

USER MANUAL

FMUX-01A

Fiber Optical Multiplexer

Standalone / Rack Type

4, 8, 12 or 16 Channel Modular Design

G.703 E1, T1(DS1)

Datacom V.35, X.21, RS-530, RS-449, RS-232

Ethernet 10/100Base-TX Bridge

SNMP Manageable



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Chapter 1. Introduction

1.1 General

Thank you for choosing the **Platform 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 19/23" rack mountable E1/T1/Data/LAN Bridge multiplexer over fiber link, built upon a highly 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, where multiple high speed synchronous data communications are required or to link a mix of platforms over a single fiber pair. By utilizing a modular design, a large variety of configurations may be realized and the unit may be easily custom tailored for each specific application when ordered. The 4-CHANNEL E1, T1, V.35 (X.21/RS-530/RS-449) data, Ethernet Bridge Port cards and optical interface cards are all optional. The standard unit is a chassis with local control and ordered with single or dual power. The appropriate hot swappable optical interface cards may be selected to support multi-mode or single-mode fiber cable operation, with a variety of transceiver power and connector options including ST™, SC, FC, LC, or MT-RJ. WDM (Wave Division Multiplexing) optical interfaces are also available to provide bi-directional transmission on a single fiber to reduce cost when using leased fiber links. The range of transmission for optical connection is from 2Km (for multi-mode) up to 120Km (single mode). **External Clock Card** (external or internal clock source) and **SNMP Card** (for local and remote management purposes) may be optionally installed in the chassis.

1.2 Functional Description

The **Fiber Multiplexer** basic chassis is available in five power supply configurations. Depending on the model, power may be derived from single AC 90~250VAC, single DC +20~60VDC, dual AC 90~250VAC, dual DC +20~60VDC, or AC plus DC power sources. The **Fiber Multiplexer** provides all Line Card connections on the rear panel. There are 4 slots available for installation of **4-CHANNEL E1 or T1 Port Cards** (ITU-T G.703 E1/T1), **4-CHANNEL Data Port Cards** (RS-530, X.21, RS-449, V.35, or RS-232), or **Single-CHANNEL Ethernet Bridge LAN Port Cards** (10/100Base-TX) into the **Fiber Multiplexer** chassis. Each 4-CHANNEL Port Card provides 4 individual channels of E1, T1, or Datacom per Port Card. The **Single-CHANNEL Ethernet Bridge LAN Port Card** provides one 8.192Mb/s (4xE1 speed) WAN link for 10/100Base Ethernet LAN bridging applications.

The **4-CHANNEL E1 Port Card** has the option of using BNC (75 Ohm unbalanced) or RJ-45 (120 Ohm balanced) connectors for E1 Line interface connections and supports four separate E1 channels at a transmission rate of 2.048Mb/s (transparent unframed E1) each.

The **4-CHANNEL T1 Port Card** provides four RJ-45 (100 Ohm balanced) connectors for T1(DS1) Line interface connections and supports four separate T1 (DS1) channels at a transmission rate of 1.544Mb/s (transparent unframed T1) each.

The **4-CHANNEL Data Port Card** provides four standard nx56/nx64Kb/s, up to 2.048Mb/s for V.35 (or X.21, RS-530, RS-449, RS-232) DCE ports on MB34 (DB15, DB25, DB37, DB25) female or male connectors (required adapter cables optional) for direct connection to terminal equipment.

The **Ethernet Bridge Port Card** provides an RJ-45 connector for 10Base-T or 100Base-TX Ethernet (auto negotiation) connections. The bridging function provides LAN to LAN segment links which operate under the same network address space.

LEDs on the front panel will show both the channel statuses and any alarm indications for installed port cards (except Ethernet card which display link status on the card itself).

Chapter 1. Introduction

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

Each **4-CHANNEL Port Card** features diagnostic capabilities for performing local loop back or remote loop back (except for Ethernet Bridge card). The loop back function is controlled by the front panel LCD menu, terminal mode (RS-232 console) or when the SNMP option board is installed via Telnet or SNMP set commands.

Up to five clock source selections are provided. Without the external clock card option, the unit operates from an internal free running oscillator. When the external clock card option is installed, additional clock sources may be selected from the clock card's own internal oscillator or from an external clock references for E1 PCM, E1 TTL, T1 PCM, or T1 TTL. All E1 and T1 equipment may connect to the **Fiber Multiplexer** without regard to master or slave timing. The **Fiber Multiplexer** is completely transparent to clocking and data transmission. This makes configuration of the MUX extremely easy.

The Fiber Multiplexer provides optical interfaces (1+1) that are completely redundant and hot swappable. By utilizing a modular design, fiber type (single mode or multi mode), the optical power margin requirement and connector type can be easily chosen at installation time. This provides an extremely flexible main unit which is not tied to a fixed optical interface. When two optical modules are installed, the secondary module is in "standby", in case of any failure in the primary path. If the primary fiber path fails, the switchover time to the secondary fiber is less than 50 milliseconds (industry standard). The automatic fall over function of the fiber allows the fiber to continue to run in the secondary fiber, even after primary fiber connection is restored. This will avoid another 50 millisecond loss of transmission on all channels. The fiber path can also be forced from primary to secondary or back through the LCD menu or terminal console.

When the **Fiber Multiplexer** is ordered with an optional **SNMP Card**, the card is installed inside the chassis. Configuration is accomplished via local control on the asynchronous RS-232 port with a standard VT-100 terminal, via Ethernet and Telnet, or via any standard SNMP network management software over Ethernet. The **Fiber Multiplexer** also has a Windows™ based GUI management program that communicates with the **Fiber Multiplexer** via SNMP protocol to display all status in real time, configure the unit, provides performance monitoring, and display alarm buffers and real time trap messages. If the **SNMP Card** option is not installed, local and remote management is still possible via the unit's internal menu system accessible from the front panel LCD and menu keys, or via the asynchronous RS-232 port with a standard VT-100 terminal.

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.

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The following photo, with graphics, shows the major components which make up the **Fiber Multiplexer** (with the External Clock and SNMP options installed). This photo shows a unit with E1-BNC card in port 1, X.21 data communications card in port 2, T1-RJ45 card in port 3, and 10/100Base Ethernet bridge in port 4.

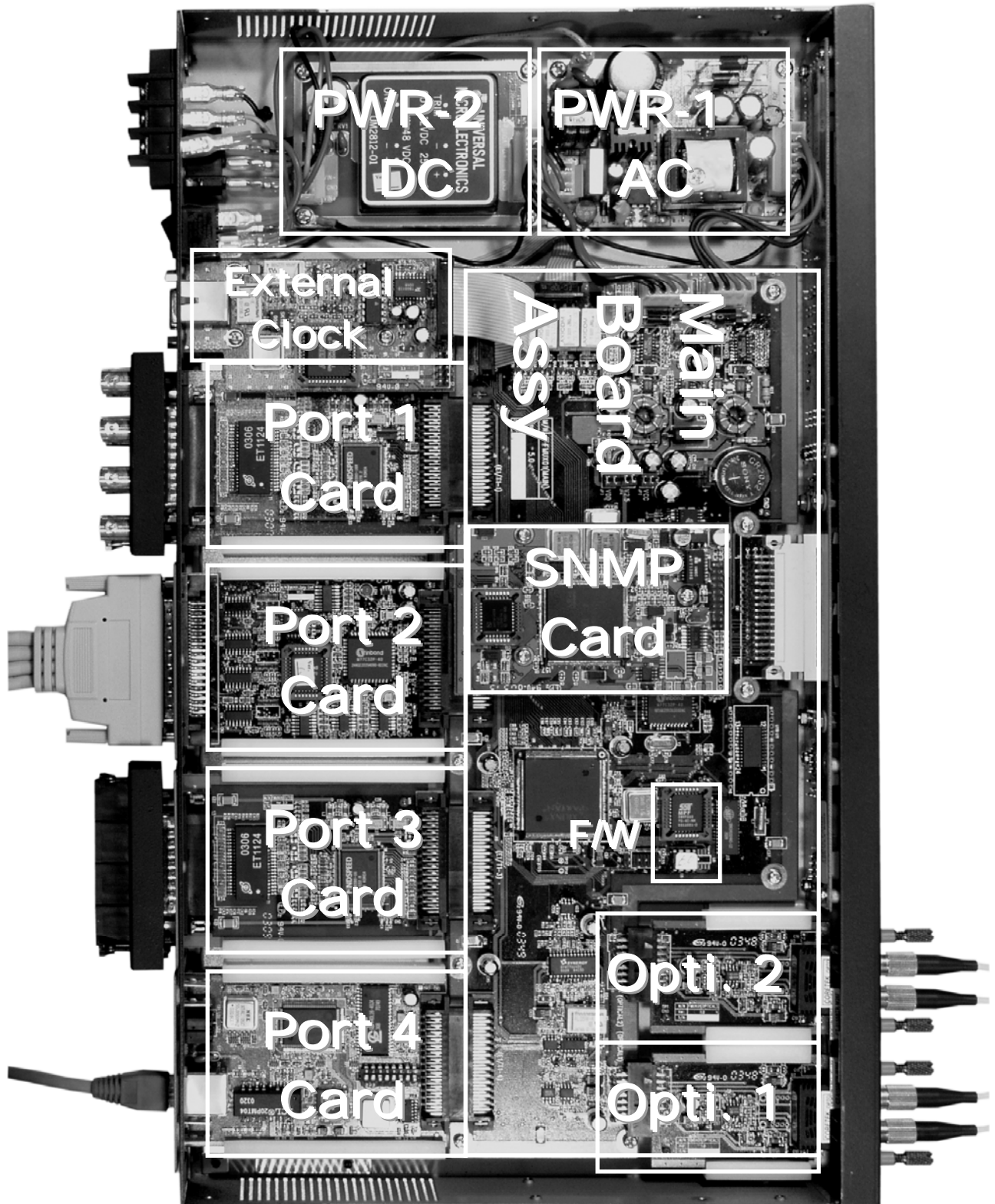


Figure 1-1 : **Fiber Multiplexer** Major Components

Chapter 1. Introduction

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 | (w/external clock card option) |
| Internal Timing | +/-30 ppm |
| Jitter Performance | According to ITU-T G.823 |
| Performance monitoring | According to ITU-T G.821 |
| Complies With | ITU-T G.703, G.704, G.706 and G.732 |
| Interface Connectors | RJ-45 (wire wrap connector also available) BNC |
| Test Loops | LLB (Local Loop Back) NELB (Near End Loop Back) RLB (Remote Loop Back) RRLB (Request Remote Loop Back) |

* Transparent to framing (ITU-T G.704); transparent to ISDN PRI (30B+1D) E1 transmissions

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 | (w/external clock card option) |
| Internal Timing | +/-30 ppm |
| Jitter Performance | According to ITU-T G.824 |
| Performance monitoring | According to ITU-T G.821 |
| Complies With | ITU-T G.703, G.704, G.706 and G.733 |
| Interface Connectors | RJ-45 (wire wrap connector also available) |
| Test Loops | LLB (Local Loop Back) NELB (Near End Loop Back) RLB (Remote Loop Back) RRLB (Request Remote Loop Back) |

Optical Interface

| | |
|------------------|--------------------------------------|
| Bit Rate | 51.84Mbps |
| Line code | Scrambled NRZ |
| Protection | 1+1 redundant, hot swappable modules |
| Switch over time | <50ms |

| | |
|--------------------------|---|
| Interface Types | V.35 X.21 RS-530/V.36 RS-449 RS-232 |
| Interface Connectors | (provided by 1 to 4 header adapter cables) |
| V.35 Interface | 34 pin, Female or Male |
| X.21 Interface | 15 pin, D-type Female or Male |
| RS-530 Interface | 25 pin, D-type Female or Male |
| RS-449 Interface | 37 pin, D-type Female or Male |
| RS-232 Interface | 25 pin, D-type Female or Male |
| Line Code | NRZ |
| Data Rate (each channel) | nx64Kb/s (64 ~ 2048Kb/s) where n equal 1 to 32 RS-232 maximum is 128Kb/s |
| Clock Modes | Transparent, recovery, External, or Internal |
| Control Signals | CTS constantly ON or follows RTS DSR constantly ON, except during test loops DCD constantly ON, except during signal loss |
| Test Loops | LLB (Local Loop Back) RLB (Remote Loop Back) V.54 |

| | |
|---------------------|---|
| Interface Type | 10Base-T, 100Base-TX (auto-negotiation) |
| Interface Connector | RJ-45 |
| WAN Data Rate | 8.192Mb/s |
| Complies with | IEEE802.3 10Base-T IEEE802.3u 100Base-TX |
| Configuration modes | bridge/repeater, full/half, 10/100, auto |
| Test Loops | NONE |

| | |
|---------------------|---|
| LCD | 2 rows of 16 characters |
| Pushbutton Switches | ESC Left Arrow (-) Right Arrow (+) Enter |

| | |
|-----------------------|--|
| Alarm Output | Four pairs of Normally Open contacts for Major and Minor alarms, both audio and visual. Contact ratings: 1A at 30 VDC resistive or 0.5A at 125 VAC resistive |
| Pin Assignment (DB9F) | 1 - 2 / Major (audio) 3 - 4 / Major (visual) 5 / frame ground 6 - 7 / Minor (audio) 8 - 9 / Minor (visual) |

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LED Indicators

| | | |
|----------------------|--------|--|
| Power 1 | Green | Power Module 1 active |
| Power 2 | Green | Power Module 2 active |
| Optical 1 | Amber | Off = off On = working (ALS is off) On = working & linked (ALS is set Auto) Blinking = working & not linked (If ALS is disabled, then the not linked condition will not be indicated by a blinking LED) |
| Optical 2 | Amber | Off = disabled On = standby (ALS is off) On = standby & linked (ALS is set Auto) Blinking = Standby & not linked (If ALS is disabled, then the not linked condition will not be indicated by a blinking LED) |
| Channels | GREEN | One LED for each channel (A-D) of each Port (1-4) or a total of 16 LED. On = In Service Off = Out of Service Blinking = Loss of Signal |
| Audible Alarm Cutoff | Amber | Audible Alarm has sounded, alarm cutoff switch has been pushed |
| Minor Alarm | Amber | Indicates a minor alarm has occurred, includes E1 or T1 BPV or fiber sync slip. |
| Major Alarm | RED | Indicates a major alarm has occurred, includes E1, T1, and fiber signal loss. |
| Far End Error | Amber | Indicates a far end (remote) error has occurred |
| Near End Error | RED | Indicates a near end (local) error has occurred |
| System Failure | RED | Indicates a failure in the "system" such as fiber LOS |
| Optical | (Dual) | GREEN = optical link established RED = optical link failure |
| E1 | (Dual) | GREEN = E1 active, no error RED = E1 Signal Loss Off = No E1 |
| T1 | (Dual) | GREEN = T1 active, no errors RED = T1 Signal Loss Off = No T1 |

RS-232 Console Port

| | | | |
|----------------------|---|-----|-----------|
| Port interface | RS-232D asynchronous, DCE | | |
| Port connector | RJ-45 | | |
| Data rate (*default) | 19200 bps | | |
| Data format | -One start bit -8 data bits -No parity -One stop bit | | |
| RJ-45 Pin Usage | RJ - 45 (DCE) | | DB9 (DTE) |
| | 4 | GND | 5 |
| | 5 | TD | 2 |
| | 6 | RD | 3 |

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Optical Specifications (secondary fiber need not be identical to primary)

| Type | Standard Types | | | | | WDM Types* | | | |
|-----------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| | M-M | S-M | S-M | S-M | S-M | S-M | S-M | S-M | S-M |
| Distance (Km) | 2 | 15 | 30 | 50 | 120 | 20(A)* | 20(B)* | 40(A)* | 40(B)* |
| Wavelength (nm) | 1310 | 1310 | 1310 | 1310 | 1550 | Tx:1310 | Tx:1550 | Tx:1310 | Tx:1550 |
| | | | | | | Rx:1550 | Rx:1310 | Rx:1550 | Rx:1310 |
| BER** | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ | <10 ⁻¹¹ |
| Sensitivity | -31dBm | -32dBm | -35dBm | -36dBm | -35dBm | -32dBm | -32dBm | -32dBm | -32dBm |
| Output Power | -20dBm | -20dBm | -15dBm | -8dBm | 0dBm | -18dBm | -15dBm | -10dBm | -7dBm |
| Power Margin | 11dB | 12dB | 20dB | 28dB | 35dB | 14dB | 17dB | 22dB | 25dB |
| Return Loss | -12dBm | -12dBm | -12dBm | -12dBm | -12dBm | -14dBm | -14dBm | -14dBm | -14dBm |
| Conn. Types | ST | v | v | v | v | | | | |
| | SC | v | v | v | v | v | v | v | v |
| | LC | v | v | v | v | | | | |
| | MT-RJ | v | v | v | v | | | | |
| | FC | v | v | v | v | | | | |

M-M: multi-mode S-M: single-mode [All optical transceivers are rated Class A.]

* WDM types must match (A) with (B) in pairs

** Bit Error Rate

All fiber transceivers in the 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 the front panel LCD, console terminal mode or SNMP (when SNMP option is installed). The fiber module ports may be independently installed with any of the above fiber features and must only match the remote side's module. Fiber modules are completely hot swappable and may be replaced in the field without taking the unit out of service.

Physical

| | |
|---------|---------------------|
| Height: | 43 mm (1.75") |
| Width: | 438 mm (17.25") |
| Depth: | 251 mm (9.875") |
| Weight: | 4.5 kg (10 lb.) Net |

Power supply

| | |
|---------------------|--------------------------|
| Voltage (AC source) | 90 ~ 250 VAC |
| Voltage (DC source) | 20 ~ 60 VDC |
| Frequency | 47 to 63 Hz for AC power |
| Power consumption | 40 VA (~ 40 watts) |

Environment

| | |
|------------------|-------------------------|
| Temperature | 0-50° C / 32-122° F |
| Humidity | 0 to 90% non-condensing |
| Heat Dissipation | <100 BTU/hr |

Miscellaneous

| | |
|---------------------|---|
| MTBF | 87,116 hours (+/- 5%) |
| 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 |

Chapter 1. Introduction

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 Port Card** supports two E1 line codes:

AMI coding.

HDB3 coding.

The **4-CHANNEL E1 Port Card** 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 Port Card** supports two T1 line codes:

AMI coding.

B8ZS coding.

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

Chapter 1. Introduction

1.6 Applications / Capabilities

In the following example, the **Fiber Multiplexer** utilizes an optical fiber connection between a pair of units to provide 4, 8, 12 or 16 channels of E1, T1, Datacom, or 1 to 4 channels of Ethernet Bridge 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. For datacom channels (V.35, X.21, etc.) full timing configuration is possible to either provide clock, receive clock or to transparently pass clock from one device to the other.

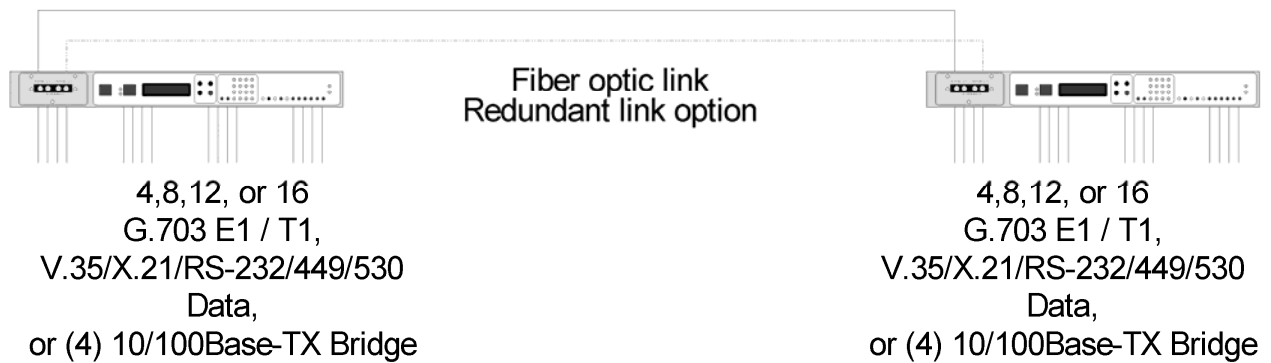


Figure 1-2 : Typical Point-to-Point Application of **Fiber Multiplexer**

Chapter 1. Introduction

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Chapter 2. Port Card Overview

2.1 Introduction

This chapter provides a more descriptive over-view of the available **4-Channel Port card** options. Detailed specifications are in Chapter 1, while removal and replacement procedures are detailed in Chapter 3. Unit configuration is all covered in Chapter 4. The cards are NOT designed to be "hot" swappable, therefore make sure the **Fiber Multiplexer** chassis is powered off before replacing a card or pulling it from the chassis. Removal and installation of **4-Channel Port Cards** with the rack chassis under power is **NOT RECOMMENDED** and will definitely effect the operation of the other **4-Channel Port Cards** (insertion and removal cannot be recognized by the **Fiber Multiplexer**).

2.2 Port Card Overview

The **4-Channel Port Cards** for the **Fiber Multiplexer** are modular PCAs which slide into the **Fiber Multiplexer** chassis, and interface with the internal "main board". The main board provides an interface connection to the **4-Channel Port Cards** for power, data connection and other logic (for local management terminal and optional SNMP).

2.3 4 x E1 I/F Module Overview

The 4 x E1 4-Channel Port Cards for the **Fiber Multiplexer** are modular PCAs which slide into the **Fiber Multiplexer** chassis and provide four completely independent ITU-T G.703 E1 interfaces. The PCA module terminates with a DB25F connector that is designed to connect to a physical adapter. The adapter is available in two options, one, with 4 pairs of BNC connectors for 75 Ohm unbalanced connections and the other with four RJ-45 jacks for 120 Ohm balanced connections.

2.4 4 x T1 I/F Module Overview

The 4 x T1 4-Channel Port Cards for the **Fiber Multiplexer** are modular PCAs which slide into the **Fiber Multiplexer** chassis and provide four completely independent T1(DS1) interfaces. The PCA module terminates with a DB25F connector that is designed to connect to a physical adapter. The adapter is available with four RJ-45 jacks for 100 Ohm balanced connections.

2.5 External Clock Overview

The **Fiber Multiplexer** is available with an external clock option that allows the unit to be synchronized with external clocks or equipment. The **Fiber Multiplexer** may receive an external clock source from E1 PCM, E1 TTL, T1 PCM or T1 TTL signal sources. Additionally, the option includes its own precision crystal based clock. The external clock is received via an RJ-45 jack from the rear panel.

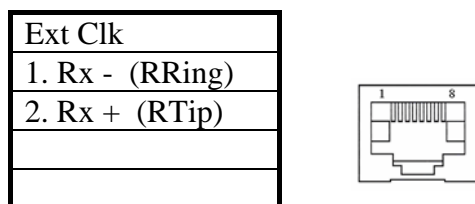


Figure 2-1. External Clock Connector

Chapter 2. Port Card Overview

2.6 4 x Data I/F Module Overview

The 4 x Data 4-Channel Port Cards for the **Fiber Multiplexer** are modular PCAs which slide into the **Fiber Multiplexer** chassis and provide four completely independent Data (V.35, X.21, RS-530, RS-449, or RS-232) interfaces. The PCA module terminates with a HD62F connector that is designed to connect to a physical adapter. The Data module is available in one of ten interface and cable options.

1. 4 x V.35 with 4 MB34 Female connectors
2. 4 x V.35 with 4 MB34 Male connectors
3. 4 x X.21 with 4 DB15 Female connectors
4. 4 x X.21 with 4 DB15 Male connectors
5. 4 x RS-530 with 4 DB25 Female connectors
6. 4 x RS-530 with 4 DB25 Male connectors
7. 4 x RS-449 with 4 DB37 Female connectors
8. 4 x RS-449 with 4 DB37 Male connectors
9. 4 x RS-232 with 4 DB25 Female connectors
10. 4 x RS-232 with 4 DB25 Male connectors

When the **Fiber Multiplexer** is ordered with an **X21 Port Card** option, a **4-CHANNEL X.21 Card** and adapter cable are supplied with each DB15 wired according to the following table.

| Signal Function | DB15 PIN# | Abbreviation | Direction | Description |
|------------------|-----------|--------------|---------------------|--|
| Shield | 1 | FG | <-> | Chassis ground. May be isolated from signal ground. |
| Ground | 8 | SG | <-> | Common signal ground. |
| Transmit(A) | 2 | TD(A) | To MUX UNIT | Serial digital data from DTE. |
| Transmit(B) | 9 | TD(B) | | |
| Receive(A) | 4 | RD(A) | Fm. MUX UNIT | Serial digital data at the output of the Fiber Multiplexer receiver. |
| Receive(B) | 11 | RD(B) | | |
| Control(A) | 3 | RTS(A) | To MUX UNIT | A ON signal to the Fiber Multiplexer when data transmission is desired. |
| Control(B) | 10 | RTS(B) | | |
| Indication(A) | 5 | DCD(A) | Fm. MUX UNIT | Constantly ON, except when a loss of the received carrier signal is detected. |
| Indication(B) | 12 | DCD(B) | | |
| Ext. Timing(A) | 7 | ETC(A) | To MUX UNIT | A transmitted data rate clock input from the data source. |
| Ext. Timing(B) | 14 | ETC(B) | | |
| Signal Timing(A) | 6 | RC(A) | Fm. MUX UNIT | A received data rate clock for use by an external data source. |
| Signal Timing(B) | 13 | RC(B) | | |

Table 2-1 : DB15 adapter cable pin out for X.21

Chapter 2. Port Card Overview

When the **Fiber Multiplexer** is ordered with an **V35 Port Card** option, a **4-CHANNEL V.35 Card** and adapter cable are supplied with each MB34 wired according to the following table.

| Signal Function | MB34 PIN# | V.35 Circuit | Direction | Description |
|-------------------------|-----------|------------------|---------------------|--|
| Frame Ground | A | Frame | <-> | Chassis ground. May be isolated from signal ground. |
| Signal Ground | B | Signal Ground | <-> | Common signal ground. |
| Transmit Data | P S | TD(A) TD(B) | To MUX UNIT | Serial digital data from DTE. |
| Receive Data | R T | RD(A) RD(B) | Fm. MUX UNIT | Serial digital data at the output of the Fiber Multiplexer receiver. |
| Request To Send | C | RTS | To MUX UNIT | A ON signal to the Fiber Multiplexer when data transmission is desired. |
| Clear To Send | D | CTS | Fm. MUX UNIT | Constantly ON. |
| Data Set Ready | E | DSR | Fm. MUX UNIT | Constantly ON, Except during test loops. |
| Data Terminal Ready | H | DTR | To MUX UNIT | DTR not used, used for a received serial data rate clock input from the DTE. |
| Data Carrier Detect | F | DCD | Fm. MUX UNIT | Constantly ON, except when a loss of the received carrier signal is detected. |
| External Transmit Clock | U W | ETC(A) ETC(B) | To MUX UNIT | A transmitted data rate clock input from the data source. |
| Transmit Clock | Y AA | TC(A) TC(B) | Fm. MUX UNIT | A transmitted data rate clock for use by an external data source. |
| Receive Clock | V X | RC(A) RC(B) | Fm. MUX UNIT | A received data rate clock for use by an external data source. |
| Remote Loopback | HH | RL | To MUX UNIT | When on, commands Fiber Multiplexer into remote loop back. |
| Local Loopback | JJ | LL | To MUX UNIT | When on, commands Fiber Multiplexer into local loop back. |
| Test Indicator | KK | TM | Fm. MUX UNIT | ON during any test mode |

Table 2-2 : MB34 cable pin out for V.35

Chapter 2. Port Card Overview

When the **Fiber Multiplexer** is ordered with an **RS449 Port Card** option, a **4-CHANNEL RS-449 Card** and adapter cable are supplied with each DB37 wired according to the following table.

| SIGNAL FUNCTION | DB37 PIN | RS-449 CIRCUIT | Direction | DESCRIPTION |
|-------------------------|----------|----------------|---------------------|--|
| Protective Ground | 1 | Frame | <-> | Chassis ground. May be isolated from signal ground. |
| Signal Ground | 19,20,37 | SG,RC,SC | <-> | Common signal ground. |
| Transmitted Data | 4 22 | SD(A) SD(B) | To MUX UNIT | Serial digital data from DTE. |
| Received Data | 6 24 | RD(A) RD(B) | Fm. MUX UNIT | Serial digital data at the output of the Fiber Multiplexer receiver. |
| Request to Sent | 7 25 | RS(A) RS(B) | To MUX UNIT | A ON signal to the Fiber Multiplexer when data transmission is desired. |
| Clear to Sent | 9 27 | CS(A) CS(B) | Fm. MUX UNIT | Constantly ON. |
| Data Set Ready | 11 29 | DM(A) DM(B) | Fm. MUX UNIT | Constantly ON, Except during test loops. |
| Data Terminal Ready | 12 30 | TR(A) TR(B) | To MUX UNIT | DTR not used, used for a received serial data rate clock input from the DTE. |
| Data Carrier Detect | 13 31 | RR(A) RR(B) | Fm. MUX UNIT | Constantly ON, except when a loss of the received carrier signal is detected. |
| External Transmit clock | 17 35 | TT(A) TT(B) | To MUX UNIT | A transmitted data rate clock input from the data source. |
| Transmit Clock | 5 23 | ST(A) ST(B) | Fm. MUX UNIT | A transmitted data rate clock for use by an external data source. |
| Receive Clock | 8 26 | RT(A) RT(B) | Fm. MUX UNIT | A received data rate clock for use by an external data source. |
| Remote Loop back | 14 | RL | To MUX UNIT | When on, commands Fiber Multiplexer into remote loop back. |
| Local Loop back | 10 | LL | To MUX UNIT | When on, commands Fiber Multiplexer into local loop back. |
| Test Indicator | 18 | TM | Fm. MUX UNIT | ON during any test mode |

Table 2-3 : DB37 adapter cable pin out for RS-449

Chapter 2. Port Card Overview

When the **Fiber Multiplexer** is ordered with an **RS530 Port Card** option, a **4-CHANNEL RS-530 Card** and adapter cable are supplied with each DB25 wired according to the following table.

| SIGNAL Function | DB25 PIN | CIRCUIT | DIRECTION | DESCRIPTION |
|-------------------------|----------|----------------|--------------------|--|
| Protective Ground | 1 | Frame | <-> | Chassis ground. May be isolated from signal ground. |
| Signal Gnd | 7 | AB | <-> | Common signal ground. |
| Transmitted Data | 2 14 | BA(A) BA(B) | To MUX UNIT | Serial digital data from DTE. |
| Received Data | 3 16 | BB(A) BB(B) | Fm MUX UNIT | Serial digital data at the output of the Fiber Multiplexer receiver. |
| Request to Sent | 4 19 | CA(A) CA(B) | To MUX UNIT | A ON signal to the Fiber Multiplexer when data transmission is desired. |
| Clear to Sent | 5 13 | CB(A) CB(B) | Fm MUX UNIT | Constantly ON. |
| Data Set Ready | 6 22 | CC(A) CC(B) | Fm MUX UNIT | Constantly ON, Except during test loops. |
| Data Terminal Ready | 20 23 | CD(A) CD(B) | To MUX UNIT | DTR not used, used for a received serial data rate clock input from the DTE. |
| Data Carrier Detect | 8 10 | CF(A) CF(B) | Fm MUX UNIT | Constantly ON, except when a loss of the received carrier signal is detected. |
| External Transmit clock | 24 11 | DA(A) DA(B) | To MUX UNIT | A transmitted data rate clock input from the data source. |
| Transmit Clock | 15 12 | DB(A) DB(B) | Fm MUX UNIT | A transmitted data rate clock for use by an external data source. |
| Receive Clock | 17 9 | DD(A) DD(B) | Fm MUX UNIT | A received data rate clock for use by an external data source. |
| Remote Loop back | 21 | RL | To MUX UNIT | When on, commands Fiber Multiplexer into remote loop back. |
| Local Loop back | 18 | LL | To MUX UNIT | When on, commands Fiber Multiplexer into local loop back. |
| Test Indicator | 25 | TM | Fm MUX UNIT | ON during any test mode |

Table 2-4 : DB25 adapter cable pin out for RS-530

Chapter 2. Port Card Overview

When the **Fiber Multiplexer** is ordered with an **RS232 Port Card** option, a **4-CHANNEL RS-232 Card** and adapter cable are supplied with each DB25 wired according to the following table.

| Signal Function | DB25 PIN | Circuit | Direction | Description |
|-------------------------|----------|---------|--------------------|--|
| Protective Ground | 1 | AA | <-> | Chassis ground. May be isolated from signal ground. |
| Signal Ground | 7 | AB | <-> | Common signal ground. |
| Transmitted Data | 2 | BA | To MUX UNIT | Serial digital data from DTE. |
| Received Data | 3 | BB | Fm MUX UNIT | Serial digital data at the output of the Fiber Multiplexer receiver. |
| Request to Sent | 4 | CA | To MUX UNIT | A ON signal to the Fiber Multiplexer when data transmission is desired. |
| Clear to Sent | 5 | CB | Fm MUX UNIT | Constantly ON. |
| Data Set Ready | 6 | CC | Fm MUX UNIT | Constantly ON, Except during test loops. |
| Data Terminal Ready | 20 | CD | To MUX UNIT | DTR not used, used for a received serial data rate clock input from the DTE. |
| Data Carrier Detect | 8 | CF | Fm MUX UNIT | Constantly ON, except when a loss of the received carrier signal is detected. |
| External Transmit Clock | 24 | DA | To MUX UNIT | A transmitted data rate clock input from the data source. |
| Transmit Clock | 15 | DB | Fm MUX UNIT | A transmitted data rate clock for use by an external data source. |
| Receive Clock | 17 | DD | Fm MUX UNIT | A received data rate clock for use by an external data source. |
| Remote Loop back | 21 | RL | To MUX UNIT | When on, commands Fiber Multiplexer into remote loop back. |
| Local Loop back | 18 | LL | To MUX UNIT | When on, commands Fiber Multiplexer into local loop back. |
| Test Indicator | 25 | TM | Fm MUX UNIT | ON during any test mode |

Table 2-5 : DB25 adapter cable pin out for RS-232

Chapter 2. Port Card Overview

2.7 Ethernet Bridge Module Option

When the **Fiber Multiplexer** is ordered with an **ET100 Port Card** option, a Single-Channel Bridge Port Card is supplied. Complete bridging functions are provided.

BRIDGE FEATURES

10BASE-T/100BASE-TX, Full Duplex or Half Duplex
HP Auto-MDIX, detects and corrects crossed cables
IEEE 802.3x flow control available
Real-time filtering with 256 address tables
Automatic address learning, aged and deleted with 5 minutes
Up to 340 packet-buffering capacity
Auto pads undersize packets to meet the minimum LAN packet size requirement
Buffering modes can be selected according to the set of WAN and LAN line speeds
Automatic TP polarity correction
Supports passing of VLAN tag packets

BRIDGE SPECIFICATIONS

| | |
|----------------------------------|---|
| <i>Compliance:</i> | IEEE 802.3/802.3u |
| <i>Connector:</i> | Shielded RJ-45 |
| <i>Data Rate:</i> | 10/100Mbps; Half Duplex (20/200Mbps; Full duplex) |
| <i>Filtering and Forwarding:</i> | wire speed |
| <i>Delay:</i> | 1 frame |
| <i>WAN Protocol:</i> | HDLC |

Filter:

When this feature is disabled (DIP1-1 OFF), all frames are passed transparently. In this configuration, the **ET100** acts as an Ethernet repeater. When the filter is enabled (DIP-1 ON), frame destinations are tested against the internal MAC address table. Filtering enabled is the normal selection for Bridging. When operating with modern switching HUB equipment, there is no need to enable the filtering function as the switching HUB will do the necessary filtering. In repeater mode, the small MAC address table (256) is not required and the unit can function in a large network without regard to MAC filtering. The module is set to repeater mode from the factory.

Auto Negotiation:

When this feature is enabled (DIP1-3 OFF), the LAN Duplex (DIP1-4) and Speed (DIP1-5) settings are ignored. In this default setting, the bridge will try to determine the proper speed and duplex mode of the connected device. This is the preferred method of configuration, and does not require the specific knowledge of the capabilities of the device to which the bridge is connected. For legacy equipment that does not support auto-negotiation, it is highly recommended to place DIP1-3 in the ON position and manually adjust the LAN duplex (DIP1-4) and speed (DIP1-5) configuration settings. Failure to make the proper Ethernet settings can result in reduced LAN performance or in worst case, no LAN function at all.

Chapter 2. Port Card Overview

Duplex:

The original specifications for Ethernet did not allow any bi-directional transmissions. The Ethernet operated in a half duplex mode. Modern Ethernet has the ability to operate in Full duplex mode which essentially doubles the throughput from 10Mbps to 20Mbps on 10Base-T or from 100Mbps to 200Mbps on 100Base-TX. Using this setting requires connection to equipment which also supports Full duplex Ethernet. Setting DIP1-4 OFF will enable this Full duplex mode. However, if Auto-negotiation is enabled (DIP1-3 OFF), then this switch's setting is ignored.

Speed:

DIP1-5 is used to set the Ethernet speed at 10Mbps (10Base-T) or 100Mbps (100Base-TX). When set ON, the Ethernet connection will operate in the slower 10Base-T speed. When DIP1-5 is set OFF, the Ethernet connection will operate at 100Base-TX speed. However, if Auto-negotiation is enabled (DIP1-3 OFF), then this switch's setting is ignored.

Auto MDI:

Auto MDI is a new Ethernet feature which allows Ethernet connections between MDI devices and/or MDI-X devices (HUBs) all using only straight thru, one-to-one, UTP connections. When DIP1-6 is ON, this feature is enabled. When this feature is disabled (DIP1-6 OFF), the device becomes MDI only and requires a crossover UTP cable to connect to another MDI device (such as PCs). Straight cable connections are used for connecting to MDI-X devices such as HUBs.

DIP Switch Settings

| DIP | State | | Function |
|-------|-------|-----|-----------------------------------|
| 1 | ON | | Enable MAC filtering |
| | OFF* | | Disable Filtering (repeater) |
| 2 | ON | | Enable 802.3x flow control |
| | OFF* | | Disable 802.3x flow control |
| 3 | ON | | NO Auto-negotiation |
| | OFF* | | Auto-negotiation |
| 4 | ON | | Half Duplex ¹ |
| | OFF* | | Full Duplex ¹ |
| 5 | ON | | 10BASE-T LAN speed ¹ |
| | OFF* | | 100BASE-TX LAN speed ¹ |
| 6 | ON* | | Enable Auto MDIX |
| | OFF | | MDI (1:1 to HUB) |
| 7 8 | OFF | OFF | Memory configuration #1 |
| | ON | OFF | Memory configuration #2* |
| | OFF | ON | Memory configuration #3 |
| | ON | ON | Reserved |

Table 2-6 DIP switch settings

* factory default settings

¹ no effect when sw3 is off (auto-negotiation is on).

LED Indicators

| Designation | Indication |
|------------------|------------------|
| Full (yellow) | ON=Full Duplex |
| Link (green) | ON=LAN Link |
| Error (red) | ON=LAN Error |
| 100M (yellow) | ON=Fast Ethernet |
| Receive (yellow) | ON=LAN Rx data |
| Transmit(yellow) | ON=LAN Tx data |

Table 2-7 LED indicators

Memory configuration detail

#1 LAN to WAN 308 packets, WAN to LAN 32 packets

#2 LAN to WAN 170 packets, WAN to LAN 170 packets

#3 LAN to WAN 32 packets, WAN to LAN 308 packets

| MDI |
|---------|
| 1. Tx + |
| 2. Tx - |
| 3. Rx + |
| 6. Rx - |

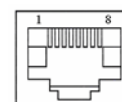


Table 2-8 ET100 pin allocation

Chapter 3. Installation

3.1 General

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

3.2 Site Preparation

Install the **Fiber Multiplexer** within reach of an easily accessible grounded AC outlet. The outlet should be capable of furnishing 90 to 250 VAC (20 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.

3.3 Mechanical Assembly

The **Fiber Multiplexer** is designed for rack mount installation and only requires 1U space (1 3/4") in a standard EIA 19 or 23 inch rack. It is highly recommended that the unit be placed in a rack. The **Fiber Multiplexer** may or may not be delivered completely assembled. No provision is made for bolting the **Fiber Multiplexer** to a tabletop.

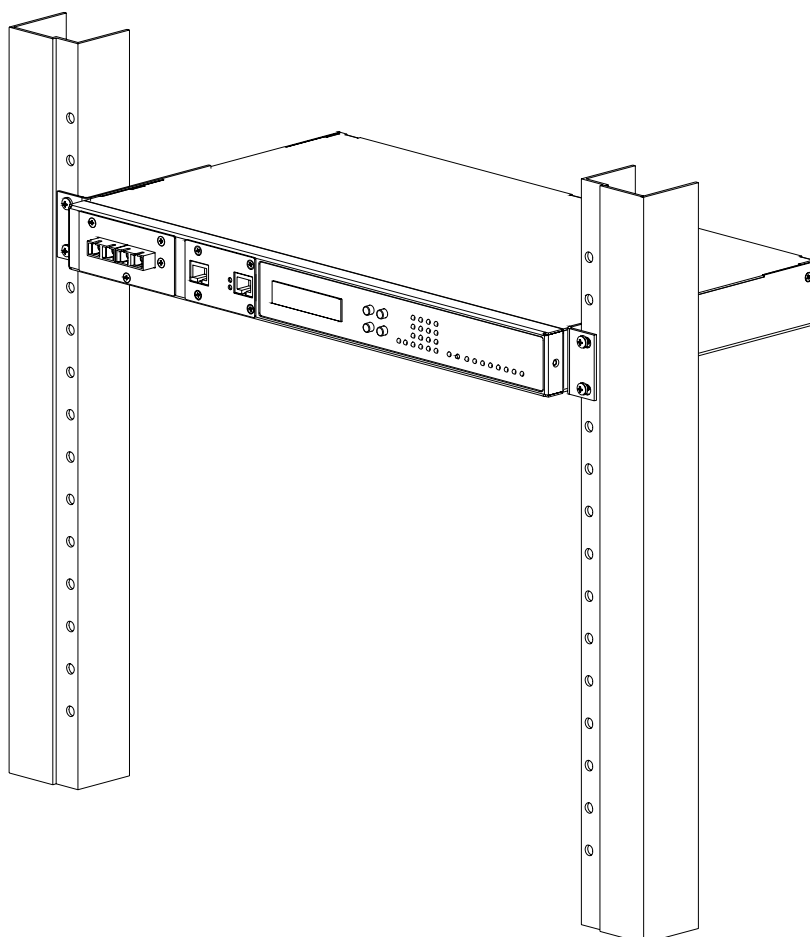


Figure 3-1 : Rack mount Installation of the **Fiber Multiplexer**

Chapter 3. Installation

3.4 Electrical Installation

3.4.1 Power connection

For a model with AC power supply, AC power (90~250VAC) is supplied to the **Fiber Multiplexer** through a standard IEC 3-prong receptacle, located on the rear of the chassis. For a model with DC power supply, DC -48V (20~60VDC) is connected to the terminal block, observing the proper polarity. In the AC/DC model, both IEC receptacle and DC terminal block are provided for dual power operation. 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.

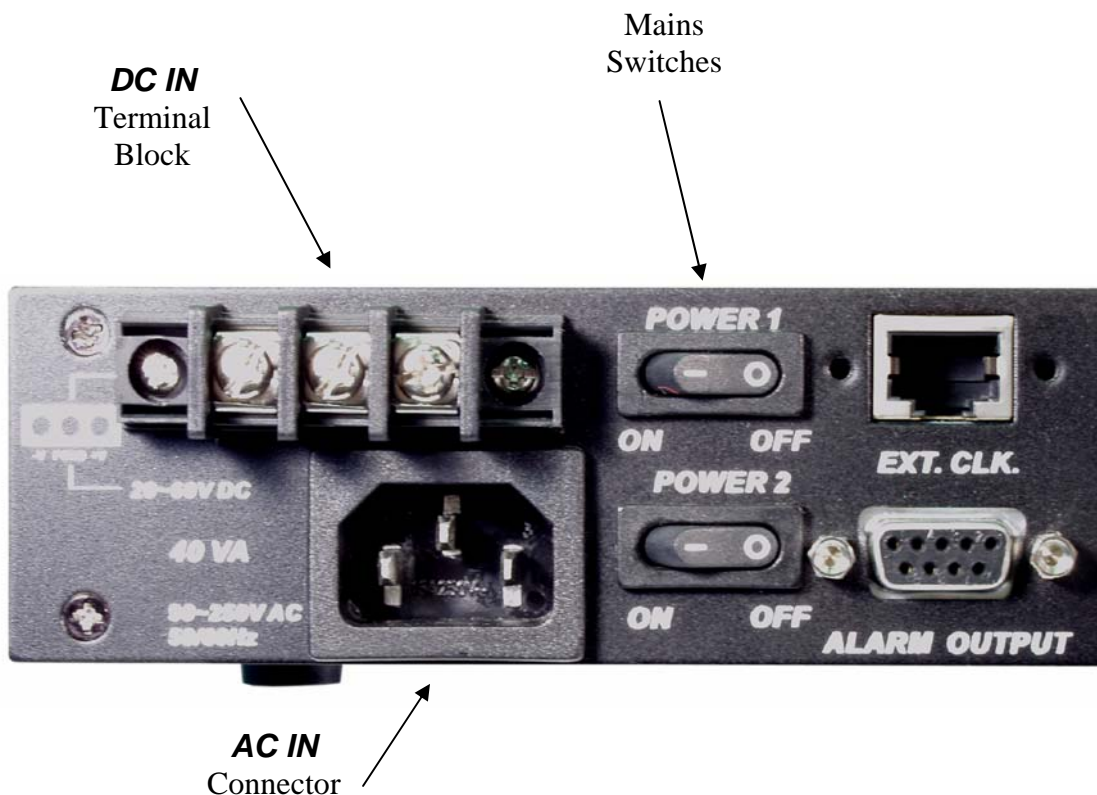


Figure 3-2 : Supply connections, AC/DC model shown

Chapter 3. Installation

3.4.2 Rear and Front panel connectors

All 4-Channel Port Cards install into the rear of the **Fiber Multiplexer**. The back plane provides both DC power to the 4-CHANNEL Port interface cards and routes signals from the cards to the multiplexing circuitry. From here, the multiplexed signal is sent to the Fiber Interface modules installed in the front panel.

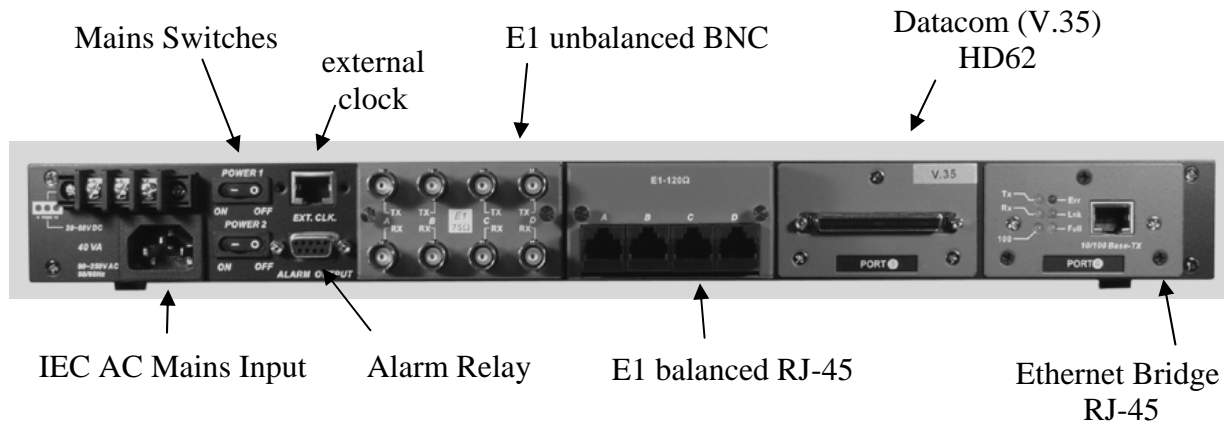


Figure 3-3 : Rear Panel Connections

The front panel of the **Fiber Multiplexer**, holds the optical interfaces, LCD display, menu keypad, LCD contrast trimmer and the status and alarm LEDs. On the optical interface, two interface connector groups are provided for connection to either the primary optical transmit and receive pair or to the redundant optical transmit and receive pair (if the optical interface card has the redundant optical option). The front panel also provides the connections to the RS-232 Console Interface (terminal mode) and to the LAN network for SNMP control (when the SNMP option is installed).

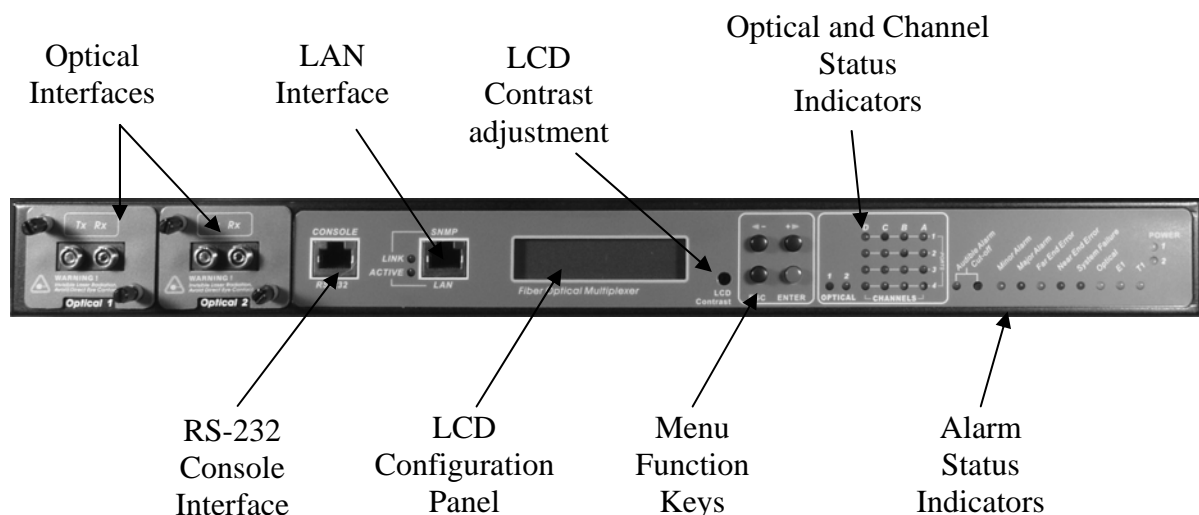


Figure 3-4 : Front Panel Controls and Indicators

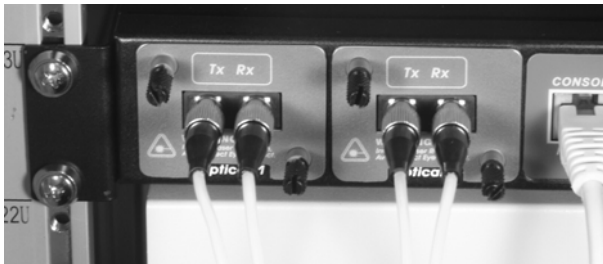
Chapter 3. Installation

3.5 Removal/Replacement Procedures

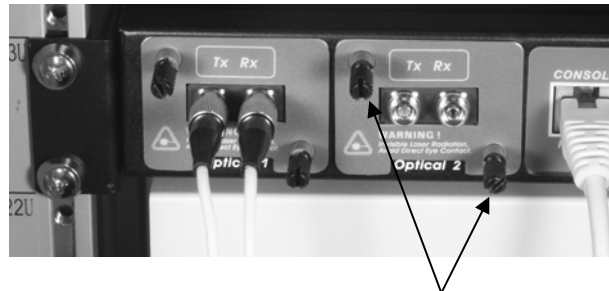
3.5.1 Optical Module Removal / Replacement (Hot Swappable)

The optical interfaces are installed into the front of the **Fiber Multiplexer**. The front plane connectors of the internal mainboard provide both DC power to the optical interface cards and routes signals from the cards to the multiplexing/de-multiplexing circuitry. Two separate modular interfaces are provided for connection to the primary optical transmit and receive pair and to the redundant optical transmit and receive pair (if the redundant optical interface module is installed). From here, the de-multiplexed signals are sent to the individual 4-CHANNEL Card module/channel installed in the rear of the unit (see 3-5-2 for removal/replacement procedures).

To remove either interface module, loosen the captive thumb screws until the threads are disengaged from the chassis. Gently pull the card straight forward by the captive screws using equal force to avoid binding. The card is only held by the friction of the connector. To install an optical module, reverse the procedure, taking care when seating the module to avoid connector damage. Gently, don't force it! Re-tighten the captive screws but don't over-tighten.



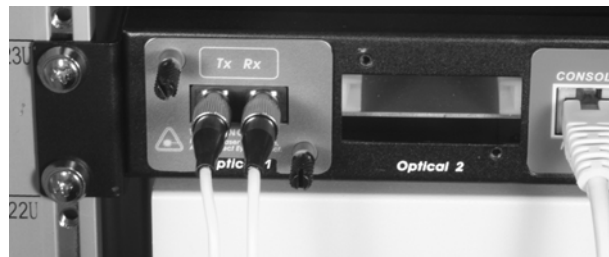
Remove fiber cables



Loosen the captive screws.



Pull out the module by the captive screws.



Reverse the procedure with replacement.

Figure 3-5 : Optical Interface Removal / Replacement (while in service)

Chapter 3. Installation

3.5.2 Channel Port I/F Module Removal / Replacement

****CAUTION**** All the following removal/replacement procedures must be done with all power sources disconnected.

All 4-Channel Port Cards install into the rear of the **Fiber Multiplexer**. The channel connector for E1/T1 is held by two "thumb" screws. Loosen both thumb screws (use a flat blade screwdriver if they are too tight), then remove the connector adapter by gently pulling straight back. The 4-Channel Port cards are held in by three small flathead screws. Using a No.2 Philips screwdriver, remove the two upper and one lower screw, then pull the module straight out (refer to the pictures below). To install the 4-Channel Port module, reverse the procedure, taking care when seating the module to avoid connector damage. Gently seat it, do not force it! Re-install the three flathead screws and do not over-tighten. Then re-install the appropriate channel adapter and tighten the thumb screws gradually and evenly. Tightening lightly with screwdriver if by hand is insufficient.

Channel
Adapter
held by
"Thumb"
Screws



Adapter
removed
exposing
the 4-
Channel
Port
Module



4-Channel
Port
Module
being slid
from
chassis

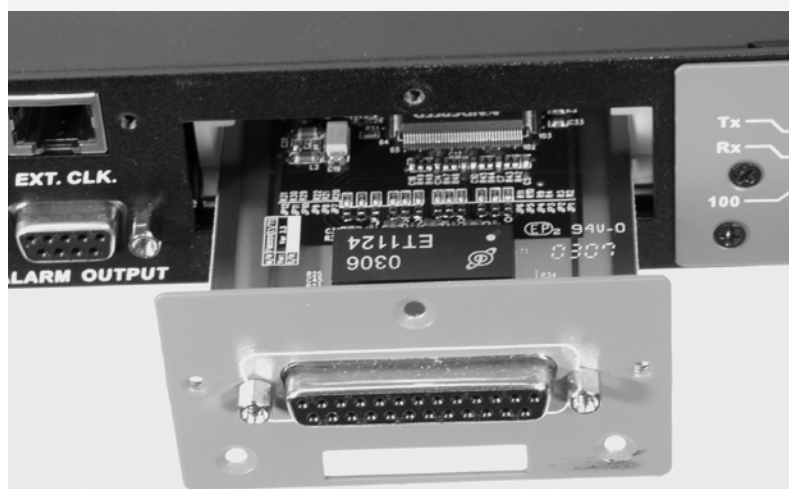


Figure 3-6 : 4-Channel Port Module Removal / Replacement

Chapter 3. Installation

3.5.3 Top cover Removal / Replacement for internal access

Normally, there is no need to remove the cover of the unit. All interface cards can be removed and replaced without the need to access the internal portion of the **Fiber Multiplexer**. However, to change any AC or DC power module, add the SNMP and/or External clock feature, or to change the internal firmware, internal access is required and the cover must be removed.

CAUTION

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

1. If the unit is installed in a rack, it must be removed.
2. The rack mounting brackets, if installed, must both be removed.
3. Follow the procedure in 3-5-2 and remove the Port No. 2 4-Channel Port module.
4. The top cover is held in place by seven screws. Remove the two upper screws on each side of the unit.
5. From the back of the unit, remove the upper screws on the far left, far right, and center of the unit. (The center screw is hidden unless the No.2 Port module is removed.)
6. Use your finger to push up the top panel through the open Port No.2 hole.
7. Once the back of the top panel is up and cleared, pull it towards the rear of the unit so that the panel slides out from under the lip of the front cover. The internals are now exposed.

Follow the procedure in reverse to re-install the top panel. Install the screws in the reverse order as well, starting with the rear panel center screw, then the left and right rear panel screws and lastly the side panel screws. Re-install the rack mount ears if they were removed.

Chapter 3. Installation

3.5.4 External Clock Feature Removal / Replacement

CAUTION

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

1. If the unit is installed in a rack, it must be removed.
2. Follow the procedure in 3-5-3 to remove the top cover.
3. Remove the two screws on the cover plate for the external clock feature. Once the feature is installed, this cover is no longer needed.
4. Place the ribbon cable on the feature card with the cable going away from the back of the card, noting the polarity of the cable. Place the red stripe to pin #1 on the feature card.
5. Place the RJ-45 connector into the hole cut-out first, align the three holes in the PC board with the three stand-offs. Insert the three pan-head screws that were supplied with the external clock feature kit. Tighten firmly but do not over tighten.
6. Connect the ribbon cable to the mainboard and confirm all pins are properly seated.
7. Re-install the top cover by following the reverse order.

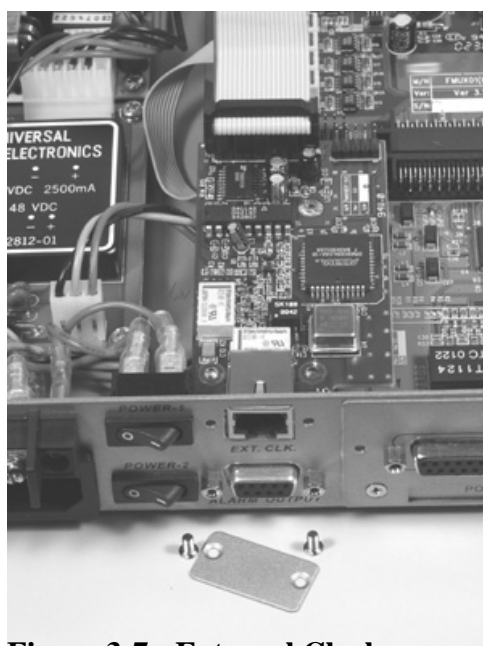


Figure 3-7 : External Clock Rear View

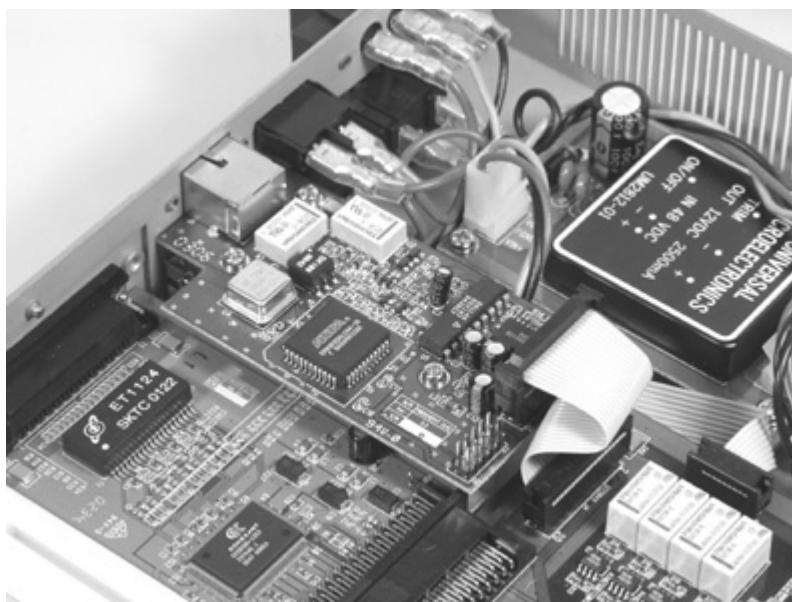


Figure 3-8 : External Clock Option Removal / Replacement

Chapter 3. Installation

3.5.5 SNMP Feature Removal / Replacement

CAUTION

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

1. If the unit is installed in a rack, it must be removed.
2. Follow the procedure in 3-5-3 to remove the top cover.
3. The connector for the SNMP daughter card is just behind the front panel display connector. Carefully seat the card, ensuring no pins are bent. The three holes in the PCB should line up with the three stand-offs on the mainboard.
4. Install the three pan-head screws supplied. Tighten firmly, but do not over tighten. Refer to the photo below.
5. Re-install the top cover.

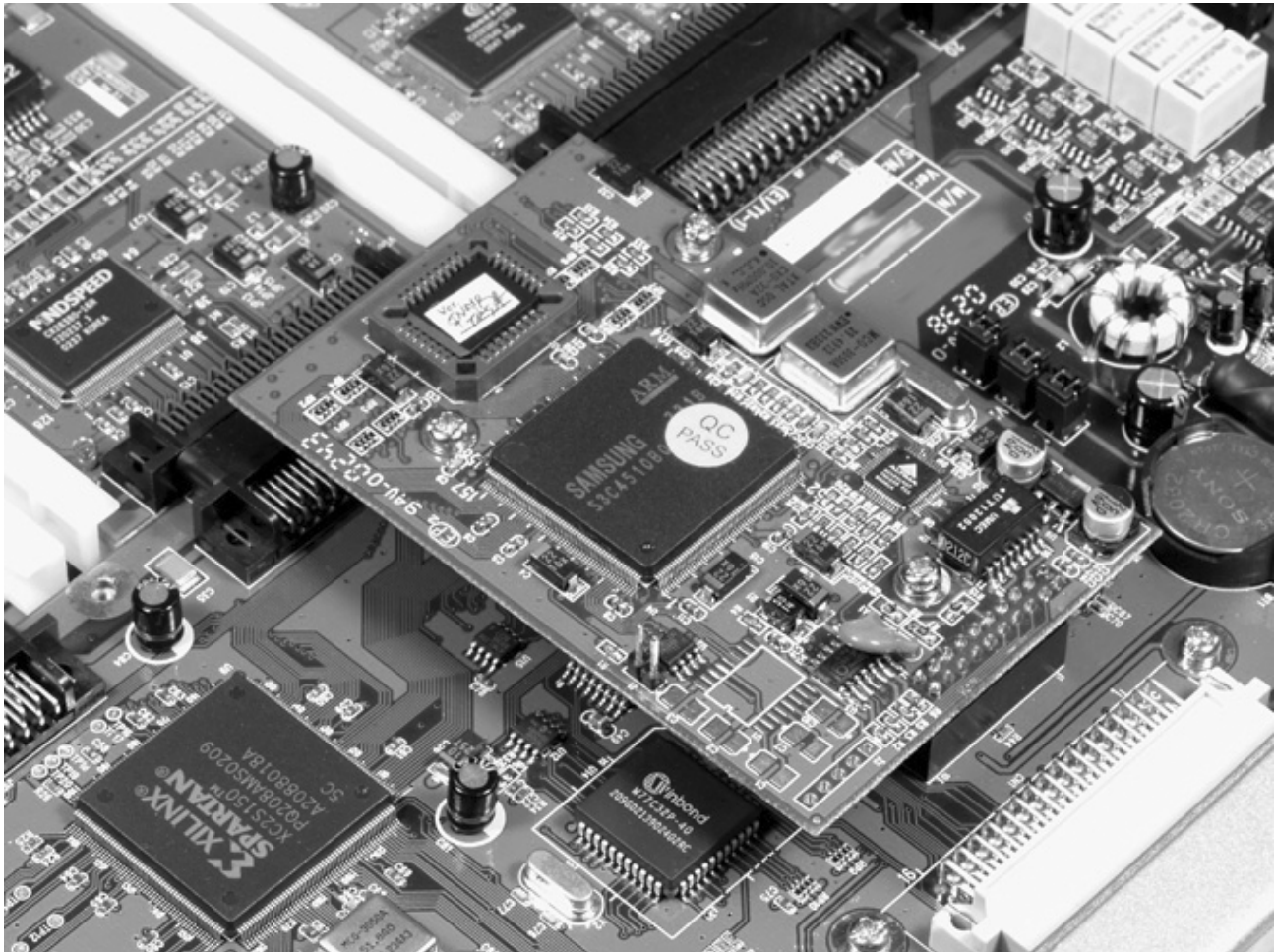


Figure 3-9 : SNMP daughter card Removal / Replacement

Chapter 4. Operation

4.1 Introduction

This chapter will go into the details of the specific configuration and operation of the **Fiber Multiplexer**. Broken into two parts, the first part outlines the procedures and functions when using the integral LCD display with push-button menu keys. The second section will outline the operation when using a VT-100 terminal connected to the RS-232 Console port. For rapid and more complete operation, a terminal connection to the Console port is recommended.

4.2 LCD Menu Operation

All controls (push-button switches), LCD display and LED indicators are located on the **Fiber Multiplexer** front panel. The pushbutton switches are used to activate menu selections and select parameter settings.

Use the '<' and '>' function keys to browse the menus and select parameters.

Use the '**Enter**' function key to enter a sub-menu or to set a selected parameter.

Use the '**ESC**' function key to return to a previous menu or to abandon setup.

When first powered on, the following "Administration" menu will be displayed. If a password has been set, it must be entered to continue. The super user password is "1021" (no quotes). **Pressing ESC from this menu will briefly display the unit's firmware version number.** Pressing either ARROW key at this point will give the option to administer the remote site (as long as there is a valid optical link). Pressing the ENTER key at this point will page the operator at the top of the 10 top level Menus of either the local or selected remote unit. While administering the local unit, the graphic menu arrows will appear as solid black (◀ ▶). While administering the remote unit, the graphic menu arrows will appear as "less than" and "greater than" signs (< >).

```
◀ ADMINISTRATION ▶
LOCAL SITE
```

Initial LCD display. Press ENTER to configure the local unit and move to the top level Menus.

Pressing ESC from this menu will briefly display the unit's firmware version number.

```
◀ ADMINISTRATION ▶
REMOTE SITE
```

Pressing either Arrow key will provide access to the remote unit.

Press ENTER to configure the remote unit and move to the top level Menus.

4.2.0 Display Version Info From the Administration Local Site Menu or press ENTER to reach the System Config menu.

```
◀ SYSTEM ▶
CONFIG
```

Pressing ESC at this menu will display the firmware and FPGA version numbers. (while in local unit only)

```
FPGA Version 5.1
Firmware V2.03
```

Chapter 4. Operation

4.2.1 Top Level Menus The following are the 10 top level Menus. Press the right arrow key to select another top level Menu or press ENTER to reach that menu's sub menu.

```
◀  S Y S T E M          ▶  
   C O N F I G
```

Set the Ext Clock (if the option is installed), Save User Set, Load Defaults, Load User Set, Modify Password or Logout. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

```
◀  O P T I C A L        ▶  
   C O N F I G
```

Set the working modes of Optical 1 and Optical 2 (if installed), the ALS function (Automatic Laser Shutoff), Loopback or BERT function of either optical port. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

```
◀  P O R T   1 - E 1    1 2 0 ▶  
   C O N F I G
```

Entering this menu allows configuration of the Port Card installed in the Port 1 slot. For the E1 card, the "in service state", Line Code and Loop back functions can be set for each of 4 channels. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

```
◀  P O R T   2 - E 1    7 5  ▶  
   C O N F I G
```

Entering this menu allows configuration of the Port Card installed in the Port 2 slot. For the E1 card, the "in service state", Line Code and Loop back functions can be set for each of 4 channels. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

```
◀  P O R T   3 - T 1    1 0 0 ▶  
   C O N F I G
```

Entering this menu allows configuration of the Port Card installed in the Port 3 slot. For the T1 card, the "in service state", Line Code and Loop back functions can be set for each of 4 channels. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

```
◀  P O R T   4 - L A N    ▶  
   C O N F I G
```

Entering this menu allows configuration of the Port Card installed in the Port 4 slot. "N/A" means that no card is installed in Port 4. Browse sub-menu items with arrow keys and select with Enter. Browse setting options with arrow keys and set option with Enter.

Chapter 4. Operation

```
◀  A L A R M      ▶  
   R E P O R T
```

Entering this menu allows "Clearing" the alarm history, setting alarm thresholds, displaying alarm history, and setting function of alarm relays.

```
◀  P E R F O R M A N C E      ▶  
   D I S P L A Y
```

Entering this menu allows displaying the current internal performance, the nearest internal performance, resetting the nearest or All performance data.

```
◀  D A T E   &   T I M E      ▶  
   D I S P L A Y
```

Entering this menu allows displaying the current date and time, as well as setting or resetting the real time clock's date and time.

```
◀  L O G O U T      ▶  
   S Y S T E M
```

Pressing ENTER at this menu will logout of the menu system back to the "Administrator" display and allow re-login or connection to the remote system for further configuration.

Chapter 4. Operation

4.2.2 Menu Table The following is a breakdown of the menu system for the **Fiber Multiplexer** (LCD).

| | | |
|--------------------|---------|-----------------------------|
| Power on self test | | |
| ADMINISTRATION | [Arrow] | (login to remote) |
| | [ENTER] | (enter local configuration) |
| | [ESC] | Firmware version |

| Local / Remote top menu | Menu Item | Parameter Settings [display] |
|-------------------------|---------------------------|---------------------------------------|
| SYSTEM CONFIG | [ESC] | FPGA/Firmware version |
| | Ext Clk | OFF |
| | | E1 PCM |
| | | E1 TTL |
| | | T1 PCM |
| | | T1 TTL |
| | | X"TAL |
| | Save User Set | (saves user defined set) |
| | Load Default | (restore factory defaults) |
| | Load User Set | (loads previously saved set) |
| | Modify PWD | (set administration password) |
| OPTICAL CONFIG | Opti 1: | work / Off |
| | Opti 2: | standby / disable |
| | ALS: (Auto Laser Shutoff) | Auto / Disable |
| | Loopback: | OFF/LLB/RLB/RRLB |
| | Status: | Opti 1 / Opti 2 |
| | BERT: | ON / OFF |
| | Pattern: | SYNC / LOSS |
| | ErrIns [ENTER] | (insert 1 bit error) |
| | ErrBit: | (count of single bit errors) |
| | RxBit: | (count of received bits) |
| | ErRate: | (bit error rate on fiber) |
| | Clear [ENTER] | (clears the error bit counter) |
| Port X-YY, Channel A~D | Service | ON / OFF |
| | Line Code | HDB3 / B8Z3 / AMI |
| | Loopback | OFF/LLB/NELLB/RLB/RRLB |
| ALARM REPORT | Clear History | |
| | Threshold Set | CV: [255 / 2048 / 65535 bits] |
| | | ES: [300 sec. / 600 sec. / 900 sec.] |
| | | SES: [300 sec. / 600 sec. / 900 sec.] |
| | | UAS: [300 sec. / 600 sec. / 900 sec.] |
| | Show History | |
| | Relay | Both/Audible/Visible/All Off |
| PERFORMANCE DISPLAY | Current Interval | CV: [bits] |
| | (Port 1-4,Ch.A~D) | ES: [sec.] |
| | | SES: [sec.] |
| | | UAS: [sec.] |
| | Nearest Interval | CV: [bits] |
| | (Port 1-4,Ch.A~D) | ES: [sec.] |
| | | SES: [sec.] |
| | | UAS: [sec.] |
| | Reset Current | |
| | Reset All | |
| DATE & TIME DISPLAY | Date: | [2006/04/17] |
| | Time: | [13:47:49] |
| LOGOUT SYSTEM | | (return to Administration) |

4-1 LCD Menu System

Chapter 4. Operation

4.3 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 RJ-45 to DB9F adapter cable (see below for pin out). The **Fiber Multiplexer's** RS-232 Console port acts as a DCE to the PC's DTE communications port. A convenient application, provided with the Microsoft Windows® 98/NT/2K/XP operating systems, is "HyperTerminal™". The settings for console port communication with the **Fiber Multiplexer** are 19.2K baud, 8 bits, no parity, 1 stop bit and no flow control. In the HyperTerminal program terminal window click the "properties" icon and set the communication parameters as in the following graphics. Click the "Configure..." button in the properties window and set the port settings. When set properly, click "OK".

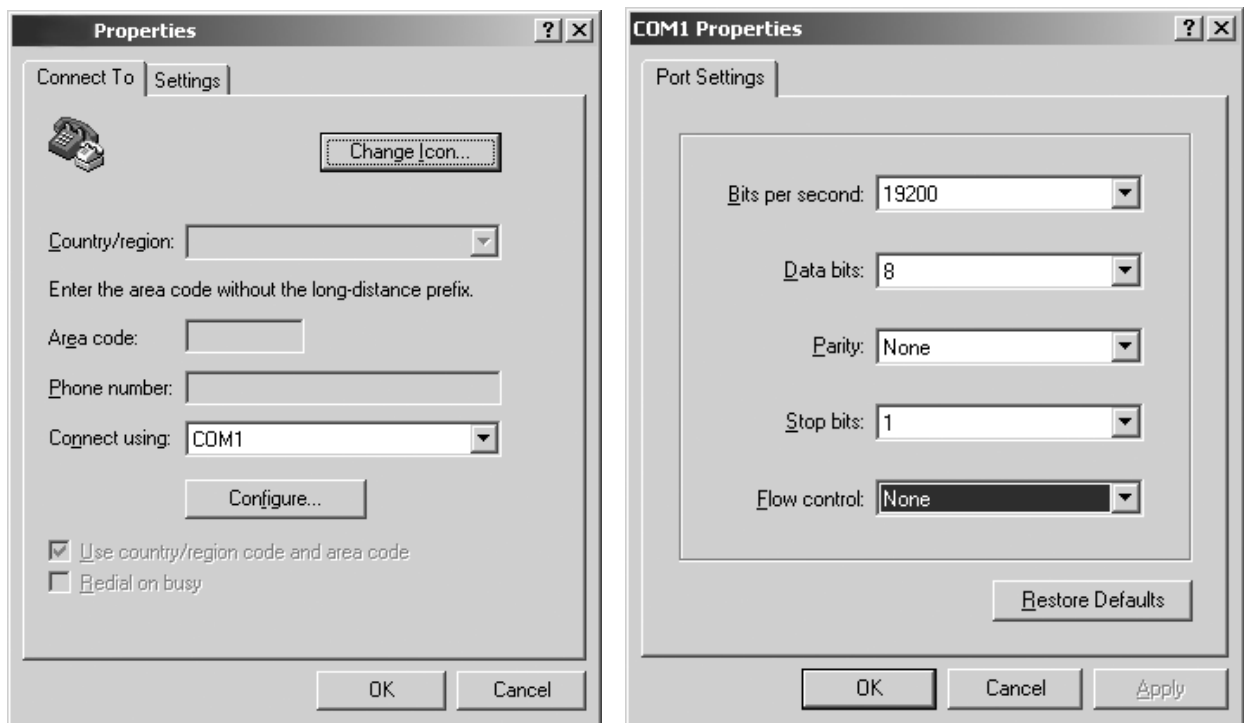


Figure 4-2 HyperTerminal port settings for Fiber Multiplexer

4.4 Connecting to the Fiber Multiplexer

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

| RJ-45 | signal | DB9 (F) |
|-------|--------|---------|
| 4 | GND | 5 |
| 5 | TD | 2 |
| 6 | RD | 3 |

Chapter 4. Operation

4.5 Configuring in Console Mode

The **Fiber Multiplexer** Control Port (labeled RS-232 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. If you are using "HyperTerminal™" the display should similar to the following. (the version may be different)



4-3 Terminal Connection

Chapter 4. Operation

4.5.1 Local or Remote Login

```
*****
****                                     ****
****          CONSOLE MODE   Ver 2.03   ****
****                                     ****
*****
```

1. Local Login
2. Remote Login

Press the "1" key to immediately enter into the Local Unit Terminal Mode. The main "LOCAL" root menu will be displayed as follows.

```
LOCAL *****
****                                     ****
****          CONSOLE MODE   Ver 2.03   ****
****                                     ****
*****
```

0. Logout
1. Display System Status
2. Define System Parameter
3. Alarm Buffer Display
4. Performance Display
5. ACO (Alarm Cut-Off)

Please select the item number.

4.5.2 Define System Parameters

Note that the upper left corner will display the word "LOCAL" in inverse text, indicating that the Terminal Mode connection is to the local unit and not the remote unit. If this is our first time connecting and we wish to configure or check the unit's configuration, we can directly enter the "Define System Parameter" menu by pressing "2". The following menu will be displayed.

```
LOCAL          <<< Define System >>>

1. System Config
2. Optical Port Config
3. Port 1 Config.      [ E1 75 ]
4. Port 2 Config.      [ T1  ]
5. Port 3 Config.      [ X.21 ]
6. Port 4 Config.      [ LAN ] [ 100M/F ]
7. Alarm Threshold
8. Date & Time
9. SNMP Card Config
```

Please select the item or <ESC> to previous menu.

Chapter 4. Operation

Press "1" to enter the System Configuration menu.

```
LOCAL          <<< System Parameter >>>
```

1. External Clock [OFF]
2. Save User Setting
3. Load Default Setting
4. Load User Setting
5. Modify Password
6. Alarm Relay [Both]

Please select the item or <ESC> to previous menu.

4.5.3 System Configuration

From this menu the item 1, **External Clock**, may be selected OFF, or if option is installed, it may be selected for E1 PCM, E1 TTL, T1 PCM, T1 TTL or to X'TAL (internal crystal) mode. The item 2, **Save User Settings**, all the current settings may be saved for later recall. The item 3, **Load Default Settings**, the factory defaults may be loaded. Be careful, there is no confirmation and the reload is immediate upon entering "3". The item 4, **Load User Setting**, will immediately load a previously saved user setting. The item 5, **Modify Password**, the password to enter administration of this unit may be modified. The password setting must be 4 numerals. When logging in, the password prompt is an empty blank line. Enter the 4 digit password and press Enter. To clear the administration password, modify it by entering four zeros (0000). If you forget the password, the super user password is "1021". The item 6, **Alarm Relay**, the functioning of the Alarm Relays may be set.

The system setting are fairly self explanatory. To configure the Major and Minor Alarm Relays, press item "6". The following menu is displayed.

```
LOCAL          <<< System Parameter >>>
```

1. External Clock [OFF]
2. Save User Setting
3. Load Default Setting
4. Load User Setting
5. Modify Password
6. Alarm Relay [Both]

```
=====
<<< Alarm Relay >>>
```

1. Both
2. Audible
3. Visible
4. All Off

Please select the item or <ESC> to previous menu.

Chapter 4. Operation

The Alarm Relays may be set to activate the "audible" alarm relay only, the "visual" alarm relay only, both the "audio" and "visual" relays, or to disable the relays. After selecting the desired action, press the <ESC> key to exit this menu.

4.5.4 System Reset

The "Load Default Setting" option of the System Parameter setting menu, on the previous page, is the method to completely restore the unit to the factory defaults. All channel service status will be "ON", all loop back settings will be "OFF" and all timing modes on data port cards will be reset to "Transparent". In addition, the real time clock will be reset to October 2003.

We will <ESC> back to the Define System configuration and select "2" for Optical Port Configuration.

4.5.5 Optical Configuration

LOCAL <<< Define Optical >>>

- | | |
|--------------|-------------|
| 1. Optical 1 | [Work] |
| 2. Optical 2 | [Standby] |
| 3. ALS | [Auto] |
| 4. Loopback | [OFF] |

Please select the item or <ESC> to previous menu.

The functions in this menu allow configuration of the Optical Card as follows:

- Optical 1 set to working mode or Off
- Optical 2 set to Standby mode or Disabled
- ALS (Auto Laser Shutoff) set to Auto or Disabled
- Loopback set to Off or to Local loopback

4.5.6 Port Option Configuration

If we <ESC> back to the "Define System" menu we can configure the card in Port 1 by pressing "3". The following will be displayed. Here is the example for the E1 4-channel module (unbalanced 75 Ohm)

LOCAL <<< Define Port 1 Parameter >>>

| | Ch A | Ch B | Ch C | Ch D |
|--------------|------|------|------|------|
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | HDB3 | HDB3 | HDB3 | HDB3 |
| 3. Loopback | OFF | OFF | OFF | OFF |

Please Select Channel A ~ D or <ESC> to previous menu

The service status, Line Code setting, and Loopback mode are displayed for each of the 4 channels. To change any of the channel settings, select the individual channel with the corresponding letter A~B~C~D or press <ESC> to exit this menu.

Chapter 4. Operation

For an example of turning on Loopback for Channel A, press "A". The following menu is displayed.

```
LOCAL                <<< Define Port 1 Parameter >>>
```

| | Ch A | Ch B | Ch C | Ch D |
|--------------|------|------|------|------|
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | HDB3 | HDB3 | HDB3 | HDB3 |
| 3. Loopback | OFF | OFF | OFF | OFF |

Please select Function 1 ~ 3 or <ESC> to previous menu.

Notice that "ch A" is highlighted, indicating it is the selected channel. To modify the Loopback status for the selected channel, press "3"

```
LOCAL                <<< Define Port 1 Parameter >>>
```

| | Ch A | Ch B | Ch C | Ch D |
|--------------|------|------|------|------|
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | HDB3 | HDB3 | HDB3 | HDB3 |
| 3. Loopback | OFF | OFF | OFF | OFF |

```
=====
[ Loopback ]
```

1. OFF
2. LLB (Local Loopback)
3. NELLB (Near End Local Loopback)
4. RLB (Remote Loopback)
5. RRLB (Request Remote Loopback)

Please select the item or <ESC> to previous menu.

Choose the desired loopback mode from the menu shown or press <ESC> to exit.

```
LOCAL                <<< Define Port 1 Parameter >>>
```

| | Ch A | Ch B | Ch C | Ch D |
|--------------|------|------|------|------|
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | HDB3 | HDB3 | HDB3 | HDB3 |
| 3. Loopback | LLB | OFF | OFF | OFF |

Please Select Channel A ~ D or <ESC> to previous menu

Chapter 4. Operation

If we <ESC> back to the "Define System" menu we can configure the card in Port 2 by pressing "4". This is an example for the T1 4-channel module (balanced 100 Ohm)

| LOCAL <<< Define Port 2 Parameter >>> | | | | |
|--|------|------|------|------|
| | Ch A | Ch B | Ch C | Ch D |
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | B8ZS | B8ZS | B8ZS | B8ZS |
| 3. Loopback | OFF | OFF | OFF | OFF |

Please Select Channel A ~ D or <ESC> to previous menu

The service status, Line Code setting, and Loopback mode are displayed for each of the 4 channels. To change any of the channel settings, select the individual channel with the corresponding letter A~B~C~D or press <ESC> to exit this menu.

For an example of turning service off for Channel D, press "D".

| LOCAL <<< Define Port 2 Parameter >>> | | | | |
|--|------|------|------|-------------|
| | Ch A | Ch B | Ch C | Ch D |
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | B8ZS | B8ZS | B8ZS | B8ZS |
| 3. Loopback | OFF | OFF | OFF | OFF |

Please select Function 1 ~ 3 or <ESC> to previous menu.

Notice that "ch A" is highlighted, indicating it is the selected channel. To modify the service status for the selected channel press "1"

| LOCAL <<< Define Port 1 Parameter >>> | | | | |
|--|------|------|------|-------------|
| | Ch A | Ch B | Ch C | Ch D |
| 1. Service | ON | ON | ON | ON |
| 2. Line Code | B8ZS | B8ZS | B8ZS | B8ZS |
| 3. Loopback | OFF | OFF | OFF | OFF |
| ===== | | | | |
| [Service] | | | | |
| 1. ON | | | | |
| 2. OFF | | | | |

Please select the item or <ESC> to previous menu.

Choose the desired loopback mode from the menu shown or press <ESC> to exit.

Chapter 4. Operation

If we <ESC> back to the "Define System" menu we can configure the card in Port 3 by pressing "5". The following will be displayed. Here is the example for the X.21 4-channel data communication module.

```
LOCAL          <<< Define Port 3 Parameter >>>

                Ch A      Ch B      Ch C      Ch D
1.  Service      ON        ON        ON        ON
2.  Rate (Kbps)  2048      2048      2048      2048
3.  Timing       Trans.    Trans.    Trans.    Trans.
4.  Loopback     OFF       OFF       OFF       OFF
5.  CTS          ON        ON        ON        ON
Please Select Channel A ~ D or <ESC> to previous menu
```

The service status, data rate setting, timing mode, Loopback and handshaking mode are displayed for each of the 4 channels. To change any of the channel settings, select the individual channel with the corresponding letter A~B~C~D or press <ESC> to exit this menu. For an example of setting the timing mode for Channel A, press "A". The following menu is displayed.

```
LOCAL          <<< Define Port 3 Parameter >>>

                Ch A      Ch B      Ch C      Ch D
1.  Service      ON        ON        ON        ON
2.  Rate (Kbps)  2048      2048      2048      2048
3.  Timing       Trans.    Trans.    Trans.    Trans.
4.  Loopback     OFF       OFF       OFF       OFF
5.  CTS          ON        ON        ON        ON
Please select Function 1 ~ 5 or <ESC> to previous menu.
```

Note that channel A is highlighted. To modify the timing parameter press "3"

```
LOCAL          <<< Define Port 3 Parameter >>>

                Ch A      Ch B      Ch C      Ch D
1.  Service      ON        ON        ON        ON
2.  Rate (Kbps)  2048      2048      2048      2048
3.  Timing       Trans.    Trans.    Trans.    Trans.
4.  Loopback     OFF       OFF       OFF       OFF
5.  CTS          ON        ON        ON        ON
=====
[ Timing ]

1.  Transparent
2.  Recovery
3.  External Clock
4.  Internal Oscillator
Press select the item or <ESC> to previous menu.
```

Chapter 4. Operation

For this example, choose the Internal Oscillator by pressing item "4".

LOCAL

<<< Define Port 3 Parameter >>>

| | Ch A | Ch B | Ch C | Ch D |
|----------------|---------|--------|--------|--------|
| 1. Service | ON | ON | ON | ON |
| 2. Rate (Kbps) | 2048 | 2048 | 2048 | 2048 |
| 3. Timing | Int Osc | Trans. | Trans. | Trans. |
| 4. Loopback | OFF | OFF | OFF | OFF |
| 5. CTS | ON | ON | ON | ON |

Please select Function 1 ~ 5 or <ESC> to previous menu.

Note that the timing setting for channel "A" has changed to internal oscillator. If we <ESC> back to the "Define System" menu we may also configure a card in port 4 by pressing "6". **Please note the following:** The LAN bridge card has no settings which can be performed via the terminal console. Please refer to the bridge card section for setting the DIP switch located physically on the bridge card module.

4.5.7 Alarm Threshold Settings

Next we will escape back to the Define System menu and select item "7" for the Alarm Threshold settings. Press "7" and the display will look like this:

LOCAL

<<< Define Alarm Threshold >>>

| | |
|---------------------------------|--------------|
| 1. CV (Code Violation) | [255] |
| 2. ES (Error Seconds) | [300 Sec.] |
| 3. SES (Severely Error Seconds) | [300 Sec.] |
| 4. UAS (Unavailable Seconds) | [300 Sec.] |

Please select the item or <ESC> to previous menu.

The current threshold settings are shown. The Code Violation, Error Seconds, Severely Error Seconds and Unavailable Seconds thresholds may all be modified here. To modify a setting, choose its item number. The available definitions for all are as follows:

CV: 255, 2048, or 65535 bits

ES: 300 sec., 600 sec., 900 sec.

SES: 300 sec., 600 sec., or 900 sec.

UAS: 300 sec., 600 sec., or 900 sec.

Chapter 4. Operation

For example to modify the Code Violation threshold, press "1".

```
LOCAL          <<< Define Alarm Threshold >>>

1.  CV   (Code Violation)           [ 255  ]
2.  ES   (Error Seconds)             [ 300 Sec. ]
3.  SES  (Severely Error Seconds) [ 300 Sec. ]
4.  UAS  (Unavailable Seconds)      [ 300 Sec. ]
=====
      <<< CV Threshold >>>

1.  255 bits
2.  2048 bits
3.  65535 bits
```

Please select the item or <ESC> to previous menu.

Select one of the available settings or press <ESC> to exit.

4.5.8 Setting System Date and Time

If we go back again to the Define System menu, we can next select the Date & Time setting function. Please <ESC> back, then press "8" for item 8.

```
LOCAL          <<< Date and Time >>>

1.  Date.      [ 2003/10/01 ]
2.  Time.      [ 03:34:15 ]
```

Please select the item or <ESC> to previous menu.

To correct the date and time, press "1" for the date or "2" for the time. The cursor will be placed on the setting for year in Date or for hour in Time.

```
LOCAL          <<< Date and Time >>>

1.  Date.      [ 2004/03/03 ]
2.  Time.      [ 14:15:15 ]
```

Press <+>,<-> Key to set, or Press <ESC> to Exit.

Use the "+" and "-" keys to the correct Date and Time values, then press ENTER. The cursor will move to the next field, month or minute. Press ENTER after adjusting the parameters. Press <ESC> when finished.

NOTE: When the factory default settings are loaded, the real time clock will require resetting.

(The setting of the SNMP agent is covered under a separate chapter. Please refer to the SNMP operation chapter.)

Chapter 4. Operation

4.5.9 Display System Status

If we escape back out to the root menu, we can select item #1 to display the system status. The display will look similar to the following.

| <<< FMUX UNIT SYSTEM STATUS >>> | | | | | | | | | | | | | | | | 14:27:24 | | | | | |
|---------------------------------|--|--------|----|----|----|-------------|----|----|----|----------|----|----|----|----------|----|----------|----|------------|----|------------|----|
| | | PORT 1 | | | | PORT 2 | | | | PORT 3 | | | | PORT 4 | | | | Optic | | PWR | |
| | | 1A | 1B | 1C | 1D | 2A | 2B | 2C | 2D | 3A | 3B | 3C | 3D | 4A | 4B | 4C | 4D | O1 | O2 | P1 | P2 |
| --- LOCAL --- | | | | | | | | | | | | | | | | | | | | | |
| Service Status | | v | v | v | v | v | v | v | v | v | v | v | v | v | | | | W | S | v | v |
| Loss of Signal | | | | | | | | | | | | | | | | | | | | | |
| Loopback Status | | | | | | | | | | | | | | | | | | | | | |
| Major Alarm | | | | | | | | | | | | | | | | | | | | | |
| Minor Alarm | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | 1A | 1B | 1C | 1D | 2A | 2B | 2C | 2D | 3A | 3B | 3C | 3D | 4A | 4B | 4C | 4D | O1 | O2 | P1 | P2 |
| --- REMOTE --- | | | | | | | | | | | | | | | | | | | | | |
| Service Status | | v | v | v | v | v | v | v | v | v | v | v | v | v | | | | W | S | v | v |
| Loss of Signal | | | | | | | | | | | | | | | | | | | | | |
| Loopback Status | | | | | | | | | | | | | | | | | | | | | |
| Major Alarm | | | | | | | | | | | | | | | | | | | | | |
| Minor Alarm | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | PORT 1 | | | | PORT 2 | | | | PORT 3 | | | | PORT 4 | | | | Optic | | PWR | |
| [v]In Service | | [*]LOS | | | | [o]Loopback | | | | [a]minor | | | | [A]major | | | | [S]Standby | | [W]working | |
| Press <ESC> key to Exit. | | | | | | | | | | | | | | | | | | | | | |

The System Status display gives an overview of the entire system, both local and remote units, the channel conditions, optical connections, and power supply status. In the above display note that all Port cards are installed and that all 4 channels (1A~1B) are in service (v) without any errors from local or remote side except for Port 4 which is a LAN card (The LAN card combines the entire port throughput into a single WAN bridge). The optical 1 (O1) connection is working (W) and optical 2 (O2) is in standby (S) mode. Both power supplies (P1 and P2) are active in both local and remote side units.

The display screen will refresh every 5 seconds. If there is no link to the remote unit, then no status information will be available from the remote side, all fields will go blank, and the refresh will take more than 20 seconds.

Another important diagnostic display of the **Fiber Multiplexer** is the Alarm Buffer display. Note that it is item three on the root menu. If we press "3" the Alarm Buffer will display.

4.5.10 Alarm Buffer Display

| <<< Alarm Buffer Display >>> | | | | |
|------------------------------|--------------|--------|------------|----------|
| Channel | Alarm Type | ON/OFF | DATE | TIME |
| Terminal | Local Login | | 2003/10/01 | 11:10:04 |
| Port 1-Ch A | Loopback | ON | 2003/10/01 | 11:13:45 |
| Port 1-Ch A | Loopback | OFF | 2003/10/01 | 11:14:08 |
| Terminal | Local Logout | | 2003/10/01 | 11:30:52 |

End of Alarm History

Press <ESC> key to Exit. or Press <C> to Clear Alarm Buffer.

Chapter 4. Operation

The Alarm Buffer can be cleared by pressing the "c" key. Note that each entry in the buffer is "time stamped" with the actual time of occurrence (based on real time clock setting). So it is important to properly set the Date & Time as described previously.

4.5.11 Performance Display

Another important diagnostic display is the Performance Monitor display. This display is also accessible from the root menu, as item "4". The display looks similar to the following.

| LOCAL <<< Performance Display >>> | | | | | | | | | |
|-----------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | P1A | P1B | P1C | P1D | P2A | P2B | P2C | P2D | |
| Line CV: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Line ES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Path CV: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Path ES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Path SES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Path UAS: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | P3A | P3B | P3C | P3D | P4A | P4B | P4C | P4D | Opt |
| Line CV: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Line ES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Path CV: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Path ES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Path SES: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Path UAS: | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Press <ENTER> to History Interval, or Press <ESC> to Exit.
Press <R> to Reset Current Interval.

The performance data for all 16 channels is shown, 4 for each of 4 ports, plus the optical performance. There is a total of 96 history pages, 00~95 with 00 being the current performance display. Each performance history represents a 15 minute interval (900 seconds), while all 96 history intervals represent the last 24 hours. To view a previous performance history interval, press the <ENTER> key and enter the two digit interval ie. enter with the leading zero, 01, 02, 03, etc. There are four (4) intervals per hour, so if we wanted to view the history interval three hours ago, enter interval 12.

To clear all the data in the history intervals, use the "R" key.

4.5.12 Alarm Cut Off

The very last item on the root menu is the Alarm Cut Off function. To turn off an activated audible or visual alarm, the ACU pushbutton on the front of the unit may be pushed or in terminal mode, the alarm may be cut off for the local or remote unit. Press item "5" from the root menu. The "Audible Alarm Cut-off" LED will light on the front panel to indicate ACO.

This completes the overview of the LCD and Console mode configuration and status monitoring of the **Fiber Multiplexer**.

Chapter 5. Loop Back Testing

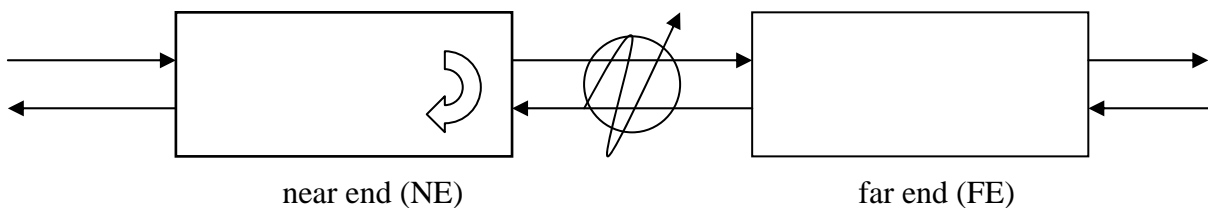
5.1 General

In this chapter we shall explain the functioning of the loop back modes available in the **Fiber Multiplexer**. The loop back modes available include Local, Remote, and Remote Request Loop Backs for the Optical interface and the secondary Optical interface (if redundant) as well as Local Loop Back, Near End Loop Back, Remote Loop Back, and Request Remote Loop Back for the E1, T1 and Data communication 4-Channel Port Cards.

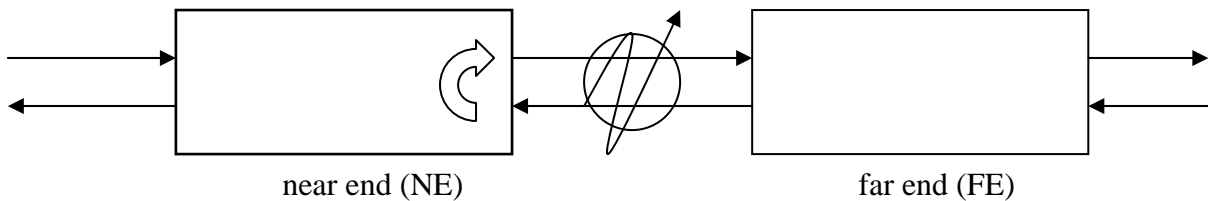
5.2 Loop Back Modes

5.2.1 Optical Loop Back

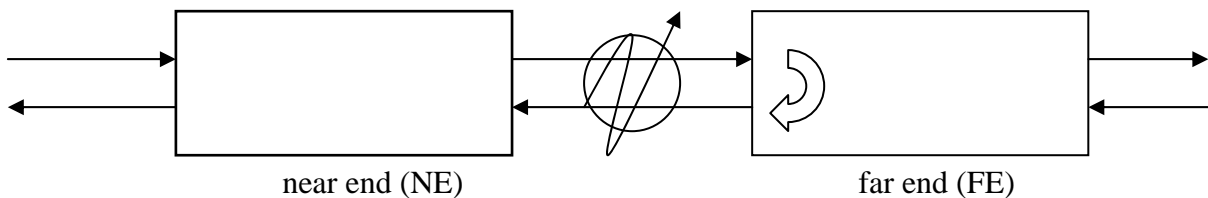
* LLB (Optical local loop back)



* RLB (Optical Remote loop back)



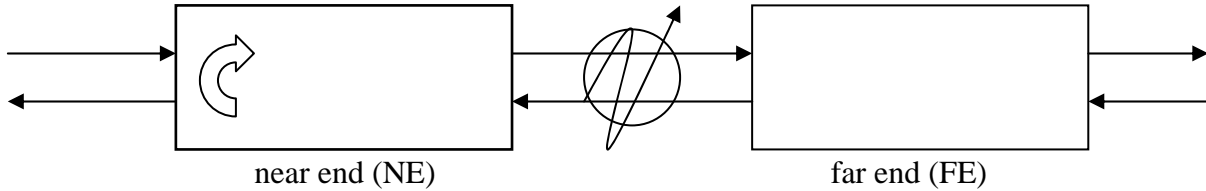
* RRLB (Request optical remote loop back)



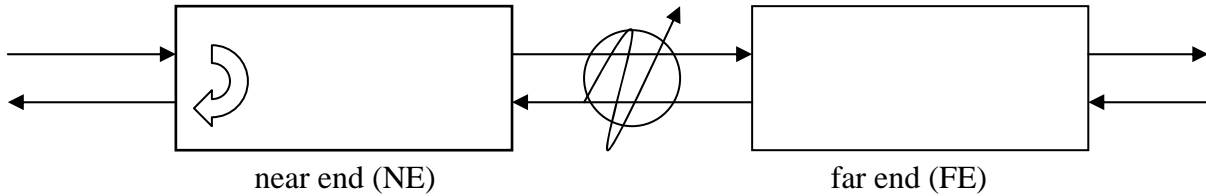
Chapter 5. Loop Back Testing

5.2.2 E1/T1 4-Channel Port Card Loop Back

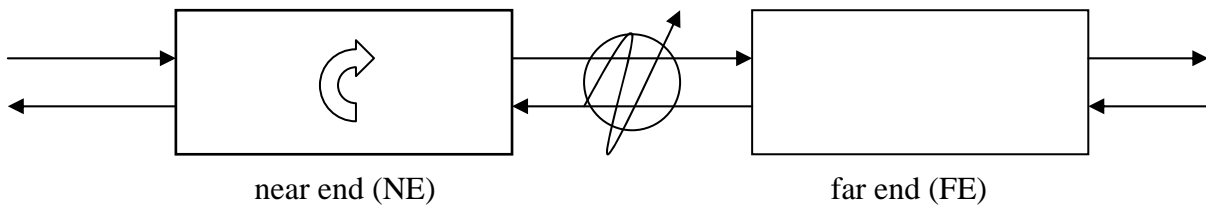
* LLB (T1/E1 local loop back)



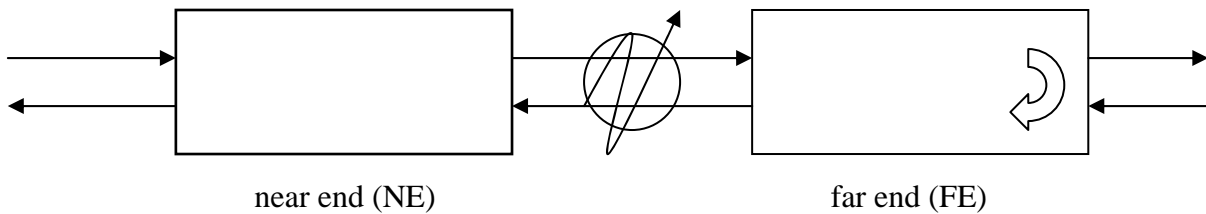
* NELLB (near end local loop back)



* RLB (T1/E1 remote loop back)



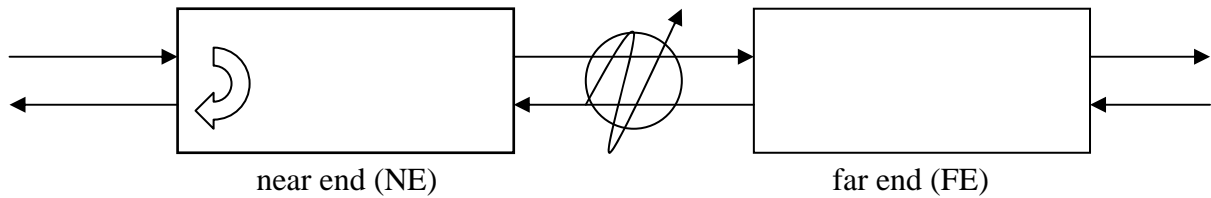
* RRLB (request T1/E1 remote loop back)



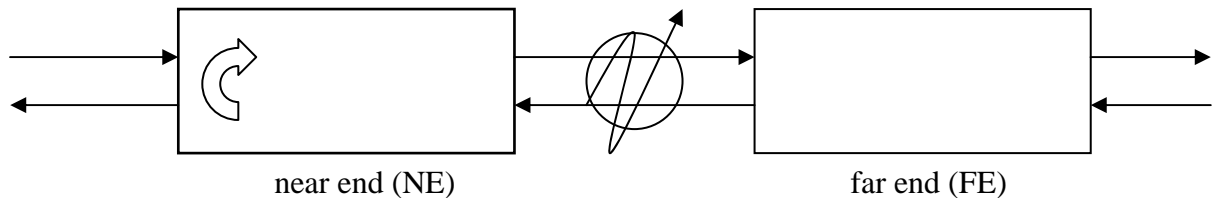
Chapter 5. Loop Back Testing

5.2.3 Datacom (RS-530, V.35, X.21, RS-449, RS-232) 4-Channel Port Card Loop Back

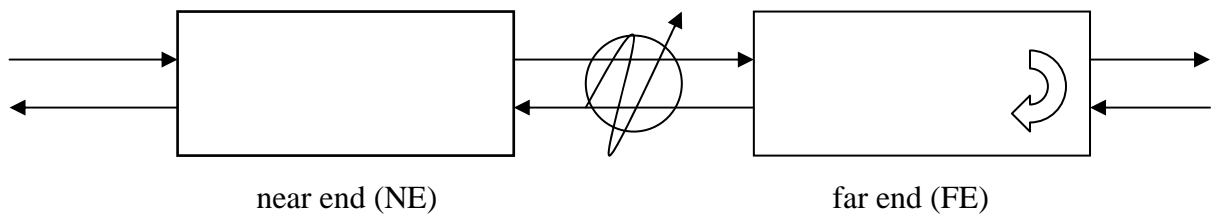
* LLB (local loop back)



* RLB (remote loop back)



* V54up (V.54 remote loop back)



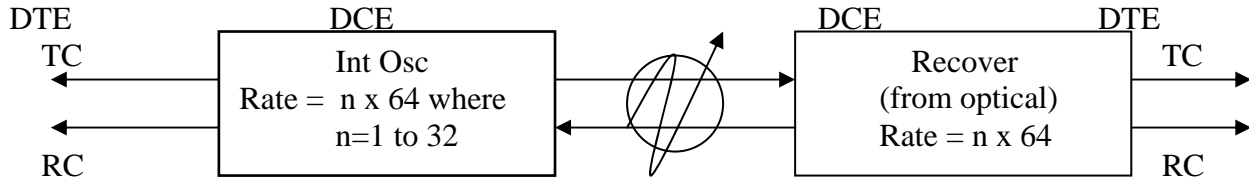
* V54dn will release the remote loop back

Set the clock "Rate" on all units in any configuration to equal the actual transmission rate. Without proper setting, the loop back functions will not operate properly.

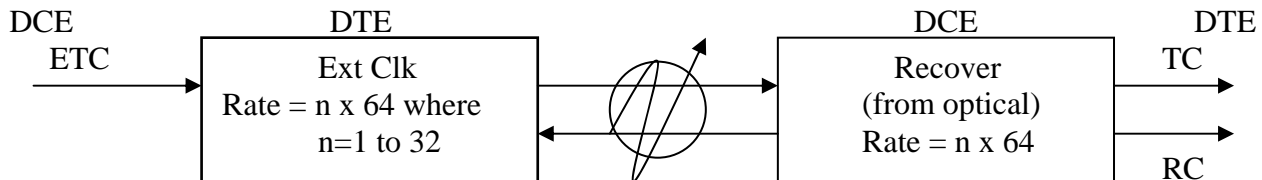
Chapter 5. Loop Back Testing

5.2.4 Datacom (RS-530, V.35, X.21, RS-449, RS-232) 4-Channel Port Card Timing

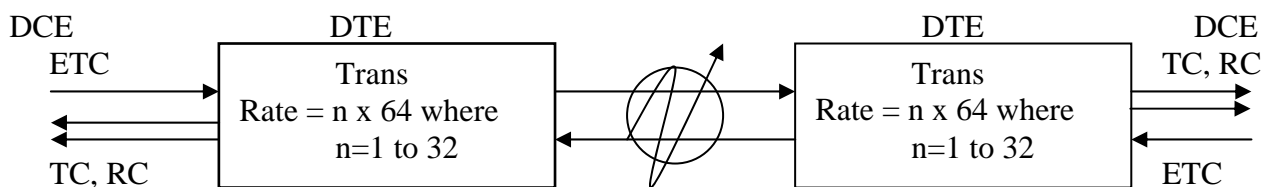
FMUX is DCE and provides clocks to connected DTEs (Internal Timing)



FMUX is placed between existing DCE and DTE (External Timing)



FMUX is placed between two DCE devices (Transparent Timing)



Chapter 6. SNMP Operation

6.1 General

The Simple Network Management Protocol (SNMP) is one of many protocols in the Internet Protocol (IP) suite. SNMP is the protocol recommended specifically for the exchange of management information between hosts residing on IP networks. Network management allows you to monitor and control network devices remotely using conventional computer network technology.

The SNMP management functions of the **Fiber Multiplexer** are provided by an internal SNMP agent, which utilizes out-of-band communication over standard 10Base-T or 100Base-TX Ethernet. The SNMP agent is compliant with the SNMPv1 standard. SNMP communications use the User Datagram Protocol (UDP). UDP is a connectionless transport protocol, part of the TCP/IP suite. The SNMP application uses an asynchronous command/response polling protocol and operates at the OSI Layer 7 (Layer 7 is the Application Layer. Other IP applications that operate at this layer are FTP, Telnet, HTTP, SMTP, etc.). All management traffic is initiated by the SNMP-based network management station. Only the addressed managed entity (agent) answers the polling of the management station (except for trap messages).

6.2 SNMP Operations

The SNMP protocol includes four types of operations:

| | |
|-----------------------|--|
| getRequest | Command for retrieving specific value of an "instance" from the managed node. The managed node responds with a getResponse message. |
| getNextRequest | Command for retrieving sequentially specific management information from the managed node. The managed node responds with a getResponse message. |
| setRequest | Command for manipulating the value of an "instance" within the managed node. The managed node responds with a getResponse message. |
| trap | Management message carrying unsolicited information on extraordinary events (that is, events which occurred not in response to a management operation) reported by the managed node. |

Chapter 6. SNMP Operation

6.3 The Management Information Base

The management information base (MIB) includes a collection of managed objects. Managed objects are defined as parameters that can be managed, such as specific information on device configuring or on performance statistics values.

The MIB includes the definitions of relevant managed objects (MIB variables) for the specific node. Various MIB's can be defined for various management purposes, types of equipment, etc. The management data itself is a collection of integer, string and MIB address variables that contain all the information necessary to manage the node.

A leaf object's definition includes the range of instances (values) and the "access" rights:

| | |
|----------------|--|
| Read-only | Instances of an object can be read, but cannot be set. |
| Read-write | Instances of an object can be read or set. |
| Write-only | Instances of an object can be set, but cannot be read. |
| Not accessible | Instances of an object cannot be read, nor set. |

6.4 MIB Structure

The MIB has an inverted tree-like structure (root over leaves), with each definition of a managed instance forming one leaf, located at the end of a branch of that tree. Each "leaf" in the MIB is reached by a unique path, therefore by numbering the branching points, starting with the top, each leaf can be uniquely defined by a sequence of numbers. The formal description of the managed objects and the MIB structure is provided in a special standardized format, called Abstract Syntax Notation 1, or ASN.1 (pronounced A-S-N dot one).

Since the general collection of MIB's can also be organized in a similar structure, under the supervision of the Internet Activities Board (IAB), any parameter included in a MIB that is recognized by the IAB is uniquely defined.

To provide the flexibility necessary in a global structure, MIB's are classified in various classes (branches), one of them being the experimental branch, another being the management (mgmt) branch, and yet another the group of private (enterprise-specific) branch. Under the private enterprise-specific branch of MIB's, each enterprise (manufacturer) can be assigned a number, which is its enterprise number. The assigned number designates the top of an enterprise-specific sub-tree of non-standard MIB's.

Chapter 6. SNMP Operation

Enterprise-specific MIB's are published and distributed by their creators, who are responsible for their contents.

The MIB supported by the **Fiber Multiplexer** SNMP Agent follows RFC 1158 (MIB-II standard).

6.5 SNMP Communities

To enable the delimitation of management domains, SNMP uses "communities". Each community is identified by a name, which is an alphanumeric string of up to 255 characters defined by the user. Any SNMP entity (this term includes both managed nodes and management stations) is assigned by its user a community name. In parallel, the user defines for each SNMP entity a list of the communities which are authorized to communicate with it, and the access rights associated with each community (this is the SNMP community name table of the entity).

In general, SNMP agents support two types of access rights:

| | |
|------------|--|
| Read-only | the SNMP agent accepts and processes only SNMP getRequest and getNextRequest commands from management stations which have a read-only community name. |
| Read-write | the SNMP agent accepts and processes all the SNMP commands received from a management station with a read-write community name. SNMP agents are usually configured to send traps to management stations having read-write communities. |

6.6 Configuring the SNMP Agent

The agent for the **Fiber Multiplexer** resides in the SNMP option card installed in the **Fiber Multiplexer**. Configuration of the agent is accomplished via the RS-232 Control Port of the **Fiber Multiplexer**. From the Define System Parameter menu select "9", SNMP Agent.

Chapter 6. SNMP Operation

Connect a terminal to console port as usual. Next, login to the local unit.

```
*****
****                                     ****
****          CONSOLE MODE   Ver 2.03    ****
****                                     ****
*****
```

1. Local Login
2. Remote Login

Press the "1" key to enter into the Local Unit Terminal Mode. The main "LOCAL" root menu will be displayed as follows.

```
LOCAL *****
****                                     ****
****          CONSOLE MODE   Ver 2.03    ****
****                                     ****
*****
```

0. Logout
1. Display Multiplexer Status
2. Define System Parameter
3. Alarm Buffer Display
4. Performance Display
5. ACO (Alarm Cut-Off)

Please select the item number.

Note that the upper left corner will display the word "LOCAL" in inverse text, indicating that the Terminal Mode connection is to the local unit and not the remote unit. If this is our first time connecting and we wish to configure or check the unit's configuration, we can directly enter the "Define System Parameter" menu by pressing "2". The following menu will be displayed.

```
LOCAL          <<< Define System >>>
```

1. System Config
2. Optical Port Config
3. Port 1 Config. [E1 120]
4. Port 2 Config. [E1 75]
5. Port 3 Config. [T1 100]
6. Port 4 Config. [N/A]
7. Alarm Threshold
8. Date & Time
9. SNMP Card Config

Please select the item or <ESC> to previous menu.

Chapter 6. SNMP Operation

Press "9" to enter the SNMP Card Configuration menu.

```
LOCAL          <<< SNMP Card Config >>>
```

1. SNMP Agent Config
2. Manager Config
3. TFTP and Flash
4. Save and Restart

Please select the item or <ESC> to previous menu.

Under item 1, "SNMP Agent Config", the parameters for the local SNMP agent (the internal SNMP card) can be configured. This includes the IP address, subnet mask, and gateway for the card as well as the IP address and server path to the TFTP server for upgrade purposes.

Press "1" to enter the SNMP agent configuration menu.

```
LOCAL          <<< SNMP Agent Config >>>
```

1. IP Address [0. 0. 0. 0]
2. Subnet Mask [0. 0. 0. 0]
3. Gateway IP [0. 0. 0. 0]
4. TFTP Server IP [0. 0. 0. 0]
5. TFTP Server Path []

Please select the item or <ESC> to previous menu.

Item number 1, IP address is the IP address that the SNMP card will answer to when "pinged", Telnet'd, TFTP'd or when accessed by SNMP.

Item number 2, is the subnet mask for the network that the card is attached to.

Item number 3, is the default gateway for the network that the card is attached to and is required if the Fiber Multiplexer is to be managed from a different subnet.

Item number 4, is the IP address of a server running the TFTP protocol (trivial FTP) used for updating the SNMP firmware image in the SNMP card.

Item number 5, is the path and filename of the image file that the SNMP card will download when the TFTP upgrade function is called.

After setting, exit the Agent configuration menu with <ESC> and then save the settings by selecting item "4" from the SNMP Card Config menu or continue to Manager Config.

HINT: when entering IP addresses, enter without "dots" and include any leading zeros. For example, the above IP address 172.24.1.11 would be entered as 172024001011 while 10.0.0.1 would be entered as 010000000001.

Remember, when setting the "server path" information for a UNIX or LINUX based server, the upper and lower case must be correctly observed. Also remember that UNIX path separators use "/" while Windows uses "\" to separate path directories.

Chapter 6. SNMP Operation

6.7 Configure the SNMP Manager

From the SNMP Card Config menu, select item "2", Manager Config. Manager configuration is required to tell the agent (the SNMP card) who has authority to access the SNMP via "Get" commands (read) or "Set" commands (write) and where to send "trap" messages (unsolicited messages that are usually generated by alarms in the Fiber Multiplexer).

LOCAL

<<< Manager Config >>>

```
1. Access IP #1           [172. 24.  1.126] [Community #1] [Trap]
2. Access IP #2           [192.168.  0. 15] [Community #2] [Trap]
3. Access IP #3           [192.168.  0.125] [Community #2]
4. Access IP #4           [192.168.  0. 53] [Community #2]
5. Community String #1 (R/W) [secret]
6. Community String #2 (Read) [public]
```

Please select the item or <ESC> to previous menu.

The manager configuration has the ability to setup access for up to four (4) different management workstations. The community strings act like passwords in dealing with the device via SNMP protocol. By changing the community strings (numbered 1 & 2) for read / write ('secret' in this case) and read only ('public') access, and assigning a community string to an access IP, an administrator can control access to the Fiber Multiplexer.

Note that in the above example, the management workstation with IP address 172.24.1.126 and using the community string 'secret', has full read and write access and receives traps. The management station at 192.168.0.15 has read only privileges when using the community string 'public' and can also receive trap messages. The other two stations at Access IP 3&4 have read only access and do not receive any trap messages. After all settings have been made, <ESC> to the SNMP Card Config menu and do "Save and Restart".

6.8 Save and Restart SNMP

<<< SNMP Card Config >>>

```
1. SNMP Agent Config
2. Manager Config
3. TFTP and Flash
4. Save and Restart
```

When selecting item "4", the card will immediately do a save of the configuration and then reboot the SNMP card.

Save to SNMP Card

Wait

Restart SNMP Card

CAUTION: It is imperative that power not be interrupted while the SNMP card is saving the configuration to flash memory. Failure of power may result in scrambled flash contents and an SNMP card in an un-usable state.

Chapter 6. SNMP Operation

6.9 SNMP Upgrade via TFTP

To upgrade the SNMP firmware, configure a TFTP server on your network. Configuring a TFTP server is beyond the scope of this document. Place the upgrade binary file on the server and set the IP address and path of the server in the SNMP agent. Refer to 6.6 for configuring the SNMP card for TFTP upgrading. From the main SNMP configuration menu, select item #3 to start the upload and upgrade process.

For any changes to be remembered in the agent, please select item #4 to "Save and Reset".
DO NOT INTERRUPT POWER DURING SAVE OPERATION OR THE FLASH MEMORY MAY BECOME CORRUPT.

6.10 SNMP Object Details

| Object ID | Object ID Description | Values | Note |
|-----------------------------|------------------------|--|--|
| local_system | | | |
| local_System-External-Clock | External clock | clock_Off(0) clock_E1-PCM(1) clock_E1-TTL(2) clock_T1-PCM(3) clock_T1-TTL(4) clock_X-TAL(5) error_Nocard(254) | Cannot be set unless external clock option installed |
| local_Alarm-Relay | Alarm relay | relay-Both(0) relay-Audible(1) relay-Visible(2) relay-All_Off(3) | |
| local_Active | Save/load user setting | active-None(0) active-Save_User_Setting(1) active-Load_Default_Setting(2) active-Load_User_Setting(3) | |
| local_Clear-Alarm | Clear alarm | alarm-None(0) alarm-Clear_Alarm(1) | |
| local_Status-LED-1 | LED Status | [Fail:OF] Failure [Opti(G):ON] Optical green [Opti(R):OF] Optical red [T1(G):ON] T1 green [T1(R):OF] T1 red [E1(G):ON] E1 green [E1(R):OF] E1 red | (Read Only) OF=off ON=on BL=blinking |
| local_Status-LED-2 | LED Status | [ACO:OF] Alarm Cut Off [Opti-1:ON] Optical 1 [Opti-2:ON] Optical 2 [Minor:OF] Minor Alarm [Major:OF] Major Alarm [Far End:OF] Far End Error [Near End:OF] Near End Error | (Read Only) |

Chapter 6. SNMP Operation

| | | | |
|-------------------------------|-------------------------------------|--|------------------------|
| local_FPGA-Version | System Version | Ver2.03 | (Read Only) |
| local_interface-Card-Type | Local MUX interfaces installed | [Opti:1 + 1] [Port 1:E1 75] [Port 2:T1] [Port 3:X.21] [Port 4:LAN-100M/Full] | (Read Only) |
| local_Optical-Port | | | |
| local_Optical-1 | Optical Port on/off | optical-1_Working(0) optical-2_Off(1) | |
| local_Optical-2 | Optical Port on/off | optical-1_Standby(0) optical-2_Off(1) | |
| local_ALS | Auto laser switch off | als_Auto(0) als_Disable(1) | |
| local_loopback.0 | Optical Port loop back on/off | loopback_Off(0) loopback_LLBB(1) loopback_RLB(2) loopback_RRLB(3) | |
| local_port-1 | (local_p1-E1T1) | (local_p1_e1t1_ChA) | |
| local_p1cha_e1t1_Service | E1/T1 channel A setting, service | service_On(0) service_Off(1) error_LanCard(252) error_WrongType(253) error_Nocard(254) | same for Ch A-D, E1/T1 |
| local_p1cha_e1t1_Line-Code | E1/T1 channel A setting, line code | line-code_HDB3-B8ZS(0) line-code_AMI(1) error_LanCard(252) error_WrongType(253) error_Nocard(254) | same for Ch A-D, E1/T1 |
| local_p1cha_e1t1_Loopback | E1/T1 channel A setting, loop back | loopback_Off(0) loopback_LLBB(1) loopback_NELLB(2) loopback_RLB(3) loopback_RRLB(4) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_p1cha_e1t1_LED-status.0 | E1/T1 channel A setting, LED status | led_Off(0) led_On(1) led_Blink(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | (Read Only) |
| local_port-1 | (local_p1-Data) | (local_p1_Data-Comm_ChA) | |
| local_p1cha_data-comm-Service | Data channel A setting, service | service_On(0) service_Off(1) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |

Chapter 6. SNMP Operation

| | | | |
|---------------------------------|-----------------------------------|---|--|
| local_plcha_data-comm_Data-Rate | Data channel A setting, data rate | data-rate_2048(0) data-rate_64(1) data-rate_128(2) data-rate_192(3) data-rate_256(4) data-rate_320(5) data-rate_384(6) data-rate_448(7) data-rate_512(8) data-rate_576(9) data-rate_640(10) data-rate_704(11) data-rate_768(12) data-rate_832(13) data-rate_896(14) data-rate_960(15) data-rate_1024(16) data-rate_1088(17) data-rate_1152(18) data-rate_1216(19) data-rate_1280(20) data-rate_1344(21) data-rate_1408(22) data-rate_1472(23) data-rate_1536(24) data-rate_1600(25) data-rate_1664(26) data-rate_1728(27) data-rate_1792(28) data-rate_1856(29) data-rate_1920(30) data-rate_1984(31) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_plcha_data-comm_Timing | Data channel A setting, timing | timing_Trans(0) timing_Recovery(1) timing_Ext-CLK(2) timing_Int-OSC(3) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_plcha_data-comm_Loopback | Data channel A setting, loop back | loopback_Off(0) loopback_V54_Down(1) loopback_V54_UP(2) loopback_LL(3) loopback_RLB(4) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |

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| | | | |
|-----------------------------------|------------------------------------|--|-------------|
| local_p1cha_data-comm_CTS | Data channel A setting, CTS | cts_On(0) cts_RTS(1) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_p1cha_data-comm_LED-Status | Data channel A setting, LED status | led_Off(0) led_On(1) led_Blink(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_Date_Time | | | |
| local_Date | System Date | Change from LCD | (Read Only) |
| local_Time | System Time | Change from LCD | (Read Only) |
| local_Performance | | | |
| local_performance_Optical | optical performance | Line-[CV: 0] [ES: 0] Path-[CV: 0] [ES: 0] [SES: 0] [UAS: 0] | (Read Only) |
| local_performance_P1-ChA | channel performance | Line-[CV: 0] [ES: 0] Path-[CV: 0] [ES: 0] [SES: 0] [UAS: 0] | (Read Only) |
| ...continue P1~4, ChA~D | | | |
| local_performance_index | history index | [Integer] | (0~95) |
| local_performance_history_optical | optical history | Line-[CV: 0] [ES: 0] Path-[CV: 0] [ES: 0] [SES: 0] [UAS: 0] | (Read Only) |
| local_performance_history_P1-ChA | channel history | Line-[CV: 0] [ES: 0] Path-[CV: 0] [ES: 0] [SES: 0] [UAS: 0] | (Read Only) |
| ...continue P1~4, ChA~D | | | |
| local_alarm-threshold | | | |
| local_CV | CV alarm threshold | cv_255(0) cv_2048(1) cv_65535(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |

Chapter 6. SNMP Operation

| | | | |
|--|------------------------|--|--|
| local_alarm-Threshold (continued) local_ES | ES alarm threshold | es_300s(0) es_600s(1) es_900s(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_SES | SES alarm threshold | ses_300s(0) ses_600s(1) ses_900s(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| local_UAS | UAS alarm threshold | uas_300s(0) uas_600s(1) uas_900s(2) error_LanCard(252) error_WrongType(253) error_Nocard(254) | |
| (end of local branch) | | | |
| remote_System | | | |
| (identical to local branch) | | | |

Chapter 6. SNMP Operation

6.11 SNMP Trap Messages

Trap messages:

| | | |
|-----------------------------|-----------------------------|--------------------------|
| Alarm Buffer Empty | Optical 1 Signal Loss ON | Port 4-Ch A Loopback ON |
| Power Turn On | Optical 1 Signal Loss OFF | Port 4-Ch A Loopback OFF |
| Power 1 Fail | Optical 2 Signal Loss ON | Port 4-Ch B Loopback ON |
| Power 2 Fail | Optical 2 Signal Loss OFF | Port 4-Ch B Loopback OFF |
| Alarm Cut-Off | Ext Clock Signal Loss ON | Port 4-Ch C Loopback ON |
| LCD Local Side Login | Ext Clock Signal Loss OFF | Port 4-Ch C Loopback OFF |
| LCD Local Side Logout | Port 1-Ch A E1/T1 BPV Error | Port 4-Ch D Loopback ON |
| LCD Remote Side Login | Port 1-Ch B E1/T1 BPV Error | Port 4-Ch D Loopback OFF |
| LCD Remote Side Logout | Port 1-Ch C E1/T1 BPV Error | Optical 1 Loopback ON |
| Terminal Local Side Login | Port 1-Ch D E1/T1 BPV Error | Optical 1 Loopback OFF |
| Terminal Local Side Logout | Port 2-Ch A E1/T1 BPV Error | Optical 2 Loopback ON |
| Terminal Remote Side Login | Port 2-Ch B E1/T1 BPV Error | Optical 2 Loopback OFF |
| Terminal Remote Side Logout | Port 2-Ch C E1/T1 BPV Error | Op1 ALS ON |
| Port 1-Ch A Signal Loss ON | Port 2-Ch D E1/T1 BPV Error | Op1 ALS OFF |
| Port 1-Ch A Signal Loss OFF | Port 3-Ch A E1/T1 BPV Error | Op2 ALS ON |
| Port 1-Ch B Signal Loss ON | Port 3-Ch B E1/T1 BPV Error | Op2 ALS OFF |
| Port 1-Ch B Signal Loss OFF | Port 3-Ch C E1/T1 BPV Error | Op2 Worked |
| Port 1-Ch C Signal Loss ON | Port 3-Ch D E1/T1 BPV Error | System Fail |
| Port 1-Ch C Signal Loss OFF | Port 4-Ch A E1/T1 BPV Error | Op1 Removed |
| Port 1-Ch D Signal Loss ON | Port 4-Ch B E1/T1 BPV Error | Op2 Removed |
| Port 1-Ch D Signal Loss OFF | Port 4-Ch C E1/T1 BPV Error | Op1 Insert |
| Port 2-Ch A Signal Loss ON | Port 4-Ch D E1/T1 BPV Error | Op2 Insert |
| Port 2-Ch A Signal Loss OFF | Port 1-Ch A Loopback ON | ES exceed |
| Port 2-Ch B Signal Loss ON | Port 1-Ch A Loopback OFF | SES exceed |
| Port 2-Ch B Signal Loss OFF | Port 1-Ch B Loopback ON | UAS exceed |
| Port 2-Ch C Signal Loss ON | Port 1-Ch B Loopback OFF | |
| Port 2-Ch C Signal Loss OFF | Port 1-Ch C Loopback ON | |
| Port 2-Ch D Signal Loss ON | Port 1-Ch C Loopback OFF | |
| Port 2-Ch D Signal Loss OFF | Port 1-Ch D Loopback ON | |
| Port 3-Ch A Signal Loss ON | Port 1-Ch D Loopback OFF | |
| Port 3-Ch A Signal Loss OFF | Port 2-Ch A Loopback ON | |
| Port 3-Ch B Signal Loss ON | Port 2-Ch A Loopback OFF | |
| Port 3-Ch B Signal Loss OFF | Port 2-Ch B Loopback ON | |
| Port 3-Ch C Signal Loss ON | Port 2-Ch B Loopback OFF | |
| Port 3-Ch C Signal Loss OFF | Port 2-Ch C Loopback ON | |
| Port 3-Ch D Signal Loss ON | Port 2-Ch C Loopback OFF | |
| Port 3-Ch D Signal Loss OFF | Port 2-Ch D Loopback ON | |
| Port 4-Ch A Signal Loss ON | Port 2-Ch D Loopback OFF | |
| Port 4-Ch A Signal Loss OFF | Port 3-Ch A Loopback ON | |
| Port 4-Ch B Signal Loss ON | Port 3-Ch A Loopback OFF | |
| Port 4-Ch B Signal Loss OFF | Port 3-Ch B Loopback ON | |
| Port 4-Ch C Signal Loss ON | Port 3-Ch B Loopback OFF | |
| Port 4-Ch C Signal Loss OFF | Port 3-Ch C Loopback ON | |
| Port 4-Ch D Signal Loss ON | Port 3-Ch C Loopback OFF | |
| Port 4-Ch D Signal Loss OFF | Port 3-Ch D Loopback ON | |
| | Port 3-Ch D Loopback OFF | |

Technical Inquiry Form

MODEL No.: FMUX01A

Please fill in the configuration settings with '✓' marks into the following table. Send it to us by fax, and we will reply to you immediately.

| | |
|--|---------------------|
| Firmware Version: _____ | FPGA Version: _____ |
| (Press the ESC key from the 'SYSTEM CONFIG' display on the LCD.) | |

| | | |
|----------------------------|---------------------|-----------|
| Installed Options (if any) | External Clock Card | SNMP Card |
|----------------------------|---------------------|-----------|

| | | | | | |
|------------|--------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|
| Optical | | | ALS: | <input type="checkbox"/> Auto | <input type="checkbox"/> Disable |
| Opti 1: | <input type="checkbox"/> Work | <input type="checkbox"/> Off | Opti 2: | <input type="checkbox"/> Standby | <input type="checkbox"/> Disable |
| Type: | <input type="checkbox"/> 2KM-M | <input type="checkbox"/> 15KM-S | <input type="checkbox"/> 30KM-S | <input type="checkbox"/> 50KM-S | <input type="checkbox"/> 120KM-S |
| Connector: | <input type="checkbox"/> ST | <input type="checkbox"/> SC | <input type="checkbox"/> FC | <input type="checkbox"/> LC | <input type="checkbox"/> MT-RJ |
| Loopback: | <input type="checkbox"/> Off | <input type="checkbox"/> LLB | <input type="checkbox"/> RLB | <input type="checkbox"/> RRLB | |

| | | | | |
|---|---|---|---|--|
| PORT Card 1 | <input type="checkbox"/> G.703 E1 | <input type="checkbox"/> T1 (DS1) | <input type="checkbox"/> Datacomm | <input type="checkbox"/> Bridge |
| Channel A | Channel B | Channel C | Channel D | |
| Service | Service | Service | Service | |
| <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | |
| Line Code | Line Code | Line Code | Line Code | |
| <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | |
| Loop Back: | <input type="checkbox"/> Off | <input type="checkbox"/> LLB | <input type="checkbox"/> NELLB | <input type="checkbox"/> RLB <input type="checkbox"/> RRLB |

| | | | | |
|---|---|---|---|--|
| PORT Card 2 | <input type="checkbox"/> G.703 E1 | <input type="checkbox"/> T1 (DS1) | <input type="checkbox"/> Datacomm | <input type="checkbox"/> Bridge |
| Channel A | Channel B | Channel C | Channel D | |
| Service | Service | Service | Service | |
| <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | |
| Line Code | Line Code | Line Code | Line Code | |
| <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | |
| Loop Back: | <input type="checkbox"/> Off | <input type="checkbox"/> LLB | <input type="checkbox"/> NELLB | <input type="checkbox"/> RLB <input type="checkbox"/> RRLB |

| | | | | |
|---|---|---|---|--|
| PORT Card 3 | <input type="checkbox"/> G.703 E1 | <input type="checkbox"/> T1 (DS1) | <input type="checkbox"/> Datacomm | <input type="checkbox"/> Bridge |
| Channel A | Channel B | Channel C | Channel D | |
| Service | Service | Service | Service | |
| <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | |
| Line Code | Line Code | Line Code | Line Code | |
| <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | |
| Loop Back: | <input type="checkbox"/> Off | <input type="checkbox"/> LLB | <input type="checkbox"/> NELLB | <input type="checkbox"/> RLB <input type="checkbox"/> RRLB |

| | | | | |
|---|---|---|---|--|
| PORT Card 4 | <input type="checkbox"/> G.703 E1 | <input type="checkbox"/> T1 (DS1) | <input type="checkbox"/> Datacomm | <input type="checkbox"/> Bridge |
| Channel A | Channel B | Channel C | Channel D | |
| Service | Service | Service | Service | |
| <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | <input type="checkbox"/> ON <input type="checkbox"/> OFF | |
| Line Code | Line Code | Line Code | Line Code | |
| <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | <input type="checkbox"/> AMI <input type="checkbox"/> HDB3/B8Z3 | |
| Loop Back: | <input type="checkbox"/> Off | <input type="checkbox"/> LLB | <input type="checkbox"/> NELLB | <input type="checkbox"/> RLB <input type="checkbox"/> RRLB |