USER MANUAL

FMUX-01

Fiber Optical Multiplexer
Standalone / Rack Type
4, 8, 12 or 16 Channel
G.703 E1, T1 (DS1)
Datacom V.35, X.21, RS-530, RS-449, RS-232
Ethernet 10/100Base-TX Bridge
SNMP Manageable

CTC union **CTC Union Technologies Co., Ltd.**

The information contained in this document is subject to change without prior notice.

FMUX-01 4, 8, 12, 16 E1, T1, Datacom, and 10/100Base-TX Bridge
Installation and Operation Manual
Version 1.0a Nov 2002 Pilot Release
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This manual supports the following models:

FMUX-01

This document is the first official release manual. It tries to follow what the final release model will be as closely as possible. However, as of this printing date, many features such as SNMP, Datacom Port Cards, and Ethernet Bridge Port Card were still under development. Please check CTC Union's website for any updated manual or contact us by E-mail at info@ctcu.com. Please address any comments for improving this manual or to point out omissions or errors to marketing@ctcu.com. Thank you.

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Chapter 1. Introduction

1.1 General

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

The **MULTIPLEXER UNIT** is a 1U (1.75") high standalone or 19" rack mountable E1/T1/Data/LAN Bridge multiplexer over fiber link, built upon a highly modular design. The **MULTIPLEXER UNIT** provides an economic optical connection solution in high-density E1 and/or T1 installations such as between central offices. By utilizing a modular design, a large variety of configurations may be realized and the unit may be custom tailored for each specific application. The 4-CHANNEL E1, T1, V.35 (X.21/RS-530/RS-449) data, Ethernet Bridge Port cards and optical interface card are all optional. The standard unit is a chassis with local control and provisions for single or dual power. The appropriate optical interface card may be selected to support multi-mode or single-mode fiber cable operation, with or without redundancy. Optical interface connections may be chosen from a wide variety of connectors including ST™, SC, FC, LC, or MT-RJ. WDM (Wave Division Multiplexing) optical interfaces are also available. The range of transmission for optical connection is from 2Km (for multi-mode) up to 120Km (single mode). Optional **External Clock Card** (external or internal clock source) and **SNMP Card** (for local and remote management purposes) may be installed in the chassis.

1.2 Functional Description

The **MULTIPLEXER UNIT** basic chassis is available in five power supply configurations. Depending on the model, power may be derived from single AC 100~240VAC, single DC +20~60VDC, dual AC 100~240VAC, dual DC +20~60VDC, or AC plus DC power sources. The **MULTIPLEXER UNIT** provides all Line Card connections on the rear panel. There are 4 slots available for installation of **4-CHANNEL E1** or **T1 Port Cards** (G.703 E1/T1), **4-CHANNEL Data Port Cards**, or **Single-CHANNEL Ethernet Bridge LAN Port Cards** into the **MULTIPLEXER UNIT** chassis. Each 4-CHANNEL Port Card provides 4 individual channels of E1, T1, or Datacom per Port Card. The first release of the **Single-CHANNEL Ethernet Bridge LAN Port Card** provides one 2048kbps WAN link for 10/100Base Ethernet bridging. A later release version will provide full 8Mbps (E1 x 4) link speed.

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 2048Kbps (transparent unframed E1) each.

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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 1544Kbps (transparent unframed T1) each.

The **4-CHANNEL Data Port Card** provides four standard nx56/nx64Kbps, up to 2048Kbps 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.

When any port card is inserted in a slot, LEDs on the front panel will show both the channel statuses and any alarm indications.

The *MULTIPLEXER UNIT* **E1** and **T1 Interface Cards** fully meet all E1 and T1 specifications including ITU-T G.703, 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 via option SNMP.

Up to five clock source selections are provided. Without the external clock card option, the unit operates from clock recovery only. When the external clock card option is installed, additional clock sources may be selected from an additional internal oscillator (located on the option card) or from an external clock references for E1 PCM, E1 TTL, T1 PCM, or T1 TTL. All E1 and T1 connected equipment must recover or slave their timing to the *MULTIPLEXER UNIT's* internal oscillator or from an external reference clock (with option).

When the *MULTIPLEXER UNIT* 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 Etherenet. If the **SNMP Card** option is not installed, local and remote management are still possible via the units 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.

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The ***MULTIPLEXER UNIT*** also includes the ability to do in-band remote configuration. Once the fiber optic link has been established, the remote unit may be configured or status checked from the local unit using any of the available management options. The following graphic shows the major components which make up the ***MULTIPLEXER UNIT*** (without the External Clock or SNMP options installed).
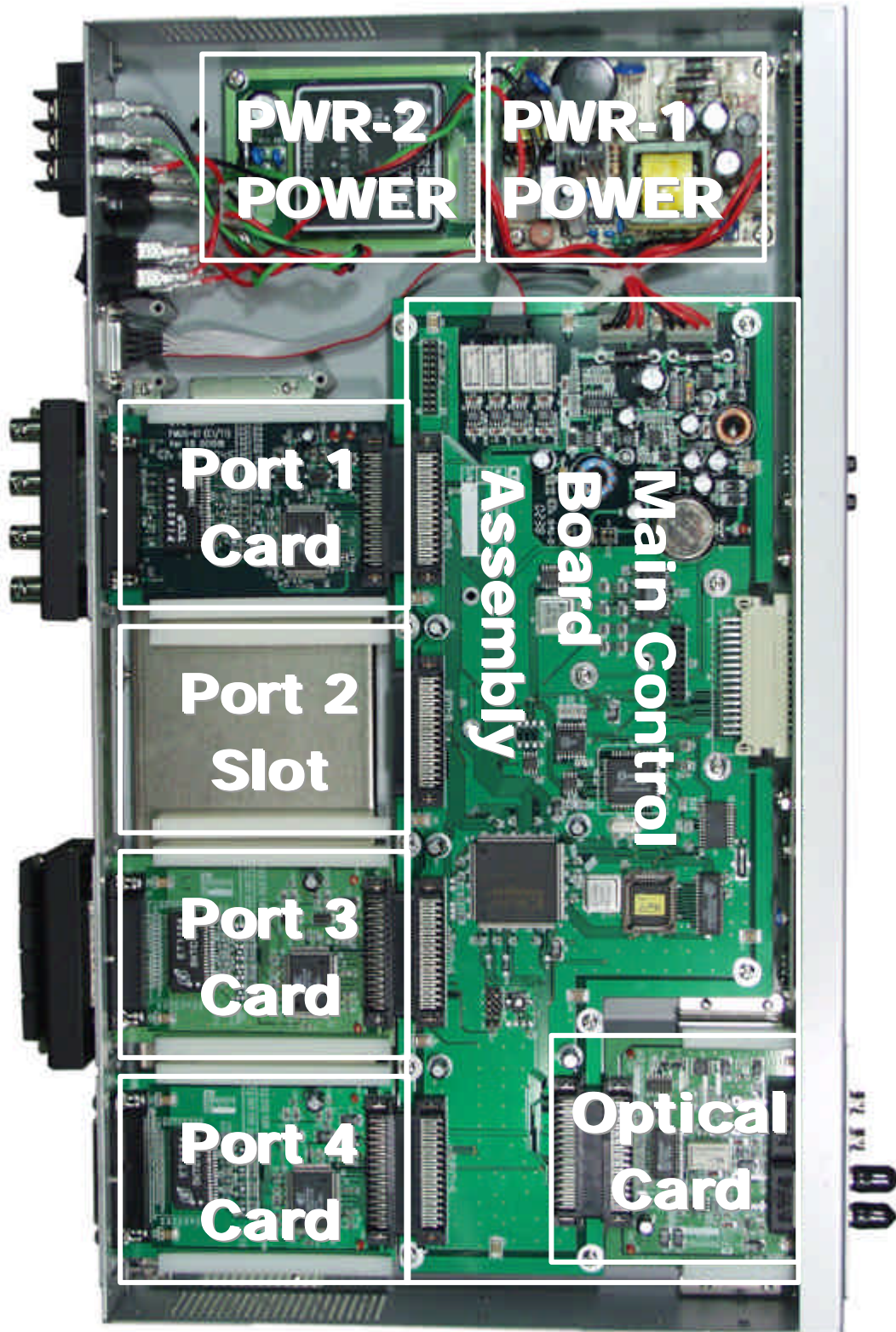
Figure 1-1 : *MULTIPLEXER UNIT* Major Components

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1.3 Technical Specifications

E1 Link

Framing	Unframed (transparent)
Bit Rate	2.048 Mbps
Line Code	AMI
	HDB3
Line Impedance	Unbalanced 75 ohms (BNC)
	Balanced 120 ohms (RJ-45)
Receiver sensitivity	-20dB
"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
Complies With	ITU-T G.703, G.706 and G.732
Interface Connectors	RJ-45
	BNC
Test Loops	LLB (Local Loop Back)
	NELB (Near End Loop Back)
	RLB (Remote Loop Back)
	RRLB (Request Remote Loop Back)

T1 Link

Framing	Unframed (transparent)
Bit Rate	1.544 Mbps
Line Code	AMI
	B8ZS
Line Impedance	Balanced 100 ohms (RJ-45)
Receiver sensitivity	-20dB
"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
Complies With	ITU-T G.703, G.706 and G.733
Interface Connectors	RJ-45
Test Loops	LLB (Local Loop Back)
	NELB (Near End Loop Back)
	RLB (Remote Loop Back)
	RRLB (Request Remote Loop Back)

Data Port Channels

Interface Types	V.35
	X.21
	RS-530/V.36
	RS-449
	RS-232
Interface Connectors	(provided by 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)	$n \times 64$Kbps (64 ~ 2048Kbps)
	where n equal 1 to 32
	RS-232 maximum is 128Kbps
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

Bridge Port Channels

Interface Type	10Base-T, 100Base-TX (auto-negotiation)
Interface Connector	RJ-45
WAN Data Rate	2048Kbps (to 8192Kbps depending on version)
Complies with	IEEE802.3 10Base-T
	IEEE802.3u 100Base-TX
Test Loops	NONE

Local Setup and Configuration

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

Alarm Output Relays

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)

LED Indicators

Power 1	Green	Power Module 1 active
Power 2	Green	Power Module 2 active
Optical 1	RED	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	RED	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 errors
		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	V.24/RS-232 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`

Optical Specifications (redundant fiber has identical specifications as primary)

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

M-M: multi-mode S-M: single-mode
* WDM types must match (A) with (B) in pairs

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).

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

Environment
Temperature	0-50°C / 32-122°F
Humidity	0 to 90% non-condensing

Chapter 1. Introduction

1.4 E1 Signal Structure

E1 link line rate

The E1 line operates at a nominal rate of 2.048Mbps.

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 2.048Mbps 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.

1.5 T1(DS1) Signal Structure

T1 link line rate

The T1 line operates at a nominal rate of 1.544Mbps.

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 1.544Mbps 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.

1.6 Applications / Capabilities

In the following example, the **MULTIPLEXER UNIT** 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 the typical point-to-point application would set all connected E1 or T1 equipment to recovery (receive timing from the **MULTIPLEXER UNITs**).

Fiber optic link
Redundant link option

4,8,12, or 16
G.703 E1 / T1,
V.35/X.21/RS-232/449/530
Data,
or (4) 10/100Base-TX Bridge

4,8,12, or 16
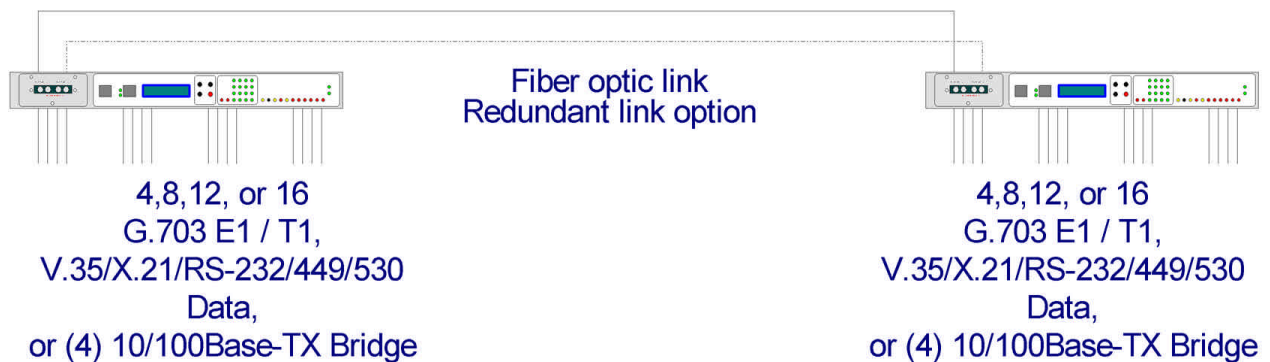G.703 E1 / T1,
V.35/X.21/RS-232/449/530
Data,
or (4) 10/100Base-TX Bridge

Figure 1-2 : Typical Point-to-Point Application of *MULTIPLEXER UNIT*

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Chapter 2. Port Card Overview

2.1 Introduction

This chapter provides brief 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 *MULTIPLEXER UNIT* 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** (and possibly cause permanent damage to the unit).

2.2 Port Card Overview

The **4-Channel Port Cards** for the *MULTIPLEXER UNIT* are modular PCAs which slide into the *MULTIPLEXER UNIT* 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 *MULTIPLEXER UNIT* are modular PCAs which slide into the *MULTIPLEXER UNIT* chassis and provide four completely independent G.703 E1 interfaces. The module 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 *MULTIPLEXER UNIT* are modular PCAs which slide into the *MULTIPLEXER UNIT* chassis and provide four completely independent T1(DS1) interfaces. The module is available with four RJ-45 jacks for 100 Ohm balanced connections.

2.5 External Clock Overview

The *MULTIPLEXER UNIT* is available with an external clock option that allows the unit to be synchronized with external clocks or equipment. The *MULTIPLEXER UNIT* 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.

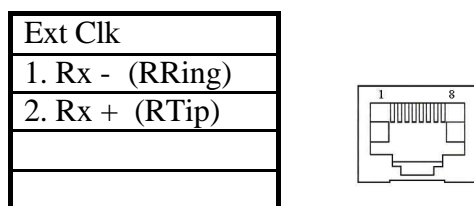| Ext Clk |
|---|
| 1. Rx - (RRing) |
| 2. Rx + (RTip) |
| |
| |

Figure 2-1. External Clock Connector

2.6 4 x Data I/F Module Overview

The 4 x Data 4-Channel Port Cards for the **MULTIPLEXER UNIT** are modular PCAs which slide into the **MULTIPLEXER UNIT** chassis and provide four completely independent Data (V.35, X.21, RS-530, RS-449, or RS-232) interfaces. The Data module is available in one of ten interface and cable options.

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

When the **MULTIPLEXER UNIT** 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) Transmit(B)	2 9	TD(A) TD(B)	To **MUX UNIT**	Serial digital data from DTE.
Receive(A) Receive(B)	4 11	RD(A) RD(B)	Fm. **MUX UNIT**	Serial digital data at the output of the **MULTIPLEXER UNIT** receiver.
Control(A) Control(B)	3 10	RTS(A) RTS(B)	To **MUX UNIT**	A ON signal to the **MULTIPLEXER UNIT** when data transmission is desired.
Indication(A) Indication(B)	5 12	DCD(A) DCD(B)	Fm. **MUX UNIT**	Constantly ON, except when a loss of the received carrier signal is detected.
Ext. Timing(A) Ext. Timing(B)	7 14	ETC(A) ETC(B)	To **MUX UNIT**	A transmitted data rate clock input from the data source.
Signal Timing(A) Signal Timing(B)	6 13	RC(A) RC(B)	Fm. **MUX UNIT**	A received data rate clock for use by an external data source.

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

Chapter 2. Port Card Overview

When the **MULTIPLEXER UNIT** 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 **MULTIPLEXER UNIT** receiver.
Request To Send	C	RTS	To **MUX UNIT**	A ON signal to the **MULTIPLEXER UNIT** 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 **MULTIPLEXER UNIT** into remote loop back.
Local Loopback	JJ	LL	To **MUX UNIT**	When on, commands **MULTIPLEXER UNIT** 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 ***MULTIPLEXER UNIT*** 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 *MULTIPLEXER UNIT* receiver.
Request to Sent	7 25	RS(A) RS(B)	To *MUX UNIT*	A ON signal to the *MULTIPLEXER UNIT* 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 *MULTIPLEXER UNIT* into remote loop back.
Local Loop back	10	LL	To *MUX UNIT*	When on, commands *MULTIPLEXER UNIT* 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

When the *MULTIPLEXER UNIT* 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 *MULTIPLEXER UNIT* receiver.
Request to Sent	4 19	CA(A) CA(B)	To *MUX UNIT*	A ON signal to the *MULTIPLEXER UNIT* 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 *MULTIPLEXER UNIT* into remote loop back.
Local Loop back	18	LL	To *MUX UNIT*	When on, commands *MULTIPLEXER UNIT* 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 **MULTIPLEXER UNIT** 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 *MULTIPLEXER UNIT* receiver.
Request to Sent	4	CA	To *MUX UNIT*	A ON signal to the *MULTIPLEXER UNIT* 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 *MULTIPLEXER UNIT* into remote loop back.
Local Loop back	18	LL	To *MUX UNIT*	When on, commands *MULTIPLEXER UNIT* 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

2.7 Ethernet Bridge Module Overview

When the *MULTIPLEXER UNIT* 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
Real-time filtering with 256 address tables
Automatic address learning, aged and deleted with 5 minutes
Up to 340 packet-buffering capacity
Auto padding 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

BRIDGE SPECIFICATIONS

Compliance:	IEEE 802.3/802.3u
Connector:	Shielded RJ-45
Data Rate:	10/100Mbps; Half Duplex (20/200Mbps; Full duplex)
Filtering and Forwarding:	90,000 packets/sec
Delay:	1 frame
WAN Protocol:	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.

Auto Negotiation:

When this feature is disabled (DIP1-3 ON), the LAN configuration is defined by the Duplex (DIP-4) and Speed (DIP-5) settings. This is the preferred method of configuration, but requires the specific knowledge of the capabilities of the device to which the bridge is connected. Failure to make the proper Ethernet settings can result in reduced LAN performance or in worst case, no LAN function at all. When Auto Negotiation is enabled (DIP-3 OFF), by default, the bridge will try to determine the proper speed and duplexity of the connected device. If the negotiation fails, as it will with a legacy device that doesn't support auto-negotiation, the settings will fallback to 10Mpbs speed and Half Duplex for compatibility.

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 DIP-4 OFF will enable this Full duplex mode. However, if Auto-negotiation is enabled (DIP-3 OFF), then this switch's setting is ignored.

Speed:

DIP-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 DIP-5 is set OFF, the Ethernet connection will operate at 100Base-TX speed. However, if Auto-negotiation is enabled (DIP-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 DIP-6 is ON, this feature is enabled. When this feature is disabled (DIP-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), if auto-negotiation fails, the interface falls back to 10Base-T and half-duplex mode to support legacy Ethernet devices.

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

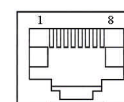| MDI |
|---|
| 1. Tx + |
| 2. Tx - |
| 3. Rx + |
| 6. Rx - |

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 ***MULTIPLEXER UNIT*** Standalone/Rack Mount Fiber Optical Multiplexer.

3.2 Site Preparation

Install the ***MULTIPLEXER UNIT*** 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 ***MULTIPLEXER UNIT*** for signal lines and interface cables.

3.3 Mechanical Assembly

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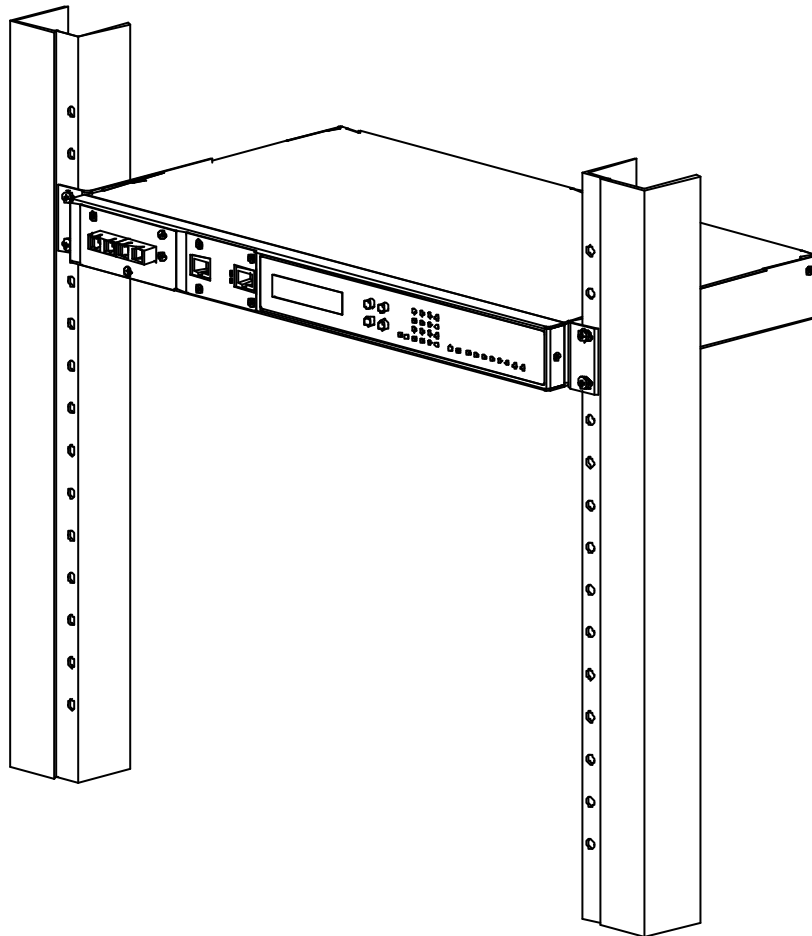

Figure 3-1 : Rack mount Installation of the *MULTIPLEXER UNIT*

3.4 Electrical Installation

3-4-1. Power connection

For a model with AC power supply, AC power (90~250VAC) is supplied to the **MULTIPLEXER UNIT** 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 **MULTIPLEXER UNIT** 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.
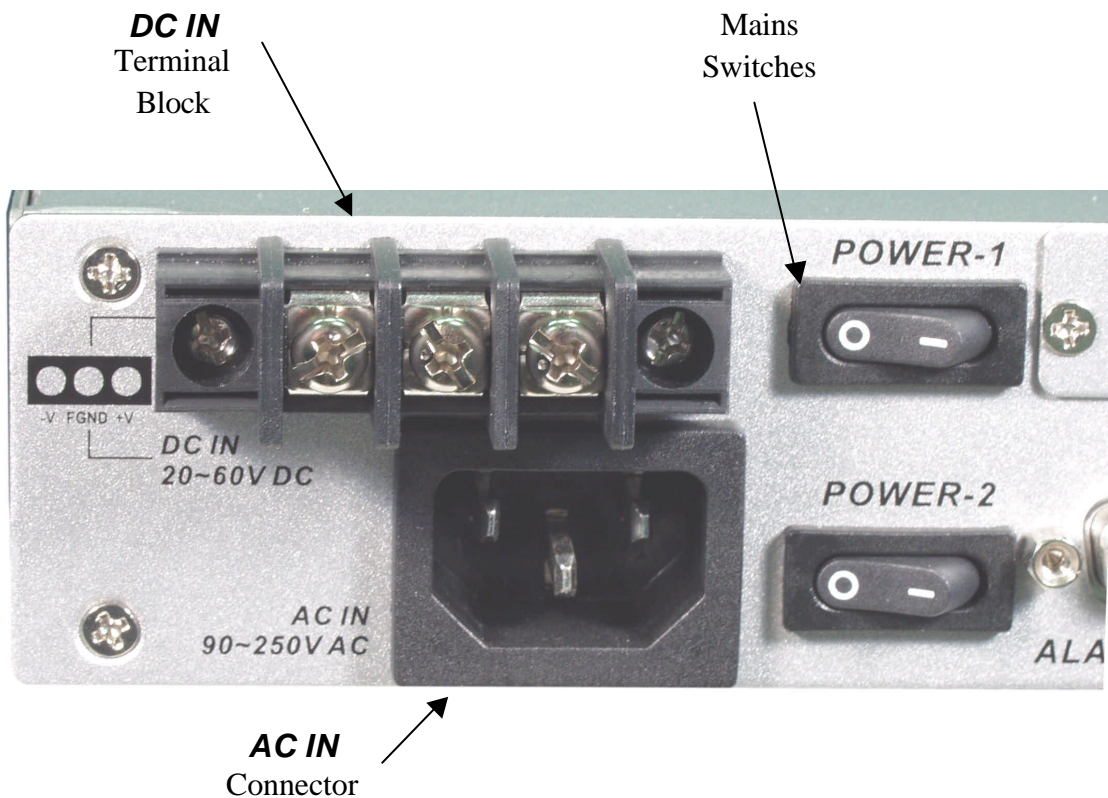

Figure 3-2 : Supply connections, AC/DC model shown

3-4-2. Rear and Front panel connectors

All 4-Channel Port Cards install into the rear of the **MULTIPLEXER UNIT**. 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 module installed in the front panel.
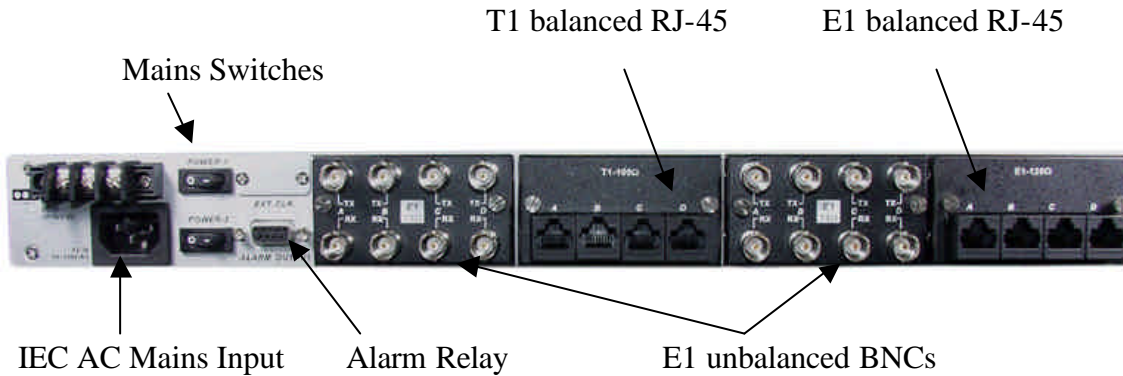
T1 balanced RJ-45   E1 balanced RJ-45

Mains Switches

IEC AC Mains Input   Alarm Relay   E1 unbalanced BNCs

Figure 3-3 : Rear Panel Connections

The front panel of the **MULTIPLEXER UNIT**, holds the optical interface, 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).

Optical   LAN   LCD   Optical and Channel
Interface   Interface   Contrast   Status
          adjustment   Indicators

RS-232   LCD   Menu   Alarm
Console   Configuration   Function   Status
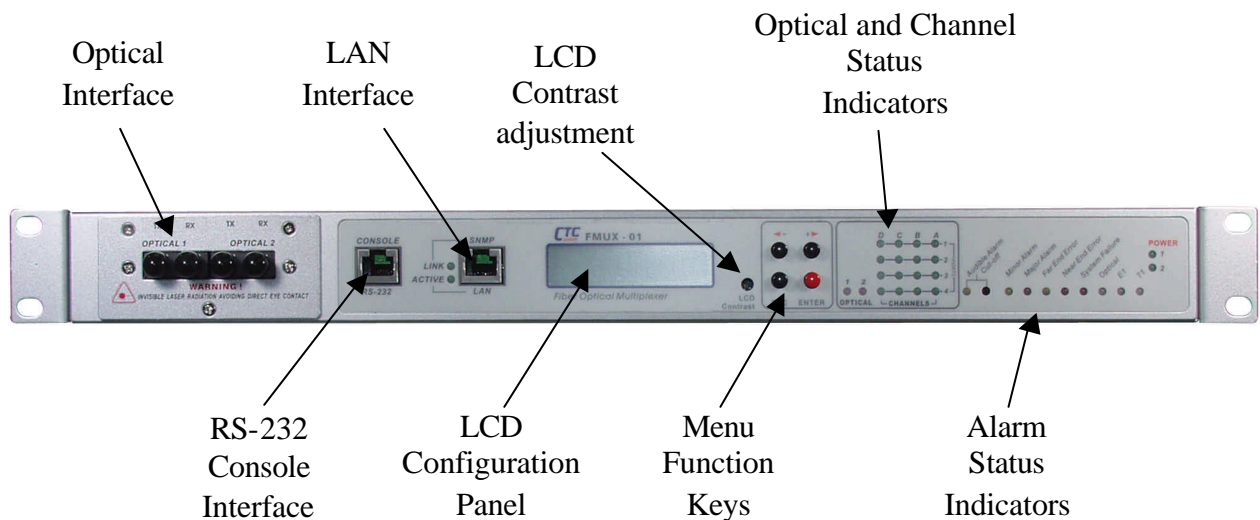Interface   Panel   Keys   Indicators

Figure 3-4 : Front Panel Controls and Indicators

3.5 Removal/Replacement Procedures

3-5-1. Optical Module Removal / Replacement

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

The optical interface is installed into the front of the *MULTIPLEXER UNIT*. The front plane of the internal mainboard provides both DC power to the optical interface card and routes signals from the card to the multiplexing/de-multiplexing circuitry. 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 as the redundant optical option). 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 the interface module, remove the two upper and one lower flat head screws using a No.2 Philips head screwdriver. Save the screws. Then gently pull the card straight forward to avoid binding. The card is only held by the friction of the connector. To install the optical module, reverse the procedure, taking care when seating the module to avoid connector damage. Gently, don't force it! Re-install the three flathead screws and don't over-tighten.
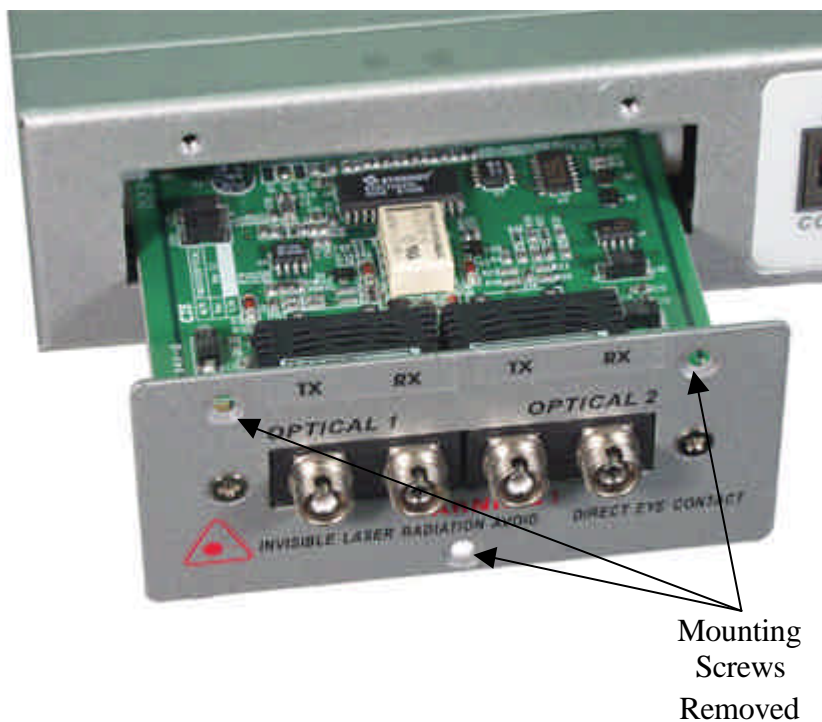

Mounting
Screws
Removed

Figure 3-5 : Optical Interface Removal / Replacement

3-5-2 Channel Port I/F Module Removal / Replacement

All 4-Channel Port Cards install into the rear of the *MULTIPLEXER UNIT*. The channel connector 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 by hand is sufficient.

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

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 **MULTIPLEXER UNIT**. 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 "ears" 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.

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.

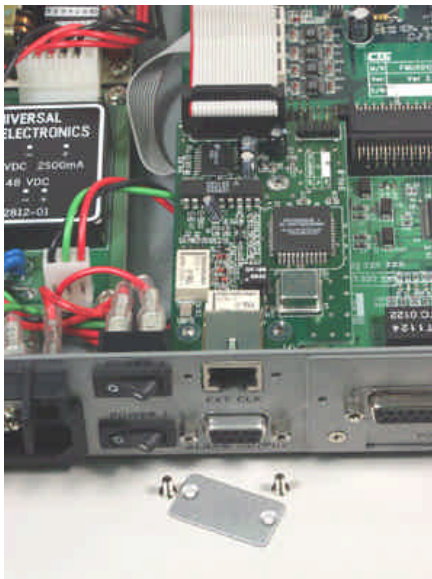7. Re-install the top cover by following the reverse order.

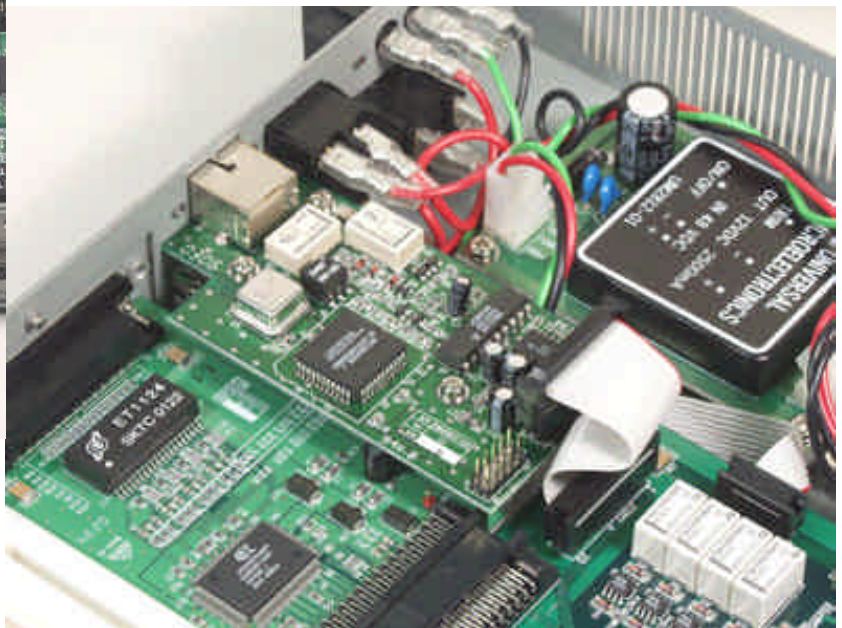**Figure 3-7 : External Clock Rear View**

Figure 3-8 : External Clock Option Removal / Replacement

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.
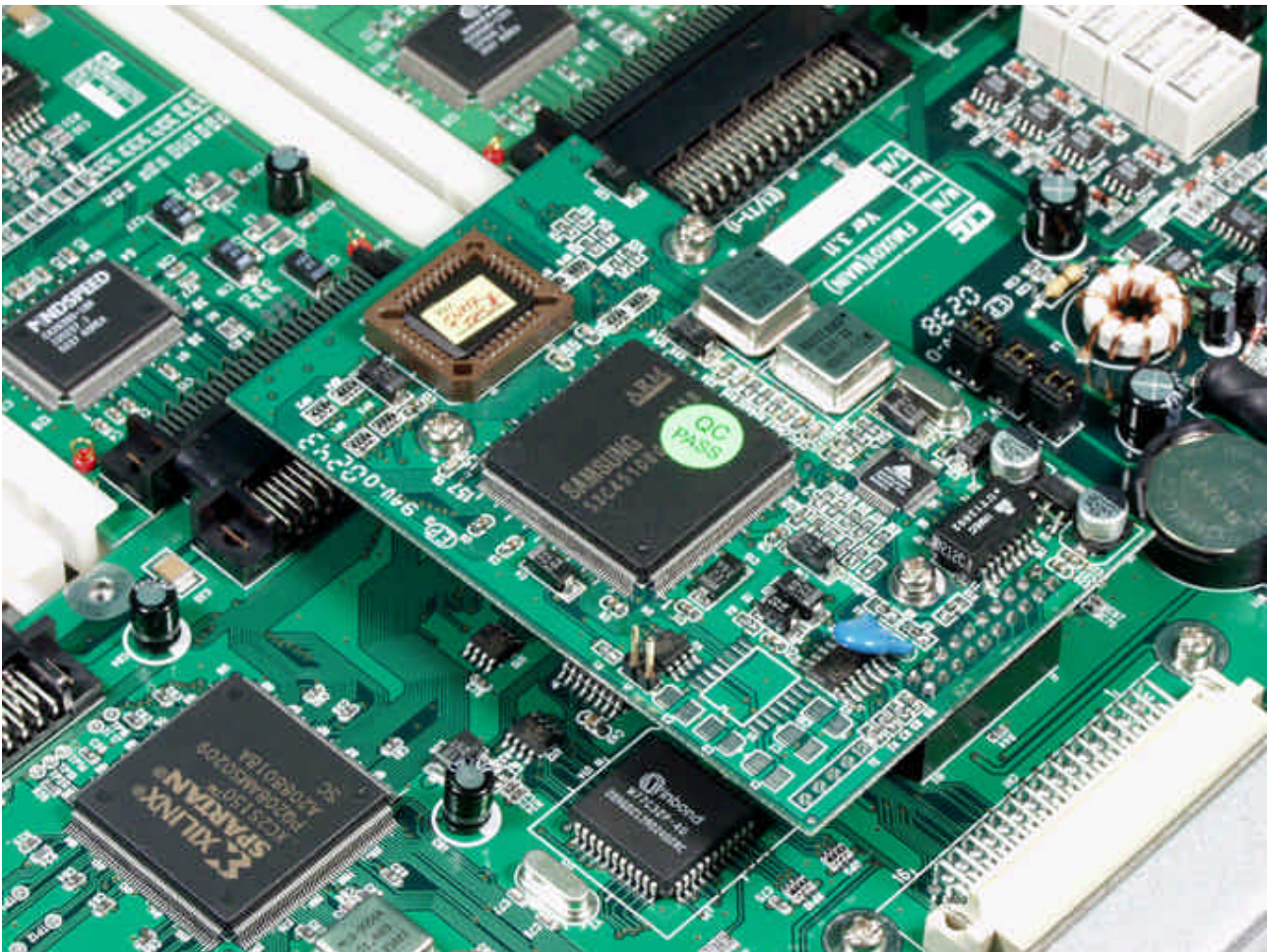
5. Re-install the top cover.

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 **MULTIPLEXER UNIT**. 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 **MULTIPLEXER UNIT** 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 '**ESC**' function key to return to a previous menu or to abandon setup.
Use the '**Enter**' function key to set a parameter of a selection or to enter a sub-menu.

When first powered on, the following "Administration" menu will be displayed. If a password has been set, it must be entered to continue. The default password is "0000" (no quotes), four zeros. Pressing an 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 6 top level Menus. When administering the local unit, the graphic "arrows" in the LCD display will display as solid black (◄ ►). While administering the remote unit, the menu arrows will appear as "less than" and "greater than" signs (< >). **Pressing ESC from this menu will briefly display the unit's firmware version number.**

```
◄ A D M I N I S T R A T I O N ►
    L O C A L     S I T E
```

Initial LCD display. Press ENTER to move to the top level Menus, Arrow key to access remote unit, ESC to display version numbers of firmware.

4.2.1 Top Level Menus The following are the 6 top level Menus. Press an arrow key to select another top level Menu or press ENTER to reach a sub menu.

```
◄     S Y S T E M              ►
      C O N F I G
```

Set the Ext Clock, Save User Set, Load Defaults, Load User Set, Modify Password or Logout. Pressing ESC at this menu will display the firmware and FPGA version numbers.

```
◄     O P T I C A L            ►
      C O N F I G
```

Set the working modes of Optical 1, Optical 2 (if installed), Automatic Laser Shutoff or Loopback function.

```
◄   P O R T   1 - E 1   1 2 O ►
    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.

```
◄   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.

```
◄   P O R T   3 - T 1   1 O O ►
    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.

```
◄   P O R T   4 - N / A       ►
    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.

```
◄   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 and allow re-login or connection to the remote system for further configuration.

Chapter 4. Operation

The following is a breakdown of the menu system for the Multiplexer Unit (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
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:	[900 sec. / 60 min. / 24 hr.]
	SES:	[900 sec. / 60 min. / 24 hr.]
	UAS:	[900 sec. / 60 min. / 24 hr.]
	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:	[2003/03/17]
	Time:	[13:47:49]
LOGOUT SYSTEM		(return to Administration)

4-1 LCD Menu System

4.3 Terminal Mode Operation

The **MULTIPLEXER UNIT** 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.
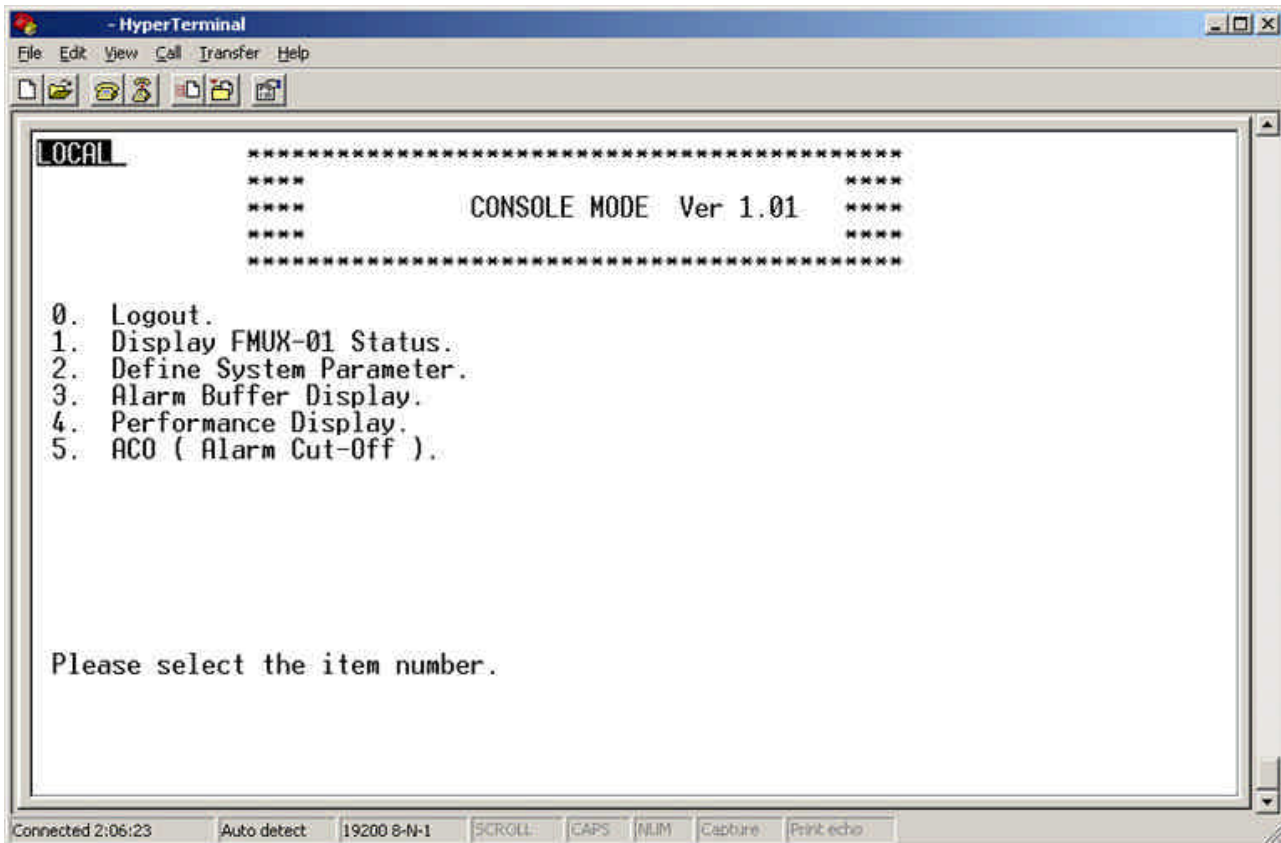
4-2 Terminal Connection

A notebook computer has become an invaluable tool of the Systems Engineer. Connection to the computer is very straight forward. The only other hardware required is a RJ-45 to DB9F adapter cable (see page 1-6 for pinout). The **MULTIPLEXER UNIT'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 operating systems, is "HyperTerminal™". Set the properties to match the **MULTIPLEXER UNIT** control port defaults as follows: Baud=19200, Data bits=8, Parity=None, Stop bits=1, and handshaking =none. Make the appropriate connections, start the terminal application, apply power to the **MULTIPLEXER UNIT**, then press ENTER on the PC keyboard. If you are using "HyperTerminal™" the display should look like that on the following page.

Chapter 4. Operation

```
*******************************************
****                                   ****
****          CONSOLE MODE   Ver 1.12  ****
****                                   ****
*******************************************
```

```
              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 1.12  ****
****                                   ****
*******************************************
```

```
0.   Logout
1.   Display FMUX-01 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     [ N/A ]
```

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

Press "1" to enter the System Configuration menu.

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


1.   External Clock      [ N/A ]
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.
```

From this menu the (1) External Clock source 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 (crystal) mode. The (2) current user settings may be saved for later recall, (3) the factory defaults may be loaded, (4) a previously saved user setting may be loaded, (5) the password to enter administration of this unit may be modified, or (6) the function of the Alarm Relay may be set. The system setting are fairly self explanatory. To configure the Major and Minor Alarm Relays press "6". The following menu is displayed.

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


1.   External Clock      [ N/A ]
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.
```

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.

We will <ESC> again and select "2" for Optical Port Configuration.

Chapter 4. Operation

```
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

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 (balanced 120Ω)

```
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. 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.

To modify the Loopback status 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.
```

Notice that "ch A" is highlighted, indicating it is the selected channel. Choose the desired loopback mode from the menu shown or press <ESC> to exit.

If we <ESC> back to the "Define System" menu we can configure the card in Port 2 by pressing "4". The following will be displayed. Here is the example for the E1 4-channel module. (unbalanced 75Ω)

```
LOCAL                  <<< Define Port 2 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. For an example of turning on Loopback for Channel A, press "A". The following menu is displayed.

Chapter 4. Operation

```
LOCAL                    <<< Define Port 2 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.
```

To modify the Loopback status press "3"

```
LOCAL                    <<< Define Port 2 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.
```

Notice that "ch A" is highlighted, indicating it is the selected channel. 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 T1 4-channel module. (100Ω)

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

               Ch A        Ch B        Ch C        Ch D

1.  Service     ON          ON          ON          ON

2.  Line Code   B8Z3        B8Z3        B8Z3        B8Z3

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 on Loopback 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.  Line Code   B8Z3        B8Z3        B8Z3        B8Z3

3.  Loopback    OFF         OFF         OFF         OFF

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

To modify the Loopback status press "3"

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


               Ch A        Ch B        Ch C        Ch D

1.  Service     ON          ON          ON          ON

2.  Line Code   B8Z3        B8Z3        B8Z3        B8Z3

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.
```

Notice that "ch A" is highlighted, indicating it is the selected channel. Choose the desired loopback mode from the menu shown or press <ESC> to exit.

Next we want to escape back to the Define System menu and select item seven 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)         [ 900 Sec. ]
3.  SES (Severely Error Seconds)[ 900 Sec. ]
4.  UAS (Unavailable Seconds)   [ 900 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: 900 sec., 60 min., or 24 hr.
SES: 900 sec., 60 min., or 24 hr.
UAS: 900 sec., 60 min., or 24 hr.

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

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


1.  CV  (Code Violation)        [ 255  ]
2.  ES  (Error Seconds)         [ 900 Sec. ]
3.  SES (Severely Error Seconds)[ 900 Sec. ]
4.  UAS (Unavailable Seconds)   [ 900 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.

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

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


1.  Date.    [ 2002/11/01 ]

2.  Time.    [ 13:34:15 ]



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

To correct the date or time, press "1" or "2" respectively. The cursor will be placed on the setting for year in Date or for hour in Time. Use the "+" and "- " keys to the correct Date and Time values. Press <ESC> when finished.

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


1.  Date.    [ 2002/11/01 ]

2.  Time.    [ 13:34:15 ]



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

(The setting of the SNMP agent is covered under a separate chapter. Please refer to the SNMP operation chapter.)
If we escape out to the root menu, we can select item #1 to display the FMUX status. The display will look like that on the following page.

```
              <<< FMUX UNIT SYSTEM STATUS >>>           11:27:24



                      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  S |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  S |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



                      Press <ESC> key to Exit.
```

The System Status display gives a overview of the entire system, both local and remote unit, the channel conditions, optical connections, and power supply status. In the above display note that only a Port 1 card is installed and that all 4 channels (1A~1B) are in service (v) without any errors from local or remote side. The optical 1 (O1) connection is in service (v) and optical 2 (O2) is in standby (S) mode. Only one power supply (P1) is active in both local and remote side units.

The display screen will refresh every 5 seconds. Of course if the optical link is completely lost 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 FMUX is the Alarm Buffer display. Note that it is item three on the root menu. If we press "3" the Alarm Buffer will display.

```
LOCAL                 <<< Alarm Buffer Display >>>


      Channel         Alarm Type       ON/OFF        DATE         TIME

   Terminal         Local Logout                  2002/11/01   11:10:04
   Terminal         Remote Login                  2002/11/01   11:10:12
   Optical          Loopback           ON         2002/11/01   11:12:22
   Optical          Loopback           OFF        2002/11/01   11:12:33
   Port 1-Ch D      Loopback           ON         2002/11/01   11:13:45
   Port 1-Ch D      Loopback           OFF        2002/11/01   11:14:08
   Terminal         Local Logout                  2002/11/01   11:22:55
   Terminal         Local Login                   2002/11/01   11:23:55
   Terminal         Local Logout                  2002/11/01   11:30:52
   Terminal         Local Login                   2002/11/01   11:32:56


                    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. So it is important to properly set the Date & Time as described previously.

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
```

All 16 channels are shown, 4 for each of 4 ports, plus the optical performance.

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 MULTIPLEXER UNIT.

Chapter 5. Loop Back Testing

5.1 General

In this chapter we shall explain the functioning of the loop back modes available in the MULTIPLEXER UNIT. As of printing of this manual (F/W ver. 1.03) 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 and T1 4-Channel Port Cards.

5.2 Loop Back Modes

Optical Section

* LLB (Optical local loop back)

near end (NE)   far end (FE)
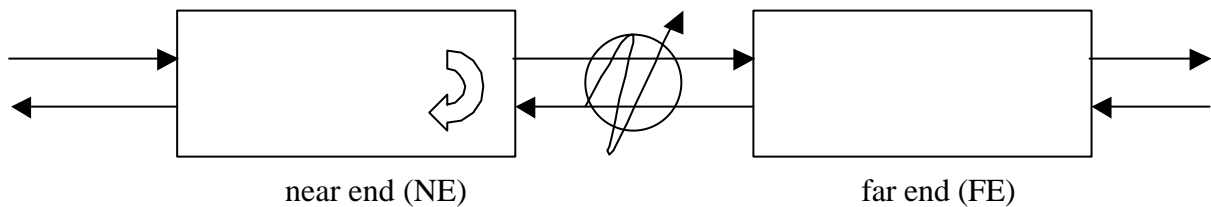
* RLB (Optical Remote loop back)

near end (NE)   far end (FE)
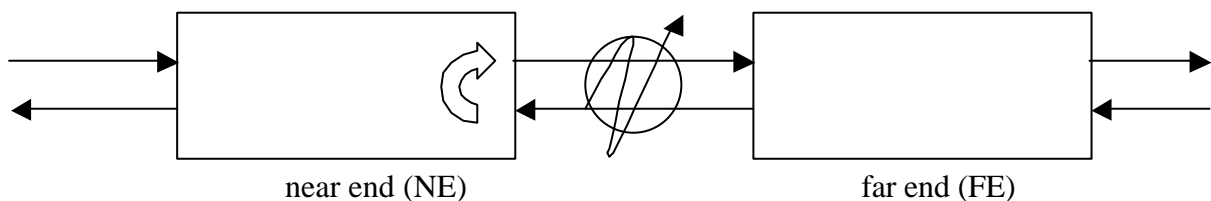
* RRLB (Request optical remote loop back)

near end (NE)   far end (FE)
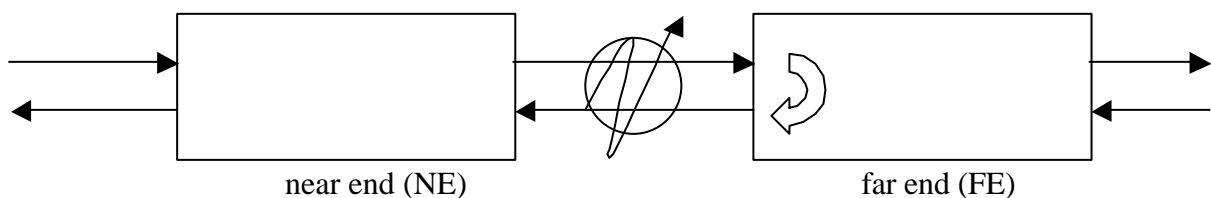
Chapter 5. Loop Back Testing

E1/T1 4-Channel Port Card Loop Back

* LLB (T1/E1 local loop back)

near end (NE)   far end (FE)

* NELLB (near end local loop back)

near end (NE)   far end (FE)
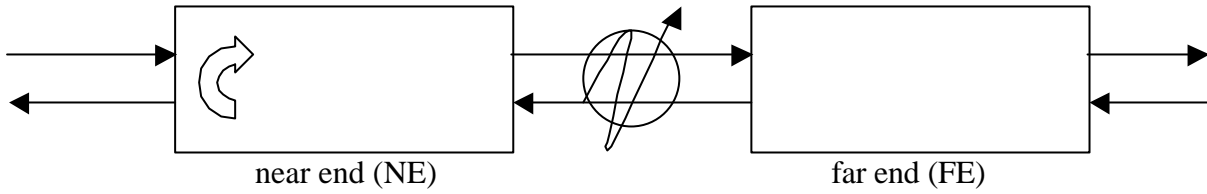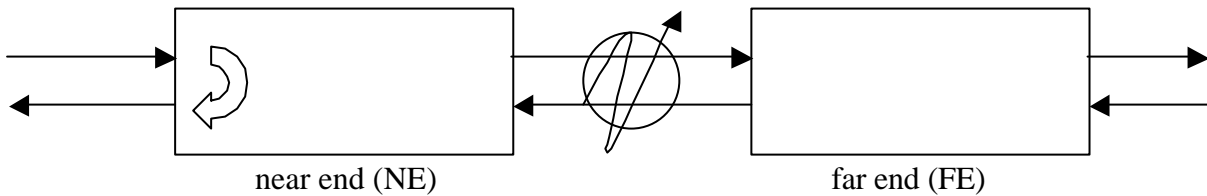
* RLB (T1/E1 remote loop back)

near end (NE)   far end (FE)
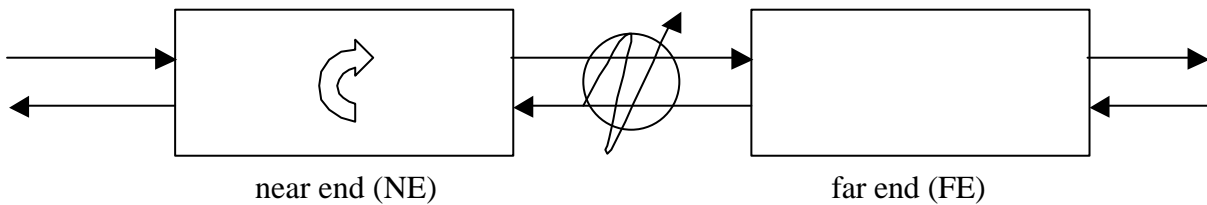
* RRLB (request T1/E1 remote loop back)

near end (NE)   far end (FE)
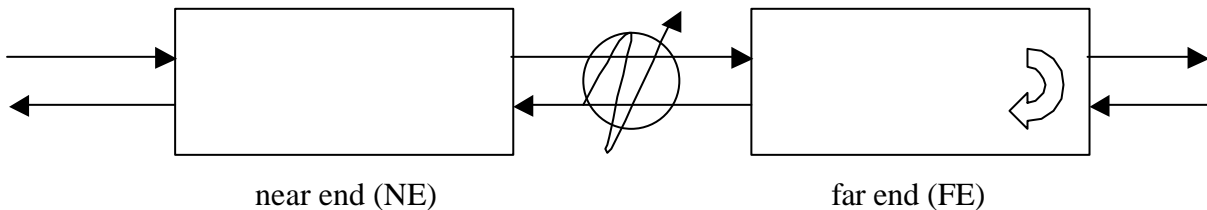
Chapter 6. SNMP Operation

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 **MULTIPLEXER UNIT** 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 communication uses the User Datagram Protocol (UDP). UDP is a connectionless transport protocol, part of the 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, 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.

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. Within this context, CTC Union has been assigned the enterprise number 4756.

Under this scheme, the path to CTC Union's Enterprise branch would be:

`iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).ctcu(4756)`

Enterprise-specific MIB's are published and distributed by their creators, who are responsible for their contents. Specific information regarding the CTC Union's sub-tree are available from CTC Union's Research and Development Division.

The MIB supported by the **MULTIPLEXER UNIT** 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 **MULTIPLEXER UNIT** resides in the SNMP option card installed in the **MULTIPLEXER UNIT**. Configuration of the agent is accomplished via the RS-232 Control Port of the **MULTIPLEXER UNIT**. From the Define System Parameter menu select "9", SNMP Agent.

Chapter 6. SNMP Operation

Connect a terminal to console port as usual. Login to the local unit.

```
****************************************
****                                ****
****      CONSOLE MODE  Ver 1.12    ****
****                                ****
****************************************



        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 1.12    ****
        ****                                ****
        ****************************************


0.   Logout
1.   Display FMUX-01 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, "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.
```

The configuration items are fairly self-explanatory. Select item #1 to set the IP address of the SNMP agent in decimal format, item #2 to set the subnet mask, and item #3 to set the default gateway IP address for the network to which the agent is attached. 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. When finished, <ESC> back to the previous menu and select item "4" to save and restart or select item "2", to continue to manager configuration.

Chapter 6. SNMP Operation

```
LOCAL              <<< Manager Config >>>


1. Access IP #1    [  0.  0.  0.  0] [community string] [trap]
2. Access IP #2    [  0.  0.  0.  0] [community string] [trap]
3. Access IP #3    [  0.  0.  0.  0] [community string] [trap]
4. Access IP #4    [  0.  0.  0.  0] [community string] [trap]
5. Community String #1 (R/W)    [ ]
6. Community String #2 (Read)   [ ]

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

Enter the information about the workstation that will be running the management software for your network. Up to four separate management stations may be configured to access the SNMP agent. Under each station, a read/write or read only community string may be defined as well as which traps will go to which management station. Under "Manager Config" items 5 and 6 you can set the specific community strings for read/write and read only.

To upgrade the SNMP firmware, configure a TFTP server on your network. Place the upgrade binary file on the server and set the IP address and path of the server in the SNMP agent. 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.

     The actual "get", "set", and "trap" items for the MULTIPLEXER UNIT were unavailable at the time of this printing. Please check your distributor for any updated information.

     This completes the section of SNMP operation. For importing the MIB and SNMP operation, please refer to the documentation for your management software.

notes:

notes:

Technical Inquiry Form

MODEL No.: FMUX01

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:	☐ Auto	☐ Disable
Opti 1:	☐ Work	☐ Off	Opti 2:	☐ Standby	☐ Disable
Type:	☐ 2KM-M	☐ 15KM-S	☐ 30KM-S	☐ 50KM-S	☐ 120KM-S
Connector:	☐ ST	☐ SC	☐ FC	☐ LC	☐ MT-RJ
Loopback:	☐ Off	☐ LLB	☐ RLB	☐ RRLB	

PORT Card 1	☐ G.703 E1	☐ T1 (DS1)	☐ Datacomm	☐ Bridge
Channel A	Channel B	Channel C	Channel D
Service	Service	Service	Service
☐ ON ☐OFF	☐ ON ☐ OFF	☐ON ☐OFF	☐ ON ☐OFF
Line Code	Line Code	Line Code	Line Code
☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐ AMI ☐ HDB3/B8Z3
Loop Back:	☐ Off	☐ LLB	☐NELLB	☐RLB	☐RRLB

PORT Card 2	☐ G.703 E1	☐ T1 (DS1)	☐ Datacomm	☐ Bridge
Channel A	Channel B	Channel C	Channel D
Service	Service	Service	Service
☐ ON ☐OFF	☐ ON ☐ OFF	☐ON ☐OFF	☐ ON ☐OFF
Line Code	Line Code	Line Code	Line Code
☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐ AMI ☐ HDB3/B8Z3
Loop Back:	☐ Off	☐ LLB	☐NELLB	☐RLB	☐RRLB

PORT Card 3	☐ G.703 E1	☐ T1 (DS1)	☐ Datacomm	☐ Bridge
Channel A	Channel B	Channel C	Channel D
Service	Service	Service	Service
☐ ON ☐OFF	☐ ON ☐ OFF	☐ON ☐OFF	☐ ON ☐OFF
Line Code	Line Code	Line Code	Line Code
☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐ AMI ☐ HDB3/B8Z3
Loop Back:	☐ Off	☐ LLB	☐NELLB	☐RLB	☐RRLB

PORT Card 4	☐ G.703 E1	☐ T1 (DS1)	☐ Datacomm	☐ Bridge
Channel A	Channel B	Channel C	Channel D
Service	Service	Service	Service
☐ ON ☐OFF	☐ ON ☐ OFF	☐ON ☐OFF	☐ ON ☐OFF
Line Code	Line Code	Line Code	Line Code
☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐AMI ☐HDB3/B8Z3	☐ AMI ☐ HDB3/B8Z3
Loop Back:	☐ Off	☐ LLB	☐NELLB	☐RLB	☐RRLB

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E1/T1 DSU/CSU Series
Fiber Converter Series

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