User Manual

FRM220

In-band Managed
Fiber Media Platform Rack
20 Slot, 2U

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Media Platform Rack, 20 Slot, 2U

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CE

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Chapter 1 Introduction

1.0 Introduction

Thank you for choosing the ***FRM220*** Platform Fiber Media Converter Rack. If you would like to skip right to the installation and provisioning of the Converter Chassis, proceed to Chapters 2 and 3.

This manual is used to explain the installation and operating procedures for the ***FRM220***, and present its capabilities and specifications. This manual is divided into 6 Sections, the Introduction, Installation, Operation, Web Based Management and Trouble Shooting Chapters, plus the Appendices. The Appendices include the details for each line card, pin assignments of special cables and gives further information on options for placing the device in service.

The divisions of the manual are intended for use by personnel to answer questions in general areas. Planners and potential purchasers may read the Introduction to determine the suitability of the product to its intended use; Installers should read the Installation Chapter and the Cabling Specification Appendix; Operating Personnel would use the Operations and Web Based Management Chapters and Appendices to become familiar with the line cards and settings. Network Administrators should read the chapters on Operation, Web Based Management and Trouble Shooting to become familiar with the diagnostic capabilities, network settings and management strategies for the SNMP managed chassis.

1.1 Functional Description

The ***FRM220*** is a 2U high 19" Rack, 20 slot modular media converter center. The ***FRM220*** provides an economic solution in high density Fiber Converter installations in enterprises or central offices. All critical components, Power, fans, management module and interface cards are hot swappable allowing online field replacement. An additional feature allows the ***FRM220*** to detect the working or failing status either of power module or any fan assembly in the unit and activate relays that can be used to control external alarm devices.

There are 19 slots available for installation of FRM Converter Cards in the ***FRM220*** compact rack. An SNMP Card is installed in the reserved slot, for local and remote management purposes. Each **FRM** Card is an independent fiber to copper converter. When linked to a compatible FRM stand-alone or "I" series FMC (Fiber Media Converter) stand-alone converter, complete in-band management is supported. All settings of the line card and remote connected stand-alone device may be managed through any of the available management interfaces. A variety of cards are or will be available that support multi-mode or single-mode fiber types and connections to SC, ST, FC or even the latest single fiber WDM (Wave Division Multiplexing) in ranges from 2Km to 120Km. Converter cards will include Fast Ethernet, Gigabit Ethernet, Serial (RS-485, RS-232 and TTL), E1, T1, Datacom (V.35, RS-530, X.21, RS-449, and RS-232) and more as the product matures.

The ***FRM220*** optionally incorporates a redundant Power Module. The supply, depending on the model, derives its power from either an AC power source (90 ~ 264VAC) and/or DC power source. Two available DC power modules provide either 18-36VDC or 36-72VDC range. When two modules are installed, they provide for power redundancy and are hot swappable even during the FRM Line Cards' transmissions. The ***FRM220*** provides all copper interface connections on the face of each FRM Line Card. The fiber interface connectors are also located on the individual FRM Line Card's face, along with status indicator LEDs. The status LED indicators provide for quick indications of both copper and fiber link statuses and in fault detection.

1.2 Chassis Front Description

The front of the ***FRM220*** contains the line card slots. They are numbered 1 through 20, from left to right as viewed from the front. The typical configuration is with one NMC (Network Management Controller) card in slot number 1 and in-band manageable line cards in any other slot numbered 2 through 20.

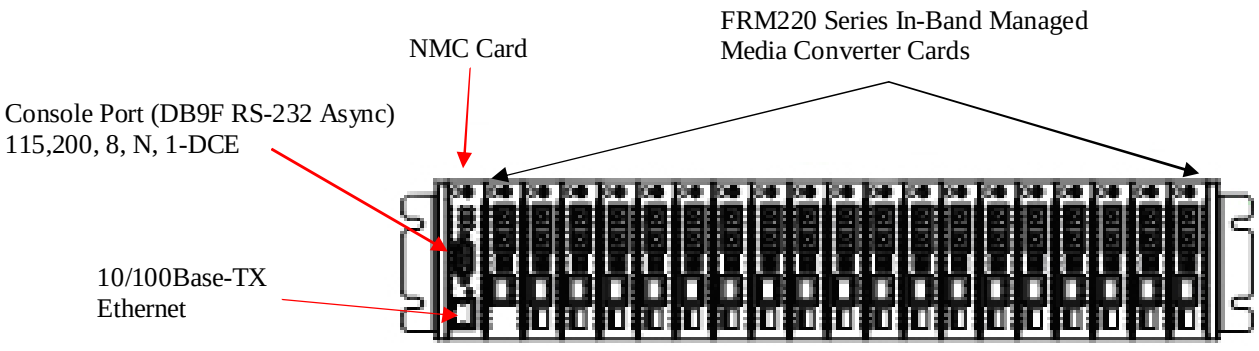


Figure 1-1 Chassis Front View

1.3 Chassis Rear Description

The rear panel holds the chassis interface, the hot-swappable cooling fan modules, and the hot-swappable power modules. The pluggable modules do not require any tools for removal and replacement.

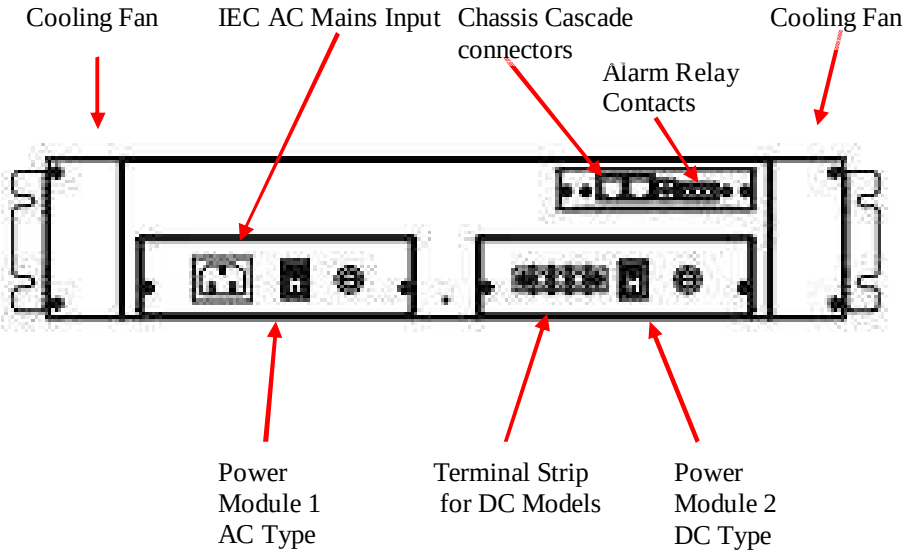


Figure 1-2 Chassis Rear View

1.4 Chassis Physical Dimensions

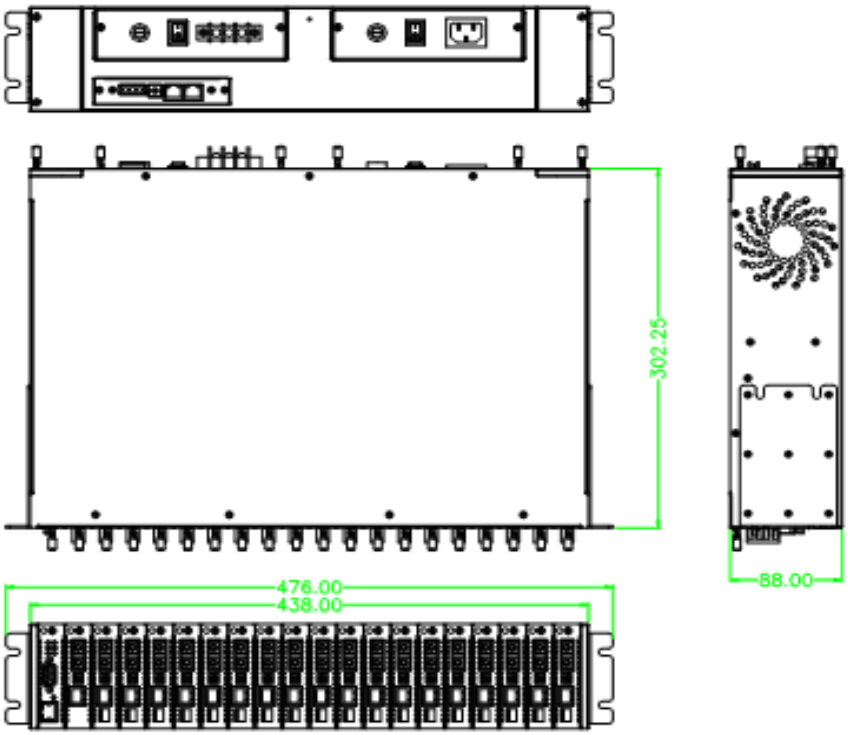


Figure 1-3 Chassis Dimensions, in millimeters

1.5 Chassis Specifications

Environment
Temperature 0 - 65°C (32-150°F)
Humidity 10-90% non condensing

Alarm relay contact ratings
125VAC 1A
110VDC 0.6A
30VDC 4A

Power Module Specifications
AC Power Module
Input : Universal, 90 (Min.) ~ 264 (Max.) VAC; Frequency : 47~63 Hz
Power Consumption : tba
Output :DC 12V, 150W maximum rating
DC Power Module
Input : -36~72 VDC
Input : -18~-36VDC (option)
Power Consumption : tba
Output :DC 12V, 150W maximum rating

Compliance
European Union : EN55022:2006, Class A, EN55024:1998+A1:2001+A2:2003, and EN60950-1:2001
FCC : part 15, subpart B, class A
UL : tba

Reliability
MTTB : >65,000 hours (25°C)

Physical Specifications
Dimensions : 438mm (Width) x 302mm (Depth) x 88mm (Height)
(US: 17 1/4" wide x 11 7/8" deep x 3 1/2" high)
Weight : 4485g (US: 9.9 lbs)

AC module weight : 690g (US 1.5 lbs)
DC module weight : 505g (US 1.2 lbs)
Fan module weight : 200g (US 0.5 lbs)
NMC card weight : 120g (US 0.25 lbs)

Net Weight : 6.2kgs (US 13 lbs 11 oz)
(includes 1 NMC, 2 fan modules, 1 AC +1 DC power module & two bracket panels for 19" rack-mounting)

Basic Package Shipping Weight : tba
(includes ….) [due to weight considerations, additional line cards are packaged separately]

1.6 Line Card Options

The ***FRM220*** is capable of supporting a variety of in-band managed line card types which may be mixed and matched in any slot of the rack. Please refer to **Appendix B** of the latest version manual for details of all the line card options for the ***FRM220***.

1.7 NMC (SNMP)

The ***FRM220*** must be ordered with an NMC (Network Management Controller) Card. The card is placed in the far left, number one card slot. Management is accomplished either via local control on the asynchronous RS-232 port with an ASCII terminal or via Ethernet and any standard SNMP network management software that supports MIB-II. The WEB GUI based interface provides an easy method for the user to operate and monitor the whole system. All FRM line cards support remote in-band configuration when paired with the same type FMC stand-alone in-band converter.

1.8 Fiber Optical Options

Fiber access connectors are provided for fiber optic cable connection on each line card. Each connector has labeling for "TX" (for transmission of optical data) and "RX" (for reception of optical data). The various multi-mode and single mode types are shown below with transmission reach.

10/100 Base Media Converter Card Specifications (Normal type)

Card Type	10/100M/2	10/100S/15	10/100S/30	10/100S/50	10/100S/120	TP Ports	Shielded RJ-45 jacks
Fiber Mode	Multi	Single	Single	Single	Single	Cable	Cat. 5 UTP up to 100 meters
Wave Length	1310nm	1310nm	1310nm	1310nm	1550nm		
Connector	*	*	*	*	*	Environment	
Fiber Cablex2	62.5/125um	9/125um	9/125um	9/125um	9/125um		Temperature : 0~50 C
Max. Length	2Km	15Km	30Km	50Km	120Km		Relative Humidity :
MDI	Auto	Auto	Auto	Auto	Auto		10%~90% non-condensing
* Available with ST, SC, FC or LC type connectors						Dimensions :	17.7x25.5x2.4cm

10/100 Base Media Converter Card Specifications (WDM type)

Card Type	10/100W/20A	10/100W/20B	10/100W40A	10/100W40B		TP Ports	Shielded RJ-45 jacks
Fiber Mode	Single	Single	Single	Single		Cable	Cat. 5 UTP up to 100 meters
Wave Length	1310/1550nm	1550/1310nm	1310/1550nm	1550/1310nm			
Connector	SC (WDM)	SC (WDM)	SC (WDM)	SC (WDM)		Environment	
Fiber Cablex1	9/125um	9/125um	9/125um	9/125um			Temperature : 0~50 C
Max. Length	20Km	20Km	40Km	40Km			Relative Humidity
MDI	Auto	Auto	Auto	Auto			10%~90% non-condensing
						Dimensions :	17.7x25.5x2.4cm

1000 Base Media Converter Card Specifications

Card Type	1000-M/550	1000-S/010	1000-S/030	1000-S/050	1000-S/080	TP Ports	Shielded RJ-45 jacks
Fiber Mode	Multi	Single	Single	Single	Single	Cable	Cat. 5 or 6 UTP up to 100 meters
Wave Length	1310 nm	1310nm	1550nm	1550nm	1550 nm		
Connector	GB or LC	GB or LC	GB or LC	GB or LC	GB or LC	Environment	
Fiber Cablex1	62.5/125um	9/125um	9/125um	9/125um	9/125um		Temperature : 0~50 C
Max. Length	550m	10Km	30Km	50Km	80 Km		Relative Humidity
MDI	Auto	Auto	Auto	Auto	Auto		10%~90% non-condensing
						Dimensions :	17.7x25.5x2.4cm

Datacom Converter Card Specifications (Normal type)

Card Type	E1B-M/2	E1B-S/15	E1B-S/30	E1B-S/50	E1B-S/120	BNC Ports	Coaxial 75 ohm G.703 E1
Card Type	E1R-M/2	E1R-S/15	E1R-S/30	E1R-S/50	E1R-S/120	RJ-45 Ports	USOC RJ-48C 120 ohm G.703 E1
Card Type	T1-M/2	T1-S/15	T1-S/30	T1-S/50	T1-S/120	RJ-45 Ports	USOC RJ-48C 100 ohm DS1
Card Type	Data/V35/M2	Data/V35/S15	Data/V35/S30	Data/V35/S50	Data/V35/S120	HD26	adapter to MB34F or M (V.35)
Card Type	Data/X21/M2	Data/X21/S15	Data/X21/S30	Data/X21/S50	Data/X21/S120	HD26	adapter to DB15F or M (X.21)
Card Type	Data/530/M2	Data/530/S15	Data/530/S30	Data/530/S50	Data/530/S120	HD26	adapter to DB25F or M (RS-530)
Card Type	Data/449/M2	Data/449/S15	Data/449/S30	Data/449/S50	Data/449/S120	HD26	adapter to DB37F or M (RS-449)
Card Type	Data/232/M2	Data/232/S15	Data/232/S30	Data/232/S50	Data/232/S120	HD26	adapter to DB25F or M (RS-232)
Card Type	Serial/M2	Serial/S15	Serial/S30	Serial/S50	Serial/S120	Terminal	6 pin wire terminal **
** Supports 3/5 wire RS-232, 2/4 wire RS-485, TTL and RS423							
Fiber Mode	Multi	Single	Single	Single	Single	Cable	
Wave Length	1310nm	1310nm	1310nm	1310nm	1550nm		
Connector	*	*	*	*	*	Environment	
Fiber Cablex2	62.5/125 m	9/125 m	9/125 m	9/125 m	9/125 m		Temperature : 0~50 C
Max. Length	2Km	15Km	30Km	50Km	120Km		Relative Humidity :
							10%~90% non-condensing
* Available with ST, SC, or FC type connectors						Dimensions :	17.7x25.5x2.4cm

All Datacom converter cards are also available with WDM type transceivers, which must be matched in pairs (A to B) and in either 20KM or 40KM reach.

Please ask our Sales or representative for availability and/or specifications of other transceiver types not listed above.

1.9 FRM220 Application

The ***FRM220*** is an excellent choice for complimenting fiber infrastructure in Metro LAN, campus, corporate buildings, factories, or in FTTx applications. With standard SNMP management, carriers or Internet Service Providers will have confidence to deploy a solution that provides the necessary remote monitoring and configuration features.

Figure 1-4 Application

Chapter 2 Installation

2.1 Introduction

The Installation chapter will cover the physical installation of the ***FRM220***, Rack Mount In-Band Managed Series Fiber Converter Platform Chassis, the electrical connections, interface connections and cabling requirements. A brief overview of the functional components such as main unit and management options will also be outlined in this chapter.

Required Tools

You will need these tools to install the ***FRM220***:

Number 2 Phillips screwdriver for the 3mm and the 12-24 rack installation screws.

Wrist strap or other personal grounding device to prevent ESD occurrences.

Antistatic mat or antistatic foam to set the equipment on.

2.2 Site Preparation

Install the ***FRM220*** within reach of an easily accessible grounded AC outlet. The outlet should be capable of furnishing 90 to 250 VAC. Refer to 2.4 Electrical Installation. Allow at least 10cm (4 inch) clearance at the front of the ***FRM220*** for the Ethernet cables.

2.3 Mechanical Assembly

The ***FRM220*** is designed for rack mount installation and will require 2U space in a standard EIA 19" or 23" rack. The ***FRM220*** has two removable fan units in the rear side of the chassis. Without operation fans, excessive temperatures within the unit might cause it to electrically shutdown. The ***FRM220*** chassis is delivered completely assembled, however converter cards may or may not be installed in the chassis upon delivery. The rack mount adapters may be placed along the front or centrally located on the chassis. Optional brackets also allow installation into a 23" rack and in this configuration, central mounting is recommended.

2.3.1 Rack mounting

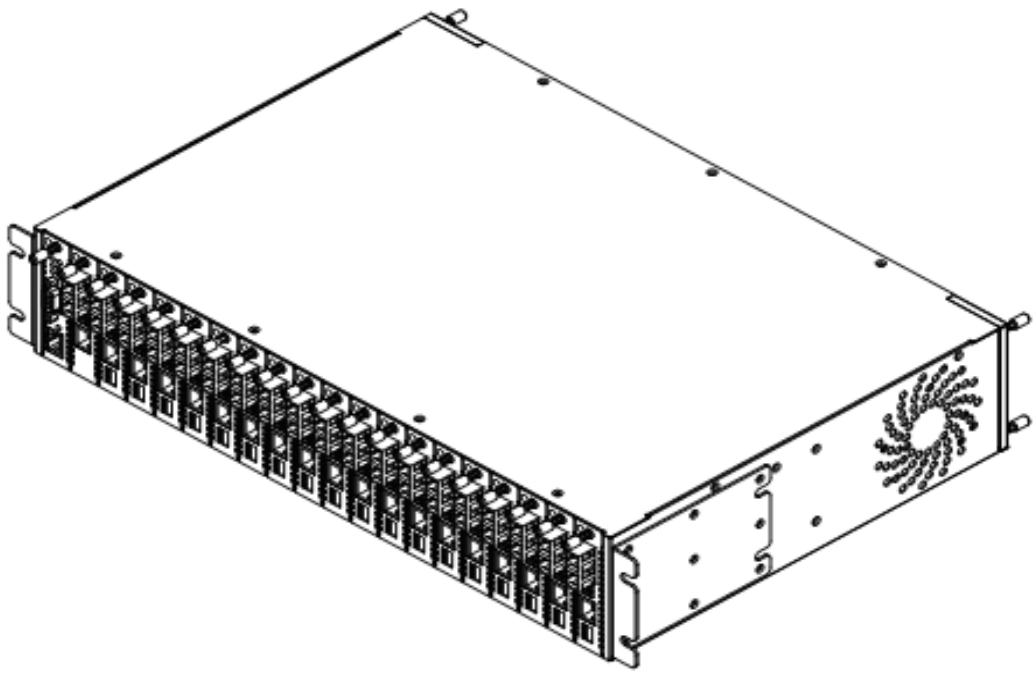


Figure 2-1 Standard 19" Rack-Mount Installation of ***FRM220*** Unit requires 2RU space

2.3.2 Fan Units Removal/Replacement

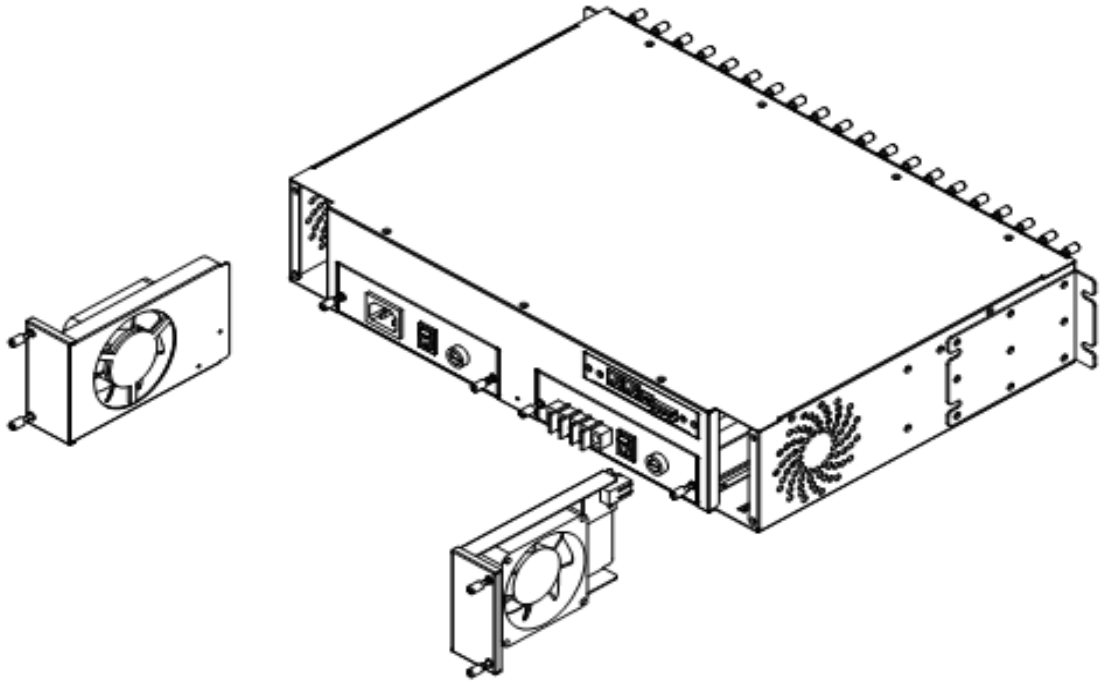
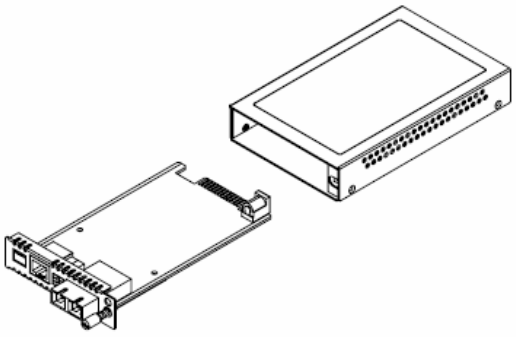


Figure 2-2 Removal/Replacement of ***FRM220*** Fan Units

2.3.3 Line Card Conversion, Stand-alone/Rack

The ***FRM*** Media Converter Line Card may be mounted in the ***FRM220*** chassis or serve as a stand-alone unit. When installing in the single slot chassis, the outer cover holds the line card. The unit then serves as a stand-alone media converter that can be linked to a line card in the ***FRM220*** chassis.



FRM220-CH01, single slot chassis
Requires external AC to DC 12V switching adapter.

FRM220-CH01-AC(DC), single slot chassis with built-in AC or DC power. (two models)

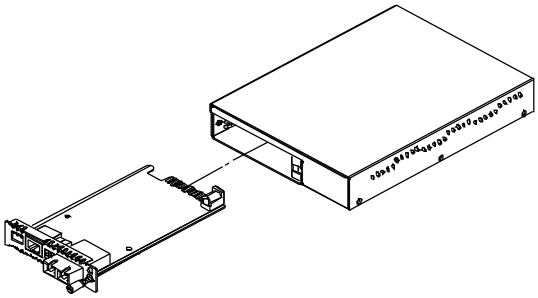


Figure 2-3 Converting ***FRM220*** line card for stand-alone use

2.4 Electrical Installation

With an AC power module, AC power is supplied to the ***FRM220*** through a standard IEC 3-prong receptacle, located on the rear of the module. With a DC module, DC -48V is connected to the terminal block located on the rear of the module, observing the proper polarity. The ***FRM220*** 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.

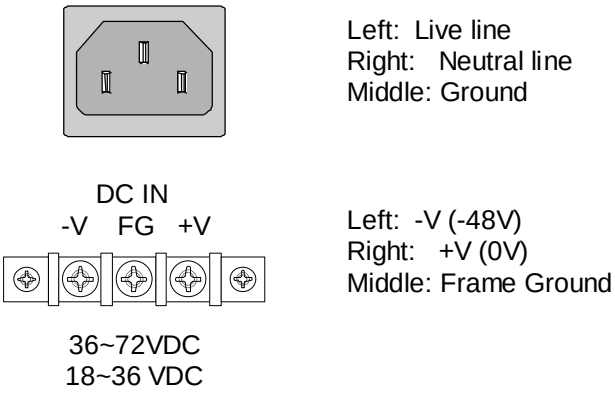


Figure 2-4 IEC (AC) & terminal block (DC) power connector pin assignment

2.5 Alarm Installation

The alarm relay provides one set of Power Failure contacts (normally open) and another set of FAN Failure contacts (normally open) contacts for monitoring the power and fans condition of the ***FRM220***.

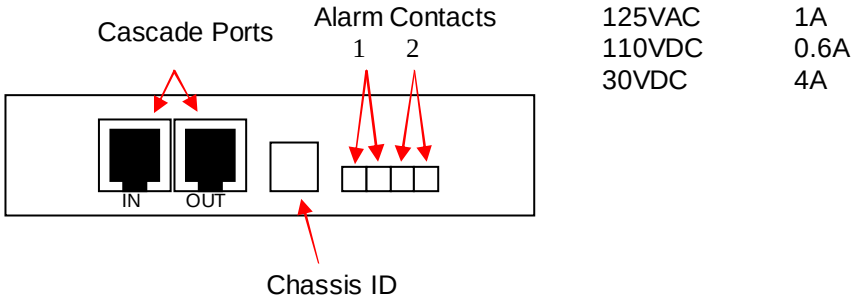


Figure 2-5 Alarm Relay Contacts and Cascade Ports

2.6 Chassis Cascade

The FRM220 chassis may be cascaded in such a manner that only one single IP address is required to manage up to 10 chassis in a single location. The connection diagram is shown below. Each chassis is assigned a unique ID starting at zero for the master chassis and incrementing for each cascaded chassis, up to an ID of nine. The "out" of the parent chassis connects to the "in" of the child using any standard UTP cable with RJ-45 connectors.

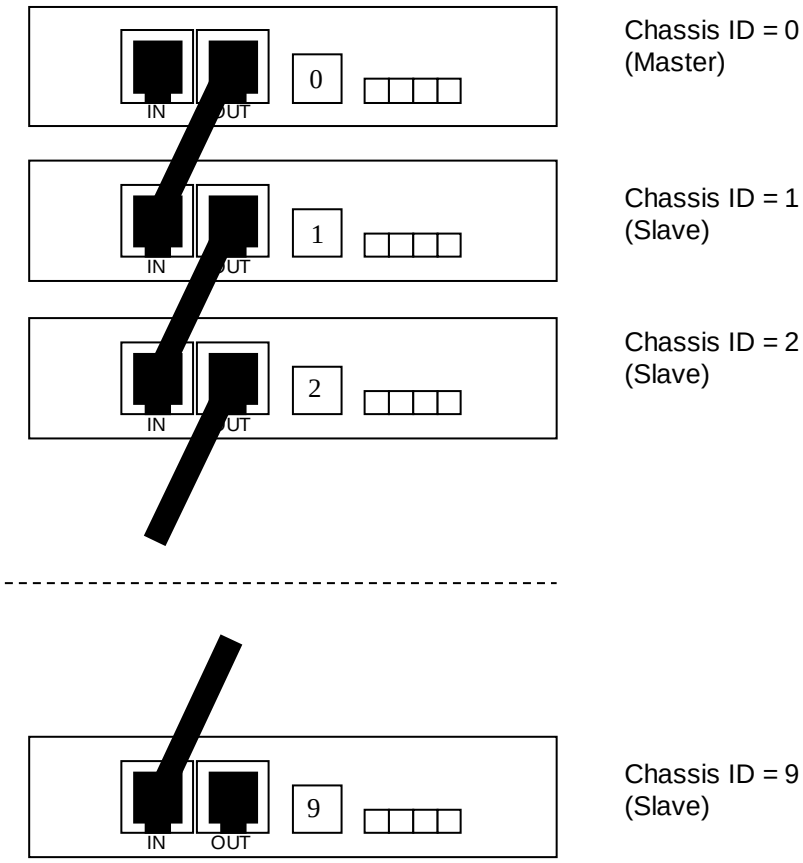


Figure 2-6 Cascade Ports Connections and ID assignment

2.7 Power Modules Removal/Replacement

The Power Supply Modules in the ***FRM220*** are available in three versions, one AC and two DC types. The universal AC version supports input voltages of 90 to 264 volts at frequencies of 47 to 63 Hertz. The DC version supports either a standard 36 to 72VDC or an optional 18 to 36VDC input voltage. Only one power supply module is required to power a completely full rack. When two Power Supply Modules are installed, the supplies are hot swappable and redundant, meaning any one supply may be removed and replaced without impacting the operation of the ***FRM220*** Rack.

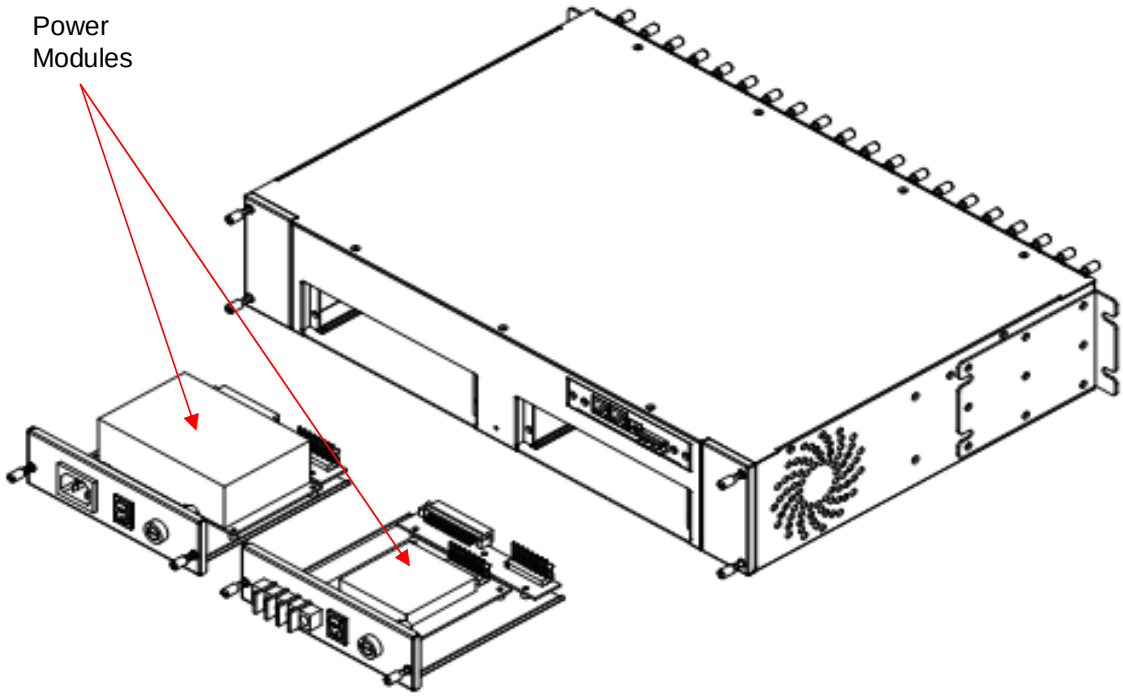


Figure 2-7 Power Modules for ***FRM220***

2.8 Installation

2.6.1 Line Card Installation

The Line Cards for the ***FRM220*** are Fiber Media Converter Cards which slide into the ***FRM220*** chassis, and interface with the pack panel "main board". The back panel provides a connection to the converter cards for power and serial control.

The media converter cards are designed to be "hot" swappable, meaning the ***FRM220*** chassis need not be powered off in order to remove or replace a card. Removal and installation of converter cards with the rack chassis under power will not effect the operation of other converter cards.

Removal of a converter card is accomplished by loosening the one (1) captive screw (upper) and then pulling the card straight out of the chassis with the same screw. Replace the card by reversing the procedure, align in the slot groove and gently seat the card, retightening the captive screw.

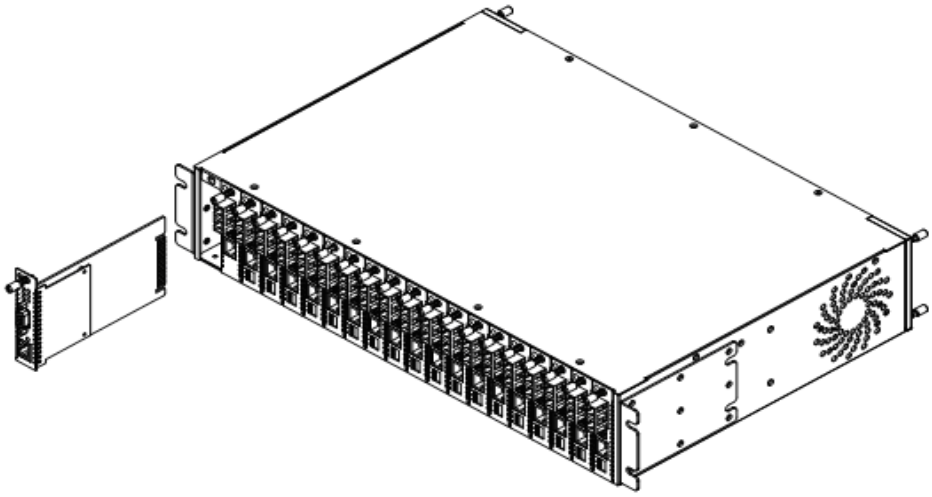


Figure 2-7 Line card removal/replacement

2.6.2 NMC Card Installation

Slot number 1 of the chassis is reserved for the Network Management Controller (NMC). The NMC card provides the full network management features. When the NMC is installed, the rack and all line cards become manageable by industry standard SNMP protocol. (Please refer to Chapter 3 for more information on the operation of the network management features). The remaining slots, numbered 2 through 20, may contain any other FRM220 In-band Managed fiber media converter card.

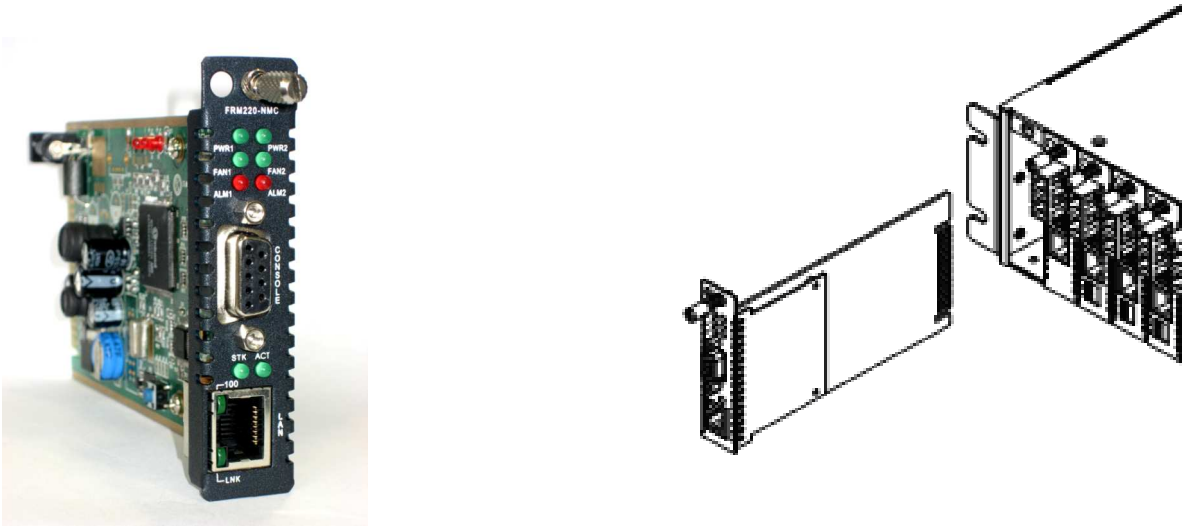


Figure 2-8 NMC removal/replacement in slot number 1

IMPORTANT: In the FRM220 In-Band Managed Rack, slot number1 must contain an NMC card. In a chassis where non-managed line cards are employed (cards that use DIP switch settings), slot number 1 may then be used for a non-managed media converter line card.

Chapter 3 Provisioning

3.1. Introduction

This chapter will go into the details of the specific provisioning and operation of the ***FRM220***. Broken into two parts, the first part outlines the procedures and functions when using the serial console for configuration. The second section will outline the operation when using a network connection, including the web based GUI. For initial operation, until the TCP/IP settings are completed, a terminal connection to the Console port is typically required.

All of the features and controls described in this chapter require the ***FRM220*** chassis to have the ***NMC*** (Network Management Controller) installed. The Management System is a collection of three control modes for the ***FRM220***. The simplest and most basic mode is "Console Mode". The terminal or console mode is a local control which requires an ASCII based terminal and an RS-232 connection to the RS-232 console port of the SNMP card. Provisioning and monitoring are performed through a series of menus and menu selection items. All changes made to line cards through console mode are executed immediately and do not require any separate 'save' operations. From the console mode, the initial network configuration can be accomplished. This will allow remote network configuration to proceed from Telnet connection (remote console), web browser or any network management software after compiling the enterprise MIB-II compliant file for ***FRM220 SNMP***. A MIB browser provides another simple platform for the user to setup using the SNMP protocol.

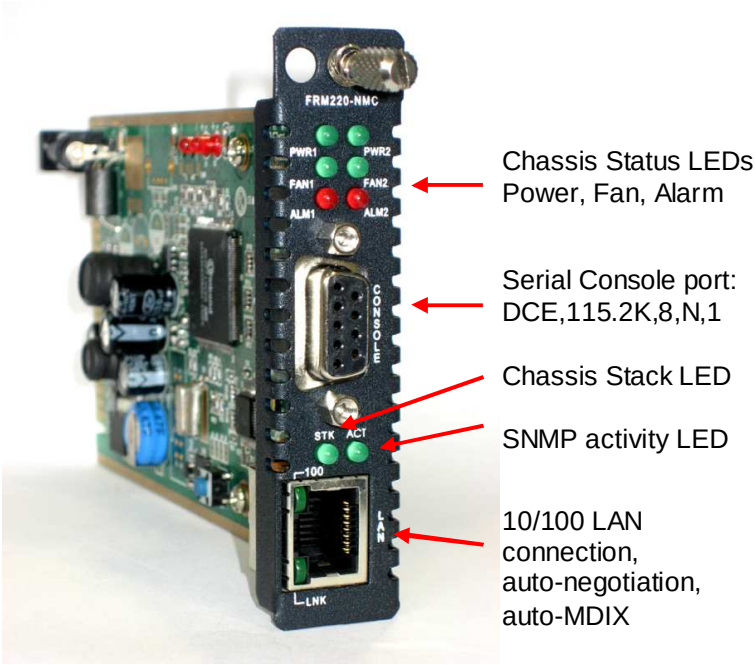


Figure 3-1 NMC card front panel, management interfaces

Prior to any initial use of the LAN interface on the SNMP card, the configuration settings for networking must be performed. These include the NMC device's IP address and subnet mask, the network's default gateway, the IP address of any TFTP server that may be used to upgrade the SNMP firmware, and lastly the IP addresses of the management workstations that will be managing the system via SNMP protocol. The front panel of the NMC card provides the connections and indicators.

The LAN connector is an RJ-45 designed for direct connection to either a HUB or DTE device (auto-MDIX supported). The interface supports 10/100Base Ethernet auto negotiation. The 'LNK' LED will light to indicate the Ethernet has a successful link and flash when there is activity on the Ethernet. The '100' LED will light to indicate the Ethernet connection speed is 100M.

The DB9 Female connector is an RS-232 DCE connector designed to connect directly to a terminal or a PC running terminal emulation software. The 'ACT' LED will flash once per second when the SNMP has successfully booted and is running. If multiple chassis are cascaded to this NMC card, the 'STK' (stack) LED will be lit.

A unique feature of the NMS, the system can restore all the previous settings in case some unexpected event occurs such as the sudden power loss. After power is restored all the settings will be restored to each line card and remote units that apply.

3.2 Console Mode

3.2.1 Control Port General

The ***FRM220 SNMP*** Console Port, labeled 'Console' on the card face, is an RS-232 asynchronous console terminal port designed to facilitate monitoring the condition of all converter cards and links as well as setup of all networking parameters through the use of a standard text based terminal or any terminal emulation program running on a Personal Computer.

3.2.2 Terminal Connection

A notebook computer has become an invaluable tool of the Systems Engineer. Connection to the computer is very simple. The ***FRM220 SNMP*** acts as a DCE to the PC's DTE communications port. The only hardware required is a DB9-pin one-to-one, male to female cable. A convenient application, provided with the Microsoft Windows® operating systems, is "HyperTerminal ™". To Start the HyperTerminal program, following the steps below: Please follow the instruction to connect in console mode.

1. Start "HyperTerminal" program --
Click 'Start', select 'Programs', 'Accessories', 'Communication', 'HyperTerminal'
Enter Connection Name
Select an Icon ' Click OK
2. Select COM port to communicate with SNMP Card
Choose direct to COM1 or COM2 ' click OK
3. Set Port Properties --
Port Setting:
Bit per second: 115200
Data bits: 8
Stop bits: 1
Parity bits: None
Flow Control: None

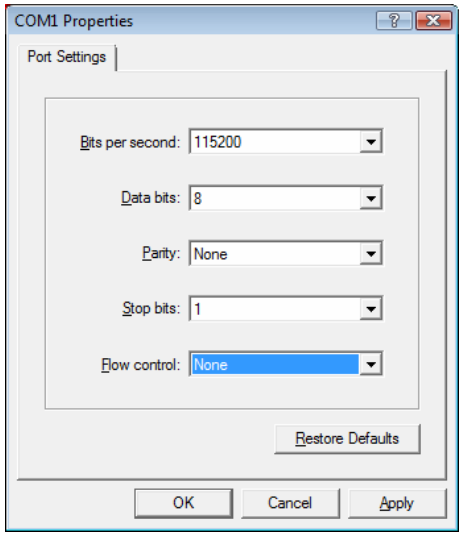


Figure 3-2 HyperTerminal port settings for FRM220

NOTE : Make the appropriate connections between the NMC card and the COM port, apply power to the ***FRM220*** , then press ESC, SPACE or ENTER after NMC card is fully booted (less than 10 seconds). When the 'ACT' LED is flashing steadily once per second, you may then use the "Console Mode" to access the ***FRM220***.

3.2.3 Terminal Pin Definition

The console port of the ***FRM220*** is an RS-232 interface (DCE) that utilizes a DB9F connector. Use the configuration cable that is supplied with the ***FRM220*** or prepare a three wire DB9(F) to DB9(M) cable with the following pin out:

DB9(M)	signal	DB9(F)
5	GND	5
2	TD	2
3	RD	3

3.2.4 Terminal Login

To enter "Console mode", a password is required. Normally, there is no password set from the factory. The user password provides security to protect the system. From a Telnet connection, if you enter the wrong password three times, the security system will not allow any login again for 15 minutes.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
Login: admin
Password:
```

After entering the correct password, if required, you will see the main menu display on the screen as follows :

The FRM220 supports two dry contact alarms that are user configurable for a number of different alarm conditions. Alarm conditions are configurable for alarms from Power, Fans, and UTP or Fiber link and Far End Fault states for local and remote converters.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
This Chassis ID:[00]  Cascade:[Yes]    Monitored Chassis ID:[00]
Chassis List:
    #0:[X] #1:[ ] #2:[ ] #3:[ ] #4:[ ] #5:[ ] #6:[ ] #7:[ ] #8:[ ] #9:[ ]

<1>:SLOT #01 > NMC & Chassis          <B>:SLOT #11 > FRM220-10/100I
<2>:SLOT #02 > FRM220-10/100I         <C>:SLOT #12 > FRM220-10/100I
<3>:SLOT #03 > FRM220-10/100I         <D>:SLOT #13 > FRM220-10/100I
<4>:SLOT #04 > FRM220-10/100I         <E>:SLOT #14 > FRM220-10/100I
<5>:SLOT #05 > FRM220-10/100I         <F>:SLOT #15 > FRM220-10/100I
<6>:SLOT #06 > FRM220-10/100I         <G>:SLOT #16 > FRM220-10/100I
<7>:SLOT #07 > FRM220-10/100I         <H>:SLOT #17 > FRM220-10/100I
<8>:SLOT #08 > FRM220-10/100I         <I>:SLOT #18 > Empty
<9>:SLOT #09 > FRM220-10/100I         <J>:SLOT #19 > Empty
<A>:SLOT #10 > FRM220-10/100I         <K>:SLOT #20 > Empty
<->:Monitor previous chassis    <+>:Monitor next chassis
<L>:SNMP System Configuration Setup
<M>:SNMP Manager Configuration Setup
<P>:Password Setup
<R>:Reboot    <Z>:Logout
```

Up to 10 chassis may be cascaded and controlled from a single point

20 slots are available in the FRM220 chassis. One slot for NMC and the rest for fiber converter cards.

The card inventory of all slots in the rack is shown. In this example, the chassis is almost completely filled with 10/100 Ethernet in-band cards and of course the NMC card. If no card is found, the slot status will display 'Empty'. The cards are number in slots #01~#20, left to right, looking from the front, and can be selected with single keyin of 1~9 or A~K. Pressing the card number will immediately display card's status and configuration screen. For details of line card settings, please refer to Appendix A for the specific line card type. The other function keys are explained below.

1: this key will immediately display the status of the power supplies and all fans (chassis).

L: the 'L' key enters the System Configuration screen, where the NMC card's networking settings are configured.

M: the 'M' key will enter the Manager Configuration screen, where the manager workstation IP is configured, the trap destinations may be setup and the SNMP community strings are defined.

P: this key will enter the user and password setting feature.

R: this key will reboot (hardware reset) the NMC.

Z: this key will logout of the console mode.

+: the plus key will select the next chassis in a cascaded stack.

-: the minus key will select the previous chassis in a cascaded stack.

3.2.5 TCP/IP Configuration

The Network Management modes that require TCP/IP communications must first have all TCP/IP configuration settings completed while in the "Console Mode". Once the settings are completed, the ***FRM220 NMC*** card can be accessed by Telnet, the Web or via standard SNMP protocol.

Two Step Configuration

The management configuration process is broken down into two logical steps. First the SNMP agent (the FRM220 NMC card itself) must be configured with an IP address, subnet mask and gateway IP. Second, the agent must be told who the network manager is, ie. the management workstation's IP address. Included in the second step are the community string settings and IP address to send the unsolicited trap messages (alarm messages).

To configure the card for use by SNMP, certain parameters must be set. They are:
a. The SNMP card (agent) needs its own IP address.
b. The SNMP card needs to know the IP address of the management workstation.
c. The community string must be set.
d. The SNMP card's subnet mask can be set.

Step One: Agent Configuration Process
From the main menu type 'L':

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
<< SNMP System Configuration Setup >>
     Model= FRM220
     S/N= 123456789
     Target MAC Address= 00:02:ab:06:20:20
<1>: Target IP=          192.168.1.1
<2>: Target Netmask=     255.255.255.0
<3>: Target Gateway=     192.168.1.254
<4>: Target Name=        FRM220
<5>: TFTP Server IP=     192.168.1.100
<6>: TFTP Download Kernel= linux.zip
<7>: TFTP Download File System= romfs.zip
<8>: Load default settings and write to system.
<9>: Do TFTP and Flash Kernel function.
<A>: Do TFTP and Flash File System function.
<ESC>: Write to system and go to previous menu.

Please select an item.
```

These are the default TCP/IP settings. You can directly connect by web browser if you have configured your Ethernet connected PC for this subnet.

The following are descriptions of the function keys available and the actions which they perform.

1: Use this key to set the NMC card's IP address.

2: Use this key to set the NMC card's subnet mask.

3: Use this key to set the NMC card's default gateway.

4: Use this key to set the System Name

5: Use this key to set the IP address of the TFTP server, used for upgrading.

6: Use this key to set the path and filename of the kernel upgrade image file.

7: Use this key to set the path and filename of the FS upgrade image file.

8: This key will reset all settings to factory default.

9: This key will initiate the TFTP image transfer and flash upgrade the kernel.

A: This key will initiate the TFTP image transfer and flash upgrade the File System.

ESC: This key will write any changes and leave the system setting menu.

NOTE: If changing the IP address, subnet mask or default gateway, please manually reboot the NMC.

Step Two: Manager Configuration Process
a.) Assign Managers

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
<< SNMP Manager Configuration Setup >>
   Manager's IP        Community String Access
   ================== ================ ==========
#1 ---                 ---              ---
#2 ---                 ---              ---
#3 ---                 ---              ---
#4 ---                 ---              ---
#5 ---                 ---              ---
#6 ---                 ---              ---
#7 ---                 ---              ---
#8 ---                 ---              ---
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

1-8: Use these keys to set the IP address, IP address range or disable for of up to 8 SNMP management destinations.

D: Use this key to delete all the management settings.

S: Use this key to confirm the settings, save and restart the NMC.

N: Use this key to go to the Trap manager configuration menu.

ESC: Use the escape key to exit this menu without doing any changes.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
<< SNMP Manager Configuration Setup >>
   Manager's IP        Community String Access
   ================== ================ ==========
#1 192.168.1.0/24      private          read-write
#2 default             public           read-only
#3 172.24.1.125        private          read-write
#4 ---                 ---              ---
#5 ---                 ---              ---
#6 ---                 ---              ---
#7 ---                 ---              ---
#8 ---                 ---              ---
Command Function Key:
<1>~<8>: Edit manager #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Trap Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

All managers on this subnet have read/write access, with community string 'private'

This single manager has read/write access, with community string 'private'

Please note the following when setting the Manager's IP:
1. Using the word 'default' will allow any IP address to manage the rack. They will be assigned the access authority per the assigned access string, read-write or read-only.
2. When using the subnet delimiter (/8 /16 /24, etc.) the entire sub-net can be allowed management rights.
3. When assigning only a single IP address for management, there is no need to use the /xx subnet.

b.) Trap Management

From the SNMP Manager Configuration Menu, select 'N' for trap management configuration.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.00 ***
                ****************************************
<< Trap Configuration Setup>>
   Trap Receiver IP Community String
   ================ ================
#1 192.168.1.100    private
#2 ---              ---
#3 ---              ---
#4 ---              ---
#5 ---              ---
#6 ---              ---
#7 ---              ---
#8 ---              ---
Command Function Key:
<1>~<8>: Edit trap receiver #1 to #8 setting.
<D>    : Delete all settings.
<N>    : Go to Manager Configuration menu.
<S>    : Confirm above setting and restart SNMP.
<ESC>  : Back to main menu without modification.
Please select an item.
```

Set up to 8 trap receivers, entering their IP addresses.

The following are descriptions of the function keys available and the actions which they perform.

1~8: Use these keys to select any of up to eight trap destination addresses.

D: Use this to clear all settings.

N: Use this key to go back to manager configuration.

S: Use this key to confirm settings and restart the SNMP agent.

ESC: This key will leave the setting menu without saving any changes.

Conclusion

The community strings act like passwords in dealing with the device via SNMP protocol. By changing the community strings for read / write ('private' in these examples) and read only (public) access, and assigning a community string to an access IP, an administrator can control access to the ***FRM220***. Community string names are case sensitive, therefore 'puBlic', 'Public' and 'public' are all different strings.

Now that both the 'System' and 'Manager' settings are complete, the ***FRM220*** is ready to be managed remotely over an IP network. The system provides a Telnet server feature that allows login over TCP/IP networks and provides a menu display almost identical to that of the serial console mode. Some functions are disabled in the Telnet session. For example, you cannot change the ***FRM220 NMC***'s IP address from Telnet. To do so would cause immediate disconnection. However, the individual line card settings remain the same as with serial console.

The ***FRM220 NMC*** is supplied with a enterprise MIB file (Management Information Base) that can be compiled into any standard SNMP network management software. The MIB file is compliant with MIB-II standards.

Later in Chapter 4, we will describe in detail the operation of the Web based management. This graphical management allows control of many chassis in a convenient and popular WWW environment. The actual communications between the browser and the NMC card is via standard HTTP protocol.

3.2.6 Chassis Information and Alarm setup

From the main menu of the FRM220, press the '1' (one) key to enter the NMC & Chassis configuration.

```
                ***************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.01 ***
                ***************************************
This Chassis ID:[00]  Cascade:[Yes]   Monitored Chassis ID:[00]
SLOT #01 > SNMP & Chassis              [ Ver:1.00-1.01 ]
Power#1 Type:[DC36-72V] Status:[Fail]  Fan#1 RPM:[2850] Status:[OK  ]
Power#2 Type:[AC90-250] Status:[OK  ]  Fan#2 RPM:[2850] Status:[OK  ]
Alarm#1 Status:[Active  ]
<1>:  Mode:   [By Power ]
<2>:  User#1: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<3>:          Local   [ ]UTP_Link_Down [ ]FX_Link_Down
                      [ ]FEF_Detect    [ ]Remote_Power_Fail
<4>:          Remote  [ ]UTP_Link_Down [ ]FX_Link_Down

Alarm#2 Status:[Inactive]
<5>:  Mode:   [By Fan   ]
<6>:  User#2: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<7>:          Local   [ ]UTP_Link_Down [ ]FX_Link_Down
                      [ ]FEF_Detected  [ ]Remote_Power_Fail
<8>:          Remote  [ ]UTP_Link_Down [ ]FX_Link_Down

<ESC>: Go to previous menu. Please select an item.
```

Version display meaning:
Hardware version 1.00
Software version 1.01

Description of Menu contents:

This Chassis ID: This ID number will reflect the actual ID number set on the selector switch on the rear of the chassis

Power#1 Type: & Status

The FRM220 can accommodate two power supply modules of any type. There are three types available:

1. AC Model, supports 90~250VAC input, 150watt maximum output.
2. DC Model (48), supports 36-72VDC input, 150 watts maximum output
3. DC Model (24), supports 18~36VDC input, 150 watts maximum output

Fan#1 RPM & Status

There are two hot swappable cooling fan assemblies that may be field replaced. The normal operational revolutions per minute (RPM) are between 2800 and 3000. The threshold for fan alarm is activated if the fan's RPM falls below 1650RPM.

Alarm#1

The FRM220 supports two dry contact alarms that are user configurable for a number of different alarm conditions, such as from Power, Fans, and UTP or Fiber link and Far End Fault states for local and remote converters. In the default configuration, Alarm #1 is Active if any failure condition exists for power. Alarm #2 is active if any fan fails or the RPM falls below the acceptable threshold (1650RPM).

For an example of configuration for Alarm #1, press '1' (one).

```
Alarm#1 Mode:
  <0>: Disable   -- ignore all alarm conditions
  <1>: By Powers -- active if any power fails
  <2>: By User#1 -- active if any user#1 definition is met
  <3>: Active    -- for manual testing
<ESC>: Go to previous menu. Please select an item.
```

0 : This will completely disable Alarm #1. The relay dry contact will not close and the NMC ALM1 red LED will not light.
1 : This is the factory default setting. This alarm will only be off when two power modules are installed and powered on.
2 : This setting will take the user parameters and set the alarm according to failures in any parameters set under items 2,3,4.
3 : This selection will set the alarm for testing purposes. The ALM1 LED will light and dry contact for Alarm 1 will close.

For an example of configuration for Alarm #2, press '5' (five).

```
Alarm#2 Mode:
  <0>: Disable   -- ignore all alarm conditions
  <1>: By Fans   -- active if any fan fails
  <2>: By User#2 -- active if any user#2 definition is met
  <3>: Active    -- for manual testing
<ESC>: Go to previous menu. Please select an item.
```

0 : This will completely disable Alarm #2. The relay dry contact will not close and the NMC ALM2 red LED will not light.
1 : This is the factory default setting. This alarm will only be off when one or both fans fail or are removed.
2 : This setting will take the user parameters and set the alarm according to failures in any parameters set under items 2,3,4.
3 : This selection will set the alarm for testing purposes. The ALM1 LED will light and dry contact for Alarm 1 will close.

User Alarm Definitions

```
Chassis [X]Power#1   [X]Power#2   [X]Fan#1   [X]Fan#2
Local   [X]UTP_Link_Down [X]FX_Link_Down
        [X]FEF_Detect    [X]Remote_Power_Fail
Remote  [X]UTP_Link_Down [X]FX_Link_Down
```

When alarm mode is set to "User", these definitions may be added to either User#1 or User#2. Any selected item that fails will cause alarm activation. For chassis activated alarms, the user may select individual power or fan combinations. For locally generated alarms, any copper, fiber, Far End Fault or Remote Power Failure can be selected, in any combination to generate an alarm on failure from any installed Line Card. For any remotely connected in-band converters, any copper, fiber, Far End Fault or Remote Power Failure may be used to trigger the alarm relay.

Below is an example of user settings where Alarm#1 will be triggered by any chassis component failure (power or fan). At the same time, Alarm#2 will be triggered if any local or remote copper or fiber link or remote power has failure. The system is designed to allow very flexible use of the two dry contact alarms through customized monitoring schemes.

```
                ***************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.01 ***
                ***************************************
This Chassis ID:[00]  Cascade:[Yes]       Monitored Chassis ID:[00]
SLOT #01 > NMC & Chassis                  [ Ver:1.00-1.01 ]
Power#1 Type:[AC90-250] Status:[OK  ]     Fan#1 RPM:[2910] Status:[OK  ]
Power#2 Type:[DC36-72V] Status:[OK  ]     Fan#2 RPM:[2970] Status:[OK  ]
Alarm#1 Status:[Inactive]
<1>:  Mode:   [By User#1]
<2>:  User#1: Chassis [X]Power#1   [X]Power#2   [X]Fan#1   [X]Fan#2
<3>:          Local   [ ]UTP_Link_Down [ ]FX_Link_Down
                      [ ]FEF_Detect    [ ]Remote_Power_Fail
<4>:          Remote  [ ]UTP_Link_Down [ ]FX_Link_Down

Alarm#2 Status:[Inactive]
<5>:  Mode:   [By User#2]
<6>:  User#2: Chassis [ ]Power#1   [ ]Power#2   [ ]Fan#1   [ ]Fan#2
<7>:          Local   [X]UTP_Link_Down [X]FX_Link_Down
                      [X]FEF_Detected  [X]Remote_Power_Fail
<8>:          Remote  [X]UTP_Link_Down [X]FX_Link_Down

<ESC>: Go to previous menu. Please select an item.
```

3.2.7 User Password Setup

From the main menu page, press the 'P' key to enter the Password Setup.

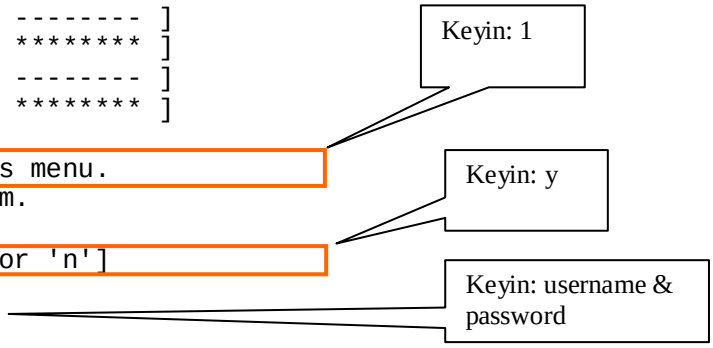
```
<< Password Setup >>

<1>: User Name #1: [ -------- ]
     Password:     [ ******** ]
<2>: User Name #2: [ -------- ]
     Password:     [ ******** ]

<ESC>: Go to previous menu.
Please select an item.

Enable User #1?['y' or 'n']
User Name #1=admin

User Password #1=
```



In the first software release, two users are configurable in the FRM220 NMC. Currently, either user will have full control over all configuration and monitoring functions of the management system. In some future release, the management will be divided between different access levels and users will be assigned a level appropriate to their level of authority in the management scheme. For now, set at least one user and password to protect Telnet and Web access by unauthorized personnel.

3.2.8 Upgrading the NMC

The design of the Network Management Controller is built around a 32 bit embedded processor that uses an open source Linux kernel and customized software on top. Line cards are designed using 8 bit 8051 microprocessors that handle all configuration of the line card through software and provide the communication via RS-485 bus from the card to the Network Management Controller (NMC). The NMC and any line cards, including any remotely connected (over fiber) in-band managed converters, are all capable of online software upgrade.

The purpose of this section is to outline the procedures and pitfalls in upgrading the NMC of the ***FRM220***.

3.2.8.1 Preconditions

The original version 1.0 hardware NMC was released with SNMP code version 1.0x for the ***FRM220***. Software upgrade is performed by the user by interacting with the NMC via the serial console port on an ASCII terminal (optionally via Telnet). The software transfer mechanism is the TCP/IP protocol TFTP (Trivial File Transfer Protocol). The end user or network engineer can perform an upgrade easily from one personal computer or from a Laptop Computer.

3.2.8.2 Items required

a. The ***FRM220*** unit with NMC installed, configured and network connected. Version 1.0X to be upgraded to version 1.0Y.
b. A Windows® based PC with a network connection and with at least one free COM port and terminal emulation software (such as HyperTerminal) or Telnet.
c. Serial console cable (DB9M to DB9F) [not required if performing by Telnet]
d. Ethernet UTP cables
e. FRM220-NMP latest version Linux kernel or ROMFS file system
f. CTC Union TFTP server for Windows® (or other TFTP server)

3.2.8.3 Equipment Setup

The upgrade procedure should not have any effect on the traffic passing through an online ***FRM220*** unit. It is not required that the unit be taken offline for maintenance.

Two connections are required between the PC that will do the upgrade and the ***FRM220*** that will be upgraded. First, a console connection, with terminal emulation program such as HyperTerminal with settings of 115.2K baud, 8 bits, no parity, 1 stop bit, and no flow control. The second connection is an Ethernet connection, either through a network or with a direct connection via UTP cable.

Check the Ethernet settings of the ***FRM220*** through the console mode (refer to Chapter 3 Provisioning). Either change the settings to match the network settings of your PC or set the PC's settings to match the ***FRM220***'s network settings. In the following example, we are on a 192.168.1.0 network with a subnet mask of 255.255.255.0 and a default gateway of 192.168.1.254. Our PC is set with an IP address of 192.168.1.100 and our ***FRM220*** has an IP address of 192.168.1.1. (factory default settings)

3.2.8.4 Setup the FRM220

The following screens will show the detailed procedures to setup the networking for the ***FRM220*** and prepare for TFTP upgrade of the SNMP.

Once the console port is connected to a terminal, the following screen will display.

```
              ****************************************
              *** CTC UNION TECHNOLOGIES CO., LTD. ***
              *** FRM220 NMC              VER. 1.00 ***
              ****************************************
This Chassis ID:[00]  Cascade:[Yes]    Monitored Chassis ID:[00]
Chassis List:
    #0:[X] #1:[ ] #2:[ ] #3:[ ] #4:[ ] #5:[ ] #6:[ ] #7:[ ] #8:[ ] #9:[ ]

<1>:SLOT #01 > NMC & Chassis          <B>:SLOT #11 > FRM220-10/100I
<2>:SLOT #02 > FRM220-10/100I         <C>:SLOT #12 > FRM220-10/100I
<3>:SLOT #03 > FRM220-10/100I         <D>:SLOT #13 > FRM220-10/100I
<4>:SLOT #04 > FRM220-10/100I         <E>:SLOT #14 > FRM220-10/100I
<5>:SLOT #05 > FRM220-10/100I         <F>:SLOT #15 > FRM220-10/100I
<6>:SLOT #06 > FRM220-10/100I         <G>:SLOT #16 > FRM220-10/100I
<7>:SLOT #07 > FRM220-10/100I         <H>:SLOT #17 > FRM220-10/100I
<8>:SLOT #08 > FRM220-10/100I         <I>:SLOT #18 > Empty
<9>:SLOT #09 > FRM220-10/100I         <J>:SLOT #19 > Empty
<A>:SLOT #10 > FRM220-10/100I         <K>:SLOT #20 > Empty
<->:Monitor previous chassis    <+>:Monitor next chassis
<L>:SNMP System Configuration Setup
<M>:SNMP Manager Configuration Setup
<P>:Password Setup
<R>:Reboot    <Z>:Logout
```

Press 'L' to enter the System Configuration Setup.

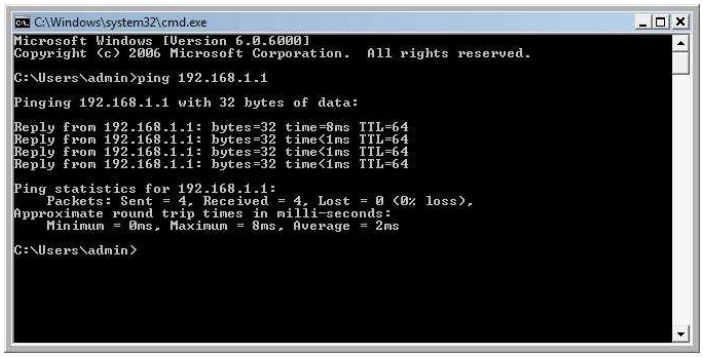
```
              ****************************************
              *** CTC UNION TECHNOLOGIES CO., LTD. ***
              *** FRM220 NMC              VER. 1.00 ***
              ****************************************
<< SNMP System Configuration Setup >>
     Model= FRM220
     S/N= 123456789
     Target MAC Address= 00:02:ab:06:20:20
<1>: Target IP=          192.168.1.1
<2>: Target Netmask=     255.255.255.0
<3>: Target Gateway=     192.168.1.254
<4>: Target Name=        FRM220
<5>: TFTP Server IP=     192.168.1.100
<6>: TFTP Download Kernel= linux.zip
<7>: TFTP Download File System= romfs.zip
<8>: Load default settings and write to system.
<9>: Do TFTP and Flash Kernel function.
<A>: Do TFTP and Flash File System function.
<ESC>: Write to system and go to previous menu.

Please select an item.
```

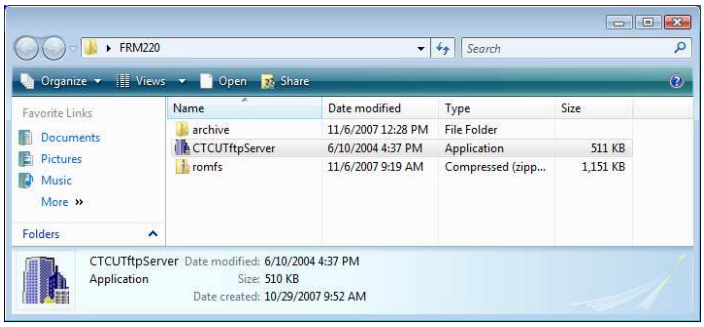
These are the default TCP/IP settings. You can directly connect by web browser if you have configured your Ethernet connected PC for this subnet.

Using the menu items 1,2,3 & 5, keyin the networking values. If your notebook will run the TFTP daemon, set its IP in the configuration for item 5, "TFTP Server IP".

If you have made any changes to items 1-5, you must write (ESC) and reboot (R) the NMC. Press 'ESC' to store the results and at the main menu press 'R' and confirm with 'y'. The NMC will reboot completely in about 8 seconds.

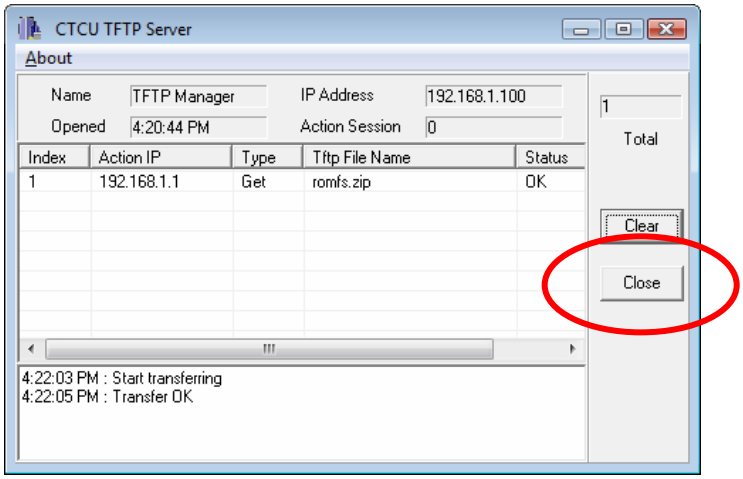


Ping the NMC from the TFTP server PC and be sure there is a response.



Place the upgrade file(s) in the same folder as the TFTP server program.

Start the TFTP server on the connected PC. In our example, we are using the CTC Union TFTP server. If Windows® is running a firewall, a security alert will popup. Click the "Unblock" button to allow TFTP protocol from the CTCUTftpServer application.



From the console terminal menu, select "9" to upgrade the kernel (very rare) or "A" to upgrade the filesystem (more likely).

The screen at the left shows that the romfs.zip file was transferred OK.

Note: Use the console menu items 6&7 to set the filenames for the kernel and/or filesystem if they do not match the upgrade file names.

You may now 'Close' the TFTP server on the PC.

OK, now let's verify the version number of the SNMP. Login to the terminal of the ***FRM220***.

Note that the version is now 1.01.

```
 ************************************************************
 *** CTC UNION TECHNOLOGIES CO., LTD      V1.01              ***
 *** FRM-220 Fiber Optical Media Converter Rack Management   ***
 ************************************************************
 Main Menu and Rack Status:
   1:Slot #1 >> Empty       << || 9:Slot #9  >> E1 BNC      <<
   2:Slot #2 >> Empty       << || A:Slot #10 >> 10/100 Base <<
   3:Slot #3 >> Empty       << || B:Slot #11 >> 10/100 Base <<
   4:Slot #4 >> Empty       << || C:Slot #12 >> 10/100 Base <<
   5:Slot #5 >> Empty       << || D:Slot #13 >> 10/100 Base <<
   6:Slot #6 >> Empty       << || E:Slot #14 >> 10/100 Base <<
   7:Slot #7 >> Empty       << || F:Slot #15 >> 10/100 Base <<
   8:Slot #8 >> Empty       << || G:Slot #16 >> 10/100 Base <<
 Command Function Key:
 '1' to '9', 'A' to 'G': I/O Cards Setting
 'P': Show Fans and Powers Status
 'R': Refresh Status
 'ESC' Logout
 'M': Manager Configuration Setup
 'S': System Configuration and TFTP Setup
Console:[On  line] Telnet:[Off line]    GUI:[Off line]
```

This completes the SNMP upgrade procedure.

This completes the basic chassis provisioning for the FRM220 2U 20 slot Platform Media Converter Rack. You will find provisioning and use of the web interface in the next chapter, Chapter 4. Specific configuration for line cards are located in the Appendix, starting with the first release line card, the FRM220-10/100I, in-band managed Fast Ethernet fiber media converter.

Chapter 4 Web Based Management

4.1 Introduction

This chapter will explain the operation of the ***FRM GUI*** (Graphical User Interface), a Web based interface used to monitor and configure the ***FRM220*** fiber media converter rack.

The management station may be attached directly to the ***FRM220 SNMP*** card with an Ethernet crossover cable. Typically the workstation will be attached to a network's HUB or switch and the equipment to be managed may be connected to the same subnet or may be connected on a remote network that has access via a router to the local subnet.

Follow the procedures in Chapter 3 for configuring the NMC for TCP/IP communication. Once this is completed and the Ethernet port of the NMC is connected to your network, the unit may be managed from any browser under any Operating System. The examples that follow are done with Microsoft's ® Internet Explorer® running on Vista.

4.2 Web Based Management Operation

4.2.1 Introduction

This section assumes that the ***Web Based*** management using a workstation as in section 1 and that the SNMP agent has been correctly configured as in section 2. This chapter will detail the operation of the web GUI in monitoring and controlling the ***FRM220*** Platform Media Rack.

4.2.2 Configuration

4.2.2.1 Start the Web Based application

Start the application by opening a web browser application such as Internet Explorer or Firefox. Enter the address of the FRM220 in the format http://xxx.xxx.xxx.xxx where xxx.xxx.xxx.xxx is the IP address of the NMC card. A login username and password may or may not be required to enter the configuration. The default username and password are not set initially. In the example, we have already set a user as 'admin' through the console.

Figure 4.1 Web manager login

After a successful login, the home page for the rack will be displayed. All card inventory and LED status are shown in near real-time.

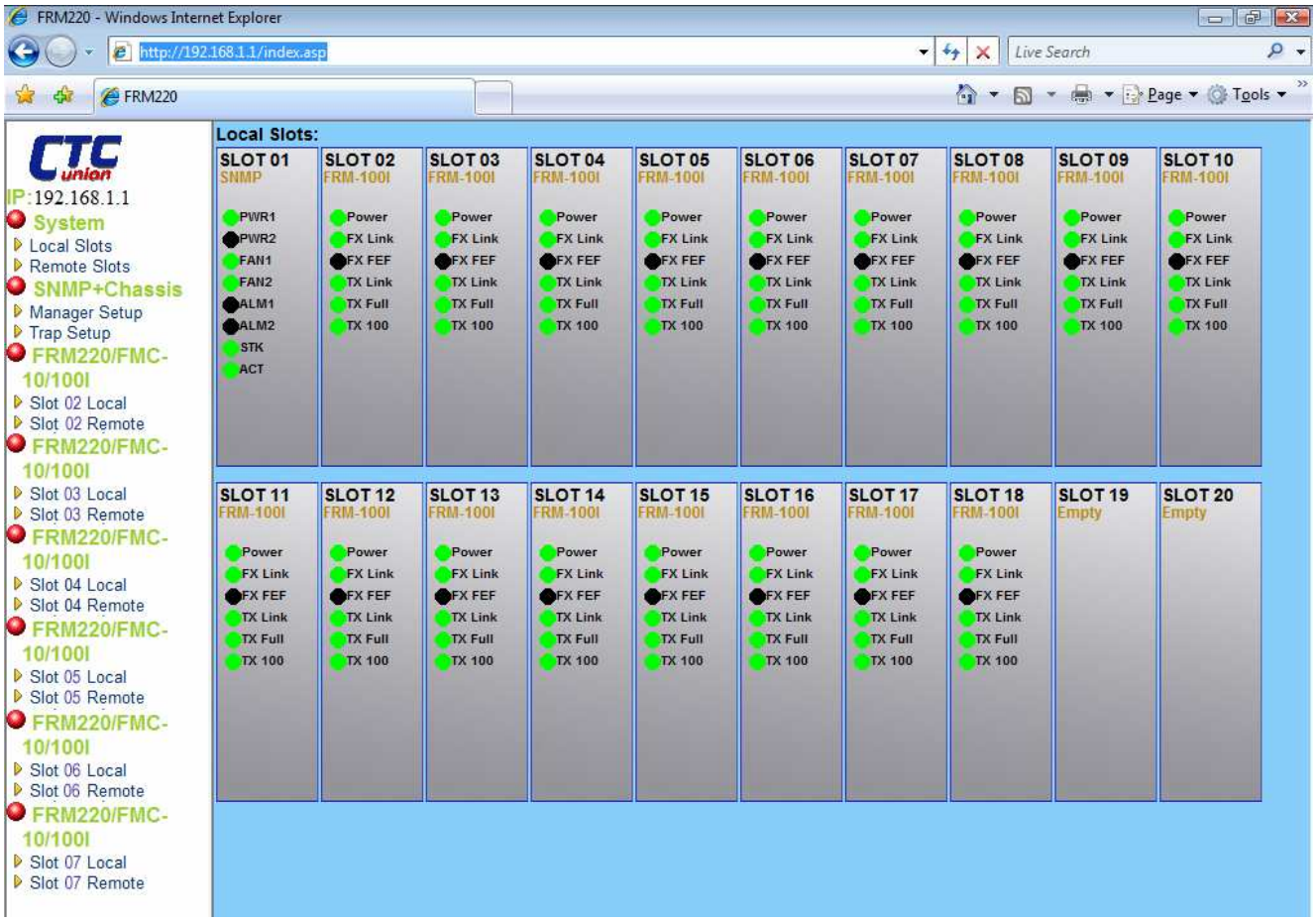


Figure 4.2 Web based manager first started

The ***Web GUI*** behaves just like any other web based application. The following graphic shows all of the areas that may be clicked for further configuration. Slots without any line card or without manageable line card will be shown as 'Empty'.

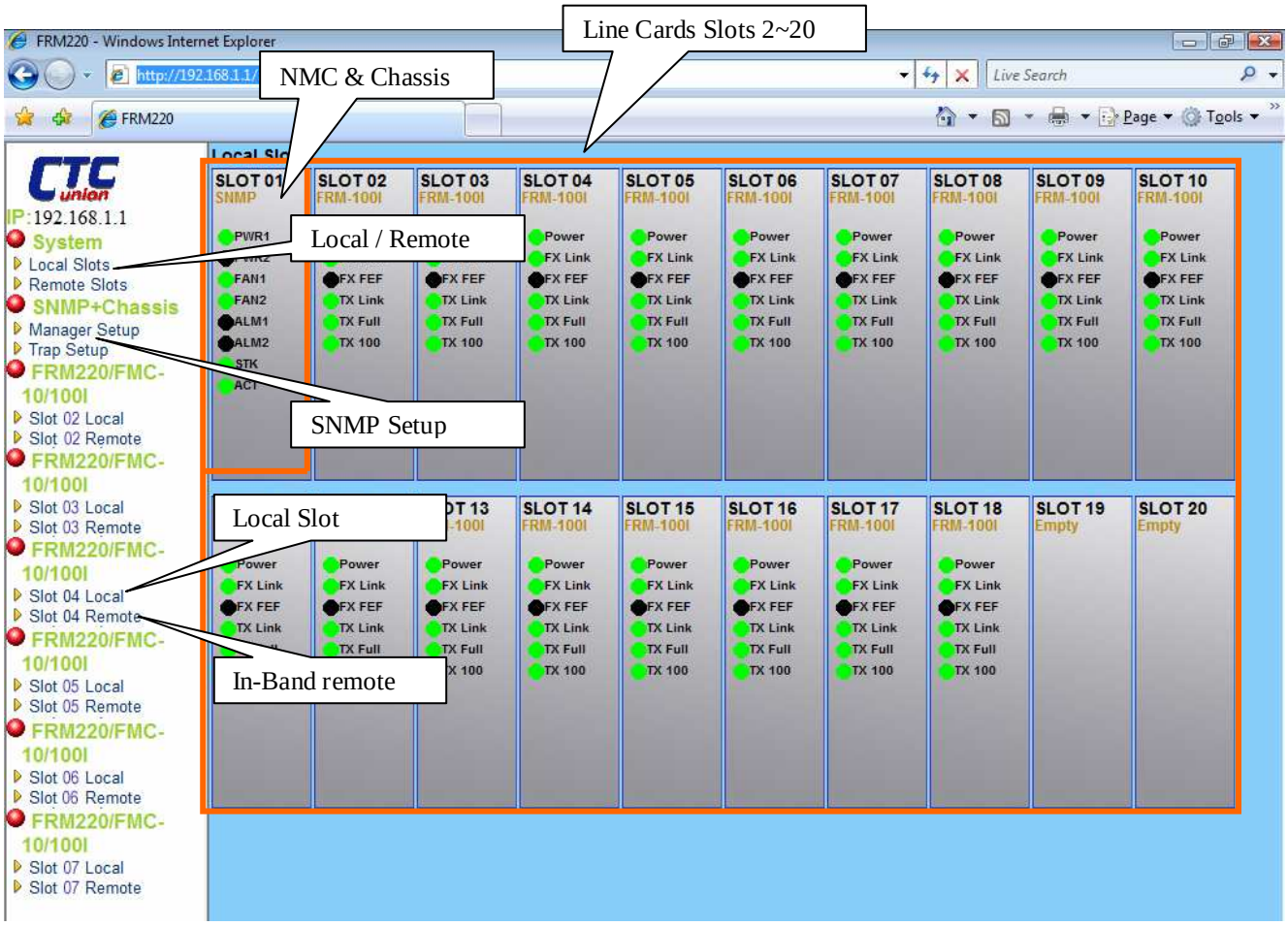


Figure 4.16 Selectable features of the Main Web GUI

4.3.2.2 View SNMP & Chassis

Click on "SNMP+Chassis" from the left hand window menu bar.

Figure 4.17 Configuration Form

Use this form to change the user password for the Web GUI. In four steps, (1)keyin the current password, (2) click the 'PassWord' button, (3)keyin the new password and (4)finish by clicking 'Save'. Note also that trap messages may be sent to a text file for logging, output to the default printer, and/or issue a warning beep on the PC by clicking the appropriate check box.

4.32.3 Edit the SNMP Agent

Click on "Edit" from the window menu bar to enter the Edit SNMP Agent Window.

Figure 4.18 Edit the SNMP Agent

4.33 Operation

The interface for the WEB is a point and click application that requires little use of the keyboard.

Figure 4.17 Operational Web GUI screen

From the operational screen, the status of all line card units may be displayed. The GUI can configure up to 10 racks. Scroll bars on the right allow scrolling through the racks, if there are many. The Pwr and Fan indicators will display "green" when two power supplies are active and their fans are operating normally. Line card types are shown and link status displayed by color code:

"Green" status indicates that both the fiber and copper are linked.
"Yellow" indicates loss of link on the copper side.
"Magenta" indicates loss of link on fiber side.
"Grey" indicates neither copper nor fiber linked
"Black" color indicates an empty line card slot or un-identified card.

If all line cards are shown with "Red" color, it indicates a communication error. Possibly the configuration is not correct or there is a network error that prevents the manager from communicating with the agent.

The trap window at the bottom displays trap messages, indicating the source IP address, the time stamping of the trap and the trap message itself. New messages are added from the bottom, when the screen is full the messages will scroll up. The "Clear Trap" button will erase all of the traps displayed and stored in memory.

4.33.1 Rack Detail

From this main display, we can view the details of any rack by clicking on the "Rack" button for that particular rack. Select the first device by clicking on the "Rack 1, Rack 2, Rack 3, etc" button. A new window will open displaying the rack's front and rear panel details.

Figure 4.18 Rack's Web GUI screen

The front panel graphic shows the operational state of all the installed line cards. The LED indications are shown in real time. Fan and power status are also displayed in "green". A "Red" indication on any of the fans, power supplies, or power supply fans indicates device or power failure.

Each channel line card is shown with the LED indications in realtime. Clicking on a channel button will enter the detailed configuration screen for that line card.

The 'Save all' button can save all the current rack settings and all line card settings to a file on the PC. The 'Load cfg' button can then be used to restore the previously saved configuration data and restore it to the rack.

The 'Close' button will close the rack view window and return to the main program window.

5.4 Troubleshooting

5.41 Network Settings

5.41.1 Review Agent Settings

During unit startup, the "SNMP" LED will light as the agent boots up, then it should blink at about one cycle per second after boot up and during normal operation. Refer to Chapter 3 section 3.1 for the SNMP agent settings. Be sure you have a valid IP address for the attached network, that the subnet mask is properly set and that the default gateway is set if you wish to manage the FRM from a remote network.

Attach a network cable to the FRM's front panel LAN/SNMP connector using a straight cable if connecting to a HUB or a cross over cable if connecting directly to another MDI device, such as direct connection to a workstation. The Link LED should be on or flashing. No link LED means no link. From any PC on the network, confirm the agent can be pinged.

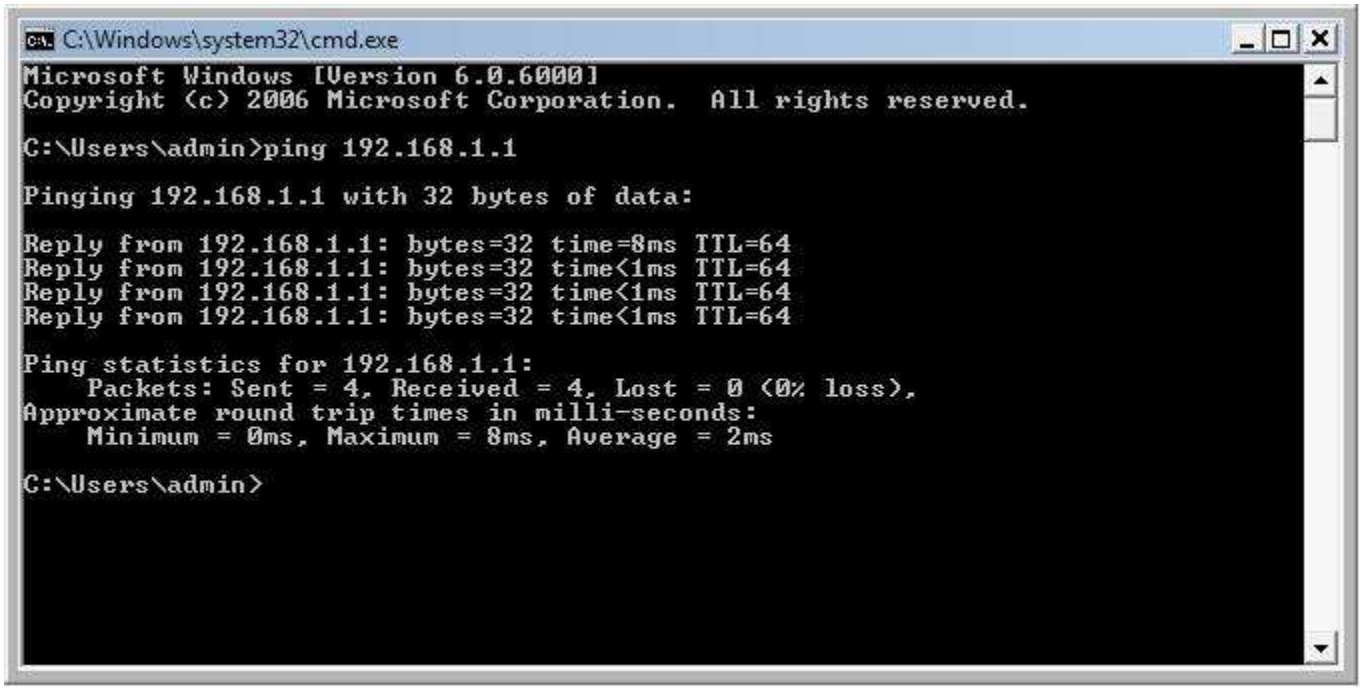


Figure 5.1 Ping

The "ipconfig" command from a command window in NT will display the workstation's IP, subnet and gateway settings. The "ping" command will send an ICMP protocol message to the agent, which in turn should reply. If no reply, double check all network connects, connect directly from a workstation to the FRM, or as a last resort replace the SNMP card of the FRM.

5.41.2 Review Manager Settings

For the browser to connect to the FRM for management, the FRM's SNMP must be properly configured with the manager's IP address and authorized for read/write (via community string setting) and trap messages. Review the settings explained in 2.5.2.

Review the "Edit" settings in 3.2.3 of the GUI, and confirm that the monitor mode is set to "1", IP address and community string for read/write match those as set from section 3.3.

If the management workstation is on a remote network, ensure it can also pass the ping test.

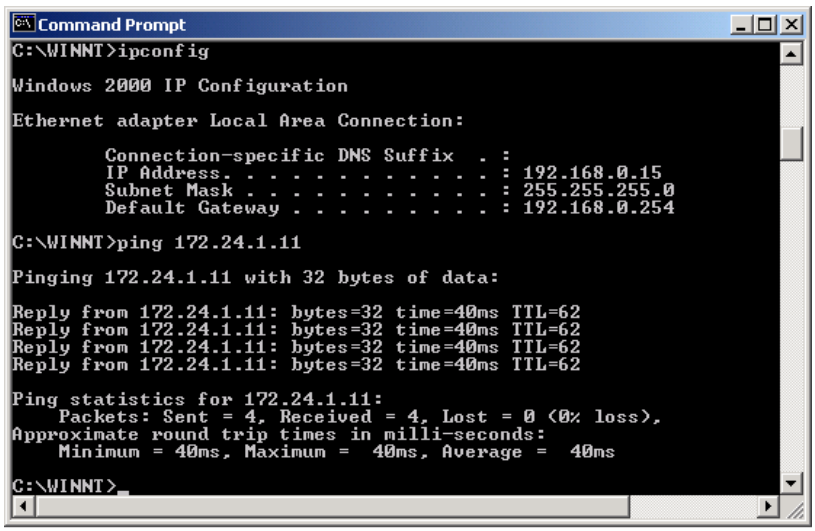


Figure 5.2 Ipconfig and Ping Remote Network

Check with your network administrator to ensure that any firewalls in place will allow passing of SNMP protocol in order to connect with an FRM on a remote network. By default SNMP uses port 161.

Always check all connections and double check all configurations. We have tested the FRM and GUI extensively on local networks, on remote networks through bridges and routers and even over wireless links. You should not experience any problems if you follow each and every step in this guide. We hope you enjoy using the FRM with SNMP option and web based GUI manager.

Appendix A. Line Cards

Introduction

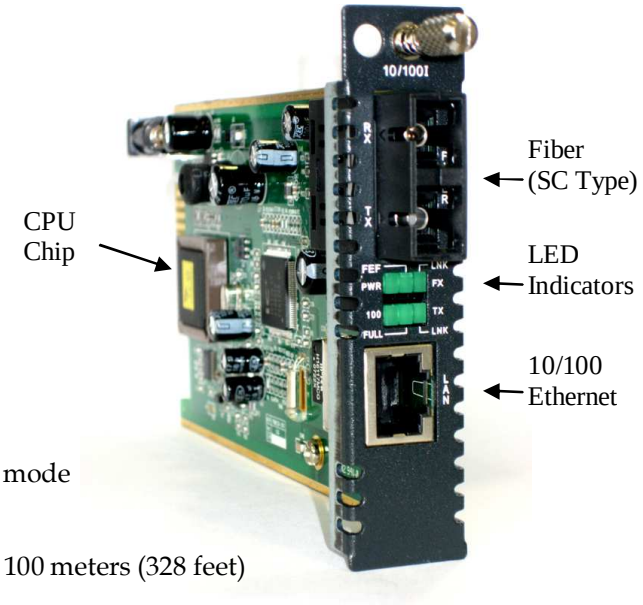
The FRM220 In-Band Managed Media Converter Chassis is designed to accept a variety of fiber to copper or fiber to fiber converter line cards. As line cards are added, this section will be updated with the relevant information for the new line cards. The management interface and all line cards support software upgrading so that new line cards and new features may be added at a future date. Please refer to Chapter 3 for details on the upgrade method and procedures for operating the FRM220.

A.1 FRM220-10/100i In-band managed 10/100 Fiber Media Converter

The FRM-10/100i (in-band converter) is a In-band Managed (OAM) Fiber Ethernet media converter (MC) that supports 10Base-T or 100Base-TX and converts to 100Base-FX (fiber). The UTP side supports auto-negotiation or forced settings for speed and duplex by setting as well as auto-MDIX. When the FRM-10/100i is placed in the FRM220 with NMC, the settings are controlled by the chassis management system. The remote FRM-10/100i stand-alone may also be configured from the FRM220 through the in-band management features (OAM).

Specifications

Complies with IEEE 802.3 and IEEE 802.3u
Auto MDIX on UTP side
Far End Fault indication (via OAM)
Link Fault Pass Through (LFP) enable or disable
288kb packet buffer in switch mode
1K MAC address table in switch mode
Forward 2046 bytes packet in switch mode
Supports IEEE802.3x flow control in switch mode
Ingress/Egress Bandwidth Control (nx32K or nx512k)
Selectable switch or converter operation mode
Supports 9Kbytes jumbo packet in converter mode
Low latency in converter mode
Pass all frames including OAM/fragment in converter mode



10Base-T UTP Cable Requirement

Cable type: Category 3, 4 or 5. Maximum distance: 100 meters (328 feet)

100Base-TX UTP Cable Requirement

Cable type: Category 5, minimum. Maximum distance: 100 meters (328 feet)

Management

The 10/100i line card is managed by an on-card CPU when installed in the FRM220 CH20 chassis. There are no DIP switches or manual settings. If the MC is placed stand-alone, without local or remote connection to FRM220 NMC management, the MC runs with default parameter. The default parameters are: switch mode, auto-negotiation, LFP disabled, ALS (Auto Laser Shutdown) disabled, and no bandwidth limit.

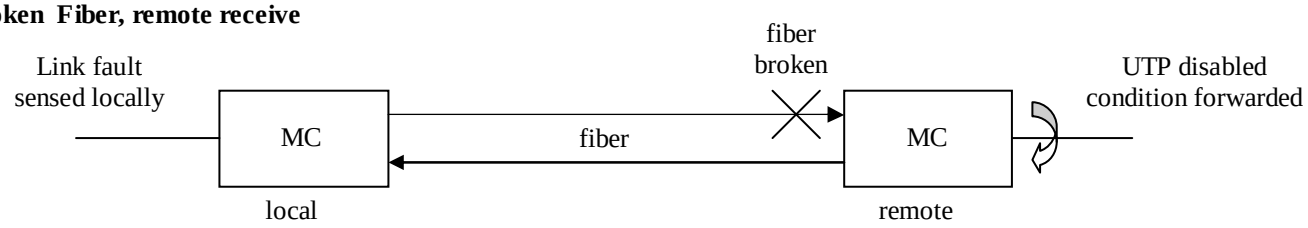
Operation Modes

The default operational mode for the FRM-10/100i is '**switch mode**'.
When the MC works in '**switch mode**' mode, it does not begin to forward a packet to a destination port until after the entire packet is received. The latency therefore depends on the packet length. The maximum packet length supported is up to 2046 bytes in this mode. Different from a normal switch chip, the MC's chip supports forwarding IEEE802.3x pause frame. In '**switch mode**' the MC operates with a 'store & forward' method that supports a 1K MAC address table. The UTP side may be 10 or 100 speed and in full or half duplex, while the fiber side runs in 100Base, full duplex.
In '**converter mode**', the MC operates with low latency. The transmission does not wait until the entire frame is received, but instead it forwards the received data immediately. Both transceivers (UTP and Fiber) in the MC are interconnected via the OAM (Operation, Administration and Maintenance) engine while the internal switch engine and data buffer are not used. The MC filters OAM frames and supports 9KB jumbo packet in this mode. Again, the switch engine is disabled in this mode and the UTP must be 100Base, Full Duplex to match the fiber's 100Base-Full.

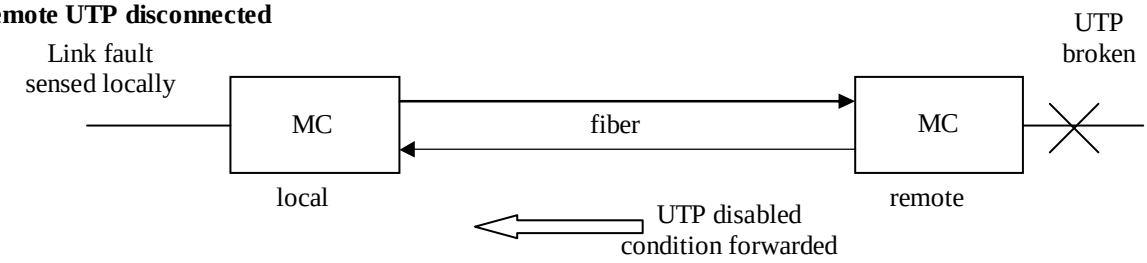
Link Fault Pass Through (LFP, AKA. Link Loss Forwarding)

This media converter incorporates a Link Forwarding feature which allows indirect sensing of a Fiber or UTP Link Loss via both the 100 Base-TX UTP and 100Base-FX connections. Whenever the media converter detects a Link Loss condition on the Receive fiber (Fiber LNK OFF), it disables its UTP transmitter so that a Link Loss condition will be sensed on the receive UTP port. (See the following figure) The link loss can then be sensed and reported by a Network Management agent at the host equipment of remote UTP port. This feature is disabled by default.

Broken Fiber, remote receive



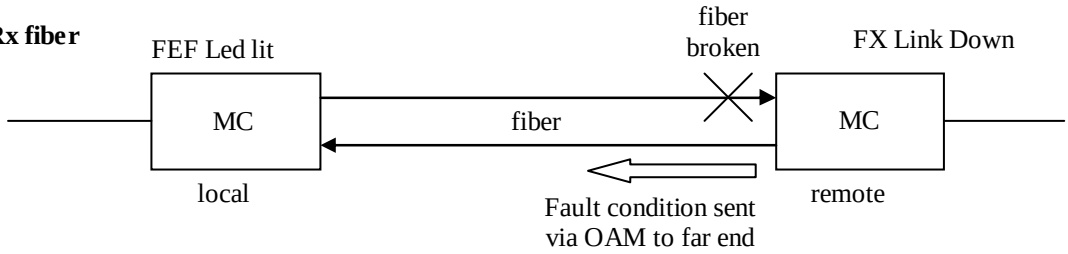
Remote UTP disconnected



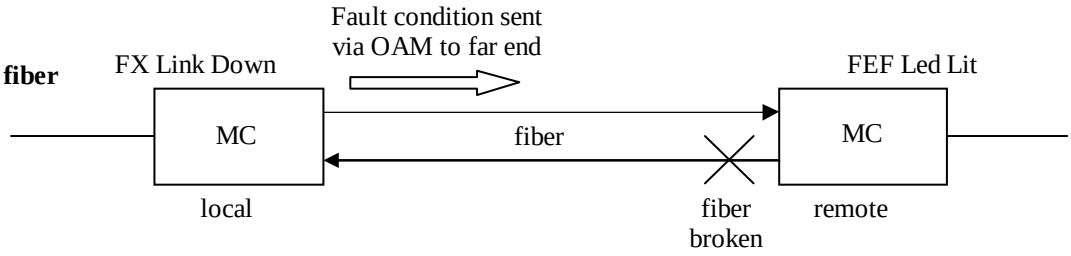
Far End Fault (FEF)

The Far End Fault or FEF feature is a built-in part of the OAM.

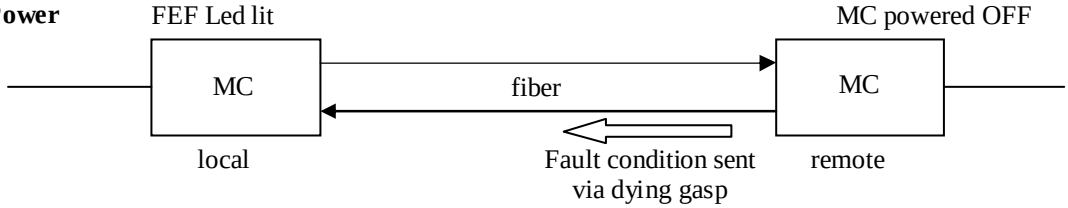
Remote Rx fiber Broken



Local Rx fiber Broken



Remote Power Failure



LED Status Indicators

LED	Function	State	Status
PWR	Power indicator	On	Converter has power.
		Off	Converter has no power or has been disabled.
		Blinking	Card is being upgraded.
FEF	Far End Fault	On	Indicates some fault condition from the unit connected on the remote fiber
		Off	Normal no fault condition
FX Link	Fiber link	On	The fiber link is ok.
		Off	No link or the link is faulty.
		Blinking	Receiving data on the fiber.
100	mode display	On	UTP side is operating in 100Mbps mode.
		Off	UTP side is operating in 10Mbps mode
Full	mode display	On	UTP side full duplex mode (20/200mbps).
		Off	UTP side half-duplex mode (10/100mbps).
TX Link	Ethernet link	On	The UTP link is ok.
		Off	No link or the link is faulty.
		Blinking	Receiving data on Ethernet.

The 10/100Base RJ-45 connector is located on the front panel of the line card. One RJ-45 connector is provided for each interface converter. All connections are designed for auto MDI-X operation, requiring only a straight connection to any device. A unique feature of the FRM220-10/100i converter is the use of a common PCB card which may either be used as a standalone converter (FRM220-Ch01 series) or placed in the FRM220-Ch20 rack.

Configuration

From the main menu of the FRM220 NMC console, select the slot number containing the 10/100i line card.

```
                ****************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.02 ***
                ****************************************
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #02 > FRM220-10/100I       [Local ] [ Ver:1.100-1.000-0.000-0.000 ]
<1>: Port Active:[Enable ]
     UTP Link:[Up  ]  Rx Active:[On ]
<2>:     Negotiation:[Auto  ]
<3>:     Speed:      [100 ]
<4>:     Duplex:     [Full]
     FX  Link:[Up  ] Rx Active:[On ] FEF:[Off     ] Remote PWR:[OK      ]
<5>:     Loop Back Test:[Off   ]  Status:[----]
<6>: Operation Mode:    [Switch   ]
<7>: Ingress Rate Limit(IRL) Mode: [No Limit] [100.0M]
<8>: Egress Rate Limit(ERL) Mode:  [No Limit] [100.0M]
<9>: Link Fault Pass Through(LFP): [Disable]
<A>: Auto Laser Shutdown(ALS):     [Disable]
<B>: Send Remote Hardware Reset
<C>: Port Reset
     Digital Diagnostic(D/D) Function:[Yes]
<D>: Go to the D/D Functions menu. <N>: Go to the Remote menu.
<ESC>: Go to previous menu. Please select an item.
```

<**1**> When the port is disabled, the PHY becomes inactive and all Ethernet traffic will be blocked.
<**2**> <**3**> <**4**> Control the auto-negotiation (n-way) and forced mode Ethernet settings.
<**5**> Performs an OAM loop back test, non-intrusive to client's transmitted data.
<**6**> Configures the MC between either switch mode (store & forward) or converter mode (cut-thru).
<**7**> Sets a rate limit on packets passing from UTP to Fiber in either multiples of 32K or 512K
<**8**> Sets a rate limit on packets passing from Fiber to UTP in either multiples of 32K or 512K
<**9**> Enable or disable the LFP function
<**A**> Enable or disable the Auto Laser Shutdown (ALS) function.
<**B**> Send hardware reset to remote unit via fiber (must enable reception from the remote side)
<**C**> Performs a reset on the port.
<**D**> View the transceiver's digital diagnostics (DD) if available.
<**N**> Go to manage the remote via OAM.

Below is an example of managing the remote MC via OAM.

```
                ***************************************
                *** CTC UNION TECHNOLOGIES CO., LTD. ***
                *** FRM220 NMC              VER. 1.02 ***
                ***************************************
This Chassis ID:[00]  Cascaded:[Yes]    Monitored Chassis ID:[00]
SLOT #02 > FRM220-10/100I       [Remote] [ Ver:1.100-1.000-0.000-0.000 ]
     Port Active:[Enable ]
     UTP Link:[Up  ]  Rx Active:[On ]
<2>:     Negotiation:[Auto  ]
<3>:     Speed:      [100 ]
<4>:     Duplex:     [Full]
     FX  Link:[Up  ] Rx Active:[On ] FEF:[Off     ] Remote PWR:[OK      ]
<5>:     Loop Back Test:[Off   ]  Status:[----]
<6>: Operation Mode:    [Switch   ]
<7>: Ingress Rate Limit(IRL) Mode: [No Limit] [100.0M]
<8>: Egress Rate Limit(ERL) Mode:  [No Limit] [100.0M]
<9>: Link Fault Pass Through(LFP): [Disable]
<A>: Auto Laser Shutdown(ALS):     [Disable]
<B>: Accept Remote Hardware Reset: [Disable]
<C>: Port Reset
     Digital Diagnostic(D/D) Function:[Yes]
<D>: Go to the D/D Functions menu. <N>: Go to the Local  menu.
<ESC>: Go to previous menu. Please select an item.
```

When managing from the remote, the port cannot be disabled. To do so would put it to sleep forever as it can not be awoken by any OAM command once the fiber is down. Therefore, no option is provided in the remote.
<**2**> <**3**> <**4**> Control the auto-negotiation (n-way) and forced mode Ethernet settings.
<**5**> Performs an OAM loop back test, non-intrusive to client's transmitted data.
<**6**> Configures the MC between either switch mode (store & forward) or converter mode (cut-thru).
<**7**> Sets a rate limit on packets passing from UTP to Fiber in either multiples of 32K or 512K
<**8**> Sets a rate limit on packets passing from Fiber to UTP in either multiples of 32K or 512K
<**9**> Enable or disable the LFP function
<**A**> Enable or disable the Auto Laser Shutdown (ALS) function.
<**B**> Enables reception of remote reset code from the local side.
<**C**> Performs a reset on the port.
<**D**> View the transceiver's digital diagnostics (DD) if available.
<**N**> Go to manage the local (in chassis) MC.

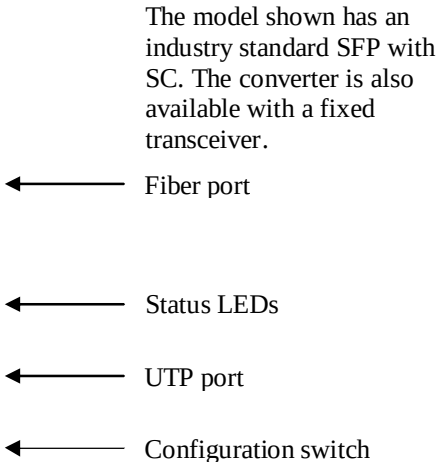
A.2 FRM220-1000A In-band (802.3ah) Managed Fiber Gigabit Media Converter (to be announced)

The FRM220-1000A is an IEEE802.3ah in-band managed optical fiber media converter for 10/100/1000Base Ethernet to gigabit fiber that also provides NMS functions for Link-Loss-Forwarding, Remote-Monitoring-Status, and Loop-Back-Test. These optional features are especially useful when the standalone units are linked to the FRM220 with SNMP management. When auto-negotiation is selected, these units will automatically tailor themselves to convert 10, 100, 1000 full or half duplex, depending on your specific network needs. A unique feature of the FRM-1000A converter is the use of a common PCB card which may either be used as a standalone converter (FRM220-CH01) or placed in the FRM220 rack.

Features and Specifications

Ports one 10/100/1000Base-TX port
one 1000Base-SX/LX port, SFP with LC

* Store and Forward Switching Mechanism
* Auto-Cross over for MDI/MDIX in TP port
* Auto-Negotiation in TP port
* Supports Auto / Force Mode in FX port
* Supports 4K MAC addresses
* Supports 256K Byte Packet Buffer
* Maximum Packet Size: 1632K Byte
* 6 diagnostic LEDs for Power, TX link/transmit, FX link/transmit, Full/Half Duplex mode, LLF and speed.
* Supports Link-Loss-Forwarding function
* Supports Loop-Back, remote status, remote in-band configuration
* Complies with IEEE 802.3 10Base-T, IEEE 802.3u 100Base-TX and 100Base-FX, IEEE 802.3z/ab 1000Base-T, IEEE 802.3x full-duplex flow control, 1000Base-SX/LX standards.
* Data Transfer Rate: 2000Mbps/full-duplex
* Emission Compliance: FCC part 15 class A, CE Mark, European standards EN55022:1994/A1:1995 A2:1997 Class A, EN61000-3-2:1995, EN61000-3-3:1995 and EN50082-1:1997
* Power Consumption : < 5W
* Temperature 0 - 50°C (Operating); 0 - 70°C (Storage)
* Humidity 20-80% non condensing (Operating) 10-90% (Storage)
* Dimensions 122.6mm x 85.6mm x 20mm (LxWxH)
* Weight 340g (11 0z)



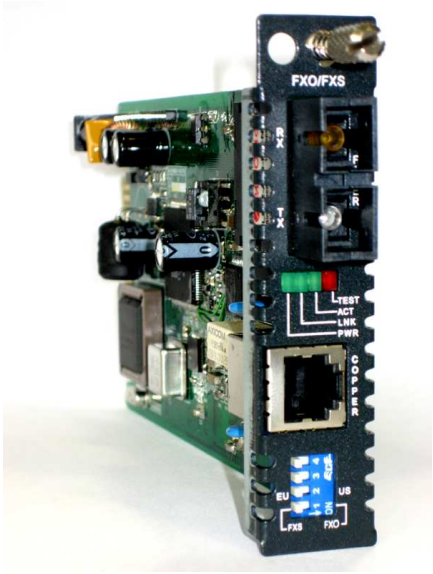
The FRM-1000 line card is an Ethernet Fiber Media Converter that is compliant with IEE802.3z 1000BASE-TX or Gigabit Ethernet and 1000Base-SX/LX Gigabit Fiber. One RJ-45 connector is provided for connection to either MDI-X (To PC) or MDI (To HUB) equipment. Utilizing Auto MDI/MDIX allows all UTP connections to be made using only a common straight-through UTP cable. A unique feature of the FRM-1000 converter is the use of a common PCB card which may either be used as a standalone converter (FMC series) or placed in the FRM220 rack. This converter may force full or half duplex mode on the fiber port.

RJ-45 Pin	568-A type	568-B type
5	Pair1-Tip	Pair1-Tip
4	Pair1-Ring	Pair1-Ring
3	Pair2-Tip	Pair3-Tip
6	Pair2-Ring	Pair3-Ring
1	Pair3-Tip	Pair2-Tip
2	Pair3-Ring-	Pair2-Ring
7	Pair4-Tip	Pair4-Tip
8	Pair4-Ring	Pair4-Ring

1000BASE-TX UTP Cable Requirement

Cable type: 1000Base-TX; 4 pair , Cat. 5 or 6, EIA/TIA-568, STP/UTP
Maximum cable distance: 100 meters (328 feet)

A.3 FRM220-FXO/FXS In-band Managed POTS/PSTN Fiber Converter



A.4 FRM220-Serial In-band Managed Datacom Fiber Media Converter (to be announced)

The ***FRM-Serial*** is a serial fiber media converter that supports RS-232, RS-485 and RS-423 conversion to fiber media. Other features include the ability to remove interface termination (go high-impedance), run in TTL interface mode, and the ability to supply external +5VDC to the auxiliary equipment.

The ***FRM-Serial*** uses a 6 pin, in-line, terminal block with removable header. Wires may be easily terminated at the header's screw posts without soldering. The front panel has a 4 position DIP switch for setting the interface type and termination. When the ***FRM-Serial*** is placed in the ***FRM220*** with SNMP, the settings are controlled by the chassis management system and any DIP settings are ignored. Additionally, when placed in the managed rack, the remotely linked ***FIB1-Serial*** unit is also controlled and configured through the in-band management system.

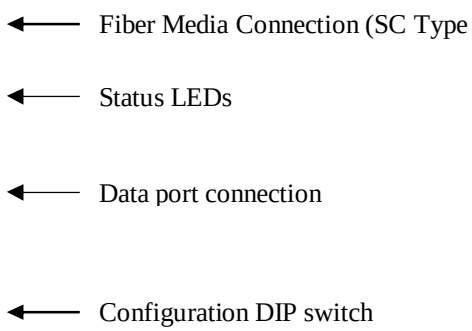


Figure A-? FRM-Serial Media Converter Card

The configuration DIP switch, located on the face of the converter, provides setting for interface selection. When placed in a managed rack, the DIP settings are ignored and the unit must be configured via the local control console, GUI application or via SNMP set/get commands.

The 6 pin interface connector has pin assignments displayed in the table below. Pin 1 provides a +5V connection that may be used for logic or to power a small interface converter. Pin 6 provides a common for all the signals. DIP Switch 4 when ON provides normal interface termination. When off, the circuit presents a high impedance to other connected equipment.

Pin assignment and DIP setting for FIB1-Serial

Pin Definition				I/F Type	DIP SW		
2	3	4	5		1	2	3
NC	NC	+	-	485-2W	ON	OFF	OFF
DO+	DO-	DI+	DI-	485-4W	OFF	OFF	OFF
NC	DO	NC	DI	232-3W	ON	ON	OFF
FI	DO	FO	DI	232-5W	OFF	ON	OFF
NC	DO	NC	DI	423-3W	ON	OFF	ON
FI	DO	FO	DI	423-5W	OFF	OFF	ON
NC	DO	NC	DI	TTL-3W	OFF	ON	ON

Legend: NC=No Connection, FI=Flow Control In, FO=Flow Control Out, DI=Data IN, DO=Data Out

The ***FRM-Serial*** is designed to provide two clear channels in each direction. In an RS-232 5-wire application, one channel is used for data transmission while the other may be used as a handshaking line for flow control. The connected system functionally works like that in the diagram below.

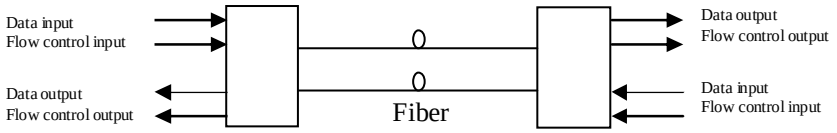


Figure A-? FRM-Serial's logical signal flow

The FRM-SERIAL is a fiber converter solution to extend RS-485 transmission distance up to 2Km over multimode fiber or up to 120Km over single mode fiber. The converter is equipped with multiple interface circuits, for connection to RS-232, RS-423, or RS-485/422 (2 or 4 wire).

The FRM-SERIAL secures data transmission over EMI immune fiber at speeds up to 256kbps for RS-232 or up to 1024kbps for RS-422/485. All media converters are available with connectors for SC, ST or FC. In single mode, WDM (Wave Division Multiplexing with SC connector) is also available in 20 or 40KM reach which will provide the ability to transmit and receive data using only a single optical fiber. A unique feature of the FRM-Serial converter is the use of a common PCB card which may either be used as a standalone converter (FMC series) or placed in the FRM220 rack.

Data Formats :

RS-485/422 2-Wire
RS-485/422 4-Wire
RS-232 + RTS/CTS 5-Wire
RS-232 3-Wire
RS-423 + RTS/CTS 5Wire
RS-423 3-Wire
TTL 3-Wire

Maximum Baud Rate:

RS-485 1024 kbps
RS-232 256 kbps
RS-423 256 kbps
TTL 1024 kbps

Bit Error Rate :

$<10^{-11}$

4 diagnostic LEDs :	Power, Data, Test & Fiber linking status
Temperature:	0 - 50^{o} C (Operating); 0 - 70^{o} C (Storage)
Humidity:	Up to 90% non-condensing
Consumption <5W	
Dimensions:	138mm x 86mm x 20mm (LxWxH).
Weight:	300g.
Emission Compliance:	FCC part 15 class A, CE EN55022, EN60950.
Optical:	ST/SC/FC type
Data:	6-Pole 'Molex type' with detachable screw terminal

Serial Line Card Detail

The following is the display screen for the Serial fiber converter.

```
Slot #05 SERIAL  Select Menu:
 Select Menu:
   1: Local Setting
   2: Remote Setting
 Command Function Key:
'1' to '2': Select Menu
'ESC': Main Menu
```

The Serial card supports remote management features; Select 1 or 2.

```
Slot #05 SERIAL  Card Status:
              Data In Status >> Mark       << H/W Version: 1.0
              Fiber          >> Link Up    << F/W Version: 1.0
              Test LED       >> Off        <<
 Card Parameter Setup Menu:
   0: Channel Enable/Disable  >> Enable          <<
   1: Far End Fault Setting   >> Disable         <<
   2: Port Reset              >> Disable         <<
   3: Mode Setting            >> RS-232 3 Wire   <<
   4: SERIAL Termination      >> Disable         <<
   5: Fiber Loop-Back test    >> Off             <<
   6: Reset Channel Setting to Default
 Command Function Key:
'0' to '4': Toggle I/O Card Settings
'5' to '6': I/O Card Commands
'R': Refresh Status
'ESC': Previous Menu
```

The following are descriptions of the function keys available and the actions which they perform.

0: This key toggles the channel enable/disable and can be used to halt transmission on this line card to the remote cpe side.

1: This key toggles the FEF setting enabled or not.

2: This key toggles the Port Reset.

3: This key toggles between the different mode settings for RS-232,485, and 423.

4: This key toggles the setting of termination for the serial interface lines.

5: This key initiates the fiber remote loop back test.*

6: This key will reset the card settings to factory default.

R: This key will refresh the screen display.

ESC: This key will leave the card setting menu.

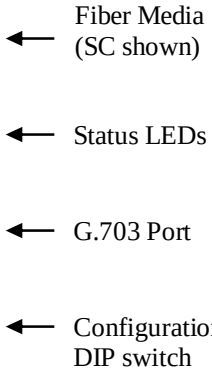
* During loop back tests, normal traffic is interrupted.

A.5 FRM220-E1/T1 In-band Managed G.703 Fiber Media Converter (to be announced)

The ***FRM-E1*** and ***FRM-T1*** are high-performance G.703 E1 or T1 (DS1) over fiber media converters. These converters fully support transparent transmissions of 2.048Mbps (or 1.544Mbps for T1) and completely handle clocking in point-to-point or network applications. Additionally, the converters may be linked to ***FRM-DATA*** converters in unframed E1 (T1) at fixed data rate of 2048Kbps (1544Kbps for T1).

There are three models of ***FRM-E1*** and ***FRM-T1*** media converters, E1-BNC, E1-RJ-45, and T1-RJ-45. The E1-BNC model supports coaxial connections with BNC connectors at 75 ohm impedance, while the E1-RJ-45 model accepts twisted pair wiring at 120 ohm impedance on a shielded RJ-45 connector wired to industry standard USOC RJ-48C. The T1 model sports an RJ-48C for twisted pair wiring at 100 ohms impedance.

There is one 4 position DIP switch located on the face of the ***FRM-E1*** and ***FRM-T1*** to configure the units when used standalone. When the ***FRM-E1*** and ***FRM-T1*** are placed in the ***FRM220*** with SNMP, the settings are controlled by the chassis management system and any DIP settings are ignored. Additionally, when placed in the managed rack, the remotely linked ***FRM-E1*** and ***FRM-T1*** units are also controlled and configured through the in-band management system.



The FRM-E1 is a fiber media transport for G.703 E1 transmission. The BNC model provides unbalanced 75 Ohm coaxial connections while the RJ-45 model provides balanced 120 Ohm connections over twisted pair wiring. The FRM-T1 is a fiber media transport for G.703 T1 transmission and features an RJ-45 connector for connection to 100 Ohm twisted pair wiring. All media converters are available with either multi-mode or single-mode optical transceivers and with connectors for SC, ST, or FC. In single mode, WDM (Wave Division Multiplexing with SC connector) is also available in 20 or 40KM reach which will provide the ability to transmit and receive data using only a single optical fiber. A unique feature of the FRM-E1 and FRM-T1 converters is the use of a common PCB card which may either be used as a standalone converter (FMC series) or placed in the FRM220 rack.

E1 Technical Specifications

Ports	1 port
Standards	ITU-T G.703, G.704, G.706, G.732, G.823
Framing	Unframed (transparent clear channel)
Data rate	2.048 Mbps
Line Code	HDB3/AMI
Receive Level	Long haul - 43dB
Line impedance	75 ohms for FIB2-E1B 120 ohms for FIB2-E1R
Connector	BNC for 75 ohms RJ-45 for 120 ohms

T1 Technical Specifications

Ports	1 port
Standards	ITU-T G.703, G.704, AT&T TR-62411, ANSI T1.403
Framing	Unframed (transparent clear channel)
Data rate	1.544 Mbps
Line Code	B8ZS/AMI
Receive Level	Long haul - 36dB
Line impedance	100 ohms for FIB2-T1R
Connector	RJ-45 for 100 ohms

Technical Specifications

Power consumption	<4W
EMI	FCC Class A, CE (EN55022), (EN60950)
Dimensions:	122.6 x 85.6 x 20 mm (H x W x D)
Weight	11 Oz (340g)
Temperature	0 - 50°C (Operating) ; 0 - 70°C (Storage)
Humidity	20 - 80 % non-condensing (Operating) 10 - 90 % (Storage)

The ***FRM-E1*** and ***FRM-T1*** fiber media converters' transmissions are transparent to clock and data. They are designed to be placed in an existing E1 or T1 application as an extension over fiber. When connected by fiber pair, the received analog signal of each device is used to generate the transmitted optical signal. Because of their transparent nature, they can be applied where the transmissions are unframed or fractional without regard and with minimal configuration (only need to configure the proper line code).

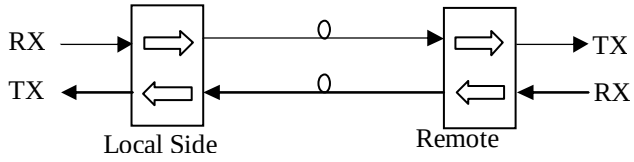


Figure A-? Transparent operation of FRM-E1 and FRM-T1

The ***FRM-E1/T1*** media converter incorporates a Far End Fault feature which allows the converters on both ends of a pair of fibers to be informed when there is a problem with one of the fibers. Without Far End Fault, it is impossible for a fiber interface to detect a problem that affects only its Transmit fiber. When Far End Fault is supported and enabled, a loss of receive signal (link) will cause the transmitter to generate a Far End Fault pattern in order to inform the device at the far end of the fiber pair that a fault has occurred. When the local receiver again detects a signal, the local transmitter automatically returns to normal operation. The design of the ***FRM-E1/T1*** utilizes the FEF to generate AIS to the connected CSU equipment, so that alarms are transmitted in the traditional fashion when there is a fiber fault.

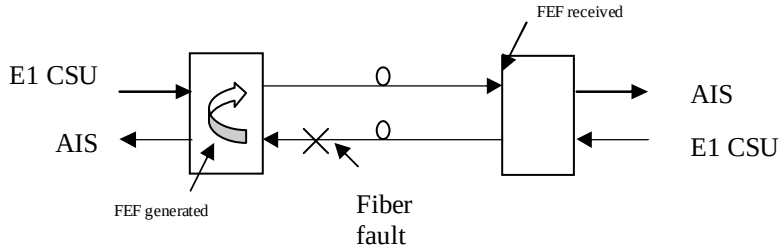


Figure A-? Far End Fault feature of FRM-E1 and FRM-T1

The ***FRM-E1*** and ***FRM-T1*** media converters incorporate Loop back testing features that may be used with BER (Bit Error Rate) test equipment. Loop back is enabled by the DIP switch#3&4 on the front panel. When installed in a manageable rack, loop back testing is enabled via the console menu, Telnet menu, SNMP get/set commands, or from a web browser.

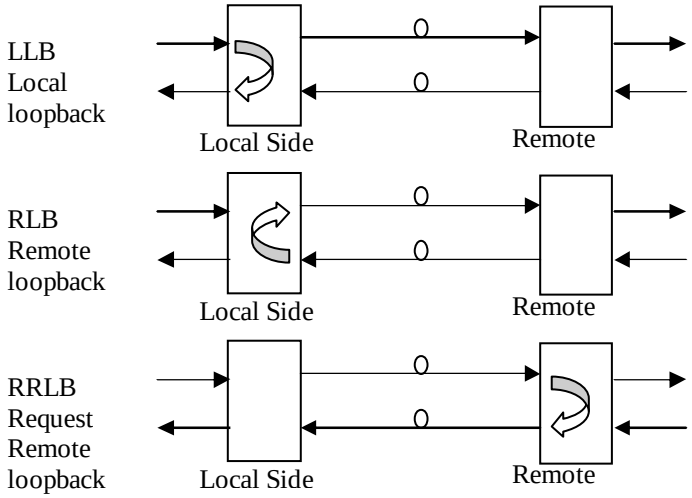


Figure A-? FRM-E1 and FRM-T1 loop back functions

DIP	Setting		Function	Description
1	OFF		HDB3 (BZ8S)	Line Code
	ON		AMI	
2	OFF		Disable	FEF
	ON		Enable	
3 & 4	3	4	Loop Back Selection	
	OFF	OFF	Normal	
	ON	OFF	LLB - Local Loop Back	
	OFF	ON	RLB - Remote Loop Back	
	ON	ON	RRLB - Request Remote LB	

Table A-? DIP setting table for FRM-E1 and FRM-T1

The ***FRM-E1*** and ***FRM-T1*** may also be applied in a transparent DSU/CSU configuration, ie. paired with an ***FRM-DATA*** converter. Below are some typical clocking applications when paired in this configuration.

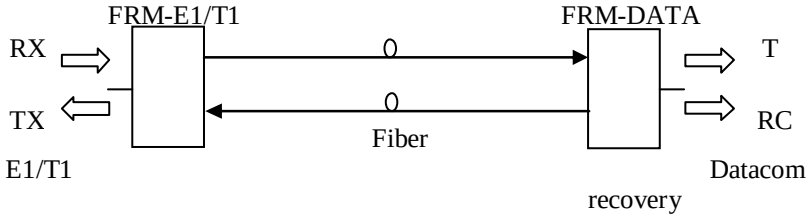


Figure A-? E1/T1 with Datacom (V.35, X.21, RS-530 etc.) termination

In the above example, the connected E1/T1 equipment provides the clock source for the ***FRM-E1/T1*** converter. The ***FRM-DATA*** recovers the clock from the fiber and acts as a DCE to any connected DTE device (such as a router). Because this is a transparent application, the data rate must be 2.048Mbps (1.544Mbps for T1), clear channel.

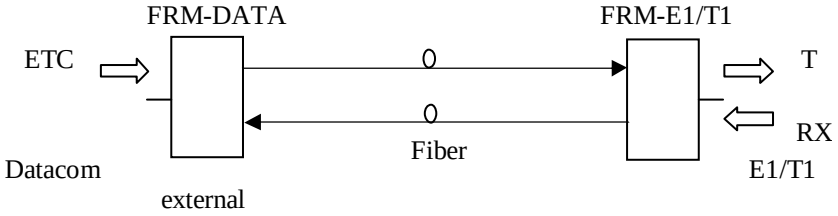


Figure A-? E1/T1 extension from Datacom network

In the example above, a serial datacom network provides clock and data to the connected ***FRM-DATA***. The data is then transmitted transparently over the fiber and recovered by the ***FRM-E1/T1***, where data is transmitted at the received data rate. Because this is a transparent application, the data rate must be 2.048Mbps (1.544Mbps for T1), clear channel.

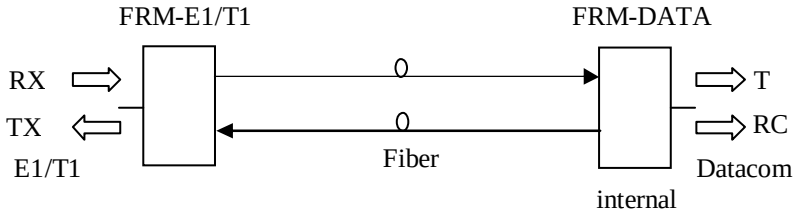


Figure A-? Another application with FRM-DATA as clock source

E1 / T1 Line Card Detail

The following is the display screen for the E1 BNC fiber converter.

```
Slot #03 E1 BNC  Select Menu:
 Select Menu:
   1: Local Setting
   2: Remote Setting
 Command Function Key:
'1' to '2': Select Menu
'ESC': Main Menu
```

The E1 / T1 card supports remote management features; Select 1 or 2.

```
Slot #03 E1 BNC  Card Status:
                  E1        >> Link Up    <<  H/W Version: 1.1
                  E1 AIS    >> Off        <<  F/W Version: 1.1
                  Fiber     >> Link Up    <<
                  Test LED  >> Off        <<
 Card Parameter Setup Menu:
   0: Channel Enable/Disable  >> Enable          <<
   1: Far End Fault Setting   >> Disable         <<
   2: AIS Setting             >> Disable         <<
   3: Line Code               >> HDB3            <<
   4: Port Reset              >> Disable         <<
   5: E1/T1 Loop-Back test    >> Off             <<
   6: Fiber Loop-Back test    >> Off             <<
   7: Reset Channel Setting to Default
 Command Function Key:
'0' to '4': Toggle I/O Card Settings
'5' to '7': I/O Card Commands
'R': Refresh Status
'ESC': Previous Menu
```

The following are descriptions of the function keys available and the actions which they perform.

0: This key toggles the channel enable/disable and can be used to halt transmission on this line card to the remote cpe side.

1: This key toggles the FEF setting enabled or not.

2: This key toggles the AIS; normal condition should disabled.

3: This key toggles between AMI and HDB3 (BZ8S for T1) Line coding.

4: This key toggles the Port Reset.

5: This key initiates the E1 remote loop back test.*

6: This key initiates the Fiber remote loop back test.*

7: This key will reset the card settings to factory default.

R: This key will refresh the screen display.

ESC: This key will leave the card setting menu.

* During loop back tests, normal traffic is interrupted.

A.6 FRM220-Data (to be announced)

The ***FRM-DATA*** is a high-performance serial over fiber media converter. These converters fully support Nx64 data transmissions up to 2.048Mbps and completely handle flow control and clocking signals in synchronous applications over fiber media. Additionally, the converters support low speed asynchronous connections as well.

There are five models of ***FRM-DATA*** media converters, V.35, RS-232, RS-530, X.21, and RS-449 which are based upon three basic hardware types, V.35, RS-232, and RS-530. The RS-530 hardware is also the source for the X.21 and RS-449 models. All models require adapter cables to adapt the unit's HDB26 interface connectors.

There are two 8 position DIP switches located on the side of the ***FRM-DATA*** to configure the units when used standalone. When the ***FRM-DATA*** is placed in the ***FRM220*** with SNMP, the settings are controlled by the chassis management system and any DIP settings are ignored. Additionally, when placed in the managed rack, the remotely linked ***FRM-DATA*** unit is also controlled and configured through the in-band management system.

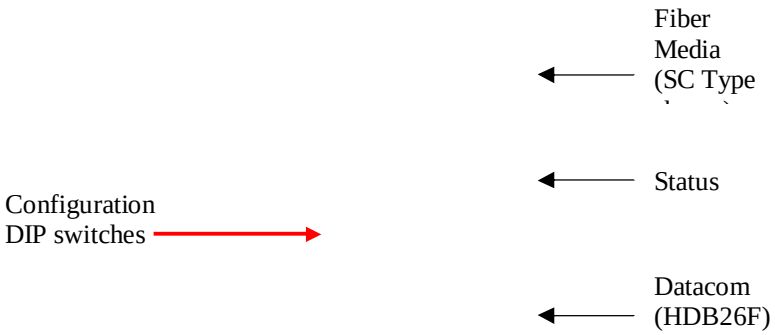


Figure A-? FRM-DATA Media Converter Card

Clocking Modes

There are three clocking schemes for the ***FRM-DATA*** converters, shown below.

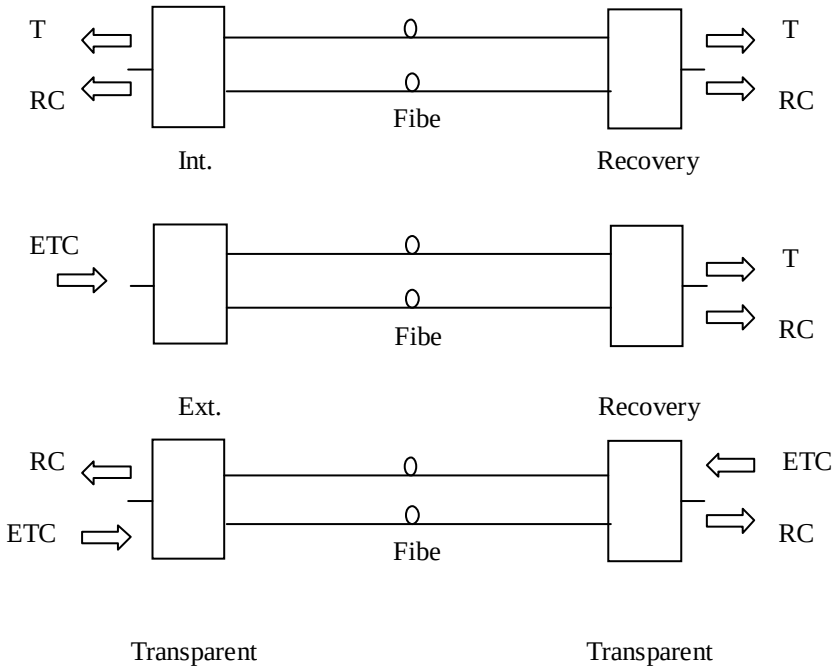


Figure A-? FRM-DATA Clocking Modes

All models of the ***FRM220-DATA*** have a physical interface which is DCE. A crossover cable is required when acting as a DTE device. In the first example, the units act as 'Fiber Modems' with the internal clocking unit acting as a master time source and the remote or loop unit recovering timing from the fiber side. In this configuration, both units are acting as DCE.

In the second example, an external clock is received at one unit and the clock is passed to the remote for recovery via the fiber. In this scheme, the left side unit acts as a DTE and a crossover cable is required. The right hand unit recovers clock from the fiber and acts as a DCE.

In our last example, transparent clocking is employed; the transmit clock on one side is used as the source for receive clock on the other. In this scheme the units may act as DCE or DTE depending on the cable used.

LED Status LED Detailed Description

LED	Function	State	Status
PWR	Power indicator	On	Converter has power
		Off	Converter has no power
		Blinking	No SNMP is installed in FRM220
FX Link	Fiber link	On	The fiber link is up
		Off	No signal or fiber link is down
		Blinking	Remote side fiber Sync loss
Test	Mode display	On	Any loop back test is on
		Off	Normal status
TD	Mode display	On	"Data Signal" is in "High" state
		Off	"Data Signal" is in "Low" state
		Blinking	Normal Data transmitting status
RD	Mode display	On	"Data Signal" is in "High" state
		Off	"Data Signal" is in "Low" state
		Blinking	Normal Data transmitting status
RTS	Mode display	On	"Data Signal" is in "High" state
		Off	"Data Signal" is in "Low" state
CTS	Mode display	On	"Data Signal" is in "High" state
		Off	"Data Signal" is in "Low" state
DCD	Mode display	On	"Data Signal" is in "High" state
		Off	"Data Signal" is in "Low" state

Loop Back Features of the FRM220-DATA

The ***FRM220-DATA*** features local and remote loop back functions for both the data port and the fiber connections. When management features are installed in the rack, loop back may be performed from local console, network connected management workstation or from any workstation running a web browser.

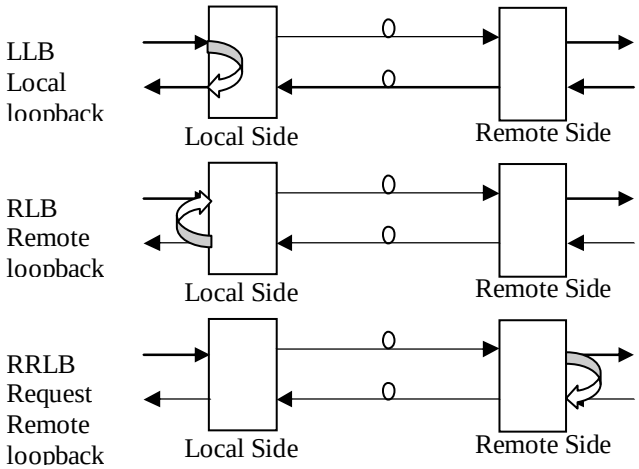


Figure 2-14 FRM-DATA Data Port loop back diagnostic modes

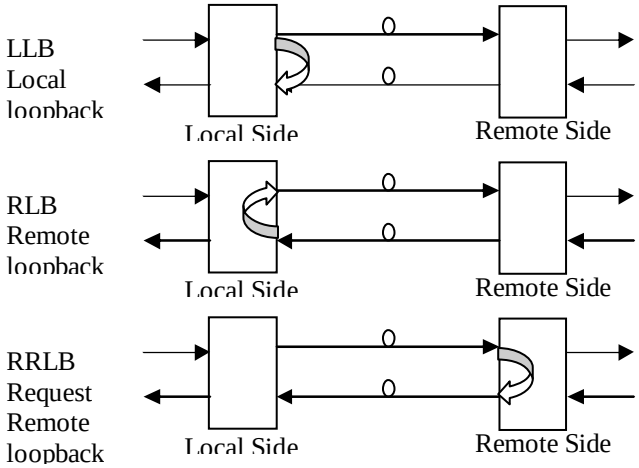


Figure A-? FRM-DATA Optical loop back diagnostic modes

DIP Switch Settings of the FRM-DATA (DIP SW 1)

DIP SW1	STATE					Function Description	
1,2	1		2			Timing mode select:	
	OFF		OFF			Transparent	
	ON		OFF			Recovery	
	OFF		ON			Data port	
	ON		ON			Internal oscillator	
3	3					Data Rate group setting	
	OFF					N x 64K	
	ON					Low speed	
4,5,6,7,8	4	5	6	7	8	Data Rate setting	
						N x 64K	Low speed
	OFF	OFF	OFF	OFF	OFF	64K	75
	ON	OFF	OFF	OFF	OFF	128K	112.5
	OFF	ON	OFF	OFF	OFF	192K	150
	ON	ON	OFF	OFF	OFF	256K	225
	OFF	OFF	ON	OFF	OFF	320K	300
	ON	OFF	ON	OFF	OFF	384K	450
	OFF	ON	ON	OFF	OFF	448K	600
	ON	ON	ON	OFF	OFF	512K	900
	OFF	OFF	OFF	ON	OFF	576K	1200
	ON	OFF	OFF	ON	OFF	640K	1800
	OFF	ON	OFF	ON	OFF	704K	2400
	ON	ON	OFF	ON	OFF	768K	3600
	OFF	OFF	ON	ON	OFF	832K	4800
	ON	OFF	ON	ON	OFF	896K	7200
	OFF	ON	ON	ON	OFF	960K	9600
	ON	ON	ON	ON	OFF	1024K	11400
	OFF	OFF	OFF	OFF	ON	1088K	19200
	ON	OFF	OFF	OFF	ON	1152K	28800
	OFF	ON	OFF	OFF	ON	1216K	38400
	ON	ON	OFF	OFF	ON	1280K	57600
	OFF	OFF	ON	OFF	ON	1344K	76800
	ON	OFF	ON	OFF	ON	1408K	115200
	OFF	ON	ON	OFF	ON	1472K	
	ON	ON	ON	OFF	ON	1536K	
	OFF	OFF	OFF	ON	ON	1600K	
	ON	OFF	OFF	ON	ON	1664K	
	OFF	ON	OFF	ON	ON	1728K	
	ON	ON	OFF	ON	ON	1792K	
	OFF	OFF	ON	ON	ON	1856K	
	ON	OFF	ON	ON	ON	1920K	
	OFF	ON	ON	ON	ON	1984K	
	ON	ON	ON	ON	ON	2048K	ASYNC MODE

Table 2-1 FRM-DATA, DIP switch 1 setting

DIP Switch Settings of the FIB1-DATA (DIP SW 2)

DIP Switch Number 2 Table		
Switch and State		Function Description
1		Data port RC polarity setting:
OFF		Normal
0N		Inverted
2		Data port TC polarity setting:
OFF		Normal
0N		Inverted
3		Data port ETC polarity setting:
OFF		Normal
0N		Inverted
4		Data port RTS setting:
OFF		Follow CTS
0N		Always ON
5		Far End Fault (FEF) Setting
OFF		Disabled
ON		Enabled
6		Loop Back Selection
OFF		Fiber Loop Back
ON		Data Port Loop Back
7	8	Loop back test setting
OFF	OFF	All loop back off
ON	OFF	Local Loop Back (LLB)
OFF	ON	Remote Loop Back (RLB)
ON	ON	Request Remote Loop Back (RRLB)

Table 2-2 FIB1-DATA DIP switch 2 setting

When the ***FRM-DATA*** is ordered with a V.35 interface, the unit comes with a HDB26 male to MB34 Female adapter cable, 1 meter long. The pin assignment follows the table below.

Abbreviation	HDB26 PIN#		MB34 PIN#	V.35 Circuit
FG	1	↔	A	Frame
SG	7	↔	B	Signal Ground
TD(A) TD(B)	2 11	↔ ↔	P S	TD(A) TD(B)
RD(A) RD(B)	3 21	↔ ↔	R T	RD(A) RD(B)
RTS(A)	4	↔	C	RTS
CTS(A)	5	↔	D	CTS
DSR(A)	6	↔	E	DSR
DTR(A)	20	↔	H	DTR
DCD(A)	8	↔	F	DCD
ETC(A) ETC(B)	24 16	↔ ↔	U W	ETC(A) ETC(B)
TC(A) TC(B)	15 23	↔ ↔	Y AA	TC(A) TC(B)
RC(A) RC(B)	17 25	↔ ↔	V X	RC(A) RC(B)
RLB	9	↔	HH	RL
LLB	18	↔	JJ	LL
TM	10	↔	KK	TM

Table 2-3 FRM-DATA V.35 cable

When the ***FRM-DATA*** is ordered with a RS-530 interface, the unit comes with a HDB26 male to DB25 Female adapter cable, 1 meter long. The pin assignment follows the table below.

Abbreviation	HDB26 PIN#		DB25 PIN#	RS-530 Circuit
FG	1	↔	1	Frame
SG	7	↔	7	AB
TD(A)	2	↔	2	BA(A)
TD(B)	11	↔	14	BA(B)
RD(A)	3	↔	3	BB(A)
RD(B)	21	↔	16	BB(B)
RTS(A)	4	↔	4	CA(A)
RTS(B)	13	↔	19	CA(B)
CTS(A)	5	↔	5	CB(A)
CTS(B)	14	↔	13	CB(B)
DSR(A)	6	↔	6	CC(A)
DSR(B)	22	↔	22	CC(B)
DTR(A)	20	↔	20	CD(A)
DTR(B)	12	↔	23	CD(B)
DCD(A)	8	↔	8	CF(A)
DCD(B)	26	↔	10	CF(B)
ETC(A)	24	↔	24	DA(A)
ETC(B)	16	↔	11	DA(B)
TC(A)	15	↔	15	DB(A)
TC(B)	23	↔	12	DB(B)
RC(A)	17	↔	17	DD(A)
RC(B)	25	↔	9	DD(B)
RLB	9	↔	21	RL
LLB	18	↔	18	LL
TM	10	↔	25	TM

Table 2-4 FRM-DATA RS-530 cable

When the ***FRM-DATA*** is ordered with a RS-449 interface, the unit comes with a HDB26 male to DB37 Female adapter cable, 1 meter long. The pin assignment follows the table below.

Abbreviation	HDB26 PIN#		DB37 PIN#	RS-449 Circuit
FG	1	↔	1	Frame
SG	7	↔	19,20,37	SG,RC,SC
TD(A) TD(B)	2 11	↔ ↔	4 22	SD(A) SD(B)
RD(A) RD(B)	3 21	↔ ↔	6 24	RD(A) RD(B)
RTS(A) RTS(B)	4 13	↔ ↔	7 25	RS(A) RS(B)
CTS(A) CTS(B)	5 14	↔ ↔	9 27	CS(A) CS(B)
DSR(A) DSR(B)	6 22	↔ ↔	11 29	DM(A) DM(B)
DTR(A) DTR(B)	20 12	↔ ↔	12 30	TR(A) TR(B)
DCD(A) DCD(B)	8 26	↔ ↔	13 31	RR(A) RR(B)
ETC(A) ETC(B)	24 16	↔ ↔	17 35	TT(A) TT(B)
TC(A) TC(B)	15 23	↔ ↔	5 23	ST(A) ST(B)
RC(A) RC(B)	17 25	↔ ↔	8 26	RT(A) RT(B)
RLB	9	↔	14	RL
LLB	18	↔	10	LL
TM	10	↔	18	TM

Table 2-5 FRM-DATA RS-449 cable

When the ***FRM-DATA*** is ordered with a X.21 interface, the unit comes with a HDB26 male to DB15 Female adapter cable, 1 meter long. The pin assignment follows the table below.

Abbreviation	HDB26 PIN#		DB15 PIN#	X.21 Circuit
FG	1	↔	1	Shield
SG	7	↔	8	Ground
TD(A)	2	↔	2	Transmit(A)
TD(B)	11	↔	9	Transmit(B)
RD(A)	3	↔	4	Receive(A)
RD(B)	21	↔	11	Receive(B)
RTS(A)	4	↔	3	Control(A)
RTS(B)	13		10	Control(B)
DCD(A)	8	↔	5	Indication(A)
DCD(B)	26		12	Indication(B)
ETC(A)	24	↔	7	Ext. Timing(A)
ETC(B)	16	↔	14	Ext. Timing(B)
RC(A)	17	↔	6	Signal Timing(A)
RC(B)	25	↔	13	Signal Timing(B)

Table 2-6 FRM-DATA X.21 cable

When the ***FRM-DATA*** is ordered with a RS-232 interface, the unit comes with a HDB26 male to DB25 Female adapter cable, 1 meter long. The pin assignment follows the table below.

Abbreviation	HDB26 PIN#		DB25 PIN#	RS-232 Circuit
FG	1	↔	1	Frame
SG	7	↔	7	SG
TD	2	←	2	TD
RD	3	→	3	RD
RTS	4			RTS
CTS	5		5	CTS
DSR	6		6	DSR
DTR	20	↔	20	DTR
DCD	8		8	DCD
ETC	24		24	ETC
TC	15		15	TC
RC	17		17	RC

Table 2-7 FRM-DATA RS-232 cable

The FRM-DATA is a media converter for V.35, RS-232, RS-530, X.21 or RS-449 high-speed synchronous or low-speed synchronous and asynchronous data transmission over optical fiber media. All media converters are available with either multi-mode or single-mode optical transceiver and with connectors for SC, ST, or FC. In single mode, WDM (Wave Division Multiplexing with SC connector) is also available in 20 or 40KM reach, which will provide the ability to transmit and receive data using only a single optical fiber. A unique feature of the FRM-Data converter is the use of a common PCB card which may either be used as a standalone converter (FMC series) or placed in the FRM220 rack.

Technical Specifications

Ports	1 port V.35/RS232/RS530/X.21/RS449
Connector	HDB26F (adapter cable to DB15, 25, 37 or MB34)
Line Code	NRZ
Data rate	n x 64Kbps where n=1 to 32 (64 ~ 2048Kbps), Low Speed Synchronous & Asynchronous 75 ~ 115.2k baud rate
Clock modes	Transparent, Recovery, External, Internal RC, TC, ETC normal or inverted
Control Signals	CTS constantly ON or follows RTS

	DSR constantly ON, except during tests
	DCD constantly ON, except during signal loss
Test Loops	LLB (Local Loop Back)
	RLB (Remote Loop Back)
	ITU-T V.54

Optical Specifications

Connector Type	ST,SC,FC,LC,MT-RJ or WDM(single fiber) connectors.
Optical mode	Multi-mode or Single-mode
Wave length	1310nm,1550nm
Power Margin	11dB(2Km,M/M) ,12dB~ 35 dB(15 ~ 120Km,S/M)
	Data rate 40.32Mbps
Line coding	Scrambled NRZ
Bit Error Rate	Less than 10^{-11}

Environmental

Power consumption	<4W
EMI	FCC Class A, CE (EN55022), (EN60950)
Dimensions:	122.6 x 85.6 x 20 mm (H x W x D)
Weight	11 Oz (340g)
Temperature	0 - 50°C (Operating)
	0 - 70°C (Storage)
Humidity	20 - 80 % non-condensing (Operating)
	10 - 90 % (Storage)

Data Line Card Detail

The following is the display screen for the Serial fiber converter.

```
Slot #07 V.35    Select Menu:
 Select Menu:
   1: Local Setting
   2: Remote Setting
 Command Function Key:
 '1' to '2': Select Menu
 'ESC': Main Menu
```

The Data card supports remote management features; Select 1 or 2.

```
Slot #07 V.35    Card Status:                              page:1/2
  TD    >> Flash     << | CTS         >> Space  << H/W Ver: 1.0
  RD    >> Flash     << | RTS         >> Space  << F/W Ver: 1.1
                        | DCD         >> Space  <<
  Fiber >> Link Up   << | Test LED    >> Off    <<

 Card Parameter Setup Menu:
   0: Channel Enable/Disable   >> Enable             <<
   1: Far End Fault Setting    >> Disable            <<
   2: Port Reset               >> Disable            <<
   3: Data Rate group Setting  >> N*64K              <<
   4: Timing mode select       >> Recovery           <<
   5: Data Rate Setting        >> 1984K              <<
   6: Reset Channel Setting to Default
 Command Function Key:
 '0' to '5': Toggle I/O Card Settings
 '6': I/O Card Commands
 'R': Refresh Status             'N': Next Page
 'ESC': Previous Menu
```

The following are descriptions of the function keys available and the actions which they perform.

0: This key toggles the channel enable/disable and can be used to halt transmission on this line card to the remote cpe side.

1: This key toggles the FEF setting enabled or not.

2: This key toggles the Port Reset.

3: This key toggles the rate group setting between Nx64 or low speed.

4: This key toggles the timing mode between internal, external or recovery.

5: This key calls up the rate menu, where data rate is selected.

6: This key will reset the card settings to factory default.

R: This key will refresh the screen display.

N: This key selects the second configuration page.

ESC: This key will leave the card setting menu.

Data Line Card Detail (second page)

```
************************************************************
*** CTC UNION TECHNOLOGIES CO., LTD  V4.06 -17[Oct. 28th]  ***
*** FRM-220 Fiber Optical Media Converter Rack Management  ***
************************************************************
Slot #07 V.35    Card Status:                          page:2/2
 TD    >> Flash     << | CTS         >> Space  << H/W Ver: 1.0
 RD    >> Flash     << | RTS         >> Space  << F/W Ver: 1.1
                       | DCD         >> Space  <<
 Fiber >> Link Up   << | Test LED    >> Off    <<

Card Parameter Setup Menu:
  0: CTS Setting              >> Follow RTS    <<
  1: RC Polarity Setting      >> Normal        <<
  2: TC Polarity Setting      >> Normal        <<
  3: ETC Polarity Setting     >> Normal        <<
  4: Data Port Loop-Back test >> Off           <<
  5: Fiber Loop-Back test     >> Off           <<
  6: Reset Channel Setting to Default
Command Function Key:
'0' to '3': Toggle I/O Card Settings
'4' to '6': I/O Card Commands
'R': Refresh Status             'P': Previous Page
'ESC': Previous Menu
```

The following are descriptions of the function keys available and the actions which they perform.

0: This key toggles the CTS setting between follows RTS or always ON.

1: This key toggles the Receive Clock polarity between normal or inverted.

2: This key toggles the Transmit Clock polarity between normal or inverted.

3: This key toggles the External Clock polarity between normal or inverted.

4: This key toggles the Data port loop back test On or Off.*

5: This key toggles the Fiber loop back test On or Off.*

6: This key will reset the card settings to factory default.

R: This key will refresh the screen display.

P: This key selects the previous configuration page.

ESC: This key will leave the card setting menu.

* During loop back tests, normal traffic is interrupted.

A.7 FRM220-10/100A In-band Managed (IEEE802.3ah) Fiber Ethernet Media Converter

(to be announced)

Fiber Series

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