23</b>	(no description yet)
<b>pattern-check start prbs31</b>	(no description yet)
<b>pattern-check start prbs7</b>	(no description yet)
<b>pattern-check start prbs9</b>	(no description yet)
<b>pattern-check stop</b>	(no description yet)
<b>default pattern-check update-freq</b>	Restore update-freq to its default state
<b>pattern-check update-freq</b> <b>&lt;0-4294967294&gt;</b>	(no description yet)
<b>default pattern-gen duration</b>	Restore duration to its default state
<b>pattern-gen duration</b> <b>&lt;0-4294967294&gt;</b>	(no description yet)
<b>pattern-gen start allOnes</b>	(no description yet)
<b>pattern-gen start alternatingOnes</b>	(no description yet)
<b>pattern-gen start cjt</b>	(no description yet)
<b>pattern-gen start cr</b>	(no description yet)
<b>pattern-gen start cs</b>	(no description yet)
<b>pattern-gen start none</b>	(no description yet)
<b>pattern-gen start prbs15</b>	(no description yet)
<b>pattern-gen start prbs23</b>	(no description yet)
<b>pattern-gen start prbs31</b>	(no description yet)
<b>pattern-gen start prbs7</b>	(no description yet)
<b>pattern-gen start prbs9</b>	(no description yet)
<b>pattern-gen stop</b>	(no description yet)
<b>pm start size &lt;1-9600&gt; duration</b> <b>&lt;60-604800&gt;</b>	(no description yet)
<b>pm stop</b>	Stop Performance Monitoring
<b>port C.S.P</b>	A port location
<b>port NAME</b>	Configure a port

Command	Description
<code>port P</code>	A port on this slot
<code>port S.P</code>	A port on this chassis
<code>default preamble-len</code>	Adjust transmitted preamble length setting
<code>preamble-len standard</code>	Always send standard 8 byte preamble
<code>preamble-len variable</code>	Allow transmission of preambles longer than 8 bytes
<code>[default no] preferred</code>	Select whether channel is preferred
<code>previous</code>	Configure previous element
<code>default priority</code>	Adjust Port Priority
<code>priority &lt;0-7&gt;</code>	Adjust Port Priority
<code>[default no] protocol</code>	Disable protocol
<code>protocol digitalvideo hdtv</code>	HDTV (1.485 GHz)
<code>protocol digitalvideo hdtv-15</code>	HDTV-15 (1.485 GHz)
<code>protocol digitalvideo sdi270</code>	SDI270 (270 MHz)
<code>protocol digitalvideo sdi270-15</code>	SDI270-15 (270 MHz)
<code>protocol digitalvideo sdi540</code>	SDI540 (540 MHz)
<code>protocol digitalvideo sdi540-15</code>	SDI540-15 (540 MHz)
<code>protocol e-carrier e1</code>	E1 (2.048 Mbps)
<code>protocol e-carrier e1-ami</code>	E1 AMI (2.048 Mbps)
<code>protocol e-carrier e1-hdb3</code>	E1 HDB3 (2.048 Mbps)
<code>protocol e-carrier e3</code>	E3 (34.368 Mbps)
<code>protocol e-carrier e3-hdb3</code>	E3 HDB3 (34.368 Mbps)
<code>protocol ethernet 10/100/1000</code>	10/100/1000 (10-1000 Mbps)
<code>protocol ethernet 1000base-t</code>	1000Base-T (1 Gbps)
<code>protocol ethernet 1000base-t/x</code>	1000Base-T/X (1 Gbps)
<code>protocol ethernet 1000base-x</code>	1000Base-X (1 Gbps)
<code>protocol ethernet 100base-fx</code>	100Base-Fx (100 Mbps)
<code>protocol ethernet 100base-tx</code>	100Base-Tx (100 Mbps)
<code>protocol ethernet 10base-f1</code>	10Base-FL (10 Mbps)
<code>protocol ethernet 10base-t</code>	10Base-T (10 Mbps)
<code>protocol ethernet 10g-lan</code>	10G-LAN (10.3125 Gbps)
<code>protocol ethernet 10g-wan</code>	10G-WAN (9.9533 Gbps)
<code>protocol ethernet 10g-lan-fec237</code>	10GLAN-FEC237 (11.0957 Gbps)
<code>protocol ethernet 10g-lan-fec238</code>	10GLAN-FEC238 (11.0491 Gbps)
<code>protocol ethernet 10gwan-fec237</code>	10GWAN-FEC237 (10.709 Gbps)
<code>protocol ethernet 10gwan-fec238</code>	10GWAN-FEC238 (10.6642 Gbps)
<code>protocol ethernet 40g</code>	40G (10.3125 Gbps)
<code>protocol ethernet quarter-10ge</code>	Quarter 10GE (3.125 Gbps)

Command	Description
<code>protocol fddi</code>	FDDI (125 Mbps)
<code>protocol fibrechannel 1/2/4/8g</code>	1/2/4/8G (1-8.5 Gbps)
<code>protocol fibrechannel 1/2/4g-repeater</code>	1/2/4g-repeater (1-4 Gbps)
<code>protocol fibrechannel 1/2/4g-retimer</code>	1/2/4g-retimer (1-4 Gbps)
<code>protocol fibrechannel 1/2/4gfc</code>	1/2/4GFC (1-4 Gbps)
<code>protocol fibrechannel 1/2gfc</code>	1/2GFC (1-2 Gbps)
<code>protocol fibrechannel 10g</code>	10G (10.5187 Gbps)
<code>protocol fibrechannel 10g-fec237</code>	10G-FEC237 (11.318 Gbps)
<code>protocol fibrechannel 10g-fec238</code>	10G-FEC238 (11.27 Gbps)
<code>protocol fibrechannel 1gfc</code>	1GFC (1.063 Gbps)
<code>protocol fibrechannel 2gfc</code>	2GFC (2.125 Gbps)
<code>protocol fibrechannel 2xgfc</code>	2xGFC (2/4/8.. Gbps)
<code>protocol fibrechannel 4gfc</code>	4GFC (4.25 Gbps)
<code>protocol fibrechannel 8gfc</code>	8GFC (8.5 Gbps)
<code>protocol ibm escon</code>	ESCON (200 MHz)
<code>protocol ibm ficon</code>	FICON (200 MHz)
<code>protocol infiniband 10g</code>	10G (10 Gbps)
<code>protocol infiniband 2.5g</code>	2.5G (2.5 Gbps)
<code>protocol infiniband 5g</code>	5G (5 Gbps)
<code>protocol otn otu3</code>	OTU3 (10.7543 Gbps)
<code>protocol ppp</code>	PPP
<code>protocol sdh stm64</code>	STM64 (9.9533 Gbps)
<code>protocol sdh stm64-fec237</code>	STM64-FEC237 (10.709 Gbps)
<code>protocol sdh stm64-fec238</code>	STM64-FEC238 (10.6642 Gbps)
<code>protocol slip</code>	SLIP
<code>protocol sonet oc1</code>	OC1 (51.84 Mbps)
<code>protocol sonet oc1/3/12/24/48</code>	OC1/3/12/24/48 (51-2488 Mbps)
<code>protocol sonet oc12</code>	OC12 (622.08 Mbps)
<code>protocol sonet oc192</code>	OC192 (9.9533 Gbps)
<code>protocol sonet oc192-fec237</code>	OC192-FEC237 (10.709 Gbps)
<code>protocol sonet oc192-fec238</code>	OC192-FEC238 (10.6642 Gbps)
<code>protocol sonet oc24</code>	OC24 (1.244 Gbps)
<code>protocol sonet oc3</code>	OC3 (155.52 Mbps)
<code>protocol sonet oc48</code>	OC48 (2.488 Gbps)
<code>protocol sonet oc48/fec</code>	OC48/FEC (2.666 Gbps)
<code>protocol sonet sts1</code>	STS1 (51.54 Mbps)

Command	Description
<code>protocol t-carrier ds3</code>	DS3 (44.736 Mbps)
<code>protocol t-carrier t1</code>	T1 (1.544 Mbps)
<code>protocol t-carrier t1-ami</code>	T1 AMI (1.544 Mbps)
<code>protocol t-carrier t1-b8zs</code>	T1 B8ZS (1.544 Mbps)
<code>protocol t-carrier t3</code>	T3 (44.736 Mbps)
<code>protocol t-carrier t3-b3zs</code>	T3 B3ZS (44.736 Mbps)
<code>protocol telcobus</code>	TelcoBus (77 MHz)
<code>protocol transparent</code>	Transparent
<code>protocol user-defined</code>	User defined
<code>default pump-pwr</code>	Restore pump-pwr to its default state
<code>pump-pwr &lt;0-4294967294&gt;</code>	(no description yet)
<code>quit</code>	Exit current context and go down to previous context
<code>default redundant-tx-mode</code>	Adjust redundant trunk transmit mode
<code>redundant-tx-mode 1+1</code>	Enable both trunk transmitters
<code>redundant-tx-mode 1:1</code>	Only enable trunk transmitter connected to the active Rx port on far end
<code>remote</code>	Configure remotely attached device
<code>default rm-chassis</code>	Set remote chassis connectivity information
<code>rm-chassis &lt;0-4294967294&gt;</code>	Set remote chassis connectivity information
<code>default rm-port</code>	Set remote port connectivity information
<code>rm-port &lt;0-4294967294&gt;</code>	Set remote port connectivity information
<code>default rm-slot</code>	Set remote slot connectivity information
<code>rm-slot &lt;0-4294967294&gt;</code>	Set remote slot connectivity information
<code>select-link active</code>	Attempt to make this port active
<code>select-link standby</code>	Attempt to make this port standby
<code>[default no] sgmi</code>	Set SGMII-PHY mode
<code>show</code>	Show running system information
<code>show attenuation</code>	Display port attenuation setting
<code>show channels</code>	Show channels detected by OSA
<code>show config</code>	Show administrative configuration for this object
<code>show config all</code>	Show administrative configuration for this object and all of its children
<code>show defaults</code>	Show default configuration for this object
<code>show defaults all</code>	Show default configuration for this object and all of its children
<code>show digital-diagnostics</code>	Show Digital Diagnostics summary
<code>show dump</code>	Dump machine readable status
<code>show eusm</code>	Show EUSM port info

Command	Description
<b>show lga</b>	Display loss_gain settings and stats
<b>show map</b>	Display port map
<b>show map dump actual</b>	Show actual (operating) state
<b>show map dump desired</b>	Show desired (administrative) state
<b>show map names</b>	Map list with full port names
<b>show map simple</b>	Map list without graphics
<b>show mapping-types</b>	Show mapping-type info
<b>show oam</b>	OAM remote management information
<b>show pattern</b>	Pattern Generator/Checker information
<b>show plugin</b>	Show Pluggable Optics (SFP/GBIC/XFP) data for this port
<b>show pm</b>	Display perf_mon settings and stats
<b>show running-config</b>	Current operating configuration
<b>show statistics</b>	Show statistics for this port
<b>show thresholds</b>	Show thresholds detected by OSA
<b>show traffic-gen-10</b>	Display traffic-gen-10 settings
<b>show traps</b>	Show trap filter configuration
<b>show tunable-channel</b>	Display tunable channel settings and allowable range
<b>show vid-list</b>	Display vid-list setting
<b>show vlan</b>	Show port VLAN-tagging info
<b>[default no] shutdown</b>	Disable the port
<b>[default no] shutdown-unmapped</b>	Enable or Disable the port when it is not mapped from another port
<b>sleep &lt;0-10&gt;</b>	Pause CLI for scripting
<b>slot C.S</b>	A slot location
<b>slot NAME</b>	Configure a slot
<b>slot S</b>	A slot on this chassis
<b>[default no] sniff-from</b>	Disable sniffer
<b>sniff-from PORT</b>	Set sniffer from port
<b>[default no] sniffer</b>	Enable sniffer
<b>default speed</b>	Adjust port speed
<b>speed 10</b>	Set to 10Mbps
<b>speed 10-gig</b>	Set to 10-Gigabit
<b>speed 100</b>	Set to 100Mbps
<b>speed 1000</b>	Set to 1-Gigabit
<b>default swing</b>	Restore Peak-to-peak Swing Amplification to default setting
<b>swing &lt;1-6&gt;</b>	Configure Output Swing

Command	Description
<b>swing high</b>	Set Peak-to-peak Swing Amplification to "high"
<b>swing normal</b>	Set Peak-to-peak Swing Amplification to "normal"
<b>sync</b>	Wait for changes to be flushed to hardware / display
<b>[default no] termination</b>	Set port termination
<b>termination 100-ohms</b>	Set to 100 ohms
<b>termination 120-ohms</b>	Set to 120 ohms
<b>termination 75-ohms</b>	Set to 75 ohms
<b>default threshold</b>	Adjust threshold setting
<b>threshold &lt;-2147483647-2147483647</b>	(no description yet)
<b>threshold osnr max &lt;21-60&gt; MAX</b>	Maximum, rising above will generate a trap
<b>threshold osnr min &lt;21-60&gt; MIN</b>	Minimum, dropping below will generate a trap
<b>threshold rx-power max &lt;21-60&gt; MAX</b>	Maximum, rising above will generate a trap
<b>threshold rx-power min &lt;21-60&gt; MIN</b>	Minimum, dropping below will generate a trap
<b>threshold-action &lt;0-4294967294&gt;</b>	Adjust threshold action setting
<b>[default no] toggle-mode</b>	Enable toggle-mode
<b>traffic-gen action start</b>	Start traffic generation
<b>traffic-gen action stop</b>	Stop traffic generation
<b>default traffic-gen all</b>	(no description yet)
<b>default traffic-gen da</b>	Egress bytes 0-5 (random, fixed, incrementing)
<b>traffic-gen da fixed WORD</b>	Specify fixed destination address
<b>traffic-gen da increment WORD</b>	Destination address is incremented starting with specified address
<b>traffic-gen da random</b>	Destination address is randomly selected
<b>default traffic-gen frame-count</b>	Frame count (fixed, continuous)
<b>traffic-gen frame-count continuous</b>	Specify continuous traffic generation
<b>traffic-gen frame-count fixed &lt;1-4294967294&gt;</b>	Specify fixed frame count
<b>default traffic-gen frame-size</b>	Frame size for fixed. Interpreted as mask for random
<b>traffic-gen frame-size fixed &lt;64-9600&gt;</b>	Specify fixed frame size
<b>traffic-gen frame-size random &lt;64-9600&gt;</b>	Frame size is randomly selected
<b>default traffic-gen inter-packet-gap</b>	IPG (bytes)--controls amount of traffic
<b>traffic-gen inter-packet-gap &lt;12-134217727&gt;</b>	IPG (bytes)--controls amount of traffic
<b>traffic-gen load LOAD</b>	Set traffic-gen load
<b>default traffic-gen pattern</b>	Data pattern (random, fixed)

Command	Description
<b>traffic-gen pattern fixed WORD</b>	Specify fixed pattern
<b>traffic-gen pattern random</b>	Pattern is randomly selected
<b>default traffic-gen sa</b>	Egress bytes 6-11 (random, fixed, incrementing)
<b>traffic-gen sa fixed WORD</b>	Specify fixed source address
<b>traffic-gen sa increment WORD</b>	Source address is incremented starting with specified address
<b>traffic-gen sa random</b>	Source address is randomly selected
<b>default traffic-gen tag</b>	Egress bytes 12-15 (random, fixed, incrementing)
<b>traffic-gen tag fixed WORD</b>	Specify fixed tag
<b>traffic-gen tag increment WORD</b>	Tag is incremented starting with specified data
<b>traffic-gen tag random</b>	Tag is randomly selected
<b>traffic-gen-10 action start</b>	(no description yet)
<b>traffic-gen-10 action stop</b>	(no description yet)
<b>default traffic-gen-10 all</b>	(no description yet)
<b>default traffic-gen-10 da</b>	Egress bytes 0-5 (random, fixed, incrementing)
<b>traffic-gen-10 da fixed WORD</b>	(no description yet)
<b>traffic-gen-10 da increment WORD</b>	(no description yet)
<b>traffic-gen-10 da random</b>	(no description yet)
<b>default traffic-gen-10 frame-count</b>	Frame count (fixed, continuous)
<b>traffic-gen-10 frame-count continuous</b>	(no description yet)
<b>traffic-gen-10 frame-count fixed &lt;1-4294967294&gt;</b>	(no description yet)
<b>default traffic-gen-10 frame-size</b>	Frame size for fixed. Interpreted as mask for random
<b>traffic-gen-10 frame-size fixed &lt;64-9600&gt;</b>	(no description yet)
<b>traffic-gen-10 frame-size random &lt;64-9600&gt;</b>	(no description yet)
<b>default traffic-gen-10 headers</b>	(no description yet)
<b>traffic-gen-10 headers STRING [OFFSET]</b>	(no description yet)
<b>default traffic-gen-10 inter-packet-gap</b>	IPG (bytes)--controls amount of traffic
<b>traffic-gen-10 inter-packet-gap &lt;12-134217727&gt;</b>	IPG (bytes)--controls amount of traffic
<b>traffic-gen-10 load LOAD</b>	Set traffic-gen-10 load
<b>default traffic-gen-10 pattern</b>	Data pattern (random, fixed)
<b>traffic-gen-10 pattern fixed WORD</b>	(no description yet)
<b>traffic-gen-10 pattern random</b>	(no description yet)

Command	Description
<b>default traffic-gen-10 sa</b>	Egress bytes 6-11 (random, fixed, incrementing)
<b>traffic-gen-10 sa fixed WORD</b>	(no description yet)
<b>traffic-gen-10 sa increment WORD</b>	(no description yet)
<b>traffic-gen-10 sa random</b>	(no description yet)
<b>default traffic-gen-10 tag</b>	Egress bytes 12-15 (random, fixed, incrementing)
<b>traffic-gen-10 tag fixed WORD</b>	(no description yet)
<b>traffic-gen-10 tag increment WORD</b>	(no description yet)
<b>traffic-gen-10 tag random</b>	(no description yet)
<b>[default no] trap</b>	Enable trap generation
<b>[no] trap NAME</b>	Enable trap generation
<b>tunable-channel CHANNEL</b>	Set tunable channel
<b>tunable-channel FREQ GHz</b>	Set tunable channel
<b>tunable-channel FREQ Hz</b>	Hertz
<b>tunable-channel FREQ MHz</b>	Set tunable channel
<b>tunable-channel FREQ PHz</b>	Set tunable channel
<b>tunable-channel FREQ THz</b>	Set tunable channel
<b>up</b>	Configure parent element
<b>default vid</b>	VLAN id
<b>vid &lt;0-4095&gt;</b>	VLAN id
<b>[default no] vid-list</b>	Set forwarding vids
<b>vid-list LINE</b>	Set forwarding vids
<b>default vlan-tag</b>	Add/remove outer VLAN tag in egress frames
<b>vlan-tag add vid &lt;0-4095&gt; priority &lt;0-7&gt;</b>	Adjust Port Priority
<b>vlan-tag ignore</b>	Leave VLAN tag(s) in egress frames unchanged
<b>vlan-tag strip</b>	Remove outer VLAN tag (if any) from egress frames
<b>who</b>	Show user sessions
<b>whoami</b>	Who am I?
<b>write file</b>	Write configuration to the startup-config file
<b>write terminal</b>	Write to terminal
<b>no zone</b>	Clear port zone (This command is only available in the startup-config file)
<b>zone C.S.P</b>	Port location (This command is only available in the startup-config file)



## 3. MetaMIB Reference

### 3.1. Fiber Config On RJ45 Port

#### 3.1.1. Fiber Auto-Neg

Fiber Auto-Negotiation state on line side of RJ45 port

Type: Enum (disabled, enabled)

Access: Read/write

CLI command: fiber-auto-neg

Default: disabled

#### 3.1.2. Fiber Mode

Set RJ45 port to work with fiber port on its line side

Type: Enum (disabled, enabled)

Access: Read/write

CLI command: fiber-mode

Default: disabled

#### 3.1.3. Fiber Speed (in Mbps)

Fiber Speed on line side of RJ45 port

Type: Enum (100, 1000)

Access: Read/write

CLI command: fiber-speed

Default: 1000

## 3.2. Hd Pmc Port Config

### 3.2.1. Path Transmitters

The transmitter on each port in a data path

Type: Enum (disable-all, enable-all)

Access: Read/write

CLI command: path-transmitters

## 3.3. PS Info

### 3.3.1. PS 1 Info

Power Supply 1 Information

Type: String

Access: Read only

CLI command: `ps-monitor-1`

### 3.3.2. PS 2 Info

Power Supply 2 Information

Type: String

Access: Read only

CLI command: `ps-monitor-2`

## 3.4. Port De-emphasis

### 3.4.1. De-emphasis (in dB)

Output De-emphasis

Type: Enum (0, 2, 4, 6)

Access: Read/write

CLI command: de-emphasis

## 3.5. Port Equal Config

### 3.5.1. Equal-config

Equal Config

Type: Enum (disabled, adaptive, manual)

Access: Read/write

CLI command: equal-config

Default: adaptive

## 3.6. Port Equalization

### 3.6.1. Equalization (in level)

Input Equalization

Type: Integer (Range: 1 to 15)

Access: Read/write

CLI command: equalization

Default: 2

## 3.7. Port Swing

### 3.7.1. Swing (in level)

Output Swing

Type: Integer (Range: 1 to 6)

Access: Read/write

CLI command: `swing`

Default: 3

## 3.8. SATA/SAS Cu SFP

### 3.8.1. De-emphasis

Output De-emphasis

Type: Enum (disabled, enabled)

Access: Read/write

CLI command: de-emphasis

Default: disabled

### 3.8.2. Equalization

Input Equalization

Type: Enum (disabled, low, medium, high)

Access: Read/write

CLI command: equalization

Default: disabled

### 3.8.3. Swing

Peak-to-peak Swing Amplification

Type: Enum (normal, high)

Access: Read/write

CLI command: swing

Default: normal



## 3.9. SFP/XFP Link Threshold

### 3.9.1. Rx Power high (in dB)

Link Threshold Rx Power High

Type: Float

Access: Read/write

CLI command: `link-threshhold rx-power high`

Default: Inf

### 3.9.2. Rx Power low (in dB)

Link Threshold Rx Power Low

Type: Float

Access: Read/write

CLI command: `link-threshhold rx-power low`

Default: -Inf

### 3.9.3. Tx Bias high (in mA)

Link Threshold Tx Bias High

Type: Float

Access: Read/write

CLI command: `link-threshhold tx-bias high`

Default: Inf

### 3.9.4. Tx Bias low (in mA)

Link Threshold Tx Bias Low

Type: Float

Access: Read/write

CLI command: `link-threshhold tx-bias low`

Default: -Inf

### 3.9.5. Tx Power high (in dB)

Link Threshold Tx Power High

Type: Float

Access: Read/write

CLI command: `link-threshhold tx-power high`

Default: `Inf`

### 3.9.6. Tx Power low (in dB)

Link Threshold Tx Power Low

Type: `Float`

Access: `Read/write`

CLI command: `link-threshhold tx-power low`

Default: `-Inf`

## 3.10. Switch Parameter

### 3.10.1. Aging Timer (in Seconds)

Switch Aging Timer in seconds

Type: Integer (Range: 1 to 86400)

Access: Read/write

CLI command: `aging-timer`

Default: 300

## 3.11. User OAM Channel

### 3.11.1. User OAM 1

User OAM Channel 1

Type: Enum(notSupported, discard, passthru)

Access: Read/write

CLI command: user-oam-1

Default: discard

### 3.11.2. User OAM 2

User OAM Channel 2

Type: Enum(notSupported, discard, passthru)

Access: Read/write

CLI command: user-oam-2

Default: discard

## 3.12. Voltage Monitor

### 3.12.1. Blade Voltage (in Volts)

Blade Voltage Monitoring

Type: Float

Access: Read only

CLI command: `volt-monitor`

### 3.12.2. Voltage Backplane & Slot 2 (in Volts)

Slot 2 Voltage Monitoring

Type: Float

Access: Read only

CLI command: `volt-monitor-2`

### 3.12.3. Voltage NM (in Volts)

Slot 5 Voltage Monitoring

Type: Float

Access: Read only

CLI command: `volt-monitor-5`

### 3.12.4. Voltage Slot 1 (in Volts)

Slot 1 Voltage Monitoring

Type: Float

Access: Read only

CLI command: `volt-monitor-1`

### 3.12.5. Voltage Slot 3 (in Volts)

Slot 3 Voltage Monitoring

Type: Float

Access: Read only

CLI command: `volt-monitor-3`

### 3.12.6. Voltage Slot 4 (in Volts)

Slot 4 Voltage Monitoring

Type: Float

Access:	Read only
CLI command:	volt-monitor-4

## 4. LNXNM Troubleshooting

### 4.1. SNMP Problems

If your SNMP manager has trouble communicating with the SNMP agent in the EM316LNXNM, check your SNMP configuration parameters.

Your network administrator can help determine if your IP configuration (IP address and netmask) is correct. If the SNMP management workstation is on a different network, make sure that you define an appropriate default gateway IP address.

Change the SNMP v1 community string configuration by using the **snmp-server community read/write** command. Please note that community string information can not be displayed using any **show** command. The community strings are encrypted, even in **write terminal** output.

If you are not receiving any traps, check that you entered the network management workstation address in the trap receiver table correctly. Display the table using the **show snmp-server hosts** command. Check that both the IP address and the SNMP v1 community string are correct.

Check that you have a working network connection.

Test the connection to the network management station by pinging it. If the network's physical topology has changed recently (e.g. a network management station has been moved from one segment to another), you may have to wait for the entries in the ARP cache to time out.

### 4.2. Hot-swap issues

If the LNXNM is hot-swapped, the configuration in the LNXNM database and the settings in the hardware may not match. For some devices, the hot-swap feature only works correctly when all changes are written to flash with the **"write file"** command *before* a hot-swap or a warm reset. To make sure that the hardware configuration matches the software database, use the **"restart cold"** command or power-cycle the box.



Always save changes with **"write file"** before a hot-swap.

### 4.3. Serial Port Connection is stuck at "=>" Prompt

If you see the "=>" prompt again when you press "enter" key and nothing else seems to work, the system is halted at the boot ROM prompt. Get out of this prompt by using the **"reset"** command or power-cycle. When it starts to boot again, "Hit any key to stop autoboot:" should appear and you will see a count down. Let the count down finish, and let the boot ROM attempt to load the firmware. You should eventually get the login prompt. If the symptom persists, and the prompt remains at "=>" even after rebooting, the system failed to boot correctly and the unit must be repaired or replaced. Alternately, see the ["Recovering from a failed 'upgrade' command"](#) section below.

## 4.4. Changing console serial port speed

The LNXNM serial console starts by default at 38400 baud. If no local terminal can use 38400 baud, then it is possible to change the LNXNM serial speed setting. You must connect at 38400 initially (somehow) to follow the procedure below.

1. Save all important work and configuration settings, and restart the LNXNM manager.
2. At the prompt **Hit any key to stop autoboot:**, press any keyboard key to enter the u-boot environment.

*(This environment is supported ONLY for the specific commands and procedures described in this document for the current release.)*

3. At the **"=>"** prompt, type **set baudrate 9600** and **<ENTER>**.

The baud rate 9600 shown above is an example. Any of the following values may be used:

- 9600
- 19200
- 38400
- 57600
- 115200

If prompted, hit **<ENTER>** to change the baud rate of the LNXNM serial port.

When the port speed changes, your current session will stop working! (continue procedure...)

4. Set your local terminal to the serial speed selected above and restart your terminal application or session.
5. Use the **<ENTER>** key to verify connection with the returned prompt.

At the prompt, type **saveenv** to set the new serial port speed as the default.

6. Restart the LNXNM with the command **boot**, and do not interrupt the startup process.
7. The LNXNM firmware should start, and eventually give the module login banner and prompt.

Contact customer support for help with this procedure.



## 4.5. All usernames and passwords fail to login

This procedure requires connection through the local RS-232 console CLI. Some user settings may be lost through this procedure. Before following the procedure listed below, make sure that it is safe to interrupt operation.

1. Power-cycle the EM316LNXNM by one of the following methods:
  - Remove, pause, and reinsert the management card
  - Cycle power to the chassis
  - Cold reset the manager module
2. After the "Hit any key to stop autoboot:" message displays but during the count down, hit any key to enter the boot ROM user interface.

3. At the ">" prompt, enter the following command to set the **"runlevel"** parameter to "S":

```
=> setenv runlevel S
=> run bfl
```

4. The **"run bfl"** ("boot from flash") command initiates a Linux shell with a "sh-3.2#" prompt. The commands entered in the following session use common Linux shell rules. Enter the command below exactly as listed:

```
sh-3.2# mv /config/startup-config /config/old-startup-config
```

This command changes the "startup-config" file name so that the failed configuration is not automatically used in the boot process.

The **"reboot -f"** command below restarts the LNXNM with the factory default configuration:

```
sh-3.2# reboot -f
```

Once the login prompt appears, login with the factory default username and password combination: "admin/admin".

5. After a successful login, examine the "old-startup-config" file to see if you can salvage any data from it. Use any known good data in **"source old-startup-config"** to create a new "old-startup-config" file and some of the old configuration.



Sourcing the old configuration file (old-startup-config) resets the "admin" user password to the failed one saved in the old file! Since this password may be unknown, assign a known password to the "admin" user with the **"username admin password new-password"** command immediately following the **"source"** command used to restore the old configuration.

6. Immediately use the **"write file"** command to save the new configuration and password back to the "startup-config" file BEFORE signing out.

## 4.6. Recovering from a failed "upgrade" command

Before restarting the LNXNM, attempt **"upgrade"** again. Make sure that there are no network disruptions. The next attempt may succeed. However, if there is no login prompt, try the following procedure that may help if the application software in the flash memory is corrupted and you are not able to login. The most frequent cause for flash corruption is ESD (ElectroStatic Discharge).

You must have a RS-232 console connection to the LNXNM for this procedure. You will have to power-cycle LNXNM during this procedure. Make sure it is safe to interrupt operation.

1. Power-cycle the LNXNM, either by removing and reinserting the management card or by cycling power to the chassis. Make sure it is safe to do so.
2. After the "Hit any key to stop autoboot:" message displays but during the count down, hit any key to enter the boot ROM user interface.

In the following commands set the IP address information appropriate for your specific network. Set **"serverip"** to the IP address of the TFTP server hosting the "uImage.initrd" file.

```
=> setenv ipaddr 10.1.125.127
=> setenv netmask 255.255.0.0
=> setenv serverip 10.1.1.13
=> setenv gatewayip 10.1.1.1
=> saveenv
=> run bnet
```

3. After the **"run bnet"** ("boot from network") command, the LNXNM fetches the software from the TFTP server and then boots the LNXNM image. The login prompt displays when it is ready for login. At this point, the software is *not* stored in the flash memory of the LNXNM. Follow the procedure to upgrade the LNXNM as described in this manual. Otherwise, boot from network again as described above each time the LNXNM is rebooted.

## 4.7. "System resources low, access denied" message appears while trying to log in

The system is dangerously low on memory without enough resources to allow another user access to the system. Log out of other sessions to free up resources. Use the **"sys idle-timeout"** command to automatically time out idle sessions after a specified length of time.

## 4.8. System state does not match "show" command display

Use the **sync** command to force completion of all outstanding commands and the EM316LNxNM-OT to poll all devices and update system status tables.

## 5. LNXNM Quick Setup Reference

Use this appendix only as a reference to configure IP and the serial console. Consider all precautions in the complete EM316LNXNM User Guide when using this reference. Use the serial console when configuring network parameters to avoid lost communications during configuration.

Connect the installed LNXNM to a PC terminal with a RS-232 serial cable listed below.

Type	Part Number
Adapter Cable (current version)	2012001-001R
Cable and adapter (previous version)	151-3028 REV-F AI 04/04 and 350-0308 REV. B MRG/20028-2

The LNXNM has at least one Ethernet port, which is typically used to connect to a Local Area Network (LAN). The factory default IP address is "192.168.14.201/24" (netmask 255.255.255.0). The EM316LNXNM-OT for Fiber Driver also has SFP ports that can be used to connect to an IP network.

The LNXNM modules have an RS-232 interface for serial communications to a local administrative terminal. The serial parameters for the RS-232 interface are:

- 38400 Baud
- 8 Data Bits
- 1 Stop Bit
- No Parity
- No Flow Control

### 5.1. First Login

The default account username is **admin** with the password **admin**. A successful login is shown below:

```
MRV Communications

mcc login: admin
Password:
EM316LNXNM v4.7 fdr 17 (Aug 2 2011 - 14:02:31).
U-Boot 1.0.3.2 (Mar 27 2008 - 10:19:12).
Linux kernel v2.6.26.5-svn12741 (#1 Fri May 29 17:18:36 PDT 2009).
EM316LNXNM (firmware 5c.1c) (00:20:1a:02:82:62).
Copyright (c) MRV Corp. 1993-2009
You are a SUPER user!

fiberdriver#
```

## 5.2. Basic LNXNM Setup

Type **configure terminal** to enter the "configuration" context. As shown below, the prompt changes to show the current context.

```
fiberdriver# configure terminal  
fiberdriver(config)#
```

Change the admin account password using the "**username**" command. Some [password strength](#) restrictions apply.

```
fiberdriver(config)# username admin password new-password  
fiberdriver(config)#
```

Set the IP address and IP netmask information using the "**ip interface**" command. The IP address (169.254.88.200) and netmask (16) shown below are for example only. Use IP values appropriate for your network.

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

Set your gateway information using the "**ip default-gateway**" command. Again, the address 169.254.88.1 shown below is for example only.

```
fiberdriver(config)# ip default-gateway 169.254.88.1  
fiberdriver(config)# ip interface update
```

The IP configuration is complete with the above included "**ip interface update**" command.



Use the "**write file**" command to save the current configuration to permanent storage in the "startup-config" file. *If not saved, the new configuration is lost when the system restarts.*

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

Exit the "configuration" context with the "**exit**" command:

```
fiberdriver(config)# exit  
fiberdriver(config)#
```

The default SNMP community names are "**public**" for read and "**private**" for write. Refer to the [SNMP](#) chapter to customize SNMP access to the LNXNM.

Refer to the complete LNXNM User Guide for details.



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