

# User Manual



## FMUX101

## FMUX1001

**Fiber Optical Multiplexer  
Standalone / Rack Type  
Modular 16 Channel E1/T1, Data,  
POTS plus 100M/1G Ethernet  
SNMP Manageable**



**CTC UNION TECHNOLOGIES CO., LTD.**



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**FMUX1001 / FMUX101**

16 Channel Modular Fiber Multiplexer with E1/ T1, Data, POTS and 1G Ethernet Trunk.

Installation and Operation Manual

Version 1.0 Nov 25, 2015 (First Release)

Version 1.1 Nov 1, 2016 (Update)

This document supports the following models:

**FMUX1001** 16-Ch. Modular E1/T1, DATA, POTS with 4-port Gigabit Ethernet Switch and 850M Ethernet trunk

**FMUX101** 16-Ch. Modular E1/T1, DATA, POTS with 4-port Fast Ethernet Switch and 100M Ethernet trunk

This document is the first official release manual. Please check CTC Union's website for any updated manual or contact us by E-mail at [techsupport@ctcu.com](mailto:techsupport@ctcu.com). Please address any comments for improving this manual or to point out omissions or errors to [marketing@ctcu.com](mailto:marketing@ctcu.com). Thank you.

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# Chapter 1. Introduction

## 1.1 General

Thank you for choosing **FMUX1001** (or **FMUX101**) modular Fiber Multiplexer. If you would like to skip right to the installation and configuration of the Multiplexer, proceed to Chapters 3 and 4.

The **Fiber Multiplexer** is a 1U (1.75") high standalone or 19" rack mountable E1/T1/DATA/POTS/LAN multiplexer over fiber link, built upon a flexible modular design. The **Fiber Multiplexer** provides an economic optical connection solution in high-density E1 and/or T1 installations such as between branch offices or for 2G/3G mobile backhaul, where multiple high speed synchronous data communications are required with high-speed Ethernet backhaul. By utilizing a modular design, multiple interfaces such as **E1/T1, DATA (V.35, RS520/449/232, X.21), Async RS232** and **POTS (FXO/FXS)** can be provided in a point-to-point over fiber architecture. The standard unit is a chassis with local control and two slots for power modules (AC or DC) to provide single or dual redundant power. Four module slots are available for 4-channel tributary cards. The fiber aggregate uses SFP cages that support any industry standard 155Mbps SFP module (**FMUX101** model) or 1.25Gbps SFP module (**FMUX1001** model). The range of transmission for optical connection is from 2km (for multi-mode) up to 120km (single mode). Standard management features include local **LCD with menu pushbuttons**, local **serial console (menu based)** and local/remote IP management via **Telnet, HTTP(web)** and **SNMP**.

## 1.2 Functional Description

The **Fiber Multiplexer** basic chassis has two slots for hot swappable power modules. Depending on the options ordered, power may be derived from single AC 100~240VAC, single DC +18~60VDC, dual AC 100~240VAC, dual DC +18~60VDC, or AC plus DC power sources. The **Fiber Multiplexer** provides all tributary connections on the rear via hot swappable slide in module cards. The front panel provides the aggregate SFP cages, LCD/Menu Keys, LED indicators, and connectors for alarm relays, order wire, clear channel RS-232, and console.

The **4-CHANNEL E1B Tributary Card** has 4 pairs of BNC (75 Ohm unbalanced) connectors for E1 Line interface connections supporting four separate E1 channels at a transmission rate of 2.048Mb/s (transparent unframed E1) each. This card may be placed in any slot of the **Fiber Multiplexer**. A maximum of 4 cards will provide 16-Channels of E1.

The **4-CHANNEL E1/T1R Tributary Card** provide 4 RJ-45 (120/100 Ohm balanced, software selectable) connectors for E1/T1(DS1) Line interface connections supporting four separate E1/T1(DS1) channels at a transmission rate of 2.048/1.544Mb/s (transparent unframed E1/T1) each. E1 and T1 configuration cannot be mixed; all ports must be either E1 or T1.

The **4-CHANNEL DATA Tributary Card** provides 1 HD68 pin connector. When used in combination of a special adapter cable, 4-channels of V.35 (MB34F), RS-530/232 (DB25F), RS-449 (DB37F) or X.21 (DB15F) are provided. Each channel is capable of nx64kbps synchronous data transmissions up to 2.048Mb/s.

The **4-CHANNEL RS232/Async Tributary Card** provides 1 HD68 pin connector. When used in combination of a special adapter cable, 4-channels of RS232 (DB25F) are provided. Each channel is capable of transparent asynchronous data transmissions up to 115.2kb/s.

The **4-CHANNEL POTS Tributary Card** provides 4 RJ-11 connectors. Two 4-channel card models provide either **4xFXO** (connects to Central Office or PSTN) or **4xFXS** (connect to telephone) channels.

The built-in **Ethernet Switch** provides four RJ-45 connectors for 10/100/1000M Ethernet (up to 850M trunk speed for **FMUX1001** model) or 10/100M Ethernet (wire-speed 100M trunk for **FMUX101** model). The switch function provides auto/forced per port settings, Port based VLAN, 1Q tag based VLAN, ingress/egress bandwidth control and Ethernet flow control enable/disable.

LEDs on the front panel will show power, alarm and channel statuses for all ports.

The **Fiber Multiplexer E1 and T1 Interface Ports** fully meet all E1 and T1 specifications including ITU-T G.703, G.704, G.706, G.732, G.733, G.823 and G.824. The Ethernet switch meets all Ethernet specifications for IEEE802.3, IEEE802.3u and IEEE802.3ab.

Each **E1/T1-CHANNEL Port** features diagnostic capabilities for performing local loop back or remote loop back. The loop back function is controlled by LCD/Menu keys, the terminal mode (RS-232 console) or via Telnet, Web or SNMP set commands.

The unit operates from an internal free running oscillator. The **Fiber Multiplexer** is completely transparent to clocking and data transmission. This makes configuration of the MUX extremely easy.

Configuration of the **Fiber Multiplexer** is accomplished via local control on the LCD/Menu Keys, asynchronous RS-232 port with a standard VT-100 terminal, via HTTP (Web) and Telnet, or via any standard SNMP network management software over IP.

The **Fiber Multiplexer** also includes the ability to do in-band remote configuration. Once the fiber optic link has been established, the remote unit may be configured or status checked from the local unit using any of the available management options.



The following graphic shows the major components which make up the **Fiber Multiplexer**. It shows a unit with redundant power modules (AC+DC) and four 4-channel tributary cards installed.

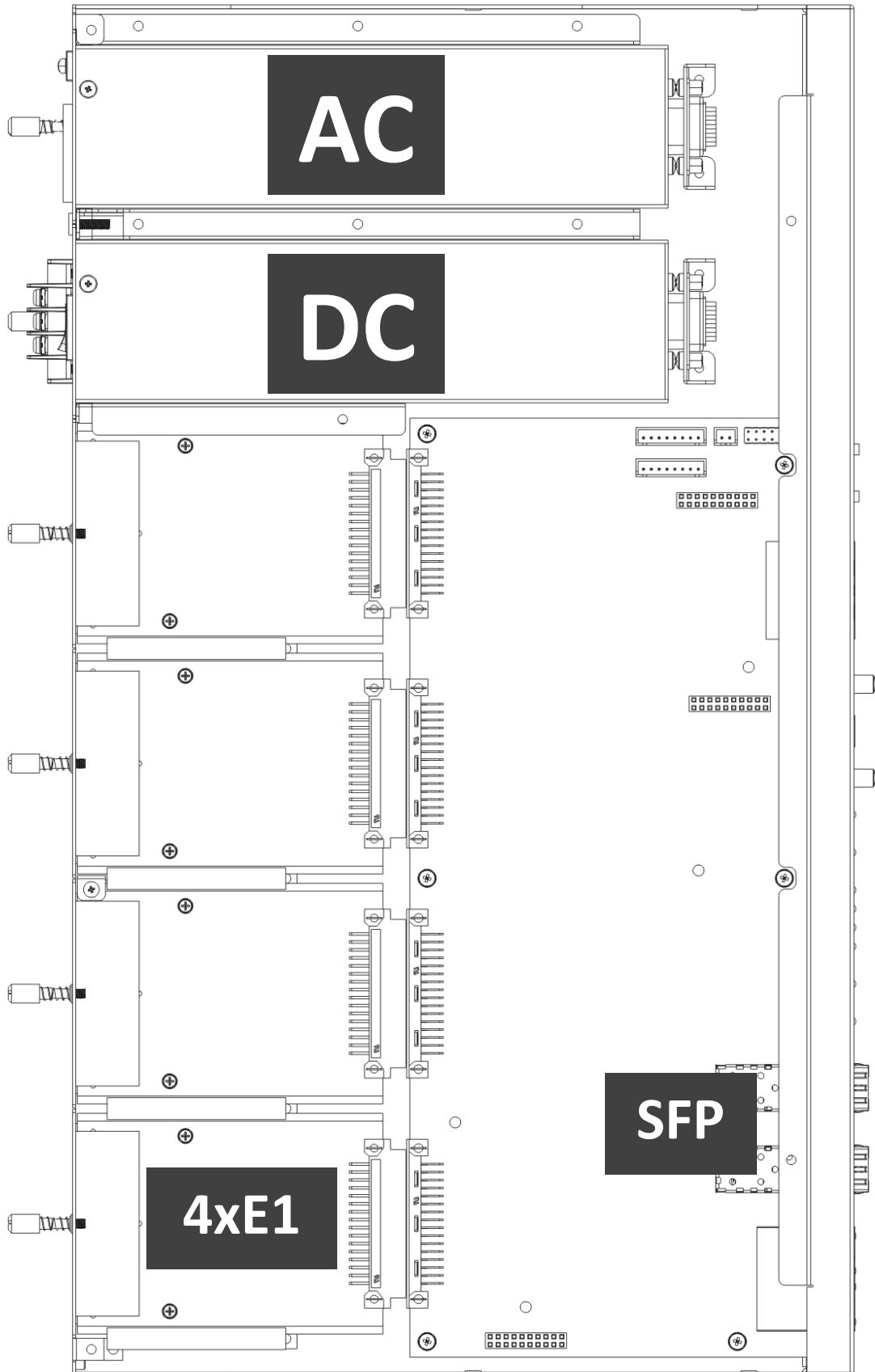


Figure 1-1 : *Fiber Multiplexer* Major Components

**1.3 Technical Specifications*****E1 Link***

Framing	Unframed (transparent)
Bit Rate	2.048 Mb/s
Line Code	AMI HDB3
Line Impedance	Unbalanced 75 ohms (BNC) Balanced 120 ohms (RJ-45)
Receiver sensitivity	+3 to -12dB (short haul)
"Pulse" Amplitude	Nominal 2.37V+/-10% for 75 ohms Nominal 3.00V+/-10% for 120 ohms
"Zero" Amplitude	+/-0.3V
Transmit Frequency Tracking	+/-50 ppm
Internal Timing	
Jitter Performance	According to ITU-T G.823
Complies With	ITU-T G.703, G.704, G.706 and G.732
Interface Connectors	RJ-45 BNC
Test Loops	LLB (Local Loop Back) RLB (Remote Loop Back) RRLB (Request Remote Loop Back)

***T1 Link***

Framing	Unframed (transparent)
Bit Rate	1.544 Mb/s
Line Code	AMI B8ZS
Line Impedance	Balanced 100 ohms (RJ-45)
Receiver sensitivity	+3 to -12dB (short haul)
"Pulse" Amplitude	Nominal 3.00V+/-10% for 100 ohms
"Zero" Amplitude	+/-0.3V
Transmit Frequency Tracking	+/-50 ppm
Internal Timing	
Jitter Performance	According to ITU-T G.824
Complies With	ITU-T G.703, G.704, G.706 and G.733
Interface Connectors	RJ-45
Test Loops	LLB (Local Loop Back) RLB (Remote Loop Back) RRLB (Request Remote Loop Back)

***Ethernet Switch***

Interface Type	10Base-T, 100Base-TX, 1000Base-T (auto-negotiation) 10Base-T, 100Base-TX (FMUX101)
Interface Connector	RJ-45
WAN Data Rate	850M (FMUX1001) / 100M (FMUX101)
Complies with	IEEE802.3 10Base-T IEEE802.3u 100Base-TX IEEE802.3ab 1000Base-T (FMUX1001) IEEE802.3x Ethernet flow control IEEE802.1Q Tagged VLAN
Configuration modes	Auto, forced, Port Based or 1Q VLAN, Ethernet flow control, ingress/egress bandwidth control
MTU	10240 bytes

### **Data Link (V.35/RS-530/X.21/RS-449)**

Channels	4 per module (Data Circuit-Terminating Equipment)
Framing	N64
Bit Rate	64kb/s to 2.048 Mb/s (nx64 where n=1 to 32)
Line Code	NRZ
Line Impedance	Balanced 100 ohms
"Pulse" Amplitude (Mark)	5V (logical zero)
"Pulse" Amplitude (Space)	-5V (logical one)
Transmit Frequency Tracking	+/-50 ppm
Internal Timing	
Timing modes	External Clock (from DTE's TTC) Internal Clock
Complies With	Recover from Remote (transparent timing)
Interface Connectors	TIA/EIA-422 VHDCI .8mm 68-pin (with adapter cable) V.35-HB34F,RS-530-DB25F,X.21-DB15F,RS-449-DB37F
Test Loops	LLB (Local Loop Back) RLB (Remote Loop Back) RRLB (Request Remote Loop Back) V.54

### **POTS Link (Plain Old Telephone Service)**

Channels	4 per module (as FXO or FXS depending on module)
Mode	Bi-directional (full duplex)
Frequency Response	300 ~ 3300Hz
Coding	G.711
Line Impedance	unbalanced 600 ohms
Transmission Medium	2-wire, twisted pair, 24AWG or greater
Interface Connectors	4 x RJ-45 (supports RJ-11 connections on center 2 pins)

### **Local Setup and Configuration**

Console	RS-232 async DCE
Terminal Parameters	Speed: 115,200 Bits: 8 bits Parity: None Stop: 1 bit Flow Control: None
Pin Assignment (RJ-45)	2 - RD Receive Data (output towards DTE) 3 - TD Transmit Data (input from DTE) 1 - SG Signal Ground

### **Alarm Output Relays**

Alarm Output	One of Normally Open/Closed contact for alarms, both audio and visual. Contact ratings: 1A at 30 VDC resistive or 0.5A at 125 VAC resistive
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### LED Indicators

PWR1	Green	Power Module 1 active
PWR2	Green	Power Module 2 active
OP1	Green	Off = off On = optical link is good blinking = working port
OP2	Green	Off = off or disabled On = optical link is good Blinking = working port
Channels	Dual Color	One LED for each channel (1-8) or (1-16) Green = E1/T1 Signal Present Off = Out of Service Amber = E1/T1 Loss of Signal Amber (blinking) = channel in loopback mode
Minor	Amber	Indicates a minor alarm is present.
Major	Red	Indicates a major alarm has occurred, includes E1 or T1 BPV, signal loss, LAN link down, or fiber sync slip.
RDI	Red	Remote Defect Indicator, indicates an alarm has occurred in the remote multiplexer, includes E1, T1, LAN and fiber signal loss.
SYS	Green	Indicates the system is normal
Port (Slot)	Green	Indicates a tributary card is installed in the module slot.
Phone	Green	Indicates the order wire is in use.
LNK (LAN)	Green	4 LEDs, one for each LAN port On = LAN link established Flashing = link with traffic Off = no LAN link or port disabled
Speed (LAN)	Dual Color	4 LEDs, one for each LAN port Amber On = The LAN speed is 1000M (FMUX1001 only) Green On = The LAN speed is 100M Off = If link is present, the LAN speed is 10M

All fiber transceivers in the fiber multiplexer incorporate an automatic laser shutdown feature (ALS) designed to protect personnel that may come into contact with a disconnected fiber connection. This feature may also be disabled for testing purposes via console terminal mode or SNMP (when SNMP option is installed).

### Physical

Height:	43 mm (1.75")
Width:	438 mm (17.25")
Depth:	250 mm (9.875")
Weight:	4 kg (8.8 lb.) Net

### Power supply

Voltage (AC source)	100 ~ 240 VAC±10% (90 ~ 264VAC absolute)
Voltage (DC source)	18 ~ 60 VDC
Frequency	47 to 63 Hz for AC power
Power consumption	<30 Watts

### Environment

Temperature	-10 ~ 60° C / 14 ~ 140° F
Humidity	0 to 95% non-condensing

### Miscellaneous

MTBF	>65,000 hours
Emission compliance	meets FCC part 15 Sub B (class A) EN55022:1994/A1:1995/A2:1997, EN61000-3-2:1995, EN61000-3-3:1995, and EN50082-1:1997
Safety compliance	EN60950-1

## 1.4 E1 Signal Structure

### E1 link line rate

The E1 line operates at a nominal rate of 2.048Mb/s.

### E1 link line coding

The basic E1 line signal is coded using either the **Alternate Mark Inversion (AMI)** or **HDB3** rule.

In the AMI format, "ones" are alternately transmitted as positive and negative pulses, whereas "zeros" are transmitted as a zero voltage level. AMI is not used in most 2.048Mb/s transmissions because synchronization loss occurs during long strings of data zeros.

In the HDB3 format, a string of four consecutive zeros is replaced with a substitute string of pulses containing an intentional bipolar violation. The HDB3 code substitutions provide high pulse density so that the receiving equipment is able to maintain synchronization with the received signal.

The **4-CHANNEL E1** supports two E1 line codes:

AMI coding.

HDB3 coding.

The **4-CHANNEL E1** supports only transparent unframed format. ie., The E1 will pass through with its original framing structure completely intact.

## 1.5 T1(DS1) Signal Structure

### T1 link line rate

The T1 line operates at a nominal rate of 1.544Mb/s.

### T1 link line coding

The basic T1 line signal is coded using either the **Alternate Mark Inversion (AMI)** or **B8ZS** rule.

In the AMI format, "ones" are alternately transmitted as positive and negative pulses, whereas "zeros" are transmitted as a zero voltage level. AMI is not used in most 1.544Mb/s transmissions because synchronization loss occurs during long strings of data zeros.

In the B8ZS format, a string of eight consecutive zeros is replaced with a substitute string of pulses containing an intentional bipolar violation. The B8ZS code substitutions provide high pulse density so that the receiving equipment is able to maintain synchronization with the received signal.

The **4-CHANNEL T1** supports two T1 line codes:

AMI coding.

B8ZS coding.

The **4-CHANNEL T1** supports only transparent unframed format. ie., The T1 will pass through with its original framing structure completely intact.

## 1.6 Applications / Capabilities

In the following example, the **Fiber Multiplexer** utilizes an optical fiber connection between a pair of units to provide up to 16 channels of E1, T1, and 1 to 4 ports of Trunk Ethernet between the units.

The timing scheme for typical E1 or T1 equipment is to transparently pass timing from a timing source unit on one side, to a timing slaved unit on the other. Each of the up to 16 available channels of the **Fiber Multiplexer** is independent of any other channel for framing or timing.

### Application

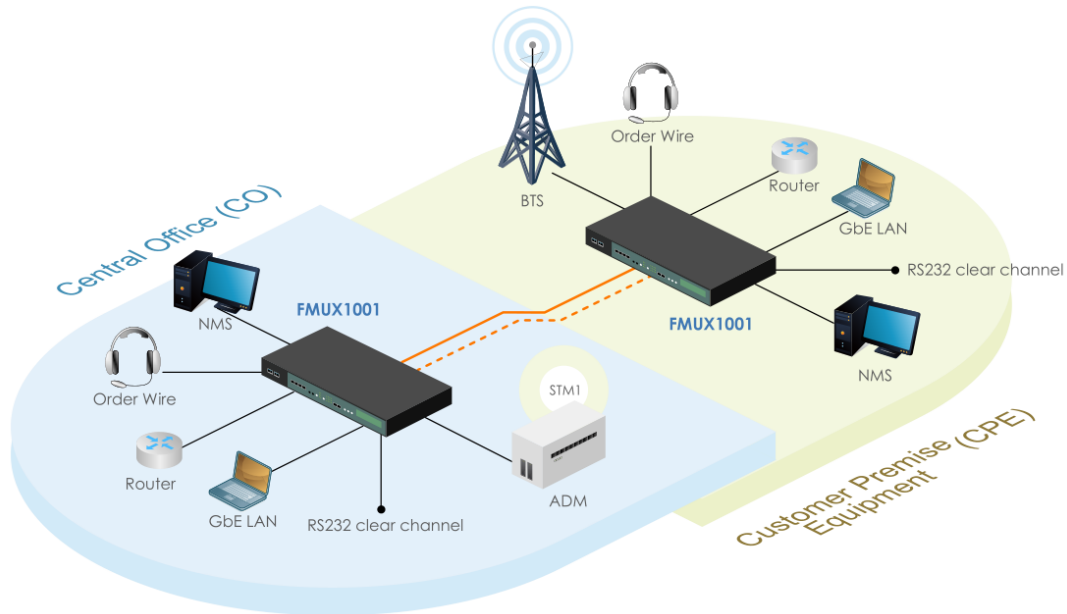


Figure 1-2 : Typical Point-to-Point Application of *Fiber Multiplexer*

## Chapter 2. Installation

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### Chapter 2. Installation

#### 2.1 General

This chapter explains in detail the requirements and procedures for the installation of the **Fiber Multiplexer Standalone/Rack Mount Fiber Optical Multiplexer**.

#### 2.2 Site Preparation

Install the **Fiber Multiplexer** within reach of an easily accessible grounded AC outlet. The outlet should be capable of furnishing 100 to 240 VAC (18 to 60 VDC for DC supply). Allow at least 10cm (4 inch) clearance at the rear and front of the **Fiber Multiplexer** for signal lines and interface cables.

#### 2.3 Mechanical Assembly

The **Fiber Multiplexer** is designed for rack mount installation and only requires 1U space (1 3/4") in a standard EIA 19 inch rack. It is highly recommended that the unit be placed in a rack. The **Fiber Multiplexer** is delivered completely assembled, with the exception of the rack mount adapter brackets. No provision is made for bolting the **Fiber Multiplexer** to a tabletop.

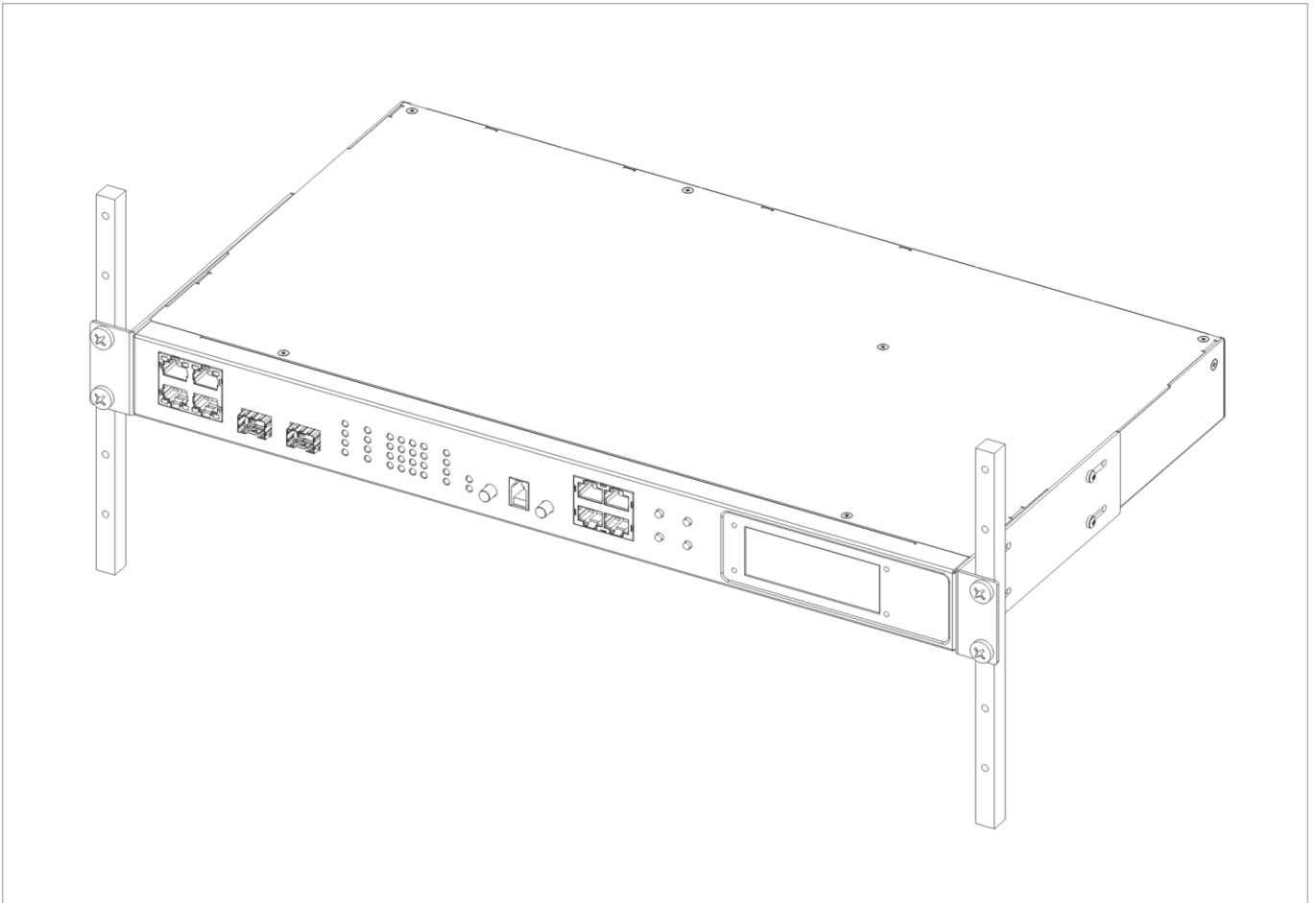


Figure 2-1 : Rack mount Installation of the **Fiber Multiplexer**

# Chapter 2. Installation

## 2.4 Electrical Installation

### 2.4.1 Power connection

For the AC power module, AC power (100~240VAC) is supplied to the **Fiber Multiplexer** through a standard IEC C14 3-prong receptacle, located on the rear of the chassis. For the DC power module, DC -48V (18~60VDC) is connected to the terminal block, observing the proper polarity. The modules are hot swappable as long as two modules are installed. Combinations of dual AC, dual DC or AC+DC are all allowed. If only a single power module is installed, there is no redundancy provided. The **Fiber Multiplexer** should always be grounded through the protective earth lead of the power cable in AC installations, or via the frame ground connection for DC installations. A separate chassis ground is provided on the rear, far right side of the chassis.

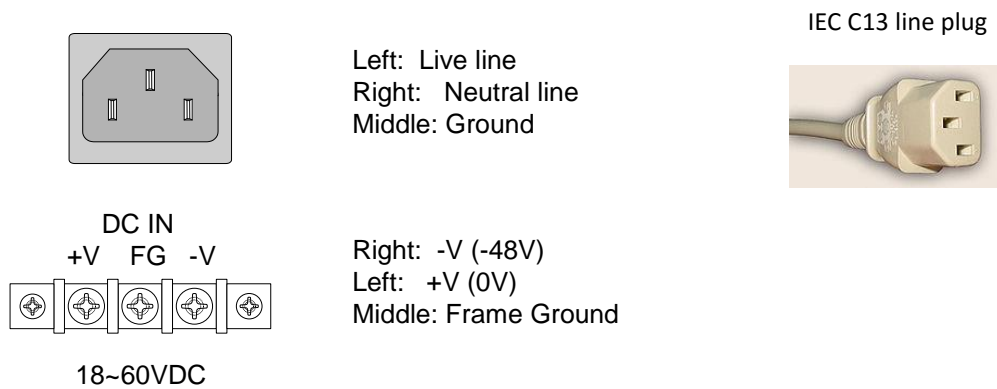


Figure 2-2 : Supply connections, AC and DC model modules shown



## Chapter 2. Installation

### 2.4.2 Rear and Front panel connectors

All Channels are modular on the rear of the **Fiber Multiplexer**. Modular designs allow for a multiplexer that supports TDM, Data and Voice.

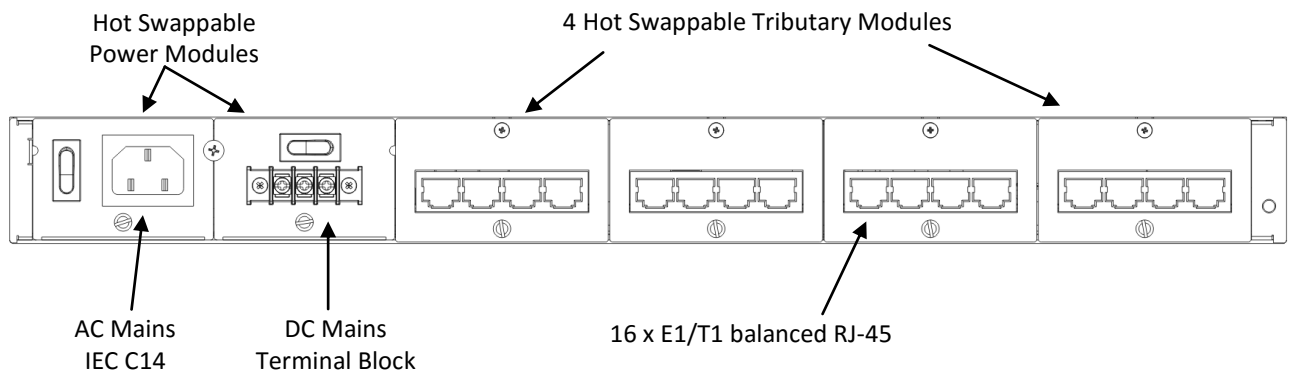


Figure 2-3 : Rear Panel Connections

The front panel of the **Fiber Multiplexer**, holds the optical interfaces, the status and alarm LEDs, the call button, order wire jack, clear RS-232 channel, the local management console port and the 4-port Ethernet connections. The optical interfaces are of the pluggable SFP type. The two optical interfaces provide 1+1 fiber protection.

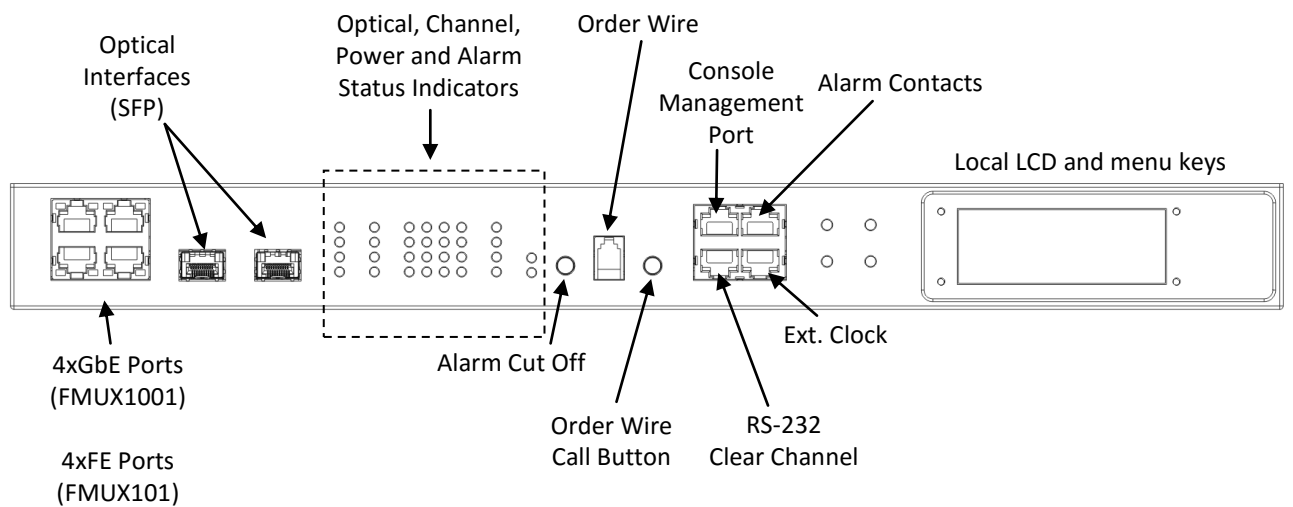


Figure 2-4 : Front Panel Controls and Indicators

## Chapter 2. Installation

### 2.5 Removal/Replacement Procedures

#### 2.5.1 SFP Removal / Replacement (Hot Swappable)

The Gigabit Ethernet **Fiber Multiplexer** accepts any SFP unit that complies with the MSA standard. Follow all ESD precautions when handling the SFP modules. Fiber optic components and cables are very sensitive to dirt, dust and mishandling, especially in high-speed networks. Dirty or mistreated fiber may cause errors and an unwanted degradation of signal quality. Remove the dust caps on SFP and patch cable connectors only when ready to plug in optical cables.

When choosing SFP optical modules, the SFP must be able to support the required data rate. SFP with a data rating of 1.25Gbps is required for **FMUX1001**, while 155Mbps are required for **FMUX101**. Make sure the SFP modules chosen are suitable for the required data rate.

#### Installation

CTC Union supplied SFP modules are of the Bale Clasp type. The bale clasp SFP module has a bale clasp that secures the module into the SFP cage.

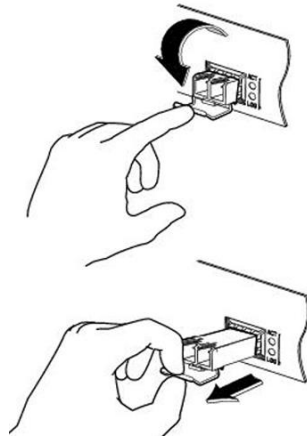


Figure 2-5 : Optical Interface Removal / Replacement (while in service)

- Removing a Bale Clasp SFP Module

Step 1 Open the bale clasp on the SFP module. Press the clasp downward with your index finger.

Step 2 Grasp the SFP module between your thumb and index finger and carefully remove it from the SFP cage.

- Inserting a Bale Clasp SFP Module into an SFP cage

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

Step 2 Line up the SFP module with the port, and slide it into the cage until it seats.

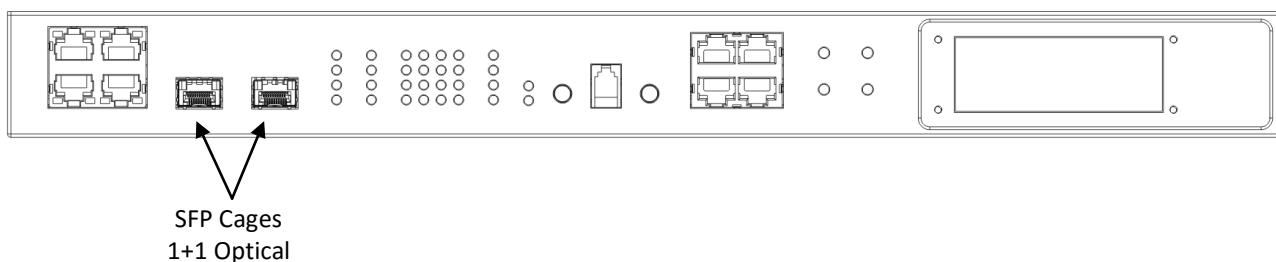


Figure 2-6 : SFP cages located on front panel

## Chapter 2. Installation

### 2.5.2 Top cover Removal / Replacement for internal access

Normally, there is no need to remove the cover of the unit. All interfaces are modular and no user serviceable components are inside.

#### **\*\*\*CAUTION\*\*\***

This procedure should only be performed by qualified service personnel. In addition, all power connections must be removed before even attempting to open the case.

1. If the unit is installed in a rack, it must be removed along with all power connections.
2. The rack mounting brackets, if installed, must be removed.
3. Remove all tributary modules and all power modules.
3. The top cover is held in place by ten screws.
4. Once all ten screws are removed, the top panel just lifts off. The internals are now exposed.

Follow the procedure in reverse to re-install the top panel. Install the screws but at first do not tighten. Make sure all ten screws are started and not cross threaded, then tighten them in a crisscross pattern. The screws are only 3mm, so do not over tighten or they may become stripped or broken. Re-install the rack mount ears if they were removed.

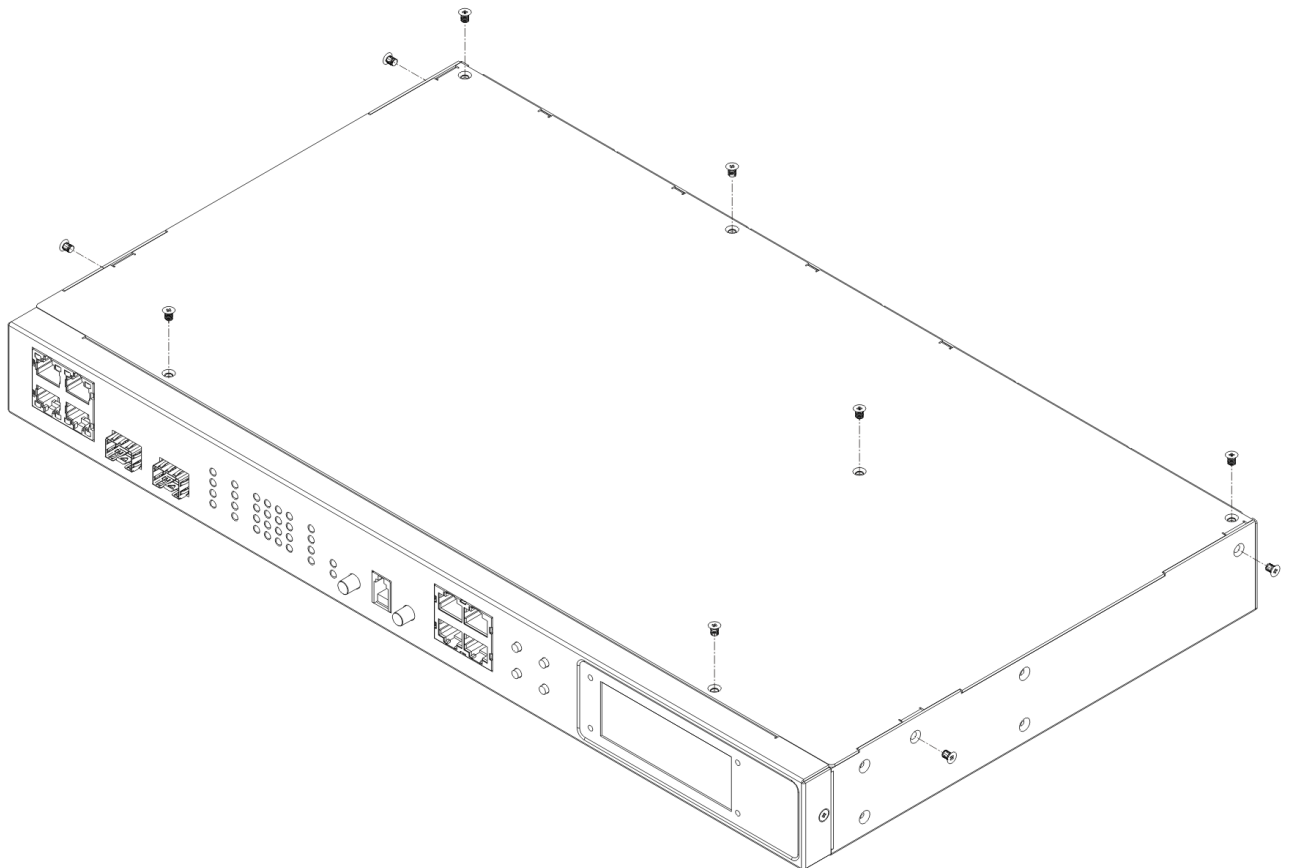


Figure 2-7 : Top cover removal (while out of service)

## Chapter 2. Installation

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### 2.5.3 Power Module Removal / Replacement

This procedure should only be performed after the power connections to module have been removed.

1. There is no need to remove the unit from a rack.
2. Remove the single flat head screw located directly in the middle between the two power modules.
3. There is no need to unscrew the thumbscrew. While holding the thumbscrew, pull the power module straight out.
4. Insert the module in the reverse order.

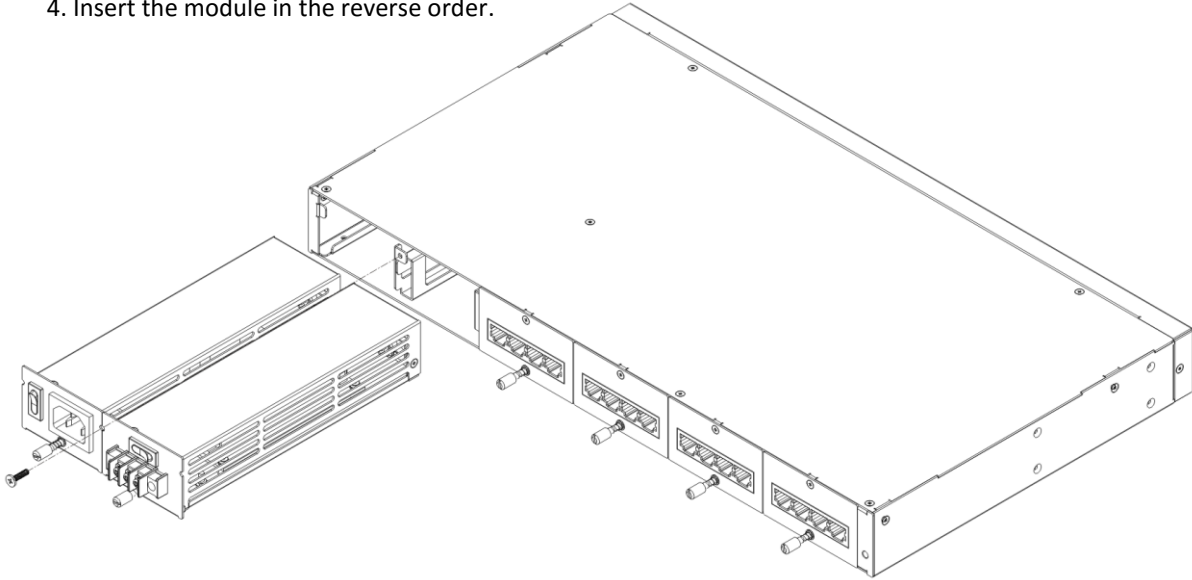


Figure 2-8 : Power module Removal / Replacement

### 2.5.4 Tributary Module Removal / Replacement

1. There is no need to remove the unit from a rack.
2. Remove the single flat head screw located at the top-middle of tributary module.
3. There is no need to unscrew the thumbscrew. While holding the thumbscrew, pull the module straight out.
4. Insert the module in the reverse order.

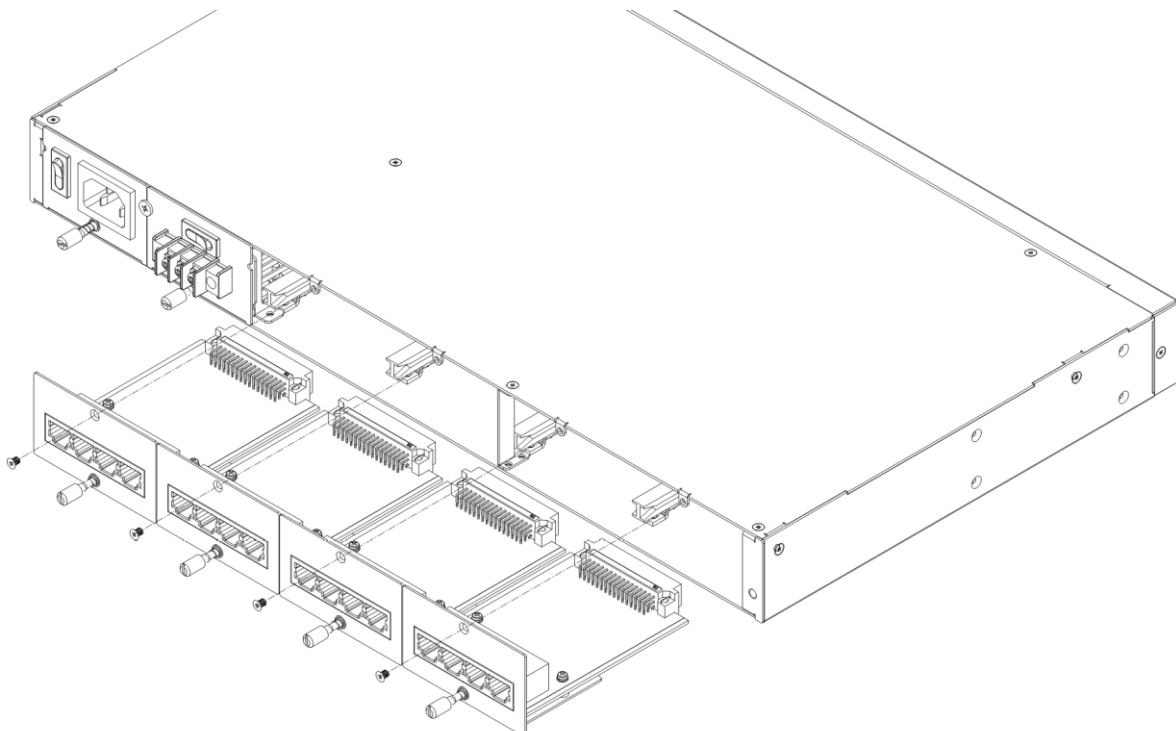


Figure 2-9 : Tributary module Removal / Replacement

## Chapter 3. Operation

### Chapter 3. Console Operation

#### 3.1 Introduction

This chapter will go into the details of the specific configuration and operation of the **Fiber Multiplexer**. The section will outline the operation when using a VT-100 terminal connected to the RS-232 Console port.

#### 3.2 Terminal Mode Operation

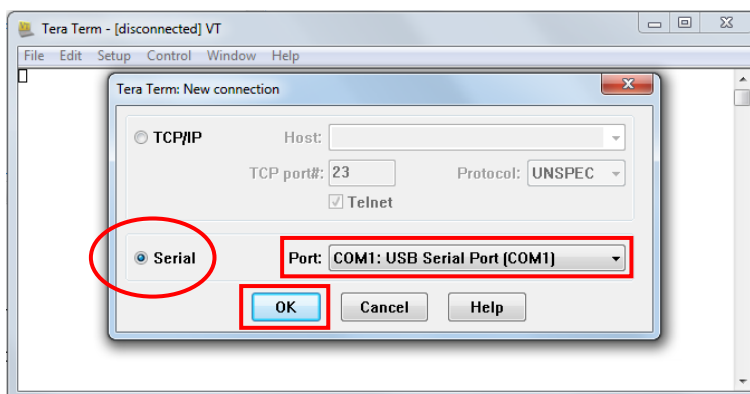
A notebook computer has become an invaluable tool of the Systems Engineer. Connection between the computer and the **Fiber Multiplexer** is very straight forward. The only hardware required is a RJ45 to DB9F adapter cable. The **Fiber Multiplexer's** RS-232 console port acts as a DCE to the PC's DTE communications port.

There are a number of common programs which can be used as terminal emulators for Microsoft® Windows™ based computers. Windows XP® computers already have a terminal emulation program called HyperTerminal™. However, in operating systems after Windows XP®, such a Windows Vista®, Windows 7®, and Windows 8®, there is no such terminal emulation program. In these cases, we highly recommend the free emulation program "TeraTerm Pro". This program can be found freely on the Internet by doing a simple search.

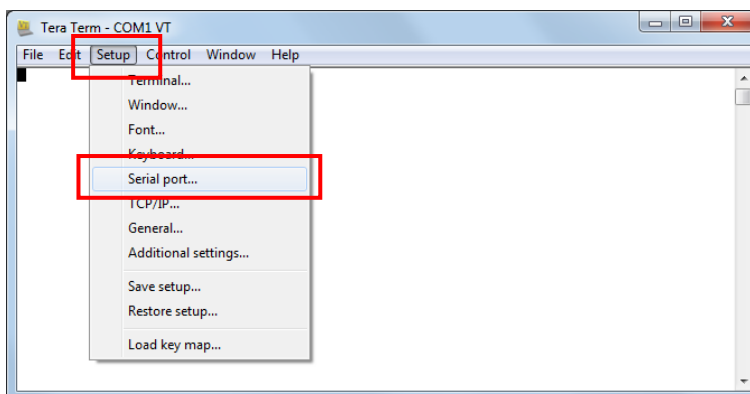
For the remainder of this chapter, "TeraTerm Pro" will be used as our terminal emulator under Windows™.

##### [TeraTerm Example]

Start the application. The 'New connection' pop-up window will appear. Select the 'Serial' radio button. From the 'Port' pull-down menu, select the communication port. In the example below, the COM port is a USB serial adapter. After selection of the communications port, click the 'OK' button.



The next step is to configure the serial port communication parameters. To do this, select the 'Setup' pull-down menu and from that menu, select 'Serial port...'. .



## Chapter 3. Operation

Modify the serial port parameters so that we can establish working communication with the **Fiber Multiplexer**. The communication parameters must be set as follows:

Baud rate: 115,200  
Data: 8 bit  
Parity: none  
Stop: 1 bit  
Flow control: none

Now, click the 'OK' button and the application will be ready to establish communication with the **Fiber Multiplexer**.

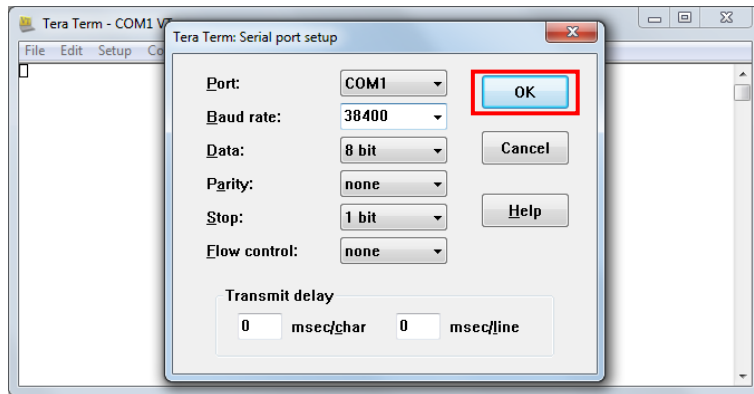


Figure 3-1 TeraTerm Pro port settings for Fiber Multiplexer

### 3.3 Connecting to the Fiber Multiplexer

The console port on the **Fiber Multiplexer** is an RS-232D interface (DCE) that utilizes a RJ-45 connector. Use the configuration cable that is supplied with the **Fiber Multiplexer** or prepare a three wire, RJ-45 to DB9(F), cable with the following pin out:

RJ-45	signal	DB9 (F)
1	GND	5
2	RD	2
3	TD	3

## Chapter 3. Operation

### 3.4 Configuring in Console Mode

#### 3.4.1 Login

The **Fiber Multiplexer** local management port (labeled "Console" on the front panel) is a console terminal port designed to facilitate setup of all parameters through the use of a standard text based terminal or any terminal emulation program running on a Personal Computer. Make the appropriate connections, start the terminal application, apply power to the **Fiber Multiplexer**, then press ENTER on the PC keyboard. The terminal display should look like the following, depending on the model type.

```
*****
***                                     ***
***           FMUX1001           Manager           ***
*****
[Local ]      Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX           Login:admin

UserName : admin           [ F1 ] admin   [ F2 ] guest
Password :
```

Use the function keys F1 or F2 to select the admin or guest login. Guests cannot make any configuration changes. The default password for both users is 'admin'.

#### 3.4.2 Main Menu

After successfully logging in as 'admin', the main menu will be displayed. From this menu, all configurations can be performed. Operation of the interface is very straight forward. The menu system requires no complex CLI commands, just simply enter the menu by keying the item. Upper and lower case letters work in any case.

```
*****
***                                     ***
***           FMUX1001           Manager           ***
*****
[Local ]      Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX           Login:admin

< 1 > Optical Configuration
< 2 > LAN Configuration
< 3 > Slot 1 ( E1/T1 4 Port RJ45 )
< 4 > Slot 2 ( E1/T1 4 Port RJ45 )
< 5 > Slot 3 ( E1/T1 4 Port RJ45 )
< 6 > Slot 4 ( E1/T1 4 Port RJ45 )

< A > Alarm Configuration
< D > Device Configuration
< M > SNMP Manager Configuration
< L > Log Information
< S > Store Parameters
< U > Firmware Upgrade
< P > Password Setup
< G > Go to Remote

[ ESC ] Logout
```

## Chapter 3. Operation

---

The following explains the functions of each menu item. These will all be detailed later:

- < 1 > **Optical Configuration** The sub-menu provides settings for ALS, protection mode, loop back, display bit error count.
- < 2 > **LAN Configuration** Leads to the sub-menu to configure the 4-port Ethernet switch.
- < 3 > **Slot 1** Leads to the sub-menu to configure the tributary module in Slot 1.
- < 4 > **Slot 2** Leads to the sub-menu to configure the tributary module in Slot 2.
- < 5 > **Slot 3** Leads to the sub-menu to configure the tributary module in Slot 3.
- < 6 > **Slot 4** Leads to the sub-menu to configure the tributary module in Slot 4.
- < A > **Alarm Configuration** The alarm status and configuration is done on this sub-menu
- < D > **Device Configuration** Information (uptime, power status) and configuration (reset, factory default) are here.
- < M > **SNMP Manager Configuration** Takes the operator to the SNMP manager configuration page.
- < L > **Log Information** Displays the unit's system log since last power on.
- < S > **Store Parameters** Before leaving the main menu, store the settings in non-volatile ram.
- < U > **Firmware Upgrade with Xmodem** In the event of any future upgrade, the firmware can be loaded here.
- < P > **Password Setup** Sets up the console login password through this sub-menu
- < G > **Go to Remote** When fiber links to a remote unit, this option is available. Remote management is done via the EOC (Embedded Operations Channel) within the fiber transmission between a pair of **Fiber Multiplexers**.

### 3.4.3 Optical Configuration Menu

```
[Local ] Ver: [1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Optical Information And Configuration >>

          Type  Exist  Link  DDM  Fault
[ Optical 1 ] [SFP ] [ Yes ] [Up ] [Yes] [ No ]
[ Optical 2 ] [SFP ] [ Yes ] [Up ] [Yes] [ No ]

Working Path Status [ OP1 ] Bit Err Cnt [0]

< 1 > Protection Mode      [Auto, Non-Revert]
< 2 > ALS                  [Enable ]
< 3 > Loopback Test        [Disable]
< 4 > Insert one BERT Error
< 5 > Clear bit Error Counter
< 6 > Optical 1 SFP-DD Information
< 7 > Optical 2 SFP-DD Information

[ ESC ] Go to previous menu. Please select an item.
```

This screen is both informational (showing if SFP modules are installed, their link state, DDMI capability and fault status) as well providing basic configuration of the fiber ports for ALS (Auto Laser Shutdown), loopback testing, integrated BERT (Bit Error Rate Test) and detailed digital diagnostics for the installed SFP.

#### Protection Modes

The **Fiber Multiplexer** has two aggregate optical ports that can provide redundant transmission in the event one single path becomes unstable or un-useable.

<0> Auto, Non-Revert : The default setting. When working path transitions to other optical link, it will remain there even if the downed link is restored (will not revert).

<1> Auto, Revert : When this mode is set, the path will switch back when the downed link is restored.

<2> Manual OP1 <3> Manual OP2 : These modes can force the working path to either OP1 or OP2.

#### Auto Laser Shutdown

This standard safety feature is disabled by default. In the event the optical port suffers a loss of receive signal, the transmit laser will be turned off. Although most lasers in SFP are class 1 (harmless to skin or eyes), this feature is still available.



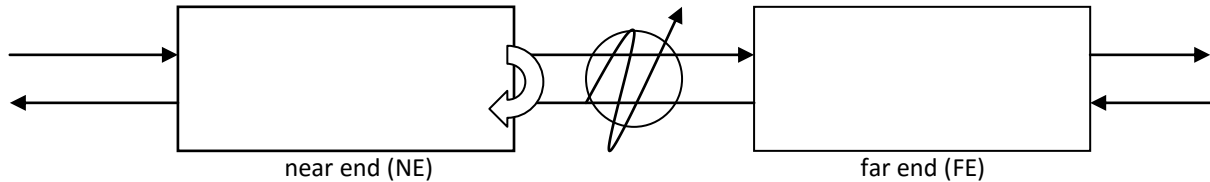
## Chapter 3. Operation

### Loopback

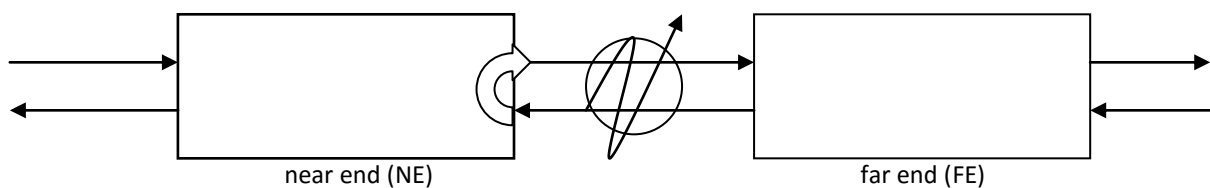
**CAUTION:** Performing optical loopback on an in-service system will cause a service disruption on ALL the E1 (T1) channels as well as create a possible broadcast storm condition on the four Ethernet LAN ports.

The graphics below indicate the location where the three loop back types are placed.

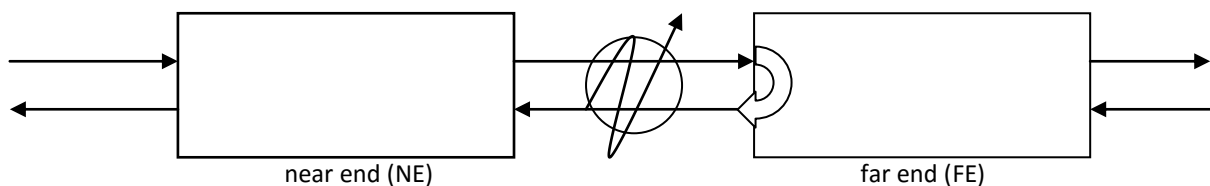
\* LLB (Optical local loop back)



\* RLB (Optical Remote loop back)



\* RRLB (Request optical remote loop back)



### Integral BERT

Within the optical transmission is a pattern generator that feeds a bit error rate channel which is constantly running and counting if there are any errors on the channel's receiver. There are two menu items related to this error checking: Insert one bit error, will insert a single forced error from the pattern generator to increment the counter by one and a clear bit error counter to reset the count to zero.

### SFP and Digital Diagnostics monitoring

The *Fiber Multiplexer* supports reading SFP and DDM information. Here is an example:

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Optical 1 D/D Function Status >>

Vendor Name       : [OEM           ]
Vendor Part Number : [SFS-7020-WB-DDI ]
Optical Type      : [ Single   ]
Wavelength        : [ 1550 nm ]

Link Length       : [ 0020 Km ]
TX Power          : [ -06 dbm ]
RX Power          : [ -15 dbm ]
Rx Sensitivity    : [ -23 dbm ]
Temperature       : [ 047 C ]

[ ESC ] Go to previous menu. Please select an item.
```

## Chapter 3. Operation

---

### 3.4.4 LAN Configuration Menu

The LAN configuration menu of the *Fiber Multiplexer* deals with all the functions of the embedded Layer 2 gigabit Ethernet switch including port up/down, auto/forced, bandwidth control, port based or tag based VLAN, 802.3x flow control and jumbo frame (10240 bytes) support.

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< LAN Information And Configuration >>

< 1 > Port 1 [Up ]
< 2 > Port 2 [Up ]
< 3 > Port 3 [Down]
< 4 > Port 4 [Down]

< P > Port VLAN [Disable]
< T > 802.1Q VLAN [Disable]
< F > Flow Control [Enable ]
< J > Jumbo Frame [Disable]
< Q > QoS Priority [Weighted]

[ ESC ] Go to previous menu. Please select an item.
```

#### Individual LAN Port Configuration

Each individual port can be manually configured.

```
[Local ] Ver:[ 1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< LAN - 1 Configuration >>

Link [Up ] Speed [ 1000 ] Duplex [Full]

< 1 > Service [Enable ]
< 2 > Negotiation [Auto ]
< > Speed [ ]
< > Duplex [ ]
< 5 > Ingress Limit [Unlimited]
< 6 > Egress Limit [Unlimited]
< 7 > Default COS [0]

[ ESC ] Go to previous menu. Please select an item.
```

- < 1 > **Service** If a port is unused, its service can be disabled to avoid any alarm indication.
- < 2 > **Negotiation** The default is "auto" but the port can be manually or 'forced' configured.
- < 3 > **Speed** Unless in 'Forced' mode, the speed of the port cannot be manually set.
- < 4 > **Duplex** Unless in 'Forced' mode, Duplex cannot be set. It cannot be set to half when speed is 1000M.
- < 5 > **Ingress Limit** Ingress refers to packets entering the switch port. The rates can only be set to 64k, 1M or 10M.
- < 6 > **Egress Limit** Egress refers to packets leaving the switch port. The rates can only be set to 64k, 1M or 10M.
- < 7 > **Default COS** Each port can be assigned a Class of Service priority from 0~7 (low to high).

## Chapter 3. Operation

### Switch Configuration

< P > Port VLAN [Disable]

```
<< Port VLAN Information And Configuration >>

< 0 > Port VLAN [ Disable ]

      GroupA   GroupB   GroupC   GroupD   Management
< 1 > Port 1   [ * ]   [   ]   [   ]   [   ]   [   ]
< 2 > Port 2   [ * ]   [   ]   [   ]   [   ]   [   ]
< 3 > Port 3   [ * ]   [   ]   [   ]   [   ]   [   ]
< 4 > Port 4   [ * ]   [   ]   [   ]   [   ]   [   ]

The Port VLAN feature is unavailable if using Static 802.1Q VLAN,
Q-in-Q VLAN or Loopback.

[ ESC ] Go to previous menu. Please select an item.
```

The port VLAN feature uses the internal mechanism in the switch chip to group virtual LANs between ports and the embedded management. This feature, when enabled, makes static 802.1Q, QinQ and loopback unavailable.

Configuration of this feature simply involves selection of ports to be included into one of 4 groups. By placing each port in a different group on each multiplexer, four isolated Ethernet links can be established. It is also possible to isolate management from other traffic through group assignment.

< T > 802.1Q VLAN [Disable]

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Static 802.1Q VLAN Information And Configuration >>

LAN 1 : < 1 > : VID [ 1] < 5 > : QinQ Support [Disable]
LAN 2 : < 2 > : VID [ 1] < 6 > : QinQ Support [Disable]
LAN 3 : < 3 > : VID [ 1] < 7 > : QinQ Support [Disable]
LAN 4 : < 4 > : VID [ 1] < 8 > : QinQ Support [Disable]

      < M > Management VID [ 1 ]
      < V > VLAN Tag Function [Disable]
      < T > Tag Type (Hex) [ 8100 ]
      < Z > Go to VLAN Table Configuration Page

[ ESC ] Go to previous menu. Please select an item.
```

<1-4> Configure the VID for ports 1-4. This function defines the tag VID which will be added to all ingress packets on the port.

<5-8> Configures QinQ for ports 1-4. This function enabled defines the outer tag added to all packets that egress the port.

<M> The management VID is used to send only those tagged packets to the CPU for management. Packets leaving the CPU will be tagged with this same VID.

<V> Until explicitly enabled, no VLAN actions are taken.

<T> The tag type for QinQ packets is entered here. The default is 0x8100. IEEE802.1ad recommends the service provider's tag type be 0x88A8.

<Z> Go to the static VLAN configuration table. There are up to 16 VLAN groups that can be defined. The behavior for each of the four LAN ports for egress packets may be defined as Unmodified, Untagged, Tagged or non-member.

Unmodified: Although being aware, the egress packet's VLAN tag will not be modified

Untagged: The packets egressing this port will have VLAN tag removed.

Tagged: The packets egressing this port will be tagged

Non-member: Packets with this VID will not be allowed to egress this port.

## Chapter 3. Operation

### < F > Flow Control [Enable ]

Toggles the IEEE802.3x Ethernet Flow Control either enabled or disabled.

### < J > Jumbo Frame [Disable]

Toggles the maximum packet size to enable up to 10240 bytes size.

### < Q > QoS Priority [Weighted]

Toggles the QoS priority between weighted (round robin) and strict priority.

Map the 3-bit QoS priority (0~7) to the switch internal 2-bit priority (0~3).

### 3.4.5 Tributary Configuration Menu

The E1/T1 tributary module card uses a software programmable LIU (line interface unit) that can be configure for E1 or T1 mode. For the BNC model cards, the mode is fixed for E1, 75 ohm as the transmission media is coaxial cable and therefore will always be E1, 75 ohm. However, for the RJ-45 cards, the multiplexer can have all ports configured for E1 75 ohms, E1 120 ohms or T1 (DS1) 100 ohms. The setting is made by choosing the 'S' item and then selecting the desired mode. (Remember to 'save' the settings under the Device menu.)

```
[Local ]      Ver: [1.100-1.002-0.000-0.030]
Alias : FMUX          Login:admin

<< Port 1 [ E1/T1 4 Channel RJ45 ] >>

< 1 > Channel A [Down]
< 2 > Channel B [Up ]
< 3 > Channel C [Up ]
< 4 > Channel D [Up ]

< S > Set to E1/T1 mode [E1 120 ohm]
< D > Set to Default

[ ESC ] Go to previous menu. Please select an item.
```

<S> Set the E1/T1 mode for all 4 channels of this tributary card module.

<1-4> Select the individual channel from this tributary card.

#### Individual channel configuration

```
[Local ]      Ver: [1.100-1.002-0.000-0.030]
Alias : FMUX          Login:admin

<< Port 1 - Channel A Configuration >>

mode: E1 [RJ45] 120 ohm
performance : 27892          TX Failure [Normal ]
AIS Detect [Normal ]          RX Loss [ Yes ]

< 1 > Service [Enable ]
< 2 > Line Code [HDB3/B8ZS]
< 3 > Auto AIS [Enable ]
< 4 > Loopback [Disable]
< 5 > Clear Performance Counter

[ ESC ] Go to previous menu. Please select an item.
```

< 1 > Service [Enable ] : Enable the service for this channel. If disabled, to traffic will pass and no alarm will be generated.

< 2 > Line Code [HDB3/B8ZS] : Select the line coding for E1 (HDB3 or AMI) or for T1 (B8ZS or AMI).

< 3 > Auto AIS [Enable ] : AIS is enabled by default. Loss of receive E1/T1 signal will result in transmitting all 1's.

< 4 > Loopback [Disable] : Supports local and remote loopback (see graphic on following page).

< 5 > Clear Performance Counter : Self explanatory. Counter can be reset to zero here and then continue counting errors.

## Chapter 3. Operation

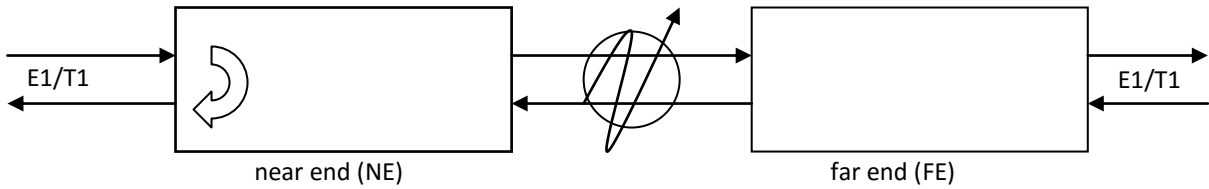
---

### Loop back

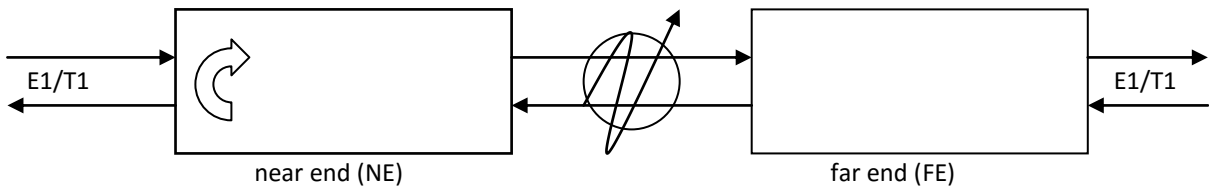
```
-----  
<0> Disable <1> LLB <2> RLB <3> RRLB <Esc> Exit
```

The following graphics explain the loopback locations for each of the three available loopback settings.

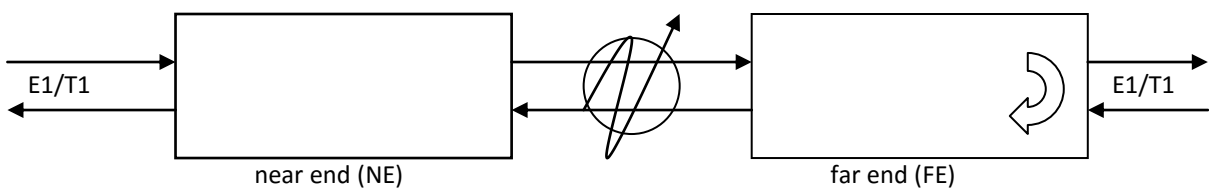
\* LLB (E1/T1 local loop back)



\* RLB (E1/T1 remote loop back)



\* RRLB (request E1/T1 remote loop back)



## Chapter 3. Operation

### 3.4.6 Alarm Configuration Menu

This menu sets up the major/minor alarms and the alarm triggers.

```
[Local ]      Ver:[1.100-1.002-0.000-0.030]
Alias  : FMUX          Login:admin

<< Alarm Configuration >>

Alarm [Normal]      Buzzer [Normal]      RDI [Normal]
Major[ ] ( Visible[ ] Audible[ ] )      Minor[ ] ( Visible[ ] Audible[ ] )

< Alarm Setting >
  < 1 > Alarm Buzzer [Enable ]
  < 2 > Major Visible [Enable ]
  < 3 > Major Audible [Enable ]
  < 4 > Minor Visible [Enable ]
  < 5 > Minor Audible [Enable ]
< Triggers >
  [          Major          ]      [          Minor          ]
  < 6 > Sync Loss - Optical [ ]      < B > Err Cnt - Optical [ ]
  < 7 > Link Loss - Optical [ ]      < C > Err Cnt - Channel [ ]
  < 8 > Link Loss - LAN [ ]          < D > RDI [ ]
  < 9 > Link Loss - Channel [ ]
  < A > Power Loss [ ]

[ ESC ] Go to previous menu. Please select an item.
```

In the default configuration, all alarm settings (major, minor, audible, visual) are enabled. None of the triggers are enabled however. There are 5 major alarm triggers and 3 minor alarm triggers.

<6> : Sync Loss - Optical ; The optical link is unable to synchronize, no transmissions are possible, no in-band.

<7> : Link Loss - Optical ; No optical signal is being received, no link or no SFP installed.

<8> : Link Loss - LAN ; This is an all or nothing setting, effects all 4 LAN ports. If a LAN port is disabled, it will not issue any alarm.

<9> : Link Loss - Channel ; This is an all or nothing setting, effects all tributary channels. If a channel is disabled, it will not issue any alarm.

<A> : Power Loss ; This is really only applicable when two power modules are installed. If enabled, alarm is triggered if one of the power modules fails.

<B> : Err Cnt - Optical ; Integral BERT is always running. When enabled, a minor alarm is issued if a bit error is detected.

<C> : Err Cnt - Channel ; When enabled, an increment in performance monitor will trigger a minor alarm.

<D> : RDI ; When enabled, a Remote Defect Indication will trigger a minor alarm.

## Chapter 3. Operation

### 3.4.7 Device Configuration Menu

The menu screen is broken into two parts, the informational part and the setting part.

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Device Configuration >>
SN :

time : [ 2015/10/12 - 13:09:59 ]
Uptime : [ 0 days - 03:59:21 ]
Power 1 [ Module | AC Power | Up ]
Power 2 [ Module | DC Power | Down ]

< Setting >
< 1 > Device Active [Enable ]
< 2 > Device Reset
< 3 > Manager Default
< 4 > System Default
< 5 > Clear System Uptime
< 6 > Device Alias : dot251
< 7 > IP Configuration
< T > Adjust Date And Time

[ ESC ] Go to previous menu. Please select an item.
```

Information shown includes the current time, Uptime of the device, power types (AC or DC) and power status.

**<1> Device Active** Indicates if the device is enabled or disabled. When disabled, no traffic will flow through the device. A confirmation will be required to disable the device.

**<2> Device Reset** When performing a device reset the CPU will reboot, FPGA code is reloaded and the saved configuration is restored. During the reset, no traffic will flow through the device. A confirmation will be required prior to resetting.

**<3> Manager Default** All management settings, IP address, SNMP community strings will all be returned to factory default.

**<4> System Default** When performing a system default, all configuration settings of tributaries, optical and LAN will be reverted to the factory default settings. Doing a system default on an in service device could lead to traffic disruption. Therefore, a confirmation will be required before the system default is performed.

```
-----
<Y> Yes <ESC> Exit ( Optical, LAN, Port )
```

**Device Reset** and **System Default** actions could result in disruption of traffic, a further confirmation will be required by the user.

**< 5 > Clear System Uptime** Use this to clear the system uptime (time since last power up or reboot of system).

**< 6 > Device Alias : FMUX** Set the device's alias name here. Must be alpha-numeric, 1~16 characters and follow hostname rules.

**< 7 > IP Configuration** Setup the networking for the management of the multiplexer.

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Device -> IP Configuration >>

MAC Address : 00:02:AB:EE:EE:EE
< 1 > IP : 192.168. 0.251
< 2 > Netmask : 255.255.255. 0
< 3 > Gateway : 192.168. 0. 10

[ ESC ] Go to previous menu. Please select an item.
```

**< T > Adjust Date And Time** Set the date and time for the device's real-time clock. Follow the example.

```
-----
yyyy/mm/dd hh:mm:ss
Current : 2015/11/10 14:35:00
```

## Chapter 3. Operation

---

### 3.4.8 SNMP Manager Configuration Menu

From the main menu, use the "M" key to access the SNMP configuration for manager and traps.

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< SNMP Manager Configuration >>

    < 1 > Manager Configuration
    < 2 > Trap Configuration

[ ESC ] Go to previous menu. Please select an item.
```

#### < 1 > Manager Configuration

```
<< SNMP -> Manager Configuration >>

< Manager Setting >
  Manager's IP      Community String Access
  =====
< 1 > 192.168. 0. 49 public Read/Write
< 2 > -
< 3 > -
< 4 > -

< Command Function Key >
< D > Delete all settings.

[ ESC ] Go to previous menu. Please select an item.
```

Up to 4 manager IP addresses may be configured with IP address and community string to access the **Fiber Multiplexer** for management via SNMP. Follow the example above and enter your SNMP manager's IP.

#### <2> Trap Configuration

```
<< SNMP -> Trap Configuration >>

< Trap Setting >
  Trap Receiver IP  Community String
  =====
< 1 > 192.168. 0. 49 public
< 2 > -
< 3 > -
< 4 > -

< Command Function Key >
< D > Delete all settings.

[ ESC ] Go to previous menu. Please select an item.
```

Up to 4 trap receivers may be configured by entering their IP address along with community string. Traps are unsolicited messages send by the **Fiber Multiplexer's** SNMP agent as a result of programmed alarm conditions. (See Alarm configuration section 3.4.5.)



## Chapter 3. Operation

### 3.4.9 Log Information Menu

From the main menu, use the "L" key to access the log information screen.

```
<< Syslog Configuration >>

Item No.  Time                Type  Message
=====
001  31  2015-11-10/16:25:56  020300  Anonymous(admin) Login Console !
002  30  2015-11-10/14:52:33  040300  Anonymous(admin) Login Timeout Console !
003  29  2015-11-10/14:39:09  020300  Anonymous(admin) Login Console !
004  28  2015-11-10/14:38:29  070400  Port04, Remote: E1/T1-RJ45 Card Found
005  27  2015-11-10/14:38:28  070300  Port03, Remote: E1/T1-RJ45 Card Found
006  26  2015-11-10/14:38:28  070200  Port02, Remote: E1/T1-RJ45 Card Found
007  25  2015-11-10/14:38:27  070100  Port01, Remote: E1/T1-RJ45 Card Found
008  24  2015-11-10/14:38:27  050000  Power Module 1 ON.
009  23  2015-11-10/14:38:27  090203  Port01, Local: Channel D Link Up
010  22  2015-11-10/14:38:27  090202  Port01, Local: Channel C Link Up

[ C ] Clear All          [ Last Clear Time ] --/--/-- --:--:--
[ Page Up ] Page Up     [ Page Down ] Page Down
[ ESC ] Go to previous menu. Please select an item.
```

The system log will keep up to 100 log events which are time stamped according to the real time configured in the **Fiber Multiplexer**. Use the 'page up/page down' keys to view multiple pages in the log. The "C" key will clear the log of all entries and the time the log was cleared will be recorded.

System log is stored in volatile memory, so the log is lost if power is interrupted to the multiplexer.

### 3.4.10 Store Parameters Function

Any changes made to running configuration are made immediately, but they are not saved unless the "Store Parameters" function is performed. From the Main Menu, press "s" and then confirm the save parameter function.

```
[Local ] Ver:[1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

< 1 > Optical Configuration
< 2 > LAN Configuration
< 3 > Port 1 ( E1/T1 4 Channel RJ45 )
< 4 > Port 2 ( E1/T1 4 Channel RJ45 )
< 5 > Port 3 ( E1/T1 4 Channel RJ45 )
< 6 > Port 4 ( E1/T1 4 Channel RJ45 )

< A > Alarm Configuration
< D > Device Configuration
< M > SNMP Manager Configuration
< L > Log Information
< S > Store Parameters
< U > Firmware Upgrade
< P > Password Setup
< G > Go to Remote

[ ESC ] Logout
```

Failure to save parameters will result in all changes being lost if the multiplexer is power cycled.

## Chapter 3. Operation

### 3.4.11 Upgrade Function

Fiber Multiplexer supports firmware and FPGA upgrade in the event new features are added or if problems are found and fixed. The upgrade method uses Xmodem transfer and therefore is performed locally through the serial console port.

#### Prerequisites:

Fiber Multiplexer with RJ45 console port.

Serial cable, DB9F to RJ45.

Laptop or PC with an available COM port (USB to Serial adapter acceptable)

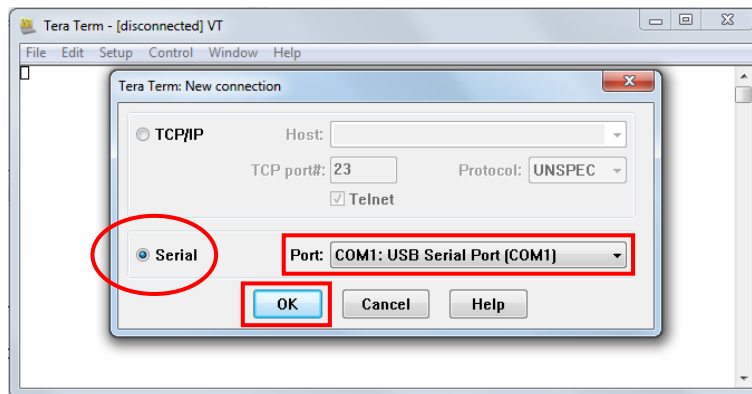
Terminal Emulator S/W Xmodem capable (TeraTerm Pro included)

Upgrade firmware, for version 1.00X, released as FMUX1001\_AP\_2105xxxxxxx.BIN' image file.

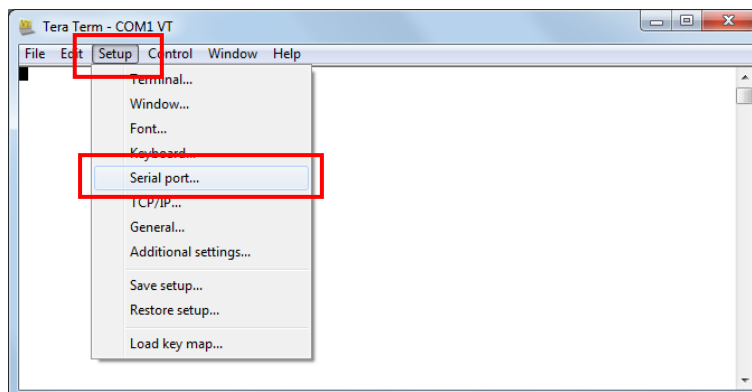
#### Procedure:

1. Extract the upgrade package with 7-Zip or other decompression tool. Connect the FMUX console port to the desktop's or laptop's COM port with DB9 to RJ45 serial adapter cable.
2. Open the terminal application, in the "ttermpro" folder and configure terminal settings on the desktop or Laptop's for:
  - a. 115200 baud
  - b. 8 bits
  - c. no parity
  - d. 1 stop bit
  - e. no flow control

[TeraTerm example]



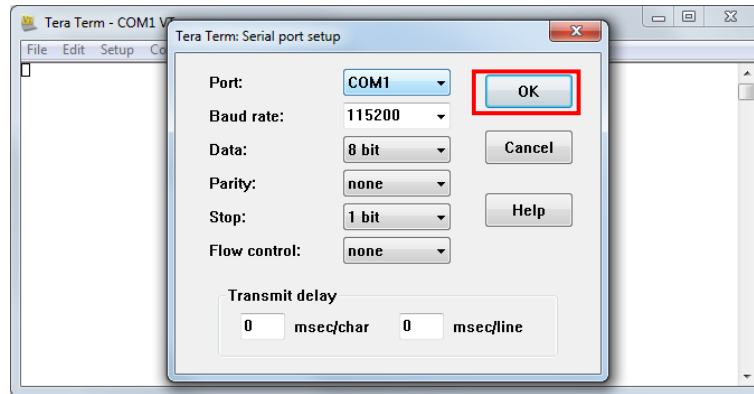
Select the 'Serial' radio button, choose the right 'Port' from the pull-down menu, and click 'OK'.



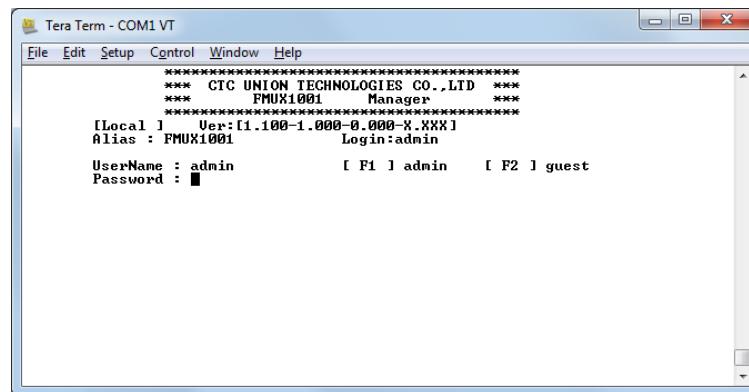
From the 'Setup' pull-down menu, select 'Serial port'

## Chapter 3. Operation

Configure the correct terminal parameters and click 'OK'.

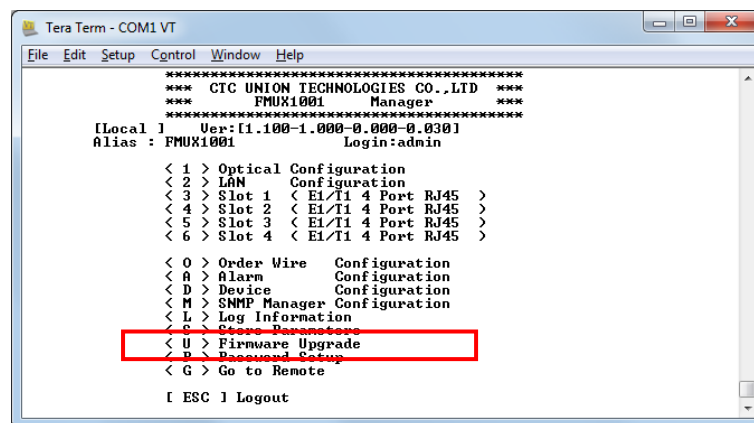


3. Power on FMUX and observe the boot.

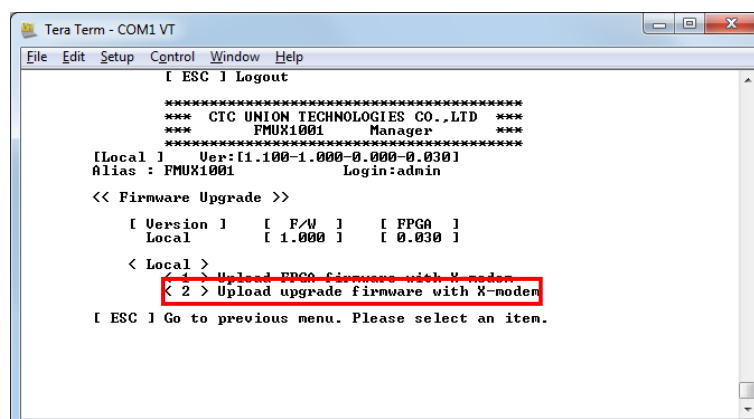


This is the display after normal boot up, waiting to login. The default password is 'admin'. If the password has been forgotten, use the super user (back-door) password '1021' to login.

4. This is the Main menu after logging in. Select item 'U' to enter the 'Firmware Upgrade' menu.

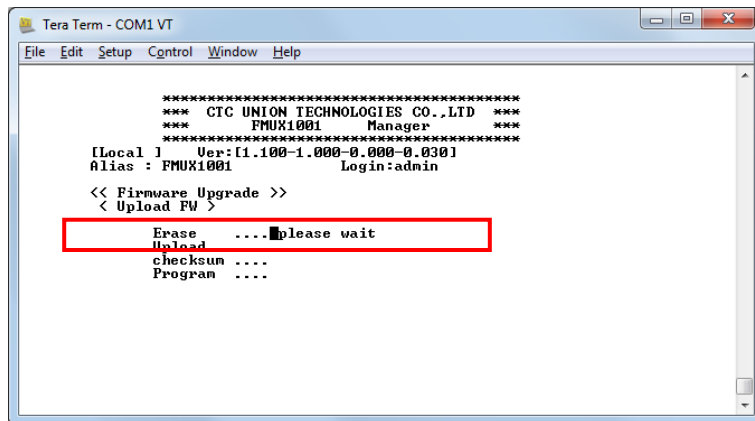


5. Select item '2' Upload Upgrade firmware.



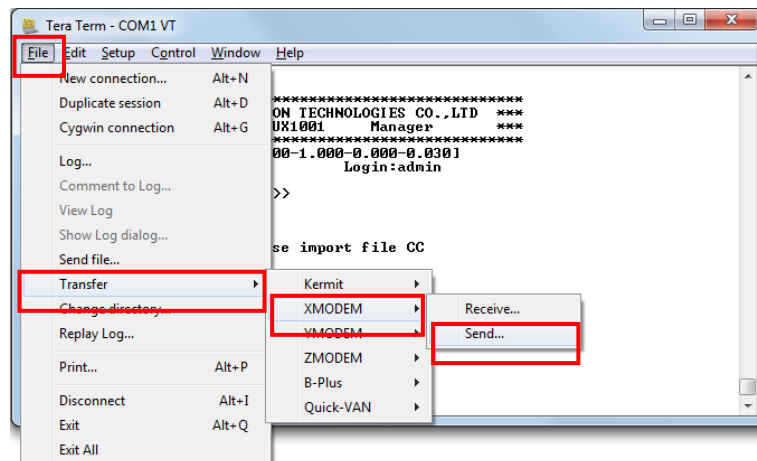
## Chapter 3. Operation

This product has both FPGA and CPU firmware codes. If upgrading both, be sure to upgrade firmware first. In most cases, only firmware upgrade is required.



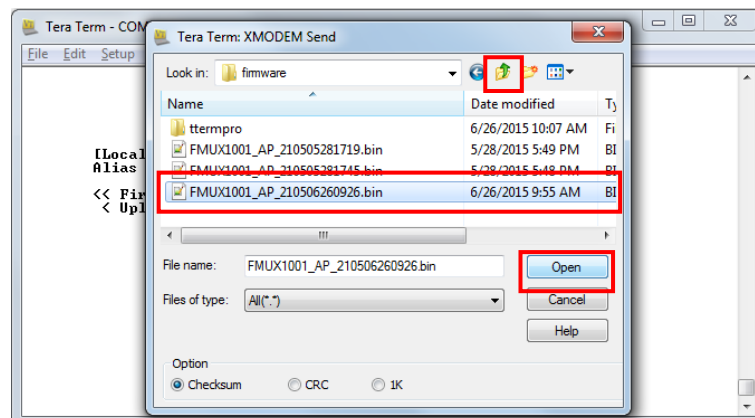
The code memory will be erased and the unit will be standing by for Xmodem image file transfer. This is indicated by the 'CC' characters being displayed after the Upload prompt. If an upload does not commence within 35 seconds, the upgrade will timeout. Don't worry, press [ESC], login, select 'U' and choose firmware (2) and then send the file before 35 seconds are up.

6. Use the TeraTerm Pro application to transfer the image file to the FMUX for writing.



7. Follow the 'File' menu pull-down, File > Transfer > XMODEM > Send.

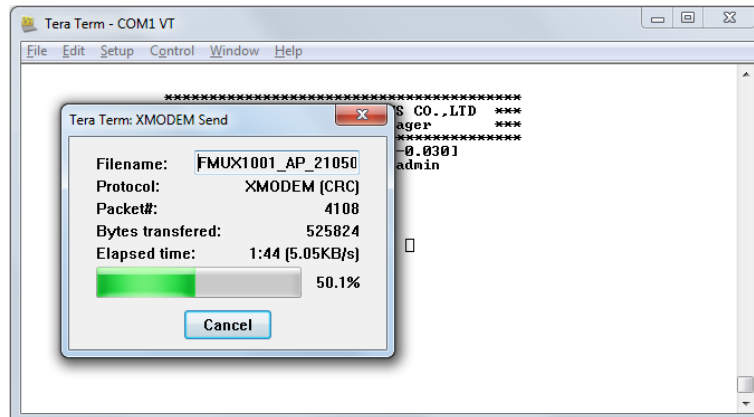
(Be very sure to use only the Xmodem protocol)



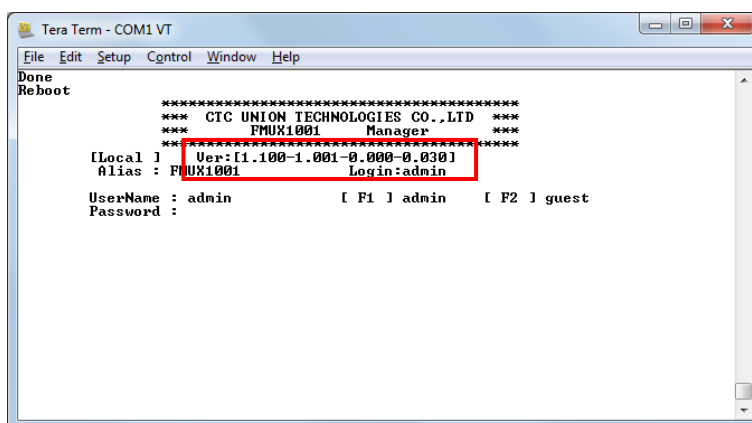
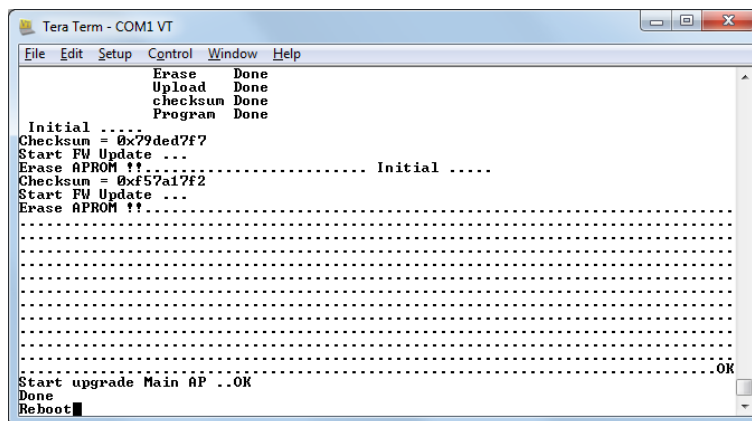
- The firmware image should be located just one directory "up" from the TeraTerm application.
- Select the image file (with the .bin extension).
- Click the 'Open' button.

## Chapter 3. Operation

8. If all is right, TeraTerm should start to transfer to the FMUX over the serial interface. The progress will be shown on the progress bar. If for some reason transfer does not start (if more than 35 seconds has elapsed), [Esc] to previous console menu and do upgrade again. Try to transfer the image before the 35 second timeout window. The file transfer will take about 3.5 minutes. The entire upgrade takes about 5 and a half minutes.



9. After the image transfer is completed, **DO NOT ALLOW ANY POWER INTERRUPTION** until the flash is erased, written and verified. The unit will reboot and format the image space. When done the unit will reboot to the main login prompt. The new version will be displayed.



Check the firmware version.

Version explanation:

a.aaa-b.bbb-c.ccc-d.ddd where;

a.aaa is the H/W (hardware) version, in this example version 1.100

b.bbb is the F/W (firmware) version of the CPU, in this example version 1.001

c.ccc would indicate the CPLD version, which is not applicable to the FMUX.

d.ddd is the FPGA version, in this example version 0.030

## Chapter 3. Operation

### 3.4.12 Password Configuration Menu

The Fiber Multiplexer has a factory default password, 'admin' for both the admin user and the guest user. In order to modify the password, choose the password configuration menu item from the main menu. First, key in the old password "admin", then key in the new password twice. If the password is not entered the same twice, it will be rejected. The password should only consist of alpha-numeric characters, i.e., a~z, 0~9. The password is case sensitive and its length is limited to 16 characters.

```
[Local ]    Ver:[1.100-1.002-0.000-0.030]
           Alias : FMUX                Login:admin

           << Password Setup >>

           < 1 > Password Setup : admin
           < 2 > Password Setup : guest

           [ ESC ] Go to previous menu. Please select an item.
```

### 3.5 Remote Management

*Fiber Multiplexer* supports in-band management using an embedded operations channel (EOC) within the fiber transmitted data. Full remote control and management is therefore supported as long as a good fiber link between the multiplexers is established.

```
[Local ]    Ver:[1.100-1.002-0.000-0.030]
           Alias : FMUX                Login:admin

           < 1 > Optical Configuration
           < 2 > LAN Configuration
           < 3 > Port 1 ( E1/T1 4 Channel RJ45 )
           < 4 > Port 2 ( E1/T1 4 Channel RJ45 )
           < 5 > Port 3 ( E1/T1 4 Channel RJ45 )
           < 6 > Port 4 ( E1/T1 4 Channel RJ45 )

           < A > Alarm Configuration
           < D > Device Configuration
           < M > SNMP Manager Configuration
           < L > Log Information
           < S > Store Parameters
           < U > Firmware Upgrade
           < P > Password Setup
           < G > Go to Remote

           [ ESC ] Logout
```

#### <G> Go to Remote

```
[Remote]   Ver:[1.100-1.002-0.000-0.030]
           Alias : FMUX                Login:admin
```

All configuration setting procedures are exactly the same as they were performed on the local multiplexer. Duplicate the settings on both multiplexers. Do not forget to save the settings under the "Device" menu.

This completes the console based setting part of configuration for the fiber multiplexers. With the standard SNMP option, both SNMP and an easy to use Web based manager are available to the engineer for local and remote configuration and monitoring. The use of the Web based management are covered in the next chapter.

## Chapter 4. Web Based Management

---

### Chapter 4. Web Based Operation

#### 4.1 General

In this chapter we shall explain the Web management features of the *Fiber Multiplexer*. The *Fiber Multiplexer* pair work as one system. In the working pair, one agent manages both units, seeing them as a local unit and a fiber linked remote unit. All management is performed from a single point.

#### 4.2 TCP/IP Configuration

The SNMP option has a default IP address of 192.168.1.1. The SNMP's IP address can be checked and changed via the console port. Log into the console and follow the menu <D> Device => <7> IP Configuration.

```
[Local ] Ver: [1.100-1.002-0.000-0.030]
Alias : FMUX Login:admin

<< Device -> IP Configuration >>

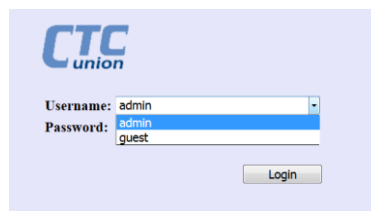
      MAC Address : 00:02:AB:0E:BF:90
< 1 > IP          : 192.168.  1.  1
< 2 > Netmask     : 255.255.255.  0
< 3 > Gateway     : 192.168.  1.254

[ ESC ] Go to previous menu. Please select an item.
```

Configure the management PC or laptop to access the Multiplexer's IP address.

#### 4.3 Browser Login

Start by opening a web browser application such as Chrome, Firefox or Internet Explorer. Enter the address of the *Fiber Multiplexer* in the format `http://xxx.xxx.xxx.xxx` where `xxx.xxx.xxx.xxx` is the IP address of the *Fiber Multiplexer*. A login username and password may or may not be required to enter the configuration. The default username and password are both 'admin'. In the example, we have connected to the Fiber Multiplexer with web browser.



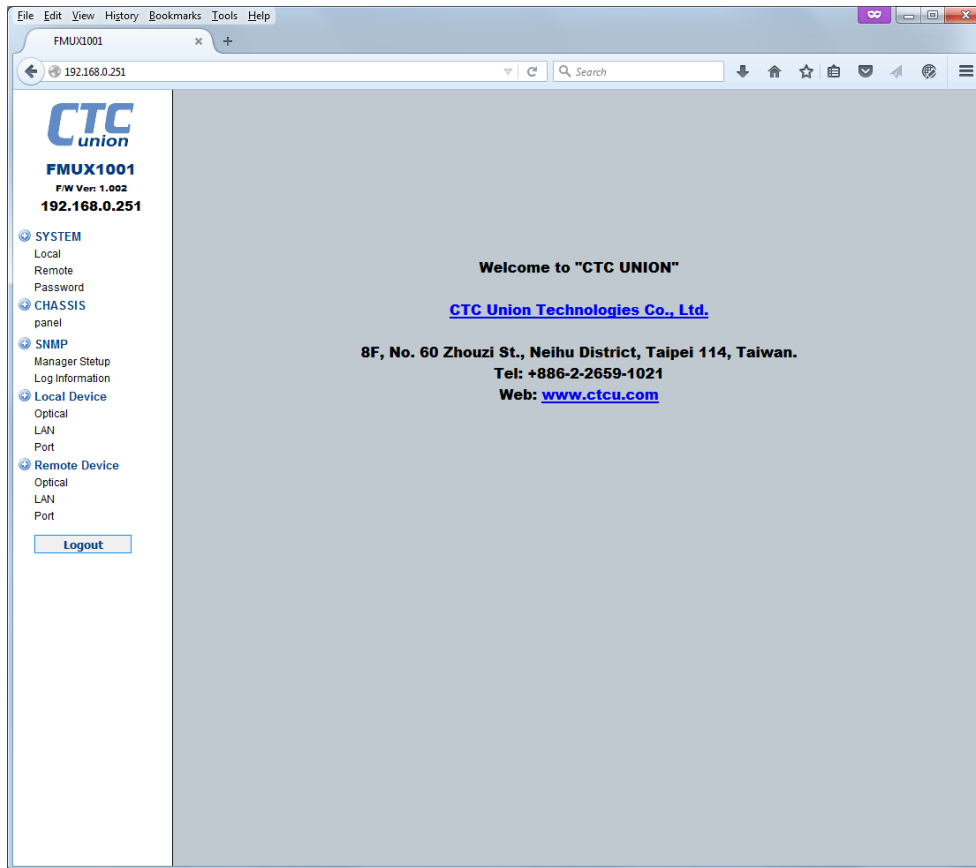
SNMP Default IP : 192.168.1.1  
Default netmask : 255.255.255.0  
Default Gateway : 192.168.1.254  
Default username : admin or guest  
Default password : admin

## Chapter 4. Web Based Management

---

### 4.3.1 Panel Display

The initial display, after successful login.



**System** : For local or remote, configure the IP address, subnet mask, default gateway and system name. Configure the date and time. View and configure alarms. Change the login password.

**Chassis** : Provides a quick informational display for both local and remote units.

**SNMP** : Setup the SNMP managers and trap receivers. View the system log.

**Local Device** : View and configure the optical aggregate, the Ethernet switch, and the tributary modules.

**Remote Device**: Do the same remote settings if a working fiber link is established between the two multiplexers.



## Chapter 4. Web Based Management

### 4.3.2 System - Local Display

The screenshot displays the web management interface for a CTC union FMUX1001 device. The left sidebar contains a navigation menu with the following items: SYSTEM (highlighted with a red box), Remote, Password, CHASSIS (panel), SNMP (Manager Setup, Log Information), Local Device (Optical, LAN, Port), and Remote Device (Optical, LAN, Port). A Logout button is located at the bottom of the sidebar.

The main content area is divided into several sections:

- System Information Table:**

Side	Version	Serial Number	MAC Address
Local	1.100-1.002-0.000-0.030		00:02:AB:0E:BF:90
- System Information:** Fields for Target IP (192.168.0.251), Netmask (255.255.255.0), Gateway IP (192.168.0.10), Target Name (FMUX), and Device Active (Enable). A warning message states: "WARNING! Device disabled, the network will be disconnected!".
- Function Key:** Buttons for Set Parameters, Refresh, Device Reboot, Manager Default, and System Default.
- Date and Time Information:** Current Time (2015-11-12 17:24:09 Thu), Uptime (0days 00:00:16), and Date And Time (Year: 2015, Mon: 01, Day: 01, Hour: 00, Min: 00, Sec: 00).
- Function Key:** Buttons for Get PC Time, Set Current Time, Sync. with PC, Refresh, and Clear Uptime.
- Alarm Information:** A table showing Alarm (Normal), Buzzer (Normal), and RDI (Normal). Below this are sections for Major Visible, Major Audible, Minor Visible, and Minor Audible, all set to Normal. There are also dropdown menus for Alarm Buzzer, Major Visible, Minor Visible, Major Audible, and Minor Audible, all set to Enable.
- Triggers:** A table with Major and Minor columns. Major triggers include Optical (Sync.), Optical 1 (link loss), Optical 2 (link loss), LAN (link loss), Channel (link loss), and Power loss. Minor triggers include Optical bit error, Channel (performance), and RDI. All checkboxes are currently unchecked.
- Function Key:** Buttons for Set Parameters and Refresh.

**Side** : Local or Remote; **Version** : show hardware - firmware - FPGA versions; **Serial Number**; **MAC**

**System Information** : Setup networking parameters, hostname and enable/disable whole device.

**Function Keys** : These buttons provide functions for setting parameters, rebooting, defaulting, and refreshing.

**Date and Time Information and Function Keys** : Use this section and buttons to setup the time keeping for the **Fiber Multiplexer**. The time may be manually set or can synchronize to PC.

**Alarm Information** : Shows the current alarm status. Allows for enabling or disabling alarms and sets which faults will cause an alarm action.

**Function Key** : These buttons allow the settings to be saved (Set Parameters) or for the screen to be refreshed.

# Chapter 4. Web Based Management

## 4.3.3 System - Remote Display

**CTC union**  
**FMUX1001**  
FW Ver: 1.002  
**192.168.0.251**

SYSTEM  
Local  
**Remote**  
Password  
CHASSIS  
panel  
SNMP  
Manager Setup  
Log Information  
Local Device  
Optical  
LAN  
Port  
Remote Device  
Optical  
LAN  
Port  
Logout

Side	Version	Serial Number	MAC Address
Remote	1.100-1.002-0.000-0.030		00:02:AB:0E:BF:8F

**System Information**

Target IP: 192.168.0.250 Netmask: 255.255.255.0  
Gateway IP: 192.168.0.10 Target Name: FMUX  
Device Active: Enable

**Function Key**

Set Parameters Refresh Device Reboot Manager Default  
System Default

**Date and Time Information**

Uptime: 0days 02:22:09

**Function Key**

Clear Uptime Refresh

**Alarm Information**

Alarm	Buzzer	RDI
Normal	Normal	Normal

Major Visible	Major Audible	Minor Visible	Minor Audible
Normal	Normal	Normal	Normal

Alarm Buzzer: Enable  
Major Visible: Enable Major Audible: Enable  
Minor Visible: Enable Minor Audible: Enable

**Triggers:**

Major	Minor
<input checked="" type="checkbox"/> Optical (Sync.)	<input type="checkbox"/> Optical bit error
<input checked="" type="checkbox"/> Optical 1 (link loss)	<input type="checkbox"/> Channel (performance)
<input type="checkbox"/> Optical 2 (link loss)	<input checked="" type="checkbox"/> RDI
<input type="checkbox"/> LAN (link loss)	
<input type="checkbox"/> Channel (link loss)	
<input type="checkbox"/> Power loss	

**Function Key**

Set Parameters Refresh

Basically, all the same settings are available here for the remote **Fiber Multiplexer** except setting the clock.

**Side** : Local or Remote; **Version** : show hardware - firmware - FPGA versions; **Serial Number**; **MAC**

**System Information** : Setup networking parameters, hostname and enable/disable whole device.

**Function Keys** : These buttons provide functions for setting parameters, rebooting, defaulting, and refreshing.

**Alarm Information** : Shows the current alarm status. Allows for enabling or disabling alarms and sets which faults will cause an alarm action.

**Function Key** : These buttons allow the settings to be saved (Set Parameters) or for the screen to be refreshed.

## Chapter 4. Web Based Management

---

### 4.3.4 System - Password Setting

The screenshot shows the CTC union web management interface. On the left is a navigation menu with the following items: SYSTEM (expanded), Local, Remote, Password (highlighted with a red box), CHASSIS (expanded), panel, SNMP (expanded), Manager Setup, Log Information, Local Device (expanded), Optical, LAN, Port, Remote Device (expanded), Optical, LAN, Port. At the bottom of the menu is a 'Logout' button. The main content area is titled 'System Password' and contains a 'Username' dropdown menu with 'admin' selected, and 'Old Password', 'New Password', and 'Confirm Password' text input fields. Below this is a 'Function Key' section with a 'Save' button.

Use the pull-down to select between the 'admin' or 'guest' user. To change the password, first key in the old password then key in the new password twice. If the old password is keyed wrong or if the two new passwords don't match, the action will be aborted. The password must contain only alpha-numeric (a~z, A~Z, 0~9) with a maximum length of 16 characters.

# Chapter 4. Web Based Management

## 4.3.5 Chassis - Panel Display

This panel is entirely informational, giving a complete overview of all conditions and settings of the local and remote **Fiber Multiplexers**.

The screenshot displays the web management interface for CTC union FMUX1001. The left sidebar contains navigation options: SYSTEM, CHASSIS (with 'panel' selected), SNMP, Local Device, and Remote Device. A 'Logout' button is at the bottom of the sidebar.

**Local Information**

Side	Version	Serial Number	MAC Address
Local	1.100-1.002-0.000-0.030		00:02:AB:0E:BF:90

Power 1	Power 2	Alarm	Buzzer	RDI
Up	Down	Normal	Normal	Normal

Major Visible	Major Audible	Minor Visible	Minor Audible
Normal	Normal	Normal	Normal

**Optical**

Item	Type	Exist	Link	DDM	Fault
OP 1	SFP	Yes	Up	No	No
OP 2	SFP	No	Down	No	Yes

**LAN**

LAN 1	LAN 2	LAN 3	LAN 4
Up	Down	Down	Down

**Port**

Item	Card Type	CH A	CH B	CH C	CH D
Port 1	E1/T1 4 Channel RJ45	No	Yes	Yes	Yes
Port 2	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes
Port 3	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes
Port 4	E1/T1 4 Channel RJ45	Yes	Yes	Yes	No

**Remote Information**

Side	Version	Serial Number	MAC Address
Remote	1.100-1.002-0.000-0.030		00:02:AB:0E:BF:8F

Power 1	Power 2	Alarm	Buzzer	RDI
Up	Down	Normal	Normal	Normal

Major Visible	Major Audible	Minor Visible	Minor Audible
Normal	Normal	Normal	Normal

**Optical**

Item	Type	Exist	Link	DDM	Fault
OP 1	SFP	Yes	Up	No	No
OP 1	SFP	No	Down	No	Yes

**LAN**

LAN 1	LAN 2	LAN 3	LAN 4
Down	Down	Down	Down

**Port**

Item	Card Type	CH A	CH B	CH C	CH D
Port 1	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes
Port 2	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes
Port 3	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes
Port 4	E1/T1 4 Channel RJ45	Yes	Yes	Yes	Yes

**Local Information** : Display the version, serial number, MAC, power and alarm statuses.

**Optical** : An overview of optical ports, SFP installed (exist), is SFP DDM type, the link status of optical and any reported SFP fault.

**LAN** : The link state is displayed for each of the four LAN ports.

**Port (Slot)** : Displays the card type in each slot (Port) and whether the channels are enabled (yes) or disabled (no)

## Chapter 4. Web Based Management

### 4.3.6 SNMP - Manager Setup

The SNMP manager setup provides the configuration for up to 4 manager IP addresses and 4 trap receivers. Community strings act as passwords and are case sensitive.

**CTC union**  
**FMUX1001**  
FW Ver: 1.002  
192.168.0.251

SYSTEM  
Local  
Remote  
Password

CHASSIS  
panel

SNMP  
**Manager Setup**  
Log Information

Local Device  
Optical  
LAN  
Port

Remote Device  
Optical  
LAN  
Port

Logout

192.168.0.251/manager.asp

**Manager Information**

	Manager IP	Community String	Access
1	192.168.0.49	public	<input type="radio"/> read-only <input checked="" type="radio"/> read-write
2			<input checked="" type="radio"/> read-only <input type="radio"/> read-write
3			<input checked="" type="radio"/> read-only <input type="radio"/> read-write
4			<input checked="" type="radio"/> read-only <input type="radio"/> read-write

**Trap Information**

	Trap Receiver IP	Community String
1	192.168.0.49	public
2		
3		
4		

**Function Key**

Set Parameters Refresh

Click the [Set Parameters] button after making any changes.

### 4.3.7 SNMP - Log Information

This informational page is an internal system log that can hold up to 100 log entries. The [Clear All] button will clear all log entries. The time the log is cleared will be recorded. If power fails to the **Fiber Multiplexer**, all log information is lost.

**CTC union**  
**FMUX1001**  
FW Ver: 1.002  
192.168.0.251

SYSTEM  
Local  
Remote  
Password

CHASSIS  
panel

SNMP  
Manager Setup  
**Log Information**

Local Device  
Optical  
LAN  
Port

Remote Device  
Optical  
LAN  
Port

Logout

**Function Key**

Refresh Clear All

**Log Information**

Last Clear Log Time: --/-- --:--

Item	Log No.	Time	Type	Message
001	36	2015-11-12 18:00:55	020100 Anonymous(admin) Login Web !	
002	35	2015-11-12 17:55:30	040100 Anonymous(admin) Login Timeout Web !	
003	34	2015-11-12 17:52:42	090100 LAN, Local: Port 1 Link Up	
004	33	2015-11-12 17:52:40	0A0100 LAN, Local: Port 1 Link Down	
005	32	2015-11-12 17:52:23	090100 LAN, Local: Port 1 Link Up	
006	31	2015-11-12 17:52:21	0A0100 LAN, Local: Port 1 Link Down	
007	30	2015-11-12 17:52:16	090100 LAN, Local: Port 1 Link Up	
008	29	2015-11-12 17:52:13	0A0100 LAN, Local: Port 1 Link Down	
009	28	2015-11-12 17:50:09	020100 Anonymous(admin) Login Web !	
010	27	2015-11-12 17:47:13	040100 Anonymous(admin) Login Timeout Web !	
011	26	2015-11-12 17:38:14	020100 Anonymous(admin) Login Web !	
012	25	2015-11-12 17:29:24	040100 Anonymous(admin) Login Timeout Web !	
013	24	2015-11-12 17:22:07	020100 Anonymous(admin) Login Web !	
014	23	2015-11-12 17:22:07	090203 Port01, Local: Channel D Link Up	
015	22	2015-11-12 17:22:07	090202 Port01, Local: Channel C Link Up	
016	21	2015-11-12 17:22:07	090201 Port01, Local: Channel B Link Up	
017	20	2015-11-12 17:22:07	090502 Port04, Local: Channel C Link Up	
018	19	2015-11-12 17:22:07	090501 Port04, Local: Channel B Link Up	
019	18	2015-11-12 17:22:07	090500 Port04 Local: Channel A Link Up	

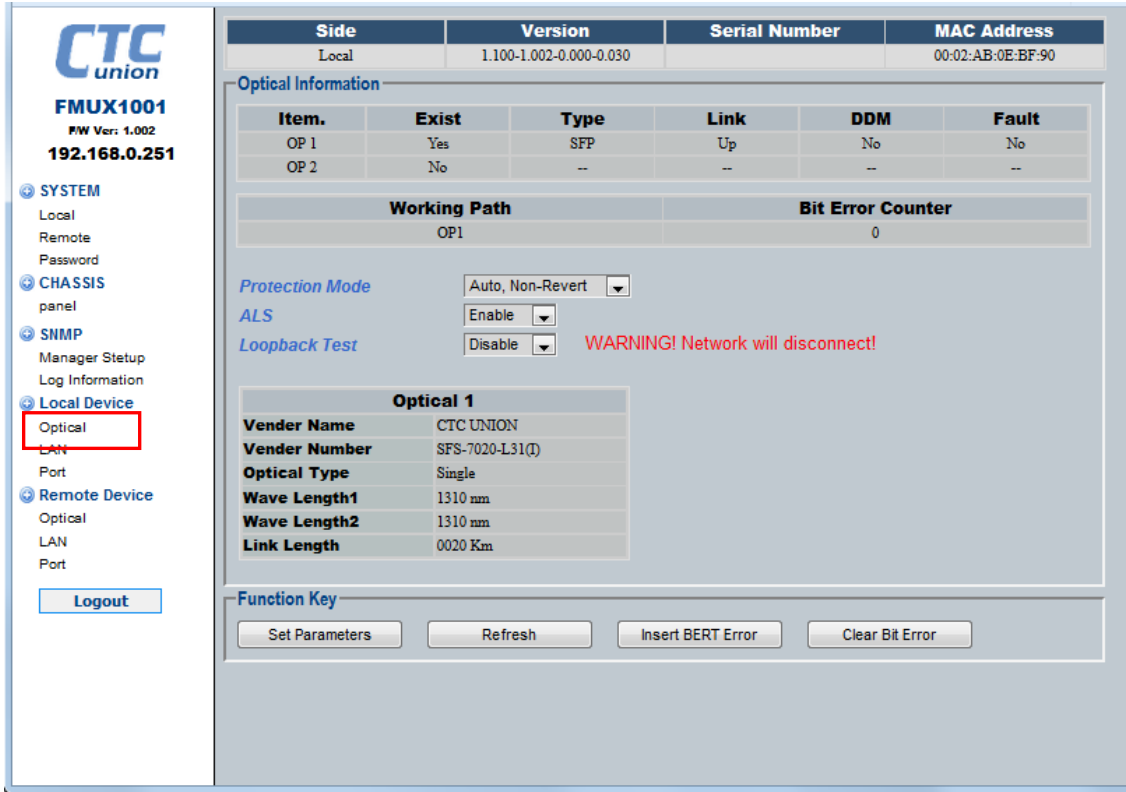
# Chapter 4. Web Based Management

## 4.4 Configuration

The menus here provide configuration for the aggregate (Optical), the LAN (Ethernet ports) and the module slot (Port) configuration. If a fiber link is established between the two multiplexers, the in-band management will allow configuration of the remote.

### 4.4.1 Local - Optical

The local optical is the aggregate for the local multiplexer. The SFP status and link are shown, the working path is displayed along with a constantly running bit error counter.



### Protection Modes

The **Fiber Multiplexer** has two aggregate optical ports that can provide redundant transmission in the event one single path becomes unstable or un-useable.

<0> Auto, Non-Revert : The default setting. When working path transitions to other optical link, it will remain there even if the downed link is restored (will not revert).

<1> Auto, Revert : When this mode is set, the path will switch back when the downed link is restored.

<2> Manual OP1 <3> Manual OP2 : These modes can force the working path to either OP1 or OP2.

### Auto Laser Shutdown

This standard safety feature is enabled by default. In the event the optical port suffers a loss of receive signal, the transmit laser will be turned off. Although most lasers in SFP are class 1 (harmless to skin or eyes), this feature is still available.

## Chapter 4. Web Based Management

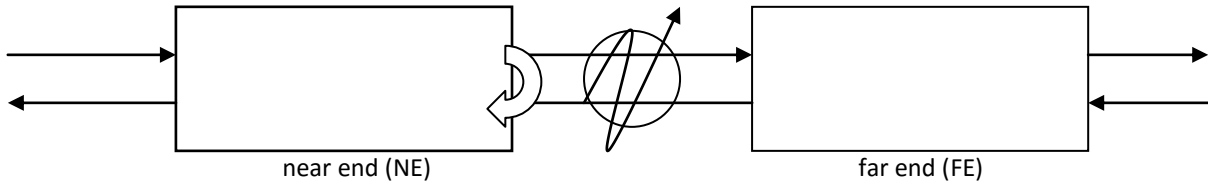
---

### Loopback

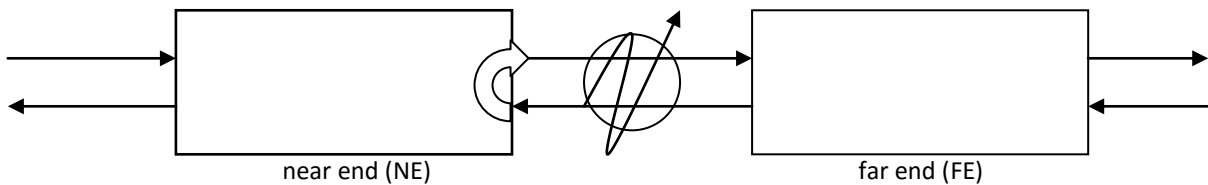
**CAUTION:** Performing optical loopback on an in-service system will cause a service disruption on ALL the E1 (T1) channels as well as create a possible broadcast storm condition on the four Ethernet LAN ports.

The graphics below indicate the location where the three loop back types are placed.

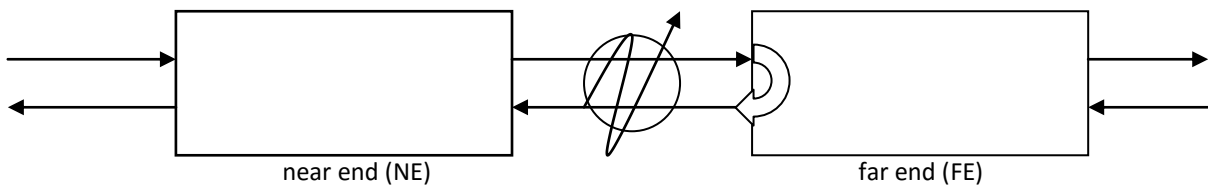
\* LLB (Optical local loop back)



\* RLB (Optical Remote loop back)



\* RRLB (Request optical remote loop back)



### Integral BERT

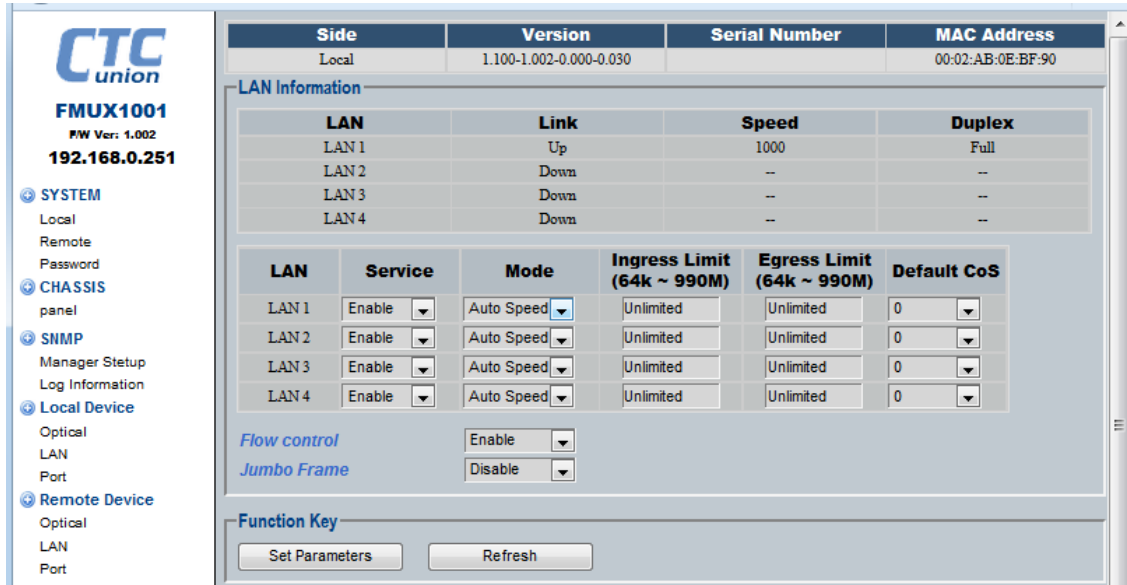
Within the optical transmission is a pattern generator that feeds a bit error rate channel which is constantly running and counting if there are any errors on the channel's receiver. There are two menu items related to this error checking: Insert one bit error, will insert a single forced error from the pattern generator to increment the counter by one and a clear bit error counter to reset the count to zero.

### SFP and Digital Diagnostics monitoring

The *Fiber Multiplexer* supports reading SFP and DDM information.

# Chapter 4. Web Based Management

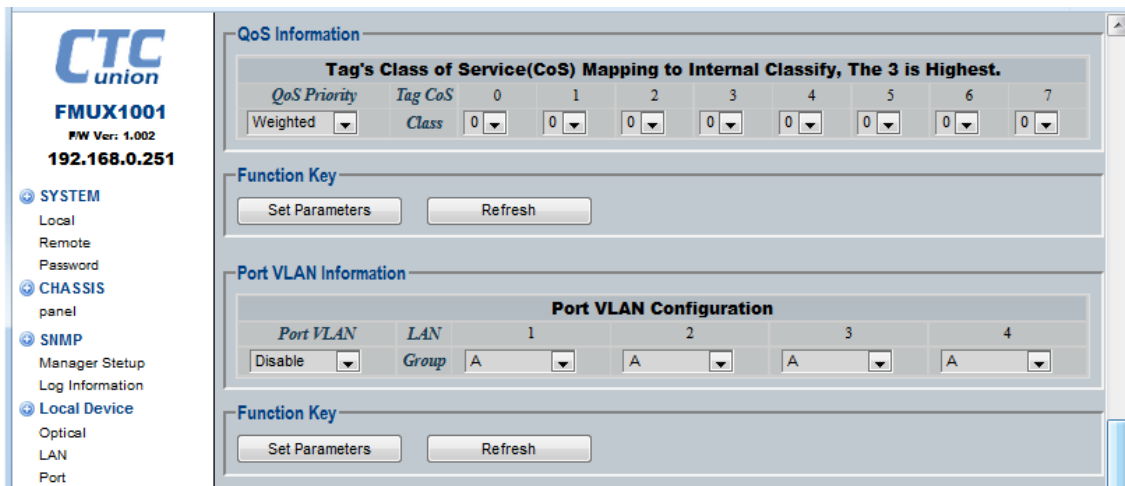
## 4.4.2 Local - LAN



The built-in switch for the **Fiber Multiplexer** has four tributary LAN ports which are aggregated to a single bit stream in the optical aggregate. For the Gigabit **Fiber Multiplexer**, the bit stream supports around 850mbps speed. For the Fast Ethernet **Fiber Multiplexer**, the bit stream supports full wire-speed 100M speed.

Each LAN port has service enable/disable setting, a mode setting to use either auto-negotiation or to select force mode speed/duplex. Bi-directional bandwidth control is supported on each LAN port as well as a Class of Service designation for each port to prioritize traffic.

Overall, the switch supports enabling or disable IEEE802.3x flow control and jumbo frame (10240 bytes) support. Use the [Set Parameters] button to save changes and the [Refresh] button to reload the page information.



Tag based QoS uses a three bit priority tag as defined in IEEE802.1p. The three bit priority results in 8 priority levels from 0 (lowest) to 7 (highest). Internally, the switch only supports two bits priority or 0 (lowest) to 3 (highest). The mapping function is used to "map" the 8 802.1p priorities to the internal switches 4 priority levels. The switch also supports either 'weighted' or 'strict' priority.

Port Based VLAN is an internal hardware based VLAN which does not use tagging. Port based VLAN is also incompatible with tagged based VLAN, so the user can only configure one or the other. There are 4 internal VLAN groups to which the LAN ports may be assigned to isolate traffic between the LAN ports.

Use the [Set Parameters] button to save changes and the [Refresh] button to reload the page information.



**802.1Q VLAN Information**

**802.1Q VLAN Configuration**

802.1Q VLAN:  Management VID:  Tag Type (Hex):

**Port Configuration**

LAN	VID	QinQ Support
LAN 1	<input type="text" value="1"/>	<input type="text" value="Disable"/>
LAN 2	<input type="text" value="1"/>	<input type="text" value="Disable"/>
LAN 3	<input type="text" value="1"/>	<input type="text" value="Disable"/>
LAN 4	<input type="text" value="1"/>	<input type="text" value="Disable"/>

**VLAN Table**

Item	VID	LAN 1	LAN 2	LAN 3	LAN 4
<input type="text" value="01"/>	<input type="text" value="1"/>	<input type="text" value="Unmodified"/>	<input type="text" value="Unmodified"/>	<input type="text" value="Unmodified"/>	<input type="text" value="Unmodified"/>
02	1	Unmodified	Unmodified	Unmodified	Unmodified
03	1	Unmodified	Unmodified	Unmodified	Unmodified
04	1	Unmodified	Unmodified	Unmodified	Unmodified
05	1	Unmodified	Unmodified	Unmodified	Unmodified
06	1	Unmodified	Unmodified	Unmodified	Unmodified
07	1	Unmodified	Unmodified	Unmodified	Unmodified
08	1	Unmodified	Unmodified	Unmodified	Unmodified
09	1	Unmodified	Unmodified	Unmodified	Unmodified
10	1	Unmodified	Unmodified	Unmodified	Unmodified
11	1	Unmodified	Unmodified	Unmodified	Unmodified
12	1	Unmodified	Unmodified	Unmodified	Unmodified
13	1	Unmodified	Unmodified	Unmodified	Unmodified
14	1	Unmodified	Unmodified	Unmodified	Unmodified
15	1	Unmodified	Unmodified	Unmodified	Unmodified
16	1	Unmodified	Unmodified	Unmodified	Unmodified

**Function Key**

**802.1Q VLAN** : Enable or Disable the IEEE802.1Q tagged VLAN function for this switch. Until explicitly enabled, no VLAN actions are taken.

**Management VID** : Assign a VID for management. The management VID is used to send only those tagged packets to the CPU for management. Packets leaving the CPU will be tagged with this same VID.

**Tag Type (hex)** : The tag type for QinQ packets is entered here. The default is 0x8100. IEEE802.1ad recommends the service provider's tag type be 0x88A8.

**Port Configuration** : Configure the VID for ports 1-4. This function defines the tag VID which will be added to all ingress packets on each of the ports. The switch supports up to 16 VLAN groups out of a possible 4095. Configure QinQ for ports 1-4. When enabled, this function defines the outer tag added to all packets that egress the port.

**VLAN Table** : This is the static VLAN table. There are up to 16 VLAN groups that can be defined. The behavior for each of the four LAN ports for egress packets may be defined as Unmodified, Untagged, Tagged or non-member.

Unmodified: Although being aware, the egress packet's VLAN tag will not be modified

Untagged: The packets egressing this port will have VLAN tag removed.

Tagged: The packets egressing this port will be tagged

Non-member: Packets with this VID will not be allowed to egress this port.

Use the [Set Parameters] button to save changes and the [Refresh] button to reload the page information.

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### 4.4.3 Local - Port (Slot)

This menu item allows the configuration for each of the modules installed in the 4 tributary slots. The E1/T1 tributary module is shown here. Other modules, as they are added, will be described in the user manual's appendix.

The screenshot displays the CTC Union FMUX1001 web management interface. On the left is a navigation menu with categories: SYSTEM (Local, Remote, Password), CHASSIS (panel), SNMP (Manager Setup, Log Information), Local Device (Optical, LAN, Port), and Remote Device (Optical, LAN, Port). A 'Logout' button is at the bottom of the menu. The main content area shows a table with columns: Side (Remote), Version (1.100-1.002-0.000-0.030), Serial Number, and MAC Address (00:02:AB:0E:BF:8F). Below this are tabs for Port 1, Port 2, Port 3, and Port 4. The 'Card Type' is 'E1/T1 4 Channel RJ45'. The 'E1/T1 Mode' is set to 'E1 120 ohm'. Two tables show channel status and configuration. The first table shows Link, AIS, Tx Fault, and Performance for channels CH A, B, C, and D. The second table shows Service, Line Code, Auto AIS, Loopback, and Clear PM for the same channels. 'Set Parameters' and 'Refresh' buttons are at the bottom.

Side	Version	Serial Number	MAC Address
Remote	1.100-1.002-0.000-0.030		00:02:AB:0E:BF:8F

Port 1 | Port 2 | Port 3 | Port 4

**Card Type**  
E1/T1 4 Channel RJ45

E1/T1 Mode: E1 120 ohm

Channel	Link	AIS	Tx Fault	Performance
CH A	Yes	Failure	Normal	0
CH B	Yes	Failure	Normal	0
CH C	Yes	Failure	Normal	0
CH D	Yes	Failure	Normal	0

Channel	Service	Line Code	Auto AIS	Loopback	Clear PM
CH A	Enable	HDB3/B8ZS	Enable	Disable	<input type="checkbox"/>
CH B	Enable	HDB3/B8ZS	Enable	Disable	<input type="checkbox"/>
CH C	Enable	HDB3/B8ZS	Enable	Disable	<input type="checkbox"/>
CH D	Enable	HDB3/B8ZS	Enable	Disable	<input type="checkbox"/>

Set Parameters Refresh

**Card Type** : Shown here is the E1/T1 4 channel card with RJ45 (for balanced transmissions). Other card types include the E1 4 channel card with BNC (for unbalanced), the 4-channel Asynchronous RS-232 card, the 4-channel Hi-Speed Synchronous card, and the 4-channel FXO and FXS cards.

**E1/T1 Mode** : Use this to select either E1 or T1 mode. Note that all channels in the card are assigned this mode.

**Status** : The channel statuses for Link, AIS, TxFault and performance are shown for each of the 4 channels.

**Configuration** : For each channel the service may be enabled or disabled, the line code selected between HDB3/B8ZS or AMI, the AIS enabled or disabled and loopback type selected. Performance monitoring count can be cleared individually for each channel.

#### Performance Monitor Note

The only performance monitor parameter available in the *Fiber Multiplexer* is ES or errored seconds. When a receive signal is lost (LOS) the ES counter will increment. The counters are separate for each channel and can be individually cleared by using the "Clear PM" check boxes followed by clicking "Set Parameters". The "Clear All PM Counter" button will clear all the channel counters.

Use the [Set Parameters] button to save changes and the [Refresh] button to reload the page information.

# Chapter 4. Web Based Management

## 4.5 Remote Management

When an active fiber link is established, the remote **Fiber Multiplexer** can be provisioned via the same simple web interface.

The screenshot displays the CTC union FMUX1001 web management interface. The left sidebar contains a navigation menu with the following items: SYSTEM (Local, Remote, Password), CHASSIS (panel), SNMP (Manager Setup, Log Information), Local Device (Optical, LAN, Port), and Remote Device (Optical, LAN, Port). The 'Remote' and 'Remote Device' items are highlighted with red boxes. A 'Logout' button is located at the bottom of the sidebar.

The main content area is divided into several sections:

- Table:** A table with columns: Side (Remote), Version (1.100-1.002-0.000-0.030), Serial Number, and MAC Address (00:02:AB:0E:BF:8F).
- System Information:** Fields for Target IP (192.168.0.250), Netmask (255.255.255.0), Gateway IP (192.168.0.10), Target Name (FMUX), and Device Active (Enable).
- Function Key:** Buttons for Set Parameters, Refresh, Device Reboot, Manager Default, and System Default.
- Date and Time Information:** Uptime: 0days 01:31:55.
- Function Key:** Buttons for Clear Uptime and Refresh.
- Alarm Information:** A table with columns: Alarm (Normal), Buzzer (Normal), RDI (Normal), Major Visible (Normal), Major Audible (Normal), Minor Visible (Normal), and Minor Audible (Normal). Below this are fields for Alarm Buzzer, Major Visible, Minor Visible, Major Audible, and Minor Audible, each with an 'Enable' dropdown.
- Triggers:** A table with columns: Major and Minor. Major triggers include Optical (Sync.), Optical 1 (link loss), Optical 2 (link loss), LAN (link loss), Channel (link loss), and Power loss. Minor triggers include Optical bit error, Channel (performance), and RDI.
- Function Key:** Buttons for Set Parameters and Refresh.

Refer to the configuration steps in 4.4.1 through 4.4.3 to configure the remote **Fiber Multiplexer**.

Note: Optical loop back is not available from the remote device. Optical loop back may only be performed from local device.



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