

User Manual



FRM220-FTEC

E1 to T1(DS1) Cross Rate Converter



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FRM220-FTEC
E1 to T1(DS1) Cross Rate Converter User Manual

Media Platform Rack, 20 Slot, 2U

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CISPR PUB.22 Class A COMPLIANCE:

This device complies with EMC directive of the European Community and meets or exceeds the following technical standard. EN 55022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment. This device complies with CISPR Class A.

CE NOTICE

Marking by the symbol CE indicates compliance of this equipment to the EMC and LVD directives of the European Community. Such marking is indicative that this equipment meets or exceeds the following technical standards: EN 55022:2006, Class A, IEC61000-3-2:2005, IEC61000-3-3:2005, EN55024:1998+A1:2001+A2:2003, and EN60950-1:2001

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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 of the Converter Chassis, proceed to Chapters 2.

This manual is used to explain the hardware installation procedures for the **FRM220**, and present its capabilities and specifications. This manual is divided into 2 Sections, the Introduction and Installation, plus the Appendix. The Appendix includes further information on options for placing the device in service.

Installers should carefully read the Chapter 2, Installation and the Cabling Specification Appendix. The companion document, the **FRM220 NMC Configuration Manual**, is available in electronic format only. The divisions in that 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; 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

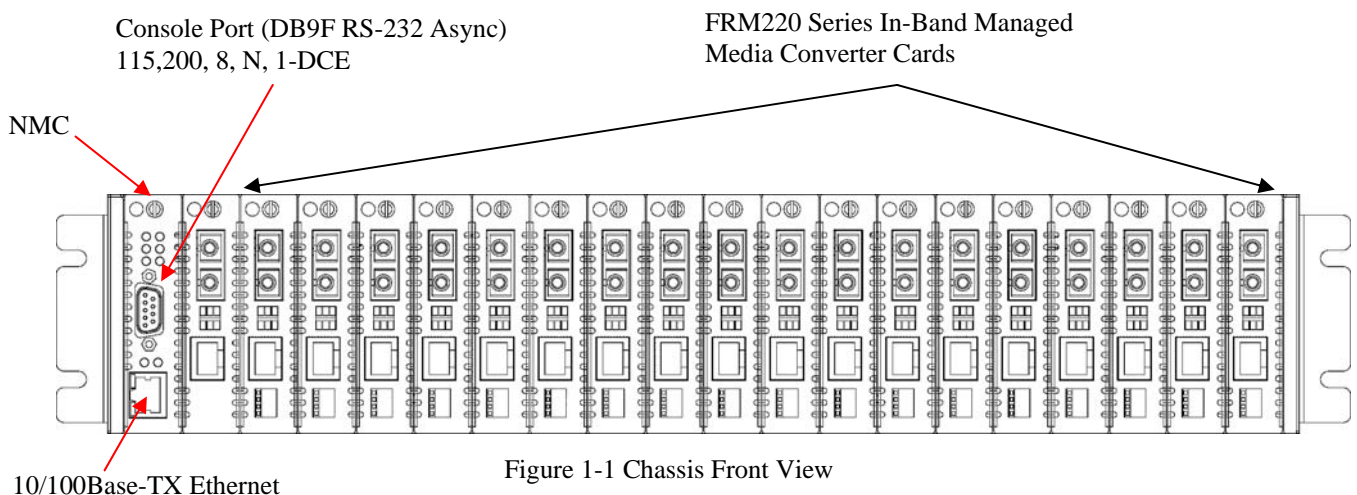
The **FRM220-CH20** is a 2U high 19" Rack, 20 slot modular media converter center. The **FRM220** provides an economic solution for high density Fiber Converter installations in enterprises or central offices. All critical components, Power, fans, management module and interface cards are hot swappable 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 FRM220 Converter Cards in the **FRM220** compact rack. An SNMP Card is installed in the far left hand, or first 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 bi-directional 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 RS-422), ITU-T G.703 E1 and T1, Synchronous and Asynchronous Datacom (V.35, RS-530, X.21, RS-449, and RS-232), 155.52M STM-1 repeater, FXO/FXS over fiber and more as the product matures.

The **FRM220** optionally incorporates redundant power modules. 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 FRM220 Line Cards' transmissions. The **FRM220** provides all copper interface connections on the face of each FRM220 Line Card. The fiber interface connectors are also located on the individual FRM220 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 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.



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.

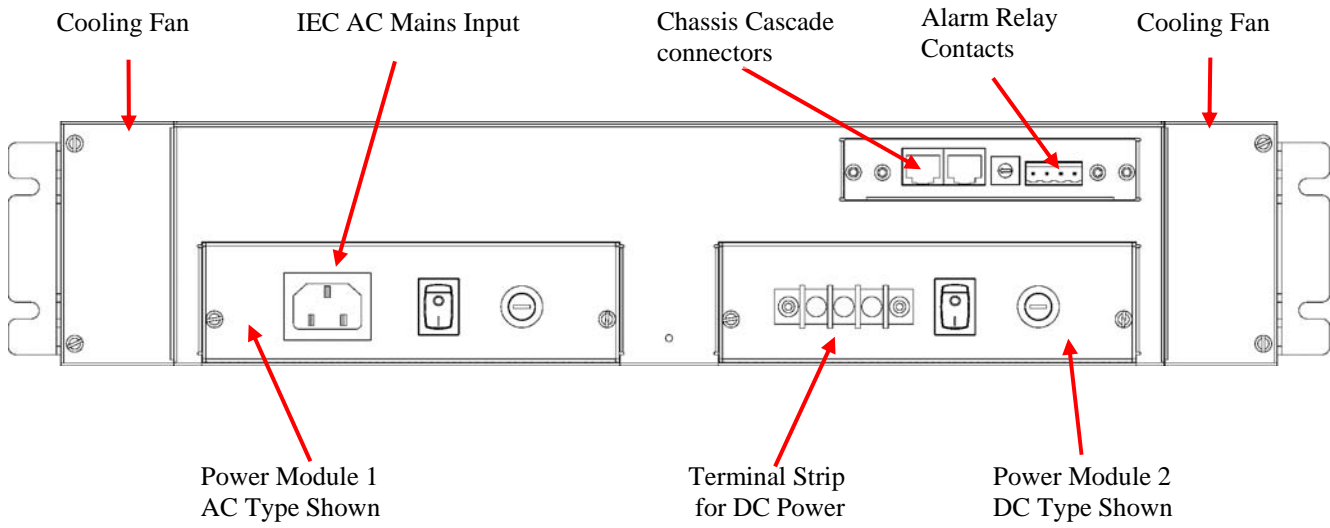


Figure 1-2 Chassis Rear View

1.4 Chassis Physical Dimensions

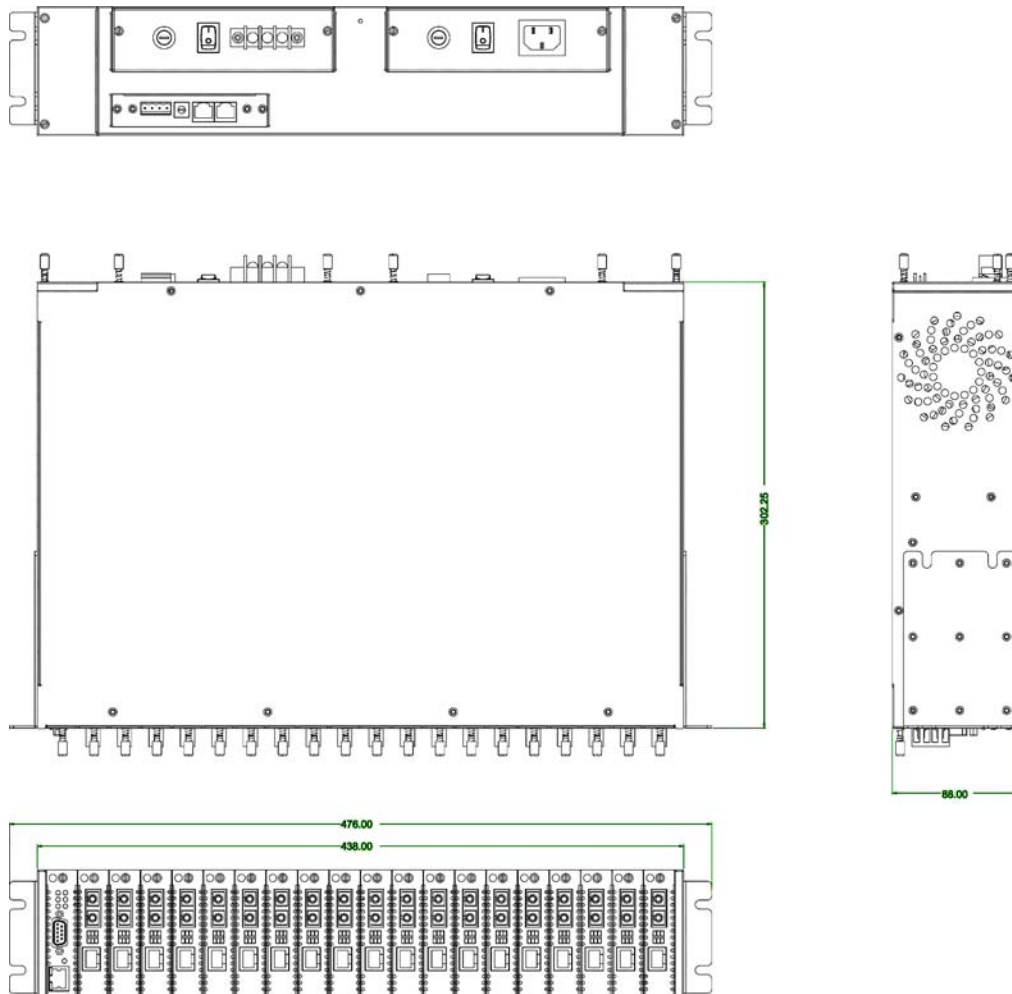


Figure 1-3 Chassis Dimensions, in millimeters

1.5 Chassis Specifications

Environment

Temperature -10 - 65°C (14-150°F)
Humidity 5-95% 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
Output : DC 12V, 200W maximum rating

DC Power Module

Input : -36~-75 VDC (option 1)
Input : -18~-36VDC (option 2)
Output : DC 12V, 200W maximum rating

Power Consumption

~60 watts (fully loaded chassis, with random mix of line card types)

Heat Generation

~210 BTU (fully loaded chassis, with random mix of line card types)

Compliance

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

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 : 4.5Kg (US: ~10 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)

(with 1 NMC, 2 fan modules, 1 AC +1 DC power module & two bracket panels for 19" rack-mounting)

Fully Populated Reference Net Weight: 8.4Kg (US 18.5 lbs.)
(fully loaded, two powers, NMC and 19 pcs 10/100i line cards)

1.6 NMC (SNMP)

The **FRM220** must be ordered with an NMC 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. Almost all FRM line cards support remote in-band configuration when paired with the same type FRM220 stand-alone in-band converter.

1.7 Line card options

The **FRM220** is capable of supporting a variety of in-band managed or non-managed line card types which may be mixed and matched in any slot of the rack. See below for a brief of the line cards at the time of this printing. Please refer to the latest version of **FRM220 NMC User Manual** for details of all the line card options for the **FRM220**.

1.7.1 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). An optional console manageable single slot chassis, the CH01M, is also available with DB9F connector for stand-alone serial console management.

Features

- Supports Loop Back Test
- Auto-Cross over for MDI/MDIX in TP port
- Supports far end fault (FEF) function via OAM
- Auto-Negotiation or Manual mode in TP port
- Supports link fault pass through (LFP) function
- Bandwidth control (32K or 512Kbps x N)
- Forward 2046 bytes (max.) packets in switch mode
- Forward 9K jumbo packets in converter mode
- Supports forwarding mode option
- Store and forward (switch) mode, Convert mode (small latency)
- Supports local or remote In-band management (Monitor and Configure status) by the SNMP manager in FRM220
- Supports remote CPE power fail detection (Dying gasp)
- Provides Auto Laser Shutdown (ALS) function
- Supports Fiber Hardware Reset (FHR) function
- Provides fiber transceiver information for management
- Supports On-Line In-band F/W upgrade (local or remote) by the SNMP manager in FRM220

Specifications

Complies with IEEE 802.3 and IEEE 802.3u
 288kb packet buffer in switch mode
 1K MAC address table in switch mode
 Supports IEEE802.3x flow control in switch mode
 OAM is based on TS-1000 protocol

10Base-T UTP Cable Requirement

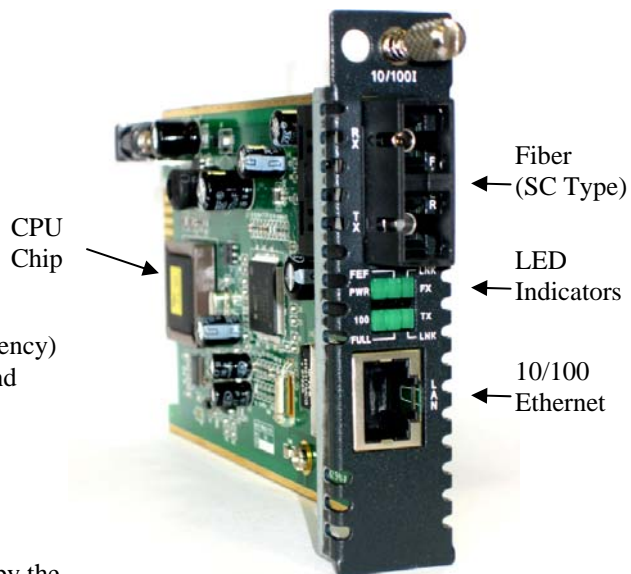
Cable type: Category 3, 4 or 5. Maximum distance: 100 meters (328 feet)

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. An optional console manageable single slot chassis, the CH01M, is available with DB9F connector for stand-alone serial console management.



10/100i is a media converter that must be placed in FRM220-CH20 for management. It utilizes fixed transceiver for 100Base-FX fiber connection and one 10/100 Ethernet electrical port.

1.7.2 FRM220-10/100iS-2 Dual Channel In-band managed 10/100 Fiber Media Converter

The FRM-10/100iS-2 (in-band converter) is Dual Channel (2 converters in 1 card) 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-10/100iS-2 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).

Features

- Dual Converter on a single card (2 independent channels)
- Supports Loop Back Test
- Auto-Cross over for MDI/MDIX in TP port
- Supports far end fault (FEF) function via OAM
- Auto-Negotiation or Manual mode in TP port
- Supports link fault pass through (LFP) function
- Bandwidth control (32K or 512Kbps x N)
- Forward 2046 bytes (max.) packets in switch mode
- Forward 9K jumbo packets in converter mode
- Supports forwarding mode option
- Store and forward (switch) mode, Convert mode (small latency)
- Supports local or remote In-band management (Monitor and Configure status) by the SNMP manager in FRM220
- Supports remote CPE power fail detection (Dying gasp)
- Provides Auto Laser Shutdown (ALS) function
- Supports Fiber Hardware Reset (FHR) function
- Provides fiber transceiver information for management
- Supports On-Line In-band F/W upgrade (local or remote) by the SNMP manager in FRM220

Specifications

Complies with IEEE 802.3 and IEEE 802.3u
 288kb packet buffer in switch mode
 1K MAC address table in switch mode
 Supports IEEE802.3x flow control in switch mode
 OAM is based on TS-1000 protocol
Compliance: FCC part 15, Subpart B, Class A,
 ANSI C63.4:2003
 CE EN55022:2006, Class A
 EN55024:1998+A1:2001+A2:2003
 LVD: EN60950-1:2001
 MTBF: 65,000 h (25°C)

10Base-T UTP Cable Requirement

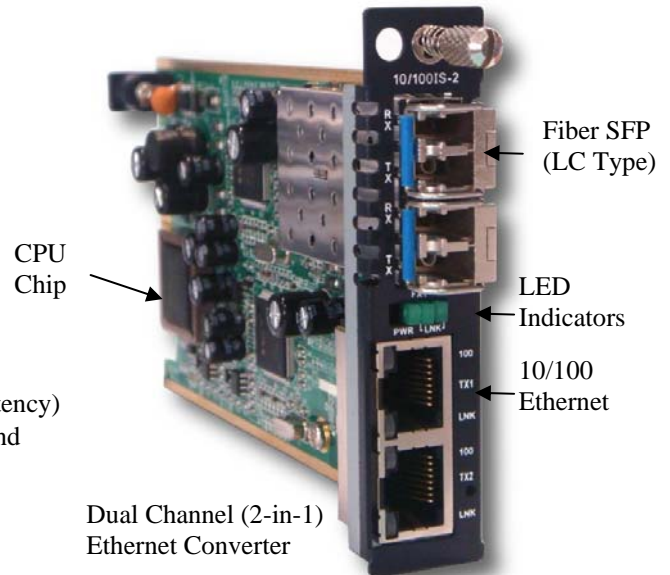
Cable type: Category 3, 4 or 5. Maximum distance: 100 meters (328 feet)

100Base-TX UTP Cable Requirement

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

Management

The 10/100iS-2 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 two separate MC run with default parameters. The default parameters are: switch mode, auto-negotiation, LFP disabled, ALS (Auto Laser Shutdown) disabled, and no bandwidth limit. When a fully populated CH20 (with 19 10/100iS-2) is deployed, a total of 38 loops are available from the 2U FRM220-CH20. Due to dimension limitations, the 10/100iS-2 is only available for SFP based fiber optics.



10/100iS-2 is a dual channel media converter that must be placed in FRM220-CH20 for management. It utilizes SFP for fiber connection and two 10/100 Ethernet electrical ports.

1.7.3 FRM220-10/100A(S) 802.3ah In-band managed 10/100 Fiber Media Converter

This IEEE802.3ah OAM compliant copper to fiber Fast Ethernet solution is designed to make conversion between 10/100Base-TX and 100Base-FX with SC or ST connector. With SNMP agent and GUI Web-based management in the FRM220, the Network administrator can monitor, configure and control the activity of each 802.3ah series line card. This 802.3ah OAM Compliant media converter, with its Q-in-Q and maximum interoperability will enable carriers and service providers to have a clear vision of their network and conveniently manage their demarcation point.

Features

- 10/100Mbps auto-negotiation or forced mode operation on the TP interface
- Fiber 100Mbps/Full
- Supports Flow control function
- Supports OAM remote loopback to assist in diagnosing network problems
- Supports bandwidth control
- Supports Dying Gasp Reporting for power outage
- Supports QoS Classification
- Supports local / remote monitor
- Supports local / remote Configuration
- Supports Q in Q double tagged frame transparent
- Supports remote firmware upgrade
- Supports IEEE 802.1q Tag VLAN pass thru
- Compatible with FRM220 Managed Chassis

LAN Interface Specification

One RJ-45 female connector for straight or cross-over connection.

Supports 10/100Base-TX, n-way (Auto-Negotiation).

Transmission Packet Rate for 10Base-T: 14880 per second

100Base-TX: 148800 per second

Copper TP cable 4 pair Cat. 3, 4, 5e or 6 UTP

Optical Interface Specification

Transceiver Connector type : ST or SC, or LC with SFP

Supports Full 100Mbps speed

Supports auto-receive sensitivity function, no extra attenuators needed.

General Specification

IEEE 802.3ah In-band OAM management compliant

6 diagnostic LEDs : Power/FX-Link ,TX-Speed/TX-Duplex/TX-Link/Test (loopback)

Temperature: 0 - 50° C (Operating); 0 - 70° C (Storage).

Humidity: 20-80% non-condensing (Operating); 10-90% (Storage).

Power: DC Jack : Switching adaptor (12V, 400mA)

Consumption: < 4W

Dimensions: 155mm x 88mm x 23mm (LxWxH).

Weight: 120g.

Compliance: FCC part 15, Subpart B, Class A,

ANSI C63.4:2003

CE EN55022:2006, Class A

EN55024:1998+A1:2001+A2:2003

LVD: EN60950-1:2001

MTBF: 65,000 h (25°C)

This product includes the following models:

- FRM220-10/100AS-2 (2 electrical plus 2 SFP 4-port fiber switch)
- FRM220-10/100A (2 electrical plus 1 fixed transceiver 3 port fiber switch)



10/100AS-2 is a stand-alone manageable 4 port Fast Ethernet fiber switch, utilizing SFP for 100Base-FX fiber connection and two 10/100 Ethernet electrical ports.

1.7.4 FRM220-1000EA(S) 802.3ah In-band managed Gigabit Fiber Media Converter

This IEEE802.3ah OAM compliant copper to fiber Gigabit Ethernet solution is designed to make conversion between 10/100/1000Base-TX and 1000Base-SX/LX with SFP-LC connector. With SNMP agent and GUI Web-based management in the FRM220, the Network administrator can monitor, configure and control the activity of each 802.3ah series line card. This 802.3ah OAM Compliant media converter, with its Q-in-Q and maximum interoperability will enable carriers and service provider to have a clear vision of their network and conveniently manage their demarcation point.

Features

- 802.3ah In-band OAM management compliant
- 2 ports 10/100/1000Base-T and 2 ports GbE fiber (SFP)
- Supports Flow control function
- Supports OAM remote loopback
- Supports spanning tree function
- Supports bandwidth control
- Supports Dying Gasp Reporting for power outage
- Supports local / remote monitor
- Supports local / remote Configuration
- Supports Q in Q double tagged frame transparent
- Supports remote F/W upgrade (In-band)
- Supports IEEE 802.1q Tag VLAN pass thru and port-base VLAN
- Provides fiber transceiver information for management
- Compatible with FRM220 Managed Chassis

LAN Interface Specification

Two RJ-45 female connectors for straight or cross-over connection.
 Supports 2-port 10/100/1000Base, n-way (Auto-Negotiation).
 Supports Full, Half duplex, 10/100/1000 speed force mode selections.
 Transmission Packet Rate for 10Base-T: 14880 per second
 100Base-TX: 148800 per second ; 1000Base-T: 1488000 per second
 Copper TP cable 4 pair Cat. 5e or 6 UTP

Optical Interface Specification

Transceiver Connector type : SFP-LC
 Supports 2-port, 1000Mbps SFP slot
 Supports auto-receive sensitivity function, no extra attenuators needed.

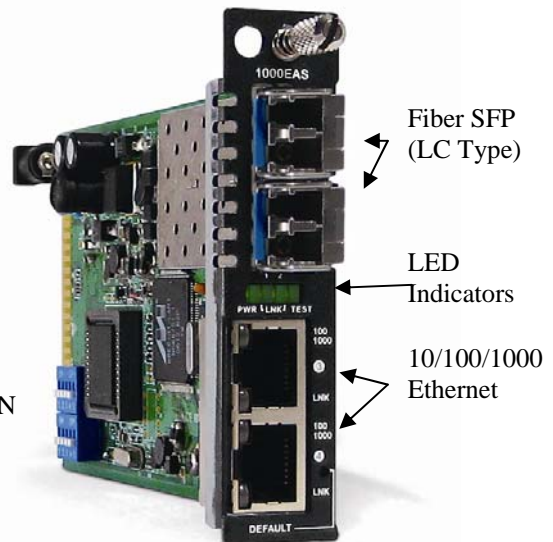
General Specification

Standards IEEE 802.3 10Base-T,
 IEEE 802.3u 100Base-TX , 100Base-FX,
 IEEE 802.3ab, 802.3z 1000Base-T, 1000Base-SX/LX
 IEEE 802.3ah In-band OAM management compliant
 6 diagnostic LEDs : Power / FX-Link ,TX-Speed / TX-Duplex/ TX-Link / Test (loopback)
 Temperature: -10 - 60° C (Operating);-20 - 70° C (Storage).
 Humidity: 0-95% non-condensing (Operating); 10-90% (Storage).
 Power: DC Jack : Switching adaptor (12V, 1A)
 Consumption: < 12W
 Dimensions: 155mm x 88mm x 23mm (LxWxH).
 Weight: 120g.

Compliance: FCC part 15, Subpart B, Class A,
 ANSI C63.4:2003
 CE EN55022:2006, Class A
 EN55024:1998+A1:2001+A2:2003
 LVD: EN60950-1:2001
 MTBF: 65,000 h (25°C)

This product includes the following models:

- 1000EAS (2 electrical plus 2 SFP)
- 1000EAS-1 (1 electrical plus 1 SFP)
- 1000EA-1 (1 electrical plus 1 fixed fiber)
- 1000EAS-2F (2 SFP)



1000EAS is a stand-alone manageable 4 port Gigabit Ethernet fiber switch, utilizing SFP for 1000Base-SX/LX fiber connection and two 10/100/1000 Ethernet electrical ports.

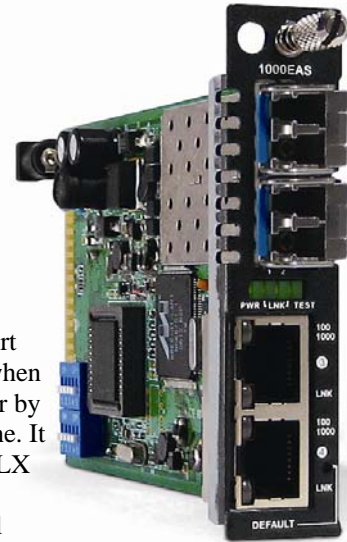
1.7.5 FRM220-1000EDS Managed Gigabit Fiber Media Converter

The FRM220-1000EDS is a dual channel (two in one) copper to fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-TX and 1000Base-SX/LX with SFP connector. With SNMP and Web-based management in the FRM220, the Network administrator can monitor, configure and control the activity of each card in the chassis. This converter also supports features such as ingress/egress bandwidth control, auto or forced mode setting for copper Ethernet as well as auto laser shutdown. The FRM220-1000E(s)-1 is a single copper to single fiber Gigabit Ethernet solution designed to make conversion between 10/100/1000Base-TX and 1000Base-SX/LX with SC or SFP LC connector.

Features

- 2-port 10/100/1000Base-T to 2-port 1000Base-SX/LX (EDS)
- 1-port 10/100/1000Base-T to 1 port 1000Base-SX/LX (ES-1)
- Supports dual converter mode or switch mode
- Auto-negotiation or forced mode
- Auto MDI/MDIX
- Forward 2046 bytes (Max.) packets
- Support Bandwidth Control (70k ~ 250Mbps)
- Supports Flow control (Pause)
- Support Link fault pass through (LFP) function
- Supports remote CPE power fail detect (dying gasp)
- Auto Laser Shutdown (ALS)
- Online local f/w upgrade

1000EDS is a manageable 4 port Gigabit Ethernet fiber switch when placed in the FRM220-CH20 or by DIP switches if used stand-alone. It utilizes SFP for 1000Base-SX/LX fiber connection and two 10/100/1000 Ethernet electrical ports.



Specifications

Ports	Optical Interface Connector : SFP LC Data rate : 1000Mbps Duplex mode : Full duplex Cable type : MM 62.2/125μm, 50/125μm. SM 9/125μm Distance : MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km Wavelength: 1310nm, 1550nm,
	Electrical Interface Connector : RJ45 Data rate : 10Mbps, 100Mbps, 1000Mbps Duplex mode: Half / Full duplex Cable type: 10Base-T Cat.3, 4, 5, UTP, 100Base-TX Cat.5, 5e, 1000Base-T Cat. 5e or higher Distance: 100 meters
Standards	IEEE 802.3, IEEE 802.3u, IEEE802.3ab, IEEE802.3z
LEDs	Power, FX-Link 1/2, 2Ch, TX-Link, TX-SPD
Power	DC In 12V
Power Consumption	< 5W
Dimension (D x W x H) mm	155 x 88 x 23mm
Weight	120g
Temperature	-10~60° C (Operating) , -20~70° C (Storage)
Humidity	10~95% non-condensing
Certification	CE LVD/EMI, FCC, RoHS
MTBF	65,000 h (25° C)

This product includes the following models:

- 1000EDS (2 electrical plus 2 SFP)
- 1000ES (1 electrical plus 1 SFP)
- 1000E (1 electrical plus 1 fixed optical)

1.7.6 FRM220-E1/T1 In-band managed G.703 E1/T1(DS1) Fiber Modem

The FRM220-E1/T1 is a fiber modem transport for G.703 E1 or T1(DS1) transmission. The BNC model (E1 only) provides unbalanced 75 Ohm coaxial connections while the RJ-45 model provides balanced 100/120 Ohm connections over twisted pair wiring. When the FRM220-E1/T1 card is placed in the FRM220 rack with in-band management, the card status, type, version, fiber link status, E1 or T1 link status and alarms can all be displayed. Configuration is also available to enable or disable the port, reset the port, do far end fault setting, and initiate local or far end loop-back tests. When configured in G.703 E1 mode, this model also supports fractional E1 (G.704) as well as remote connection to FRM220-Data (V.35, RS-530/449, X.21) fiber modem for either unframed (2048Kbps) or fractional (nx64kbps where n=1 to 31) transmissions.

Features

- Network Management via Terminal or SNMP in FRM220 chassis
- T1/E1 RJ-45 (USOC RJ-48C) or Coax (BNC) Fiber Modem
- Supports AMI or B8ZS/HDB3 line codes
- Unframed (transparent clear channel) mode
- N x 64K (fractional E1) mode
- Supports point to point (CPE) solution with FRM220-DATA
- User selectable Loop back tests
- Far End Fault (FEF) detection

E1/T1 is a stand-alone manageable G.703 E1/DS1(T1) Fiber Optical Modem that can carry E1/T1 over fiber transparently or with framing. One model is designed with RJ-45, while another model supports E1 via coaxial BNC connections.



Specifications

<i>Ports</i>	Connector	1x9 (SC, ST, FC) or SFP LC
<i>Optical Interface</i>	Cable type	MM 62.2/125µm, 50/125µm. SM 9/125µm
	Cable length	MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
	Wavelength	MM 1310nm, SM 1310, 1550nm, WDM 1310Tx/1550Rx(type A), 1550Tx/1310Rx(type B)
	Data rate	36.864Mbps
<i>Electrical Interface</i>	Connector	RJ45 E1-120ohm, T1-100ohm, BNC E1-75ohm
	Data rate	E1: 2.048Mbps, T1:1.544Mbps
	Line Code	E1 HDB3/AMI, T1 B8ZS/AMI
	Cable type	Cat.3 or higher Twisted-Pair cable
<i>Standards</i>		E1 ITU-T G.703, G.704, G.706, G.732, G.823 T1 ITU-T G.703, G.704, AT&T, TR-62411, ANSI T1.403
<i>LEDs</i>		Power, FX-Link, E1/T1 SIG, Test, SYN, RD, TD, AIS
<i>Power</i>		DC In 12V
<i>Consumption</i>		< 5W
<i>Dimensions</i>		155 x 88 x 23mm (D x W x H)mm
<i>Weight</i>		120g
<i>Temperature</i>		-10~60°C (Operating) , -20~70°C (Storage)
<i>Humidity</i>		10~95% non-condensing
<i>Certification</i>		CE, FCC, LVD, RoHS
<i>MTBF</i>		65,000 h (25°C)

This product includes the following models:

- E1/T1R (RJ-45 electrical plus fixed optical)
- E1T1RS (RJ-45 electrical plus SFP)
- E1B (Dual BNC plus fixed optical)
- E1BS (Dual BNC plus SFP)

1.7.7 FRM220-Data In-band managed V.35, X.21, RS-530/449/232 Fiber Modem

The FRM220-DATA is a fiber modem for high-speed (up to 8.192Mbps) synchronous or low speed synchronous and asynchronous data transmissions (V.35, RS-232, RS-530, X.21 or RS-449) over fiber optical media. When the FRM220-DATA card is placed in the FRM220 rack with SNMP management, in-band management allows viewing the card and remote modem's status, type, version, fiber link status, data link status and alarms. Both card and remote can be configured to enable or disable the port, reset the port, set the data rate, modify the clock mode, and initiate local or far end loop back tests. The FRM220-Data Fiber Modem may also be paired with the FRM220-E1/T1 for Nx64K transmissions.

Features

- Synchronous or Asynchronous data over fiber
- In-band network management
- Manage via terminal, web or SNMP in FRM220-CH20 chassis
- Software selectable interface, V.35, X.21, RS530, RS449, RS232
- Software selectable DCE or DTE mode
- User selectable data rate n x 64kbps, up to 9Mbps
- Independent clock mode setting
- TC RC clock (internal, external, or recovery)
- Electrical and optical loop back tests
- Compatible with FRM220-E1 on same fiber link for N x 64k
- Stand-Alone Console management with CH01M single slot chassis



Specifications

Ports

Optical Interface

Connector : 1x9 (SC, ST, FC) or SFP LC
 Data rate : 36.864Mbps
 Line coding: Scrambled NRZ
 Bit Error Rate: Less than 10⁻¹⁰
 Cable type : MM 62.2/125μm, 50/125μm. SM 9/125μm
 Distance : MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km
 Wavelength: 1310nm, 1550nm,

Electrical Interface

Connector : **HDB26F w/ adapter cable for V35, X21, RS530, RS449,RS232**

Line Code: NRZ
 Baud Rate: RS-232 up to 384K sync and async
 V.35/RS-530 up to 9152k sync, async up to 2048k
 N*64Kbps , where n=1 to 143 (64K ~ 9152Kbps)
 Receive and Transmit Clock source :Internal, Recovery, External

Standards

ITU-T
 Power, FX Link, RTS, Test , TD, RD, CTS, DCD

LEDs

Power

Power Consumption

Dimension (D x W x H) mm

Weight

Temperature

Humidity

Certification

MTBF

DC In 12V

< 5W

155 x 88 x 23mm

120g

-10~60° C (Operating) , -20~70° C (Storage)

10~95% non-condensing

CE LVD/EMI, FCC, RoHS

65,000 h (25° C)

This product includes the following models:

- FRM220-Data/XXX (Fiber Modem with fixed optical and adapter cable)
- FFRM220-DataS/XXX (Fiber Modem with SFP and adapter cable)

Where XXX equals:

232 for RS-232 cable (DB25F)

530 for RS-530 cable (DB25F)

V35 for V.35 cable (MB34F)

X21 for X.21 cable (DB15F)

449 for RS-449 cable (DB37F)

1.7.8 FRM220-Serial/485 In-band managed RS-485/422/232 Fiber Modem

The FRM220-Serial/485 provides an Asynchronous Fiber Modem solution to extend RS-485 or RS-232 transmission distance up to 2km over multimode fiber or up to 120km over single mode fiber. The modem is equipped with multiple interface circuits for connection to RS-232 or RS-485/422 (2 or 4 wire, full or half duplex). The FRM220-Serial/485 secures data transmission over EMI resistant fiber at speeds up to 460kbps for RS-232 or up to 1024kbps for RS-485/422. When the FRM220-Serial/485 card modem is placed in the FRM220 rack with SNMP management, in-band management allows viewing the card and remote modem's status, type, version, fiber link status, data link status and alarms. Both card and remote can be configured to enable or disable the port, reset the port and set the interface type.

Features

- Extend asynchronous serial transmission from 2km to 120km over fiber
- In-band network management
- Manage via terminal, web or SNMP in FRM220-CH20 chassis
- Software selectable data interface for RS232/ 422/ 485
- Software selectable two wires (half duplex) or four wires (full duplex) RS485
- Software selectable three or five wires RS232
- Speeds up to 460kbps for RS232 (Async. mode)
- Speeds up to 1Mbps for RS485/ 422 (Async)

Specifications

Ports

Optical Interface

Connector : 1x9 (SC, ST, FC) or SFP LC

Data rate : 36.864Mbps

Line coding: Scrambled NRZ

Bit Error Rate: Less than 10^{-10}

Cable type : MM 62.2/125 μ m, 50/125 μ m. SM 9/125 μ m

Distance : MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km

Wavelength: 1310nm, 1550nm,

Electrical Interface

Connector : 6 pins Terminal block

Data Signal Formats

RS485 2-wire

RS422 4-wire

RS232 RTS/CTS 5-wire

RS232 3-wire

Baud Rate:

RS422, RS485 up to 1024kbps

RS232 up to 256kbps

EIA/TIA RS485, RS422, RS232

Power, FX Link, DI, DO, Test

DC In 12V

Standard

LEDs

Power

Power Consumption

Dimension (D x W x H) mm

Weight

Temperature

Humidity

Certification

MTBF

< 5W

155 x 88 x 23mm

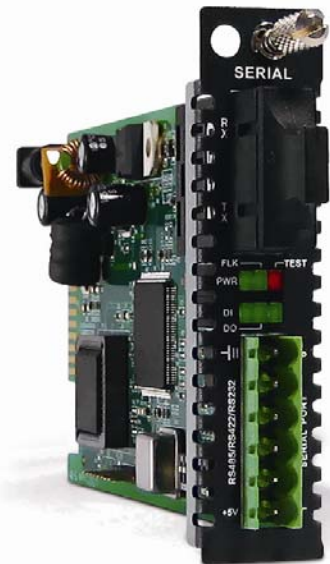
120g

-10~60° C (Operating) , -20~70° C (Storage)

10~95% non-condensing

CE LVD/EMI, FCC, RoHS

65,000 h (25° C)



This product includes the following models:

- FRM220-Serial/485 (6 pin terminal block and fixed fiber transceiver)
- FRM220-Serial/485S (6 pin terminal block with SFP)

1.7.9 FRM220-FXO/FXS In-band managed POTS (Voice) over Fiber Modem

FRM220-FXO/FXS POTS phone line converter extender is used to connect PSTN voice signals to distant Plain Old Telephone (POTS) devices. FRM220-FXO/FXS provides a fiber media transport for POTS transmission and features an RJ-11C for copper connection. A pair of FRM220-FXO/FXS is required to implement an end to end system. FXO mode connects to a telephone line or PBX and has ability to detect ringing voltages and to act as a telephone. FXS mode is the reciprocal unit and has ability to act as PSTN and connects to a telephone device. When the FRM220-FXO/FXS card is placed in the FRM220 rack with SNMP management, in-band management allows viewing the card and remote converter's status, type, version, fiber link status, on hook status and alarms. Both card and remote can be configured to enable or disable the port, reset the port and set the FXO or FXS mode.

Features

- Extend telephone voice transmission from 2km to 120km over fiber
- Management via terminal, web or SNMP in FRM220-CH20 chassis
- Manage stand-alone via DIP Switch
- Supports telephone voice transmission
- Supports caller ID pass through
- Selectable FXO or FXS mode
- Supports FXS to FXS hot line

Specifications

Ports

Optical Interface

Connector : 1x9 (SC, ST, FC) or SFP LC

Cable type : MM 62.2/125 μ m, 50/125 μ m. SM 9/125 μ m

Distance : MM 2km, SM 15/30/50/80/120km, WDM 20/40/60/80km

Wavelength: 1310nm, 1550nm,

Electrical Interface

Connector : RJ-11

FXO mode

Impedance : 600 ohms

Coding : 16 bits liner

Loop Current : 10~100mA

Ring Frequency : Acceptable 20 ~50Hz

Insertion Loss: 0.0 \pm 1.0dB at 1000Hz

FXS mode

Impedance : 600 ohms

Coding : 16 bits liner

Dial: DTMF and Dial Paul

Battery Source: 48VDC \pm 4V

Ringing Waveform : Sine wave

Ringing Frequency : 20/25/30/50 Hz selectable

Ring Cadence: FXS to FXS : On / 1 sec, Off / 2 sec

FXO to FXS; Reproduces the cadence detected by FXO

Insertion Loss 0.0 \pm 1.0dB at 1000Hz

REN: 4.0B(Ring Equivalence Number)

Power, FX Link, Phone Act, Test

DC In 12V

< 5W

LEDs
Power
Power Consumption
Dimension (D x W x H) mm
Weight
Temperature
Humidity
Certification
MTBF

155 x 88 x 23mm

120g

-10~60 $^{\circ}$ C (Operating) ,-20~70 $^{\circ}$ C (Storage)

10~95% non-condensing

CE LVD/EMI, FCC, RoHS

65,000 h (25 $^{\circ}$ C)



This product includes the following models:

- FRM220-FXO/FXS (POTS over Fiber fixed transceiver)

- FRM220-FXO/FXS-S (POTS over Fiber SFP)

1.7.10 FRM220-155MS SM/MM, MM/SM converter / repeater

The FRM220-155MS is a fiber to fiber optical media converter and repeater that allows data rates up to 155Mbps. FRM220-155MS supports 2R regeneration, which consists of re-amplification and reshaping. This converter is compatible with fiber interfaces such as 100Mbps Fast Ethernet, 155Mbps STM1 and OC3. The FRM220-155MS works well with FRM220-CH20 chassis as slide-in card or with FRM220-CH01, one slot chassis as a stand-alone fiber converter. When the FRM220-155MS card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, fiber link status and alarms. The card can be configured to enable or disable the port, reset the port or enable/disable Auto Laser Shutdown.

Features

- Transparent fiber media converter / repeater
- Speed up to 155Mbps (Fast Ethernet, OC3, STM-1)
- Manage via terminal, web or SNMP in FRM220-CH20 chassis
- Extend transmission from 2km to 120km over fiber
- Perform optical repeater function (Re-amplification & Reshaping)
- Supports Client / Line loop back test
- Link Fault Pass through (LFP)
- Auto Laser Shutdown (ALS)
- Does NOT support in-band management



Specifications

Ports

Optical Interface

Connector : 1x9 (SC, ST, FC) or SFP LC
 Data rate: Up to 155Mbps (Fast Ethernet, OC3, STM-1)
 Regeneration type: 2R
 Loop back: Line/Client
 Cable type : MM 62.2/125 μ m, 50/125 μ m. SM 9/125 μ m
 Wavelength:1310nm, 1550nm,
 Power, Line Link, Client Link, Test

LEDs	Power, Line Link, Client Link, Test
Power	DC In 12V
Power Consumption	< 5W
Dimension (D x W x H) mm	155 x 88 x 23mm
Weight	120g
Temperature	-10~60° C (Operating) ,-20~70° C (Storage)
Humidity	10~95% non-condensing
Certification	CE LVD/EMI, FCC, RoHS
MTBF	65,000 h (25° C)

This product includes the following models:

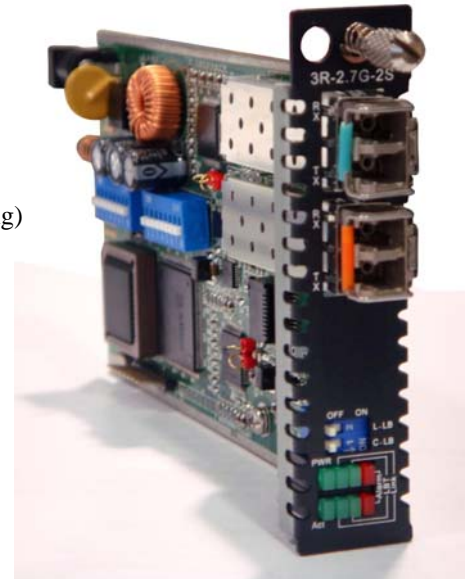
- FRM220-155MS (STM-1 Fiber Repeater with fixed transceivers)
- FRM220-155MS-SFP (STM-1 Fiber Repeater with SFP)

1.7.11 FRM220-2.7G-2S, 2.7Gbps 3R Fiber Transponder

The FRM220-2.7G-2S is an optical 3R regeneration device, which provides re-amplification, reshaping and retiming. The transponder card converts a data signal to the correct wavelength for transmission on a specific channel by supporting SFP optics on both line side and client side interfaces. When the FRM220-2.7G-2S 3R card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, fiber link status and alarms. The card can be configured to enable or disable the port, reset the port and set the desired data rate.

Features

- Protocol transparent fiber media converter / repeater
- Up to 2.7Gbps
- Clocking for Fast Ethernet, OC3, STM-1, STM-4, STM-16, FC-1, FC-2
- Network management via terminal, web or SNMP in FRM220-CH20 chassis
- Extend transmission from 2km to 120km over fiber
- Perform 3R optical repeater function (Re-amplification & Reshaping, Re-clocking)
- Supports Client / Line loop back test
- Link Fault Pass through (LFP)
- Auto Laser Shutdown (ALS)
- Serial console for stand-alone management
When used with CH01M one slot chassis



Specifications

Ports

Optical Interface

Connector : LC (SFP)

Data rate: Up to 2.7Gbps

Fixed rates for:

Fast Ethernet (125M)

STM-1/OC3 (155.52M)

STM-4/OC12 (622.080M)

STM-16/OC48 (2,488.32M)

FC-1 (1.0625G)

FC-2 (2.125G)

Regeneration type: 3R

Loop back: Line/Client

Cable type : SM 9/125 μ m, MM 50/125 μ m, 62.2/125 μ m

Wavelength: 850, 1310, 1550nm,

Power, Line Link, Client Link, Test, Alarm

DC In 12V

< 10W

Dimension (D x W x H) mm

155 x 88 x 23mm

Weight

120g

Temperature

-10~60° C (Operating) , -20~70° C (Storage)

Humidity

10~95% non-condensing

Certification

CE, FCC, LVD, RoHS

MTBF

65,000 h (25° C)

LEDs

Power

Power Consumption

Dimension (D x W x H) mm

Weight

Temperature

Humidity

Certification

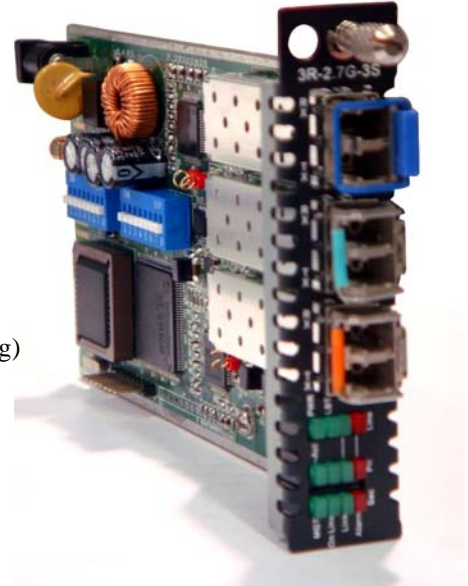
MTBF

1.7.12 FRM220-2.7G-3S 3R Transponder with Protection

The FRM220-2.7G-3S is an optical 3R regeneration device, which provides re-amplification, reshaping and retiming and offers fiber protection. The transponder card converts a data signal to the correct wavelength for transmission on a specific channel by supporting SFP optics on line side to Primary or Secondary interfaces. When the FRM220-2.7G-3S 3R card is placed in the FRM220 rack with SNMP management, the management can view the converter card's status, type, version, fiber link status and alarms. The card can be configured to enable or disable the port, reset the port and set the desired data rate.

Features

- Protocol transparent fiber media converter / repeater
- Supports fiber redundancy by switching Primary to Secondary path
- Programmable receive optical threshold fiber protection
- Up to 2.7Gbps
- Clocking for Fast Ethernet, OC3, STM-1,STM-4, STM-16,FC-1, FC-2
- Network management via terminal, web or SNMP in FRM220-CH20 chassis
- Extend transmission from 2km to 120km over fiber
- Perform 3R optical repeater function (Re-amplification & Reshaping, Re-clocking)
- Supports Line / Primary / Secondary loop back test
- Link Fault Pass through (LFP)
- Auto Laser Shutdown (ALS)
- Serial console for stand-alone management
When used with CH01M one slot chassis



Specifications

Ports

Optical Interface

Connector : LC, 1 Line SFP, 1 Primary SFP, 1 Secondary SFP

Data rate: Up to 2.7Gbps

Fixed rates for:

Fast Ethernet (125M)

STM-1/OC3 (155.52M)

STM-4/OC12 (622.080M)

STM-16/OC48 (2,488.32M)

FC-1 (1.0625G)

FC-2 (2.125G)

Regeneration type: 3R

Loop back: Line / Primary or Secondary

Cable type : SM 9/125 μ m, MM 50/125 μ m, 62.2/125 μ m

Wavelength: 850, 1310,1550nm,

Power, Line Link, Primary Link, Secondary Link, Test, Alarm

DC In 12V

LEDs

Power

Power Consumption

Dimension (D x W x H) mm

Weight

Temperature

Humidity

Certification

MTBF

< 10W

155 x 88 x 23mm

120g

-10~60° C (Operating) ,-20~70° C (Storage)

10~95% non-condensing

CE, FCC, LVD, RoHS

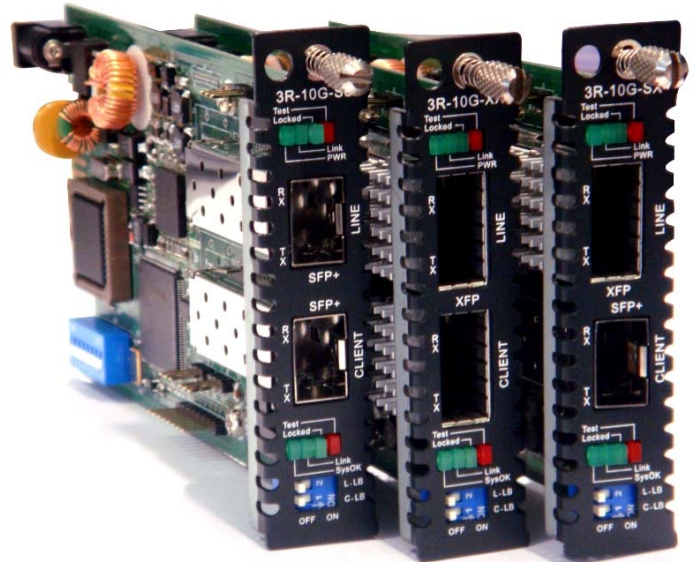
65,000 h (25° C)

1.7.13 FRM220-10G-xx 10Gbps 3R Fiber Transponder

The FRM220-10G-xx is a series of managed 10G fiber to fiber 3R repeater/transponders. Based on a number of 10 Gigabit Fiber standards, these transponders support XFP to XFP (XX), SFP+ to XFP (SX), or SFP+ to SFP+ (SS) fiber connections. The transponders are protocol transparent, providing 3R regeneration between these different optical module types. One of the major applications for this converter is in connecting proprietary transceiver equipment to CWDM or DWDM when these 'colored' optical modules are not available for the proprietary equipment. With full duplex wire speed forwarding capability between the 2 fiber media, the FRM220-10G-xx brings you the best and simplest solution for your 10G conversion between fiber and fiber.

Features

- Protocol transparent 3R fiber media transponder/repeater
- Supports IEEE802.3ae, 10G Fiber Ethernet
- Supports 1G,2G,4G,8G,10G Fiber Channel
- Supports STM-64
- Network management via terminal, web or SNMP in FRM220-CH20 chassis
- Extend 10G Ethernet transmission over fiber
- Useful as a 'Transponder' in CWDM or DWDM systems for 10G Ethernet/Fiber Channel/STM-64
- Supports Client / Line loop back tests
- Serial console for stand-alone management
When inserted in CH02M Single Slot Chassis



Specifications

Ports

Optical Interface

FRM220-10G-SS

Connector : LC, 1 Line SFP+, 1 Client SFP+

FRM220-10G-XX

Connector : LC, 1 Line XFP, 1 Client XFP

FRM220-10G-SX

Connector : LC, 1 Line XFP, 1 Client SFP+

Data rates:

- 10G Fiber Channel (10.51875G)
- 10G Base Ethernet (10.3125G)
- STM-64/OC192 (9.95328G)
- OTN G.709 OTU2 (10.709225G)
- Fiber Channel FC1 (1.0625G)
- Fiber Channel FC2 (2.125G)
- Fiber Channel FC4 (4.25G)
- Fiber Channel FC8 (8.5G)

Loop back: Line/Client

Cable type : SM 9/125 μ m, MM 50/125 μ m, 62.2/125 μ m

Wavelength: 850, 1310, 1550nm,

Power, Line Link, Client Link, Test

DC In 12V

< 8W

155 x 88 x 23mm

120g

-10~60° C (Operating) , -20~70° C (Storage)

10~95% non-condensing

CE, FCC, LVD, RoHS

65,000 h (25° C)

LEDs

Power

Power Consumption

Dimension (D x W x H) mm

Weight

Temperature

Humidity

Certification

MTBF

This product includes the following models:

- FRM220-10G-SS (10G fiber 3R transponder/repeater, SFP+ to SFP+)
- FRM220-10G-XX (10G fiber 3R transponder/repeater, XFP to XFP)
- FRM220-10G-SX (10G fiber 3R transponder/repeater, SFP+ to XFP)

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 or three wire (-48VDC, Power return, Earth Ground) central office power. The AC 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 Fiber and other copper 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 that install in the rear side of the chassis. Without fans, excessive temperatures within the unit might cause it to electrically shutdown. The **FRM220** chassis is delivered completely assembled, however power modules and 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. The same brackets also allow installation into a 23" rack and in this configuration, central mounting is recommended.

2.3.1 Rack mounting

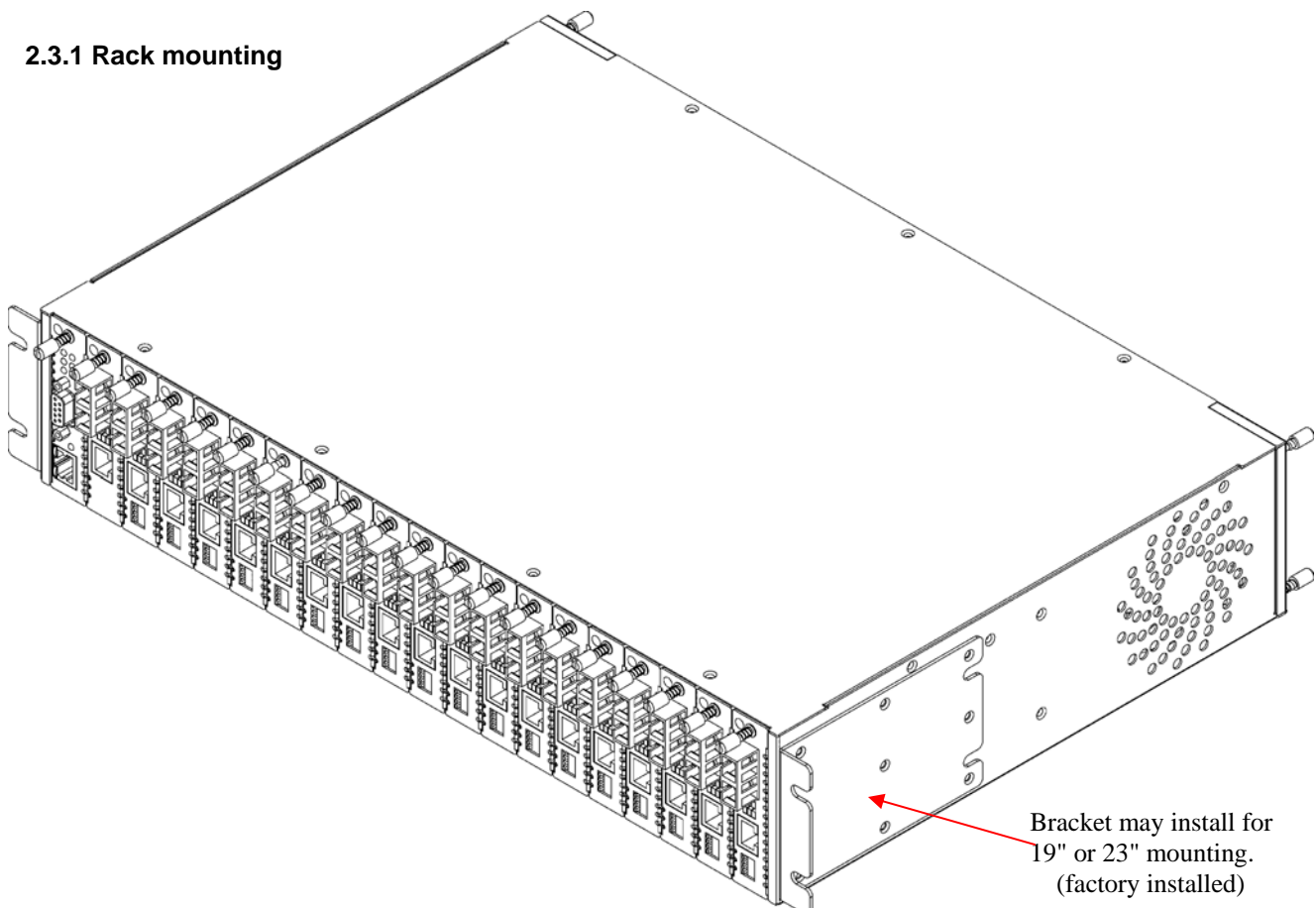


Figure 2-1 Standard 19" Rack-Mount Installation of **FRM220** Unit requires 2RU space

2.3.2 Fan Units Removal/Replacement

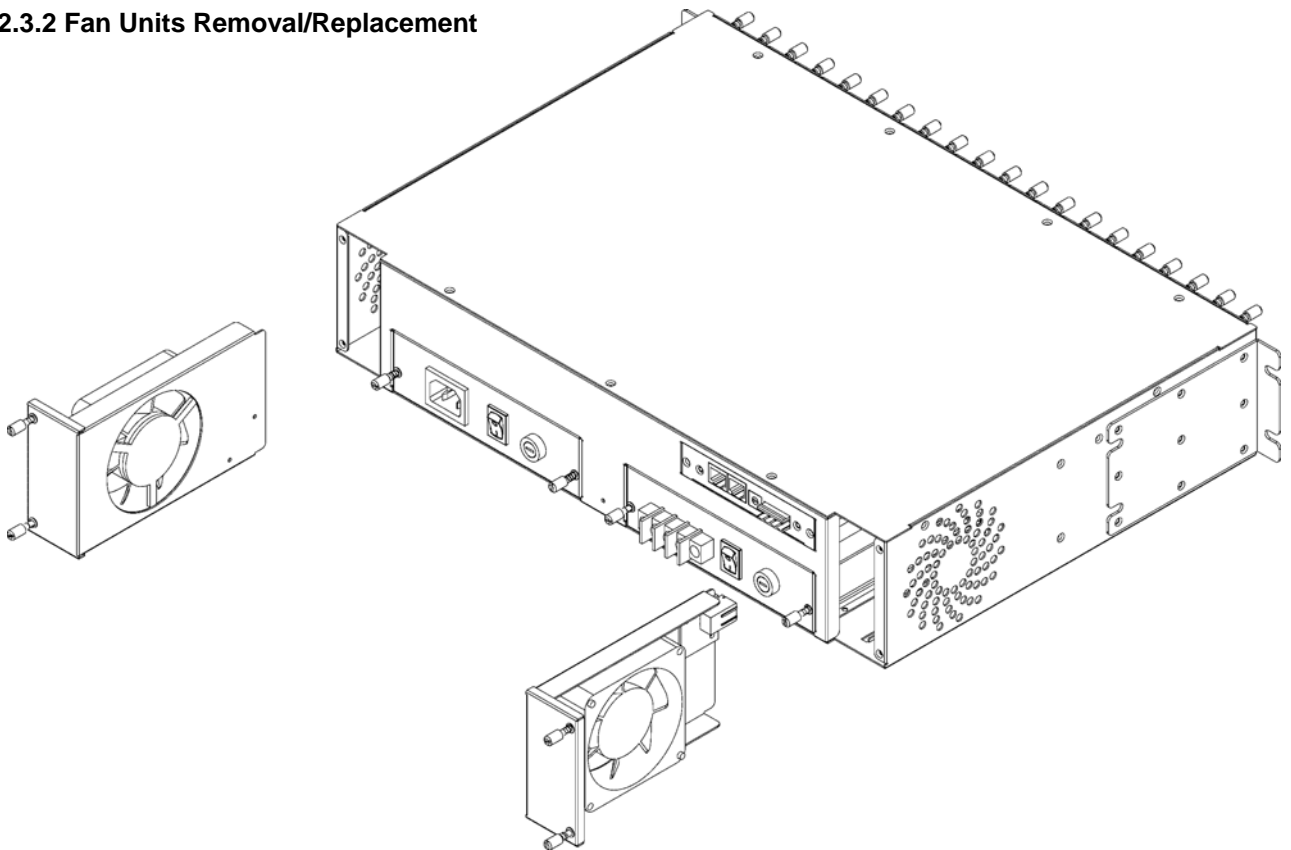
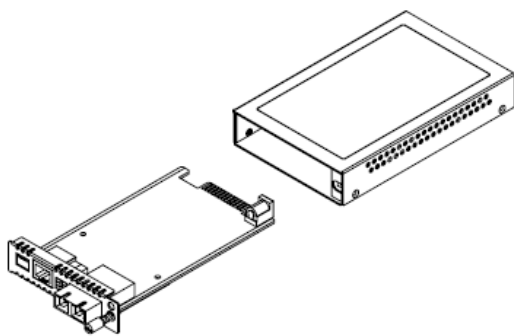


Figure 2-2 Removal/Replacement of **FRM220** Fan Units

2.3.3 Line Card Conversion, Stand-alone/Rack

The **FRM220** Media Converter Line Card may be mounted in the **FRM220-CH20** chassis or serve as a stand-alone unit. When installing in the **FRM220-CH01** 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, DC or 2AC, 2DC, AC+DC power. (five models)

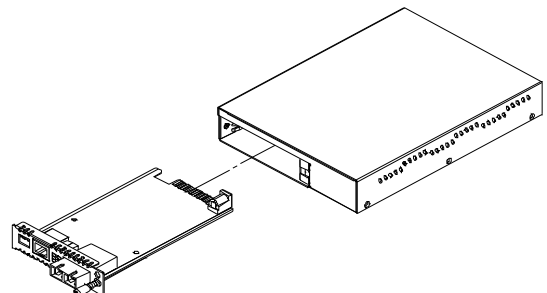


Figure 2-3 Converting **FRM220** line card for stand-alone use

2.4 Electrical Installation

With an AC power module, AC power is supplied to the **FRM220** through a standard IEC C14 3-prong receptacle, located on the rear of the module. Any national power cord with IEC C13 line plug may be used to connect AC power to the power 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.

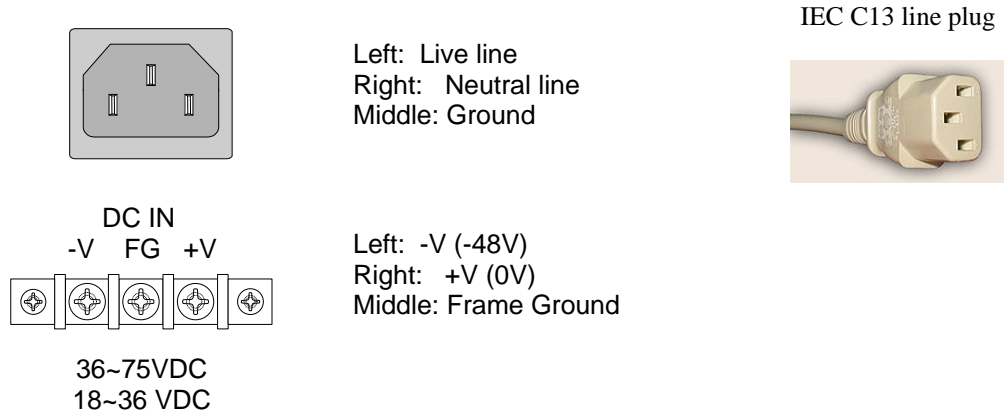


Figure 2-4 IEC (AC) & terminal block (DC) power connector pin assignment

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**. The alarm contacts may also be programmed through the management interface to react to different fault conditions.

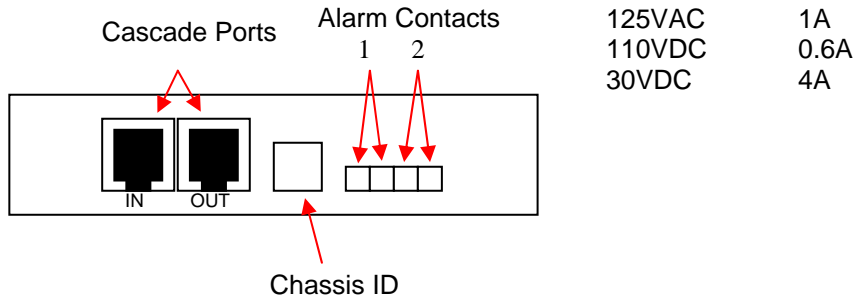


Figure 2-5 Alarm Relay Contacts and Cascade Ports

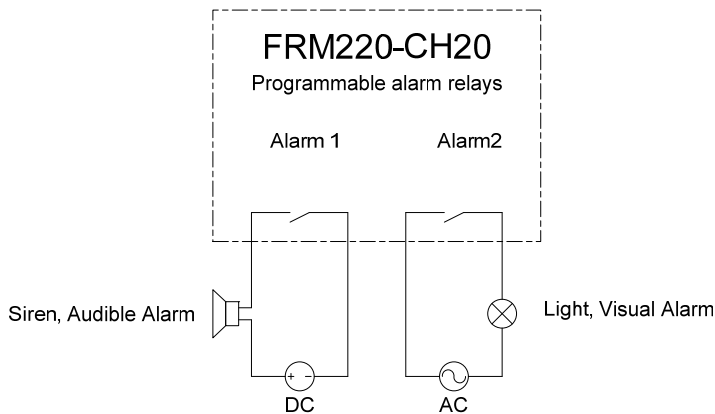


Figure 2-6 Example of electrical circuit for visual and audible alarms

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 slave using any standard Ethernet UTP cable with RJ-45 connectors. (Do not use Ethernet crossover cable.)

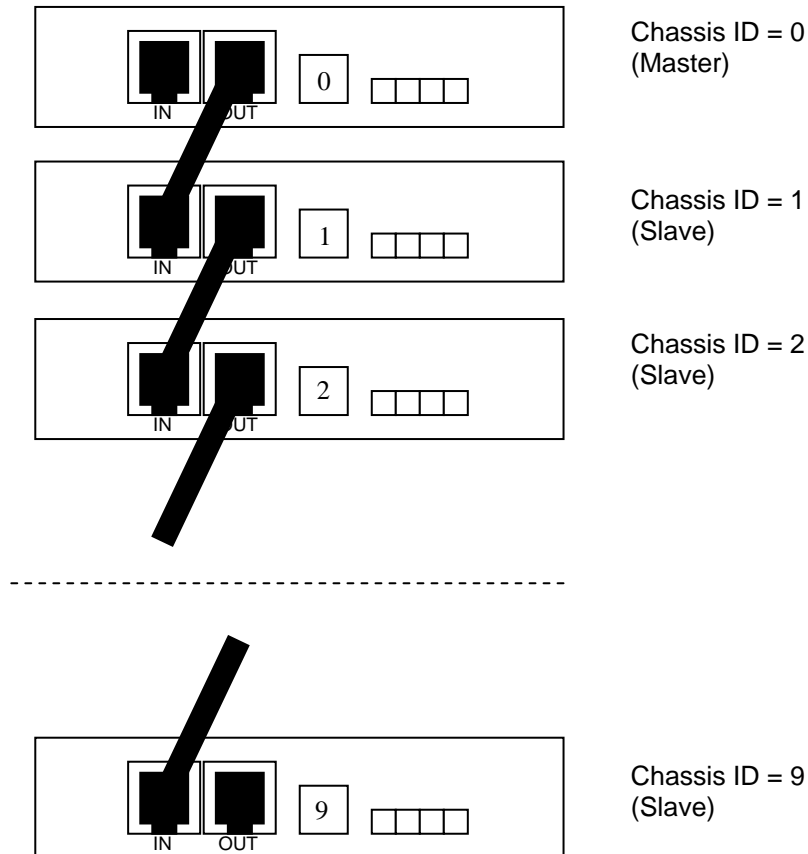


Figure 2-7 Cascade Ports Connections and ID assignment

Figure 2-8 Cascade Ports Detailed Pin 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.

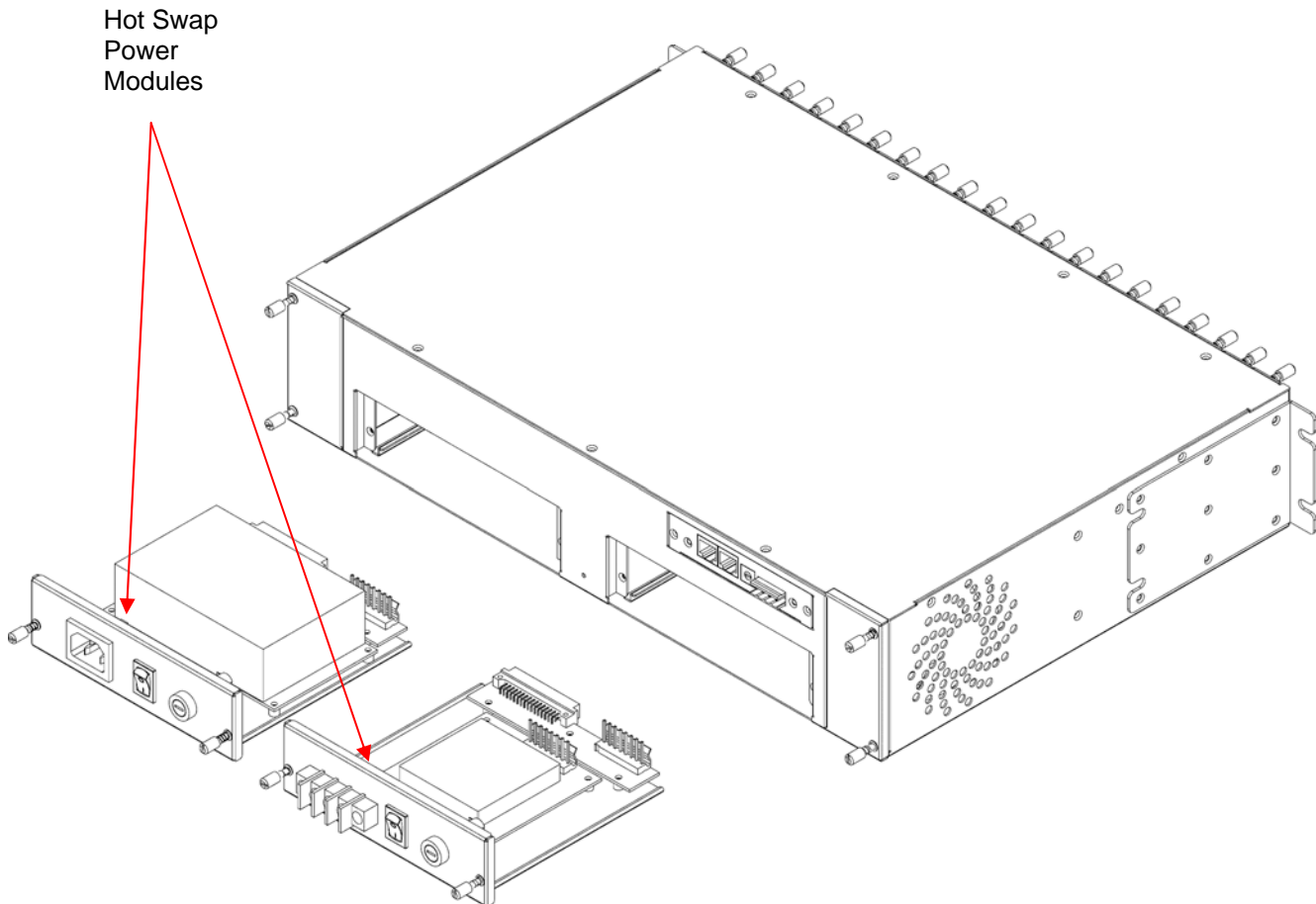


Figure 2-7 Power Modules for **FRM220**

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.

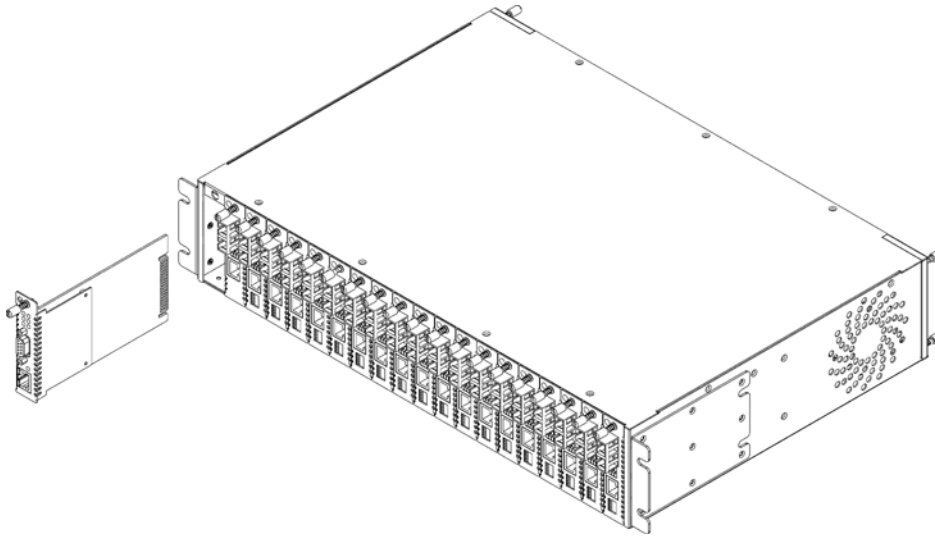


Figure 2-7 Line card removal/replacement

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.

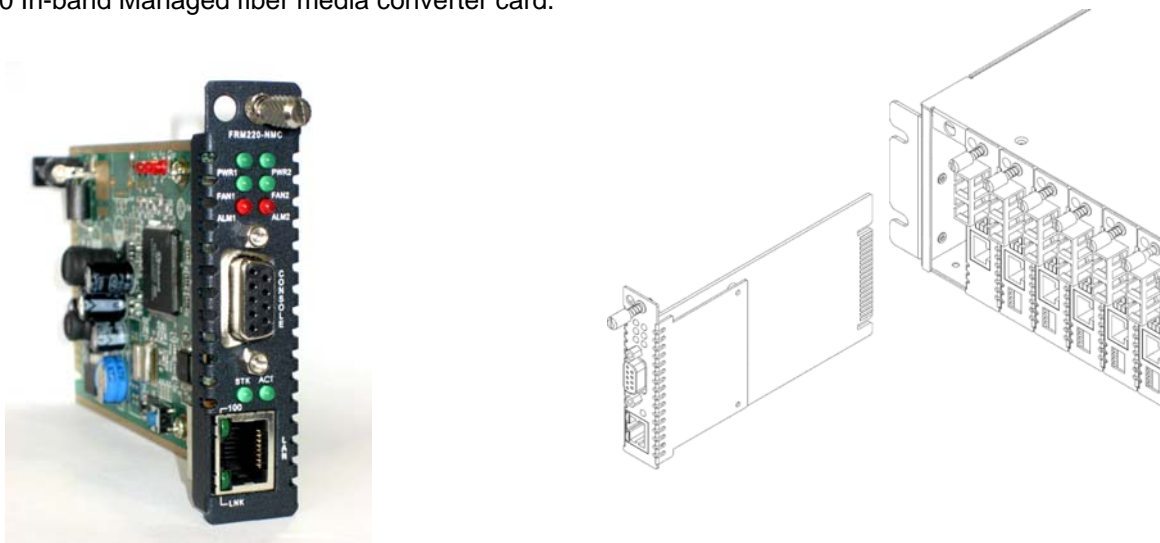


Figure 2-8 NMC removal/replacement in slot number 1

IMPORTANT: In the FRM220 In-Band Managed Rack, slot number 1 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. Management Quick Start

3.1 Introduction

The information here is only a brief introduction to the management interfaces and methodologies for managing the FRM220. For in-depth use of the management features of the FRM220, please refer to the FRM220 Network Manager Controller User Manual.

3.2 Management Methods

The management methods for the FRM220 include textual based serial console, IP based textual console (Telnet), web based GUI management through web browser, SNMP management through proprietary MIB and via CTC Union's Element Management System (EMS).

3.3 Console Terminal

The NMC card has a DB9F RS-232 serial console port for local management purposes. The console provides a menu driven display, with simple keyboard item selections and the ability to control all aspects of management in the FRM220. The console interface also provides the initial provisioning to setup the TCP/IP interface (the Ethernet RJ-45 10/100Base-TX port) for remote management by Telnet, Web, SNMP and EMS.

3.3.1 Terminal Connection & Settings

The DB9F port on the NMC is a DCE (Data Communications Equipment) wired device that allows for direct 1:1 cable connection to the DTE (Data Terminal Equipment) of PC's COM port. The FRM220 includes the 1:1 DB9F to DB9M serial cable for connection to PC's COM port or laptop's USB to RS-232 adapter. Any VT100 terminal emulation program for Windows may be used, including HyperTerminal™, TeraTerm, or PuTTY.

The terminal settings must follow these communication parameters:

- 115200 data rate
- 8 bits
- No parity bit
- 1 Stop bit
- No Flow Control

3.3.2 Terminal Login

Connect the console cable to PC and power up the FRM220. Start your favorite terminal emulation program. The terminal screen is refreshed every few seconds. By default, no password is set from the factory, so you should immediately see a screen similar to that below.

```

*****
*** CTC UNION TECHNOLOGIES CO., LTD. ***
*** FRM220 NMC VER. 1.85 ***
*****

1 { This Chassis ID: [00] Cascaded: [Yes] Monitored Chassis ID: [00]
2 { Chassis List: [Master]
   { #0: [X] #1: [ ] #2: [ ] #3: [ ] #4: [ ] #5: [ ] #6: [ ] #7: [ ] #8: [ ] #9: [ ]
3 { <1>: SLOT #01 > NMC & Chassis <B>: SLOT #11 > FRM220-SERIAL
   { <2>: SLOT #02 > FRM220-10/100I <C>: SLOT #12 > FRM220-1000EDS
   { <3>: SLOT #03 > FRM220-10/100I <D>: SLOT #13 > FRM220-1000EAS
   { <4>: SLOT #04 > FRM220-10/100I <E>: SLOT #14 > FRM220-155MS
   { <5>: SLOT #05 > FRM220-10/100I <F>: SLOT #15 > FRM220-155MS
   { <6>: SLOT #06 > FRM220-10/100I <G>: SLOT #16 > FRM220-E1/T1
   { <7>: SLOT #07 > FRM220-10/100I <H>: SLOT #17 > FRM220-E1/T1
   { <8>: SLOT #08 > FRM220-10/100I S-2 <I>: SLOT #18 > FRM220-FX0/FXS
   { <9>: SLOT #09 > FRM220-10/100A <J>: SLOT #19 > FRM220-FX0/FXS
   { <A>: SLOT #10 > FRM220-10/100AS-2 <K>: SLOT #20 > FRM220-FX0/FXS
4 { <->: Monitor Previous Chassis <+>: Monitor Next Chassis
   { <L>: SNMP System Configuration Setup
   { <M>: SNMP Manager Configuration Setup
   { <P>: Password Setup
   { <R>: Reboot <Z>: Logout
   { Please select an item.

```

Items of interest:

1. This is the display header. The version shown reflects the currently installed 'romfs.gz' or file system version (1.85).
2. These rows indicate which chassis in a cascaded stack is being managed. The default is the local chassis zero (0).
3. This block supports selecting any of the installed cards, numbered in slots 1~20.
4. In this block of commands is the all important 'SNMP System Configuration Setup'. The TCP/IP settings are done through this selected menu.

3.3.3 TCP/IP Setup

From the main menu, use the 'L' key to enter the 'SNMP System Configuration Setup' menu. An example menu is displayed below.

```

1  { *****
    { *** CTC UNION TECHNOLOGIES CO., LTD. ***
    { *** FRM220 NMC VER. 1.85 ***
    { *****
2  { << SNMP System Configuration Setup of Chassis 0 >>
    { Model = FRM220
    { S/N = 000000
    { Target MAC Address = 00:02:ab:06:20:20
3  { <1>: Target IP : 59.125.162.252
    { <2>: Target Netmask : 255.255.255.240
    { <3>: Target Gateway : 59.125.162.241
    { <4>: Target Name : FRM220
    { <5>: TFTP Server IP : 172.24.1.251
4  { <6>: TFTP Download Kernel : kernel12314.gz
    { <7>: TFTP Download File System : romfs185.gz
    { <8>: Load default settings and write to system.
    { <9>: Do TFTP and Flash Kernel function.
5  { <A>: Do TFTP and Flash File System function.
    { <T>: Adjust Date and Time.
    { <U>: Upgrade Line Card Menu.
    { <ESC>: Write to system and go to previous menu.
    { Please select an item.

```

Items of interest:

1. This is the display header. The version shown reflects the currently installed 'romfs.gz' or file system version (1.85).
2. The model name and serial number are shown in this section.
3. The TCP/IP settings for IP, subnet mask, default gateway and hostname and set using keyin 1~4.
4. Items 5~A handle setting and upgrading via TFTP protocol. Set the TFTP server's IP and names of the kernel and filesystem file names. Execute upgrade as directed in the upgrade procedure included with each update package.
5. Item 'T' is used to setup the SNTP time protocol so that this management can synchronize time with a time server. Item 'U' enters the menu to upgrade line cards in the FRM220.

Setup the default gateway, subnet mask and IP address as instructed by your network administrator. After any TCP/IP setting change, the NMC must be rebooted. So, ESC back to the main menu and key-in 'R' to reboot and confirm with 'Y' (yes).

3.3.4 Test TCP/IP Connection

Open a command window and ping the FRM220. Make sure the network settings are correct.

```

C:\WINDOWS\system32\cmd.exe
C:\>ping 59.125.162.252
Pinging 59.125.162.252 with 32 bytes of data:
Reply from 59.125.162.252: bytes=32 time=178ms TTL=50
Reply from 59.125.162.252: bytes=32 time=156ms TTL=50
Reply from 59.125.162.252: bytes=32 time=66ms TTL=50
Reply from 59.125.162.252: bytes=32 time=169ms TTL=50
Ping statistics for 59.125.162.252:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 66ms, Maximum = 178ms, Average = 142ms
C:\>_

```

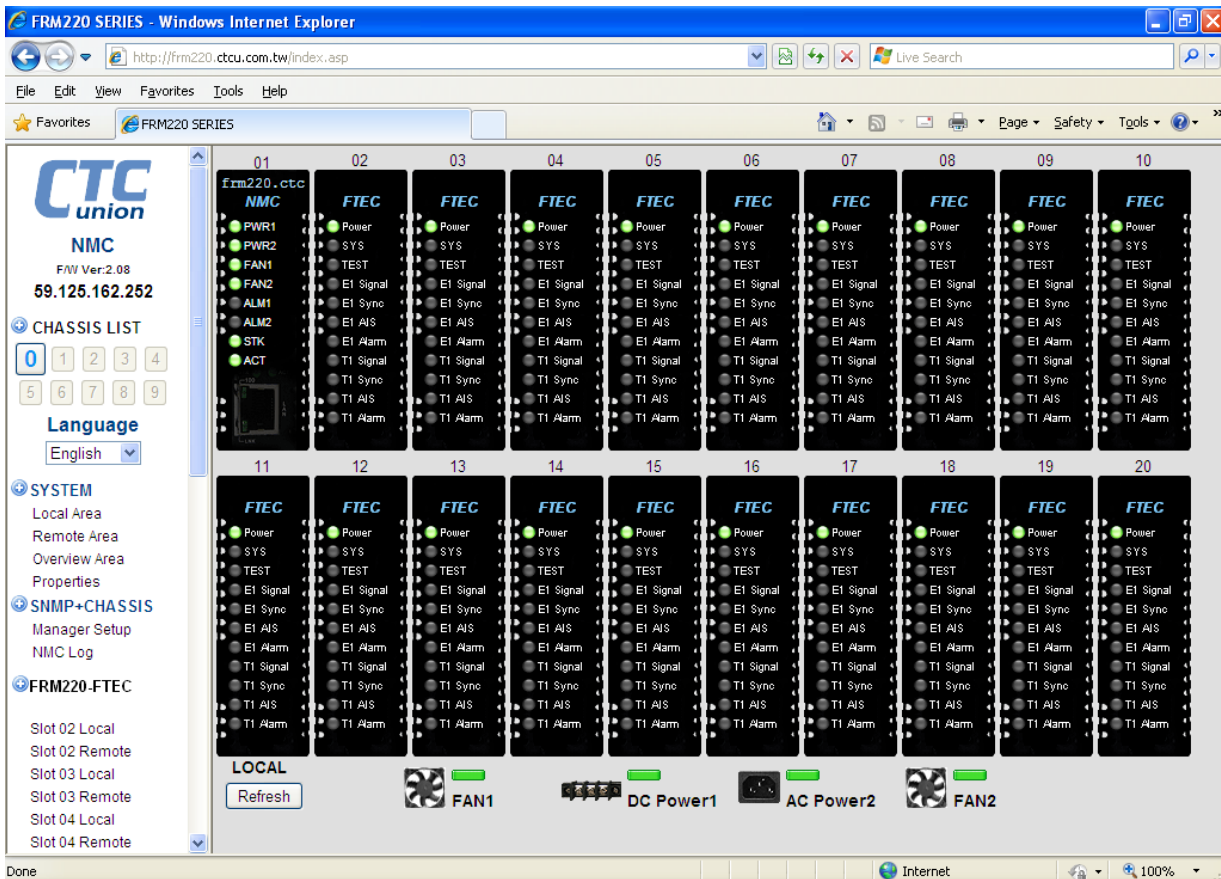
3.4 Telnet Terminal

Use either a Windows® command window or Telnet client application and connect to the FRM220 NMC using the assigned management IP address. The following is an example of a Telnet screen. It is exactly the same as a local serial console screen, only it can be accessed remotely.



3.5 Web Based Manager

The FRM220 NMC supports web based management. Use your favorite browser (Internet Explorer or Firefox) and connect to the FRM220 NMC by using the NMC's IP address. Refer to the FRM220 NMC User Manual for details.

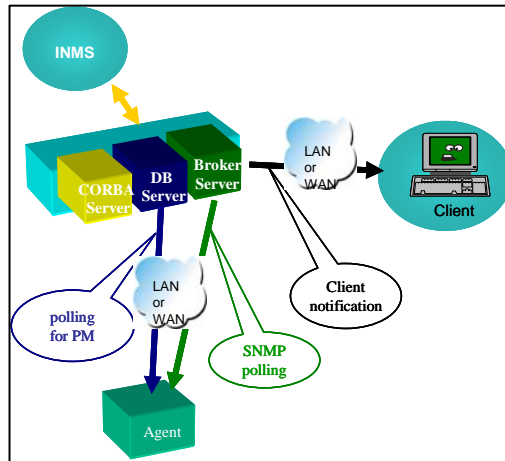


3.6 Element Management System (EMS)

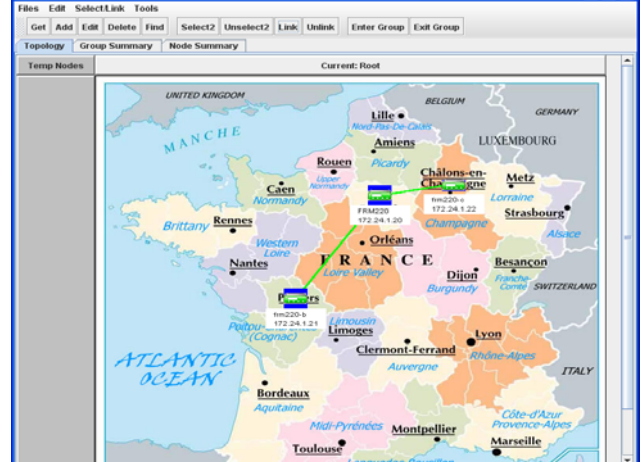
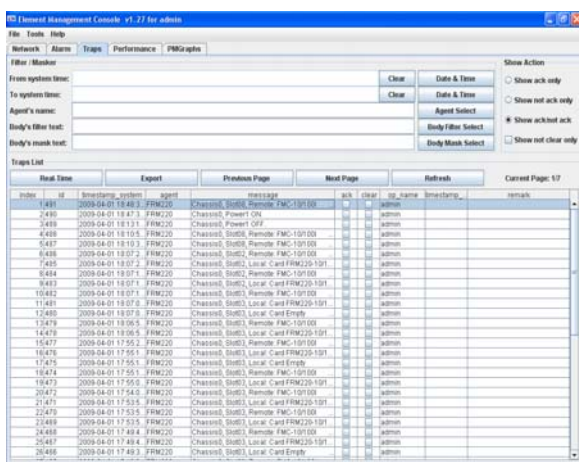
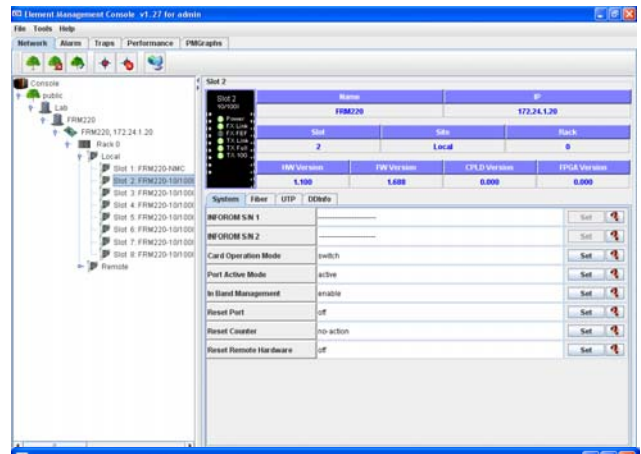
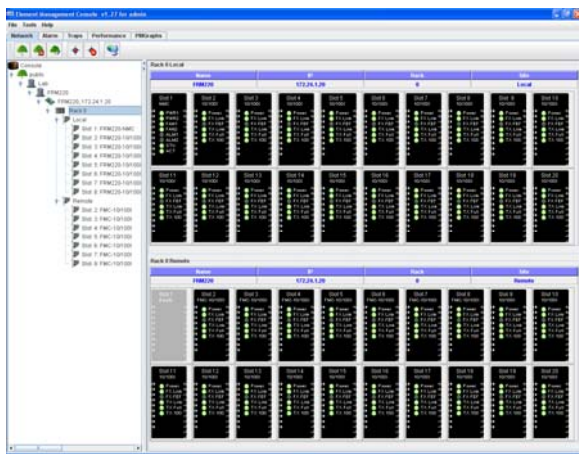
The objective of an Element Management System is to provide four major functions for telecommunication operators:

- Fault Management (FM)
- Performance Management (PM)
- Configuration Management (CM)
- Security Management (SM)

CTC Union's EMS is a proprietary management system designed to provision, monitor and maintain multiple equipments designed by CTC Union. It is a client/server architecture using a Windows® based server with Microsoft MS-SQL Server for a database and Java based server and client. The client software can be run on the server or remotely on another physical machine as long as there is an IP connection between the client and server. Refer to the EMS User Manual for details.



The EMS administrator creates users with different permissions and builds different management trees. Public trees can be seen by all users while private trees can only be seen by their creator. Client interface provides provisioning functions and the viewing and handling of Alarms, Traps and performance data.



Chapter 4. FTEC Interface Card

4.1 Introduction

This chapter will explain the proper configuration steps for the **FRM220-FTEC**, a blade designed for the FRM220 Series that may be placed in the CH20 with NMC for management or in any non-managed stand-alone 1, 2 or 4 slot chassis.

4.2 Functional Description

The **FRM220-FTEC** is a T1 (US Standard) /E1 (European Standard) converter and timeslot cross connect which enables conversion between one T1 signal and one E1 signal.

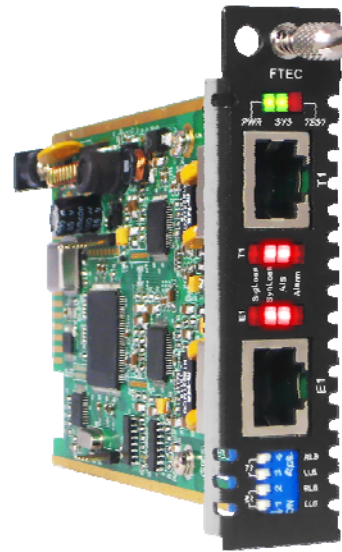
T1 and E1 signals with framing employ u-Law and A-Law compander encoding principles respectively and encode those analog (voice) signals into 64kbits digital data.

Tests and diagnostics can easily be performed from the NMC console interface or via Web based management of the FRM220. Diagnostics include T1 local/remote and E1 local/remote loop back.

The T1 interface supports D4 or ESF frame formats with B8ZS or AMI line code. The E1 interface supports CCS (PCM31) or CAS (PCM30) framing without CRC-4 and framing with CRC-4. The line code is HDB3.

The **FRM220-FTEC** fully meets all T1/E1 specifications, including ITU G.703, G.704, G.706 and G.711.

Multiple clock source selection provides maximum flexibility in connecting both T1 and E1. The clock source may be from the T1 recovery clock, from the E1 recovery clock, from the internal oscillator, from an external clock or via transparent timing.



4.3. Timing Considerations

The eight timing options provide for flexible system timing. This section presents typical applications for each timing mode and considerations that influence the selection of each mode.

4.3.1 Transparent Timing

In this mode, the clock signal recovered from the E1 signal by the FRM220-FTEC is used as a reference for the T1 transmit clock generation circuits. The clock signal recovered from the T1 signal by the FRM220-FTEC is used as a reference for the E1 transmit clock generation circuits. Slips will occur if both E1 and T1 clocks are not referenced to Stratum 1 clock source.

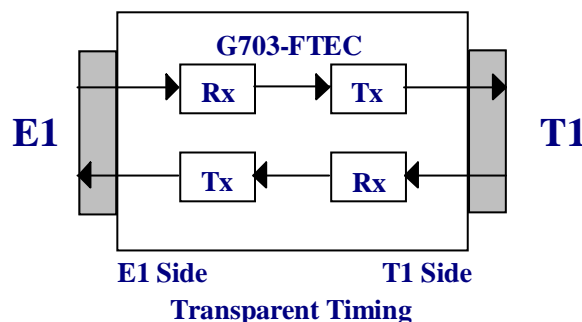


Figure 4-1 Clock signal flow transparent timing mode

4.3.2 Loop Back Timing

In this mode, the clock signal recovered from the E1 received signal is used by the *FRM220-FTEC* as a reference for the E1 transmit clock. The clock signal recovered from the T1 received signal is used by the *FRM220-FTEC* as a reference for the T1 transmit clock. Slips are possible if both E1 and T1 clocks are not referenced to Stratum 1 clock source.

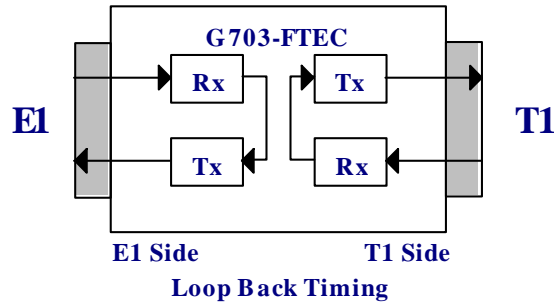


Figure 4-2 Clock signal flow in loop back timing mode

4.3.3 T1 Recovery Timing

In this mode, the clock signal recovered from the T1 received signal is used by the *FRM220-FTEC* as a reference for the E1 and T1 transmit clock generation circuits. The E1 equipment should not be connected to any other network timing.

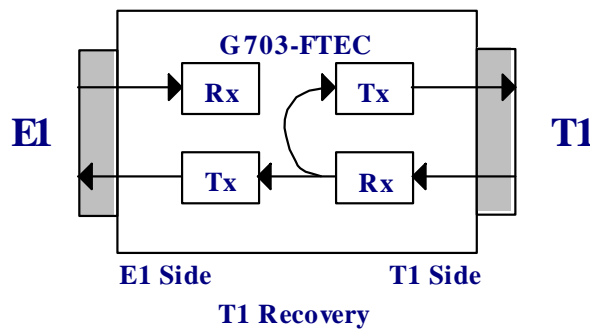


Figure 4-3 Clock signal flow in T1 recovery timing mode

4.3.4 E1 Recovery Timing

In this mode, the clock signal recovered from the E1 received signal is used by the *FRM220-FTEC* as a reference for the E1 and T1 transmit clock generation circuits. The T1 equipment should not be connected to any other network timing.

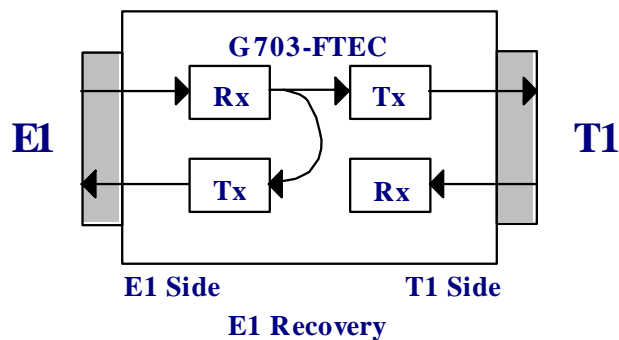


Figure 4-4 Clock signal flow in E1 recovery timing mode

4.3.5 Internal Timing

In this mode, the internal oscillator (1544Khz or 2048Khz) of the *FRM220-FTEC* provides the reference clock for the T1 and E1 transmit clock generation circuits. The E1 and T1 equipment should not be connected to any other network timing.

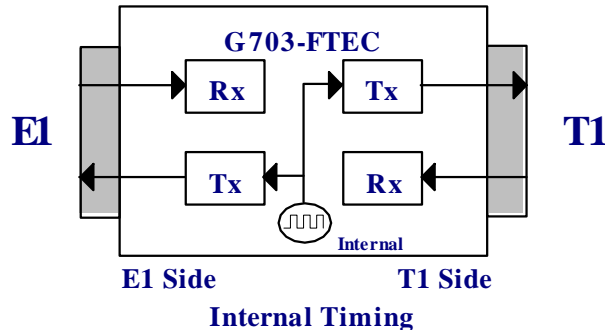


Figure 4-5 Clock signal flow in internal timing mode

4.4 Technical Specifications

4.4.1 T1 Interface Specifications

Complies with:	ITU-T G.703 Recommendation
Bit rate:	1.544Mbps
Frame format:	D4(SF) or ESF selectable
Line code:	AMI or B8ZS selectable
Equalization:	0-655 feet settable
Voice channel sample rule:	u-Law
CRC check:	CRC-6 (when ESF)
Impedance:	100 Ohm balanced
Transmit pulse level:	+/-3.0V (10%)
Receive signal level:	0 to -36dB
Connectors:	RJ-45 (USOC RJ-48C)

4.4.2 E1 Interface Specifications

Complies with:	ITU-T G.703 Recommendation
Bit rate:	2.048Mbps
Frame format:	CAS (PCM30) or CCS (PCM31)
Line code:	HDB3
Voice channel sample rule:	A-Law
CRC check:	CRC-4 enable/disable
Impedance:	75 Ohm or 120 Ohm selectable
Transmit pulse level:	75 Ohm +/-2.37V (10%) 120 Ohm +/-3.0V (10%)
Receive signal level:	0 to -30dB
Connectors:	RJ-45 (USOC RJ-48C) BNC (via RJ-45 to 2xBNC adapter cable)

4.4.3 Timeslot mapping selectable

E1 CAS mode:	TS1-TS15, TS17-TS31 any 24 timeslots
E1 CCS mode:	TS1-TS31 any 24 timeslots

4.4.4 Timing source

Transparent
Loop back timing
Internal oscillator timing 1544KHz
Internal oscillator timing 2048KHz
E1 recovery timing
T1 recovery timing

4.4.5 Elastic buffer

Buffer length:	2 T1 frames
Underflow: (Slip)	A frame of data was repeated
Overflow: (Slip)	A frame of data was deleted

4.4.6 Unconnected codes

FF Hex code (all ones) on unused timeslots

4.4.7 Alarm responses

Received impairment on E1: Loss Of Signal
Transmitted response on E1: Remote Alarm Indication (RAI)
Transmitted response on T1: Yellow Alarm
Received impairment on T1: Loss Of Signal
Transmitted response on T1: Yellow Alarm
Transmitted response on E1: Remote Alarm Indication (RAI)

4.4.8 Diagnostic tests

T1 local loop back
T1 remote loop back
E1 local loop back
E1 remote loop back

4.4.9 LED indicators for system

PWR	Green	Power ON
SYS	Green	Normal

4.4.10 LED indicators for both T1 and E1

Sig Loss	Red	Signal loss
Syn Loss	Red	Frame sync loss
AIS	Red	Alarm Indication Signal
Alarm	Red	Remote alarm
Test	Red	In loop back test

4.4.11 Panel DIP switches

T1 – RLB	T1 side Remote Loop Back
T1 – LLB	T1 side Local Loop Back
E1 – RLB	E1 side Remote Loop Back
E1 – LLB	E1 side Local Loop Back

Switches may be enabled or disabled via software

4.4.12 Power supply

Voltage:	12VDC
Power consumption:	< 5 Watts

4.4.13 Physical

Height:	9 cm / 3.5 in.
Width:	2.1 cm / 0.875 in.
Depth:	13.7 cm / 5.4 in.
Weight:	120 g / 0.25 lb. net weight

4.4.14 Environment

Temperature:	0-50°C (32-125°F)
Humidity:	Up to 90% Non-condensing

4.4.15 Regulatory Approvals

FCC & EMC :	Part 15 & Part 22 CISPR 22 Class B
LVD (Safety)	EN60950-1:2001

4.5. Terminal Mode Operating Procedure

When the **FRM220-FTEC** card is placed in a CH01M stand-alone, the DB9 provides an RS-232 serial console port for local management. When the **FRM220-FTEC** is placed in CH20 with NMC, the NMC card has a DB9F RS-232 serial console port for local management purposes. The console provides a menu driven display, with simple keyboard item selections and the ability to control all aspects of management in the FRM220. The console interface also provides the initial provisioning to setup the TCP/IP interface (the Ethernet RJ-45 10/100Base-TX port) for remote management by Telnet, Web, SNMP and EMS.

4.5.1 Terminal Connection & Settings

The DB9F port on the NMC is a DCE (Data Communications Equipment) wired device that allows for direct 1:1 cable connection to the DTE (Data Terminal Equipment) of PC's COM port. The FRM220 includes the 1:1 DB9F to DB9M serial cable for connection to PC's COM port or laptop's USB to RS-232 adapter. Any VT100 terminal emulation program for Windows may be used, including HyperTerminal™, TeraTerm, or PuTTY.

A notebook computer has become an invaluable tool of the Systems Engineer. Connection of the FRM220-NMC to the computer is accomplished by a DB9-pin one-to-one, male to female cable. The NMC acts as a DCE to the PC's DTE communications port. A convenient application, provided with the Microsoft Windows® NT/9X/2K/XP operating systems, is "HyperTerminal™". Set the properties to match the NMC control port defaults as follows: Baud=115200, Data bits=8, Parity=None, Stop bits=1, and handshaking=None and use a direct connection to the PC's COM port. Set the terminal emulation mode to VT100. Make the appropriate connections, start the terminal application, apply power to the FRM220. If you are using "HyperTerminal™" the display should look like that on the following page.

Windows® is a registered trademark of Microsoft Corp., Redmond, WA.
HyperTerminal is a trademark of Hilgraeve, Monroe, MI

4.5.2 Terminal Connections & Settings for Stand-alone (CH01M & CH02M)

The **CH01M** and **CH02M** have DB9F ports which are DCE (Data Communications Equipment) wired devices that allows for direct 1:1 cable connection to the DTE (Data Terminal Equipment) of PC's COM port. The **CH01M** and **CH02M** include the 1:1 DB9F to DB9M serial cables for connection to PC's COM port or laptop's USB to RS-232 adapter. Any VT100 terminal emulation program for Windows may be used, including HyperTerminal™, TeraTerm, or PuTTY.

Set the properties to match the CH01M control port defaults as follows: Baud=38400, Data bits=8, Parity=None, Stop bits=1, and handshaking=None and use a direct connection to the PC's COM port. Set the terminal emulation mode to VT100. The menu displays in stand-alone console are the same as those with NMC management in 20-Slot chassis.

4.5.3 Menu System Detail (NMC, CH01M & CH02M)

The following section will detail actual displays with descriptions of parameter settings via relevant key commands.

This is the first screen seen after connecting. This is the main menu for the FRM220 NMC. Refer to the quick configuration section in Chapter 3.

```

*****
*** CTC UNION TECHNOLOGIES CO., LTD. ***
*** FRM220 NMC VER. 3.08 ***
*****
This Chassis ID: [00] Cascaded: [Yes] Monitored Chassis ID: [00]
Chassis List: [Master]
  #0: [X] #1: [ ] #2: [ ] #3: [ ] #4: [ ] #5: [ ] #6: [ ] #7: [ ] #8: [ ] #9: [ ]
<1>: SLOT #01 > NMC & Chassis <B>: SLOT #11 > FRM220-FTEC
<2>: SLOT #02 > FRM220-FTEC <C>: SLOT #12 > FRM220-FTEC
<3>: SLOT #03 > FRM220-FTEC <D>: SLOT #13 > FRM220-Empty
<4>: SLOT #04 > FRM220-FTEC <E>: SLOT #14 > FRM220-Empty
<5>: SLOT #05 > FRM220-FTEC <F>: SLOT #15 > FRM220-Empty
<6>: SLOT #06 > FRM220-FTEC <G>: SLOT #16 > FRM220-Empty
<7>: SLOT #07 > FRM220-FTEC <H>: SLOT #17 > FRM220-Empty
<8>: SLOT #08 > FRM220-FTEC <I>: SLOT #18 > FRM220-Empty
<9>: SLOT #09 > FRM220-FTEC <J>: SLOT #19 > FRM220-Empty
<A>: SLOT #10 > FRM220-FTEC <K>: SLOT #20 > FRM220-Empty
<->: Monitor Previous Chassis <+>: Monitor Next Chassis
<L>: SNMP System Configuration Setup
<M>: SNMP Manager Configuration Setup
<P>: Password Setup
<R>: Reboot <Z>: Logout
Please select an item.

```

The above screens shows that FTEC interface cards have been placed in the FRM220-CH20 chassis in slots 2 through 12 and slots 13 through 20 are empty. To select a card for configuration, choose it by its menu item; 2-9, A-K. The next screen is an example of FTEC when used stand-alone in the CH01M single slot chassis.

NOTE: The screens in Stand-alone and NMC all use the same basic menu system.

```

*****
*** CTC UNION TECHNOLOGIES CO., LTD. ***
*** FRM220 FTEC Ver: 1.000-1.000-1.000 ***
*****
[CH01M]
Signal Frame Sync Rx AIS Alarm
T1 port status: [Normal] [Normal] [No] [No]
E1 port status: [Normal] [Normal] [No] [No]
<1>: T1 parameter setting : [SF(D4)][B8ZS][0-133feet/OdB CSU]
<2>: E1 parameter setting : [CCS(PCM31)][HDB3][CRC-4 OFF][120ohm][0x7E]
<3>: Timing source setting : [Transparent]
<4>: E1 Activate channel setting.
<5>: Data/Voice channel setting.
<6>: Signaling mode setting : [Signaling Disable]
<7>: Loop back setting : [Off]
<8>: Line card active/disable : [Enable]
<9>: Line card reset.
<D>: Set to default.
<S>: Save setting value.
<Q>: Quit terminal.
<ESC>: Go to previous menu. Please select an item.

```

4.5.4 T1 Channel Settings

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CH01M]
T1 parameter setting.
<1>: Framed mode      : [SF(D4)]
<2>: Line code       : [B8ZS]
<3>: Line Bulid-Out  : [0-133feet/0dB CSU]

```

Explanation

- 1 – The T1 framing can be selected between SF(D4) or ESF framing.
- 2 – The line coding for T1 transmission can be selected between B8ZS or AMI coding.
- 3 – The LBO supports the following setting selections:

- <1>:0-133 feet / 0dB CSU
- <2>:133-266 feet
- <3>:266-399 feet
- <4>:399-533 feet
- <5>:533-655 feet
- <6>:-7.5dB CSU
- <7>:-15dB CSU
- <8>:-22.5dB CSU

4.5.5 E1 Parameter Settings

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CH01M]
E1 parameter setting.
<1>: Framed mode      : [CCS(PCM31)]
<2>: Line code       : [HDB3]
<3>: CRC-4           : [CRC-4 OFF]
<4>: Line Impedance  : [120ohm]
<5>: Idle Code       : [0x7E]

```

Explanation

- 1 – The framing mode for E1 transmission can be selected between CCS (PCM31) or CAS (PCM30).
- 2 – The line coding for E1 transmission can be selected between HDB3 or AMI coding.
- 3 – The Cyclic Redundancy Check for E1 (CRC4) can be enabled or disabled.
- 4 – The FTEC supports software setting of line impedance for use with twisted pair (120 Ohms) or Coaxial (75 ohms).
- 5 – The E1 idle code (unused timeslots) can be set as either 7E (01111110) or FF (11111111).

4.5.6 Timing Source Setting

The different timing source scenarios are explained and shown graphically in Section 4.3 Please refer to that when doing these settings.

From the main FTEC menu, select item “3”. The following footer will display on the console menu:

```

-----
Timing source setting
<1>: Transparent
<2>: E1 Side Recovery
<3>: T1 Side Recovery
<4>: Internal Oscillator
<5>: Loopback
<ESC>: Go to previous menu. Please select an item.

```

Make the setting after referring to Section 4.3.

4.5.7 E1 Active Channel Settings

From the main FTEC menu, select item “4” to enter this menu.

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
[CH01M] *****
T1/E1 channel mapping and Data/Voice type
T1 Channel :01 02 03 04 05 06 07 08 09 10 11 12
E1 Channel :01 02 03 04 05 06 07 08 09 10 11 12
Data/Voice: D D D D D D D D D D D D D

T1 Channel :13 14 15 16 17 18 19 20 21 22 23 24
E1 Channel :13 14 15 17 18 19 20 21 22 23 24 25
Data/Voice: D D D D D D D D D D D D D
```

E1 activate channel setting.
<A>: Activate the front 24 channels.
<ESC>: Go to previous menu.
<Key in E1 activate channel > Example: 1, 3, 5-8, 15-19, 31<Enter>
Please select an item or key in E1 activate channel:

By pressing the “A” key, TS1-TS24 of E1 can be quickly made active. This is the typical setting when transporting T1’s 24 timeslots over E1.

The FTEC also supports random timeslot setting for the E1. Follow the example by separating non-contiguous timeslots with a comma (,) and using a dash (-) for contiguous groups of timeslots.

4.5.8 Codec Translation

The FTEC can do the μ Law / ALaw translation for voice data between E1 and T1 standards. From the main FTEC menu, select “5” to enter this menu.

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
[CH01M] *****
T1/E1 channel mapping and Data/Voice type
T1 Channel :01 02 03 04 05 06 07 08 09 10 11 12
E1 Channel :01 02 03 04 05 06 07 08 09 10 11 12
Data/Voice: D D D D D D D D D D D D D

T1 Channel :13 14 15 16 17 18 19 20 21 22 23 24
E1 Channel :13 14 15 17 18 19 20 21 22 23 24 25
Data/Voice: D D D D D D D D D D D D D
```

T1 Data or Voice channel setting.
<D>: Set all channels to data.
<V>: Set all channels to voice.
<ESC>: Go to previous menu.
<Key in T1 voice channel > Example: 1, 3, 5-8, 15-19, 24<Enter>
Please select an item or key in T1 voice channel:

By pressing the “D” key, all timeslots will be treated as pure data with no translation. By pressing the “V” key, all timeslots will be treated as voice and the μ Law / ALaw translation will be enabled.

The FTEC also supports random setting for the μ Law / ALaw translation. Follow the example by separating non-contiguous timeslots with a comma (,) and using a dash (-) for contiguous groups of timeslots.

4.5.9 Signaling Settings

One of the most complex functions of the **FRM220-FTEC** is in the ability to carry signaling (T1 over E1 or T1->E1<->T1) or to translate signaling between E1 and T1 devices. Not all applications of E1 to T1 conversion can be supported by the **FRM220-FTEC**. So it is important to review this section to determine if the **FRM220-FTEC** is suitable for the intended application. Note: This is still a draft manual, and section on signaling will be added to the final version.

To enter the signaling settings, select “6” Signaling Mode Setting from the main menu.

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CH01M]
Signaling setting
<1>: Signaling mode setting: [Signaling Disable]
<2>: Signaling A setting : [Not invert]
<3>: Signaling B setting : [Not invert]
<4>: Signaling C setting : [Not invert]
<5>: Signaling D setting : [Not invert]

```

```

-----
Signaling mode setting.
<1>: Signaling Disable
<2>: According ABCD Setting
<3>: T1 E&M Signaling to E1 MFC R2 Signaling
<4>: According to Signaling Table A
<5>: G.802 Annex B function(T1 Over E1)
<ESC>: Go to previous menu. Please select an item.

```

The **FRM220-FTEC** currently supports 4 modes of signaling.

- 1 – Use this key to enable or disable signaling function.
- 2 – This will setup signaling according to ABCD settings.
- 3 – Choosing this option will do signaling conversion between T1 E&M signaling and E1 MFC R2 signaling.
- 4 – This option will setup signaling according to Signal Transfer Table A (Below).
- 5 – Selecting this option will provide for T1 over E1 (G.802 Annex B).

Signal Transfer Table A			
T1	E1	E1	T1
AB	ABCD	ABCD	AB
00	1010	1010	11
01	0110	01XX	11
10	0010	10XX	00
11	0010	11XX	00

X= Don't Care

4.5.10 Diagnostic Loop Back Functions

The FTEC supports a number of loop back options set through software. From the main **FRM220-FTEC** menu, select item “7” to enter this menu.

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CH01M]
Loopback setting.
<1>: T1 Loopback : [Off]
<2>: E1 Loopback : [Off]
<3>: Front panel LB : [Disable]

```

- 1 – Selects the menu for setting T1 loop back.
- 2 – Selects the menu for setting E1 Loop back.
- 3 – Enables or disabled front panel push buttons.

4.5.10.1 T1 Loop Back

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CHO1M]
Loopback setting.
<1>: T1 loopback      : [Off]
<2>: E1 loopback     : [Off]
<3>: Front panel LB : [Disable]
-----
T1 loopback setting.
<1>: Disable
<2>: LLB
<3>: RLB
<ESC>: Go to previous menu. Please select an item.
```

Make a selection between Local Loop Back (LLB), Remote Loop Back (RLB) or disabling an already established loop back.

4.5.10.3 E1 Loop Back

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CHO1M]
Loopback setting.
<1>: T1 loopback      : [Off]
<2>: E1 loopback     : [Off]
<3>: Front panel LB : [Disable]
-----
E1 loopback setting.
<1>: Disable
<2>: LLB
<3>: RLB
<ESC>: Go to previous menu. Please select an item.
```

Make a selection between Local Loop Back (LLB), Remote Loop Back (RLB) or disabling an already established loop back.

4.5.10.3 Enable/Disable front panel pushbuttons

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CHO1M]
Loopback setting.
<1>: T1 loopback      : [Off]
<2>: E1 loopback     : [Off]
<3>: Front panel LB : [Disable]
-----
<1>: Disable
<2>: Enable
```

Make a selection between enabling or disabling the function of the front panel push buttons. The default setting is to disable front panel push buttons for security. This will disallow an intentional or unintentional pressing of the panel button that results in

4.5.11 Card Active Setting

The **FRM220-FTEC** supports a disable function which will disconnect all service without powering off or removing the card from chassis. In an NMC based system, SNMP can be used to disable and enable the card. For console or stand-alone management this function is available under the **FRM220-FTEC** main menu by selecting item “8”.

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CHO1M]
      Signal      Frame Sync      Rx AIS      Alarm
T1 port status: [Normal] [Normal] [No] [No]
E1 port status: [Normal] [Normal] [No] [No]
<1>: T1 parameter setting      : [SF(D4)][B8ZS][0-133feet/OdB CSU]
<2>: E1 parameter setting      : [CCS(PCM31)][HDB3][CRC-4 OFF][120ohm][0x7E]
<3>: Timing source setting     : [Transparent]
<4>: E1 Activate channel setting.
<5>: Data/Voice channel setting.
<6>: Signaling mode setting    : [Signaling Disable]
<7>: Loop back setting        : [Off]
<8>: Line card active/disable : [Enable]
<9>: Line card reset.
<D>: Set to default.
<S>: Save setting value.
<Q>: Quit terminal.
-----
Line card active setting.
<1>: Disable.
<2>: Enable.
<ESC>: Go to previous menu. Please select an item.

```

4.5.12 Card Reset

From the main **FRM220-FTEC** menu, select item “9” to reset the card.

```

*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CHO1M]
      Signal      Frame Sync      Rx AIS      Alarm
T1 port status: [Normal] [Normal] [No] [No]
E1 port status: [Normal] [Normal] [No] [No]
<1>: T1 parameter setting      : [SF(D4)][B8ZS][0-133feet/OdB CSU]
<2>: E1 parameter setting      : [CCS(PCM31)][HDB3][CRC-4 OFF][120ohm][0x7E]
<3>: Timing source setting     : [Transparent]
<4>: E1 Activate channel setting.
<5>: Data/Voice channel setting.
<6>: Signaling mode setting    : [Signaling Disable]
<7>: Loop back setting        : [Off]
<8>: Line card active/disable : [Enable]
<9>: Line card reset.
<D>: Set to default.
<S>: Save setting value.
<Q>: Quit terminal.
-----
<< Port Resetting... >>

<ESC>: Go to previous menu.

```

4.5.13 Factory Default

Select item “D” from the main **FRM220-FTEC** menu to restore the factory default settings to the card.

```
*****
***      CTC UNION TECHNOLOGIES CO., LTD.      ***
***      FRM220 FTEC Ver: 1.000-1.000-1.000    ***
*****
[CH01M]
      Signal      Frame Sync      Rx AIS      Al arm
T1 port status: [Normal] [Normal]      [No]      [No]
E1 port status: [Normal] [Normal]      [No]      [No]
<1>: T1 parameter setting      : [SF(D4)] [B8ZS] [0-133feet/OdB CSU]
<2>: E1 parameter setting      : [CCS(PCM31)] [HDB3] [CRC-4 OFF] [120ohm] [0x7E]
<3>: Timing source setting      : [Transparent]
<4>: E1 Activate channel setting.
<5>: Data/Voice channel setting.
<6>: Signaling mode setting      : [Signaling Disable]
<7>: Loop back setting      : [Off]
<8>: Line card active/disable : [Enable]
<9>: Line card reset.
<D>: Set to default.
<S>: Save setting value.
<Q>: Quit terminal.
-----
Set to Default.
<1>: Default and Quit.
```

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

Either key-in a “1” to set the card to factory default, or press [ESC] to exit with no change.

4.5.14 Save Settings

Up to this point no settings have been permanently saved. If the unit were to be powered off and restarted, it would have all the previous settings. Therefore, after configuring the card, the settings **MUST** be saved. Press the “S” key from the main **FRM220-FTEC** menu to save all settings to the card. (Note: When installed in FRM220-CH20 with NMC, settings are always saved in the NMC, not in the card itself. The NMC has management priority over all other configuration interfaces. This allows for a minimal MTTR time by letting a bad card be replaced with same type card and immediately resuming with the current configuration in the NMC.)

```
-----
Save Setting Value.
<1>: Save and Quit.
```

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

Either key-in a “1” to save the card settings, or press [ESC] to exit with no change.

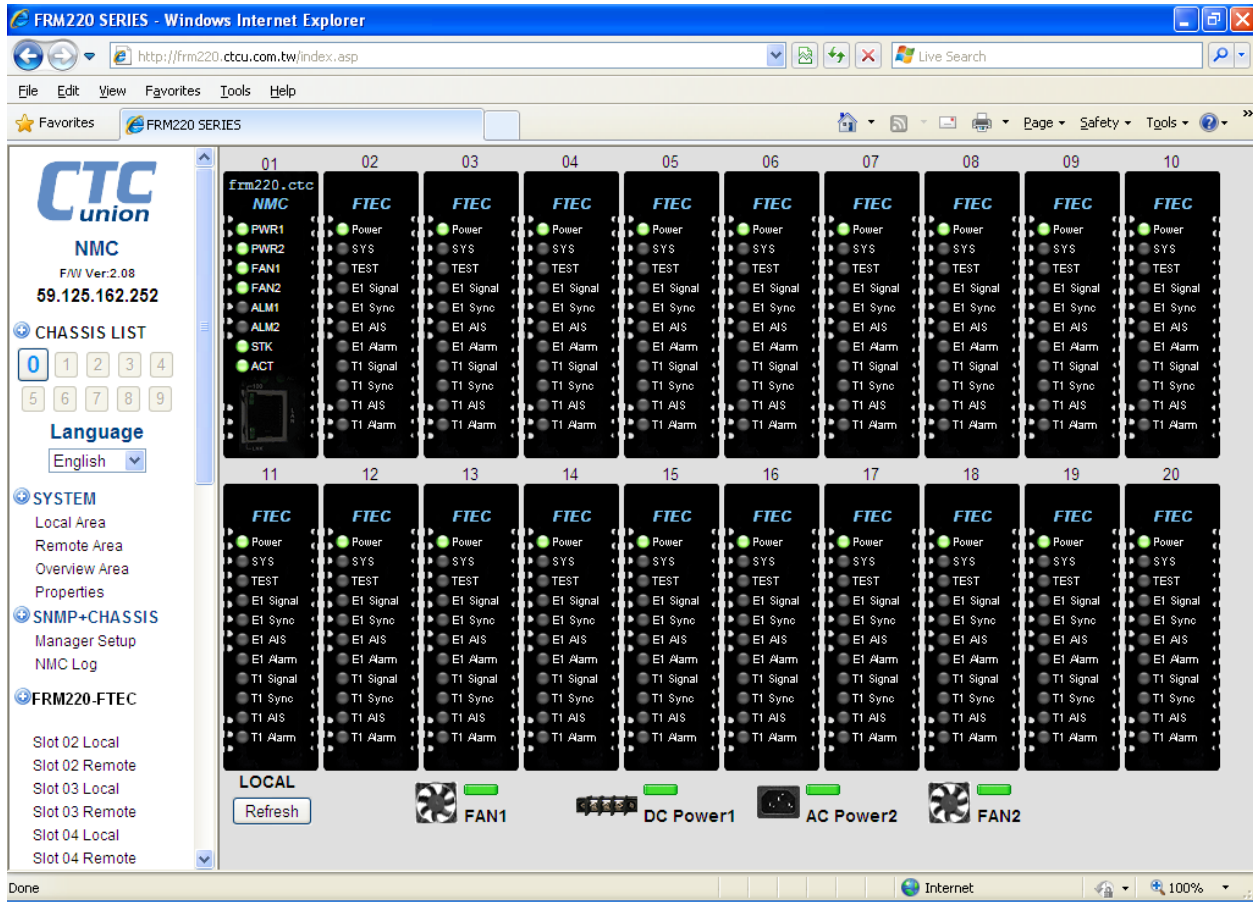
4.5.15 Exit Card Configuration

From the main **FRM220-FTEC** menu, select the “Q” menu item to quit terminal mode. This item is only on the stand-alone managed **FRM220-FTEC** in a CH01M or CH02M.

Goodbye!

4.6 Web Based Management with NMC

When the **FRM220-FTEC** card is installed in the CH20, twenty slot chassis with NMC, a web based GUI interface is available for remote configuration and monitoring. Open your favorite web browser and connect to the NMC's IP address.



For detailed operating instructions for all of the **FRM220-NMC's** settings, please refer to the *FRM220 NMC Operation Manual*.

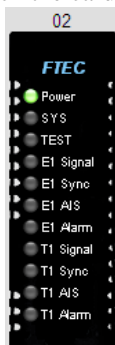
4.6.1 Selecting FRM220-FTEC Card for Management

In the NMC's Web Based management, access to card configuration page can be gained in one of two easy methods.

1. Select the card from the left hand frame's menu and click it.



2. Directly click the card in the graphic



4.6.2 Configuring FRM220-FTEC from Web Interface

Refer to section 4.5 to understand all of the settings of the FRM220-FTEC. In the web interface, these settings are all chosen from drop-down selection items. After selecting the proper selection items, be sure to click the “Set Parameters” button at the bottom of this page.

Chassis ID	Slot	Side	Type	Version
00	10	Local	FRM220-FTEC	1.000-1.000-1.000-0.000

E1 Information

Signal	Sync	AIS	Alarm
Normal	Sync	No	No

Framer Mode CCS *Line Code* HDB3
CRC-4 Disable *Line Impedance* 75 Ohm
Unused timeslot code 0X7E *Loopback Test* OFF

T1 Information

Signal	Sync	AIS	Alarm
Normal	Sync	No	No

Framer Mode SF(D4) *Line Bulid-Out* 0-133 feet/0dB CSU
Line Code BBZS *Loopback Test* LLB

Device Information

System OK	Test Mode
No	No

Device Active Enable *Timing Source* Transparent
Front Panel Loopback Disable *Signaling Mode* Signaling Disable
Signaling Bit A Not Invert *Signaling Bit B* Not Invert
Signaling Bit C Not Invert *Signaling Bit D* Not Invert

Source E1 Time Slot:

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

Data or Voice:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24						
<i>Data</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>Voice</i>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	

Function Key

Main Web Page for FRM220-FTEC Line Card.

4.6.2.1 Information Header

Chassis ID	Slot	Side	Type	Version
00	10	Local	FRM220-FTEC	1.000-1.000-1.000-0.000

The Information Header lets the user know which card is being configured. The Chassis number, slot number and local/remote side are indicated along with the card type.

The Version fields (4) indicate 'Hardware-Firmware-CPLD ver-FPGA ver' when applicable.

4.6.2.2 E1 Settings

E1 Information

Signal	Sync	AIS	Alarm
Normal	Sync	No	No

<i>Framer Mode</i>	<input type="text" value="CCS"/>	<i>Line Code</i>	<input type="text" value="HDB3"/>
<i>CRC-4</i>	<input type="text" value="Disable"/>	<i>Line Impedance</i>	<input type="text" value="75 Ohm"/>
<i>Unused timeslot code</i>	<input type="text" value="0X7E"/>	<i>Loopback Test</i>	<input type="text" value="OFF"/>

The E1 information includes the signal status (normal or Loss), sync status (Sync or No), Alarm Indication Signal (Yes or No) and alarm status (Yes or No).

As described previously in section 4.5, the E1 interface supports settings for CCS (PCM31) or CAS (PCM30) framing, line code for HDB3 or AMI, CRC-4 enabled or disabled, line impedance of 75 ohm (BNC) or 120 ohm (twisted pair), selectable idle code and loop back functions for local loop back (LLB) and remote loop back (RLB).

4.6.2.3 T1 Settings

T1 Information

Signal	Sync	AIS	Alarm
Normal	Sync	No	No

<i>Framer Mode</i>	<input type="text" value="SF(D4)"/>	<i>Line Build-Out</i>	<input type="text" value="0-133 feet/0dB CSU"/>
<i>Line Code</i>	<input type="text" value="B8ZS"/>	<i>Loopback Test</i>	<input type="text" value="LLB"/>

The T1 information includes the signal status (normal or Loss), sync status (Sync or No), Alarm Indication Signal (Yes or No) and alarm status (Yes or No).

As described previously in section 4.5, the T1 interface supports settings for SF(D4) or ESF framing, line code for B8ZS or AMI, Line Build Outs for different transmission distances and loop back functions for local loop back (LLB) and remote loop back (RLB).

4.6.2.4 Device Information

Device Information

System OK	Test Mode
No	No

<i>Device Active</i>	<input type="text" value="Enable"/>	<i>Timing Source</i>	<input type="text" value="Transparent"/>
<i>Front Panel Loopback</i>	<input type="text" value="Disable"/>	<i>Signaling Mode</i>	<input type="text" value="Signaling Disable"/>
<i>Signaling Bit A</i>	<input type="text" value="Not Invert"/>	<i>Signaling Bit B</i>	<input type="text" value="Not Invert"/>
<i>Signaling Bit C</i>	<input type="text" value="Not Invert"/>	<i>Signaling Bit D</i>	<input type="text" value="Not Invert"/>

The device information section enables or disables the line card, sets the timing mode, enables or disables the front panel pushbuttons for loop back and sets up the signaling translation method for T1 to E1.

4.6.2.5 E1 timeslot activation

Source E1 Time Slot:

<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

The E1 timeslot selection provides complete random assignment. Select the check boxes for the E1 timeslots to be active in this application.

4.6.2.6 Voice Translation

Data or Voice:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
Data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Voice	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>

When voice channels are mapped between E1 and T1, the compander algorithms between the T1’s μ -law and E1’s A-law must be converted. When selecting these timeslots as “Voice”, the conversion is done in the digital domain. When selecting the timeslot as “Data”, no conversion is done and the data is passed between E1 and T1 transparently.

Note that in international connections, it is possible that T1 circuits are already encoded with A-law (which provides lower distortion for smaller signals). Check carefully with the carrier. If A-law companding is used in the T1 circuits, DO NOT select them as “Voice” in the **FRM220-FTEC**. Instead, select them as “Data” so they will be transparently carried.

4.6.2.7 Function Keys

Function Key

<input type="button" value="Set Parameters"/>	<input type="button" value="Port Reset"/>	<input type="button" value="Set to Default"/>	<input type="button" value="Refresh Status"/>
---	---	---	---

The “Set Parameters” button will take all the parameters set on this page and save them to the NMC for this Chassis, Slot and location.

The “Port Reset” will do a soft reboot of this line card’s firmware.

The “Set to Default” function will return all settings of this card back to their original factory default settings and save them to the NMC.

Status information on this page is not refreshed automatically. The “Refresh Status” button is used to update all of the screen display data.

4.7 Upgrading

Please refer to the **FRM220-NMC Operation Manual** which includes the detailed upgrade method when using the NMC. Line cards can be upgraded via local RS-232 console at the NMC, via remote Telnet connection or via the Web interface. In all three cases, a TFTP server must be available to transfer image file data to the NMC so that the NMC can transfer these images to the appropriate line cards.



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